CORA Cork Open Research Archive
Cartlann Taighde Oscailte Chorcaí

Title	The Irish brewing industry, c. 1780-1930: an archaeology
Authors	Harris, Caen
Publication date	2020-04
Original Citation	Harris, C. 2020. The Irish brewing industry, c. 1780-1930: an archaeology. PhD Thesis, University College Cork.
Type of publication	Doctoral thesis
Rights	© 2020, Caen Harris. - https://creativecommons.org/licenses/by-nc-nd/4.0/
Download date	2026-11-02 10:59:32
Item downloaded from	https://hdl.handle.net/10468/9988

UCC
University College Cork, Ireland
Coláiste na hOllscoile Corcaigh

The Irish Brewing Industry, *c*. 1780-1930: An Archaeology

Volume 1 of 2

Caen Harris

Submitted for the qualification of **Doctor of Philosophy [PhD]**

Department of Archaeology, National University of Ireland, Cork

April 2020

Supervisor: **Dr. Colin Rynne**

Head of Department: **Professor William O'Brien**



Table of Contents (Volume 1)

Declaration 1

Abstract 2

Chapter 1 Introduction 3

1.1 The aims and objectives of this research 3

1.2 Research questions 5

1.3 Previous scholarship 6

1.4 Methodology 12

Chapter 2 The development of the Irish brewing industry before 1850 28

2.1 The economic history of the industry to 1850 28

2.2 The changing regionality of the industry to 1850 42

2.3 Conclusions 51

Chapter 3 The development of the industry after 1850 57

3.1 The development of the industry in 1850-85 57

3.2 The development of the industry after 1885 66

3.3 Conclusions 77

Chapter 4 Raw materials 80

4.1 Hops 80

4.2 Water 83

4.3 Malted barley 85

4.4 Conclusions 108

Chapter 5 Brewing, process and technology (i), core brewing processes 110

5.1 Malt Milling 111

5.2 Mashing 116

5.3 Boiling 125

5.4 The significance of the surviving plant 135

5.5 Conclusions 136
Chapter 6 Brewing, process and technology (ii)- cooling, fermentation and maturation 138
6.1 Cooling and refrigeration 138
6.2 Fermentation 145
6.3 Maturation 153
6.4 Conclusions 158
Chapter 7 Powering the brewery 160
7.1 Horse Power 161
7.2 Water Power 165
7.3 Steam Power 171
7.5 Conclusions 190
Chapter 8 The physical development of the brewery in Ireland 193
8.1 The components of a brewery complex 193
8.2 The physical development of the brewery in Ireland before 1850 206
8.3 The physical development of the brewery in Ireland after 1850 218
8.4 Conclusions 228
Chapter 9 The Dublin city brewing industry 230
9.1 An overview of the development of the brewing industry in Dublin's Liberties 231
9.2 The locational advantages of breweries located in Dublin's Liberties 238
9.3 The physical expansion of Guinness's James's Gate Brewery 249
9.4 Conclusions 259
Chapter 10 Conclusions 263
10.1 Answering the posed research questions 263
10.2 Areas for future research 271
Glossary of Technical Terms 275
Bibliography 278

Table of Contents (Volume 2) Catalogue of Sites

Connaught 1

County Galway 2

Ballinasloe 3
Clifden 6
Eyrecourt 7
Galway City 9
Loughrea 15
Oranmore 17
Portumna 19
Tuam 21

County Mayo 25

Ballina 26
Ballindine 31
Ballinrobe 32
Castlebar 33
Claremorris 34
Shrule 35
Westport 39

County Roscommon 44

Boyle 45
Castlerea 46
Elphin 47
Roscommon Town 48
Strokestown 49

County Sligo 51

Sligo Town 52

Leinster 60

County Carlow 61

Borris 62
Carlow Town 63
Tullow 68

County Dublin 70
Dublin City 72
Kinsaley 114
Stillorgan 115
County Kildare 116
Athy 117
Kilcock 119
Maynooth 120
Monasterevin 122
County Kilkenny 123
Clogh/Cloneen 124
Graiguenamanagh 125
Kilkenny City 126
Thomastown 133
County Laois 137
Abbeyleix 138
Ballinakill 139
Mountmellick 140
Mountrath 145
Rathdowney 147
Rush Hall 148
County Longford 149
Longford Town 150
County Louth 151
Castlebellingham 152
Drogheda 154
Dundalk 159
County Meath 166
Kells 167
Trim 168
County Offaly 169
Banagher 170
Birr 171

Clonygowan 177
Kilcormac 178
Killeigh 179
Shinrone 181
Tullamore 182
County Westmeath 186
Athlone 187
Kilbeggan 190
Moate 191
Mullingar 192
County Wexford 193
Enniscorthy 194
Gorey 202
New Ross 203
Wexford Town 206
County Wicklow 218
Arklow 219
Ballintglass 220
Bray 221
Carnew 224
Newtownmountkennedy 225
Rathdrum 227
Munster 229
County Clare 230
Ennis 231
Killaloe 233
County Cork 234
Bandon 236
Bantry 244
Clonakilty 245
Cork City 250
Dunmanway 272
Fermoy 273
Kinsale 278

Mallow 280
Midleton 282
Mitchelstown 288
Riverstown 289
Skibbereen 290
Youghal 292
County Kerry 293
Dingle 294
Killarney 295
Tralee 296
County Limerick 301
Limerick City 302
Newcastle West 313
County Tipperary 315
Borrisokane 316
Borrisoleigh 318
Carrick-on-Suir 320
Clogheen 322
Cloghjordan 327
Clonmel 331
Nenagh 336
Roscrea 338
Thurles 340
County Waterford 343
Dungarvan 344
Tallow 347
Waterford City 350
Ulster 361
County Antrim 362
Antrim Town 363
Ballycastle 364
Ballymena 365
Ballymoney 366
Belfast 367

Lisburn 383
County Armagh 384
Armagh City 385
Lurgan 386
County Cavan 388
Belturbet 389
Killashandra 390
Virginia 391
County Derry/Londonderry 392
Ballyronan 393
Coleraine 394
Derry/Londonderry City 395
Desertmartin 398
Limavady 399
Maghera 400
Magherafelt 401
County Donegal 402
All Saints/Ballybegly Little 403
Ballyshannon 404
Rathmelton 405
County Down 406
Downpatrick 407
Hillsborough 410
Newry 411
Newtownards 414
Portaferry 416
Waringstown 418
County Fermanagh 419
Enniskillen 420
County Monaghan 421
Carrickmacross 422
Clones 423
Monaghan Town 424
County Tyrone 425

Ballygawley 426
Donaghmore 427
Dungannon 429
Omagh 430
Strabane 431

List of Figures

Figure 2.1. The import, export and production of beer in Ireland, 1720-1809. 29
Figure 2.2. Malt consumed by Irish breweries, 1810-30. 36
Figure 2.3. Malt consumed by and number of licensed breweries in Ireland, 1831-60. 39
Figure 2.4. The distribution of breweries in Ireland, by excise district, in 1791. 43
Figure 2.5. The distribution of breweries in Ireland, by excise district, in both 1791, on left and 1831, on right 45
Figure 2.6. The distribution of breweries in Ireland, c. 1835-50. 47
Figure 2.7. The distribution of breweries in Ireland, by excise district, in both 1831, on left and 1837, on right. 48
Figure 2.8. Populations of villages, towns and cities that sustained breweries in c. 1835, on left, and c. 1850, on right. 49
Figure 3.1. Malt consumed by and number of licensed breweries in Ireland, 1850-85. 58
Figure 3.2. Sales figures, in barrels, for Guinness, divided by British and Irish markets, for Beamish and Crawford (B & C), 1850-85, and for Murphy's Brewery, Cork city, 1858-85. 59
Figure 3.3. The distribution of breweries in Ireland, c. 1850-85. 62
Figure 3.4. Malt consumed by brewers, 1885-1914. Number of licensed breweries in Ireland, 1885-1920. 68
Figure 3.5. The distribution of breweries in Ireland, c. 1885-1920. 75
Figure 4.1. Beamish and Crawford's Rutland Street maltings 105
Figure 5.1. Upper-floor surveys of Beamish and Crawford, c. 1818 and 1839 119
Figure 5.2. Survey of Lane's Southgate Brewery, Cork, dated 1880. 134
Figure 6.1. Undated surveys of all three floors of the River Lee Porter Brewery, Cork, ... 139
Figure 6.2. The brewhouse at Beamish and Crawford in the late-1880s. 144
Figure 6.3. Undated measured survey of the vat room, Beamish and Crawford Cork 157

Figure 7.1. Plan of a complex horse engine designed by John Smeaton for the Weevil Brewery in Gosport, Hampshire. 162
Figure 7.2. Section drawing of a complex horse engine designed by John Smeaton for the Weevil Brewery in Gosport, Hampshire 162
Figure 7.3. Horse wheels at Beamish and Crawford, 1802 and c. 1818. 163
Figure 8.1. Hackett's Brewery, Birr, county Offaly, depicted on the OS Manuscript Townplans; 194
Figure 8.2. Two burgage plot breweries located either side of Water Lane in Sligo town. 208
Figure 8.3. Two burgage plot breweries located to the south of West Street in Drogheda, county Louth. 208
Figure 8.4. The early development of Beamish and Crawford, Cork city 209
Figure 8.5. OS Manuscript Townplan depiction of the Garryowen Brewery, Limerick city. 211
Figure 8.6. OS Manuscript Townplan depiction of the Watergate Brewery, Bandon, county Cork ... 211
Figure 8.7. Beamish and Crawford, as depicted in an 1880s etching. 223
Figure 9.1. Brewery sites identified by the survey in the Liberties area of Dublin city. 233
Figure 9.2. The distribution of breweries in Dublin city, after the 1828 *Valuation of Dublin* 235
Figure 9.3. The distribution of breweries in Dublin city, after the 1854 *Primary Valuation*. 236
Figure 9.4. The distribution of breweries in Dublin city, 1870-1930. 237
Figure 9.5. Dublin city's breweries and canal harbours. 242
Figure 9.6. The locations of each of Dublin's four primary train stations, depicted in conjunction with the distribution of breweries in the city in 1870. 247
Figure 9.7. Guinness's Brewery in 1820. 251
Figure 9.8. The phasing of Guinness's expansion from 1820 to 1924. 253

List of Plates

Plate 4.1. Guinness's first purpose-built hop store, constructed on Grand Canal Place in the 1850s or early 1860s. 82
Plate 4.2. Guinness's second, larger hop store, constructed on Rainsford Street in the late-1870s and early 1880s. 82
Plate 4.3. The Shrule Brewery maltings, a farmhouse maltings located in the outskirts of a village in county Mayo. 86
Plate 4.4. The Bantis Brewery maltings, a farmhouse maltings located near the town of Cloghjordan, county Tipperary. 86
Plate 4.5. Four-storey maltings at the Newcastle West Brewery in county Limerick. 91

Plate 4.6. One of two adjoining four-storey maltings, dating to the 1830s, at the Lough Gill or Sligo Brewery, Sligo town. 91
Plate 4.7. Simple two-storey maltings with un-fenestrated ground floor, the Killeigh Brewery, county Offaly. 93
Plate 4.8. Four-storey malting with partially fenestrated ground and first floors, Graham's Brewery, Westport. 93
Plate 4.9. Historic photograph of malt kiln drying floor, the Mill Park Brewery, Enniscorthy. 94
Plate 4.10. Cast-iron malt kiln furnace, the Mill Park Brewery, Enniscorthy. 94
Plate 4.11. Vaulted ground floor of maltings with furnace arch at the St. Mary's Well Brewery, Carlow town. 94
Plate 4.12. Early 20th century, double-floored malt kiln with ridge ventilator, the Lee Maltings, Cork city. 94
Plate 4.13. Late-1880s century, double-floored malt kiln with ridge ventilator, now glazed. Murphy's Lady's Well Brewery, Cork city. 94
Plate 4.14. Maltings at Read's Brewery, Kilkenny city. 96
Plate 4.15. Maltings at the Newtownards Brewery, county Down. 96
Plate 4.16. Barley stores, dating to the mid-1860s, at the Mill Park Brewery in Enniscorthy, county Wexford. 97
Plate 4.17. Barley stores, dating to the late-18th or early 19th century, at the Watergate Brewery in Bandon, county Cork. 97
Plate 4.18. Un-fenestrated malt stores, on right, dating to the mid-1860s, at the Cambrickville Brewery in Dundalk, county Louth. 98
Plate 4.19. Full-height internal void, viewed from the ground floor, at the eastern maltings, Rutland Street, Cork city. 99
Plate 4.20. Hand-dressed timber sack hoist at the Bantis Brewery, near Cloghjordan, county Tipperary. 99
Plate 4.21. Malt stores at Watkin's Brewery, Ardee Street, Dublin city. 100
Plate 4.22. Four-storey over semi-basement maltings, Wickham's Gibson's Lane Brewery, Wexford town. 103
Plate 4.23. Five-storey maltings, O'Neill's Brewery, Limerick city. 103
Plate 4.24. Five-storey-plus-attic maltings, Drinan's Brewery, Cork city. 103
Plate 4.25. Aerial view of Deasy's Brewery in Clonakilty, county Cork. 106
Plate 4.26. Aerial view of a courtyard maltings on King Street Upper, Wexford town. 106
Plate 4.27. Aerial view of a courtyard maltings on Harbour Street, Tullamore, county Offaly. 106

Plate 4.28. 1860s maltings, modest in scale, at the St. Mary's Well Brewery in Carlow town. 107
Plate 4.29. Late-1880s maltings and malt kiln at the Lady's Well Brewery, Cork city.....107
Plate 4.30. Substantial maltings dating to the 1880s located on Beresford Street, Dublin city. Constructed as a component of the North Anne Street Brewery. 107
Plate 5.1. Ganz roller mill, produced in Budapest, Hungary. Guinness Storehouse, Dublin. 111
Plate 5.2. Roller mill no. 1, produced in Dresden, Germany. Malt-milling loft, Beamish and Crawford, Cork.....111
Plate 5.3. Rotary screening plant, Beamish and Crawford 113
Plate 5.4. Malt-milling loft at Beamish and Crawford following damage received in hurricane-force storms in October 2017. 114
Plate 5.5. Millstones and Avery's grain weigher, the Mill Park Brewery, Enniscorthy. 115
Plate 5.6. Interior view of mash tun no. 1, the St. Mary's Brewery, Waterford.....118
Plate 5.7. Steel's mashing machine with cast-iron grist case, belt-driven by an extant electric motor. Mash tun no. 3, the St. Mary's Brewery, Waterford. 120
Plate 5.8. Painted cast-iron Steel's mashing machine, manufactured by Spence of Dublin. Guinness Storehouse, Dublin.....121
Plate 5.9. Open mash tun at the Mill Park Brewery, Enniscorthy in 1957.....122
Plate 5.10. Cast-iron mash tun by Spence of Dublin. Guinness Storehouse, Dublin. 123
Plate 5.11. Mash tuns nos. 1 and 2, the St. Mary's Brewery, Waterford. 124
Plate 5.12. Mash tun no. 3, the St. Mary's Brewery, Waterford. 125
Plate 5.13. Mash tun, grist case and Steel's mashing machine, Beamish and Crawford, Cork. 125
Plate 5.14. Brewing coppers with conical caps at Beamish and Crawford, Cork, in the early 20th century.....126
Plate 5.15. Two brewing coppers at the Mill Park Brewery, Enniscorthy in 1957.....129
Plate 5.16. Brewing copper with conical cap at Beamish and Crawford, Cork.....131
Plate 5.17. Dome-capped brewing copper, Guinness Storehouse, Dublin.....131
Plate 5.18. Brick setting for brewing copper, Watkins' Brewery, Dublin.....131
Plate 5.19. Barrel-vaulted furnace arch, the Belfast and Ulster Brewery, Belfast.....132
Plate 5.20. Remains of barrel-vaulted furnace arches, the Mill Park Brewery, Enniscorthy.....133
Plate 5.21. Fragmentary remains of former barrel-vaulted spaces, the Southgate Brewery, Cork. 133
Plate 6.1. Morton's vertical refrigerators at Beamish and Crawford, late-19th century.....140
Plate 6.2. Horizontal refrigerators at Guinness, Dublin. Late-19th or early 20th century 141
Plate 6.3. Horizontal plate heat exchanger by APV. Guinness Storehouse, Dublin.....145

Plate 6.4. Attemperated fermenting square, the St. Mary's Brewery, Waterford. 146
Plate 6.5. Cleansing stillion at the Millpark Brewery, Enniscorthy in 1957 147
Plate 6.6. Portion of cleansing stillion, reduced in length and upside-down, the Millpark Brewery, Enniscorthy. 147
Plate 6.7. Manual yeast skimming at the Guinness Storehouse in the early 20th century 149
Plate 6.8. Cleansing square with manual yeast skimmer, Guinness Storehouse, Dublin. 151
Plate 6.9. Upper floor of the fermenting block, the St. Mary's Brewery, Waterford. 152
Plate 6.10. Lower floor of the fermenting block at the St. Mary's Brewery, Waterford. 152
Plate 6.11. Late-19th century photograph of the vat room, Beamish and Crawford, Cork 157
Plate 6.12. Late-19th or early 20th century photograph of a vat room, Guinness, Dublin 157
Plate 6.13. Vat house no. 4, Guinness, Dublin city. Constructed between 1862 and 1865. L 158
Plate 6.14.Maturation Vat, dated to c. 1880. Guinness Storehouse, Dublin. 158
Plate 7.1. Apsidal western elevation of building at Blake's Brewery, Tuam. It potentially housed a horse wheel. 164
Plate 7.2 Multi-storey flour mill, Grubb's Brewery, Clogheen. 167
Plate 7.3 Five-storey, multi-bay maltings and grain store. Grubb's Brewery, Clogheen. 167
Plate 7.4 Multi-bay, four-storey maltings, on left, meeting double-pile, three-storey flour mill, on right. The Bray Brewery, county Wicklow 167
Plate 7.5 Sluice gate at the Dunnamark milling complex, Bantry, county Cork. 168
Plate 7.6 Partially surviving water-wheel pit and axle, Walker's Brewery, Fermoy, county Cork. 168
Plate 7.7 Masonry mill race, a canalised tributary of the River Corrib. The Madeira Island Brewery, Galway city. 169
Plate 7.8 Cast-iron bracket for water-wheel axle, the Madeira Island Brewery, Galway city. The water wheel in the background is a recent replica. 169
Plate 7.9. Cast-iron water wheel, originally from the St. Francis's Abbey Brewery, Kilkenny city. Stored, in two halves, at the Straffan Steam Museum, county Kildare. 170
Plate 7.10. House-built Boulton and Watt beam engine at the National Museum of Scotland, Edinburgh. It was originally installed in Barclay's Brewery in London in 1786 and remained in use at the brewery until 1885. 171
Plate 7.11. Beam engine house, Beamish and Crawford, Cork city. 175
Plate 7.12. Date stone, Beamish and Crawford beam engine house. 175
Plate 7.13. A-frame independent steam engine. Originally installed at the Watergate Brewery in Bandon, county Cork. Now at the Straffan Steam Museum, county Kildare. 181

Plate 7.14 Two-column, independent beam engine. Originally installed at the St. Francis's Abbey Brewery, Kilkenny city. Now at the Straffan Steam Museum, county Kildare. 181
Plate 7.15 Engine house and chimney, dating to the mid-1860s reconstruction. The Cambrickville Brewery, Dundalk, county Louth. 183
Plate 7.16 Engine house and chimney, dating to the mid-1860s reconstruction. The Mill Park Brewery, Enniscorthy, county Wexford. 183
Plate 7.17 Engine room at the Belfast and Ulster Brewery. 187
Plate 7.18 Northern set of sliding fire doors in the engine room at the Belfast and Ulster Brewery. 187
Plate 7.19. Horizontal non-condensing engine by Spence of Dublin. Installed in Guinness's Cooke's Lane maltings in c. 1896. Guinness Storehouse, Dublin. 188
Plate 7.20. Gas engine, manufactured by Crossley Brothers Ltd., Manchester. Dating to 1895 and used power an electrical light system. Guinness Storehouse, Dublin. 190
Plate 8.1. Rare surviving single-building brewhouse, probably dating to the early 19th century. Hackett's Brewery, Birr, county Offaly 194
Plate 8.2. The much-altered remains of the the brewhouse at the Mill Park Brewery, Enniscorthy, county Wexford. 195
Plate 8.3. Historic photograph of the brewhouse at the Mill Park Brewery, Enniscorthy, county Wexford, taken in 1957. 195
Plate 8.4. Single-building brewhouse at the St. Mary's Well Brewery in Carlow town, constructed in the early 1860s 197
Plate 8.5. Single-building brewhouse at Wickham's Gibson's Lane Brewery in Wexford town, on right. Probably dating to the early 19th century. 197
Plate 8.6. Ventilated core brewery buildings at the Cambrickville Brewery, Dundalk, county Louth. 198
Plate 8.7. Fermentation block at the St. Mary's Brewery, Waterford city, constructed in 1899-1901. 198
Plate 8.8. The experimental brewery, Guinness, Dublin city. A tower brewery constructed in 1904. 199
Plate 8.9. The Castlebellingham Ale Brewery, county Louth. A rare example of a Victorian tower brewery in Ireland, likely constructed in c. 1870. 199
Plate 8.10. Rooftop rivetted cast-iron water tank at the City of Dublin Brewery, originally constructed as a distillery by John Busby in 1836. 200
Plate 8.11. Rooftop rivetted cast-iron water tank at Beamish and Crawford, Cork city. 200

Plate 8.12. Vat houses, dating to the late-19th and early 20th centuries, arranged on either side of Belview. Guinness, Dublin city. 201
Plate 8.13. Much-altered late-18th or early 19th century vat house, the Watergate Brewery, Bandon, county Cork. 201
Plate 8.14. The cask-cleaning shed at Guinness in the early 20th century 202
Plate 8.15. The cask-making shop at Guinness in the early 20th century 202
Plate 8.16. Beamish and Crawford's decorative 1902 stables on Bishop Street, Cork city. 203
Plate 8.17. Probable stables, the Mill Park Brewery, Enniscorthy, county Wexford. 203
Plate 8.18. Brewer's house, Watkins' Brewery, Dublin city. 204
Plate 8.19. Brewer's house, the Phoenix Brewery, Dublin city 204
Plate 8.20. Modestly composed brewer's house, the Quay Brewery, Thomastown, county Kilkenny. 205
Plate 8.21. Modestly composed brewer's house, the Borrisoleigh Brewery, county Tipperary. 205
Plate 8.22. Simple office building at the Mill Park Brewery, Enniscorthy, county Wexford. Constructed in the mid-1860s redevelopment of the brewery. 205
Plate 8.23. Ornate office building, the Cambrickville Brewery, Dundalk, county Louth. Constructed in the mid-1860s redevelopment of the brewery. 205
Plate 8.24. The much-altered, two-storey, eight-bay, north range of Walker's Brewery, Fermoy, county Cork. 212
Plate 8.25. The probable brewhouse of Jones and Cowperthwaite's Brewery, Cork city. 214
Plate 8.26. The core brewery at Beamish and Crawford, Cork city, viewed from the west. 216
Plate 8.27. The City of Dublin Brewery, Fumbally Lane, Dublin city. Originally a distillery, constructed in 1836, that was converted to brewing in the 1860s. 217
Plate 8.28. Thomas Murphy's Brewery, Clonmel, county Tipperary. A purpose-built brewery with a crenelated pediment, constructed in c. 1830. 217
Plate 8.29. The remains of the primary courtyard at Beamish and Crawford, as seen in October 2016. The building on the left has since been demolished. 218
Plate 8.30. Late-19th century photograph of the primary courtyard at Beamish and Crawford, Cork city 218
Plate 8.31. Decorative gateway, the sole surviving element of Manders and Powell's Brewery, Dublin city 218
Plate 8.32. Decorative gateway and gate lodges, providing access to the 'north deck' of Guinness's Brewery, Dublin city. 218

Plate 8.33. Mid-18th century foundling hospital buildings, the sole surviving element of the 1856 Lady's Well Brewery, Cork city. 219
Plate 8.34. Limestone warehouse, one of the few surviving elements of the Mountjoy Brewery, Dublin city. 219
Plate 8.35. Decorative offices at the Belfast and Ulster Brewery in Belfast, demolished in the c. 1970s. Elements of the sculpted masonry have been preserved. 222
Plate 8.36. Former brewhouse at the Belfast and Ulster Brewery, Belfast. Constructed in 1864-7 in a classical revival style, featuring polychrome brick and sculpted masonry detailing. 222
Plate 8.37. Beamish and Crawford, Cork city, as seen in October 2016. 223
Plate 8.39. The façade of a former ornate office building at the Lady's Well Brewery, Cork city. 225
Plate 8.38. Limestone warehouse, Watkins' Brewery, Dublin city. 225
Plate 8.40. The Counting House, Beamish and Crawford, Cork city. 227
Plate 9.1. The residence of the first Arthur Guinness. Constructed in c. 1770 and 249
Plate 9.2. Vat houses, dating to the late-18th and early 19th centuries. 251
Plate 9.3. Vat house, located on the east side of Crane Street, northeast of the junction with Rainsford Street. Constructed between 1865 and 1872. 254
Plate 9.4. Guinness's Brewery No. 2. The original brewhouse is the rectangular structure in the foreground, constructed in 1877-9. The late-19th and early 20th century extensions comprise the heavy block of buildings with sawtooth roofs that project from the rear. 255
Plate 9.5. Locomotive no. 17, designed by Samuel Geoghan and constructed by Spence's Iron Works of Cork Street, Dublin city, in 1902. 256
Plate 9.6. Narrow-gauge rail tracks on Rainsford Street. 256
Plate 9.7. Vat houses located on the south side of Belview. Constructed in at least two phases between 1900 and 1924. 257
Plate 9.8. Guinness's Robert Street Store, a purpose-built malt store constructed in 1880-4. At the time of its construction it is said to have been both the largest malt store in Europe and also the building with the tallest load-bearing brick walls in the world. 258
Plate 9.9. Guinness's Market Street Storehouse, viewed from the southwest. The western elevation, on left, is said to be a particularly early examples of a true brick cladding which has been proposed as being the earliest use of such a cladding in Britain or Ireland. 259
Plate 9.10. Guinness's Market Street Storehouse, viewed form the southeast 259

List of Tables

Table 2.1. The import, export and production of beer in Ireland, 1780-1809, in barrels. 33
Table 2.2. Sales figures for Beamish and Crawford (B & C), 1793-1820, and for Guinness, 1800-20. . 35
Table 2.3. Production figures for Dublin's nine largest breweries in 1810-11. 35
Table 2.4. Number of licensed brewers in Ireland, 1790-91. 35
Table 2.5. Sales figures for Beamish and Crawford (B & C) and Guinness, 1835-50, and for the Madeira Island Brewery in Galway city, 1836-40. 40
Table 2.6. Raw data for places with a population greater than 15,000 in 1841 that are known to have sustained a brewery in c. 1835. 52
Table 2.7. Raw data for places with a population of 5-15,000 in 1841 that are known to have sustained a brewery in c. 1835. 53
Table 2.8. Raw data for places with a population of 2-5,000 in 1841 that are known to have sustained a brewery in c. 1835..... 54
Table 2.9. Raw data for places with a population of 1-2,000 in 1841 that are known to have sustained a brewery in c. 1835..... 55
Table 2.10. Raw data for places with a population below 1,000 in 1841 that are known to have sustained a brewery in c. 1835. 56
Table 3.1. Sale figures for Guinness and Beamish and Crawford (B & C), 1885-1920, for Murphy's Brewery, 1885-99, and for the Watergate Brewery, Bandon, 1887-1913. 68
Table 6.1. Vatting capacity vs annual output at Guinness, 1820-1938..... 155
Table 7.1. Water-powered breweries identified in the course of the survey. 166
Table 7.2. Steam engines installed in brewery contexts, as recorded by the Railway Commissioners. 177
Table 9.1. Unlocated breweries in Dublin's Liberties, as listed in *Wilson's Dublin Directory* of 1794 and 1815 234

Declaration

This is to certify that the work I am submitting is my own and has not been submitted for another degree, either at University College Cork or elsewhere. All external references and sources are clearly acknowledged and identified within the contents. I have read and understood the regulations of University College Cork concerning plagiarism.

Signed:

_____

Caen Harris

Abstract

From the late-18th to the early 20th centuries, the Irish brewing industry underwent an extended process of transformation. This extended period saw the early industrialisation of several Irish breweries in the late-18th and early 19th centuries. This was followed by the continued concentration of the industry towards ever greater units of production in the 19th century and the rise of Guinness, in particular from the 1830s on, a brewery that expanded to become both the most-substantial industrial concern in Ireland and the world's most-productive brewery before the close of the 19th century. The process of transformation that the industry witnessed during the extended period under consideration laid the foundations for the makeup of the Irish brewing industry today, where the bulk of production is confined to one truly international-scale brewery. While previous histories have aimed to further our knowledge on the various factors that led to this transformation, they have been somewhat limited in their scope. This is owing to the relatively under-studied nature of many of the breweries that produced in Ireland during the period. This thesis, which is grounded in the discipline of industrial archaeology, is intended to fill many of the considerable gaps in our knowledge of the industry's development during an extended timeframe that was key in Ireland's wider economic, industrial, social and political development.

Chapter 1 Introduction

This thesis outlines the physical, technological and economic development of Irish brewing across a broad timeframe. During the extended period under consideration brewing in Ireland had transformed from being a craft, the products of which were primarily consumed locally, to becoming an internationally significant industry that was dominated by one international-scale brewery, Guinness. Grounded firmly within the discipline of industrial archaeology, the thesis aims to elucidate on the causative factors behind the industry's considerable advancement during the period. The principal topics considered are the industry's regional and technological development as well as the architectural and functional form of Irish breweries, both great and small. The principal dataset that is analysed is derived from an island-wide survey of Irish brewery sites, which comprises the first island-wide survey of an Irish industry. The survey data is then contextualised through the engagement with both published histories and original historical research, an approach that intends to provide as balanced a view as possible of the industry's development.

1.1 The aims and objectives of this research

In order to elucidate on the various causative factors that led to the industry's transformation during the extended period under consideration, the following four principal aims and related objectives for this research were formulated:

a) The temporal regionality of the Irish brewing industry has not been presented by previous scholars, with neither the locations nor the histories of the majority of the breweries that operated in Ireland during the extended studied timeframe being previously engaged with. In order to address this significant gap in our knowledge of the industry's development, the development of both a temporal and regional framework for the brewing industry in Ireland is one of this thesis's principal aims. To achieve this aim, a detailed paper survey of Ireland's historic breweries has been carried out. This paper survey, which engaged with the most-relevant cartographic and historical sources, both primary and secondary, involved the identification of both the locations and general dates of operation of as many of Ireland's historic breweries as was possible. This paper survey formed the initial stages of what was the first island-wide survey of a historic industry in Ireland. The data collected enables the conclusions of previous histories to be re-assessed on both regional and temporal grounds, with a particular focus on the causative factors that led to periods of expansion and decline for the industry.

b) The architecture of the Irish brewing industry, and in particular the physical development of the porter brewery in Ireland, has previously been outlined by Rynne (1999, 40-59; 2006, 236-48). While Rynne's works are particularly important pieces of scholarship, they are somewhat limited in their scope, with the industrial archaeologies of both Ireland's brewing and related malting industries being provided as sub-sections of chapters dedicated to the food processing industries. These chapters are, in turn, presented in significant wider works that outline to the industrial archaeologies of Cork city and Ireland as a whole. This thesis aims to expand upon Rynne's overviews of the physical development of the brewery in Ireland, while also contextualising this physical development within the context of the contemporary developments in Britain. In order to achieve these aims, the paper survey of Ireland's historic brewing industry was followed by an extensive field survey, which aimed to record as much detail as possible from the standing remains of the historic breweries that were previously identified in the course of the paper survey. In addition to the field survey, cartographic analysis has been used extensively to identify the layout and arrangement of Ireland's historic breweries, with the aim being to identify regional and temporal trends in brewery form and arrangement in addition to surviving architecture. In order to place the identified trends within a wider context, Pearson's architectural histories of the British brewing industry (1999; 2010; 2014) and Patrick's (1996; 2004) industrial archaeologies of the English malting industry have been engaged with.

c) The early industrialisation of several significant breweries located in both Dublin and Cork cities during the late-18th and early 19th centuries has previously been outlined by scholars. The process of this early industrialisation, which was triggered by a movement of both ideas and labour from the London porter brewing industry in the second half of the 18th century, has also previously been outlined. However, it remains unclear whether the process of early industrialisation was confined to breweries located in Ireland's largest port cities during the late-18th and early 19th centuries, while no previous studies have engaged with the transmission of industrialisation to Ireland's less-substantial local and regional breweries as the 19th century progressed. This research aims to further our knowledge on both the regionality and temporality of the transmission of industrialised brewing. In order to achieve this aim, an inter-disciplinary approach has been adopted. This approach combines the study of the archaeological features associated with industrialisation, principally surviving brewing plant and features associated with the production of motive power, and both the cartographic and historic record.

d) The final principal aim of this research is to further our knowledge on the factors that led to Guinness's ascension to becoming first Ireland's and later the world's largest brewery by output. Previous scholars have commented on the factors that led to Guinness's domination of the Irish market, which Lynch & Vaizey (1960, 242-50) primarily ascribed to the sound management decisions of successive generation of the Guinness family and appointed senior management figures. More recently, Bielenberg, in general, agreed with Lynch and Vaizey's interpretation. However, the unique makeup of the Irish brewing industry following the significant contraction in the number of breweries operating in Ireland during the late-1830s and 1840s was also highlighted as being a further contributing factor in Guinness's acquisition of the majority share in the market for beer in Ireland y. While the impacts that the sound management of the brewery had on its growth, as highlighted by Lynch and Vaizey, will not be challenged, this research aims to identify further factors that contributed to the brewery's unique development. In particular, any advantages that the brewery's location may have provided will be identified, with particular reference to the availability of raw materials and access to improved transport systems. In addition, the brewery's physical development will be outlined, with the aim being to identify any unique areas of this development that set it apart from Ireland's other significant 19th century brewing firms.

1.2 Research questions

The previously outlined aims and objectives of this research have led to the formulation of the following inter-related research questions that this thesis aims to answer:

a) What was the regionality of the Irish brewing industry? Did the regionality of the industry change in time?

b) If so, what was the temporality of these regional changes and how does this changing regionality fit within the historical framework provided by previous scholarship? These questions are posed with a particular reference to the periods of expansion and decline that industry witnessed in the 19th century, with the aim being to further our knowledge of the causative factors of each of these particular temporal trends.

c) Was the early industrialisation of brewing in Ireland during the late-18th and early 19th centuries confined to both Cork and Dublin cities or did breweries located elsewhere engage with the trend?

d) How rapidly did industrial brewing technology and the use of steam-powered automation spread to the regional Irish brewing industries?

e) How does the temporality of this technological transmission compare to that seen in Britain?

f) What were the principal forms of Irish brewery complexes at various points in the studied period?

g) How does the architecture of Irish breweries compare to the contemporary architecture of those in Britain?

h) The key locational concerns for an Irish brewery, which were 'immediate access to an urban population, a barley supply, and … some form of water transport for the supply of bulky raw materials', were highlighted by Rynne (2006, 244). How did these locational concerns shape the makeup of the Irish brewing industry at various key points in the extended studied period?

While each of the previous research questions are concerned with the wider development of the Irish brewing industry, Guinness, as the world's largest most-productive brewery in the late-19th century, deserves a particular focus. This has led to the formulation of two research questions that focus on the Guinness site itself:

i) Did Guinness have any unique locational advantages that may have been factors in the brewery's increasing dominance of the Irish market during the second half of the 19th century?

j) Is there a unique archaeological signature at the Guinness site that sets its development apart from Ireland's other industrial breweries?

1.3 Previous scholarship

The Irish brewing industry is a relatively understudied topic, from both a historical and an industrial archaeological perspective, with much of the previous scholarship having been focussed on Ireland's more-substantial historic breweries. Dedicated histories of the industry have typically been focussed on individual firms, with Ireland's largest breweries in the 18th and 19th centuries, Guinness of Dublin city and both Murphy's and Beamish and Crawford of Cork city, being provided detailed company histories.

There has been a wealth of both popular and amateur historical research on Guinness, though two academic histories of the firm have been produced. The earliest of the academic histories of Guinness, by Lynch and Vaizey (1960), is an important early piece of Irish economic history that interprets the history of the brewery to 1876 in the light of Ireland's wider economic development. In

the authors' own words, the history is 'for the most part dry and technical, because an objective account of a great business's evolution in an economy whose main outlines are often misunderstood had for us a far greater value' (Lynch & Vaizey 1960, 243). Primarily focussed on Ireland's most-substantial 19th century industrial concern, one that would rise to become the world's largest brewery before the close of the century, the work provides a detailed overview of the technical and financial management of the brewery. The authors outline the development of the brewery from being one of many small-scale producers located in a large and expanding city through its early industrialisation at the close of the 18th century and onto to its dominance of both the Irish and export markets. The early introduction of porter brewing to Dublin in the 1760s, instigated by a movement of both people and ideas from the London brewing industry, is covered, as is a reasonably detailed overview of Guinness's engagement with new technologies, though sources pre-dating *c.* 1830 are sparse and information from that period is largely absent. While detailed information on the firm's development makes up the greatest part of the work, its primary importance is in the contextualisation of the firm's development against the economic and political development of Ireland as a whole. In particular, the authors' overview of the legislative reforms that encouraged the early industrialisation of Irish brewing at the close of the 18th century is of importance, as is the analysis of Guinness's exploitation of improved transport systems as both a source of raw materials and as a vector for the expansion of the brewery's markets in the 19th century.

More recently, Dennison and MacDonagh (1998) provided a more-traditional company history of Guinness. It begins in 1886, when the brewery was floated on the stock markets, and continues to 1939. Unlike Lynch and Vaizey's history, the work does not aim to contextualise the firm's development within a wider context, though several important phases in the firm's industrial development are covered. Perhaps the most important elements of the work, at least in respect of the aims of this thesis, is the overview of Guinness's engagement with scientific practice in the late-19th and early 20th centuries. This had begun in the 1880s, when the brewery introduced a policy of hiring practical chemists, and matured in the early decades of the 20th century, when the firm carried out extensive research into the chemical properties of both barley and hops. From the perspective of the current study, Dennison and MacDonagh provide a regrettably limited overview of the technical development of the brewery itself, with little discussion of either building works at the site or the introduction of new brewing technologies.

Recent histories by Ó Drisceoil and Ó Drisceoil (1997; 2015) provide a detailed overview of the two largest breweries that operated in Cork city during the period under consideration. These are Beamish and Crawford's Cork Porter Brewery, Ireland's largest brewery in the late-18th and early 19th centuries, and Murphy's Lady's Well Brewery, a foundation of the 1850s that supplanted Beamish and

Crawford as the city's most-productive brewery before the close of the 19th century. Both histories are particularly well illustrated, with historic photographs of both breweries presented in conjunction with detailed historic plans of the sites, which plot their physical developments. The earliest of these works covers the history of Murphy's Brewery. While it is somewhat limited in its scope, providing a company history that does not aim to contextualise the development of the brewery in a wider context, it is a detailed history that covers many points that are of interest to the current thesis. Information is provided on the technical development of the brewery, with both the development of the brewery's building stock and its engagement with new technologies covered, while information on the brewery's primary markets, which were largely confined to the Munster counties, and its exploitation of improved transport systems is also provided.

Ó Drisceoil and Ó Drisceoil's (2015) recent history of Beamish and Crawford's Cork Porter Brewery is wider in its scope. In addition to the firm that it is primarily focussed on, sections are also dedicated to Cork city's remaining industrial breweries, the developments of which are contextualised within the wider context of the development of both the British and Irish brewing industries and Ireland's economic and political history. The brewery's physical development is particularly well covered, with the brewery's extensive collection of detailed plans, themselves housed in the brewery's archives, presented. Throughout the work, the sources of the brewery's raw materials are referred to, as is the regionality of the brewery's markets, which were primarily local throughout the period under consideration. The technical development of the brewery is also covered, with the brewery's engagement with new technologies after *c.* 1860 provided a particular focus. The authors' treatment of the early 20th century is significant. Unique, from an Irish perspective, is their outline of the impacts that the extended period of industrial unrest and war that began in the 1910s had on the wider Irish brewing industry, with the output of the industry not returning to their pre-*c.* 1910 highs following the close of the Irish Civil War of 1922-3.

While both Lynch and Vaizey's history of Guinness and Ó Drisceoil and Ó Drisceoil's history of Beamish and Crawford contextualise the development of Ireland's largest breweries within a wider context, Bielenberg (1991, 50-60; 1998; 2009, 77-87) is the only historian to provide an overview of the history of the Irish brewing industry as a whole. Bielenberg has produced three important works of economic history that cover the industry, two of which are minor sections of greater works, economic histories of Cork city and Ireland, while the third is an article that contextualises Guinness's development within that of both the Irish and British brewing industries. In Bielenberg's works on the economic histories of both Cork city and Ireland, the early industrialisation of brewing in Dublin and Cork cities is covered. This first phase of industrialisation occurred at a time when imports from Britain were hampered by the contemporary French Wars and was followed by a period of decline for the

industry that followed the cessation of these wars in 1815 (Bielenberg 2009, 78-9). Bielenberg highlighted the dense populations of both cities as being a factor in this early industrialisation, while also highlighting the Grand Canal as being a vector for the growth of the industry in Dublin city during the 19th century. Changing consumption patterns, in particular the decline in spirit consumption, were proposed as being a factor in the post-Famine expansion of the industry, while Bielenberg also followed Lynch and Vaizey's assertion that both the development of the rail network and the expansion of the cash economy in rural Ireland played a significant role in this expansion.

While Bielenberg's works provide a detailed overview of the industry's economic history, they also primarily focus on Ireland's largest breweries. This is due to the well-documented nature of the likes of Guinness and Beamish and Crawford, with the majority of Ireland's smaller local and regional breweries having previously received little in the way of academic interest. Indeed, the primary focus of Bielenberg's two more recent publications on the industry was largely concerned with explaining Guinness's rise to prominence, with Bielenberg (2009, 87) highlighting that the firm was 'the most successful concern in the Irish food and drink sector' in the 19th and early 20th centuries. Three distinct phases that led to the firm's domination of the Irish brewing industry were identified (Bielenberg 1998, 103-4). The first occurred in the late-18th and early 19th century when the firm engaged with the first phase of industrialisation. This was followed by an expansionist phase in the 1820s and 1830s, where the brewery exploited both the Grand Canal and steam shipping to expand their markets in both Ireland and Britain. The third phase of expansion was in the decades that followed 1850, when the expanding rail network enabled the brewery's continued exploitation of both the British and Irish markets. The growth of the brewery's Irish trade in the decades before 1900 was highlighted as being particularly important, underlined by the fact that by 1900 more than two-thirds of the brewery's sales were in Ireland, while the British market increased in importance for the brewery after 1920 (Bielenberg 2009, 87).

As was previously stated, Rynne (1999, 40-59; 2006, 236-48) is the only archaeologist to have published on the Irish brewing industry. These works, which form sub-sections of chapters dedicated to the food processing industries, are presented within substantial works that outline the industrial archaeologies of Cork city and Ireland as a whole. General overviews of the development of both the malting and brewing industries are provided which, while constrained by the nature of the wider works in which they are presented, provide a baseline for the current study. Outlined in brief are the rational and practice of each of the sub-processes of both the malting and brewing processes, with reference made to surviving plant. In addition, a brief overview of their impacts on the architecture of the buildings in which they were carried out is provided, while a general overview of the development of the brewery complex in Ireland is outlined. As with the previously discussed histories, Rynne's works

on the industry are largely confined to the discussion of Ireland's more-substantial historic breweries, though some comment on the development of Ireland's less-substantial regional and local breweries is also made. In particular, the prominence of the courtyard arrangement in the surviving late-18th century breweries in Cork city is highlighted, as is the early installation of steam engines, which supplanted horse-powered automation, at sites such as Sweetman's Brewery on Francis Street in Dublin city.

The previously discussed publications comprise the majority of the breadth of academic scholarship on the Irish brewing industry. In order to provide broader comparative data on the development of the industry in Ireland, the industrialisation of which occurred in tandem with the industrialisation of the British provincial brewing industries, further works on the development of the British brewing industry have been consulted. These can be divided into works of economic history and architectural history.

The economic history of British brewing is well covered by two considerable publications. The first, considered a classic of the genre, is an early work by Mathias (1959), whose PhD research focussed on the development of the English brewing industry in the period 1700-1830. This work is primarily focussed on the internationally significant London porter brewing industry, where industrial scale production had been achieved before the mid-18th century. While largely focussed on London, some reference is made to the transmission of industrialisation towards the provinces at the close of the 18th century. Mathias provides a detailed overview of the industry, focussing on brewing itself, malting and the hop trade. Of particular importance for the aims of this thesis is the considerable detail that is provided on the early development of improved brewing plant and power transmission in the late-18th and early 19th centuries in London. This data provides a framework in which the contemporary developments in Ireland can be contextualised.

More recently, Gourvish and Wilson (1994) provided an immensely detailed overview of the economic history of the wider British brewing industry from 1830 to 1980. This work is divided into two sections with the first, produced by Wilson, covering the period 1830-1914, and the second, provided by Gourvish, covering the period 1914-80 (*ibid*., xix-xx). While the work as a whole provides important comparative data to contextualise the development of the Irish brewing industry within that of the British, it is again in the treatment of the industry's processual and technological developments that provide the most important data for this thesis. When discussing the technical development of the industry, Gourvish and Wilson highlighted the dearth of evidence for the use of steam-powered brewing plant in many of the provincial British brewing centres prior to the 1870s (*ibid*., 51). This is in direct contrast to the detailed overview of the developments in London prior to

1830 that were outlined by Mathias and to the post-*c*. 1870 developments in both process and technology, which are provided by Gourvish and Wilson.

While the economic histories of British brewing provide a good level of detail on the technological development of the industry, they say little about either the architecture of the breweries themselves or the rates of survival of brewing plant. These areas have been the focus of extensive study by Pearson (1999; 2010; 2014), who has provided overviews of both the architectural and technological development of the wider British brewing industry. While Pearson makes reference to the physical and technical development of the industry in Britain prior to 1830, the works are primarily focussed on the industry's post-1830 development. This is a situation that has been predicated by survival, with Pearson having identified that few British breweries that pre-date *c*. 1830 have survived. Pearson's works highlight how the brewing process has shaped the architecture of purpose-built brewery buildings from at least the mid-18th century, while they have also identified the early engagement of engineers and architects in the design of breweries, which had begun in the 1780s. The architectural trends highlighted will serve to suggest the levels of contact between the British and Irish brewing industries throughout the studied period, enabling the standing remains recorded in the course of the survey to be compared and contrasted to those recorded by Pearson. Also provided is a detailed overview of brewing technology, with the prevalence of surviving plant recorded in addition to general histories of the primary manufacturing firms. This will serve to highlight the importance of the surviving brewing plant in Ireland, a scarce resource, while it will also provide insight into the contemporary technological advancement of the Irish brewing industry.

The previously discussed works enable the sub-division of the extended period under consideration into periods of decline and expansion for the wider Irish brewing industry. For much of the 18th century, brewing in Ireland can be said to have been in decline while imports from Britain increased significantly from the 1740s, when the Irish market was directly targeted by the industrial-scale London porter breweries. This situation changed in the closing decades of the century when a combination of legislative reforms intended to encourage the industry and the impacts of the French wars led to the early industrialisation of several Irish breweries. Previous studies have identified this trend in both Dublin and Cork cities. The cessation of the French wars resulted in a period of decline for the industry that last for much of the 1820s, while the industry's output is known to have expanded in the 1830s. However, a significant contraction, both in the output of the industry and in the number of breweries in Ireland, is confirmed to have lasted through the late-1830 and 1840s. Beginning in the early 1850s, the industry again expanded, both in its output and in the number of breweries operating in Ireland. The expansion in output of the wider industry continued through to the early 20th century, though it was primarily driven by the exponential growth that Guinness saw in this period, with

Guinness rising to become world's largest brewery by the 1880s. In contrast, many of Ireland's regional and local breweries struggled during the same period and by the beginning of the 20th century Ireland was served by relatively few breweries which were primarily located in large towns and cities in Munster and Leinster.

1.4 Methodology

1.4.1 The Scope of the Thesis

The current thesis is essentially a traditional industrial archaeology, focussing primarily on sites of production that are typically interpreted through the lens of economic and industrial history. That is not to say that it has been carried out in ignorance of the reasonably recent movement within industrial archaeology towards becoming a period rather than a thematic discipline. This movement has called for a shift in the discipline's approach away from its previously descriptive and often site-specific focus towards the analytical.[1] As Palmer (2005, 60) succinctly stated, the interpretations of industrial archaeologists have often gravitated towards 'technological paradigms rather than social meanings', with the suggestion being that a period discipline would seek to explore the cultural rather than the purely technical or economic impacts of industrialisation. In order to infer both the social and cultural, a range of topics for future industrial archaeological studies have been proposed. These include, but are certainly not limited to, studies of class, gender and identity, which could be inferred through the use of traditional industrial archaeological methods that are grounded in a firm theoretical framework and focussed on new site types, typically those not solely devoted to production. Housing, in particular has been an area that has achieved a great deal of attention from scholars within the discipline.[2] In comparison, areas such as sites of retail and commerce, which are closely linked with both industry and wider cultural and social matters, have largely been omitted from industrial archaeological debate.

At its base level this thesis, and in particular the field survey on which it is founded, remains largely descriptive. However, rather than remaining reasonably narrow in its perspective, the broad geographic scope of the survey, which can be viewed as being successively national, regional and local in scope, partly alleviates this shortcoming. In addition, the attention that has been paid to the smaller sites of production, which have previously eluded the attention of scholars for the most part, enables a balanced view of the industry's development. This could not have been achieved through

[1] See the volumes edited by Casella & Symonds (2005) and Horning & Palmer (2009) for detailed discussions on the potential future research aims for both industrial and historical archaeology.
[2] The relative maturity of workers' housing as a point of study for industrial archaeologists is displayed in the recent publication of an edition of *Industrial Archaeology Review* (2017 vol. 39:2) dedicated to the subject.

a narrower analysis that focussed solely on Ireland's larger historic breweries, whether they be international, national or regional in scale. The thesis is also product rather than people focussed by design. Indeed, in its early inception it had been intended to follow the product both backwards and forwards through the supply chain. This would have been achieved through the inclusion of additional chapters, themselves based on further extensive field survey, focussed on both the wholesale and retail of beer. This approach would have enabled a true archaeology of a product, one which would have had a more integrated inclusion of both the social and cultural through the inclusion of the consumer as a key point of research. However, the sheer wealth of data collected in both the paper and field surveys of brewery sites, and the many nuanced interpretations that this data has both suggested and affirmed, served to highlight that a robust archaeology of production was a required predecessor to any archaeology of retail focussing on the consumer and consumer habits. As such, this thesis should be viewed as being an essential steppingstone towards a robust archaeology of consumption, one that requires extensive follow-on studies to be realised.

These follow-on studies would require a robust theoretical framework through which the act of consumption could then be contextualised. The inter-disciplinary study of consumption is now reasonably well established in academia, with extensive inputs from the varied social sciences such as economics, psychology, sociology and anthropology. Indeed, the study of consumption is a topic that industrial archaeology has previously engaged with. However, this engagement has tended to focus on artefactual assemblages derived from domestic sites. One example is the study of workers' housing at Boott Cotton Mills in Lowell, Massachusetts, described by Mrozowski (2005). There, an overall reduction in working class living conditions as the 19th century progress was suggested when compared to the housing of the middle classes. This could be seen in the lack of investment in sanitation systems in working class housing as opposed that of the likes of agents and managers, despite the similarities seen in the artefactual assemblages excavated at both classes of housing.

The previous example displays the abilities of a consumption-focussed industrial archaeology to interpret finds on a micro scale. However, a product-focussed archaeology of consumption conducted on a grander scale would benefit from further engagement with theoretical frameworks from outside of the discipline. Looking towards economics, a discipline that shares many of its interests with industrial archaeology, the application of the 'systems of provision' theory advocated by Fine would appear to be particularly well positioned to be adopted by industrial archaeologists (Fine & Leopold 1993; Fine 2002). Fine views the act of consumption as being the culminating link in a chain of successively interlinked processes, both material and cultural, which together form the system of provision for an individual product. These systems of provision are defined as being 'the inclusive chain of activity that attaches consumption to the production that

makes it possible' (Fine 2002, 79). Rejecting the linear and horizontal approach typically applied to studies of production and consumption in economics, systems of provision are viewed as being complex constructs that comprise both horizontal and vertical elements, each of which may be successively inter-linked (Fine & Leopold 1993, 3-5; REFERENCE).

At its base level, a product's chain of manufacture and distribution is linear, comprising individual material processes that include, but are not limited to, the sourcing and/or production of raw materials, product formulation, the act of production itself, packaging, distribution, and retail. Each of these processes may in turn be said to be affected by their own linear chains of material processes, which may in turn also be successively inter-linked. Each of these material processes are, again in turn, affected by a variety of cultural processes which may include historical events, (e.g. periods of war or international trade disputes), State encouragement or hindrance, social ideology and belief, and the availability of capital and credit, among many. The combination of these material and cultural processes comprises a product's system of provision which, according to Fine (2002, 97), 'is taken to denote the articulation of economic and social factors that give rise both to the level and composition of consumption … and the meanings with which it is endowed'. One example of the conclusions that can be drawn from the application of the theory can be seen when it is applied to the sugar industry (Fine *et al* 1996, 77-145). Fine (2002, 98-89) interpreted the United Kingdom's position as being among the nations with 'the highest per capita consumptions of sugar in the world' as testifying 'to the enduring effects of its imperial past'. This is despite the major overhaul seen in the organisation of the sugar industry during the 20th century, in particular the movement from cane to beet sugar, as well as the changing perception of the health and nutritional impacts of sugar consumption and the introduction of alternative sweeteners to the market (Fine *et al* 1996, 77-145).

The application of the systems of provision theory to industrial archaeology would appear to be relatively straight forward. Indeed, industrial archaeology in its traditional form is focussed on the description and analysis of the material processes that, when combined, comprise a product's production chain. These are typically interpreted through the lens of the cultural processes, generally derived from the historic record, which affect each and all of the material processes. As such, traditional industrial archaeological studies may be viewed as forming a somewhat truncated version of the system of provision approach, one that has tended to culminate at the point of production, but which may also include the discussion of transport systems and distribution. To provide further insight into what production means on a societal or social level beyond the economic or political, the discipline requires a shift in its focus away from production to include the retail sphere as a focus for research. While this lies outside of the remit of the current thesis, it is one of the principal areas for future research that are proposed in the concluding chapter.

While the current thesis does not provide a fully developed system of provision for beer in Ireland during the studied period, Fine's approach has helped to shape many of the suggested and affirmed conclusions that have been provided. The data chapters have sought to disentangle the nuanced meanings of each of the historical events, various State interventions and primary movements in social ideologies and beliefs that have helped to shape the industry's development, contextualising the industry's wider development within that of both the economic and social development of Ireland during the period. However, it would be remiss to suggest that the societal and cultural meanings of consumption and its changing patterns across a broad timeframe have been satisfactorily provided due to the omission of retail as a study focus. As was previously stated, this omission was by design, owing to the sheer quantity of data compiled in the survey of historic brewery sites and to the assertion that a robust archaeology of production is a prerequisite to any robust archaeology of retail. As such, the current thesis intends to act as the foundation point of a wider, retail-informed archaeology of a product that considers both the factors that led to and the societal and cultural meanings of the consumption of beer during the extended period under consideration.

In the data chapters that explore technological change and the layout and architecture of brewery complexes, many of the conclusions are derived from comparisons with the similar developments seen contemporarily in the British brewing industry. There are several principal reasons why these comparisons focus primarily on British examples rather than those from continental Europe. From a political perspective, Ireland and Britain comprised a single political entity, the United Kingdom of Great Britain and Ireland, for the majority of the extended period under consideration, from the Act of Union of 1801 until the establishment of the Irish Free State in 1922. This political union resulted in free trade between Britain and Ireland, enabling the easy movement of ideas and labour between the two islands, while also hindering similar movements between Ireland and the continent, particularly in times of war and strife. Indeed, the close relations between the British and Irish brewing industries pre-dated the Act of Union, a situation that is unsurprising given Ireland's position as a client state of England in the centuries that had preceded. This can be seen in the early adoption of porter brewing in Ireland, recorded from at least the 1760s, as well as in the early industrialisation of a small subset of Irish breweries at the close of the 18th century, each outlined in Chapter 2. Previous scholars have identified both of these trends as having been the direct result of the transmission of labour, ideas and technology from the London brewing industry.

While a similar knowledge transmission from London to European breweries in the same timeframe has also been identified, principally to northern Europe, it remains unclear how impactful

this transmission was on the development of industrial brewing in continental Europe where distinct differences in both traditional brewing practises and technologies are evident. The most-clear example of this variance in practice can be seen in the differences in the *mashing* processes applied in both traditional British and Irish brewing when compared to that of European. In Britain and Ireland, *infusion mashing*, initially through the use of successive *mashing* and later with the addition of the *sparging* sub-process, is viewed as being the traditional method of extracting fermentables from malt (Brynildson 2011c). In comparison, traditional European breweries primarily utilised *decoction mashing*, which is an entirely different process that achieves similar results. This shows that industrial breweries in both Britain and Ireland operated in a manner that was removed in terms of process and technology from their continental counterparts.

The final reason for the focus on the British brewing industry in the comparative studies is quite simple, it is the availability of sources. For both the British malting and brewing industries the extensive works carried out by both Patrick (1996; 2004) and Pearson (1999; 2010; 2014) are comprehensive and readily accessible. In comparison, Tufegdžić & Blagojević's (2015) study of the development of Austro-Hungarian breweries remains a rare English-language account of the development of a continental brewing industry.

1.4.2 The Survey

In order to answer the previously posed research questions, an island-wide survey of Ireland's historic brewing industry has been carried out. This survey is the first island-wide survey of an Irish industry, though its methodology is routed in that of previous regional surveys of Irish industry. The aim of the survey is to provide as much detail as is possible about each of the breweries that operated in Ireland during the extended period under consideration. As such, a holistic approach to data has been taken, with an extensive survey of each of the most-relevant cartographic and historical sources for a site being carried out in conjunction with an extensive field survey of historic brewery sites. While the survey aims to be as comprehensive as possible, it is recognised that neither the location nor the histories of every brewery that operated in Ireland during the extended period under consideration can be provided. However, the survey has provided detailed locational and historical sources for as many as 258 historic brewery sites.

1.4.2.1 Previous approaches to industrial archaeological survey in Ireland

Industrial archaeology is a discipline with a relatively long history in Ireland, though many of the early works were confined to the six counties of Northern Ireland. Green's (1963) *The Industrial Archaeology of County Down* is, significantly, the earliest regional survey of industrial archaeology to be published in Britain or Ireland (Rynne 2006, 6). It is also amongst the earliest government funded surveys of industrial archaeology, with the survey having been carried out in the late-1950s and early

1960s. Governmental support for industrial archaeology in Northern Ireland continued following the publication of Green's work. During the 1960s, McCutcheon carried out a systematic survey of industrial sites in Northern Ireland, which eventually led to the publication of *The Industrial Archaeology of Northern Ireland* in 1980. While the work is the culmination of an extensive survey of the wider industry of Northern Ireland, the first such detailed study carried out in either Britain or Ireland, Rynne (2006, 6-7) highlighted it as being a 'somewhat erratic compilation' that was principally focussed on transport infrastructure, the development of industrial energy and Ulster's linen processing and coal mining industries.

Following a hiatus of fieldwork in the region that lasted for much of the 1970s, the 1980s saw the resumption of industrial archaeological survey in Northern Ireland (Rynne 2006, 7). Beginning in 1982, the Department of the Environment Northern Ireland (DOENI) instigated the compilation of the Industrial Archaeological Record, now the Industrial Heritage Record (IHR). The work initially comprised the re-evaluation and restructuring of McCutcheon's extensive archives and was later expanded to include fieldwork, beginning with the Greater Belfast Industrial Archaeological Survey, which was completed in 1988. Further fieldwork was carried out throughout the region during the 1980s, which included the re-survey of 500 sites that were previously highlighted as being of particular importance by McCutcheon. While these surveys did not lead to publication, their records remain accessible as paper archives held by the DOENI.

While industrial archaeology in Northern Ireland has long been carried out with governmental support, a different situation is evident in the Republic of Ireland, where the discipline was not recognised on a statutory basis until the late-1980s. While early societies with an interest in both the renewal and preservation of historic transport systems, railways and canals, had been active in Ireland from the 1940s, it was not until the 1970s, with the foundation of the Irish Society for Industrial Archaeology, that the discipline aimed to become more organised and integrated (Rynne 2006, 7-8). The Society was reasonably short-lived and, while similarly short-lived societies were also established during the 1980s, it was not until 1996 when the Industrial Heritage Association of Ireland was established and the organisation of industrial archaeology as a discipline in the Republic of Ireland can be said to have occurred.

The preservation and recording of industrial archaeological sites in the Republic of Ireland held no statutory basis until the 1980s, with the 1987 amendment to the *National Monuments Act* empowering the Office of Public Works (OPW) to preserve industrial sites that were deemed to be of national importance through the planning system (Rynne 2006, 8-9). A further amendment, made in 1994, provided the statutory basis for industrial archaeological sites to be included in the Record of

Monuments and Places (RMP), providing those included with the same statutory protections as pre-1700 archaeological sites.

Despite the lack of either a statutory basis or governmental support, regional industrial archaeological surveys in the Republic of Ireland had been carried out through the 1970s and 1980s. The institutional involvement in industrial archaeological survey began in the late-1980s with the survey of the industrial archaeology of Cork city, funded by the Royal Irish Academy (RIA) and carried out by Rynne. This survey was published, with the support of Dúchas, as *The Industrial Archaeology of Cork City and its Environs* in 1999. Hamond's (1990) *An Industrial Archaeological Survey of County Kilkenny* is another important, though unpublished, work of the period that was carried out for Kilkenny County Council. Hamond, who had previously worked on the DOENI's IHR in the 1980s, would go on to carry out further important regional surveys in the 2000s, when several regional surveys were carried out on a county basis. Generally unpublished, it is these surveys that the methodology of the current survey is derived from.

Hamond's methodology was laid out was laid out in a paper that called for the creation of a national inventory of industrial archaeological sites in the Republic of Ireland, an inventory that is yet to be produced (Hamond 1998). Separating the recording of sites into documentary and descriptive records, four tiers of recording were proposed for each. For the documentary, or paper, survey of sites, the tiers proposed are as follows. Tier 1 involves map recognition, utilising available OS maps to locate industrial sites. Tier 2 involves the analysis of general secondary sources, such as local and county histories, journal articles and the published *Primary Valuation*. Tier 3 involves the study of unpublished primary sources, such as the preparatory works of the *Primary Valuation*, while tier 4 involves the analysis of site-specific primary sources, such as company archives. For the recording of industrial sites, Hamond recommended that tier 1 would involve the identification of basic site parameters, recording the name, if available, of a site, and highlighting the principal standing remains and surviving plant. Tier 2 involves the identification and description of all surviving structures, highlighting significant architectural remains and the recording of surviving plant. Tier 3 involves the detailed recording, with measurements where applicable or possible, of each surviving element of a site, with a provisional assessment of a site's evolution. Tier 4 involves a further detailed analysis of a site, one that would require physical intervention, such as excavation, and the involvement of further specialists, such as structural engineers.

Following this methodology, Hamond has carried out several regional surveys for county councils, each of which involved both a paper survey and extensive fieldwork. Rather than general surveys of industrial archaeology, they have been carried out on a thematic basis. For example, in conjunction with Friel, Hamond carried out a detailed survey of the railways of counties Louth and

Monaghan (Hamond & Friel 2007). The most important of Hamond's surveys, at least from the perspective of this thesis, are the county surveys of mills, which Hamond defined as being 'buildings in which raw materials are mechanically converted into usable forms' (Hamond 2009 vol. 1, 1). Hamond has carried out mill surveys for both Laois County Council and Offaly County Council (Hamond 2005; 2009). These mills surveys comprise a Tier 3 paper survey which was followed by a Tier 2 survey of the sites identified.

These are not the only county inventories of industrial archaeology that have been carried out in the recent past, though they are the most comprehensive. Further inventories have been compiled for counties Waterford, Clare, Meath, Kildare and Longford (Dublin Civic Trust 2008; O'Connor 2008; Giacometti, Duffy & Ní Cheallaigh 2007; Giacometti & Duffy 2008; Giacometti, Duffy & McGlade 2010). With the exception of the Waterford survey, which involved a limited amount of selected site recording, these surveys are paper surveys and have not, at the time of writing, been followed up by fieldwork. However, while limited in their scope, they provide a baseline for future fieldwork and the compilation of similar county inventories should be viewed as being a requirement of local government, whose preservation of industrial heritage is enshrined in law under the 2000 *Local Government (Planning and Development) Act* (Rynne 2006, 8-9).

1.4.2.2 Survey methodology

The paper survey

Broadly following Hamond's methodology, with some key departures, the current, island-wide survey of the Irish brewing industry can be divided into two distinct sections, the initial paper survey which was followed by extensive fieldwork. The paper survey was generally carried out a tier 3 standard, though some select sites were expanded to tier 4 level. The survey began with site identification, a process that, owing to the large geographic area covered by the survey, departed from Hamond's approach. Hamond's county surveys, and indeed each of the paper surveys of industrial heritage that have been carried out, primarily relied on OS mapping for site identification, though further records, such as estate maps, were also used. While OS maps have provided the principal tool used in the identification of sites in the current survey, a detailed island-wide analysis of each of the maps produced by the OS was neither plausible nor possible. To mitigate against this, a selection of 19th century trade directories were analysed, with the aim being to reduce the volume of cartographic analysis that would be required to identify the individual brewery sites. While several local directories were consulted, this analysis was primarily confined to trade directories with an island-wide coverage, principally those produced by the Manchester-based publishers Pigot (1820; 1824) and Slater (1846; 1856; 1870; 1881; 1894). This was an important step in reducing the work load of an island-wide

survey of an Irish industry and, while the approach cannot be said to have enabled the identification of each of Ireland's historic breweries, it did lead to the identification of a significant number of sites.

By and large, industrial sites are identified on the first edition of the OS, which was produced at a scale of 1:10560 (6") and published between 1829 and 1842. However, many significant industrial sites, including Guinness in Dublin city, were not identified and this led to the consultation of the Manuscript Townplans which were composed, generally at a scale of 1:1056 (60"), for Ireland's larger centres of population in the process of the production of the published first edition. Held by the National Archives of Ireland (NAI), these maps provide an unparalleled level of detail on industrial sites and, in addition to the primary use of the site itself, in many cases they identify both the proprietors of a site and the uses of individual buildings.[3] These were the only paper maps that were consulted in the course of the survey, with the remainder of the consulted OS maps being consulted in digital format. The Ordnance Survey of Ireland (OSI) have made each map sheet of the first edition of the 1:10560 maps available for each of the 32 counties of Ireland in various digital repositories, while the later 1:2500 (25") maps, produced between 1897 and 1913, are made available for the 26 counties of the Republic of Ireland.[4] For Northern Ireland, where the copyright is held by the Ordnance Survey of Northern Ireland (OSNI), the majority of each of the three editions of the 1:10560 OS that were produced in the 19th and early 20th centuries are available for consultation on the website of the Department of Communities Northern Ireland.[5] Unfortunately, the 1:2500 maps for the six counties of Northern Ireland have not been digitised and presented. In the second half of the 19th century, the OS also published a significant volume of medium and large-scale maps of Ireland's towns and cities, typically at a scale of 1:1056 though often at smaller scales, of which no single repository on the island of Ireland holds a full collection. The analysis of these medium and large-scale maps has been confined to those that have been digitised and made available by the University College Dublin (UCD) Digital Library.[6]

While the OS maps enabled the identification of the majority of sites that were identified in the course of the survey, a small subset of sites were identified through primary and secondary source analysis. The varied records of the Valuation Office have proven to be of paramount importance. The identification of several brewery sites, such as Saul's Brewery in Downpatrick, county Down, was enabled through the consultation of the *Primary Valuation*, commonly referred to as *Griffith's*

[3] NAI/OS140.
[4] The most useful website for the consultation of the OS maps that have been digitised and made available by the OSI is operated by the National Monuments Service (NMS) and features overlays of both the Sites and Monuments Record (SMR) and the National Inventory of Architectural Heritage (NIAH). It is available at www.archaeology.ie
[5] www.communities-ni.gov.uk
[6] www.digital.ucd.ie

Valuation, and its associated, though undated mapping. The entirety of the published *Primary Valuation* has been digitised and made available for consultation online, in conjunction with the accompanying maps for the 26 counties of the Republic of Ireland, the originals of which are held by the NAI and are not available for consultation at the time of writing.[7] While not digitised, original copies of the associated maps for the six counties of Northern Ireland are available for consultation at the Public Records Office of Northern Ireland (PRONI).

The *Primary Valuation*, which was published between 1848 and 1864, followed an extensive period of fieldwork by Valuation Office surveyors. This fieldwork had been instigated in 1830 with the aim being to assess the rateable value of properties throughout Ireland in order to regularise the collection of property taxes (McGee 2018, 22-4). Over the course of more than three decades, an extensive archive of surveyor's notebooks that recorded features of the individual properties was accumulated, many of which survive, now in the collections of the NAI and the PRONI.

These notebooks may provide an incredible amount of detail on an individual site. They often provide data on the dimensions, age and condition of individual buildings, their uses and, occasionally, information on technologies used, in addition to identifying both the lessors and lessees of a property. The level of detail provided is defined both by their format, with different notebooks used to record different features of a property, and the discretion of the surveyors, who often recorded additional information beyond the requirements of the survey itself. This additional information may vary from points of opinion, with a surveyor declaring that the Shrule Brewery in county Mayo was producing 'inferior beer and porter', to comment on the relative success of a firm, with a surveyor remarking on the repressed trade that was being experienced by Hare's Brewery in Longford town.[8] The consulted notebooks comprise a selection of *House Books*, *Quartro Books* and *Field Books*, of which several editions survive for some sites, though only a portion of the original archive has survived, of which only a portion has been consulted. The *House Books* tend be the most informative, providing the dimensions and condition of each building contained within a premises, often accompanied by detailed descriptions and comment from the surveyors. Both the *Quatro Books* and *Field Books* provide far less detail, though both provide the lessors and lessees of a premises and often contain additional, though concise, comment on a site. The NAI's collection has recently been digitised and the current study has been limited to those that have been made available online.[9] Unfortunately, the digitisation project has not preserved the original archiving system and, while the collection is now text searchable by topographic information and the name of the principal lessee, this poses difficulties

[7] The digitised *Primary Valuation* and associated mapping has been made available on several websites, of which www.askaboutireland.ie provides free access.
[8] See catalogue LD 013-001 and MO 122-001.
[9] www.genealogy.nationalarchives.ie

for the referencing of the material. This is further compounded by variations in spelling, which is both an artefact of the time of the notebooks' production, when the names of both people and places were often not regularised, and of the digitisation project, which has unfortunately introduced further inconsistencies and errors. Due to the difficulties in referencing the data, digital copies of each notebook sheet referenced are provided in CD-ROM format, organised in a nested folder system, divided first by province and then by project code and site name. The notebook sheets are provided in their original pdf format, unedited, as accessed from the NAI's website.

While the combined evidence from the Valuation Office records and historical trade directories have proven to be invaluable resources for site identification, they also serve to enrich the known histories of many of Ireland's smaller, and indeed larger breweries, the majority of which have, to date, been largely omitted from the wider historic record. These records generally provide the names of the proprietors of an industry and, while they generally cannot confirm dates of foundation or closure, they can help to identify a generalised period of operation for an industrial concern. The *Primary Valuation* enables the identification of breweries that had closed by the time of its publication, many of which were recorded as being either an 'old brewery' or were recorded as being vacant, while an earlier inclusion in a surveyor's notebook may provide evidence for a brewery's continued production at the time of its compilation. In addition, surveyors occasionally made comment on the dates of closure of concerns that had ceased to produce prior to the date of survey. For example, when the site of the then-closed Burrough's Brewery in Carlow town was surveyed in 1841, the surveyors noted that brewing had ceased at the site in 1830.[10] Similarly, a brewery's inclusion in the trade directories is suggestive of its continued operation at the time of the directory's publication, though some caution should be exerted over this evidence. For example, the Bellaugh Brewery in Athlone, county Westmeath, was listed in *Slater's Directory* of 1856, though it appears to have closed prior to 1855 when no brewery was recorded at the site in the *Primary Valuation*. Similarly, Blake's Brewery in Tuam, county Galway, was listed in *Slater's Directory* of 1894, though it is known to have closed in *c*. 1890 (Claffey 2009, 7). Despite these issues, the trade directories remain the best sources for the dates of operation of many of Ireland's regional and local breweries, many of which have left little to no evidence in further historic records.

In order to fill, as best as possible, further gaps in our knowledge of both the dates of foundation and closure many of the under-documented sites identified in the course of the survey, a general survey of the contemporary press has been carried out. This general survey, which may have been more extensive in a project with a more limited regional scope, was largely limited to

[10] See catalogue CW 007-002.

newspapers that have been digitised and made available by the Irish Newspaper Archive.[11] The levels of further detail acquired were variable, with no further records identified for many sites, particularly those that had closed prior to 1850. However, the survey did serve to identify dates of both closure and foundation for several breweries. Perhaps unsurprisingly, the level of detail that can be gleaned from the contemporary press improves as time advances, with breweries that operated in the second half of the 19th century more likely to have been referred to in the consulted newspapers. However, many of the references identified are somewhat fleeting, with notices referring to the sale or auction of a site following the cessation of brewing being the records that have been most commonly identified.

While a wide variety of secondary sources were also consulted in the course of the survey, the most informative of these have proven to be the volumes produced as part of the RIA's Irish Historic Towns Atlas (IHTA) series. At the time of writing, 27 volumes have been produced in this long-standing and continuing series, with the first publication, covering Kildare town, having been published in 1986 (Andrews 1986). The volumes provide immense detail on many of Ireland's towns and cities, with as many as 23 towns and cities covered, with both Dublin city and Belfast being covered by multiples volumes. Each volume provides a detailed overview of the historical and geographical development of the town or city covered, accompanied by an unrivalled selection of both historic and original cartography. While the general overviews of the developments of the towns and cities provide some relevant detail on the brewing industry, it is the detailed historical and topographical information provided that has proven to be most beneficial for the survey. Each volume was the result of a considerable study of the available sources which include, but are not limited to, Valuation Office records, the contemporary press, leasehold evidence and secondary source analysis. As such, each volume essentially serves as a detailed bibliography of the principal primary and secondary sources for a town and city, one that identifies, as best as possible, the principal historical sources for a town or city's development. In the topographical sections, the sources identified for each form of industry or commerce in a town or city are presented, records that provide an unparalleled level of detail on the otherwise scant histories of many of Ireland's less-substantial industrial concerns.

The field survey

These sources have enabled the identification of the locations of as many as 258 historic brewery sites, situated in 31 counties on the island of Ireland, with Leitrim being the only county where the location of a historic brewery has not been identified. The volume of sites identified exceeded the expectations that were held prior to the paper survey's beginnings and a process of elimination was required to narrow the scope of sites to be surveyed, with the survey of 258 sites located across a

[11] www.irishnewsarchive.com

wide geographic area being neither practical nor desirable. In order to narrow the scope of the field survey while ensuring that the greatest level of detail on the development of the industry as a whole was recorded, a number of recent cartographic and topographic sources were consulted in order to identify the sites where the survival of significant standing remains was most likely. This involved a detailed overview of the recent OS maps and the extensive imagery that has been produced by Google Earth. The recent OS maps were compared and contrasted to their historic counterparts, with the aim being to identify buildings that respect the footprints of historic structures. In addition, Google Earth imagery, which comprises both satellite imagery and 3D orthophotography that is derived from both satellite and Street View data, was studied for each of sites identified by the survey. Google Earth proved to be an unparalleled source in identifying the survival of historic buildings prior to the start of the field survey.

In order to gain as much detail as possible from the surviving architectural remains of the industry, efforts were to made to visit and record each site where the survival of historic buildings was deemed likely. However, several sites where standing remains are confirmed were not visited, though by and large the standing remains that were not surveyed comprise little more than fragments of historic brewery complexes. Of these, the fragments typically comprise the shells of minor structures related to a wider brewery complex, though the potential fragments of a brewhouse appear to survive at one significant site that was not visited, the Donaghmore Brewery in county Tyrone.

The field survey itself took place across four seasons, with survey work generally carried in the summer months of 2015-18. The survey itself involved site visits, where the observed buildings were recorded, both in field notebooks and by a photographic survey. Further access was sought for sites where the level of survival was deemed to be significant, with the aim being to record internal features and any potential surviving plant. Internal access proved to be difficult to attain for many of the sites visited. Several significant sites are, at the time of writing, either undergoing or awaiting extensive redevelopment, with examples including both Beamish and Crawford and Guinness. Unfortunately, access was denied to many of the historic buildings at these, and many other sites, generally owing to health and safety concerns that arise with providing access to an independent researcher to buildings that are deemed, from an insurance perspective, to be construction sites. Access also proved difficult at vacant sites, where the identification of site owners was difficult. In addition, a relatively substantial proportion of surviving brewery buildings are today in domestic use and no internal access was sought in these cases, with the intention being to protect the privacy of the occupiers. Difficulty in access to both vacant site and those awaiting or undergoing redevelopment would be overcome by conducting future surveys on a statutory basis, supported by either a central government body or a local authority.

The presentation of the survey

The data derived from the survey is presented as a catalogue of sites, divided successively by province, county and ultimately village, town or city. General overview maps of the locations of historic breweries are provided at a province level, while each county is provided with a table that outlines the basic information for each of the brewery sites identified within. At county level, the historical sources for villages and towns where breweries are confirmed historically though not cartographically are also presented.

At village, town or city level, general topographic information is provided, such as the barony and civil parish that villages and smaller towns are located within, in conjunction with information on the consulted OS mapping. In addition, trade directory entries that have not been equated with the identified sites are also provided. The layout of the record sheets for the individual brewery sites identified follows a set template. Each site has been provided a project code that follows the standard that was introduced in Ireland with the Sites and Monuments Record (SMR) and which has been extensively used in each of the RMP, IHR and Hamond's surveys. For each identified site, local topographic information is presented, comprising the townland in which a brewery was located for smaller centres of population and street names for those located in larger centres. This is presented alongside the ITM grid reference for each site, the general dates of operation for the breweries themselves, the relative rate of survival, date of site visit, the labelling of the site on individual OS mapping, information on the forms of motive power used, where identified, and each of the confirmed references to the site in the consulted trade directories.

The rate of survival that is presented for each site is neither intended to denote the industrial archaeological significance of a site or its physical condition. Instead, it is intended to denote the relative rate of survival of a wider brewery complex. Typically, elements of the core brewery have survived at sites that have been deemed to display a substantial rate of survival, though this may also denote the survival of further important buildings, such as a largely intact maltings or malt kiln. Sites deemed to display a good rate of survival typically comprise roofed buildings, often ancillary structures, that remain in use today, many as domestic or commercial buildings, though were not typically related to core brewing processes. Exceptions to this include several surviving maltings that are now much altered. Fragmentary survival may denote the survival of architectural fragments, though it may also denote the survival of minor ancillary buildings, such as a solitary brewer's house. Sites recorded as 'probably no survival' are those where survival was deemed unlikely in the course of the paper survey and have not been visited. Sites that have been visited and where standing remains are confirmed to not survive are recorded as 'no survival'.

Following this general information, each site is provided with a brief history where each of the sources identified in the course of the paper survey are provided. This is followed by a general overview of the site, which includes a brief description of a site's depiction on the historic OS maps. Where surviving buildings have been recorded, they are provided in a third section. There, each building is provided with a unique project code and its principal surviving architectural features are described. Where possible, the likely or confirmed former uses of the buildings are presented, while the potential dating of each individual building is also proposed. Where individual buildings, and indeed wider brewery complexes, have been included in previous surveys, these have been engaged with in an effort to further elucidate in what the standing remains represent. Each building is also provided with a tier 1 photographic record, providing general views of the building rather than focussing on individual features. Exceptions to this are made when particularly significant features survive, both internally and externally.

1.4.3 Chapter layout

In order the answer the research question that have been posed, the thesis has been divided into eight data chapters, each of which is focussed on a theme related to the wider development of the Irish brewing industry. In Chapters 2 and 3 the historical and regional development of the industry is outlined. Divided chronologically, covering the periods before and after 1850 respectively, the chapters provide a detailed overview of the historical development of the industry, while they also serve to disseminate the results of the paper survey. The primary aim of these chapters is to identify the changing regionality of the industry, which is assessed in the light of previous scholarship.

In Chapter 4 the principal raw materials of the industry are covered, with reference to their sources, the rationality behind their uses and their archaeological signatures. While both hops and water are provided with dedicated sections, malted barley is the primary focus of the chapter. Outlined in detail is the physical development of brewery maltings in Ireland, the primary form and function of which are provided. The development of the brewery maltings in Ireland is compared and contrasted with the contemporary developments in England, where the industrial archaeology of the malting industry has been the subject of extensive research by Patrick (1996; 2004).

Chapters 5, 6 and 7 are focussed on the technological development of the industry. Both Chapters 5 and 6 provide an in-depth overview of the processual and technological development of the brewing process in Ireland, while Chapter 7 is concerned with the various forms of motive power that were exploited by Irish breweries. Each of the three chapters features an extensive survey of the historical sources that outline the contemporary developments in Britain. The aim of these surveys is to infer, as best as possible, the rational of the technological evolution of the industry and both the temporal regionality of the subsequent transmission of technologies. Each of these three chapters

also serve to disseminate the rates of survival for each form of brewing technology and power source in Ireland, as was identified in the course of the survey, while also outlining the sources of the plant used in Irish breweries, both surviving and attested to in historical sources. These chapters will enable further comment on both the regionality and temporality of the industrialisation of the Irish brewing industry, with the adoption of steam-powered automation being used as a proxy for engagement with the process of industrialisation by a brewery.

In Chapter 8 the physical development of the brewery in Ireland is outlined, drawing data from the survey, with the intention being to outline the various forms and arrangements of Irish breweries throughout the studied period. Rynne's previous studies will be considerably expanded upon, while Pearson's studies will provide comparative data that can be used to suggest both the levels of indigenous development in Ireland and influences from the British brewing industry in the architecture of Irish breweries.

In the final data chapter, Chapter 9, the development of the industry in Dublin city is outlined, with a particular focus on Guinness, whose unique development warrants additional attention. The intention of the chapter to is to identify further factors, beyond the sound management of the brewery, that eventually led to the firm's growth to become first Ireland's and later the world's most-productive brewery. In the chapter both the history of the industry and the locational advantages that were held by breweries located in the Liberties area of Dublin, the most-concentrated brewing quarter in Ireland, will be assessed. A particular focus will be cast on the micro-locational advantages that Guinness's location provided the brewery over its local competitors. The physical development of the Guinness site will also be presented in isolation, with the aim being to outline its unique industrial archaeological signature and to highlight the national and international significance of several of the wider brewery's surviving historic buildings.

The conclusions from each of these eight data chapters will be summarised in the final concluding chapter, where answers to each of the key research questions posed will be provided. There, a new outline of the industrial archaeology and history of the Irish brewing industry, which remains an important facet of Ireland's industrial output today, will be presented, alongside recommendations for future areas of study.

Chapter 2 The development of the Irish brewing industry before 1850

This is the first of two chapters that outline the overall development of the Irish brewing industry, focussing here on the period before 1850. The chapter is divided into two primary sections, both of which are sub-divided chronologically. In the first section, the economic history of the industry is outlined, drawing largely from published histories but also introducing some analysis of original primary and secondary sources. It is sub-divided into three sub-sections, outlining the economic history of the industry in the periods before 1775, 1775-1815 and 1815-50. The second section outlines the regionality of the industry between the late-18th century and 1850. It is sub-divided into two sub-sections, outlining the changing regionality of the industry in the periods 1790-1830 and 1830-50. For the early period, which lacks a comprehensive cartographic record, as is provided by the first edition of the OS for the later period, mapped data derived from the returns of licensed brewers in the years 1791 and 1831 provides the primary dataset. Owing to the limited nature of the dataset, a less-detailed overview of the regionality of the period is provided, though several strong conclusions can be inferred. The regionality of the later period, 1830-50, is provided a reasonably comprehensive overview, as seen in maps compiled from survey data, derived from the historic OS maps and Valuation Office records, both preparatory works and the published *Primary Valuation*. The aim of the chapter is to reassess the conclusions of the published histories in light of the regionality of the industry, which is presented here for the first time in a comprehensive manner.

2.1 The economic history of the industry to 1850

2.1.1 Brewing in Ireland before 1775

A superficial examination of the official statistics for the import, export and production of beer in Ireland, provided in table 2.1, would suggest that for much of the 18th century the Irish brewing industry was, at best, stagnant. In reality, the industry was in decline, with Ireland's rising population, which is estimated to have increased by more than 50% during the century, not being reflected in a subsequent rise in beer production (Malcolm 1986, 22). In 1720, Irish breweries paid duty on as many as 601,457 barrels of beer produced. The overall production figures fluctuated as the century progressed, decreasing to 441,132 barrels in 1736 and increasing to a little over 600,000 in the early 1750s. The early 1760s saw a brief period of resurgence. Duty was paid on more than 618,000 barrels annually in 1761-4, the highest recorded level in the century, though production declined thereafter. In each year between 1771 and 1782 duty was paid on less than 500,00 barrels annually, while the years 1784-7 were the lowest points for the industry in the century, when duty was paid on less than 400,000 barrels in each year.

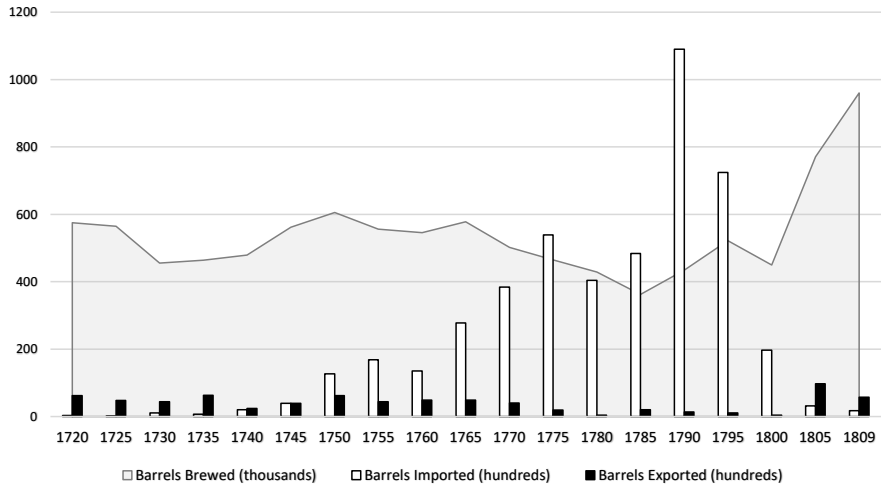


Figure 2.1. The import, export and production of beer in Ireland, 1720-1809. Source: Morewood 1838, 726-7.

Ireland had been a net exporter of beer in the early decades of the 18th century. It was only in 1741, when imports almost trebled from the previous year, that imports first exceeded exports and Ireland remained a net importer of beer from 1746 to 1803. The period saw a consistent decline in Ireland's exports of beer, while imports increased dramatically. The 5,278 barrels imported in 1741 far exceed the 292 in 1720, while the figures from 1741 were themselves dwarfed by the 40,542 recorded in 1769. In the early 1790s, more than 100,000 barrels of beer were being imported annually, representing about 20% or more of the beer consumed in Ireland, at least on which duty was paid.

In contrast to the decline in Irish brewing, the production and importation of spirits increased dramatically in the same period. Between the beginning of the century and 1762, both the importation and licit production of spirits had more than trebled, while illicit production was rife (Morewood 1838, 726-7; Lynch & Vaizey 1960, 49). Between 1762, when duty was paid on as many as 692,875 gallons of Irish manufactured spirits, and 1799, when duty was paid on as much as 4,253,187 gallons, licit Irish spirt production saw a more than five-fold increase. In the same period, annual imports of more than 1,000,000 gallons were common, though the figures for imports fluctuated wildly. Between 1720 and the 1790s the consumption of spirits on which duty was paid is said to have increased by a massive 746% (Malcolm 1986, 22).

Ireland's movement from being a net exporter to a net importer of beer in the early 1740s can be directly linked with the development of porter brewing in early 18th century London. Porter has long been believed to have been a somewhat accidental invention. In the traditional invention story, a London brewer, Ralph Harwood, was said to have produced a dark beer from accidentally burnt malt

in 1722 (Mathias 1959, 13-4). However, recent research by Cornell (2003) and Sumner (2008) has shown that the story is itself an invention of the late-18th century, one that was popularised in the 19th. Instead, porter is now believed to have developed from the highly hopped, dark ales that were favoured by working class beer drinkers in London in the late-17th and early 18th centuries.

One of the chief characteristics of early porter was that it was a matured beer. Initially the beer was matured in large casks, known as butts (Mathias 1959, 58-62). From at least the 1730s, large coopered vats of ever-increasing capacity became common in the largest of the porter breweries and by 1760 they had been widely adopted. The bulk maturation of porter in vats gave the London porter breweries several advantages over their competitors, both local and distant. The matured beer catered for the tastes of the time while it was also a relatively stable product, one that could be stored for extended periods. The use of bulk maturation vats enabled the London porter breweries to produce at full capacity regardless of the prevailing market conditions. It also enabled the sale of beer year-round, mitigating against the seasonal nature of brewing, which was generally not carried out in the warmer summer months. The stability of the product also meant that porter was suitable for long-distance trade and, from 1740 on, Ireland became the principal export market exploited by the London porter breweries (Mathias 1959, 151-70).

The increase in imports of beer to Ireland in the early 1740s was, according to Mathias (1959, 152), due to a barley shortage in Ireland following the famine of 1740-1. A further compounding factor may have been the introduction in 1735 of an exemption from tithes for pasture land, which, according to Lynch and Vaizey (1960, 41), had led to a reduction in tillage farming. Probably in direct response to the increased level of imports, the Irish Parliament increased the import duty on beer, from 1*s*. per barrel to 2*s*. 6*d*. (*ibid*., 50). Despite the increased import duty, which did reduce the level of imports in 1743-4, from 1745 imports again began to rise (Morewood 1838, 726-7). They first exceeded 10,000 barrels in 1747, a number that would be exceeded every year from 1749 to 1802.

English-produced beer was not a cheap product when imported to Ireland. Irish breweries had a lower taxation burden than their English counterparts, while carriage fees and import duties also added to the costs. The beer duty in England ranged from between 5*s*. to 8*s*. per barrel in the 18th century, while in Ireland it ranged from between 2*s*. 6*d*. to 4*s*. 6*d*. (Lynch & Vaizey 1960, 51-2). English brewers also had an additional taxation burden in the form of the malt tax, which was not levied in Ireland until 1786. Lynch and Vaizey (*ibid*.) estimated that the tax on malt equated to as much as a further 2*s*. on each barrel of beer produced in England in 1780. It should be worth noting that Irish producers did have further taxation burdens, principally in the form of import duties levied on both coal and hops, while they were also discouraged from exporting to Britain by the 'prohibitively high' import duties then levied in Britain (Lynch & Vaizey 1960, 52). The taxation burden on English brewers

was partly eroded by the introduction of bounties that encouraged the export of beer from England in years of good barley harvest (Mathias 1959, 154). However, the drawback was not significant enough to outweigh the disparate taxation burden seen by the brewers in the two countries, though the London porter breweries were apparently willing to absorb the additional costs. Lynch and Vaizey (1960, 53) posited that the increased levels of imports from Britain to Ireland after 1750 'were a response to a demand for beer of a quality that Irish brewers could not produce'.

Irish breweries did not succumb willingly to the increased levels of outside competition and instead began to adapt. Before 1765, at least two breweries in Dublin were producing porter; operated by Joseph and Ephraim Thwaites and Thomas Andrews (Lynch & Vaizey 1960, 44-6). Andrews was awarded a prize by the Royal Dublin Society (RDS) in 1765 for the largest volume of Irish-produced porter sold by retail. While this shows that Irish breweries were adapting to changing tastes, the volume of porter sold by Andrews was insignificant in comparison to the volume imported. The prize was awarded on sales of 14,958 gallons, equating to just 415.5 standard 36-gallon beer barrels. The RDS played a key role in the resurgence of Irish brewing in the late-18th century. In 1772 they opened correspondence with the London-based, French-born brewer Michael Combrune, the author of an influential brewing manual, *The Theory and Practice of Brewing* (Lynch & Vaizey 1960, 44). Combrune, in 1758, had been the first to describe the use of thermometry in both brewing and malting and, despite his often-unscientific dissemination methods and many theoretical flaws, is viewed as being among the first true brewing scientists (Sumner 2005, loc. 895-945 & 1383-1424). Combrune's correspondence assured the RDS that there were no practical barriers, in terms of raw materials, process or technology, for the production of porter outside of London, and Combrune provided the Society with a practical guide for porter brewing. This is firm evidence for the transmission of ideas from the London brewing industry to Ireland.

In the decades that followed, the transmission of ideas was joined by a subsequent transmission of skilled labour from England to Ireland. In one of several examples, a brewer from London, John Purser, travelled to Dublin in 1776 to brew porter for Farrell, a brewer based in Blackpitts (Lynch & Vaizey 1960, 232). His son, also John, was employed by Guinness in 1799 and would later become a partner in the firm, while successive generations of the family would perform key administrative roles in the firm until the late-19th century (*ibid*., 113-6; Dennison & MacDonagh 1998, 32-3). Further examples include Samuel Madder, a brewer from England who travelled to Dublin in 1778 and acquired a brewery (Lynch & Vaizey 1960, 90-2). Madder, who was regarded as being amongst the finest brewers of porter in city, acquired the brewery that would later be known as the Phoenix Brewery in 1788. In 1798 Kavanagh and Brett, proprietors of what would later be known as the Anchor Brewery, also employed a brewer with experience in the London porter brewing industry,

Charles Page. These are just three well-documented examples of what was probably a much greater influx of skilled labour from the London porter brewing industry. For example, Beamish and Crawford are believed to have employed several people sourced from London breweries, though their names have not been recorded (Mathias 1959, 44-5; Bielenberg 1991, 55-6). Indeed, the transmission of skilled labour from London in the period was a wider phenomenon in the late-18th and early 19th centuries. London-trained brewers were recorded in several provincial British brewing centres in the late-18th century, while the early 19th century saw London-trained brewers employed further afield, in places like Sweden, Russia and the German states (Mathias 1959, 44-5; Donnachie 1979, 87).

2.1.2 Governmental encouragement and the early industrialisation of brewing in Ireland, 1775-1815

The years 1775-1815 proved to be a transformational period for the Irish brewing industry. During the period, the production of beer in Ireland was encouraged by a series of legislative reforms that both simplified and reduced the taxation burden on Irish brewers, while also impeding the importation of beer from Britain. The French Wars of 1793-1815 dramatically reduced the volume of imports to Ireland, while also acting as a broad economic stimulus, providing an increased market for Ireland's agricultural output (Bielenberg 2009, 78). As can be seen in table 2.1, the period saw Ireland's transition from being a net importer to a net exporter of beer, while it also saw the expansion of several large firms, who in the 1790s would approach, though not match, the scale of several of the large London porter breweries. Bielenberg (2009, 78) stated that it was a combination of the legislative reforms and the impacts of the French wars 'that helped to initiate the first phase of industrialisation in the Irish brewing industry'.

While the overall output of the Irish brewing industry was yet to reach its lowest point of the century, when production dropped below 400,000 barrels in 1784, 1775 proved to be a key year for the development of the industry. It was the year that lobbying by the Dublin Brewers' Corporation first enabled legislative change with the intention of encouraging the industry (Lynch & Vaizey 1960, 55). The Corporation had been lobbying for a total abolition of the beer tax and its replacement with a malt tax since at least 1767 (*ibid*., 45). While the tax reduction achieved in 1775 was more modest than had been proposed, the reduction in duty of 5*d*. per barrel was not insignificant. Both proposals of the Corporation were eventually enacted, though with an interval of nine years between the introduction of the malt tax and the abolition of beer duty. In 1785-6 the malt tax was introduced, with the intention being to discourage the distillation of spirits (Lynch & Vaizey 1960, 67; Malcolm 1986, 27). Its introduction coincided with the lowest levels of production in the century by Irish breweries and, in the years before the abolition of beer duty in 1795, imports reached their peak. While lobbying by the Brewers' Corporation in the 1760s and 1770s had failed to encourage Irish beer

production, their efforts after 1785 were far more successful. They found an influential and sympathetic lobbying partner in Henry Grattan, a member of both the Parliament and Privy Council of Ireland and, perhaps not coincidentally, a relative through marriage of the Guinness family (Lynch & Vaizey 1960, 57; Malcolm 1986, 26). Following lobbying by Grattan and several further prominent political and banking figures, further increases in import duty were imposed in 1789 and 1791, while spirit duty was also increased (Mathias 1959, 154; Bielenberg 2009, 91). The lobbyists framed their argument as one of public health, arguing that the encouragement of the Irish brewing industry, and the consequent increase in beer consumption, would be at the expense of the distilling industry (Lynch & Vaizey 1960, 65-6; Malcolm 1986, 26-7, 50-52). However, the legislative reforms also seem to have been of economic priority, with the increased taxes intended to both fund the war effort and to swell Ireland's dwindling national coffers. Following the increase in import duty, Irish beer was said to have a cost advantage at retail of some 6*s*. per barrel over English imports (Mathias 1959, 154).

Year	Produced	Imports	Exports	Year	Produced	Imports	Exports
1780	429200	40,459	412	1795	521,822	72,393	1,076
1781	485,826	54,365	719	1796	528,686	58,738	2,611
1782	503,942	63,495	1,006	1797	567,284	67,188	797
1783	452,098	54,456	1,253	1798	600,038	50,914	1,149
1784	388,027	54,251	2,084	1799	545,806	25,178	1,631
1785	361,903	48,381	2,054	1800	449,790	19,709	444
1786	382,400	55,282	1,727	1801	398,746	17,972	363
1787	395,087	68,492	2,285	1802	402,942	10,495	2,108
1788	412,137	74,725	1,298	1803	561,438	9,884	5,782
1789	389,318	91,009	1,122	1804	695,100	3,209	6,775
1790	434,397	109,049	1,372	1805	770,688	3,143	9,707
1791	467,436	101,655	1,452	1806	760,371	2,160	5,797
1792	531,648	125,058	1,677	1807	750,307	2,449	4,510
1793	590,307	125,057	495	1808	751,146	2,188	4,630
1794	535,359	76,255	809	1809	960,300	1,708	5,713

Table 2.1. The import, export and production of beer in Ireland, 1780-1809, in barrels. Source: Morewood 1838, 726-7.

As can be seen in table 2.1, Irish beer production immediately increased following the increases in import duty in 1789 and 1791. Despite a brief decline in 1801-2, output consistently increased year-on-year until 1809, the year that statistics were last provided by Morewood. Imports had actually reached their zenith following the increases in duty, with import duty paid on over 125,000 barrels in each of the two years 1792-3. Their sharp decline after 1793 can be directly associated with the onset of the French wars that year, some two years before the abolition of beer duty in Ireland. Imports dropped by nearly 40% from 1793-4, perhaps due to interruptions in the shipping channels. By 1804 they had fallen to just a small fraction of the number recorded a decade previously, some 3,209 barrels, representing a reduction of more than 97% in just eleven years. 1804 was also the year that Ireland again became a net exporter of beer. According to the official statistics, charted in figure 2.2, the Irish brewing industry primarily targeted 'foreign countries' rather than the

British market, at least until the 1820s. As early as 1802, Guinness were brewing beer specifically for the West Indies market, while Beamish and Crawford's first recorded export to the market was made in 1799 (Lynch & Vaizey 1960, 122; Ó Drisceoil & Ó Drisceoil 2015, 69). In 1804-5, Beamish and Crawford shipped beer to the West Indies, north America and Lisbon in continental Europe, a market said to have been unaffected by the French wars and also one that Guinness is known to have targeted (Lynch & Vaizey 1960, 122). While the total volume of exports remained modest, under 10,000 barrels annually until the mid-1820s, the period saw Irish beer gain a firm foothold in distant markets that would be further exploited as the 19th century progressed.

Beginning in the early 1790s, several Irish breweries underwent a rapid expansion in output which Bielenberg (2009, 78) correctly coined 'the first phase of industrialisation'. Somewhat fortuitously, detailed accounts on the number of licensed brewers in Ireland divided by excise district have been preserved for the years 1790 and 1791 in the *Journals of the House of Commons of the Kingdom of Ireland.* Unfortunately, the figures are unique for the period and, while similar datasets were surely recorded by excise officials, they have not survived again until the years 1830-31. The total number of breweries recorded is provided in table 2.4. Despite the limited nature of the dataset, the phase of rapid change that the industry was undergoing is evident. Retail breweries were in decline, with the numbers licensed reducing by 29% in just one year. In contrast, licenses to brew strong beer had increased by 12%.

The most dramatic expansion was seen in Cork city where two merchants, Beamish and Crawford, had acquired an out-of-work porter brewery in 1791 (Ó Drisceoil & Ó Drisceoil 2015, 36). The timing of the acquisition was impeccable, coinciding with the second increase in import duty and preceding the abolition of beer duty by just four years. Sales figures for the brewery have been preserved for each year from 1793 (Ó Drisceoil & Ó Drisceoil 2015, App. B, 375; table 2.2). The brewery saw a more than four-fold increase in output from 1793 to 1800, by which time it had expanded its trade to become the largest in Ireland by output. In that year, the earliest year where sales figures for Guinness were presented by Lynch and Vaizey (1960, App., 206), Beamish and Crawford's sales were more than six times the volume of their Dublin rival. Both firms continued to expand their output to 1815, the year that the French wars ended. Beamish and Crawford's output more than doubled between 1800 and 1814, while Guinness's sales increased more than five-fold in the same period. However, in 1814 their output remained a little under 50% of Beamish and Crawford's.

Year	B & C	Guinness	Year	B & C	Guinness
1793	12,003	-	**1807**	99,889	29,520
1794	21,688	-	**1808**	101,305	39,790
1795	26,412	-	**1809**	115,496	61,872
1796	43,911	-	**1810**	117,139	56,988
1797	46,778	-	**1811**	102,473	48,160
1798	50,549	-	**1812**	112,403	54,232
1799	55,103	-	**1813**	123,054	65,009
1800	63,230	10,026	**1814**	134,039	66,017
1801	61,950	14,533	**1815**	118,689	66,672
1802	69,239	23,126	**1816**	86,689	56,164
1803	74,074	22,479	**1817**	80,884	50,535
1804	81,645	25,144	**1818**	78,928	36,374
1805	94,142	27,660	**1819**	83,875	32,569
1806	100,137	28,886	**1820**	77,971	27,374

Table 2.2. Sales figures for Beamish and Crawford (B & C), 1793-1820, and for Guinness, 1800-20. Sources: Lynch & Vaizey 1960, App., 206; Ó Drisceoil & Ó Drisceoil 2015, App. B, 375.

Brewery	1810	1811
Conlan, William & Edward	21,560	15,678
Connolly & Somers	50,571	41,595
Egan & Co.	25,950	16,089
Grange, Leeson & Co.	27,463	16,658
Guinness	70,614	55,488
Madder & Co.	16,807	14,135
Sherlock, David & Son	15,547	13,244
Sweetman, Michael	24,924	19,697
Trevor & Keogh	27,424	22,193

Table 2.3. Production figures for Dublin's nine largest breweries in 1810-11. Source: BPP 1812.

	Strong Beer	Small Beer	Retail
1790	236	55	646
1791	261	58	484

Table 2.4. Number of licensed brewers in Ireland, 1790-91. Source: JHCKI 1797a; 1797b.

Sales figures for Dublin's nine most-productive breweries have been preserved for the years 1810-11, presented in table 2.3. Guinness's output, then the greatest in Dublin, was actually stated to have been greater than Lynch and Vaizey had recorded. The brewery operated by Connolly and Somers was then the city's second-largest, with an output of over 50,000 barrels recorded in 1810 and over 40,000 in 1811. Of the remainder, the sales of each of the breweries operated by Sweetman, Trevor and Keogh, Egan, and Conlan were more than double those of Guinness in 1800, while not one of the nine breweries were recorded as having an annual output of under 13,000 barrels in either year. While data to confirm it is lacking, it would appear likely that each had undergone a similar, though perhaps less-dramatic process of rapid expansion as had been seen at both Beamish and Crawford and Guinness in the two decades that had preceded. While the majority of the breweries that had taken part in this phase of rapid growth and industrialisation appear likely to have been located in the large port cities, it should be worth noting that at least one exceptional case has been identified. In 1810, Walker's Brewery in Fermoy, county Cork, was, probably erroneously, stated to have been the 'second in the kingdom' (Townsend 1810, 490-1). The kingdom referred to by the author was clearly the kingdom of Ireland as Beamish and Crawford were correctly stated to have been the 'first'.

2.1.3 Periods of decline, consolidation and the first forays into the British market, 1815-50

In the period 1815-50, the Irish brewing industry underwent a further phase of extreme change. The period began with a phase of consolidation for the industry following the cessation of the French wars in 1815, when output decreased dramatically. The 1820s and 1830s were a period of optimism for the industry, when Irish breweries first began to target the British export market. However, a further phase of consolidation followed from the late-1830s, one that saw both total output and the number of licensed breweries in Ireland decrease dramatically. The decline of the industry coincided with the popular temperance movement promoted by the Capuchin Friar, Fr.

Theobald Mathew, and continued through the years of the Famine, which actually saw a modest increase in overall brewery output.

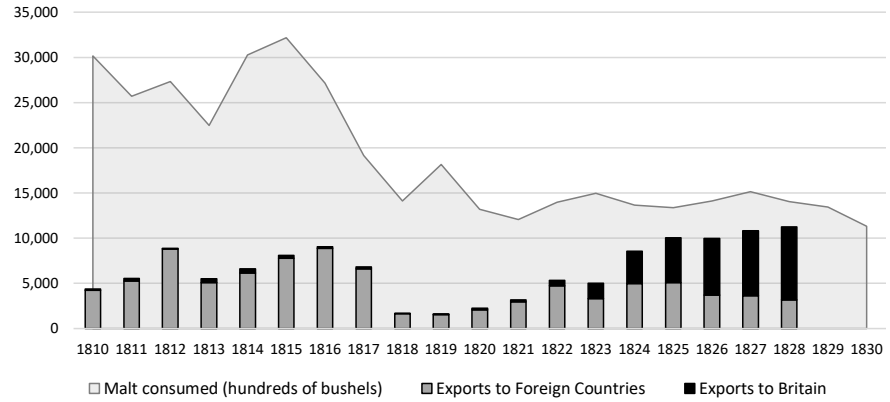


Figure 2.2. Malt consumed by Irish breweries, 1810-30. Sources: Bielenberg 1998, App. 1, 104-5; BPP 1827; 1828.

Figures for beer production in Ireland were not kept after 1809 and for the years that followed we are reliant on the returns of the volume of malt consumed by brewers to gauge total output. The amount of malt consumed, in bushels, is charted for the years 1810-30 in figure 2.2 and for the years 1831-60 in figure 2.3. A dramatic reduction of more than 50% is evident for the years 1815-18, coinciding with a wider economic depression that affected both Britain and Ireland following the cessation of the French wars (Lynch & Vaizey 1960, 32-6). The depression saw increased unemployment, while poor harvests exacerbated economic conditions, resulting in food shortages and the depreciation of the Irish pound. The depression continued until 1820 and, while the years 1820-25 saw a modest upturn in the wider Irish economy, it was not until the middle of the decade that Ireland's economy is said to have recovered. The sales figures for Beamish and Crawford and Guinness show that both breweries' trade had declined in the same years, though at a lesser percentage than is evident in the malt returns (table 2.2). Beamish and Crawford's sales fell by a little over one-third, while Guinness's fell by a more substantial 45%. This would appear to suggest that, while the large breweries that had industrialised in the two decades previous were affected by the depression, its effects were probably felt disproportionately by smaller breweries.

Unfortunately, statistics on the number of licensed brewers in Ireland were not recorded until 1831 and it is not possible to provide a quantitative figure on the impact of the decline beyond the evidence from the malt returns. Bielenberg (2009, 79) recorded that as many 319 breweries had been producing in Ireland in 1791 and, by 1831, the number had declined to 215. Unfortunately, given the lack of data, it is unclear whether the decline in the number of breweries was a direct result of the

post-1815 depression. What is known is that breweries had both failed and been founded in the years immediately before and after 1815. In Cork city, where the period is well-covered by Ó Drisceoil & Ó Drisceoil, the River Lee Porter Brewery, founded in 1796, closed in 1813, while Drinan's Brewery, founded before 1809, had closed before 1821 (West 1809; Ó Drisceoil & Ó Drisceoil 2015, 62, 168). The firm that operated another of the city's breweries, the Southgate Brewery, was declared bankrupt in 1817, though the brewery re-opened under new ownership the following year (*ibid*. 165-8). Perhaps surprisingly, two breweries are known to have been founded in the years immediately following 1815. Both were located in Galway city; the Madeira Brewery was established in 1816 and the Nun's Island Brewery in 1817 (Prunty & Walsh 2016, 29-30). Beyond these examples, little can be said in detail about the impact of the depression, though post-1815 foundations show that the industry did not undergo a linear decline, marked solely by closures.

A superficial look at the malt returns suggests that the 1820s was a reasonably flat decade for the industry, where output remained reasonably static (figure 2.2). However, as was previously stated, it was the decade where Irish breweries first began to target the British market in a deliberate manner, initially through the port of Bristol (Lynch & Vaizey 1960, 130-2). Export statistics from Ireland to Britain in the years 1810-28, charted in figure 2.2, show that the total amount exported was negligible to 1822. In each of the years that followed, year-on-year increases are evident. As with the first decade of the century, when distant markets were first targeted by Irish breweries, the amounts exported to Britain were initially modest, though they provided Irish breweries with a first foothold in a much larger market than was available locally. In the early 1820s, it was the breweries located in both Cork and Waterford cities and Clonmel in county Tipperary that are said to have dominated the then-modest Bristol trade (Lynch & Vaizey 1960, 130-2). Guinness entered the Bristol trade in 1825 when a small shipment of just ten hogsheads (a cask of 1.5-barrel capacity) was made from the brewery. From 1826 their trade in the port city began to rise in importance, though Beamish and Crawford are said to have remained the largest Irish exporter to the market. The late-1820s also saw Guinness expand their pre-existing modest trade in Liverpool, while in 1830 the firm began to directly target the London market (Lynch & Vaizey 1960, 134-40). Guinness was not the only Dublin brewery targeting the British market in the period and, while the brewery's overall exports increased, their share in the total Irish exports to Britain was said to have declined in the late-1820s. While statistics for exports of beer to Britain from Ireland were not recorded after 1828, the evidence from Guinness suggests that they had increased dramatically. Lynch and Vaizey (1960, 140) recorded that 'by 1840 53% of Guinness's sales in bulk barrels were in England and Scotland'. It was Guinness's successful exploitation of the British market after 1825 that saw the brewery's output surpass Beamish and Crawford's in 1833, the year Guinness became Ireland's largest brewery by output (Lynch & Vaizey 1960, 89). Guinness had

managed to expand their sales, which in that year surpassed their previous peak in 1815, while in 1833 Beamish and Crawford's output was less than one-half of their previous high point, recorded in 1814 (tables 2.2 & 2.5).

English breweries felt rightly threatened by the increasing levels of imports from Ireland which, despite the abolition of beer duty in Britain in 1830, were said to undercut the price of British-produced beer at the point of sale (Bielenberg 2009, 80). According to testimony in a Parliamentary inquiry held in 1833-4, the chief reason for the price disparity was the widespread evasion of malt duty in Ireland (Lynch & Vaizey 1960, 81-4). Henry Feath, head maltster for Beamish and Crawford, took part in the debate (*ibid*.; Ó Drisceoil & Ó Drisceoil 2015, 89). Feath, reinforcing the beliefs of the English brewers, stated that 'the (Irish) country brewers … cannot, from the price they charge for their liquor, have paid duty on one-fourth of the malt they consume'. Lynch and Vaizey (1960, 83-4) posited that the dramatic reduction in malt use by breweries after 1815 was a direct reflection of the evasion of malt duty. However, Feath, who had been employed by Beamish and Crawford since 1799 and had witnessed first-hand the changes in the trade in the more than three decades that had followed, suggested that the evasion of malt duty had only become truly problematic after 1828 (Ó Drisceoil & Ó Drisceoil 2015, 89). Regardless of the timeframe for the evasion of malt duty, the debate casts doubt on the veracity of the official statistics, particularly for the period 1825-35 when exports to Britain increased dramatically. It also suggests that the decline in the years that followed, when malt returns show a decrease in the amount of malt consumed by brewers of more than 50% in the years 1836-42, was more pronounced than is recorded in the official statistics.

The returns for the number of licensed brewers, charted in figure 2.3, show that the number of Irish breweries increased from 215 in 1831 to a peak of 256 in 1836, representing a significant increase of a little under one-sixth. It would appear likely that the trend for new brewery foundations pre-dated 1831 though, with the exception a few confirmed foundations of the 1820s, this has not been verified. For instance, Cairnes' Brewery in Drogheda, county Louth, is a known foundation of 1825, while Burr's Brewery in Nenagh, county Tipperary, is said to have been founded in 1821 (Callan MacArdle & Callan 1902, 479; Sheehan 1976, 28). Confirmed foundations of the 1830s were certainly more common. Examples include, but are not limited, to the Dunmanway Brewery in county Cork, founded in 1831; the Gorey Brewery in county Wicklow, founded in 1832; the Lough Gill/Sligo Brewery in Sligo town, founded in 1834; the Clonroad Brewery in Ennis, county Clare, founded in 1835; and Caffrey's Brewery in Dublin city, founded in the mid-1830s (Lewis 1837 vol. 1 585-6; Gallagher 2008, 628; Ó Dálaigh 2012, 17).[1] The greater number of confirmed foundations of the 1830s may suggest

[1] The Gorey Brewery was said to have been founded in 1832 when it was offer for sale in 1836, *Freemans Journal* 08/11/1836, 2. Caffrey's Brewery was likely founded after 1834, when it was omitted from the trade

that the dramatic increase in the number of breweries was primarily a phenomenon of the decade, though evidence to confirm or indeed refute this is simply lacking.

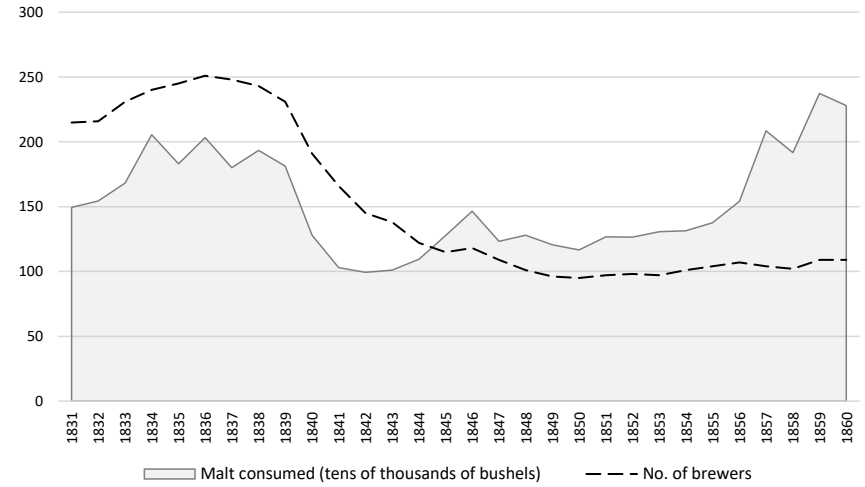


Figure 2.3. Malt consumed by and number of licensed breweries in Ireland, 1831-60. Source: Bielenberg 1998, App. 1, 104-5.

As can be seen in figure 2.3, the number of breweries in Ireland decreased dramatically after the peak in 1836. A reasonably small decline is recorded from 1836-8, though from 1838-50 the decline was pronounced. The period saw a reduction in the number of licensed brewers from 243 to just 95, representing a rate of reduction of some 61%. In the same period the malt returns show a reduction in malt consumption by brewers of some 40%, though the overall rate of reduction is masked by an increase in the years 1843-6. The figures show that the largest reduction in the use of malt was in the years 1838-42, when it had reduced by a little under 50%. If we accept that that the malt returns under-represent the true total of malt consumed by breweries during the period, as suggested by the Parliamentary inquiry of 1833-4, it suggests a far greater decline than is evident in the official statistics. Before the causative reasons for the decline, which preceded a period of growth for the industry after 1850, are discussed, let us first consider the scale of the breweries that produced in the period.

directories, and before 1837, when it was depicted on the 1:1056 OS, Pettigrew & Oulton 1834; NAI/OS140/Dublin 1837.

Year	B & C	Guinness	Madeira	Year	B & C	Guinness
1831	54,972	53,965	-	1841	41,295	73,369
1832	60,048	56,977	-	1842	36,865	68,178
1833	65,585	68,357	-	1843	32,848	68,664
1834	63,394	80,984	-	1844	33,945	74,249
1835	53,388	76,578	-	1845	38,339	81,441
1836	52,213	74,010	*2,343	1846	46,887	100,895
1837	58,429	71,519	#4,494	1847	54,584	95,750
1838	61,143	73,192	4,070	1848	56,233	89,563
1839	63,031	87,322	3,151	1849	46,738	94,278
1840	45,417	79,924	1,793	1850	43,070	100,111

*Table 2.5. Sales figures for Beamish and Crawford (B & C) and Guinness, 1835-50, and for the Madeira Island Brewery in Galway city, 1836-40. Sources: Lynch & Vaizey 1960, App., 206; Ó Drisceoil & Ó Drisceoil 2015, App. B, 375; Madeira Island Brewery Sale Book, NUIG/Archives/BUS/1. *incomplete returns from June to December #no records for March and April.*

In addition to sales figures for Beamish and Crawford and Guinness, sales figures for the Madeira Island Brewery in Galway have been preserved for the early period of the decline. In addition, Lewis, whose *Topographical Dictionary* was published in 1837 on the eve of the decline, provided approximate sales figures for several Irish breweries. By and large, the figures provided by Lewis were modest. In Limerick city, a total of seven breweries were stated to have had sales of about 5,000 barrels each, while breweries at Templemore in county Tipperary and Tuam in county Galway were each said to have had a similar output (Lewis 1837 vol. 2, 269, 608, 646). The breweries in four towns were stated to produce a greater volume. The Donaghmore Ale Brewery in county Tyrone was said to produce more than 10,000 barrels annually, while the Bray Brewery in county Wicklow was said to have the capacity to produce more than 15,000 (*ibid*. vol. 1, 222, 469). The Newtownards Brewery in county Down was said to have annual sales of over 7,000 barrels, while in Bandon, three 'extensive' breweries were said to produce a combined 25,000 barrels annually (*ibid*., vol. 1, 179; vol. 2, 435). Each of the remaining four breweries where figures were provided, located in Tallow, county Waterford, Dunmanway, county Cork, Coleraine, county Derry/Londonderry, and Armagh city, were each said have annual sales of between 2,500 and 4,000 barrels (*ibid*. vol. 1, 68, 386, 586; vol. 2, 589).

The Madeira Island Brewery's sales figures suggest that it produced at a similar scale to the majority referred to by Lewis (table 2.5). The brewery's greatest recorded sales were made in 1837, a year where the ledger is incomplete and where sales are suggested to have been in the region of *c*. 5,000 barrels. While it cannot be confirmed due to lack of comprehensive evidence, it is certainly suggested that, with the exception of the few large-scale breweries primarily located in the port cites, the majority of Irish breweries' annual output was of 10,000 barrels or less in the years that preceded the decline.

The few surviving sales figures show that the decline of the period was not felt evenly across the industry (table 2.5). The Madeira Island Brewery's sales decreased dramatically in 1837-40 and the fact that the ledger is incomplete for 1837 shows that the reduction of over 60% recorded is an

under-representation of the true figure. The steepest decline was in the years 1839-40 when sales fell by more than 43%. Beamish and Crawford's sales fell steeply in the same year, by 28%, while Guinness's declined by some 8.5%. However, the declining sales of Ireland's two largest breweries had been preceded by modest growth from 1837-9 and, while Beamish and Crawford's sales declined by 22% from 1837-40, Guinness's figures show an increase in sales in the period of some 11.5%. While far from being a comprehensive dataset, these sales figures suggest that it was Ireland's smaller breweries, located outside of the large port cities, that were most affected by the early period of the decline.

The traditional explanation for the early period of the decline has been the effects of the popular temperance campaign led by Fr. Mathew from 1838. It is worth noting that organised temperance societies had been a part of Irish society since the 1820s, initially associated primarily with Protestant and dissenter congregations and later, in the 1830s, with a minority of the Catholic clergy (Malcolm 1986, 56-91). As was previously noted, the legislative reforms of the late-18th century, which were designed to encourage the Irish brewing industry, were enacted in an attempt to discourage the growing consumption of spirits (Malcolm 1986, 26-7). Beer was then viewed as being a temperance drink, one that was seen, in comparison to spirits, as being wholesome (Malcolm 1968, 50-51). What separated Fr. Mathew's temperance campaign from its predecessors was its sheer popularity, while it also pushed for teetotalism, or total abstinence from alcohol, a consideration that several of the early temperance societies had also campaigned for, though largely unsuccessfully.

Mathew's 'crusade', as it is often coined, began in earnest in 1838 with the foundation of the Cork Total Abstinence Society in Cork city, where he had been a member of clergy since 1814 (Malcolm 1986, 105-11). By February 1839 the society was said to have some 9,000 members and by November that year membership was said to be increasing by as many as 4,000 members a week (Malcolm 1986, 112-3). It was in November 1839, with a visit to Limerick city, that Mathew began to preach beyond Cork. In a three-day visit, as many as 150,000 people were said to have taken 'the pledge', swearing off the consumption of all alcohol, wine, beer and spirits. From there the campaign picked up pace and in the years that followed Mathew travelled widely, conducting hundreds of what Malcolm coined 'major temperance missions', preaching throughout Ireland and to a lesser degree in England. In the first five years of the campaign, nearly 3,000,000 people in Ireland are said to have taken 'the pledge' (Ó Drisceoil & Ó Drisceoil 2015, 84). The success of the campaign was said to have been primarily rural and provincial (Malcolm 1986, 119). The populations of Dublin city, and to a lesser degree Cork city, were said to be less interested in the moralising message of teetotalism, though significant proportions of the populations of both cities were said to have taken 'the pledge'. The campaign continued, though to a lesser degree, through the early years of the Famine. Its momentum was said

to have slowed after 1843 owing to poor financial management, hostility within the Catholic church and, perhaps most tellingly, the loss of campaigners to the Repeal movement (Ó Drisceoil & Ó Drisceoil 2015, 84). The movement effectively ended when Mathew suffered a stroke in April 1848, after which he suffered poor health and spent an extended period of recuperation in north America (Malcolm 1986, 143).

Lynch and Vaizey (1960, 141) noted that, while Guinness did suffer a loss of trade in the years 1839-43, it was primarily felt in the English market, casting doubt on the impacts that the temperance movement had on the industry. Instead, a trade depression in England, increases in both malt tax and hop duty and the introduction of income tax were proposed as reasons for Guinness's loss of trade in the period. However, Beamish and Crawford, located at the epicentre of Mathew's campaign, suffered a far greater loss of trade in the period, while both the malt returns and the returns on the number of licensed brewers show that the wider industry suffered greatly (table 2.5; figure 2.3). Indeed, the notebooks of Valuation Office surveyors contain remarks on the impacts of the temperance movement on several Irish breweries. For instance, surveyors directly blamed the temperance movement for the closures of both Monahan's Brewery in Portumna, county Galway, before 1844 and Robinson's Brewery in Birr, county Offaly, before 1843.[2] Hare's Brewery in Longford town was said to have suffered a loss of three-quarters of its trade in the years immediately before 1841, a change also blamed by surveyors on the temperance movement.[3] The brewery continued to produce to at least 1846, though had closed by 1848 (Slater 1846; Gerraty, Morris & O'Ferrall 2010, 13). The closure of Hare's Brewery suggests that closures in the years 1845-50, when the returns show that the number of breweries had reduced from 115 to 95, were impacted by reduced trade in the years that had preceded. The years of the Famine saw a minor resurgence in the wider industry, as seen in the malt returns. In addition to increased trade, several Irish breweries, including Beamish and Crawford, made substantial profits from the food relief schemes, winning contracts for both storing and milling maize for distribution to those in need (Ó Drisceoil & Ó Drisceoil 2015, 85-6).

2.2 The changing regionality of the industry to 1850

2.2.1 1790-1830

Clear regional trends can be viewed when the returns for the number of licensed brewers in Ireland during the early 1790s are mapped, as is presented for 1791 in figure 2.4. With few exceptions, commercial brewing was almost entirely confined to Ireland's east, south and midlands. In Ulster,

[2] See catalogue entries GY 127-001 and OY 035-001.
[3] See catalogue entry LD 013-001.

commercial breweries were reasonably common in the east of the province, while they appear to have been largely confined to the area around Coleraine and Derry/Londonderry city in the province's west. Apart from the Galway and Sligo districts, where a combined seven commercial brewing licenses had been issued, commercial breweries were particularly uncommon in Connaught. In contrast, retail brewing remained common in both Connaught and western Ulster, in addition to the midlands and the southeast. While commercial brewing was reasonably common in east Munster, the west of the province was served by comparatively few breweries, either retail or commercial. Indeed, no breweries were licensed in the Ennis excise district, while commercial brewing in the southwest appears to have been limited to areas covered by the Limerick, Baltimore and Bandon districts. Just one retail brewing license had been issued in the Tralee district, suggesting that commercial brewing was entirely absent in much, if not all, of county Kerry.

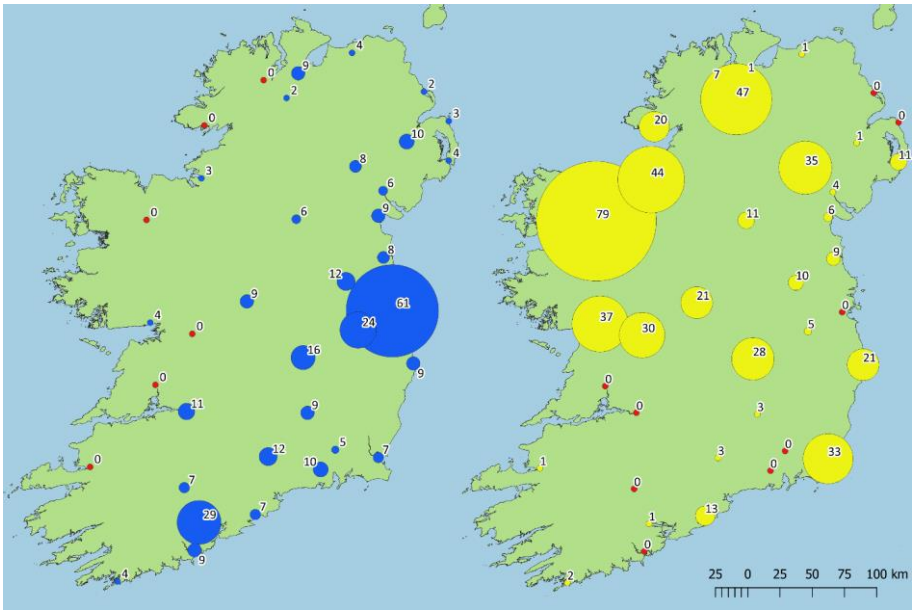


Figure 2.4. The distribution of breweries in Ireland, by excise district, in 1791. Commercial breweries, a combined total of both small and strong beer brewers, are mapped on left, while retail breweries are mapped on right. Source: JHCKI 1797b.

Malcolm (1986, 22) commented briefly on the regionality of the industry in the early 1790s, highlighting that more than half, some 169, of the licenses had been issued from Leinster-based excise districts. Some 61 of these had been issued by the two Dublin districts, 48 by the city district and 13 by the county. There had been a further four excise districts within the wider vicinity of Dublin, the Drogheda, Maryborough (now Portlaoise), Naas and Wicklow districts, between which a further 53 licenses had been issued. Combined, this shows that more than one-third, some 114, of the

commercial brewers' licenses issued in Ireland in 1791 had been issued within the broad vicinity of Dublin city. Malcolm also commented on the density of the industry in Cork city, where as many as 29 licenses had been issued. The Cork excise district appears likely to have included just a small portion of the wider county, which was covered by five further districts, Baltimore, Bandon, Kinsale, Mallow and Youghal, between which a further 27 commercial brewing licenses had been issued.

Bielenberg (2008, 79) highlighted the absolute decline in the number of breweries in Ireland between the 1790s and the 1830s. As was previously highlighted, this was a period that had seen the number of brewers' licenses issued decrease from a combined 319 small and strong beer brewers in 1791 to 215 breweries by 1831. Retail brewing, at least licensed, had entirely ceased in the interim period and there is no suggestion that illicit production was common. The distribution of licensed brewers in 1831, divided by excise district, is mapped in figure 2.5, where it presented alongside the corresponding map of licensed commercial brewers from 1791.

Between 1791 and 1831, the number of excise districts had reduced from 32 to 21 and this reorganisation makes the direct comparison of the data difficult. However, a superficial overview of the maps reveals several distinct and obvious regional trends. The expansion of commercial brewing in the west of Ireland is clearly evident, as is the marked contraction of the industry in the regions surrounding both Dublin and Cork cities. A similar, less-dramatic decline is also evident in the northeast, while the industry's development in regions such as the southeast, midlands and in the region around Derry/Londonderry city in the north appears to have been nuanced. The decline of the industry in the areas around Cork and Dublin cities, and perhaps also in the northeast within the vicinity of Belfast, can be viewed as being the result of the early industrialisation of several breweries within the cities. As was previously highlighted, several breweries in both Cork and Dublin cities had undergone a phase of rapid expansion in output during the years of the French wars and the evidence may suggest a similar, though perhaps less-dramatic, expansion of several breweries in Belfast, then a large town with a rapidly expanding population (Gillespie & Boyle 2003, 6-7). In contrast, the expansion of the industry in the west of Ireland, and particularly in Connaught, should be viewed as marking the de-regionalisation of commercial brewing. In Connaught, a small number of commercial breweries, each likely producing for local consumption, had replaced a greater number of retail brewers. A similar trend, though less obvious in the data, appears likely to have been at play in other regions where retail brewing had been common in the early 1790s, such southeast, parts of the midlands and perhaps west Ulster.

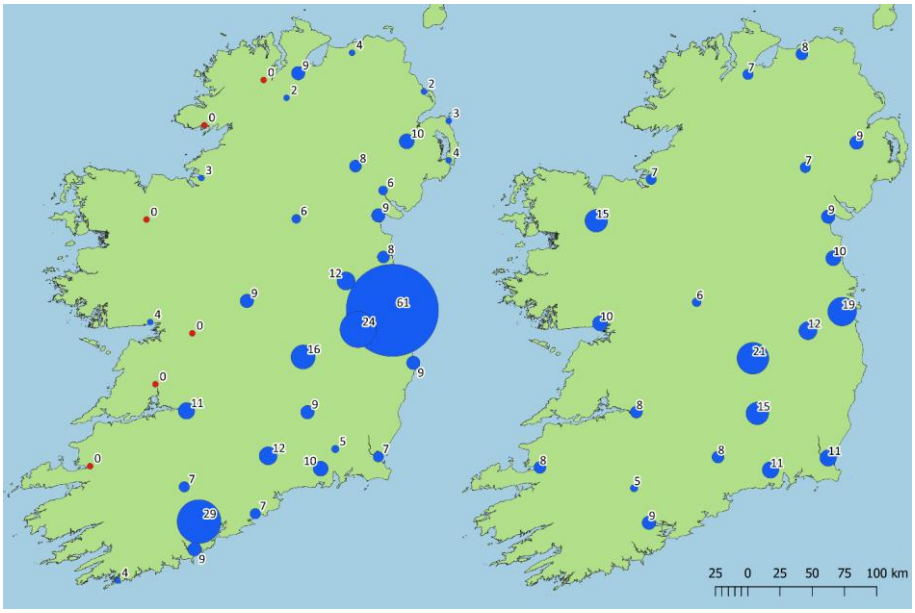


Figure 2.5. The distribution of breweries in Ireland, by excise district, in both 1791, on left and 1831, on right. Source: JHCKI 1797b; & BPP 1832.

Unfortunately, the mapped data provides little insight into the wider trends seen during the French wars of 1793-1815 and the period of decline for the industry that followed their cessation. While the overall output of the industry, as seen in the malt returns, is confirmed to have declined in the years that immediately followed 1815, it remains unclear whether this decline in output was met with a similar decline in the number of breweries, or indeed whether it was a regional trend, perhaps affecting the areas where the industry was over saturated, such as within the vicinities of Cork and Dublin cities. The well-documented case of the Southgate Brewery in Cork city displays the nuanced nature of the decline in the number of breweries between the early 1790s and the 1830s. There, four breweries had amalgamated in the period 1790-1815 before the amalgamated brewery itself failed in 1818 (Ó Drisceoil & Ó Drisceoil 2015, 165-9). The brewery was re-opened under new ownership the same year and in 1821 acquired the premises of another of the city's breweries that had also failed during the period of decline, Drinan's Brewery. A similar trend for brewery amalgamations in the period 1790-1815 has been noted in Dublin city. In just two examples, the trade directories show that both Guinness and the brewery that would later be known as the Phoenix Brewery had subsumed neighbouring breweries during the years of the French wars. Between 1804 and 1815, Guinness had subsumed a neighbouring brewery, previously operated by Cox, located at 83 James's Street, while

the brewery that would later be known as the Phoenix Brewery had subsumed two neighbouring breweries in the same period, located at 90 James's Street and 66 Watling Street (Wilson 1804; 1815).

Further underlining the nuanced nature of the industry's wider development during the period is the previously mentioned foundation of two new breweries in Galway city in the years that immediately followed 1815. There, the Nun's Island Brewery and the Madeira Island Brewery had been founded in 1816 and 1817 respectively and in 1820 the city was served by four breweries, the two new foundations, a foundation of *c*. 1800, the Newcastle Brewery, and a foundation of the late-18th century, the Newtownsmith Brewery (Pigot 1820; Prunty & Walsh 2016, 29-30). To further elucidate on both the local and regional trends in the period, a combination of in-depth local and regional studies would be required, drawing data from such historical sources as the contemporary press, trade directories and the Registry of Deeds. The sheer depth of historical sources available for Dublin city, which in *Wilson's Directory* is provided a unique source for the period, an annually published trade directory, makes the city a particularly tempting candidate for such a study, though it remains outside of the remit of the current study.

2.2 1830-50

Both the historical and cartographic sources are rich for the period 1830-50, a period that can be divided into two distinct sub-periods, each marking a different trend for the industry. As was previously noted, the period 1830-7 witnessed the expansion of the industry, while the years that immediately followed saw a phase of rapid decline. The period coincided with the production of both the first edition of the OS and the compilation, though not publication, of much of the *Primary Valuation*, sources that have enabled a reasonably rich, though certainly not comprehensive, mapping of the industry. In figure 2.6, the distribution of breweries in Ireland in both *c*. 1835 and *c*. 1850, as is suggested by these sources, is provided.

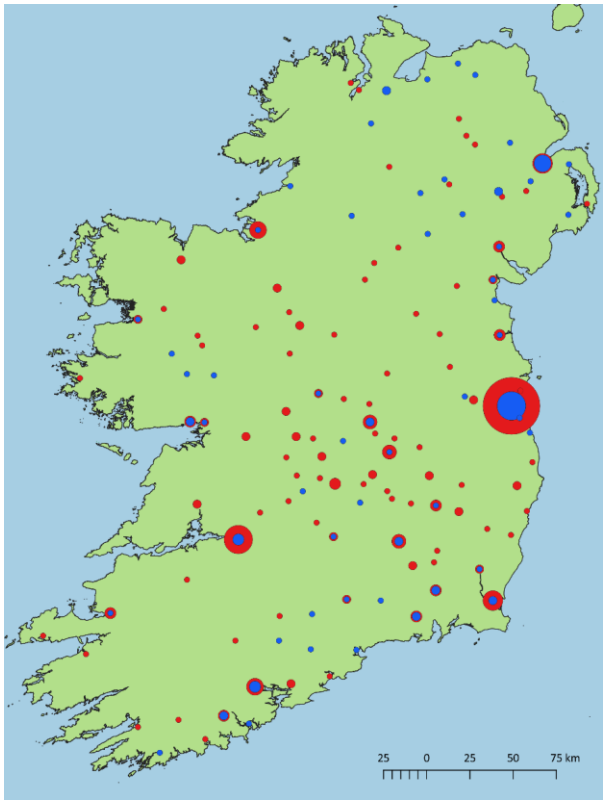


Figure 2.6. The distribution of breweries in Ireland, c. 1835-50. Those marked in blue are confirmed to have produced post-1850 while those marked in red show no evidence of such. Markers are graduated in size by the number breweries.

Mapping the returns for the number of licensed brewers in both 1831 and 1837, as is seen in figure 2.7, confirms the regionality of the industry's expansion during the period. The expansion was quite dramatic in areas such as the south, southeast and northeast, while a corresponding decline is confirmed in other areas, particularly to the west of Dublin city. The south midlands appears to have had a reasonably nuanced development in the period. In the north of the region, the number of breweries had actually declined within the Maryborough district, while the number of breweries in the Kilkenny district to the south had increased. Historical sources confirm many of the new brewery foundations of the period, though the coverage is far from comprehensive. For example, in county Cork, the Dunmanway Brewery is a known foundation of 1831, while otherwise undocumented breweries are also known to have been founded in both Kanturk and Millstreet during the decade (Lewis 1837 vol. 1, 585-6; vol. 2, 33, 270). In the southeast, a small brewery is known to have been founded in the village of Kyle, county Wexford during the decade, while Perry's Brewery in

Rathdowney county Laois was amongst the new foundation within the Kilkenny district (*ibid*. vol. 2, 198; Hamond 2005 vol. 2, LAIAR-028-011). New foundations of the period were also common in the cities. In Dublin, Caffrey's Brewery on Summer Street was founded in the mid-1830s, while in Cork, Jones and Cowperthwaite's Brewery would appear likely to have been founded at a similar date.[4] The Foyle Brewery in Derry/Londonderry is a known foundation of 1836, while the Thomond Brewery in Limerick was founded in 1832 (Thomas 2005, 25; O'Flaherty 2010, 31). These are just a few of many confirmed foundations of the period and it is worth noting that many more of the breweries identified on the first edition of the OS remain probable, though unconfirmed foundations of the period, with many being otherwise undocumented.

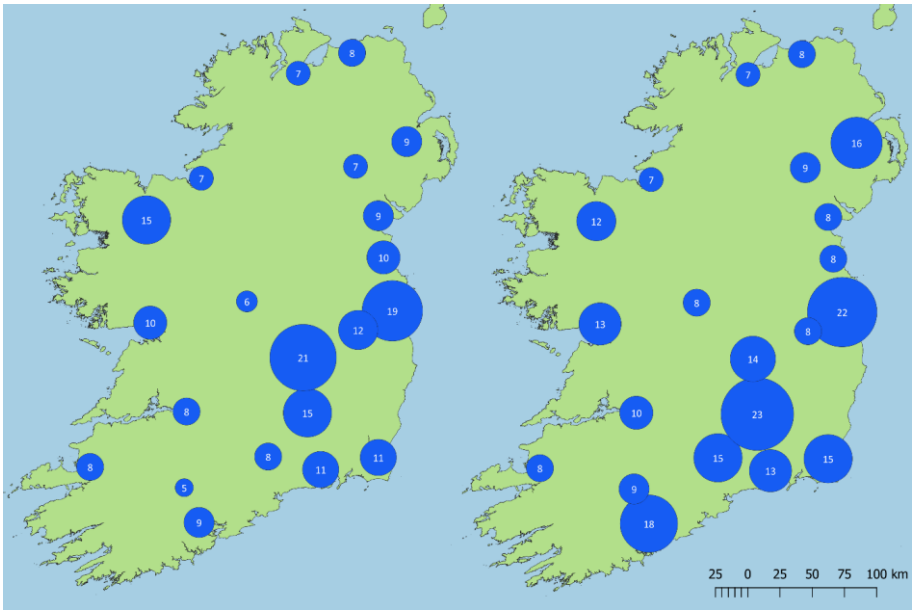


Figure 2.7. The distribution of breweries in Ireland, by excise district, in both 1831, on left and 1837, on right. Source: BPP 1832 & 1838a.

As can be seen in figure 2.6, the brewery closures of the late-1830s and 1840s, while distributed across the island of Ireland, were heavily weighted towards midlands areas, in particular the areas traversed by both the Grand Canal and Royal Canal. Brewery closures were also particularly common in the west of Ireland, while the northeast appears to have been less affected by the trend. In order to assess the causative factors behind the trend, the populations of each location that

[4] Caffrey's Brewery was likely founded after 1834, when it was omitted from the trade directories, and before 1837, when it was depicted on the 1:1056 OS, Pettigrew & Oulton 1834; NAI/OS140/Dublin 1837. Jones and Cowperthwaite's Brewery was included just once in the consulted trade directories, in *Slater's Directory* of 1846. The standing remains of the brewery suggest an 1830s date of foundation, see catalogue CK 074-007.

supported a brewery in the 1830s, whether village, town or city, have been assessed, drawing raw data from the 1841 Census. This data is mapped in figure 2.8 and provided in tables 2.6-2-10.

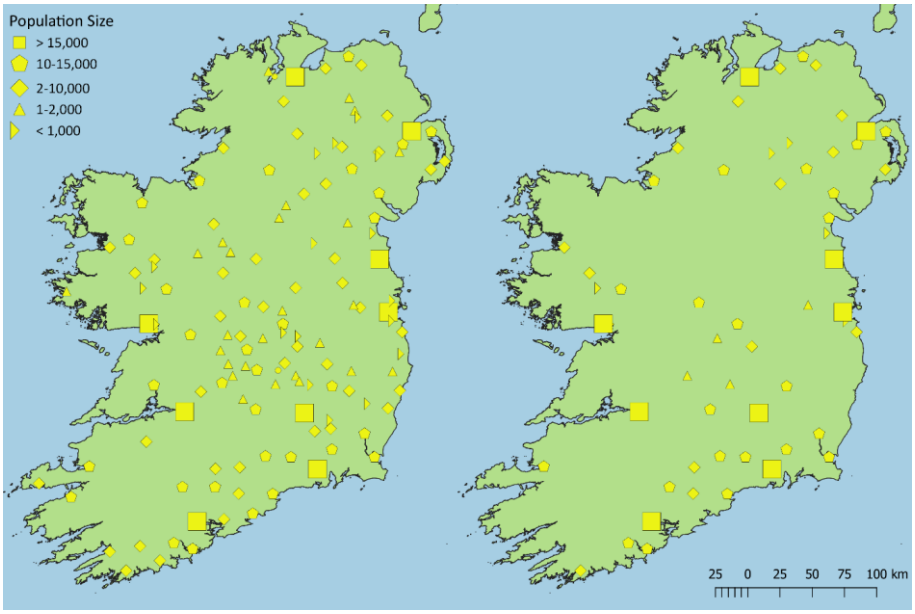


Figure 2.8. Populations of villages, towns and cities that sustained breweries in c. 1835, on left, and c. 1850, on right.

As can be seen in figure 2.8, the industry was not limited by local population in the mid-1830s, when breweries were reasonably common in small towns and villages with a population below 2,000. In the mid-1830s, as many as 17 villages, taken here as a settlement with a population below 1,000, sustained breweries, while as many as 26 small towns, taken as a settlement with a population of between 1,000 and 2,000, sustained breweries. Regional trends in population class are evident, with breweries being reasonably common in small towns in the midlands in the mid-1830s, particularly in areas south of the Royal Canal. This was the region where the closures in the period that followed were most common and these closures were most-heavily weighted towards these smaller centres of population. By *c.* 1850, the number of small towns that sustained breweries had reduced to just four, each located in the midlands, while six village-based breweries continued to produce. While the distribution of small-town context breweries was then confined to the midlands, village-based breweries were more widespread, located at Shrule in county Mayo, Oranmore in county Galway, Stillorgan in county Dublin, Castlebellingham in county Louth, and both Ballygawley and Donaghmore in county Tyrone. The number of medium-sized towns that sustained breweries, those with a population of between 2,000 and 10,000, had also significantly reduced, from 45 to 15, while the

corresponding number of large towns, those with a population of between 10,000 and 15,000, had reduced from 33 to 23.

As was previously noted, the traditional explanation for the decline of the industry in the period is the impacts of the temperance campaign led by Fr. Mathew, who promoted total abstinence from alcohol. While the overall impacts of the campaign should not be understated, and the regionality of the decline can be used to reinforce the traditional interpretation, it may also suggest an alternative interpretation. The lesser number of brewery closures in the northeast may well be seen as reinforcing the traditional interpretation. Mathew's temperance campaign is said had less success in the Ulster counties, primarily due to religious differences (Malcolm 1986, 151-2). As such, the lesser number of brewery closures in the province can be viewed as being indicative of the regionality of the campaign. As will be outlined in the chapter that follows, the province's brewing industry suffered greatly in the decades that followed, perhaps due to the resurgence in the ideology of teetotalism in the province's Protestant population.

However, the heavy weighting of brewery closures towards both the smaller centres of population and the midlands may suggest that the impacts of the temperance campaign have been overstated. Instead, the trend for closures may be viewed as being part of the wider trend for the breakdown of traditional craftwork in Ireland, a trend that was, perhaps, accelerated by the impacts of the temperance movement. For example, Bielenberg (13-19, 179) noted that the period, and in particular the 1840s, had seen the contraction of domestic textile production, which similarly to commercial brewing had expanded in the 18th and early 19th centuries. Lynch and Vaizey (1960, 141, 202-4) noted that Guinness's loss of trade during the period had been primarily in England and that the brewery had actually expanded its Irish sales outside of Dublin. The 1830s had seen the brewery expand its agency system, principally in towns located on the Grand Canal and its branch lines. The marked decline in the number of breweries in areas traversed by the canal network would appear likely to have been at least partially impacted by Guinness's Irish expansion in the period. Indeed, it would appear likely that Guinness were not the only Dublin brewery that utilised the canal network to expand their sales in the period, though it remains the only documented case.

Returning to the period 1790-1830, the greatest number of brewery closures had occurred in the areas immediately south and west of Dublin city, while the industry had continued to contract to the west of the city during the 1830s. It was proposed that these closures had been influenced by the industrialisation of brewing in the capital and it would appear likely that the closures in the midlands during the late-1830s and 1840s had at least been partially affected by the growing trade networks that Dublin's large-scale industrial breweries developed in the period. In effect, the accelerated trend for closures in the midlands areas appears to have been the continuation of the trend for the Dublin

city breweries advancement of their trade westward, a point that is reinforced by the continued contraction of the industry within the Maryborough excise district in the period 1831-7.

2.3 Conclusions

Following an extended period of decline that lasted for much of the 18th century, the late-18th and early 19th centuries were a transformational period for brewing in Ireland. The period saw the total failure of retail brewing in Ireland, while a small number of breweries, primarily located in the large port cities, had undergone a rapid phase of expansion, the initial period of industrialisation. The period also saw the de-regionalisation of commercial brewing, with commercial breweries founded in areas such as the west, midlands and southeast where production had previously been carried out by a large number of retail brewers. At the same time, commercial brewing declined within the vicinities of both Cork and Dublin cities where the phase of early industrialisation had been primarily focussed. This contraction would appear likely to have been directly related to the expanded output of the newly industrialised breweries. Unfortunately, the available evidence has not enabled either the scale or regionality of the changes during the key period 1790-1820 to be outlined. However, the evidence does suggest that the impacts of the French wars and the economic decline that followed had a varying regional effect on the wider industry, with the expansion of the industry in the west of Ireland being the most obvious of these varied regional trends.

The evidence for the period 1830-50 is far more comprehensive. Commercial brewing expanded in the period 1830-7, a period that saw the further contraction of the industry in midlands areas to the west of Dublin city, while new breweries were founded elsewhere, in particular along Ireland's south coast. The industry's decline in the late-1830s and 1840s is well documented and has traditionally been viewed as being the result of the temperance campaign led by Fr. Mathew. The regionality of the decline, which was presented here for the first time, both reinforces the traditional interpretation while also suggesting an alternative. In particular, the lesser decline in the northeast, a region where religious differences are said to have seen the message of teetotalism gain less traction, reinforces the interpretation. However, the fact that the closures of the period were heavily weighted both towards both the smaller centres of population, small towns and villages, and the midlands areas traversed by both the Grand Canal and Royal Canal, may suggest that many of the closures can be viewed as part of the trend for the failure of traditional craftwork in Ireland. Comparisons can be drawn with the similar decline in domestic textile working in the same period, with the suggestion being that the heavy weighting of the closures towards the midlands was the result of the large, industrialised breweries in Dublin city expanding their markets westward. Indeed, the regionality of the closures in the decades that had preceded would appear to reinforce this interpretation. In the

period 1791-1831, brewery closures had been most common in the areas to the west and southwest of Dublin city, and this trend for brewery closures appears to have spread further west during the 1830s when the industry is suggested to have markedly contracted within the Maryborough excise district. The decline of the late-1830s and 1840s had also seen the near-total failure of the industry in the midlands areas to the north of the Royal Canal. This was, in effect, the beginning of the re-regionalisation of the industry, a trend that, as will be outlined in the chapter that follows, continued throughout the second half of the 19th century.

Location	County	Province	Population 1841	Identified Breweries *c.* 1835	Identified Breweries c. 1850
Galway City	Galway	Connaught	17,275	3	2
Dublin City	Dublin	Leinster	232,726	19	9
Kilkenny City	Kilkenny	Leinster	19,071	4	2
Drogheda	Louth	Leinster	17,300	3	1
Cork City	Cork	Munster	80,720	5	3
Limerick City	Limerick	Munster	48,391	9	3
Waterford City	Waterford	Munster	23,002	3	2
Belfast	Antrim	Ulster	70,447	6	5
Derry/Londonderry	Derry	Ulster	15,196	2	2

Table 2.6. Raw data for places with a population greater than 15,000 in 1841 that are known to have sustained a brewery in c. 1835. Population data derived from the returns of the 1841 Census, drawn from the returns of the 1871 Census (BPP 1872; 1873; 1874a; 1874b).

Location	County	Province	Population 1841	Identified Breweries *c.* 1835	Identified Breweries c. 1850
Loughrea	Galway	Connaught	5,458	2	-
Tuam	Galway	Connaught	6,034	1	1
Ballina	Mayo	Connaught	5,313	2	-
Castlebar	Mayo	Connaught	5,137	1	-
Sligo Town	Sligo	Connaught	12,272	5	1
Carlow Town	Carlow	Leinster	10,409	3	1
Dundalk	Louth	Leinster	10,782	2	1
Birr	Offaly	Leinster	6,890	2	-
Tullamore	Offaly	Leinster	6,343	4	2
Athlone	Westmeath	Leinster	6,393	2	1
Enniscorthy	Wexford	Leinster	7,016	2	1
New Ross	Wexford	Leinster	7,133	3	2
Wexford Town	Wexford	Leinster	11,252	6	2
Ennis	Clare	Munster	9,318	2	-
Bandon	Cork	Munster	9,019	3	2
Fermoy	Cork	Munster	6,379	1	1
Kinsale	Cork	Munster	6,918	1	1
Mallow	Cork	Munster	7,014	1	-
Youghal	Cork	Munster	9,939	1	-
Killarney	Kerry	Munster	7,127	1	-
Tralee	Kerry	Munster	11,363	3	1
Carrick-on-Suir	Tipperary	Munster	8,369	1	1
Clonmel	Tipperary	Munster	13,010	2	1
Nenagh	Tipperary	Munster	8,618	1	-
Roscrea	Tipperary	Munster	5,275	3	-
Thurles	Tipperary	Munster	7,523	2	1
Dungarvan	Waterford	Munster	8,625	1	1
Lisburn	Antrim	Ulster	6,284	1	1
Armagh City	Armagh	Ulster	10,245	1	1
Coleraine	Derry	Ulster	6,255	1	1
Newry	Down	Ulster	11,972	3	1
Newtownards	Down	Ulster	7,621	1	1
Enniskillen	Fermanagh	Ulster	5,686	1	1

Table 2.7. Raw data for places with a population of 5-15,000 in 1841 that are known to have sustained a brewery in c. 1835. Population data derived from the returns of the 1841 Census, drawn from the returns of the 1871 Census (BPP 1872; 1873; 1874a; 1874b).

Location	County	Province	Population 1841	Identified Breweries *c.* 1835	Identified Breweries c. 1850
Ballinasloe	Galway	Connaught	4,932	2	-
Ballinrobe	Mayo	Connaught	2,678	1	1
Claremorris	Mayo	Connaught	2,256	1	-
Westport	Mayo	Connaught	4,912	2	1
Boyle	Roscommon	Connaught	3,235	2	-
Roscommon Town	Roscommon	Connaught	3,439	1	-
Tullow	Carlow	Leinster	3,097	2	-
Athy	Kildare	Leinster	4,698	2	-
Maynooth	Kildare	Leinster	2,129	2	-
Graiguenamanagh	Kilkenny	Leinster	2,248	1	-
Thomastown	Kilkenny	Leinster	2,348	2	-
Mountmellick	Laois	Leinster	4,755	4	1
Mountrath	Laois	Leinster	3,000	2	-
Longford Town	Longford	Leinster	4,957	1	-
Kells	Meath	Leinster	4,200	1	-
Trim	Meath	Leinster	2,269	1	-
Banagher	Offaly	Leinster	2,827	1	-
Moate	Westmeath	Leinster	2,095	1	-
Mullingar	Westmeath	Leinster	4,569	1	-
Gorey	Wexford	Leinster	3,365	1	-
Arklow	Wicklow	Leinster	3,254	1	-
Bray	Wicklow	Leinster	3,169	1	1
Killaloe	Clare	Munster	2,009	1	-
Bantry	Cork	Munster	4,082	1	-
Clonakilty	Cork	Munster	3,993	1	1
Dunmanway	Cork	Munster	3,086	1	-
Midleton	Cork	Munster	4,591	2	-
Mitchelstown	Cork	Munster	4,181	1	-
Skibbereen	Cork	Munster	4,715	1	1
Dingle	Kerry	Munster	3,836	1	-
Newcastle West	Limerick	Munster	2,917	1	1
Clogheen	Tipperary	Munster	2,049	1	1
Tallow	Waterford	Munster	2,969	1	1
Antrim Town	Antrim	Ulster	2,393	1	1
Ballymoney	Antrim	Ulster	2,490	1	1
Lurgan	Armagh	Ulster	4,677	2	2
Limavady	Derry	Ulster	3,101	1	1
Ballyshannon	Donegal	Ulster	3,518	1	1
Downpatrick	Down	Ulster	4,651	1	1
Portaferry	Down	Ulster	2,107	1	-
Clones	Monaghan	Ulster	2,877	1	-
Monaghan Town	Monaghan	Ulster	4,130	1	1
Dungannon	Tyrone	Ulster	3,801	1	-
Omagh	Tyrone	Ulster	2,947	1	-
Strabane	Tyrone	Ulster	4,704	1	1

Table 2.8. Raw data for places with a population of 2-5,000 in 1841 that are known to have sustained a brewery in c. 1835. Population data derived from the returns of the 1841 Census, drawn from the returns of the 1871 Census (BPP 1872; 1873; 1874a; 1874b).

Location	County	Province	Population 1841	Identified Breweries *c.* 1835	Identified Breweries c. 1850
Clifden	Galway	Connaught	1,509	1	-
Eyrecourt	Galway	Connaught	1,419	2	-
Portumna	Galway	Connaught	1,643	1	-
Castlerea	Roscommon	Connaught	1,233	1	-
Elphin	Roscommon	Connaught	1,551	1	-
Strokestown	Roscommon	Connaught	1,610	2	-
Kilcock	Kildare	Leinster	1,327	1	1
Monasterevin	Kildare	Leinster	1,097	1	-
Abbeyleix	Laois	Leinster	1,021	1	-
Ballinakill	Laois	Leinster	1,540	1	-
Rathdowney	Laois	Leinster	1,414	1	1
Kilcormac	Offaly	Leinster	1,345	1	1
Shinrone	Offaly	Leinster	1,054	1	-
Kilbeggan	Westmeath	Leinster	1,910	1	-
Baltinglass	Wicklow	Leinster	1,928	1	-
Rathdrum	Wicklow	Leinster	1,232	2	-
Borrisokane	Tipperary	Munster	1,625	1	-
Borrisoleigh	Tipperary	Munster	1,438	1	-
Cloghjordan	Tipperary	Munster	1,164	1	1
Belturbet	Cavan	Ulster	1,620	1	-
Killashandra	Cavan	Ulster	1,085	1	-
Maghera	Derry	Ulster	1,123	1	-
Magherafelt	Derry	Ulster	1,560	1	-
Rathmelton	Donegal	Ulster	1,428	1	-
Hillsborough	Down	Ulster	1,338	1	-
Carrickmacross	Monaghan	Ulster	1,977	1	-

Table 2.9. Raw data for places with a population of 1-2,000 in 1841 that are known to have sustained a brewery in c. 1835. Population data derived from the returns of the 1841 Census, drawn from the returns of the 1871 Census (BPP 1872; 1873; 1874a; 1874b).

Location	County	Province	Population 1841	Identified Breweries *c.* 1835	Identified Breweries c. 1850
Oranmore	Galway	Connaught	842	2	1
Ballindine	Mayo	Connaught	448	1	-
Shrule	Mayo	Connaught	729	1	1
Borris	Carlow	Leinster	950	1	-
Kinsaley	Dublin	Leinster		1	-
Stillorgan	Dublin	Leinster	611	1	1
Clogh	Kilkenny	Leinster	525	1	-
Castlebellingham	Louth	Leinster	665	1	1
Clonygowan	Offaly	Leinster	180	1	-
Killeigh	Offaly	Leinster	262	1	-
Carnew	Wicklow	Leinster	979	1	-
Newtownmountkennedy	Wicklow	Leinster	-	1	-
Virginia	Cavan	Ulster	965	1	-
Ballyronan	Derry	Ulster	-	1	-
Waringstown	Down	Ulster	825	1	-
Ballygebly Little	Donegal	Ulster	-	1	-
Ballygawley	Tyrone	Ulster	881	1	1
Donaghmore	Tyrone	Ulster	542	1	1

Table 2.10. Raw data for places with a population below 1,000 in 1841 that are known to have sustained a brewery in c. 1835. Population data derived from the returns of the 1841 Census, drawn from the returns of the 1871 Census (BPP 1872; 1873; 1874a; 1874b).

Chapter 3 The development of the industry after 1850

This chapter, which outlines the development of the industry after 1850, begins where the previous chapter finished. During the period in question, the Irish brewing industry underwent a further process of immense change which was marked by periods of both optimism and consolidation for the industry. Guinness expanded their output to become the world's largest brewery, while the industry as a whole can be said to have declined throughout the extended period. The chapter is divided chronologically into two primary sections, outlining the development of the industry in the period 1850-85 and after 1885. Both primary sections are sub-divided thematically. In the first section, the economic history of the industry in the period 1850-85 is outlined first, followed by a discussion of the regional trends seen in the period. The second primary section is sub-divided into three sub sections. The first two outline the economic history of the industry in the periods 1885-1914 and after 1914. The final sub-section deals with the regionality of the industry in the period after 1885.

3.1 The development of the industry in 1850-85

3.1.1 The economic history of the industry in post-Famine Ireland, 1850-85

Looking solely at the malt returns, charted in figure 3.1, the period 1850-85 appears to have been one of expansion for the Irish brewing industry, one that saw an almost four-fold increase in the industry's overall output. While the expansion in trade was certainly seen by other Irish breweries, the reality was that the increase was primarily driven by the expansion of Guinness's output in the period. While in 1840 more than half of the brewery's trade was targeted at the English market, by 1864 Guinness were producing more than half of the beer consumed in Ireland outside of Dublin (Lynch & Vaizey 1960, 140, 199-200; Bielenberg 2009, 80). While, in general, the period was one of optimism for the industry, one that saw the foundation new breweries following a period of decline, it was also one where the accelerated consolidation of the industry in the years that had preceded continued, though at a lesser pace. As can be seen in figure 3.1, the number of breweries in Ireland increased in the early years of the period though, as overall output expanded, the number of breweries began to decline from 1859. By 1885, the number of breweries in Ireland had reduced to just 42, a reduction of more than 61% from a high of 109 in 1859. While the period can be viewed as being one of critical growth for the largest Irish breweries, it should be viewed as being one of consolidation for the wider industry.

The period immediately following the Famine was a prosperous time for both Ireland and the Irish brewing industry. According to Ó Drisceoil and Ó Drisceoil (2015, 88), the 1850s was a decade

where ‘wages were rising, there was an increase in the standard of living and growing prosperity in cities and large towns provided concentrated markets that could be exploited by breweries.’ Lynch and Vaizey (1960, 168-74) agreed with this viewpoint, though stressed that the improved standard of living was not solely an urban phenomenon. They highlighted the expansion of the banking system, the reduction in the number of small-hold farms, wage increases due to labour shortages and an influx of cash returning to Ireland from emigrants as reasons for the expansion of the cash economy in rural Ireland, while also highlighting that rural poverty remained. The consumption of spirits was also on the decline in Ireland during the 1850s, a decline that was no doubt triggered by dramatic increases in spirit duty that were introduced during the decade (Malcolm 1986, 166-7).

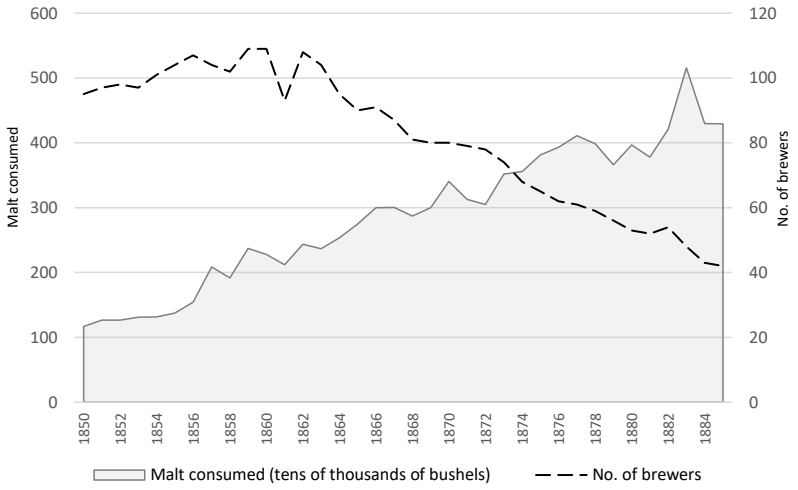


Figure 3.1. Malt consumed by and number of licensed breweries in Ireland, 1850-85. Source: Bielenberg 1998, App. 1, 104-5.

The malt returns show that the output of the Irish brewing industry almost doubled in the decade 1850-60, an increase seen in Guinness’s overall output and exceeded by Beamish and Crawford’s, whose sales increased by 153% (figures 3.1 & 3.2). While Guinness continued to improve its position in the British market during the decade, with an increase of over 80% in its exports to Britain, its Irish sales expanded at a greater rate, by some 113% (figure 3.2). While the expansion of the brewery’s English exports in the 1830s had enabled it to expand to become Ireland’s largest brewery by output, it had also expanded its Irish country trade in the decade, which had roughly equalled the brewery’s Dublin trade in financial value in 1840 (Bielenberg 2009, 80). This expansion had been via the canal systems that radiated west from Dublin, traversing the Irish midlands and joining the navigable rivers Shannon and Barrow. While the canal network had enabled the brewery

to amass a considerable trade in Ireland outside of Dublin before 1840, it was the expansion of the rail network that enabled the brewery to become the dominant figure in Irish brewing (Lynch & Vaizey 1960, 201-2).

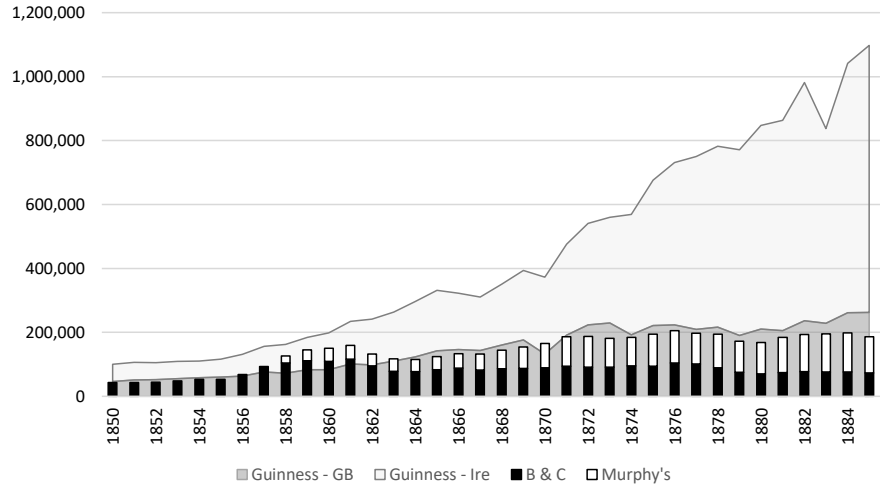


Figure 3.2. Sales figures, in barrels, for Guinness, divided by British and Irish markets, for Beamish and Crawford (B & C), 1850-85, and for Murphy's Brewery, Cork city, 1858-85. Sources: Hughes 2006, 276-9; Ó Drisceoil & Ó Drisceoil 1997, 45, 61; 2015, App. B, 375.

Guinness was not the only Irish brewery that exploited the growing rail network to expand its market, though the scale of the exploitation is certainly unique. In Cork city, both Beamish and Crawford and the newly founded Murphy's Lady's Well Brewery, established in 1856, are known to have exploited the rail network to expand their markets, primarily in Munster (Ó Drisceoil & Ó Drisceoil 1997, 41; 2015, 150). Figure 3.2, which charts the sales figures of both Beamish and Crawford and Murphy's against those of Guinness, shows that city's breweries expanded their total market share in the 1850s before seeing a decline in sales during the 1860s. This decline may be related to further competition within the city and its environs, both local and distant. The 1860s saw the expansion of another of the city's breweries, the St. Finnbarr's Brewery, which had been acquired by Sir John Arnott in 1862 (Ó Drisceoil & Ó Drisceoil 2015, 181-5). Arnott oversaw the renovation of the brewery and embarked on an aggressive expansionist phase in the early years of his proprietorship. While sales figures for the brewery have not been preserved, it would appear likely that the period actually saw an increase in the city's breweries overall market share, rather than the contraction suggested by the sales figures from both Beamish and Crawford and Murphy's. While the city remained a strong brewing centre, Ireland's second by output, Guinness managed to make successful inroads in the Cork city market in the 1850s, opening an agency in the city in 1859 (Ó Drisceoil & Ó Drisceoil 2015, 92).

Even in Cork city, where a highly developed brewing industry was present, Guinness were able to gain a not insignificant foothold in the local market for beer. It would appear likely that, given the closures of the decades that preceded, the vast changes in the Irish brewing industry had played a major role in Guinness's expansion of its Irish country trade after 1850.

While it was the period 1855-65 that had seen Guinness rise to become the dominant brewery in Ireland, Lynch and Vaizey (1960, 214) stated that Dublin city was then 'an unconquered market on [Guinness's] doorstep'. The brewery's trade in the city had increased in the decade before 1864, by which time Guinness were producing a little under half of the beer consumed in the city. However, it was the period 1865-75 that saw the brewery attain the dominant position in the market for beer in Dublin. The price of beer in the city had long been controlled by trade agreements between the city's brewers, though by the mid-1860s the price agreements appear to have been little more the reaffirmation of the prices set by Guinness (*ibid*., 213). The ultimate fate of the agreement has not been outlined, though it had begun to fail by at least the late-1860s, with Manders and Powell refusing to operate under its terms in 1868. The apparent breakdown of the agreement in the 1860s coincided with Guinness's major expansion in the Dublin market. The value of the brewery's Dublin sales in the period 1863-72 almost doubled, from £139,482 to £246,700. Lynch and Vaizey (1960, 214) proposed several reasons for the brewery's increased dominance in Dublin. The quality of Guinness's beer was stressed, while the bankruptcy of several of the city's breweries was proposed as a potential factor, though it would appear more likely to have been a symptom instead. The most important factor appears to have been price. Guinness was said to have 'clipped profit margins because of its own low costs' during the period, undercutting the prices offered by the city's remaining breweries (*ibid*.). Indeed, the period 1860-80 saw the brewery's overall profit margins reduce from 30% to 20%, a reduction that had been enabled by the brewery's economies of scale (*ibid*. 216). This led Lynch and Vaizey to speculate that Guinness may have further cut its profit margins in times of decreased demand, placing additional strain on competitors that were not realising economies of scale in any way approaching those experienced by Guinness.

While Fr. Mathew's popular temperance campaign had faded in the years of the Famine, the Ulster temperance societies, which are said to have largely disassociated themselves from Mathew owing to religious differences, strengthened in the 1850s (Malcolm 1986, 151-2). Indeed, Malcolm (1986, 180) stated that it was 'the 1850s and 1860s [that] saw the emergence in Ireland of a highly organised and professional temperance movement', one that was 'closely linked to societies in England and Scotland.' The 1860s saw the campaign's expansion towards Cork and Dublin cities, while the influence of pre-Famine temperance societies remained strong in both Limerick and Galway cities (Malcolm 1986, 177-9). The efforts of the rejuvenated temperance societies in the period were

primarily focussed on restricting the consumption of alcohol by placing legislative restrictions on its retail, which they are said to have campaigned for through a combination of 'lobbying and electioneering' (Malcolm 1986, 181). Despite aligning their ideals with both the Liberal and Home Rule parties in the 1870s, Malcolm (1986, 274) described their 'long struggle' for legislative reform as being one of 'disappointed hopes, smashed ideals and ultimate frustration'. The Liberal Government of the early 1880s was said to be more pre-occupied with issues such as the 'Irish land question and Home Rule', while the early support of the Home Rule Party was largely lost in the same period due to the perceived sectarian nature of many of the temperance societies (Malcolm 1986, 251). Despite these setbacks, political support for the ideals of temperance never fully abated, though it was only following the outbreak of the First World War that political support for the cause of temperance would again prove fruitful.

3.1.2 The regionality of the industry, 1850-85

Despite the large number of brewery closures in the late-1830s and 1840s, the distribution of breweries in Ireland remained reasonably widespread in *c.* 1850 (figure 3.3). However, the industry had essentially failed in the north midlands before 1850 and brewing was becoming increasingly uncommon in the southwest. While the period 1790-1830 had seen the de-regionalisation of commercial brewing, which came at the expense of retail brewing, it was in the period 1850-85 that the process of the re-regionalisation of the industry began. As can be seen in figure 3.3, by 1885 the industry had considerably contracted in the northeast, where closures had been reasonably uncommon in the late-1830s and 1840s, while the decline of the industry in both the southwest and south midlands continued. While the period 1850-70 was marked by a slew of new brewery foundations, the consolidation of the industry in the period that preceded continued, though at slower pace, while the period 1870-85 was primarily marked by brewery closures, with the wider industry contracting as Guinness's share in the market for beer increased.

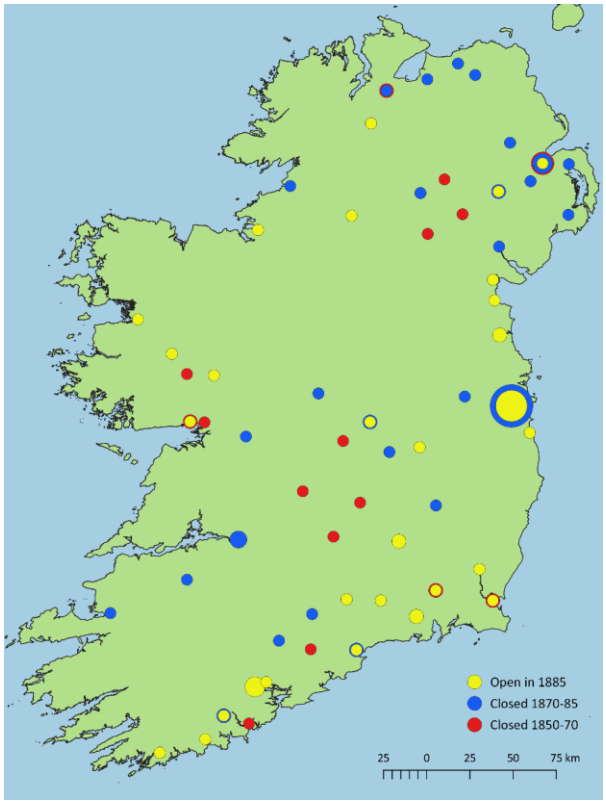


Figure 3.3. The distribution of breweries in Ireland, c. 1850-85. Markers are graduated by the number of breweries.

The trend for new brewery foundations had begun in the early 1850s and accelerated in the 1860s. In these two decades new breweries were founded, brewing resumed at several breweries that had failed in the years before 1850 and several distilleries were converted to brewing, probably as a direct result of the increases in spirit duty in the 1850s. By and large, the trend was confined to the larger centres of population, cities, regional capitals and large towns. The industry in Dublin city expanded considerably during the period; four new foundations in the city are reasonably well documented while several more are implied by fleeting references in newspapers and trade directories. Foundation of the 1850s include the Mountjoy Brewery, established in 1852, Read's Brewery on Ardee Street, established before the 1854 *Primary Valuation*, and a poorly documented brewery on Parkgate Street in the city's north side, established in the late-1850s (Riordan 1920).[1] The 1860s saw the foundation of the Greenmount Brewery before 1867, while the City of Dublin Brewery,

[1] *Freemans Journal* 22/02/1864, 1.

incorporated in 1865, is one of several distilleries that had been converted to brewing during the period.[2] Outside of the capital, Waterford was the only city where a new brewery does not appear to have been founded in the period. In Cork city, Murphy's Lady's Well Brewery was established in 1856, while brewing resumed at the Crosses Green Brewery in 1853 following a period of disuse (Ó Drisceoil & Ó Drisceoil 1997, 29-30).[3] In Galway city, the New Road Brewery was established before the 1855 *Primary Valuation*, while in Kilkenny city the poorly documented St. Mary's Brewery had been established in the early 1860s.[4] In Belfast, the Belfast and Ulster Brewery was constructed between 1864 and 1867, while in Limerick city, Flynn's Brewery was established before 1870 (Slater 1870).[5]

Outside of the cities, new foundations were primarily confined to the larger towns. Indeed, several had been founded in towns where the industry had failed in the decades that preceded. In Tralee, county Kerry, the Castledesmond Brewery was founded at the site of a former distillery in 1865, some seven years after the closure of the Oakview Brewery, the only brewery in the town that had survived the decline of the industry in the late-1830s and 1840s.[6] Similarly, in Athlone, county Westmeath, Kelly's Brewery had been founded before 1870, probably following the closure of the Bellaugh Brewery before 1855, while in Carlow town the St. Mary's Well Brewery had been founded before 1865, probably following the closure of Paul's Brewery, which produced to at least 1856 (Slater 1856).[7] Further foundations of the period have been recorded in Drogheda, county Louth, where Casey's Brewery had been founded before 1857 and the Mell Brewery before 1865, and at Dungarvan, county Waterford, where the New Lane Brewery had been founded before 1869 (Loftus 1869).[8]

In addition to new brewery foundations, the period also saw the resumption of brewing at several sites where it had ceased in the period before 1850. The resumption of brewing at the Crosses Green Brewery in Cork city has previously been highlighted, while brewing resumed at Cassidy's

[2] *Freemans Journal* 11/12/1865, 2; 31/01/1867, 4.
[3] Valuation Office surveyors noted that the Crosses Green Brewery (CK 074-006) had closed before 1849. It was said to have been completely rebuilt prior to reopening in 1853; *Irish Examiner* 10/01/1853, 1; 07/05/1855, 1.
[4] The brewery was said to have been 'nearly new' when it was offered for sale in 1864; *Waterford News and Star* 30/09/1864, 2.
[5] While Pearson (1999, 46, 182) stated that the Belfast and Ulster Brewery had opened in 1869, further sources state that construction of the brewery had begun in 1864 and works and had been completed by 1867 (PRONI/D1905/1/1; Boyle 2007, 48).
[6] *Kerry Evening Post* 21/04/1858, 3; 22/11/1865, 2.
[7] While the Bellaugh Brewery in Athlone had been listed in *Slater's Directory* of 1856, it was recorded as being vacant in the 1855 *Primary Valuation*. The earliest identified reference to Kelly's Brewery was its inclusion in *Slater's Directory* of 1870, while the St. Mary's Brewery in Carlow town is known to have been founded before 1865; *Freemans Journal* 03/04/1865, 2.
[8] Casey's Brewery was previously believed to have been founded in 1840 (Callan MacArdle & Callan 1902, 482). However, a brewery was not recorded at the site, only a small portion of which was then in the possession of the Casey family, in the 1851 *Primary Valuation*. This certainly suggests that the brewery, which was in operation by 1857, had been founded after 1851. The earliest identified reference to the Mell Brewery was made in 1865; *Freemans Journal* 17/06/1865, 1.

Brewery and Distillery in Monasterevin, county Kildare, in 1860 and at the Cambrickville Brewery in Dundalk in 1863 (Callan MacArdle & Callan 1902, 482-5).[9] The resumption of brewing at the Cambrickville site actually marked the movement of a firm, MacArdle and Moore, from another brewery in the town, the Dublin Street Brewery, which the firm continued to use as a maltings. The period also saw the movement of another firm, Wickham's of Wexford town, from their Gibson's Lane Brewery to a new brewery located on Oyster Lane.[10]

While new brewery foundations were common in the 1850s and 1860s, the previous trend for closures continued, though at a lesser pace. Many of the suggested closures were small-scale breweries located in villages and by 1870 just two village-based breweries are known to have produced in Ireland, the Castlebellingham Ale Brewery in county Louth and the Ballygawley Brewery in county Tyrone. This followed the closures of each of Kelly's Brewery in Oranmore county Galway, the Shrule Brewery in county Mayo, the Stillorgan Brewery in county Dublin and the Donaghmore Brewery in county Tyrone.[11] Several of the new breweries founded in the period had also failed before 1870. For example, each of the New Road Brewery in Galway city, the Mell Brewery in Drogheda and the St. Mary's Brewery in Kilkenny city were particularly short-lived and had closed by the mid-to-late-1860s (Prunty & Walsh 2016, 30).[12] Given the volume of both new foundations and closures in the period, the official statistics appear to have masked the realities of both trends, with the number of both new foundations and closures appearing likely to have been far greater than the changing number of breweries suggested by the numbers of licenses issued. The period 1850-70 was certainly one of immense change for the industry. While Ó Drisceoil and Ó Drisceoil were correct in stating that the economic prosperity of post-Famine Ireland had been a boon for the wider industry, particularly in the larger towns and cities, the early failure of several of the new foundations and the continued trend for brewery closures suggests that it was also one of consolidation. The evidence suggests that localised brewing was then in the process of entirely failing across large parts of Ireland, marking the beginning of a trend that would continue in the decades that followed.

The trend for new brewery foundations appears to have largely halted in the late-1860s and only one further new foundation has been identified in the 1870s or 1880s. The Riverstown Ale

[9] Valuation Office surveyors recorded that brewing had ceased at Cassidy's Distillery and Brewery 'some years' before 1851, see catalogue entry KE 026-001. Brewing had ceased at the Cambrickville Brewery before the 1854 *Primary Valuation*.

[10] The Gibson's Lane Brewery was advertised to let in 1862; *Wexford People* 11/10/1862, 1. The Oyster Lane Brewery was first identified as such on the 1882 1:1056 OS. Before being converted to brewing it had been a maltings, operated by members of the Devereaux family, proprietors of the Bishop's Water Distillery which was located in the townland of Slippery Green to the southwest of the town.

[11] Apart from the Donaghmore Brewery, which closed in *c*. 1863, and the Stillorgan Brewery, which closed in 1857, the closures are assumed rather than confirmed and the final identified historical source for each of the remainder is their inclusions in the *Primary Valuation*; *Freemans Journal* 15/12/1857, 1; 09/02/1863, 1.

[12] *Waterford News and Star* 30/09/1864, 2; *Freemans Journal* 28/10/1868, 2.

Brewery near Cork city was founded by Denny Lane at the site of a former distillery before 1881 (Slater 1881; Ó Drisceoil & Ó Drisceoil 2015, 184). The trend for closures also accelerated after 1870. While brewery closures continued in the midlands and southwest, they were heavily weighted towards the northeast where, by the mid-1880s, brewing appears to have been confined to just Belfast, Lurgan in county Antrim and county Louth. The regionality of the trend is certainly suggestive of the rejuvenation of the temperance movement in Ulster, a possibility introduced in the previous chapter. As was stated in the previous section, the ideology of teetotalism had achieved popularity in the region during the second half of the 19th century in areas where, due to religious differences, it had previously been frowned upon.

The 1870s also saw the closure of the majority of the remaining breweries that had been established after 1850. Of the new foundations of the period, only the Mountjoy Brewery in Dublin city, Murphy's Brewery in Cork city and a poorly documented brewery on Patrick Street in Mullingar, county Westmeath, show evidence of having produced in the 1880s (Slater 1881). This certainly suggest that the expansion of the industry in the two decades before 1870 was unsustainable. This, in turn, suggests that many of the new breweries of the period 1850-70 had been founded on a somewhat speculative basis, perhaps intending to meet a demand for beer that was not present locally. The possibility remains that the expansion of Guinness in the period had an impact on many of the closures. This possibility runs counter to Lynch and Vaizey's (1960, 201) interpretation, which saw the closures of the period being primarily confined to breweries that were 'small and obsolescent'. This interpretation relied heavily on the official statistics for the number of brewers' licenses issued in the period, figures that have previously been highlighted as being unrepresentative of the reality of the period, masking both the rate and chronology of the counter-trends for both brewery foundations and closures.

The probable impacts of Guinness's expansion in the period on the rate of brewery closures is further reinforced by the continued trend for closures in the midlands areas traversed by the Grand Canal and Royal Canal. This was the continuation of the pre-1850 trend for closures in the region that was discussed in the previous chapter. There, the trend was proposed as being evidence for the increased centralisation of the industry towards Dublin, with the city's breweries expanding their trade via the canal network. The continuation of the trend in the midlands during the railway era further reinforces the suggestion that the region's breweries were failing under competition from Dublin. This suggestion is further reinforced by the entire failure of the industry in Limerick city, linked to Dublin via the navigable River Shannon and the Grand Canal. The city's final brewery, the Garryowen Brewery, appears likely to have closed in the early 1880s, perhaps under direct

competition from the Dublin city breweries, and Guinness in particular.[13] The early 1880s also saw the failure of the industry in Derry/Londonderry, with the Londonderry Brewery closing in *c*. 1883, perhaps as a result of the rejuvenation of local temperance societies. By the mid-1880s, the industry had failed in two of Ireland's three westernmost cities, Limerick and Derry/Londonderry, while brewing would entirely cease in Galway city during the early 1890s following the closure of the Nun's Island Brewery.[14]

By the mid-1880s, the industry had essentially re-regionalised. As can be seen in figure 3.3, the industry had returned to a distribution that largely mirrored the situation in the early 1790s, with the primary distinctions being in the entire failure of retail brewing and the overall reduction in the number of commercial breweries. While the greatest concentration of breweries in the early 1790s had been within the wider vicinity of Dublin city, it was along the south coast where the industry remained most active by the mid-1880s. The industry had almost entirely failed in the southwest in the decades that followed 1850, while the industry had failed in the north midlands in the decades that had preceded 1850. After 1885, the re-regionalisation of the industry continued and, while overall output increased, much of the growth in the period appears to have been confined to Guinness and the Cork city breweries.

3.2 The development of the industry after 1885

3.2.1 The further consolidation and modernisation of the industry in the pre-war period, 1885-1914

The period 1885-1914 saw the overall output of the industry increase to 1913, the final year where statistics on malt use by breweries were recorded (figure 3.4). The period saw the continuation of the trends seen in 1850-85, though on a lesser scale. Despite increased taxation and industrial unrest in the early 20th century, the malt returns suggest that the wider industry expanded throughout the period, though, as will be outlined below, this was certainly not the case. As in the previous period, Guinness's growth outpaced that of the wider industry, while the Cork city breweries continued to advance their market positions. In contrast, the output of many breweries appears to have markedly declined in the period, while the trend for closures and consolidation seen in the previous period continued unabated. This was despite a temporary lull in closures during the mid-to-late-1890s when the official statistics show that a small number of new breweries were again being founded in Ireland (figure 3.4). The period to 1900 witnessed the flotation of many breweries in both Britain and Ireland on the stock markets, the most profitable of which was Guinness, while it also saw the beginnings of

[13] The brewery was last listed in *Slater's Directory* of 1881 and would appear likely to have closed shortly after.
[14] Brewing continued at the Nun's Island Brewery to at least the early 1890s, though it would appear likely the brewery had closed before its omission from *Slater's Directory* of 1894 (Prunty & Walsh 2016, 29-30).

the trend for prominent brewery mergers, a trend seen in both Britain and Ireland throughout the 20th century.

Guinness's flotation on the stock markets in 1886 marked the beginning of a trend that would ultimately lead to the flotation and amalgamation of many of the United Kingdom's breweries. Guinness was not the first brewery to list on the stock exchanges, though, as far as has been ascertained, it was the first Irish brewery to do so (Vaizey 1960, 3-4). The listing triggered a run on Baring's Bank, who conducted the massively oversold share offering (Dennison & MacDonagh 1998, 18). While the share offering raised the intended £6M in just one hour, it was estimated that as much £130M in capital had been offered in total. Driving this incredible interest was the fact that Guinness was then the world's largest brewery by output, while Vaizey (1960, 8) stressed 'the firm's universally acknowledged security and soundness' as being a major factor. Many of Britain's large breweries followed Guinness's lead and, by 1890, as many as 87 brewing companies had been publicly listed on the stock exchanges. The trend for public listing had less of an effect on the industry in Ireland, where, as far as has been ascertained, just two further brewing companies were floated. The amalgamated Drogheda and Castlebellingham Breweries Ltd. was floated in 1890, raising £265,000, and the Phoenix Brewery was floated in January 1897, raising £290,000 (Callan MacArdle & Callan 1902, 473-4, 479). While the 'Stock Exchange boom', as Vaizey (1960, 12-13) coined it, did not have an immediate major impact on the industry in Ireland, other than to increase Guinness's capitalization, it did begin the process of brewery amalgamations in Britain. Many of the smaller, and indeed larger, brewing firms had been encouraged to amalgamate before listing, thereby increasing the potential capitalization of the share offering. Thus, the process that led to the homogenization of the industry in the mid-20th century had begun.

As can be seen in the malt returns, the output of Irish breweries continued to increase throughout the period (figure 3.4). Despite increases in beer duty, introduced in 1900 to help fund the Boer War, growth continued throughout the first decade of the 20th century though at a slower pace than was seen previously (Gourvish & Wilson, 1994, 291-2). The increases in output in the period were certainly not universal. As can be seen in table 3.1, Guinness's output consistently increased to 1914, while both Beamish and Crawford and Murphy's in Cork city suffered a reduction in output in the 1880s before seeing expansion in the 1890s. Sales figures have not been presented for Murphy's Brewery after 1899, while Beamish and Crawford's indicate large increases in trade in the years 1901-3. These increases can be directly attributed to the brewery's absorption of the trade of the Southgate Brewery in 1901, the same year that Murphy's acquired another of the city's breweries, the St. Finnbarr's Brewery (Ó Drisceoil & Ó Drisceoil 2015, 174-5, 184-5). Beamish and Crawford's sales

figures indicate a reduction in output during the years 1905-6, a period where Murphy's was also said to suffer a similar contraction in output (Ó Drisceoil & Ó Drisceoil 1997, 63-4).

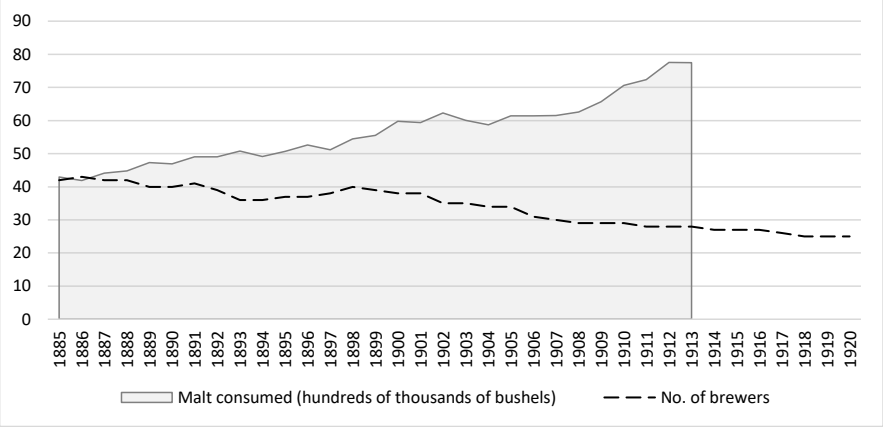


Figure 3.4. Malt consumed by brewers, 1885-1914. Number of licensed breweries in Ireland, 1885-1920. Sources: BPP 1903-15; 1920; Bielenberg 1998, App. 1, 104-5.

Year	Guinness	B & C	Murphy's	Watergate	Year	Guinness	B & C	Watergate
1885	1,183,074	73,588	112,875	-	1903	2,027,473	151,734	11,792
1886	1,217,966	61,645	95,098	-	1904	2,005,785	145,741	11,406
1887	1,282,576	56,322	91,726	8,252	1905	2,081,950	144,926	10,406
1888	1,329,303	55,851	91,363	9,433	1906	2,116,146	125,897	8,805
1889	1,333,594	59,035	101,614	8,697	1907	2,176,514	122,181	8,388
1890	1,368,383	61,527	*c.*108,000	8,875	1908	2,188,638	121,126	8,267
1891	1,433,069	63,878	108,637	8,549	1909	2,262,323	123,992	8,627
1892	1,432,055	69,738	*c.*111,000	7,851	1910	2,414,491	126,857	8,698
1893	1,442,849	79,333	*c.*118,000	7,124	1911	2,503,122	126,987	8,348
1894	1,473,450	78,024	*c.*125,000	6,128	1912	2,673,555	121,331	7,796
1895	1,493,600	83,036	*c.*126,000	6,367	1913	2,828,243	117,378	7,652
1896	1,533,615	85,490	*c.*126,000	6,743	1914	2,842,740	122,088	-
1897	1,568,273	86,558	*c.*132,000	6,813	1915	2,602,346	122,281	-
1898	1,625,325	94,357	*c.*135,000	6,993	1916	2,484,831	110,951	-
1899	1,728,030	102,033	140,000+	7,052	1917	1,457,132	82,887	-
1900	1,786,098	104,457	-	7,338	1918	1,418,612	59,326	-
1901	1,867,944	120,073	-	7,643	1919	2,255,550	68,803	-
1902	1,962,782	141,290	-	9,631	1920	3,194,791	74,977	-

Table 3.1. Sale figures for Guinness and Beamish and Crawford (B & C), 1885-1920, for Murphy's Brewery, 1885-99, and for the Watergate Brewery, Bandon, 1887-1913. Sources: Hughes 2006, 276-9; Ó Drisceoil & Ó Drisceoil 1997, 61; 2015, 240 table 10.2, App. B, 375.

A similar trend can be seen in the sales figures for the Watergate Brewery in Bandon, county Cork, the only small brewery where sales figures have been preserved for the period. The brewery saw a consistent decline in output throughout the closing years of the century before an upturn in sales in 1900-6, after which sales figures declined marginally until the brewery's closure in 1913 (Ó Drisceoil & Ó Drisceoil 2015, 239). Ó Drisceoil and Ó Drisceoil (1997, 63-4) blamed poor harvests, in

turn caused by adverse weather, on the reduction in Murphy's Brewery's sales in 1905-6, while also noting that the decline in trade was primarily rural, with sales in Cork city continuing to increase. It is unclear whether this reduced trade was limited to Munster breweries, though Guinness's sales figures show that they were somewhat immune to the causative factors.

In the years that immediately preceded the First World War, Ireland saw large-scale industrial unrest following the foundation of the Irish Transport and General Workers' Union (ITGWU) in 1909 (Dennison & MacDonagh 1998, 143; Ó Drisceoil & Ó Drisceoil 2015, 244-5). Between the foundation of the union and the outbreak of war, several large-scale strikes and lockouts were called, organised on both a local and national level. While not all breweries were directly impacted by strikes, disruptions to transport systems and the reduced spending power of striking employees certainly had a negative impact on the wider industry. The largest Irish breweries were generally able to avert direct industrial action within their firms. Guinness adopted a neutral position to the growing trade unionism. Initially, they did not oppose their employee's membership of unions and refused to join the Dublin Federation of Employers, founded in 1913 to protect business interests (Dennison & MacDonagh 1998, 143-8). While difficulties with the unions did arise in the period, they were largely averted by correspondence between brewery management and both Larkin and Connolly, the senior members of the ITGWU. The brewery's trade appears to have been primarily impacted by the disruptions in transport systems rather than as a direct result of the industrial disputes themselves.

In Cork, Beamish and Crawford had actually suffered a strike of maltings workers in 1905, while a wider brewery strike was averted in 1907 (Ó Drisceoil & Ó Drisceoil 2015, 244-5). The ITGWU called a city-wide strike in 1909 that lasted some five weeks, though the strike ended without resolution and the union is said to have lost much of its influence in the city as a result (Ó Drisceoil & Ó Drisceoil 1997, 67-8). The large-scale strike of 1911 is actually said to have been a boon for the city's breweries. Transport from Dublin was largely curtailed, restricting the supply of Guinness, with both Cork city breweries filling the void in the market. While the largest breweries were able to avoid industrial unrest within their companies, smaller breweries were less capable of meeting their employee's demands. For instance, both Cherry's Brewery in New Ross, county Wexford, and Thomas Murphy's Brewery in Clonmel, county Tipperary, were closed by strikes in September 1911.[15] It would appear likely that the industrial unrest at the eve of the First World War had a disproportionate effect on these smaller breweries who were less able to absorb the increased transport costs and to acquiesce to workers' demands. This, in turn, would have left them ill-prepared for the drastic changes that the both the industry and Ireland as a whole witnessed in the decade that followed.

[15] *Freemans Journal* 25/09/1911, 7; 27/09/1911, 8

Before the major impacts the political upheaval seen after 1914 in Ireland had on the industry are discussed, it is worth considering the scale of the breweries that continued to produce in Ireland at the beginning of the 20th century. Callan MacArdle and Callan (1902, 469) provided a unique table outlining the scale of breweries producing in Ireland in 1901, with the data provided by the Commissioners of Inland Revenue. Of the 41 brewers' licenses that had been issued in 1901, four were for breweries with an output of under 1,000 barrels, while a further 16 were for breweries with an output below 10,000. This shows that a little under half of Irish breweries remained particularly small in scale, producing at a similar rate to those common in Ireland before the decline of 1838-50, as is highlighted in the previous chapter. Of the remainder, 13 of the breweries had outputs of 10-50,000 barrels, though seven of these were said to produce in the range of 10-20,000. Just three breweries were said to produce over 100,000 barrels, including Guinness whose output is suggested to have been greater than 2,000,000, a number that the brewery's sales figures, provided in table 3.1, do not suggest was exceeded until 1903. The remaining two were Beamish and Crawford and Murphy's in Cork city, whose sales are known to have exceeded 100,000 barrels in each year from the late-1890s (table 3.1).

These figures paint a reasonably poor picture for the state of the industry in Dublin beyond Guinness. Several of the city's other large breweries were said to have capacities that far-exceeded the production figures that are suggested (Callan MacArdle & Callan 1902, 473-6). For example, the Anchor Brewery was said to have the capacity produce over 250,000 barrels annually, while the North Anne Street Brewery's capacity was said to exceed 150,000. While the capacity of the Phoenix Brewery was not provided, the firm then claimed to be Ireland's second largest brewery by capacity. Each of the three was clearly producing at just a fraction of their potential output, meaning that any potential economies of scale were not being realised. Given the situation, it is unsurprising that several of the city's breweries amalgamated in the years that immediately followed. Two of the firms closed, the North Anne Street Brewery in 1904 and the Phoenix Brewery in 1905.[16] Following the closures the trade and trademarks of the closed breweries were acquired by Watkins' Brewery and the Anchor Brewery respectively. These amalgamations followed those previously mentioned in Cork city in 1901 and preceded Beamish and Crawford's acquisition of the Watergate Brewery, Bandon, in 1913. One further amalgamation of two smaller breweries has been confirmed for the period. In 1911, the proprietors of Feehan's Brewery in Carrick-on-Suir, county Tipperary, and Sullivan's Brewery in Kilkenny city entered a partnership agreement that resulted in the closure of the brewery in Carrick.[17] Despite the amalgamation, the Kilkenny city brewery also closed shortly after, in 1917.

[16] *Evening Herald* 02/12/1904, 3; *Irish Independent* 14/06/1905; *Freemans Journal* 09/09/1905; 25/10/1905.
[17] *Kilkenny People* 23/12/1911, 7; *Kilkenny People* 28/04/1917, 5.

3.2.2 An industry in decline, the economic history of the industry after 1914

The onset of the First World War in 1914 triggered a series of legislative changes that sought to limit the brewing industry in the wider United Kingdom, increasing the tax burden on brewers and placing limits on raw material use, product formulation and brewery output. While wartime demand increased the overall demand for beer, the wartime limits placed increased strain on the industry. In Ireland, where Guinness were well on the way to achieving a virtual monopoly, the wider industry did not recover to pre-war levels of production. The situation was certainly not helped by the prolonged period of war witnessed in Ireland during the period. The Irish War of Independence immediately followed the close of the First World War and was itself followed by the Irish Civil War. The fiscal policy of the Irish Free State government, in power from 1922, also exacerbated the economic difficulties that the industry felt. The industry at the onset of the First World War was essentially centralised, with the bulk of production being confined to one truly massive brewery and with much of the remainder being confined to just a few large-scale breweries. The economic realities of the period further reinforced the centralised nature of the industry in the period that followed the foundation of the Irish Free State. In the 1930s Guinness aligned themselves as being both a British and Irish company, moving a significant proportion of their production to London, while the mid-20th century saw the failure of independent brewing in Ireland. By 1965, Guinness controlled the majority of Ireland's remaining few breweries, with each of the remainder having been absorbed by the British 'Big Six' brewing conglomerates.

Gourvish and Wilson (1994, 317-8) regarded the First World War as being a period of 'unqualified misfortune' for the wider brewing industry. Lloyd George, Chancellor of the Exchequer at the outbreak of war, was sympathetic to the cause of temperance and in the Budget of 1914-15 introduced the first of a slew of excise changes that saw the taxation burden on the industry increase massively. Between 1914 and 1920, Gourvish and Wilson, who allowed for war-time inflation, calculated a 430% increase in the tax burden on brewers. The actual inflation in monetary value was greater, rising from 7*s* 9*d* per barrel in 1914 to £5 in 1920. In addition to the dramatic tax increases, the closing of the international shipping lanes placed pressure on domestic food production. In an effort to secure the domestic cereal crop, restrictions were placed on both product formulation and brewery output. The aim was to divert the barley used in beer production to both the livestock and human food chains. Brewery output was restricted twice by legislation, in 1916 and 1917, though the more drastic reductions in 1917 were partly lifted late that year when a beer shortage was blamed for increasing industrial unrest in Britain (Gourvish & Wilson 1994, 321; Ó Drisceoil & Ó Drisceoil 2015, 252-3). Rather than reducing output, the government instead sought to reduce the amount of barley used in production. Limits were placed on the original gravity of beer, the pre-fermentation sugar

content, which limited the finished beer's potential alcohol content. Irish breweries successfully lobbied for the restrictions to be diminished in Ireland (Dennison & MacDonagh 1998, 156-7; Ó Drisceoil & Ó Drisceoil 2015, 249-52). They argued that Irish-produced stout and porter had long been produced at a higher alcohol content than the average English ale, while also stressing the large-scale unemployment that would have been seen if the largest Irish breweries, and consequently Irish barley and malt production, had declined or, in the extreme, failed.

Perhaps surprisingly, the wartime restrictions actually proved to be beneficial for breweries that were capable of altering their trade to exploit the new market dynamics. The increased taxation was paid for by consumers rather than the producers, with beer prices increasing at the point of sale. The enforced reduction in output led to a consequent increase in demand, both from traditional customers and military canteens, while the reduction in strength meant that raw material costs were reduced. Beamish and Crawford's net profits almost doubled between 1914 and 1918, a period that, as can be seen in table 3.1, the brewery's output reduced by more than 50% (Ó Drisceoil & Ó Drisceoil 2015, 248). Beamish and Crawford's increased profitability in the period was far from exceptional. Indeed, the profits of the wider United Kingdom brewing industry more than trebled in monetary value and more than doubled when wartime inflation is allowed for (Gourvish & Wilson 1994, 334-5). The industry is said to have 'emerged from the war in better shape' than it had been in previously (*ibid*.). However, while the British brewing industry's principal challenges in the immediate aftermath of the war were changing consumption patterns, the Irish industry's wartime difficulties were not yet finished, with the Irish War of Independence leading to massive disruptions in trade.

The ITGWU, who had organised the large-scale strikes and lockouts that immediately preceded the First World War, again campaigned for an improvement in workers' conditions and wages (Ó Drisceoil & Ó Drisceoil 2015, 261-5). Ireland was hit by strikes throughout 1918-20, many of which directly affected brewing companies. The strikes, which were initially instigated by the decision to extend military conscription to Ireland, were crucially supported by the Home Rule Party, Arthur Griffith's Sinn Féin and the clergy of the Catholic church. They set the backdrop for the beginning of the Irish War of Independence, with the general election of 1918 providing Sinn Féin with some 73 of 105 Parliamentary seats in Ireland. The party declared Irish independence with the foundation of Dáil Éireann in January 1919. The bitter War of Independence that ensued resulted in major disruptions in trade and the fracturing of Irish society. Whole towns were, at times, cut off due to military actions, while transport systems were widely disrupted and economic decline, curfews and the disruption of the traditional social calendar resulted in both decreased demand for beer and problems with supply for breweries. The end of the War of Independence, which followed the signing of the Anglo-Irish Treaty in December 1921 and the foundation of the Irish Free State the following year, did not mark

the end of the disruptions for the industry. Indeed, the industry's difficulties were exacerbated by the onset of the Irish Civil War of 1923-4 which, while short in duration, was bitterly fought and resulted in further disruptions to transport systems (Ó Drisceoil & Ó Drisceoil 2015, 288). The trade in beer was impacted by strikes and boycotts, while the increased wartime taxation on beer was not lifted by the Free State government, despite petitions from brewers (Ó Drisceoil & Ó Drisceoil 2015, 294-5).

Ireland's brewing industry did not return to pre-war levels of production following the close of the Irish Civil War. Sales figures for both Beamish and Crawford and Guinness show the decline of the industry in the 1920s and, while both breweries reduced prices, the measures were largely unsuccessful (Dennison & MacDonagh 1998, 160-75; Ó Drisceoil & Ó Drisceoil 2015, 294-7). Ó Drisceoil and Ó Drisceoil (2015, 297) saw the expansion of the leisure industry as playing a key role in the decline, while the fact that breweries did not return to pre-war recipes, which were higher in strength, no doubt played a significant role. As in Britain, the market for beer was in decline though the Irish brewing industry, which was more centralised, appears to have been more vulnerable than the British to the changing market trends. The 1930s saw Guinness move a significant proportion of their production to a new brewery in London, the Park Royal Brewery (Vaizey 1960, 31-2; Dennison & MacDonagh 1998, 248-62). The Park Royal Brewery expanded to become Britain's largest by output during the years of the Second World War, though the firm's Dublin brewery continued to out-produce the new brewery in London, which was not capable of meeting the total demand for Guinness in Britain. Upon the initiation of brewing at Park Royal, the Guinness's original brewhouse in Dublin was mothballed. The closure of the brewhouse, which had been continually upgraded from a least the late-18th century and had witnessed the firm's growth from being one of many small-scale producers in Dublin to becoming the world's largest brewery, was a fitting allegory for the state of the industry in Ireland in the 1930s.

The 1950s and 1960s essentially saw the end of independent brewing in Ireland. The Mountjoy Brewery in Dublin, the last brewery apart from Guinness to produce in the city, closed in 1956.[18] Guinness acquired several regional breweries in the 1950s and 1960s, including the St. Mary's Brewery in Waterford city and Cherry's Brewery in New Ross among others.[19] In 1961, Irish Ale Breweries Ltd. was formed, a holding company that was two-thirds owned by Guinness and one-third owned by Ind Coope of Burton-upon-Trent.[20] The merger saw the closure of several Irish breweries, including Cairnes's Brewery in Drogheda and Perry's Brewery in Rathdowney. However, under the new company each of the St. Mary's Brewery in Waterford city, the St. Francis's Abbey Brewery in Kilkenny city and both the Great Northern Brewery and the Cambrickville Brewery in Dundalk, county Louth,

[18] *Irish Independent* 01/12/1956, 20.
[19] *Waterford News and Star*, 05/11/1954, 2; *Irish Independent* 12/12/1953, 11; 16/12/1955, 5.
[20] *Irish Press* 06/05/1961, 8.

continued to produce until the early 21st century.[21] Brewing ceased at Ireland's final independent regional brewery, the Mill Park Brewery in Enniscorthy, county Wexford, in 1957, though the firm, G H Lett & Co., continues to operate today as an independent drinks distributor (D. Lett, pers. comm.). The Mountain Brewery in Belfast was acquired by Northern Breweries Ltd. in 1960, while in Cork, Beamish and Crawford fended off an attempted acquisition by Guinness in 1962 and was acquired that year by Canadian Breweries (Ó Drisceoil & Ó Drisceoil 2015, 322-3).[22] Murphy's Brewery remained independent for just a further three years, it was acquired by Watney Mann in 1965 (Ó Drisceoil & Ó Drisceoil 1997, 163). Following this acquisition, each brewery operating in Ireland was under the control of either one of the 'Big Six' British brewing firms, which had themselves been formed via amalgamations in the 20th century, or Guinness.

3.2.3 The regionality of the industry after 1885

The re-regionalisation of the industry, which had begun in the decades before 1885, continued through the late-19th and early 20th centuries. As can be seen in figure 3.5, closures of the late-19th century were primarily confined to the west of Ireland, with the likes of McCarthy's Brewery in Skibbereen, county Cork, closing in 1889 and Blake's Brewery in Tuam, county Galway, in 1890 (Claffey 2009, 8).[23] The period saw the trend for the failure of the industry in Ireland's western cities, which had begun in the early 1880s, continue and following the closure of the Nun's Island Brewery in Galway city in the early 1890s no breweries continued in any of Galway, Limerick or Derry/Londonderry cities.[24] Outside of the west of Ireland, the Bray Brewery in county Wicklow, which was operated by Watkins' Brewery of Dublin city and produced to at least 1884, is the only regional brewery that is known to have closed in the late-19th century (Slater 1856; 1870; Davies 1998, 12). In that case, the closure of the brewery is indicative of the centralisation of production, with brewing being confined to the Watkins' Brewery site while the Bray Brewery appears to have continued to produce malt for the Dublin brewery.[25]

The 1890s saw several new brewery foundations, a trend that did not continue into the 20th century. The best documented are the Great Northern Brewery in Dundalk, county Louth, established in 1897, and McConnell's Brewery in Belfast, established in 1899, while new breweries were also founded in both Dublin city and Coleraine in county Derry/Londonderry before 1894 (Slater 1894; Callan MacArdle & Callan 1902, 482; Riordan 1920).[26] While McConnell's Brewery continued to

[21] *Irish Independent* 05/09/1961, 6.
[22] *Irish Independent* 15/11/1962, 14.
[23] *Freemans Journal* 25/07/1889, 8.
[24] See page 62, footnote 14.
[25] The site was identified as being a maltings on the 1909 1:2534 OS; WW 004.
[26] McConnell's Brewery was founded in 1899 as a separate entity to the adjacent McConnell's Distillery, though under the same management (PRONI/D1326/19/7). Both companies merged in 1902.

produce to at least 1920 and brewing continued at the Great Northern Brewery until the recent past, the remaining two appear to have been reasonably short-lived and neither was referred to by Callan MacArdle and Callan (1902) in their overview of the industry at the beginning of the 20th century (Riordan 1920). The regionality of the new foundations suggests an expansion of the industry in the northeast, an expansion that is further reinforced by the opening of the Mountain Brewery, located outside of Belfast, in 1897 (Callan MacArdle & Callan 1902, 487-8). The brewery, which is commonly referred to as being a new foundation of the period, was actually constructed by a pre-existing brewing firm that was managed by the Caffrey family, who had previously produced at the Smithfield Brewery within the city itself.

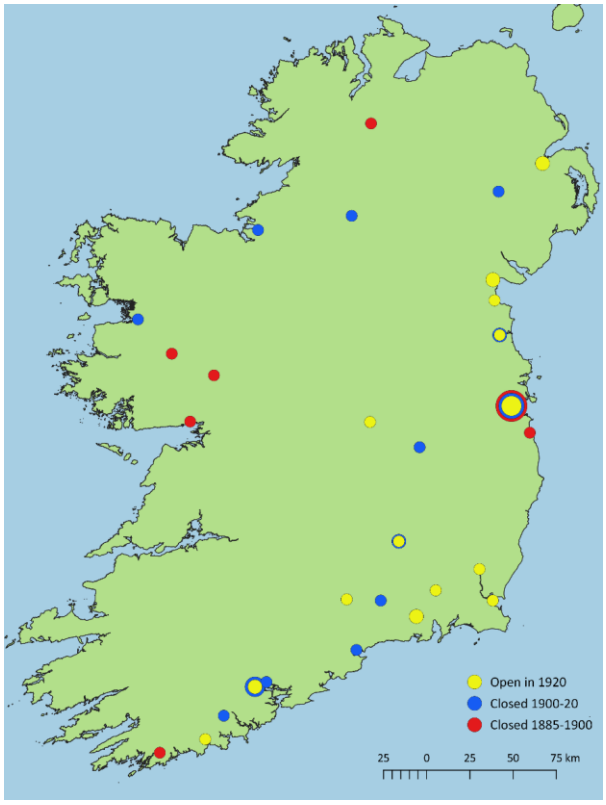


Figure 3.5. The distribution of breweries in Ireland, c. 1885-1920. Markers are graduated by the number of breweries.

The trend for closures accelerated in the early 20th century, coinciding with the increased beer duty introduced to help fund the Boer War. The period 1900-20 saw the failure of the industry in Connaught, with the closure of the province's final two breweries, Livingstone's Brewery in Westport county Mayo and the Lough Gill/Sligo Brewery in Sligo town. Contemporary accounts blamed

increases in beer duty for the failure of Livingstone's Brewery, which closed in 1910.[27] The cessation of brewing at the Lough Gill/Sligo Brewery, where brewing ceased in *c*. 1915 though the firm continued as both a drinks distributor and soft drinks manufacturer, would appear likely to have been affected by the disruptions in trade brought about by the First World War (Gallagher 2008, 632). The period also saw the failure of the industry in Ulster outside of Belfast. This was following the closure of both the Enniskillen Brewery in county Fermanagh and the final remaining brewery in Lurgan, county Armagh, both of which had failed between 1902 and 1920.[28] By 1920, brewing in the province was confined to two Belfast breweries, both of which had been constructed at the close of the 19th century, while in county Louth, brewing continued at each of Dundalk, Drogheda and Castlebellingham. As can be seen in figure 3.5, by 1920 brewing was almost solely confined to towns and cities in Ireland's south and east, with just two breweries continuing outside of these areas. Both were located in the south midlands, Smithwick's St. Francis's Abbey Brewery in Kilkenny city and Perry's Brewery in Rathdowney, county Laois. Brewing remained most-common in the southeast, in port towns and cities and in towns located on navigable waterways, principally the River Suir and River Slaney, while county Cork continued to support three breweries, both Murphy's and Beamish and Crawford in Cork city and Deasy's Brewery in Clonakilty.

Callan MacArdle and Callan (1902, 466) commented on the regionality of the industry at the beginning of the 20th century. They highlighted the close link between brewery location and barley cultivation, highlighting that most breweries were located 'within the triangle formed by Waterford and Cork as the extremities of the base and Dundalk as the apex'. This triangle is contiguous with the most-productive barley growing regions in Ireland, with the suggestion being that breweries were located within the regions where their principal Irish-produced raw material was grown. While the correlation between brewery location and barley cultivation at the beginning of the 20th century is undeniable, Callan MacArdle and Callan projected this regionality backwards in time, claiming that brewing had never been particularly common in either of Connaught or Ulster (*ibid*.). The regionality of the industry in the century that preceded 1885, outlined both in this chapter and the one previous, shows that this assertion, while probably not entirely erroneous, certainly contains some falsehood. Indeed, as late as the early 1880s, breweries remained as common in parts of Connaught as they did in the barley growing areas of the south midlands and southeast, while the industry in Ulster had witnessed a major contraction in the 1870s. While it probably remains true that the volume of beer

[27] *Mayo News* 09/07/1910, 4.

[28] Both breweries were referred to by Callan MacArdle and Callan (1902) in their overview of the industry at the beginning of the 20th century. Johnston's Brewery in Lurgan had closed before 1920 and, while the brewery was listed as operating by Riordan (1920), leasehold evidence confirms that brewing had ceased at the Enniskillen Brewery before 1918; PRONI/D1390/40/6.

produced in these provinces was insignificant in comparison to the volumes produced by the large-scale breweries in the likes of Dublin and Cork cities, reliance on access to locally produced barley does not appear to have been a limiting factor in brewery location prior to *c.* 1870. However, it certainly appears to have been a deciding factor in the continued success of a brewery. As such, it should be viewed as having been a limiting factor on the growth of a brewery, one that essentially decided whether a brewery could expand to produce at a regional, national or, in the case of Guinness, international scale. Indeed, the requirement for access to locally produced barley for the continued success of a brewery is confirmed by the regionality of the brewery closures in the early 20th century. As can be seen in figure 3.5, by 1920 the only breweries located outside of the prime barley growing regions were located in Ireland's two most-populous cities, Dublin and Belfast.

3.3 Conclusions

The period 1850-70 was a dichotomous period for the Irish brewing industry, marked by two counter trends for both brewery foundations and closures. The expansion of the Irish brewing industry in the two decades that followed the Famine has been highlighted by previous studies. However, the continued contraction of the industry in the same period, which is masked in the official statistics by the many new foundations, is a trend that was previously unknown. New foundations of the period were primarily limited to Ireland's cities and large towns, while brewery closures were seen in both large and small centres of population, with brewing in Ireland's small towns and villages having largely failed by *c.* 1870. The re-regionalisation of the industry, which had begun in the period before 1850 with the near failure of brewing in north midlands areas, continued through the 1850s and 1860s, with closures being weighted towards midlands areas to the west of Dublin city. This reinforces the suggestion raised in the previous chapter, where the marked decline of the industry in midlands areas in the late-1830s and 1840s was suggested to have been affected by the expansion of the markets of the large Dublin city breweries to the west.

Brewery foundations in Ireland in the decades that followed 1870 were particularly uncommon, with a small number of new breweries established in the 1890s, primarily in Ireland's northeast, being amongst the few breweries known to have been established in the period. The re-regionalisation of the industry continued throughout the late-19th century, with brewing primarily restricted to Ireland's south and east before 1900. The 1870s saw a significant decline in the number of breweries operating in Ulster, which may be viewed as being indicative of the expansion of the ideology of teetotalism in the province. The 1880s and 1890s saw the entire failure of brewing in Ireland's western cities, while the industry in towns in Ireland's west also declined markedly. The suggestion is that two factors had influenced the trend for the contraction of the industry in Ireland's

west during the period. Access to raw materials, in particular locally grown barley, appears to have been a major factor, though the expansion of Guinness in the period has to be seen as being a major contributor in the decline, one that has been downplayed in previous studies.

Guinness's expansion in the Dublin city market during the same period can be said to have had a major impact on the makeup of the city's brewing industry. While Lynch and Vaizey had seen the failure of several of the city's breweries as being a factor in Guinness's acquisition of the majority share of the city's market for beer in the 1860s and 1870s, the reality is that the closures referred to had occurred following Guinness's expansion in the Dublin market. Instead, the brewery failures in the city during the period must be viewed as being a symptom of the expansion instead, with the suggestion being that Guinness's competitors were unable to compete on a cost basis. The economies of scale that were then realised by Guinness essentially enabled the firm to undercut the prices offered by the city's remaining breweries. This is likely to have been further enforced following Guinness's public flotation on the stock markets in 1886, which massively increased the brewery's capitalisation.

While the early 20th century was a time of expansion for Ireland's largest breweries, primarily Guinness and both Beamish and Crawford and Murphy's in Cork city, it appears to have been a time of contraction for the majority of Ireland's remaining small and medium-scale breweries. With the exception of Guinness, breweries located in Dublin city appear to have been producing significantly below their potential output at the beginning of the 20th century, while direct evidence for the negative impacts of the increased taxation burden on the industry that had been introduced to help the fund the Boer War is seen in the contemporary accounts of the closure of Livingstone's Brewery in Westport, county Mayo.

The difficulties that Ireland's few remaining small-scale brewers felt in the first decade of the century were exacerbated in the years that followed 1910. This period was marked by increasing levels of industrial unrest in conjunction with an extended period of war, seen both internationally and within the island of Ireland itself. The difficulties faced by breweries in the period appear to have favoured the larger units of production. Smaller breweries appear to have been less capable of adapting to the changing market dynamics of the period, while industrial unrest also appears to have been more common in these smaller units of production. While a small subset of small-scale regional breweries continued to produce in Ireland after *c*. 1920, the majority had failed in the years that immediately preceded. This left the Irish brewing industry in a reasonably centralised position, with the bulk of production being confined to one truly international-scale brewery, Guinness. As such, the failure of independent brewing in Ireland during the 1950s and 1960s can be said to have been a near certainty when the makeup of the industry in the 1920s is considered. Unlike Britain, where production at a large number of small-scale breweries had continued well into the 20th century, and

indeed to today, the Irish brewing industry was continually centralised towards one producer as the 19th and early 20th centuries proceeded. This granted Guinness a virtual monopoly at the beginning of the 20th century, one that was further reinforced in the mid-20th century when the firm acquired the majority of Ireland's remaining few regional breweries.

Chapter 4 Raw materials

As with all manufacturing industries, breweries are reliant on a sufficient supply of high-quality raw materials to ensure the continued production of a high-quality product. The Irish brewing industry, both in the past and today, is reliant on a range of both locally sourced and imported raw materials, principally locally sourced water, both Irish-produced and imported malted barley and imported hops. Each raw material has left a varied archaeological signature, both within and without the sites of production themselves, while various breweries at different points in time exerted some level of control over their manufacture, movement and, in the case of both hops and barley, cultivation. In this chapter, both the uses and archaeological signatures of each of these primary raw materials will be outlined and discussed, while the varying levels of control that the breweries themselves exerted over the sourcing of each material will be highlighted. The chapter is divided into three primary sections. The first two are dedicated to raw materials that have a reasonably low level of archaeological visibility, hops and water. The third section, which makes up the greatest part of the chapter, is devoted to the raw material with the greatest archaeological visibility, malted barley.

4.1 Hops

The Irish brewing industry was reliant on a raw material that was primarily, if not solely, imported for much of the period in question, hops. Hops were, and remain, a high-value, low-volume raw material that is essential for beer production. The hop is a plant that is native to temperate climates in the northern hemisphere, one that is used as both a preserving and bittering agent in beer (Briggs *et al.*, 2004, 227-8). Today, hops are not grown commercially in Ireland. However, hop growing was, while not common, certainly carried out in Ireland during the 18th century. In the middle decades of the century the Royal Dublin Society (RDS) made efforts to encourage Irish hop growing, offering prizes for their cultivation and premiums for brewers who used Irish hops (Lynch & Vaizey 1960, 41-3). The RDS's efforts appear to have been in vain and by the early 19th century hop growing was almost unheard of in Ireland. However, small-scale hop cultivation continued into the early 19th century in either the townlands of Cangort Demesne or Cangort Park, near Shinrone in county Offaly (Coote 1801, 60-1). There, a small hop garden, which had previously been awarded the prize for hop cultivation by the RDS, was in the process of failing at the beginning of the 19th century. The garden had been reduced to just one acre, with the author stating that, rather than for any technical reasons, it was the Irish brewing industry's preference for English hops that had caused the essential failure of the enterprise. Mathias (1959, 167-9), who considered that the failure of hop growing in Ireland may

have been due to a combination of a lack of local expertise and economic reality, stated that 'the failure is probably more that of nature than man', implying that it was Ireland's wet climate that was to blame. Whatever the reasons behind the failure of hop growing in Ireland, the reality was that Ireland provided the English hop growers with their largest export market (*ibid*.).

The preference for English hops was probably driven by the ban on hop imports from outside of Britain during the 18th century (Lynch & Vaizey 1960, 50). Until the 1840s, Guinness solely used English hops, though the amounts imported from continental Europe and north America increased from the 1850s (*ibid*. 222). From the late-1860s, the brewery tended to use an even proportion of English, American and Bavarian hops, though the proportion of English tended to be reduced in years of high prices. Until the beginning of the 20th century, the brewery sourced its hops solely on the open market, typically through contracts with hop factors (Dennison & MacDonagh 1998, 107-9). In 1905, the brewery began to show an interest in exerting some control over their English hop supplies, first having a brewer trained in hop cultivation at Wye Agricultural College, Kent, and then acquiring a 31 acre hop garden at Bodiam, also in Kent, which was initially leased and later purchased. The hop garden was essentially an experimental concern, though it did prove profitable, providing as much as 1.8% of the total hops used in brewing in the period 1909-13. Perhaps the primary result of the experiments at Bodiam was shift from the use of qualitative analysis when evaluating hops purchased, based on appearance and smell, towards quantitative analysis, based purely on the soft resin content of the hops, which contain the plant's primary bittering and preservative compounds (*ibid*. 224-5). While this was not wholly enacted until the mid-1920s, it enabled the brewery to purchase high-quality hops that appeared, based solely on sensory analysis, to be of a lower quality. In this regard, Guinness were at the forefront of the movement towards the chemical analysis of their raw materials and had introduced the purchase of hops based on their chemical properties, as is used in brewing today, at an early date.

As a low-volume raw material, hops generally did not require the construction of specialised storage areas within a brewery. For example, the surveys of the upper floors of Beamish and Crawford, dated 1839 and 1863, indicate that a portion of the upper floor of one of the brewery's blocks, the fifth from the north, served as the brewery's hop stores.[1] However, Guinness's phenomenal rate of expansion after 1840 saw the construction of two dedicated hop stores, both of which are extant. The first was constructed on Grand Canal Place, on the northern bank of the Grand Canal's James's Street Harbour in the 1850s or early 1860s (plate 4.1).[2] The distinctive building, the plan of which is curved following the line of the since infilled harbour, was later converted for use as an experimental maltings

[1] The surveys were reprinted by Ó Drisceoil & Ó Drisceoil (2015, 100-2).
[2] The building was first depicted on the 1864 edition of the 1:1056 OS.

and is generally known as the Canal Maltings today. Between the late-1870s and 1884, the brewery constructed a second, much-larger hop store in two phases, located southeast of the junction of Crane Street and Rainsford Street (plate 4.2).[3] It comprises four blocks of adjoining four-storey structures, constructed of brick with blind arcading. Both the scale of the hop stores and their standing as a unique building type, at least in Ireland, is indicative of Guinness's unparalleled rapid expansion in output during the second half of the 19th century.



Plate 4.1. Guinness's first purpose-built hop store, constructed on Grand Canal Place in the 1850s or early 1860s.



Plate 4.2. Guinness's second, larger hop store, constructed on Rainsford Street in the late-1870s and early 1880s.

[3] The building was constructed on a plot of land that was acquired before 1879 survey of the brewery. The eastern block had been constructed before 1879 with the area that the central and western blocks were constructed identified as being a yard on both the 1879 and 1881 surveys. Both blocks had been constructed before 1884. *James's Gate Brewery, Historical Plans*. Guinness Archives, Guinness Storehouse, Dublin.

4.2 Water

Water is both the lowest value and the highest volume raw material used in brewing. The availability of a supply of water that was both suitable and sufficient was essential for a brewery to produce a quality product, while water was also used extensively in cooling and refrigeration, malting, cleaning, steam production and firefighting. An efficient brewery today will use as little as three times the volume of water as beer produced, while in exceptional cases, and probably commonly in the past, as much as 30 times the volume of water as beer output may be used (Briggs *et al.* 2004, 53). A varied range of water supplies were exploited by breweries, which commonly exploited multiple forms of supply for varying purposes. For instance, in the late-1880s Guinness used a combination of water sourced from the Grand Canal for brewing, from artesian wells for cooling and refrigeration, and from the municipal supply for steam production (Barnard 1889-91 vol. 3, 9). Similarly, when the Cork Porter Brewery was acquired by Beamish and Crawford in 1792, the brewery was drawing water from a combination of artesian wells, the municipal supply and directly from the adjacent River Lee (Ó Drisceoil & Ó Drisceoil 2015, 41-2). Evidence of a brewery's water supply should be expected to survive sub surface, even at sites where standing remains have not survived. Wooden and later lead or cast-iron water pipes should be expected at sites where breweries utilised the municipal supply, while well shafts should survive sub surface at sites that drew their water from artesian wells. Indeed, a deep, brick-lined well shaft, complete with cast-iron water mains, is known to survive within the much-altered brewhouse at the Mill Park Brewery in Enniscorthy, county Wexford (D. Lett, pers. comm.).

The chemical properties of the water supplies exploited for brewing had a significant effect on both the colour and flavour profile of the finished beer. Without delving too deep into the chemistry, hard waters extract less colour from malt and are more suited to extracting sugars from pale malts than softer waters (Cornell 2003, 137). This led to regional specialisations in brewing. For example, the calcium sulphate rich hard waters sourced from the wells of Burton-upon-Trent in England was ideally suited for the production of the pale ales that became popular from the 1830s. In contrast, the soft or semi-soft waters of both Dublin and London were better suited for the production of dark beers such as porter (Mathias 1959, 16, 174-5; Gourvish & Wilson 1994, 89-91; Briggs *et al*. 2004, 53). When the impacts that the chemical composition of water had on the finished product came to be understood, beer brewed with water that was treated to mimic the chemistry of the supply of Burton was often said to have been 'Burtonized' (Cornell 2003, 137). Contemporarily, this practice appears to have been frowned upon; in the 1883 Cork Exhibition one of the judges noted their disagreement with the prizes awarded for the pale ales produced by the Riverstown Ale Brewery, then operated by Arnott's Brewery of Cork city (anon. 1886, 344). The judge stated that the chemical analysis of the ale suggested that it had either been blended with beer produced in Burton or

produced with water that had been treated to mimic Burton's water supply. The judge's statement may well have been erroneous, and it may be that the brewery was supplied with water that was similar in chemistry to that of Burton.

Indeed, it would appear likely that several Irish breweries had access to water supplies that were similarly suited to the production of pale ales, though the suggestion remains unconfirmed. For instance, the survey has identified just four village-based breweries that survived the decline of the industry in the late-1830s and 1840s, located at Castlebellingham in county Louth, Donaghmore in county Tyrone, Stillorgan in county Dublin and Oranmore in county Galway. The breweries at both Donaghmore and Castlebellingham were primarily associated with ale production and in the mid-1830s were stated to have produced 'celebrated' ales, perhaps suggesting that they held some form of technical advantage over other ale producers (Lewis 1837 vol. 1, 290, 469). An interesting exercise would be to identify the water supplies used by the breweries and subject them to a simple chemical analysis, which would either confirm of refute the suggestion. This exercise could similarly be repeated for the reasonably large-scale ale breweries that survived to produce in the 20th century. These include Smithwick's St. Francis's Abbey Brewery in Kilkenny city, Egan's Brewery in Tullamore, county Offaly, Perry's Brewery in Rathdowney, county Laois, MacArdle and Moore's Cambrickville Brewery in Dundalk and Cairnes' Brewery in Drogheda, both in county Louth.

Access to a secure water supply for brewing appears likely to have been one of the primary reasons for the dense concentration of breweries in the Liberties area of Dublin, which by the early 18th century had become the city's primary brewing quarter (Lennon 2008, 6). From the late-12th century, the area was supplied by fresh water diverted from both the rivers Poddle and Dodder, which had been diverted to cisterns via an artificial waterway known as the City Watercourse (Clarke 2002, 7, 28). In the early 18th century, a new cistern was constructed to replace the previous medieval examples, located to the south of James's Street, immediately southwest of Guinness's brewery (Lennon 2008, 6). It was from this supply, which later supplied the Grand Canal, that Guinness sourced their brewing water and under the terms of the brewery's leases access was provided tariff free (Lynch & Vaizey 1960, 75-7).[4]

In popular discourse, Guinness was commonly said to have brewed with water sourced from a holy well which was associated with the medieval church of St. Thomas (*ibid*.; Sumner 2008, 294-5). While this opinion does not appear to have been propagated by the brewery itself, two breweries founded in the period 1850-70 associated themselves with holy wells, Murphy's Lady's Well Brewery in Cork city and the St. Mary's Well Brewery in Carlow town. While the water source of the St. Mary's

[4] The first Arthur Guinness defended the brewery's water rights by threat of violence in 1775, an act that ensured the brewery's continued tariff-free access to brewing water from what was then the area's primary municipal supply.

Well Brewery, and indeed the location of the well from which the brewery derived its name, remains unclear, it is known the Lady's Well Brewery did not source water, whether for brewing or elsewise, from its eponymous well, which was located outside of the brewery's grounds (Ó Drisceoil & Ó Drisceoil 1997, 36). The naming of both breweries can, perhaps, be viewed as being an example of the propagandisation of a brewery's water supply, linking the product with a water supply that was not actually utilised. Sumner (2008, 294-5) highlighted how, in the 18th century, London porter was commonly believed to have distinct characteristics that arose from the use of water from the Thames. This was despite the fact that London's porter breweries actually sourced their brewing water either from the New River or artesian wells.

4.3 Malted barley

Barley, in malted form, is the second-most voluminous raw material used in brewing behind water. Today, malting is viewed as a separate industry to brewing. However, in the past most breweries managed their own maltings, either located on or off site, while many also acted as maltsters for sale. This included Beamish and Crawford who, in the 1830s, operated as many as eight maltings in Cork city and were said to have been amongst the most-productive malt producers in the United Kingdom (Rynne 2006, 237; Ó Drisceoil & Ó Drisceoil 2015, 89). In addition, breweries may have sourced malt from independent maltings, who either operated as contract maltsters, producing malt directly for a brewery or distillery, or as independent maltsters, producing for sale on the open market (Patrick 2004 vol. 1, 5-6).

In 1785 as many as 2,216 maltings were at work in Ireland, a number that had reduced to 388 by 1835 (Rynne 2006, 237). The earlier, late-18th century maltings were generally independent, probably producing malt for local consumption by publican brewers in parts of Ireland such as the north, west, southeast and midlands where, as was outlined in Chapter 2, commercial brewing remained reasonably uncommon. By the 1830s, malting was almost solely in the hands of the producers of finished product, distillers of whiskey and brewers of beer, though large-scale independent maltings, such as those that survive at Ballinacurra near Midleton in county Cork, were certainly not uncommon (Rynne 2006, 240). The suspicion remains, though is largely unconfirmed, that many Irish breweries of the 1830s had initially been independent maltings that were later adapted to brewing. Indeed, it is reasonably common for historical evidence of malting at a site to pre-date the evidence for brewing by a period of decades, though this should not be viewed as conclusive evidence for malting pre-dating brewing in each individual case. One example is J. and J. Anderson's Brewery on Water Lane in Sligo town, where the earliest reference to brewing was made in 1804 though malting is confirmed as early as 1748 (Gallagher & Legg 2012, 5, 17-18). Another is Tarrant's

Brewery in Mallow, county Cork, where brewing had commenced before 1820 though leasehold evidence, in a private collection, confirms that malting had been carried out from at least 1766 (Pigot 1820). These are just two of many similar examples that are suggested by historical sources, while surviving brewery maltings that pre-date the earliest reference to brewing at the site by at least several decades have been recorded at the Bantis Brewery, near Cloghjordan in county Tipperary, Graham's Brewery in Westport, county Mayo, and the Kinsale Brewery in county Cork among many.[5]



Plate 4.4. The Bantis Brewery maltings, a farmhouse maltings located near the town of Cloghjordan, county Tipperary.



Plate 4.3. The Shrule Brewery maltings, a farmhouse maltings located in the outskirts of a village in county Mayo.

Early English maltings, which solely served local markets, tended to be located either in farm contexts, where they are often indistinguishable from agricultural outbuildings, or within towns, where they tend to respect the boundaries of medieval burgage plots (Patrick 2004 vol. 1, 6-7). In terms of location, early brewery maltings have been identified in both farm and urban contexts in Ireland. At Newcastle West in county Limerick, the surviving four-storey maltings is a classic burgage plot maltings, radiating from a street-facing building and located on the opposite side of a laneway to the brewery's brewhouse, which is no longer extant (plate 4.5). While it remains the only classic burgage plot maltings that has been recorded, it would appear likely that the form was particularly common in Ireland at an early date. For example, the incomplete 17th century *Civil Survey of Cork* recorded a large number of maltings in the city, the majority of which were located on burgage plots and were generally accessible by laneways (Simington 1942, App. E 397-497). Indeed, in a point that will be returned to in a later chapter, many of Ireland's urban breweries developed along the lines of former burgage plots before expanding, subsuming neighbouring properties both as space was required and opportunity arose. These included Ireland's largest breweries, Guinness and Beamish and Crawford. Extant farm-context maltings have been identified at the Bantis Brewery, near Cloghjordan in county Tipperary, and at the Shrule Brewery, located in the outskirts of a village in

[5] In each case the surviving maltings appear to date to the 18th century while the earliest references to brewing at the sites, which are poorly documented, date to the 1820s and 1830s; see catalogue entries CK 112-001, MO088-002 and TY 015-001 for further information.

county Mayo (plates 4.3 & 4.4). Both would appear likely to have been components of wider grain-processing complexes, with the Bantis Brewery operated by the Kennedy family, also the proprietors of a distillery within Cloghjordan itself (Lewis 1837 vol. 1, 135).

In the 18th century, following the development of the canal system, independent maltings in England tended to be built in canal-side locations, providing access to distant markets (Patrick 2004 vol. 1, 27). This was a trend that was repeated in the 19th century following the development of the rail system (*ibid*., 7). In the majority of cases, and certainly before 1850, Irish breweries typically served local markets and, as such, access to bulk transport systems was generally not a deciding factor in their location. However, independent maltings were constructed in locations that provided access to bulk transport. One well-documented example is at Ballinacurra, county Cork, where two large-scale maltings were constructed in harbour-side positions, one in the 1790s and the second in the early 19th century (Rynne 2006, 240). As in England, access to bulk transport became one of the deciding factors in the location of an independent maltings in Ireland as the 19th century progressed. For example, towns such as Athy in county Kildare and Carlow town, both situated on the navigable River Barrow and connected to Dublin city via the Grand Canal, grew to become major malting centres in the second half of the century. In both cases, the malting industry replaced local brewing. Brewing in Athy, which is poorly documented, does not appear to have survived the period of decline for the industry in the late-1830s and 1840s, while Carlow town had been reduced from three breweries to one before 1850.[6] While the industry in the town continued into the early 1870s, the final brewery to close was a short-lived foundation of the 1860s, the St. Mary's Well Brewery.[7]

The sources of both the barley and malt consumed by Guinness are well covered by Lynch and Vaizey (1960) and Dennison and MacDonagh (1998). Throughout the period in question, the brewery sourced both malt and barley from Ireland and England, with the quantities of Irish and English barley varying. In years of poor harvest, as in 1802, most barley was sourced in England and was imported both raw and malted, while in 1816 the entire barley crop was sourced from a merchant in Midleton, county Cork (Lynch & Vaizey 1960, 128-9). In the early 19th century, imported raw barley was malted both by the brewery and by contract maltsters at Athy, county Kildare, and Ballinacurra, near Midleton

[6] No historical sources have been identified for the two breweries depicted on Duke Street in Athy on the 1837 1:10560 OS (KE 035). In Carlow town, two breweries were depicted on the 1837 1:10560 OS (CW 007), Ferrall's Brewery on Centaur Street (CW 007-001), which had closed before the 1852 *Primary Valuation*, and Burrough's Brewery on Bridwell Lane (CW 007-002), which Valuation Office surveyors recorded as having closed in 1830. One brewery continued to produce in the town post-1850, Paul's Brewery on Tullow Street (CW 007-001), which Valuation Office surveyors described as being 'very small'. Listed in *Slater's Directory* of 1856, it appears likely to have closed before the foundation of the St. Mary's Well Brewery (CW 007-004) in the 1860s.

[7] The St. Mary's Well Brewery had been founded before 1865 and continued to produce to at least 1872; *Freemans Journal* 03/04/1865, 2; *Leinster Express* 29/06/1872, 3.

in county Cork amongst others. Irish-produced malt was acquired via the coastal trade, from the likes of Ballinacurra and Youghal in county Cork, Drogheda in county Louth and Waterford city and Wexford town, and from the Grand Canal, sourced from towns such as Mountmellick in county Laois and Athy in county Kildare.

This situation appears to have changed little in the decades that followed and by 1880 Guinness were consuming more than half of the total of the Irish barley crop, a proportion that was maintained in the decades that followed (Lynch & Vaizey 1960, 221-2; Dennison & MacDonagh 1998, 95). Indeed, the entirety of the Irish barley crop would appear to have been sufficient to only support Guinness in the early 1880s; Irish-grown barley amounted to a little more than half of the barley consumed by the brewery in 1880, with shipments from countries as distant as Sweden and Chile recorded. In 1878, Guinness malted about one-seventh of the barley consumed at the brewery at the Cooke's Lane maltings (Dennison & MacDonagh 1998, 94). A little under half of the remainder was malted under contract by independent Irish maltsters, with the shortfall purchased on the open market, primarily sourced from Irish maltsters but with a significant proportion sourced from England. By the late-1880s the proportion of malt purchased on the open market had increased, primarily due to disputes with the contract maltster over costs.

The acreage of the Irish barley crop increased in conjunction with Guinness's expansion in output, while yields also improved (Dennison & MacDonagh 1998, 94-5). Guinness made a major contribution to the improvement of the crop, beginning in the late-1890s. The brewery entered a partnership with the Irish Agricultural Organisation Society (IAOS) and the Irish Department of Agriculture, both organisations that were heavily linked with Horace Plunkett, the founder of the first dairy co-operatives in Ireland (*ibid*., 96-103). Under the partnership, experiments were conducted on both barley varieties and malting techniques, with the development of new barley varieties through hybridisation being the primary driver in the increases in Irish barley yield. Guinness's contribution to Irish agriculture was intended to secure their barley supply, which the brewery ensured by purchasing Irish barley at an uncompetitive price. Rather than pricing Irish barley within the context of international supplies, in 1899 the brewery introduced a policy of purchasing barley at a price that was intended to provide a profit for both the farmers and the maltsters.

4.3.1 The malting process and its impacts on the architecture of a maltings

Malting, a biochemical process, is the artificial germination of cereal grains, primarily barley (Briggs *et al.* 1981, 1-3). Following the introduction of the malt tax in 1785 and the abolition of beer duty in 1795, the primary tax levied on beer production in Ireland was on the volume of malt consumed (Callan MacArdle & Callan 1902, 452-3). This led to the industry being heavily regulated by

excise officials, with two of the primary stages of production, *steeping* and *couching*, being closely monitored (Patrick 2004 vol. 1, 12-14; Rynne 2006, 236). Owing to this, the malting industry was quite conservative with few major changes in process being enacted until after the abolition of the malt tax in 1880 (Patrick 2004 vol. 1, 4). Throughout the period in question, floor malting was the principal method in which malt was produced in Ireland. While experiments were made with mechanised malting by Perry's Brewery of Rathdowney, county Laois, who had converted a former flour mill near Roscrea in county Tipperary into a pneumatic maltings in 1876, floor malting continued to be the primary method used in Ireland well into the 20th century (Rynne 2006, 241). Today there are no operational floor maltings in Ireland. The last to close, in 2003, was Bennett's of Ballinacurra, near Midleton in county Cork, though many remain in operation in Britain (Patrick 2004 vol. 1, 1; Rynne 2006, 240).

As with brewing, malting was a seasonal activity, one that followed the barley harvest, typically beginning in October, and continued through the winter and spring months, typically ending in May (Patrick 2004 vol. 1, 9). In its traditional method, it is also a labour-intensive process, one that supported a large number of seasonal employees, with the seasonality of the process making it an ideal winter activity for agricultural labourers.

The malting process has several purposes, though the primary aim is to encourage enzymatic growth within the cereal grains. In wine and cider production, the principal raw materials are naturally sugar-rich fruits that are ideal for conversion to alcohol through fermentation. In contrast, cereals are naturally starchy. It is only through the natural production of a range of enzymes, collectively known as *diastase*, that these starches can be converted into sugars, which in the natural life of a plant are used as fuel for the plant's growth (Briggs 1998, 154). The primary aim of the maltster is to artificially trigger this enzymatic growth through germination, before arresting the process, through kilning, prior to the loss of potentially fermentable starches. Malt, as the principal fermentable in beer, makes a major contribution to the finished product's colour and flavour. It is primarily the choices made at kilning that decide this contribution. Differing kiln schedules, based on both the length of time that the malt is kilned and the temperature or temperatures applied, are chosen to produce the desired product, while also preserving sufficient quantities of the *diastatic* enzymes required for brewing. Put simply, lighter, less-kilned malts preserve a greater amount of *diastatic* enzymes, ensuring a more-efficient conversion of starches to sugars than darker, highly kilned malts, which provide both colour and different flavour profiles in the finished beer.

4.3.1.1 Steeping

In the *steeping* process, which encourages the initiation of germination, the grains are immersed in a large water-filled cistern, referred to as a *steep*, for an extended period, typically of 60-72 hours, but often longer (Briggs *et al.* 1981, 110; Patrick 2004 vol. 1, 12; Rynne 2006, 236). Today, the steeping process is deemed complete when the barley's water content has increased to 40-45%, an increase that was gauged on volume in the past (Briggs *et al.* 1981, 110). Until the closing decades of the 19th century, *steeps* were permanent fixtures within a maltings, comprising a large, flat-bottomed, quadrilateral cistern, typically constructed of brick or stone (Patrick 2004 vol. 1, 11-12). Both the dimensions and flat-bottomed nature of the *steep* were defined by excise regulations for much of the 19th century. Flat-bottomed *steeps* may have been located on any floor of a maltings and were occasionally installed on a mezzanine level between malt floors where they would have been supported by a framework (*ibid*.; Rynne 2006, 239). Following the repeal of the malt tax, when direct supervision by excise officials became unnecessary, rectangular, cast-iron, hopper-bottomed *steeps* became common, typically installed in the upper floors of a maltings. No *steeps* have been recorded in Irish brewery contexts, with the majority of brewery maltings surviving essentially as shells which have long been re-repurposed. Three mid-19th century cast-iron *steeps* survived at the Lee Maltings in Cork city until 1991 when they removed without recording by UCC (Rynne 1999, 44).

4.3.1.2 Couching

Following *steeping*, the grains are *couched*, a process that involves heaping the water-swollen grains in piles, allowing the naturally generated heat produced to trigger the first stages of germination (Briggs *et al.* 1981, 110-11). The process itself is not integral to malting and it is only a necessity in times of cold weather. However, *couching* was a legal requirement for much of the 19th century, until the repeal of the malt tax in 1880, with the amount of tax payable being decided on the volume of grain measured within the *couch frame*, also a legal requirement that was not integral to the malting process (Patrick 2004 vol. 1, 13-14; Rynne 2006, 236). The time that the grain spent within the *couch frame* was also regulated by legislation; initially a period of 30 hours was required, reduced to 24 in 1827. *Couch frames* typically comprised a rectangular wooden frame, the dimensions of which were defined in law, with one removable side that enabled the efficient emptying of the frame. *Couch frames* were typically located adjacent to the *steep*, from which they would have been filled directly. While *couching* continued to be practised, when required, after the repeal of the malt tax in 1880, the *couch frame* itself became redundant. Patrick (2004 vol. 1, 14) noted that physical evidence of *couch frame* rarely survives, with the most-common surviving features being the slots that held the timber boards of the frame. As with the *steep*, no *couch frames* have been recorded in Irish brewery contexts.

4.3.1.3 Flooring

The next stage in floor malting is commonly known as *flooring* or growing. In *flooring*, the water-swollen grains are spread across a floor surface at a varying depth, typically of between 10-20cm (4–8"), for an extended period (Patrick 2004 vol. 1, 15). The purpose of *flooring* is to enable the continued germination of the grain, which is later arrested at a point decided by the maltster (Briggs *et al.* 1981, 110-11; Briggs 1998, 343-52; Patrick 2004 vol. 1, 14-18; Rynne 2006, 236-7). The *flooring* process is temperature dependant and an ideal grain temperature of 13-16.5˚C is desirable. A range of varied methods can be used to control the grain temperature in floor malting. The depth of the grain bed itself can be altered, allowing for the natural heat produced by the barley to rise or fall, while the grain itself can also be turned, causing an initial but temporary drop in grain temperature. The atmospheric temperature within the maltings can also be manipulated, traditionally using well-placed windows to create drafts, a practice replaced by the use of air-conditioning systems in the 20th century (Patrick 2004 vol. 1, 9). Throughout the flooring process, the germinating grain is turned at regular intervals. In addition to causing a temporary drop in grain temperature, turning prevents the emerging root chits from tangling while also ensuring that the level of germination is consistent. Broad, flat-bladed wooden shovels were traditionally used to turn the germinating grain. Later, malt ploughs, effectively a three-pronged malt shovel, were used, while automated systems for turning malt were developed in England in the early 20th century (*ibid*., 17).



Plate 4.5. Four-storey maltings at the Newcastle West Brewery in county Limerick. The maltings was located on the opposite side a laneway to the brewhouse, which is no longer extant.



Plate 4.6. One of two adjoining four-storey maltings, dating to the 1830s, at the Lough Gill or Sligo Brewery, Sligo town. The four-bay building that adjoins to the right and bears resemblance to a kiln is a recent structure.

The use of bare wood flooring in a malt floor generally frowned upon (*ibid*., 14-15). Typically, a malt floor would have been of wood covered with a scree coat of mortar, though floors constructed of slate, tile or brick are also said to have been common. Among the most characteristic features of a floor maltings are the numerous, small, closely spaced windows that typically dominate their long elevations (*ibid*. 16-17, 23-4). These windows were used to control the internal temperatures of the growing floors rather than providing illumination. Typically, they were not glazed and instead were

louvered or shuttered. Another typical feature of a floor maltings is closely spaced internal floors with reduced head heights. Where evident, these denote the existence of a malt floor and are a symptom of the horizontal nature of the *flooring* process, which did not require vertical space beyond what was required for access by the maltsters themselves. Reduced head height is a feature that is often, though certainly not always, evident in the fenestration pattern of a floor maltings. Clear examples can be seen at the Newcastle West Brewery in county Limerick, an early maltings that probably dates to the late-18th century, and at the Lough Gill/Sligo Brewery in Sligo town, a maltings of the mid-1830s, among others (plates 4.5 & 4.6). In both examples, the window arrangement shows that head height at both first and third floors was reduced, indicating that these served as malt floors. A further, occasional feature of a maltings, which was not uncommon in Britain in the mid-19th century, was a half-basement ground floor (Patrick 2004 vol. 1, 24). Where evident, this denotes that the ground floor was used as a growing floor, with the semi-subterranean form simplifying the regulation of the grain temperature. It appears to have been a reasonably common feature in Irish brewery maltings constructed before 1850. Surviving examples can be dated to the late-18th century, as at the Watergate Brewery in Bandon county Cork, the early 19th century, as at Wickham's Gibson's Lane Brewery in Wexford town, and the 1830s, as at Read's Brewery in Kilkenny city.

4.3.1.4 Withering

In the past, the un-kilned, germinated barley, which is known as *green malt*, was *withered*, a process that is not carried out in malting today (Patrick 2004 vol. 1, 18-19). In *withering*, the green malt was heaped in piles and allowed to rest for a period of about twelve hours, allowing the moisture content to reduce before kiln drying. Improved kiln design in the late-19th century made the process redundant, though it is known to have been practiced as late as the 1930s in England. Areas dedicated to *withering* can often be identified by either an un-fenestrated section of a maltings, or an area that is fenestrated in alternating bays. The upper floor of the previously mentioned maltings at the Lough Gill/Sligo Brewery features alternating fenestration, suggesting that it may have been used for withering. Patrick (2004, 19) noted that early maltings were commonly un-fenestrated at ground-floor level, where *withering* would have been carried out. This pattern is evident at a small, two-storey, vernacular maltings at the Killeigh Brewery in county Offaly, where *flooring* is likely to have been carried out on the fenestrated first floor (plate 4.7). A further example can be seen at the Graham's Brewery in Westport, county Mayo, where one of two surviving maltings features little fenestration at both ground and first-floor levels, suggesting that one or more of the floors may have been used for *withering* (plate 4.8).



Plate 4.7. Simple two-storey maltings with un-fenestrated ground floor, the Killeigh Brewery, county Offaly.



Plate 4.8. Four-storey malting with partially fenestrated ground and first floors, Graham's Brewery, Westport.

4.3.1.5 Kiln drying

Following the *flooring* process the malt is transferred to the malt kiln for drying (Briggs 1998, 439-41; Patrick 2004 vol. 1, 19-21). Kiln drying serves two primary purposes. The first is to arrest the germination at a critical point, when the enzymatic growth has reached its peak, allowing the malt to be stored in a stable state. The second decides the colour of the malt itself, which ultimately adds to both the colour and flavour profile of the finished beer. The kilning process involves drying the malt via an indirect, moderate heat source for an extended period, typically measured in days. Both the temperature and timeframe of the process play a role in the colouring of the malt, with higher temperatures and longer kilning times producing a darker malt.

Kilns are amongst the most recognisable features of a maltings. Typically, they are two or three-storey structures, square or rectangular in plan, with pyramidal or conical roofs, topped with a ventilation cowl (Patrick 2004 vol. 1, 22; Rynne 2006, 237). Intact kilns are reasonably rare survivors in Irish brewery contexts and those that do survive have typically been altered and do not retain their ventilation cowls. Typical examples that maintain their cowls can be seen in Cork city at the Lee Maltings, formerly the River Lee Porter Brewery which was converted to malting by Beamish and Crawford, and at Murphy's Lady's Well Brewery (plates 4.12 & 4.13). The kiln at Murphy's Brewery dates to the late-1880s, while the Lee Maltings example dates to the beginning of the 20th century (Rynne 1999, 45, 57).



Plate 4.12. Early 20th century, double-floored malt kiln with ridge ventilator, the Lee Maltings, Cork city. Courtesy C. Rynne.



Plate 4.13. Late-1880s century, double-floored malt kiln with ridge ventilator, now glazed. Murphy's Lady's Well Brewery, Cork city.



Plate 4.9. Historic photograph of malt kiln drying floor, the Mill Park Brewery, Enniscorthy. Courtesy D. Lett.



Plate 4.10. Cast-iron malt kiln furnace, the Mill Park Brewery, Enniscorthy.



Plate 4.11. Vaulted ground floor of maltings with furnace arch at the St. Mary's Well Brewery, Carlow town.

Internally, the ground floors of a malt kiln are typically vaulted in brick or stone, a fire-proofing measure, and contain the furnace or furnaces (Patrick 2004 vol. 1, 20; Rynne 2006, 237). Surviving examples of vaulted ground floors, both dating to the 1860s, have been recorded at the Mill Park Brewery in Enniscorthy, county Wicklow, where a triple-vaulted space maintains two cast-iron furnaces, and at the St. Mary's Brewery in Carlow town, a single-vaulted, single-furnace example where the furnace itself has not been preserved (plates 4.10 & 4.11). Utilising the draw of the ventilation cowl, the heat from the furnace is drawn vertically through brick or stone shafts to a hot air chamber contained above the vaulting. Directly above the hot air chamber is the drying floor itself, typically floored with either perforated-ceramic or wire-framed tiles, or in later periods, wedge-wire flooring. The drying chamber at the Mill Park Brewery in Enniscorthy, which historic photographs shows was floored with perforated ceramic tiles, is believed to survive intact, though is not accessible (D. Lett, pers. comm.; plate 4.9). Kilns with two drying floors were first developed in Continental

Europe and became popular in Britain in the late-19th century (Patrick 2004 vol. 1, 21). Two previously mentioned examples, both in Cork city, were installed at Murphy's Lady's Well Brewery in the late-1880s and at the Lee Maltings in *c*. 1903 (Rynne 1999, 44-5, 57).

In the kilning process, the green malt is typically spread evenly on the drying floor to a depth of 20-30cm (Patrick 2004 vol. 1, 20). Throughout the process, the malt is turned manually at regular intervals to ensure consistency. In the past, temperatures within the kiln may have risen as high as 105˚C, though lower temperatures were typically recommended. The length of time that the malt was kilned was varied based on several factors, such as the quality of the kiln's construction, the prevailing weather conditions and the desired outcome. Poor kiln construction or windy conditions could cause an enhanced draw in the kiln, forcing hot air to rise prior to the evaporation of sufficient moisture, impacting negatively on the kiln's efficiency.

In the 19th century, kilning was typically carried out for an extended period of between three and four days, though this has been reduced to just 24 hours in modern maltings (*ibid*.). For much of the 19th century, the emissions from the furnace would have passed through the drying malt before exiting the kiln. Because of this, fuel choice was paramount, and both coke and anthracite were preferred due to their low smoke yields, while low arsenic levels were also a requirement in the choice of coal. Wood-fired kilns appear to have been common in parts of Britain, particularly during the 18th century, while peat-fired kilns remain common in the Scottish distilling industry, where the flavour imparted in the final product is desirable.

4.3.1.6 Barley and malt storage

Barley intended for malting would have been purchased as required and would have been received, direct from the farm or merchant, following winnowing and threshing. Sufficient quantities of barley for continued production would have been stored on site, with a portion of the facility designated for this purpose (Patrick 2004 vol. 1, 9-11). In a self-contained maltings, barley was often stored in one or more floors of the facility. This can often, though not always, be recognised by increased ceiling heights, a feature that can occasionally be seen in a malting's fenestration pattern, as at the previously mentioned Newcastle West Brewery in county Limerick and the Lough Gill/Sligo Brewery in Sligo town (plates 4.5 & 4.6). An alternative arrangement saw a maltings divided horizontally rather than vertically, with barley storage contained on all floors of one end of the maltings (Patrick 1996, 190-3). This arrangement can also be identified from the fenestration pattern of the maltings, which is typically divided by a grain entry point, itself demarked by a sack hoist with upper-floor loading doors at all floor levels. Characteristic examples can be seen at the Newtownards Brewery in county Down, probably constructed in 1819, and at Read's Brewery in Kilkenny city,

probably dating to the 1830s (plates 4.14 & 4.15).[8] In both examples, the horizontal separation of barley storage and malting floors is evident in the original fenestration pattern, which is preserved in the Kilkenny example and, while altered, can be seen in the red-brick scars of upper-floor doorways in the Newtownards example.



Plate 4.15. Maltings at the Newtownards Brewery, county Down. Note the red-brick scars of the former grain entry point between the two leftmost bays.



Plate 4.14. Maltings at Read's Brewery, Kilkenny city. Note the dormer window and upper-floor doorway in the third bay from the left.

Alternatively, barley may have been stored in a separate, adjoining building. This arrangement is evident at Deasy's Brewery in Clonakilty and the Watergate Brewery in Bandon, both in county Cork, and at the Mill Park Brewery in Enniscorthy, county Wexford (plates 4.16 & 4.17). In both cases in county Cork, the OS Manuscript Townplans identified separate barley stores directly adjoining the breweries' maltings.[9] Both barley stores survive and date to the late-18th or early 19th centuries, while the Mill Park Brewery's barley stores, which also directly adjoined the brewery's no longer extant maltings, were erected in mid-1860s renovations. The provision of large barley stores suggests that breweries malted most, and probably all, of their own barley, with an annual stock probably purchased at or shortly after the barley harvest. Indeed, Deasy's Brewery are known to have brewed solely with locally sourced barley at the beginning of the 20th century, while the Mill Park Brewery also operated as a retail maltster in addition to brewing (Bassett 1885, 297; Callan MacArdle & Callan 1902, 478).

[8] In the 1830s, the Newtownards Brewery was said to have been re-constructed in 1819 when brewing resumed at the site following a period of disuse (Lewis 1837 vol. 2, 435). A Valuation Office surveyor, writing in 1847, appraised the buildings of Read's Brewery, which was then out of work, as being of recent construction. The brewer was later subsumed by the neighbouring Sullivan's Brewery, with whom the surviving maltings are primarily associated with today. See catalogue entries KK 019-002 & 003 for full details.
[9] NAI/OS140/Bandon & Clonakilty.



Plate 4.17. Barley stores, dating to the late-18th or early 19th century, at the Watergate Brewery in Bandon, county Cork.



Plate 4.16. Barley stores, dating to the mid-1860s, at the Mill Park Brewery in Enniscorthy, county Wexford.

Until the 20th century, barley was typically stored in well-ventilated wooden bins. Despite previously being winnowed and threshed, barley intended for malting was generally cleaned before storage, ensuring that foreign matter did not make its way into the brewing process (Briggs *et al.* 1981, 34-6). In the late-19th century, mechanical cleaning systems were common, unfortunately little is known of the systems used prior to this (Patrick 2004 vol. 1, 9). Today, barley intended for storage is typically dried first. While this is not a prerequisite for malting, it helps to guarantee the barley's continued dormancy and discourages the growth of moulds and fungi (Briggs *et al.* 1981, 29-31). Before the introduction of steam threshing in the second half of the 19th century, barley was allowed to mature prior to threshing, naturally reducing its water content (Callan MacArdle & Callan 1902, 461; Rynne 2006, 189 & 236). While this appears to have partially obviated the need for the pre-drying of barley intended for malting, following a wet harvest barley is likely to have been dried in the malt kiln prior to storage. From the mid-19th century, British maltings were often provided with specialist barley drying kilns in addition to their malt kilns (Patrick 2004 vol. 1, 9). While the arrangement has not survived, Murphy's Lady's Well Brewery in Cork city erected a second, smaller kiln specifically for drying barley prior to storage when they built their new maltings in the late-1880s (Barnard 1889-91 vol. 1, 546).

A typical maltings also maintained storage areas for finished malt, while a brewery that either malted off-site or apart from the brewhouse may have had dedicated malt stores. In a self-contained maltings, malt storage, as with barley storage, may have been within a floor or a horizontally arranged section of the maltings itself. One dedicated brewery malt store has been recorded, located directly adjacent to the brewhouse at the Cambrickville Brewery in Dundalk, county Louth (plate 4.18). It is a large, primarily un-fenestrated, red-brick building that dates to the brewery's reconstruction in the mid-1860s following its acquisition by MacArdle and Moore, who produced their malt both on site and off site at the former Dublin Street Brewery (Callan MacArdle & Callan 1902, 480-2).



Plate 4.18. Un-fenestrated malt stores, on right, dating to the mid-1860s, at the Cambrickville Brewery in Dundalk, county Louth.

4.3.1.7 Interior features

Interiors of maltings tend to be distinctive where historic fabric has been retained. The sheer weight of grain meant that a typical maltings required a heavy framework to support its internal floors, while wrought-iron tension rods are also a common feature that provided structural integrity (Rynne 2006, 239). Initially, the internal skeleton of a maltings comprised heavy timber beams, themselves supported on timber stanchions. As the 19th century progressed, timber stanchions were replaced by cast-iron columns, which may have supported a framework of timber or, less-commonly, masonry or brick vaulting, as was provided in Guinness's Cooke's Lane Maltings, constructed between 1873 and 1877 (Stevens 1959, 58; Lynch & Vaizey 1960, 239; Rynne 2006, 239). The movement of product between floor levels may have been via a combination of internal sack hoists, floor hatches, chutes in both floors and walls, internal doors and, particularly in later maltings, a combination of various forms of automated plant (Patrick 2004 vol. 1, 23).

Unfortunately, few of the brewery maltings that have been recorded maintain historic fabric within their interiors, with the majority essentially surviving as shells. However, the interior of the northwest block of the quadrilateral east maltings at Rutland Street in Cork city has survived virtually intact, while the Bantis Brewery maltings in county Tipperary also maintains significant internal fabric. The maltings at Bantis, which is of three storeys, show that smaller 18th century maltings did not require the heavy support structures of their larger counterparts. Fragments of the internal floors survive in adjoining maltings at the site, which comprised simple joists of hand-dressed timber, some left in the round. In contrast, the interior of the four-storey Rutland Street maltings, which dates to *c.* 1792, comprises a heavy timber framework of stanchions and beams on which the floor joists are

supported.[10] The framework is integral to building, with the heavy timber beams projecting through the exterior walls on its northern elevation.



Plate 4.20. Hand-dressed timber sack hoist at the Bantis Brewery, near Cloghjordan, county Tipperary.



Plate 4.19. Full-height internal void, viewed from the ground floor, at the eastern maltings, Rutland Street, Cork city. The chain visible in the left foreground hangs from a hand-dressed timber sack hoist, reinforced by a steel H beam.

Both the Bantis and Rutland Street maltings also maintain interior fabric related to the movement of grain. At Bantis, the easternmost bay of the western maltings is penetrated by a carriageway from which grain was loaded and unloaded from carts via sack hoists above first-floor loading doors. One hand-dressed timber sack hoist is maintained, while the timber ceiling of the carriageway also features a hatch (plate 4.20). The Rutland Street maltings also maintains a hand-dressed timber sack hoist which is now reinforced by a steel H-beam and, quite incredibly, remains in occasional use today. This sack hoist, which is located above an upper-floor doorway at attic level of the gable-fronted western elevation, served dual purposes, enabling both the entry of raw barley into the maltings and the movement of both malt and barley within the interior, via a full-height internal void (plate 4.19). A plan of the maltings as it stood in the mid-1860s, preserved within the Beamish and Crawford archives, depicts the maltings' *steep* at ground-floor level, directly below this void (figure 4.1).

[10] The Rutland Street malting complex was originally constructed as independent maltings, with malting having been carried out at the site before 1753 (Rynne 1999, 41). Both maltings were acquired by Beamish and Crawford in 1813 as part of their acquisition of the River Lee Porter Brewery. The area is comprehensively covered by late-18th century cartographic sources. The street, originally Bradshaw Street, was first depicted on the 1789 *Murphy's Map of Cork City*, which indicated that the area where the maltings were later constructed was then a garden or orchard. The buildings were first depicted on the 1801 *Beauford's Map of Cork City.*

4.3.1.8 Power

Typically, maltings were worked manually until the late-19th century when mechanised barley and malt cleaning systems and systems for the movement of grain, such as bucket elevators, conveyors and automated hoists, became common (Patrick 2004 vol. 1, 23). Several Irish breweries devised complex systems for the movement of malt within the brewery itself. At Beamish and Crawford, an automated tramway was installed in the mid-1860s, bridging the brewery's malt stores with the brewery itself, while a similar system was also developed at Watkins' Brewery in Dublin city (Barnard 1889-91 vol. 2, 366). In that case, a conveyor linked the brewery's maltings, which are no longer extant, with an extant red-brick tower from which it was fed via a series of chutes, Archimedean screws and elevators to the brewery's malt bins which were contained within an extant two-storey malt store, from which the tower projects (plate 4.21). Guinness's Cooke's Lane maltings was provided with a dedicated steam engine which was replaced in *c.* 1896 by a horizontal non-condensing engine by Spence of Dublin (Stevens 1959, 58; Bowie 1986, 85). This engine, which is outlined in a later chapter, is extant and remains the only recorded primary evidence for the use of steam power in an Irish brewery maltings. In exceptional cases, water-powered plant was installed, as at a large independent maltings at Castlebridge in county Wexford, though no evidence has been identified for the use of water power within a brewery maltings in Ireland (Rynne 2006, 239).



Plate 4.21. Malt stores at Watkin's Brewery, Ardee Street, Dublin city. The two-storey malt stores date to the early 19th century while the red-brick tower appears to be an addition of the 1860s.

4.3.2 The physical development brewery maltings in Ireland

Patrick (1996; 2004a) provided a framework for the physical development of English maltings, highlighting several phases in their early development and also providing a typology for maltings of the 18th and 19th centuries. As will be seen, the physical development of the Irish brewery maltings

closely followed the developments in England for much of the period, though with some key variations, which should be viewed as being both regional and site-specific developments.

Throughout the period in question, and indeed in the centuries that preceded, the plan of an English maltings generally remained within a defined ratio of width to breadth, with a typical maltings being between two and three times as long as they are wide (Patrick 2004 vol. 1, 23-4). While the buildings increased in scale as time progressed, particularly in the late-19th century, this ratio, which was a symptom of the requirement for ventilation, remained constant. Until the 1860s, English maltings were typically of between two and four storeys, with simple single and two-storey variants appearing to have been the earliest forms (*ibid*. 30-4).

In Patrick's (1996; 2004a 31-4) typology, three distinct forms of early English maltings have been identified, each of which had developed concurrently as early as the 17th century. The most-basic arrangement is the Two-Storey Pattern, which comprised a simple two-storey building where the upper floor was used for barley storage, while *flooring* was carried out on the ground floor. The more-complex Ware Pattern, as its name implies, was prevalent in the region around Ware, Hertfordshire, but later became widespread throughout England (Patrick 1996, 190-3). In Ware-type maltings, which may have been either two storey or multi storey, storage and *flooring* were separated horizontally, rather than vertically. Barley was stored at one end of the maltings, adjacent to the malt floors, which directly adjoined the kiln. At the opposite end of the maltings to the barley stores were malt stores, which would have contained the cleaning and dressing plant. Newark Pattern maltings were common, again as their name implies, in the area around Newark-upon-Trent, though, as with the Ware type, they were also widespread across England (*ibid*., 193-4). While some two and four-storey examples have been recorded, Newark-type maltings are typically of three storeys. Barley storage was confined to the first floor, while *flooring* was carried out at both ground and second-floor level. While they are often difficult to identify based solely on external features, the dominant feature of a Newark-type maltings is increased ceiling height at first-floor level, the area dedicated to barley storage. Maltings of the Two-Storey Pattern do not appear to have been constructed in England after the mid-19th century, though pre-existing examples continued to work (Patrick 1996, 193-4). Newark-type maltings continued to be constructed in England into the late-19th century, while maltings of the Ware type continued to be built late as the early 1950s.

While each of the previous styles outlined had emerged at an early date, the final style in Patrick's typology, the Multi-Storey Pattern, was a late development. The earliest survivors of the type have been dated to the 1860s, while their construction continued until *c.* 1940 (Patrick 1996, 194-7). They are distinctive buildings, typically featuring steeply pitched roofs broken by dormer windows, containing single or double attics that served as barley stores. In a typical Multi-Storey maltings, the

finished malt was stored in the attic space, in separate, though adjacent bins to the raw barley. A further development of the 1880s saw the hybridisation of the multi-storey and Ware-type maltings, which arranged the malt stores horizontally adjacent to the kiln rather than within the attic space.

In Ireland, brewery maltings that subscribe to both the Newark and Ware Patterns appear to have been reasonably common in the late-18th and early 19th centuries. The 18th-century Bantis Brewery maltings is a classic example of the Newark Pattern, standing to three storeys with reduced head height at both ground and first-floor levels. Four storey variants, both previously mentioned, have also been recorded at Newcastle West, probably dating to the late-18th century, and at the Lough Gill/Sligo Brewery in Sligo town, erected in the mid-1830s (Gallagher 2008, 628). In both cases, the fenestration patterns confirm reduced head height at first and fourth-floor levels. Ware Pattern maltings also appear to have been reasonably common. The previously mentioned Newtownards Brewery maltings are a classic early 19th century example, while the western maltings at Rutland Street in Cork city, which date to the 1790s, appear to have also operated under the same principal. Grain entry at the maltings, which comprise three adjoining blocks, appears to have been via sack hoists in the northern range, with the southern portion of range and the majority of both the central and southern ranges devoted to *flooring*.

No classic examples of Two-Storey Pattern maltings have been recorded in Irish brewery contexts. That is not say that maltings of two storeys have not been identified, though those that have been appear likely to have operated on a different principal. For example, the extant two-storey, L-plan maltings at the Watergate Brewery in Bandon, county Cork, was located directly adjacent to the brewery's large, four-storey barley store. The suggestion is that both storeys of the maltings were used for *flooring*. Further two-storey maltings, such as those that survive at the Kinsale Brewery in county Cork and the previously mentioned Killeigh Brewery in county Offaly, appear to have been arranged with their malt floors in the upper level. In both cases, the ground floors are either un-fenestrated or partially fenestrated, a feature that was previously highlighted as being indicative of an area dedicated to winnowing.

While maltings of the late-18th and early 19th centuries in England tended to be of between two and four storeys, several five-storey maltings, each dating to the ultimate 18th or early 19th centuries, have been recorded in Ireland. The best documented is located on Cove Street in Cork city (plate 4.24). It was originally constructed as part of Drinan's Brewery and was acquired by the Southgate Brewery in 1821 (Ó Drisceoil & Ó Drisceoil 2015, 168). As late as the 1880s, when it was described by Barnard (1889-91 vol. 4, 323-4), it was considered to be a somewhat curious example, and it would appear likely to have been constructed in 1809, a date that Barnard recorded as having been inscribed on one of the building's internal supporting beams. The fenestration pattern of its long

east and west elevations has been altered in a *c*. 1990 conversion to domestic use. However, irregular internal ceiling heights, which have been altered in the recent development, are evident in the gabled southern elevation, which indicates a greater ceiling height at second and fourth-floor levels. Barnard (*ibid*.) had indicated that three of the six working floors, which included the attic, had been used for barley storage, and the physical evidence suggests that it was at attic, fourth and second-floor levels that raw barley was stored. The building can be viewed as a multi-storey variant of the Newark Pattern, with its location in a restricted urban location, perhaps, being the primary cause for its increased vertical height, in comparison to the more traditional three and four-storey variants.



Plate 4.24. Five-storey-plus-attic maltings, Drinan's Brewery, Cork city.



Plate 4.23. Five-storey maltings, O'Neill's Brewery, Limerick city.



Plate 4.22. Four-storey over semi-basement maltings, Wickham's Gibson's Lane Brewery, Wexford town.

Two further examples have been recorded at O'Neill's Brewery in Limerick city and Wickham's Gibson's Lane Brewery in Wexford town, where the lowest floor is semi-subterranean (plates 4.22 & 4.23). While their fenestration patterns do not indicate increased internal head heights at any floor levels, both would also appear likely to have been multi-storey variants of the Ware type. Their construction to a height that has not been recorded for the period in England may, potentially, relate to the early development of the multi-storey flour mill in Ireland (Rynne 2006, 256-60). The five-storey Lock Mills, outside Slane in county Meath, was the largest flour mill in Europe at the time of its completion in 1766. Its arrangement, with grain storage in the attic space, enabled the efficient movement of raw materials from top to bottom. This arrangement can be seen in the Cove Street maltings in Cork, where three floors were dedicated to storage, each located above the malt floors, while it can certainly be suggested for both the Wexford and Limerick examples. In contrast, the typical Ware-Pattern maltings had a less-efficient internal arrangement, with malt floors both above and

below the barley storage areas, necessitating the use of internal hoists in addition to gravity for the movement of barley within.

Several four-storey combined maltings and grain stores have been identified at large brewing and flour milling complexes, at Grubb's Brewery in Clogheen, county Tipperary, the Mill Park Brewery in Enniscorthy, county Wexford, and the Bray Brewery in county Wicklow. Each also appears likely to date to the period 1790-1810; the Bray Brewery had been established before 1798, Grubb's Brewery before 1802, while the Mill Park Brewery is a known foundation of 1810 (Riordan 1920; Davies 1998, 12; Ahern 2003, 204). In each case, the buildings directly adjoined the mills, which at both Bray and Clogheen were located apart from the brewhouse itself. It would appear likely that the buildings served several purposes, containing malt floors, grain storage, and both flour and malt dressing plant. While each is located outside of the larger urban settlements where the five-storey examples have been identified, they reinforce the suggestion that Irish maltings architecture was being influenced by contemporary indigenous developments in mill construction.

A further indigenous development of the late-18th and early 19th centuries is the courtyard maltings, a style that was identified by Rynne (2006, 239) and which was to become common in independent maltings constructed in the second half of the 19th century. While the five-storey maltings of the period appear to have been a local development of the Newark Pattern, the courtyard maltings can be viewed as being a development of the Ware type, one that was spread across several adjoining structures arranged around a central courtyard. Two early examples, both in county Cork, have been identified, at Deasy's Brewery in Clonakilty and at Rutland Street in Cork city. At Rutland Street, initially an independent maltings and later operated by both the River Lee Porter Brewery and Beamish and Crawford, it is the eastern maltings that is constructed around a central courtyard (figure 4.1). Unlike later examples where the courtyard arrangement enabled access for wheeled transport, the courtyard was essentially non-functional, with the maltings' primary yard located to the north of the buildings. It would appear likely that the courtyard form was a symptom of the site on which the maltings had been constructed. In comparison to the previously discussed western maltings, which comprises three maltings buildings joined end to end, the eastern site was deeper than it was long. The form appears to have been due to the requirement for maintaining the many closely spaced windows that enabled the interior temperatures of the malting floors to be regulated, rather than as an access point for wheeled transport.

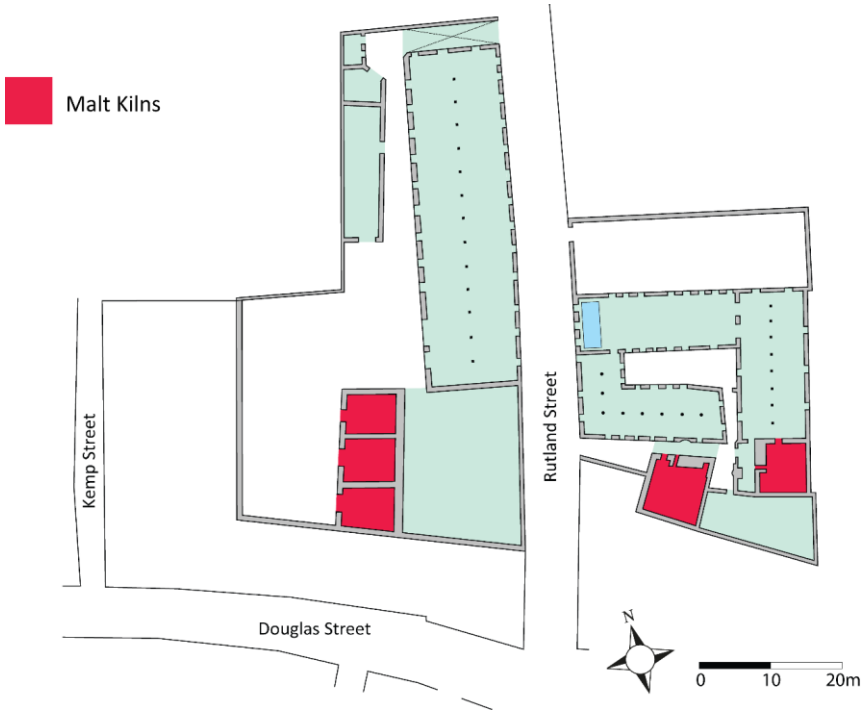


Figure 4.1. Beamish and Crawford's Rutland Street maltings, after a detailed survey dated 1865. CCCA/U18/MPD/37.

The example at Deasy's Brewery in Clonakilty, which was probably erected in 1805, is the earliest recorded courtyard maltings where the form can be said to have favoured access to wheeled transport (plate 4.25).[11] The layout and arrangement of the brewery is evident on the 1841 OS Manuscript Townplans, which labelled each of the brewery's component structures.[12] The brewery's barley stores and maltings comprised each of the four ranges that surrounded the quadrilateral courtyard, while two brewhouses, one that probably dates to 1805 and one that was constructed in 1837, as stated on a surviving datestone, project to both the east and west respectively. The courtyard form was identified as one of the primary forms of brewery constructed in the late-18th and early 19th centuries by Rynne (2006, 245-6). While Deasy's Brewery remains one of the best-preserved courtyard breweries of the period, one well-documented example, the River Lee Porter Brewery in Cork city, did

[11] Ó Drisceoil & Ó Drisceoil (2015, 150) recorded that the brewery was originally located on Astna Street before moving to the identified site. They erroneously stated that the move was carried out in 1837, likely following a datestone at the site which, instead of identifying the date of construction of the brewery complex, instead provides the date of construction of a new brewhouse. The move likely occurred in 1805, a date referred to in a mid-20th century newspaper article concerned with the brewery's closure; *Southern Star* 03/02/1940, 1.
[12] NAI/OS140/Clonakilty.

not maintain a maltings on site, showing that the arrangement of buildings as seen at Deasy's Brewery was not the prevailing form of brewery layout in the period. However, a further surviving example, at Robinson's Brewery in Birr, county Offaly, which was constructed around two central courtyards, does suggest that the arrangement at Deasy's Brewery was not uncommon. While, as will be outlined in a later chapter, breweries of the second half of the 19th century had largely abandoned the courtyard layout, independent courtyard maltings of the period appear to have been reasonably common and examples survive at King Street Upper in Wexford town and Harbour Street in Tullamore, among many (plates 4.26 & 4.27). It would appear likely that they had been influenced by trends in Irish brewery architecture in the late-18th and early 19th centuries. However, the late-18th century example on Rutland Street in Cork city highlights the influence that both local topography and the requirements of the malting process itself had on the development of the form.



Plate 4.25. Aerial view of Deasy's Brewery in Clonakilty, county Cork. Source: Google Earth.



Plate 4.27. Aerial view of a courtyard maltings on Harbour Street, Tullamore, county Offaly. Source: Google Earth.



Plate 4.26. Aerial view of a courtyard maltings on King Street Upper, Wexford town. Source: Google Earth.

As in England, both independent and brewery maltings in Ireland increased in scale as the 19th century progressed. However, smaller maltings continued to be constructed as late as the 1860s, with a three-storey, six-bay example surviving at the St. Mary's Well Brewery in Carlow town (plate 4.28). While it is larger than a typical 18th century maltings, it is of a lesser scale to the large five-storey

maltings of the late-18th and early 19th centuries that have been recorded in Cork and Limerick cities and Wexford town. While evidence of reduced head height at second-floor level is not evident in the fenestration pattern, it would appear likely to have been constructed in the Newark style and it is a late example of a maltings with a semi-subterranean ground floor. Its modest scale would appear likely to reflect the brewery's intended output.



Plate 4.28. 1860s maltings, modest in scale, at the St. Mary's Well Brewery in Carlow town.



Plate 4.30. Substantial maltings dating to the 1880s located on Beresford Street, Dublin city. Constructed as a component of the North Anne Street Brewery.



Plate 4.29. Late-1880s maltings and malt kiln at the Lady's Well Brewery, Cork city

Several particularly large brewery maltings were constructed in the 1880s. An atypical example of Patrick's Multi-Storey Pattern was described by Barnard (1889-91 vol. 2, 398-400) at the North Anne Street Brewery in Dublin city. The maltings, which is extant though much altered following a recent conversion to domestic use, is particularly large (plate 4.30). Originally of 21 bays, it stands to five storeys and originally stood over a basement level which, in conjunction with the ground floor, was said to have been fireproof. Malt storage was in the top floor, while both the third and fourth floors were growing floors. Each of the remaining floors were dedicated to malt cleaning and storage, with the brewery operating a further maltings in the city at the time of Barnard's visit, at the former

South King Street Brewery. Another large maltings of the decade survives at Murphy's Lady's Well Brewery in Cork city (Rynne 2006, 239-40; plate 4.29). While the maltings stands to five storeys in height, it was not constructed in the form of a typical English Multi-Storey maltings. Indeed, its arrangement was the exact opposite, with grain storage at both ground and first-floor levels, where the maltings was fireproofed with jack arches, and the growing floor in the top three storeys. While at face value this would appear to be an inefficient arrangement it was perhaps a symptom of the application of steam power for the movement of malt internally; as was previously highlighted, the maltings had been fitted with a dedicated steam engine when it was constructed.

4.4 Conclusions

Throughout the period in question, Irish breweries aimed to exert as much control over the supply of their principal raw materials as possible. Access to a suitable and sufficient water supply was amongst the primary locational concerns for a brewery, with the chemical properties of the supply used for brewing making a major contribution to both the appearance and flavour profile of the finished product. Access to a sufficient supply of water appears to have been one of the primary factors behind the development of the Liberties area of Dublin as the city's primary brewing quarter by the early 18th century, while the soft waters of the city were ideal for the production of porter, the product that Guinness solely produced after the 1790s. While unconfirmed, it would appear likely that, as in Britain, several Irish ale breweries were supplied with a water supply that gave them a technical advantage over their competitors.

In contrast, Irish breweries had little direct control over their hop supplies, which were primarily imported throughout the studied period. Indeed, the failure of Irish hop growing in the 18th century meant that Irish breweries provided English hop growers with their largest export market. It was not until the early 20th century, when Guinness acquired their own hop garden in England, that an Irish brewery sought to control a portion of their supply. Even in this case, it was the experimental nature of the hop garden that provided Guinness with a technical advantage. The experiments conducted enabled the brewery to shift their purchasing criteria from the qualitative to the quantitative, providing them with a price advantage over their competitors. From an archaeological perspective, hops have left little in the way of physical evidence, with the exception to this rule being the large-scale hop stores constructed by Guinness in the second half of the 19th century.

Malt is the raw material that provides the best physical evidence for the direct control of the supply of raw materials by Irish breweries. Between the late-18th century and the 1830s, the production of malt in Ireland had shifted from being controlled by a large number of small independent maltsters to being primarily in the hands of the producers of finished product, brewers

and distillers. This change occurred in tandem with the industrialisation of the Irish brewing industry and should be viewed as being part of the same trend. While large-scale independent maltings remained reasonably common, by the 1830s the majority of Irish breweries, both large and small, produced a portion, if not all, of their own malt and maltings are the most common surviving building type in Irish brewery contexts. As in many ways, Guinness stand out as an exception to the rule. While the brewery did produce a significant proportion of their own malt, they primarily used malt that was produced by independent maltsters, either purchased on the open market or produced under commission, with Guinness providing the barley that was malted. While the production of malt for the brewery was primarily carried out by third parties, this arrangement meant that Guinness remained in control of the supply. At the close of the 19th century, the brewery set about improving the Irish barley crop. This was a move that was intended to provide a superior malting barley while also continuing to support both Irish barley farmers and maltsters, whose continued success was paramount to the continued growth of the brewery. As with the brewery's hop garden, the experiments conducted in the early 20th century in conjunction with both the IAOS and the Irish Department of Agriculture further provided the brewery with an advantage over their competitors, securing the supply of superior malting barley. However, the brewery's policy of purchasing Irish-grown barley at a premium price meant that this advantage was technical, providing a superior product rather than a cost advantage.

From an architectural perspective, Irish brewery maltings show clear evidence of influence from England, an influence that dates from at least the late-18th century. However, certain indigenous developments that have not been identified in England, such as the early five-storey Irish maltings and the courtyard maltings, are evident, with both developments dating to the late-18th and early 19th centuries. The early development of multi-storey maltings in Ireland can, perhaps, be attributed to contemporary indigenous developments in mill architecture. The courtyard maltings appears to have been predicated by local topography, the requirements of the malting process and, particularly in later examples, the requirement for access by wheeled transport. Indeed, the courtyard arrangement had become particularly common in Irish independent maltings in the second half of the 19th century and it would appear likely that this trend was directly influenced by brewery architecture of the late-18th and early 19th centuries.

Chapter 5 Brewing, process and technology (i), core brewing processes

This is the first of two chapters that outline the levels of engagement that Irish breweries had with changes in both process and technology in each of the component sub-processes of brewing. Both chapters are divided thematically, with each of the core sub-processes of brewing outlined in this chapter, which is sub-divided into four primary sections. In order, the changing processes and technologies of each of the malt milling, mashing and boiling sub-processes will be outlined in the first three sections. The primary aim is to elucidate on the levels of engagement that Irish breweries had with the processual and technological changes that were being enacted in British breweries throughout the extended period under consideration. This, in turn, enables a discussion on the varying levels of industrialisation of Irish breweries. Unfortunately, evidence on technological change is reasonably sparse, though the amount of data available increases as the time period advances, with the period after *c*. 1860 providing the most detail. This is unsurprising, given the sparsity of the historical record for the majority of Irish breweries, particularly those that produced in the early period.

The discussion, by nature of data availability, is heavily weighted towards Ireland's largest breweries, in particular those that were contemporarily described. As such, the technological development of both Guinness and Beamish and Crawford, breweries that have received the greatest attention in both contemporary and recent sources, comprises the greatest part of both chapters. However, where sources for Ireland's lesser breweries are available, they are engaged with in an effort to provide a balanced view of the technological development of the wider industry in Ireland. In addition to contemporary and recent accounts of brewing technology, both chapters engage with surviving brewing plant in Ireland, a scarce resource that is primarily limited to four sites. Prime brewing plant survives *ex situ* at Guinness, presented within the brewery's visitor centre, the Guinness Storehouse. *In situ* brewing plant has survived at two sites, Beamish and Crawford in Cork city and the St. Mary's Brewery in Waterford city. In addition to these three sites, a small assemblage of brewing plant has survived at the Mill Park Brewery in Enniscorthy, county Wexford, where it makes up a significant proportion of what is an extensive artefactual assemblage. The surviving brewing plant is referred to in each section dedicated to a component sub-process of brewing, while the significance of the surviving plant related to the core brewing processes will be discussed in the final section of this chapter.

5.1 Malt Milling

The first stage in the brewing process is malt milling. The requirements for malt milling differ to those of flour milling. Malt milled for brewing is ground to a course grist that retains the husk. This is due to the tendency for finely ground malt to impede the *mashing* process, creating a *wort* that will not separate from the *spent grains* (Briggs *et al.* 2004, 175). While technical improvements were made to mills themselves throughout the period under consideration, it was a process that saw little in the way of processual development with the fundamentals, principally the requirement for a coarse grist, being understood at an early date.

Traditionally, millstones would have been used in malt milling, but, from at least 1800, the London porter breweries were applying roller-milling technology (Sumner 2005). The use of roller mills in breweries pre-dates their use in the flour-milling industry by at least seven decades, although it must be noted that the technologies applied were much simpler (Rynne 2006, 264-6). While the roller-milling technology adopted by late-19th century flour mills involved a succession of metal rollers, each of which revolved at a different speed, separating each of the main components of the grain, those used in brewing consisted of a single set of rollers that simply crushed the malt, maintaining the husk.



Plate 5.2. Roller mill no. 1, produced in Dresden, Germany. Malt-milling loft, Beamish and Crawford, Cork (courtesy Diarmuid Ó Drisceoil).

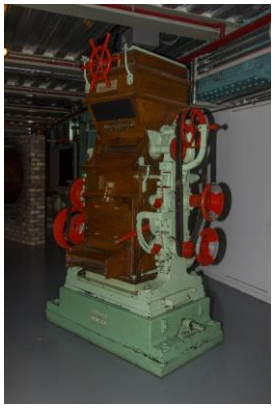


Plate 5.1. Ganz roller mill, produced in Budapest, Hungary. Guinness Storehouse, Dublin.

The earliest evidence for the application of roller-milling technology in an Irish brewery comes from Guinness who, in 1809, offered the brewery's original horse wheel and a pair of malt rollers for sale following the installation of the brewery's first steam engine (Lynch & Vaizey 1960, 154n.).[1] The sale of the malt rollers suggests that their use was well-established in the brewery at that time. At

[1] *Freemans Journal* 11/12/1809, 2.

Beamish and Crawford, the *c*. 1818 survey of the upper floor of the brewery captions roller mills, showing their early use at the brewery (figure 5.1). The only other direct evidence for the use of roller mills in an Irish brewery in the first half of the 19th century comes from the St. Francis's Abbey Brewery in Kilkenny where, in addition to three sets of mill stones, a 'malt crushing machine', probably a roller mill, was in use in 1847.[2] While the evidence is reasonably sparse, the use of roller mills can probably be assumed at each of the large-scale breweries that had installed steam engines at an early date, while, as we have seen with Guinness, breweries are known to have utilised roller mills powered by horse wheels, as appears likely in the case of Beamish and Crawford in 1818. The pace of adoption of steam engines by Irish breweries in Ireland is outlined in Chapter 7.

Before milling, the malt would have been screened to remove immature grains and any extraneous material that may have damaged the mill itself. Initially, these screens are likely to have been simple sieves similar to those used by contemporary cereal farms and mills, or by the large grain stores common in the period (Pearson 2014, 128-9). In the second half of the 19th century, complex screening systems were developed. These generally comprised rotating cylinders, perforated with various sized apertures, that first removed dust and dirt particles followed by the malt itself, leaving any larger foreign material behind. By the mid-1880s, rotary screens were being supplemented with magnetic screening systems, ensuring the removal of metal objects prior to milling, objects that were likely to have caused damage to iron or steel rollers (Southby 1885, 52). The most famous producers of malt screening systems were Stopes and Co. of London, Nalder and Nalder of Wantage, Oxfordshire, and Robert Boby of Bury St. Edmonds, Suffolk (Pearson 2014, 128–9). Stopes and Co. were specialist maltings engineers, while both Nalder and Nalder and Robert Boby primarily manufactured for the agricultural and flour-milling sectors, though both firms developed plant that was specifically designed for brewery use.

Very little is recorded about the screening plant used in Irish breweries in the contemporary brewery descriptions. Measom (1866a; 1866b) provided no information on the use of rotary screens, though their use was universal in each of the breweries described by Barnard, each of which had also applied roller milling technology. However, Barnard rarely provided detailed insight into the individual screening systems installed at the breweries. For example, the St. Finnbarr's Brewery in Cork is known to have installed a complex screening system developed by their head brewer before 1873, while Barnard simply stated that malt at the brewery was screened before milling (Johns 1873, 10; Barnard 1889-91 vol. 4, 328). While Barnard has provided few details of the screening systems used, where manufacturers are mentioned the plant was generally sourced from the specialist British manufacturers. The Anchor Brewery was then using screening plant by both Robert Boby and Stopes

[2] *Griffith's Valuation House Book* 13/11/1847. Full reference in catalogue entry KK 019-001.

and Co., the Lady's Well Brewery had sourced their screening plant from Nalder and Nalder, while Beamish and Crawford had installed a combined rotary and magnetic screening system by Stopes and Co. (Barnard 1889-91 vol.1, 547; vol. 2, 357, 375-6). The Phoenix Brewery in Dublin was the only brewery that Barnard (1889-91 vol. 1, 74) specified as using screening plant constructed by an Irish manufacturer, Byrne of Dublin. Byrne, who had also carried out major works on the automation of product flow at the brewery, was said by Barnard to be a specialist brewery engineer whose offices were located nearby the brewery, on James's Street.

Roller mills have survived at two Irish breweries, Guinness and Beamish and Crawford. At Guinness, a single roller mill survives *ex situ* within the brewery's visitor centre, the Guinness Storehouse (plate 5.1). The mill was manufactured by Ganz of Budapest and bears a maker's mark showing that it was constructed in 1903. The mill comprises a single set of steel rollers within a wooden frame, which is itself mounted on a painted cast-iron frame by Spence of Dublin. Guinness had installed their first mill manufactured by Ganz as early as 1886 (Stevens 1959, 23). It was installed in the brewery's original brewhouse and acted as a prototype for the 16 mills that were later installed in the brewery's second brewhouse, Brewery no. 2, when it was expanded between 1900 and 1917. Each of the Ganz mills installed at the brewery were electrically driven, while the first eight mills installed in Brewery no. 2 were steam powered and had been manufactured by Coates of Belfast.



Plate 5.3. Rotary screening plant, Beamish and Crawford (courtesy Diarmuid Ó Drisceoil).

At Beamish and Crawford, the entirety of the breweries early 20th century milling and screening plant had survived until recently within a two-storey malt-milling tower that projects from the upper-floor of the brewery (Hamond 2010, 33-44). Hamond (2010, 61) described the surviving

malt milling tower and its largely intact and *in situ* equipment as being the 'jewel in the crown' of the site. The plant within the malt-milling tower was said to have been the earliest *in situ* roller mills and screening plant in Ireland, either within a brewery or flour-milling context (plates 5.2 & 5.3). Unfortunately, the milling tower received extensive damage in a hurricane-force storm in October 2017 (plate 5.4). This the saw the loss of the mill's roof and the damage of its western wall. The fate of the equipment that was housed within the milling loft remains unclear.

The malt-milling loft appears to have been initially constructed in *c.* 1870, though Hamond's (2010, 34) research suggests that it may have been partially or entirely rebuilt in 1906-7. The milling equipment itself was contained in the lower floor, while the upper floor contained a full set of screening plant. The movement of malt within the mills was via a series of bucket elevators, one of which was partially intact, with further dismantled sections stored within the mill itself. The screening equipment originally comprised four rotary cleaners, three of which survived. They were manufactured by Nalder and Nalder and comprised a series of rotary wire screens, each of a successively finer mesh, that separated the correctly sized malt from smaller and larger particles. Following screening the malt was fed to a series of weighers on the lower storey, two of which survived. One was steel-built, by Avery of Birmingham, the other was of cast-iron, by Nalder and Nalder.



Plate 5.4. Malt-milling loft at Beamish and Crawford following damage received in hurricane-force storms in October 2017.

From the weighers the grain was lifted, via a pair of bucket elevators, to a large wooden hopper, before being fed, via a series of wooden chutes, to one of three magnetic screens, manufactured by Stopes and Co. The screened and cleaned malt was then fed to the roller mills

themselves. All three, which were constructed by Mühlenbauanstalt & Maschinenfabrik vorm Gebrüder Seck of Dresden, survived at the time of Hamond's survey and bore nameplates. Each comprised a single set of steel rollers, encased in a cast-iron and timber frame. The machinery within the loft was powered by a pair of 3-phase electric motors by H. J. Scott of Belfast, both of which survived along with fragmentary remains of their drive systems, which comprised a number of belt-driven line shafts.

Hamond's research has shown that the malt-milling equipment was largely refitted in 1906-7, with electric motors powering the new mills on their installation (*ibid*., 35–6). For this renovation a set of three roller mills were imported from Germany in 1907, giving a firm date for the roller mills themselves (*ibid*., 42). Nalder and Nalder were twice commissioned, in 1912 and 1916, to install equipment. The rotary screening plant likely results from either of these dates. Hamond (2010, 44) proposed that the surviving electric motors likely post-dated the installation of a new electricity generating plant at the brewery in 1940. The magnetic screens, by Stopes and Co., appear likely to be the oldest pieces of surviving equipment in the mill at the time of Hamond's survey. They were possibly the same magnetic screens that were present at the time of Barnard's visit in the late-1880s.



Plate 5.5. Millstones and Avery's grain weigher, the Mill Park Brewery, Enniscorthy.

Milling plant also survives *ex situ* at the Mill Park Brewery in Enniscorthy. There, a pair of millstones, manufactured by Kay and Hilton of Fleet Street, Liverpool and in use until brewing ceased at the site in 1957, shows that roller milling did not entirely replace the use of mill stones in Irish breweries (plate 5.5). Two reasons can be proposed for the late use of millstones at the brewery, which had been entirely overhauled in the mid-1860s. The brewery was water powered and it also

served a secondary function as a flour mill, with the overhaul of the brewery pre-dating the application of roller mills in Irish flour mills by about a decade (Rynne 2006, 264-6). Also surviving at the site is a grain weigher, manufactured by Avery. Constructed of cast iron within a wooden frame, its date remains unclear, though it probably dates to the final decades of the 19th century.

5.2 Mashing

Following milling, the malt would have been transferred to a specialised vessel known as a *mash tun* or, often in Irish breweries, *kieve*. Within the *mash tun*, the grist is mixed with moderately heated water, referred to as *hot liquor*. This causes a biochemical reaction where the diastatic enzymes contained within the malt are reactivated, converting the malt's starches into sugars (Briggs *et al.* 2004, 85-96). This process creates a sugar-rich suspension that is known as *sweet wort. Mashing* is an entirely heat-dependant process; maintaining too low a *mash* temperature will impede the enzymatic reaction while too high will halt it completely. Typically, temperatures of 60-80˚C are applied at varying times in the process, with different temperatures being chosen by the brewer, depending on the desired outcome.

From a processual perspective, *mashing* was the one brewing process that saw major developments in the period, particularly between the mid-18th and the mid-19th centuries. Until the second half of the 18th century, *mash* temperatures would have been gauged via qualitative measurements, often based on touch or time (Mathias 1959, 63-73). However, following the application of the hydrometer in the 1760s and the thermometer in the 1780s to the brewing process, brewers were, for the first time, capable of altering *mash* temperatures through the use of quantitative measurements (Sumner 2007). This allowed skilled brewers to ensure consistency in mashing, replacing the often-literal rule-of-thumb approach that was used previously.

In modern brewing, there are several ways in which the *mashing* process can be carried out, each of which is a multi-stage process in its own right. Outlined here are each of the primary stages of the *infusion mashing* process, seen as the traditional method in both British and Irish brewing. In traditional *infusion mashing*, each grist would have been *mashed* a number of times, usually between two and four, with each *mash* typically taking between one and three hours (Donnachie 1979, 108). This consecutive mashing helped to ensure that the enzymatic reaction had reached its full potential and that no sugars remained within the grist. The *wort* from these consecutive *mashes*, which would have extracted decreasing levels of sugars, was often blended to make several beers of differing strengths in a process known as *parti-gyling* (Buttrick 2011a). This involved blending different amounts of each *wort* to create constituent *worts*, each of which had differing characteristics from the original component *worts*. One of the innovations in the London porter breweries of the early decades of the

18th century was the mixing of *wort* from each of the *mashes* to create a single beer, contemporarily known as 'intire' or 'entire' (Mathias 1959, 12-4).

In modern *infusion mashing*, consecutive *mashing* is generally not practised, though its use continues in some traditional British breweries (Buttrick 2011a). Instead, a process known as *sparging* follows the initial *mash* (Briggs *et al.* 2004, 198-9). In *sparging*, a slow trickle of heated water, typically at a higher temperature than the *mash* itself, is sprayed over the grist as the *wort* is drawn off. *Sparging* serves a similar purpose to consecutive mashing but is far more efficient. The *sparging* process appears to have initially been a Scottish development and from the 1830s it was being practised by English breweries (Donnachie 1979, 108-9, 182-3).

The *mash tun* itself is a large, cylindrical vessel, that, at least by the mid-1880s, was assumed to be lidded (Southby 1885, 66-7). Initially most were constructed of oak though metal *mash tuns*, usually of copper or iron, are known to have been constructed as early as the first decade of the 19th century (Pearson 2014, 129-34). These generally remained wood-lined to ensure sufficient insulation for the retention of heat. *Mash tuns* typically contained a false bottom or double floor, with a perforated upper floor that allowed the grist to be held as the *wort* was drawn off from below (Mathias 1959, 41). The use of double-floored *mash tuns* appears to have been an early development, pre-dating porter brewing and probably present in breweries as early as the 15th century (Pearson 2014, 16).

Prior to the invention of external *mashing machines*, water warmed to a pre-defined temperature was transferred to the *mash tun*. The grist was then added via a hopper known as a *grist case*, before being thoroughly mixed with the *hot liquor*. Initially this mixing was done manually using wooden oars or rakes. The need for manual mixing was obviated from the late-18th century when various systems for mechanical *mashing* were invented. The first of these was patented in 1787 and by 1811 as many as nine patents had been taken out on similar equipment (Mathias 1959, 94-5; Pearson 2014, 134, 158-9). Their use was then ubiquitous in the London porter breweries. These internal mechanical mash rakes comprised a centrally placed vertical shaft within the *mash tun* that had one or more rotating, horizontal arms, from each of which protruded a series of revolving rakes. Where *sparging* equipment was utilised, it comprised a number of perforated copper tubes, known as a *sparge arm*, that rotated around a horizontal axis through which hot liquor was fed (Donnachie 1979, 108–9; Hornsey 2003, 470–2). They were driven either by a centrally placed column within the mash tun, typically a component of the mechanical *mash rake*, or via the pressure of the *sparging liquor* itself, in which case the *sparge arms* were suspended above the mash tun. Plate 5.6 shows the interior of a *mash tun* at the St. Mary's Brewery in Waterford city, replete with perforated false bottom, mechanical mash rakes and *sparging* mechanism.



Plate 5.6. Interior view of mash tun no. 1, the St. Mary's Brewery, Waterford. Note the perforated base plates, mechanical mash rakes and sparging mechanism suspended from above.

Unfortunately, little can be said about the early evolution of the *mash tun* in Ireland. The earliest evidence for the use of mechanical *mash rakes* in an Irish brewery comes from Morewood's description of Guinness in 1838 (Morewood 1838, 629-30). At that time, three wooden *mash tuns* were in use at the brewery, each fitted with mechanical *mash rakes*. Morewood (1838, 629), who was clearly familiar with the technology at Guinness, described Beamish and Crawford as being 'elegantly fitted up, having the appropriate machinery'. It would be unsurprising if the brewery, which had been the largest in Ireland by output between the 1790s and 1833, had engaged with mechanically driven *mashing* technology at an early date, though it is not confirmed (Ó Drisceoil & Ó Drisceoil 2015, 54, 80). Guinness are known to have adopted the *sparging* process in 1840 and its adoption is said to have led to an immediate increase in efficiency in the mashing process (Lynch & Vaizey 1960, 154). It may be that the adoption of *sparging*, leading to a similar increase in efficiency, led to the reduction in the number of *mash tuns* in use at Beamish and Crawford from three in *c*. 1818 to two in 1839 (figure 5.1). However, it should be worth noting that the brewery's output had decreased during the same period, from a high of 134,039 barrels in 1814 to a low of 52,213 in 1836, which provides an alternative explanation for the reduction in the number of *mash tuns* at the brewery (Ó Drisceoil & Ó Drisceoil 2015, appendix B).

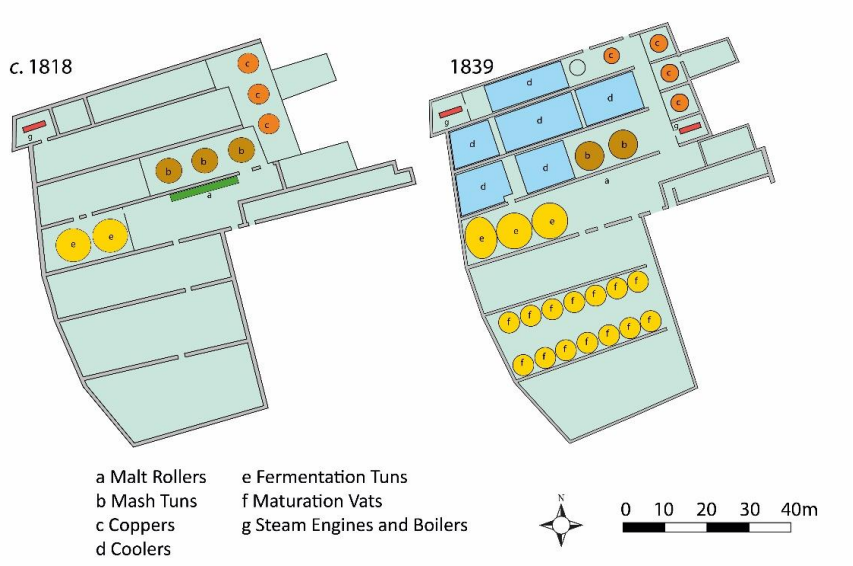


Figure 5.1. Upper-floor surveys of Beamish and Crawford, c. 1818 and 1839, including brewing plant. Source: CCCA/U18/MPD/13, 42. Approx. scale.

Mashing technology was further revolutionised in the 1850s when external *mashing machines* were developed, increasing efficiency. The first of these was the Steel's *mashing machine* which was patented in 1853 by the Glasgow-born engineer James Steel and remains in production today (Steele 2011; Pearson 2014, 134). Steel's *mashing machines* comprise a large metal cylinder that is mounted horizontally adjacent to the *mash tun* and fed directly via the *grist case.* Inside the grist is mixed with *hot liquor* via the action of an Archimedean screw or a rotating axle and rake, before being fed to the *mash tun*. Steel was not the only brewing engineer to patent external *mashing machines*. For example, another Scottish engineer, Maitland, patented a *mashing machine* with no moving parts in the early 1860s, though it was the Steel's masher that was widely adopted by the Irish brewing industry.



Plate 5.7. Steel's mashing machine with cast-iron grist case, belt-driven by an extant electric motor. Mash tun no. 3, the St. Mary's Brewery, Waterford.

Irish breweries were quick to employ external *mashing machines*. Guinness installed two in 1862, in conjunction with the brewery's first two metal *mash tuns*, both of which were sourced second hand (Stevens 1959, 3-4). One was fitted with a Steel's masher, the second with a Maitland's masher. Each of the 24 *mash tuns* that were later installed in the brewery's second brewhouse, Brewery no. 2, between 1878 and 1917, were identically built, constructed of cast-iron and fitted with Steel's mashers (*ibid*. 20). Each of the *mash tuns* and the *mashing machines* were constructed by Spence, an iron works located near the brewery on Cork Street. While each of the *mash tuns* installed at the brewery from 1862 were iron-built and fed by an external *mashing machine*, four timber examples that had been installed before 1862 continued to operate until the closure of Brewery no. 1 in 1932 (*ibid*. 2-3). Steel's *mashing machines* had been installed at both the St. Francis's Abbey Brewery in Kilkenny and the Southgate Brewery in Cork by the mid-1860s, and the St. Finnbarr's Brewery in Cork before 1873 (Measom 1866a, 35, 328; Johns 1873, 7). Of the remaining nine breweries described by Barnard, seven were utilising Steel's *mashing machines*, as was Deasy's Brewery in Clonakilty in county Cork in 1894.[3] The only two Irish breweries visited by Barnard (1889-91 vol. 1, 547; vol. 4, 324) that were not specifically said to have utilised Steel's mashing machines were the Lady's Well Brewery and the Southgate Brewery, both in Cork city.

Mechanical *mash rakes* were then assumed in each of the breweries described by Barnard and, while metal *mash tuns* were in the majority, in certain cases wooden *mash tuns* remained in use.

[3] *Southern Star* 27/01/1894, 5.

Apart from Guinness and Beamish and Crawford, who continued to use one wooden *mash tun*, their use was generally confined to breweries that produced ale, such as Watkins' Brewery in Dublin and the Southgate Brewery in Cork (Barnard 1889-91 vol. 2, 358, 367; vol. 4, 324). Indeed, when the contents of Caffrey's Brewery in Dublin were offered for sale in 1885 they included three *mash tuns*, two constructed of iron and one of oak that was specifically stated to have been used for ale production.[4] The rational for the association of wooden *mash tuns* with ale production remains unclear and not all breweries who produced ale continued to use wooden *mash tuns*.

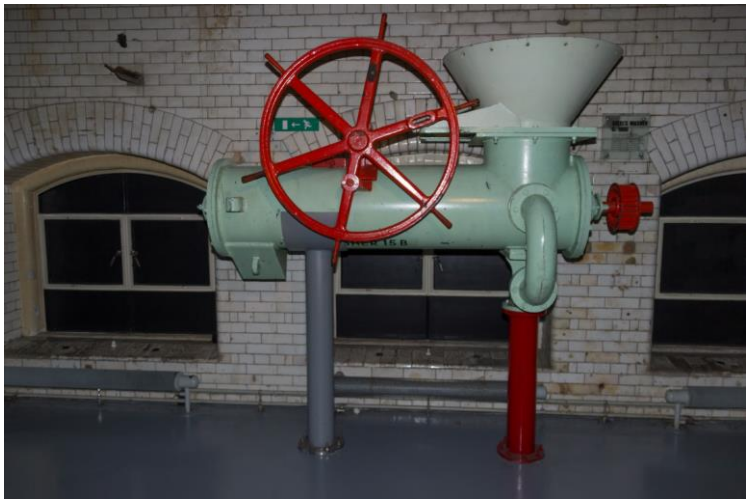


Plate 5.8. Painted cast-iron Steel's mashing machine, manufactured by Spence of Dublin. Guinness Storehouse, Dublin.

While the evidence suggests that the larger breweries were engaging with mechanised *mashing machines* utilising technology imported from Britain by the 1860s and likely earlier, the use of dry *mashing*, using manual labour to mix the grist and *hot liquor*, appears to have continued in some of the smaller Irish breweries into the late-19th century. This is confirmed by the list of contents published for Pim's Brewery in Mountmellick, county Laois, when the brewery's contents were offered for sale by auction in 1885.[5] Included within the listing was four *mash rakes*, showing that small-scale production reliant on manual labour remained a feature of Irish brewing into the late-19th century. Indeed, photographs of the Mill Park Brewery in Enniscorthy, taken when brewing ceased in 1957, show that the brewery had been using an uncovered timber-built *mash tun* into the mid-20th century (plate 5.9). While, as the brewery had installed a steam engine as part of its mid-1860s rebuild, it would appear likely that the *mash tun* contained mechanical mash rakes, the use of open *mash tuns*

[4] *Belfast Newsletter* 04/07/1885, 1.
[5] *Leinster Express* 19/12/1885, 4

was, as was outlined previously, assumed to have been finished in British breweries by the mid-1880s. Both of these cases suggest that many of the small regional and local breweries that operated in Ireland in the late-19th and early 20th centuries were not engaging fully with the processual and technological improvements that were developed in the British brewing industry.



Plate 5.9. Open mash tun at the Mill Park Brewery, Enniscorthy in 1957. (courtesy D. Lett)

Some five *mash tuns* have survived in Irish brewery contexts, three at the St. Mary's Brewery in Waterford city and one at each of Guinness in Dublin and Beamish and Crawford in Cork. Each of those that survive at both the St. Mary's Brewery and Beamish and Crawford survive *in situ*, while the *mash tun* at Guinness is preserved *ex situ* within the brewery's visitor centre, the Guinness Storehouse. The earliest of the five is the Guinness example, Kieve no. 15, which was installed when the brewery's second brewhouse, Brewery no. 2, was expanded in 1886 (Stevens 1959, 23; plate 5.10). Unfortunately, it only partially survives and none of its interior is maintained. The body of the *mash tun*, which is partially dismantled to enable its use as an interactive exhibit, is constructed of iron and was manufactured by Spence of Dublin. The upper portion, which was visible above floor level when it was in use, is decoratively panelled, painted and bears makers marks. The lower portion, which would have been below floor level, is of plain iron and maintains outlet pipes. The *mash tun* is capped with a convex copper lid with inspection hatches. The *mash tun's* Steel's *mashing machine*, constructed of iron and also by Spence, is also on display (plate 5.8).



Plate 5.10. Cast-iron mash tun by Spence of Dublin. Guinness Storehouse, Dublin. The painted and panelled section of mash tun wall was visible above floor level when originally installed in the Brewery no. 2. The plain cast-iron section below was below floor level. Note the wort outlet pipes in the bottom right.

Each of the three mash tuns that survive at the St. Mary's Brewery were installed when the brewery was overhauled between 1899 and 1901. *Mash tun* no. 1 was manufactured by George Adlam of Bristol, while each of the remaining two were by Robert Morton of Burton-on-Trent (plates 5.7, 5.11 & 5.12). *Mash tun* no. 3 was internally overhauled in the late-20th century, when its *mash rakes*, *sparging* mechanism and baseplates were replaced. The baseplates survive, dismantled, within *mash tun* no. 2. Each of the remaining two survive complete. Both *mash tuns* nos. 1 and 2 are of timber, likely oak, bound by bronze hoops. The use of timber for their construction shows wooden *mash tuns* remained relevant in Irish breweries at the beginning of the 20th century. All three are capped with convex copper lids, replete with inspection hatches. The lids are lifted via a counter-balance chain and pulley system to enable the removal of spent grains and cleaning. Internally, both *mash tun* nos. 1 and 2 maintain their copper baseplates, mechanical *mash rakes* and *sparging* mechanisms (plate 5.6). The *mash rakes* were driven from below, while the *sparge arms* appear to have been rotated under the power of the *hot liquor* that flowed through them.

All three *mash tuns* were fed by two copper-built, belt-driven Steel's *mashing machines*. One, manufactured by Lewellyn and James of Bristol, fed both *mash tuns* nos. 1 and 2, while the second, by Robert Morton, was dedicated to *mash tun* no. 3. Both Steel's *mashers* were fed via large, rivetted, cast-iron *grist cases*, also by Robert Morton, which in turn were fed via a system of chutes from the mill, which was located in an adjacent building. *Mash tun* no. 3 remained in use until 2004, when a new brewery was built at the site. While its interior was overhauled in the mid-to-late-20th century, it

maintains several unique features (plate 5.12). The Steel's *mashing machine* has been adapted for electrical power and remains fitted to a three-phase electric motor. Its original controls, two pillars topped with cog wheels which controlled the flow of both *hot liquor* and grist, are preserved alongside their replacements, installed in *c*. 1970 (I. Hamilton, per. comm.). Another unique surviving feature is a timber-stage which provided access to the tun for cleaning.



Plate 5.11. Mash tuns nos. 1 and 2, the St. Mary's Brewery, Waterford. Both mash tuns were fed by a single Steel's mashing machine, suspended from the ceiling between. Note the counterbalance chain and pulley system for lifting the copper lids.

At Beamish and Crawford, one *mash tun*, no. 5, survives *in situ* and almost complete (Hamond 2010, 61; plate 5.13). It is located within the first floor of the brewhouse and is constructed of cast iron (Hamond 2010, 20). It was initially insulated with an asbestos-fibre plaster and lined with wood, which has since been removed. It is fitted with a cap constructed of wood and metal on a cast-iron frame. A copper-built Steel's *mashing machine* is supported on an RSJ frame to one side and fed by a large, riveted-steel *grist case*. It was belt-driven and was almost certainly originally powered by steam, though in its last phase of use it was powered via an extant 3-phase electric motor by Scott of Belfast. Internally the *mash tun* retains a vertical shaft that is likely all that remains of an internal *mash rake* and *sparging* mechanism. The base plates for the *mash tun's* false bottom have not survived. However, a full set of base plates survives elsewhere in the brewery. They were originally from *mash tun* no. 4, which had been decommissioned and scrapped in the early 1970s (*ibid*., 50-1). These were inserted into the floor of the brewery's Counting House during the early 1990s as a decorative feature.



Plate 5.12. Mash tun no. 3, the St. Mary's Brewery, Waterford. The original controls for the Steel's mashing machine can be viewed in the mid-foreground. Their c. 1970 replacements, in aluminium, are located adjacent, to the right.



Plate 5.13. Mash tun, grist case and Steel's mashing machine, Beamish and Crawford, Cork. (courtesy Diarmuid Ó Drisceoil).

Rynne (1999, 52) dated the largely intact *mash tun* to 1896, while the *ex situ* base plates have long been dated to 1880. Both pieces of plant were previously thought to have been manufactured by Robert Morton. However, Hamond (2010, 18-9, 51), citing the Improvement Books in the Beamish and Crawford Archives, noted that George Adlam of Bristol had manufactured five new *mash tuns* for the brewery, all installed 1917-19. It would appear likely that the surviving *mash tun* and base plates were installed at that time. The Steel's *mashing machine* was ignored by Hamond when it came to dating, and it may be that this pre-dates the mash tun itself. It is, potentially, one of the original Steel's mashing machines that had been installed by the brewery before Barnard's visit in the late-1880s.

5.3 Boiling

Following *mashing* the *wort* is transferred to a holding vessel, commonly known as an *underback*, before being transferred to the *copper*, or brewing kettle. In the *copper* it is boiled with hops for an extended period, typically more than one hour (Briggs *et al.* 2004, 326-8). It is during the boil that the acids in the hops are extracted in a process known as *isomerization* (Brynildson 2011a). These acids lend a bitter flavour to the final beer and also act as a preservative. In the first half of the 19th century, brewing *coppers* served two purposes, heating the *hot liquor* for *mashing* and boiling the *sweet wort* with hops to produce *hopped wort*. By the 1860s, the two purposes had been separated, with dedicated *coppers* for *hot liquor* and *wort* boiling becoming common in British breweries during the decade (Pearson 1999, 41-2). Apart from the separation of *hot liquor* and *wort coppers*, the boiling process saw little in the way of processual improvement during the studied period. This was despite major technological improvements in areas such as product flow and heat application. Even in the late-19th and early 20th centuries, when the chemical properties of hops, in particular the actions that

lead to the *isomerisation* of the hop acids, became to be understood, they reinforced previous techniques. It had long been understood that a vigorous boil, which extracted the maximum amount of the acids that both flavoured the beer and acted as a preservative, was a requirement.

The *copper* itself is a large, deep cylindrical vessel. Until the 20th century, *coppers* were typically made of copper, as the name suggests, though stainless steel is now the primary material used in their construction (Pearson 2014, 135-9). Before the early 19th century *coppers* tended to be open vessels. The adoption of closed *coppers*, usually with conical or domed caps, however, was not universal and open *coppers* remained in use in both Burton-on-Trent and Edinburgh into the 20th century. Open *coppers* allowed the evaporation of the *wort*, creating a more-concentrated *wort* and, hence, a lesser quantity of a stronger beer following fermentation. In the mid-1880s, open *coppers* were said to be favoured by ale breweries, with the primary difficulty being the requirement for constant supervision, ensuring that the *wort* did not boil over (Southby 1885, 93-4). Caps, when present, are typically vented, with vertical, cylindrical discharge pipes allowing volatile oils to be evaporated. Closed *coppers* were also fitted with access or inspection hatches which allowed for the addition of hops.



Plate 5.14. Brewing coppers with conical caps at Beamish and Crawford, Cork, in the early 20th century (courtesy Diarmuid Ó Drisceoil).

Before the 1860s all brewing *coppers* were directly fired, usually by coal. Directly fired coppers tend to have convex bases which were located directly above the furnace, enabling the transfer of heat vertically within the copper itself. Housings, typically constructed of brick, acted as supports for the coppers themselves while also containing their coal fired furnace. The development of coal-fired furnaces, and their later automation, has not been covered by the British brewery histories. However,

later advances in the heating systems receive a more comprehensive treatment. Steam heating was explored in the 1860s with the London-based engineering firm Pontifex and Wood being an early proponent (Pearson 2014, 135-7). The earliest form of steam heating involved a coil of copper tubing, often referred to as a worm. This coil was mounted within the vessel and through it steam was passed, heating the wort within. These systems were common in British breweries of the 1870s. Later, more efficient systems used sets of vertical tubes, known as *calandria*, which may have been mounted internally or externally (Hampson 2011). As the *wort* was boiled it was forced through these tubes, via convection in the internal arrangement, or via a pump in the external, where it was rapidly heated by steam. Direct gas firing was first explored in the mid-1880s and was said to be common in British breweries within a decade (Pearson 2014, 173).

Very little is known about the early development of brewing *coppers* in Irish breweries. As with the technology used in the other brewing process, sources from the second half of the 19th century provide more information. As seen on a measured survey of the brewery dating to it its foundation in 1856, Murphy's Lady's Well Brewery in Cork was utilising a combination of dedicated *coppers* for wort boiling and 'boiling backs' for heating *hot liquor* for *mashing* (Ó Drisceoil & Ó Drisceoil 1997, 31). This relatively early use of dedicated *wort coppers* may well stem from the founding family's engagement in the distilling trade. They had founded the Midleton Distillery, which continues to operate today as Irish Distillers, in 1825 (*ibid*., 4-5; Bielenberg 1991, 64-5). The St. Francis's Abbey Brewery in Kilkenny had also separated *hot liquor* and *wort* boiling by the mid-1860s (Measom 1866a, 35). By the late-1880s, the use of dedicated plant for both processes was common in the larger Irish breweries. Five of the breweries visited by Barnard (1889-91 vol. 1, 76; vol. 2, 391, 401-2; vol. 4, 324-5, 328) were utilising dedicated plant for *hot liquor* heating and *wort boiling*; each of the Phoenix Brewery, the Mountjoy Brewery and the North Anne Street Brewery in Dublin, and both the St. Finnbarr's Brewery and the Southgate Brewery in Cork. However, the practice was not ubiquitous. Several of the breweries visited by Barnard (1889-91 vol. 2, 358, 367, 378) continued to use multi-purpose *coppers*, including Watkin's Brewery and the Anchor Brewery in Dublin and Beamish and Crawford in Cork. Indeed, at Guinness a *copper* was installed for *each mash tun* that was installed in the brewery's new brewhouse between 1878 and 1917, with the *coppers* being used for both the heating of *hot liquor* for the *mash tun* and the boiling of *wort* (Stevens 1959, 24).

Unlike many other pieces of brewing plant, the manufacturers of brewing *coppers* were rarely named by the authors of brewery visits. The manufactures of the *coppers* at just two breweries are named by Barnard (1889-91 vol. 2, 358, 391); the Mountjoy Brewery had installed four *coppers* by Miller of Dublin, while Beamish and Crawford are known to have installed two *coppers* by each of Lewellyn and James of Bristol and Murphy of Dublin. Little information is provided on the *coppers* at

the remaining breweries described, though the St. Finnbarr's Brewery in Cork are known to have installed three *coppers* of Irish manufacture before 1873 (Johns 1873, 7). The fact that both breweries where the manufacturers are named had installed Irish-manufactured plant raises the possibility that Irish-built *coppers* were reasonably common. It may be that Barnard's tendency to not state the manufacturers stems from either his, or his primarily British audience's, unfamiliarity with Irish manufacturing firms, though without further detail this remains a tentative suggestion.

Domed *coppers* were said to have been preferred by porter breweries in Britain during the mid-1880s, at which point the use of conical caps was implied to be a reasonably recent innovation (Southby 1885, 94-5). Of the ten breweries that were visited by Barnard, all but three were specifically stated to have used dome-capped *coppers* (Barnard 1889-91 vol.). No reference was made to caps of the *coppers* at the remaining three, the Mountjoy Brewery in Dublin and both the Lady's Well Brewery and the Southgate Brewery in Cork (Barnard 1889-91 vol. 1 557, vol. 2, 391-2; vol. 4, 324-5). However, it can be assumed that the *coppers* at each were capped, with the use of open *coppers* being something that Barnard was likely to comment upon. The earliest identified reference to the use of *coppers* with conical caps in an Irish brewery was made in 1894, when they were in use at Deasy's Brewery in Clonakilty.[6] Guinness continued to install domed *coppers* in their Brewery no. 2 during its regular expansion until 1917 (Stevens 1959, 24). An early 20th-century photograph of the *copper* stage at Beamish and Crawford shows that the brewery had transitioned from the use of domed caps to conical caps, with two conical capped *coppers* surviving at the brewery, outlined below (plates 5.14 & 5.16).

While the large breweries visited by Barnard appear to have had a preference for capped *coppers*, primarily capped with domed caps, open *coppers* remained in use in Irish breweries, though relatively few sources for their use have been identified. In the mid-1860s, the St. Francis's Abbey Brewery in Kilkenny were using open *coppers* for wort boiling (Measom 1866a). The brewery's two *hot liquor coppers* were then capped. A photograph of the Mill Park Brewery, Enniscorthy, taken in 1957 when brewing ceased at the site, shows that at least one open *copper*, used in conjunction with a closed *copper* with a domed cap, remained in use in an Irish brewery into the mid-20th century (plate 5.15).

[6] *Southern Star* 27/01/1894, 5.

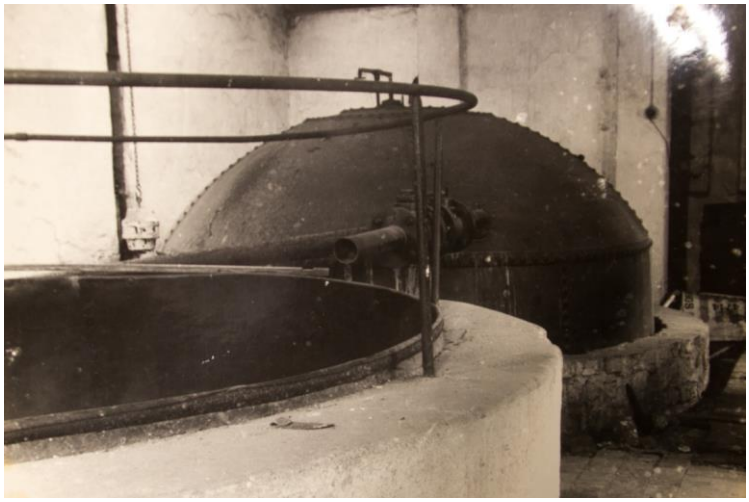


Plate 5.15. Two brewing coppers at the Mill Park Brewery, Enniscorthy in 1957. Note that the copper in the foreground was not lidded, while the one in the background is capped with a domed lid (courtesy D. Lett).

Irish breweries were reasonably swift to adopt improved heating systems for brewing *coppers* after 1860. Guinness installed their first Juckes patent furnace in 1860 (Stevens 1959, 5). The Juckes furnace was a steam-powered, automated, chain-grate furnace that comprised a steam-boiler that drove sets of pistons (Francis 1864, 41-3). These pistons in turn drove an automated conveyor that conveyed coal from a hopper directly to the furnace. The first Juckes furnace was installed in the brewery's original brewhouse, while each of the *coppers* installed at Brewery no. 2 between 1878 and 1917 were fired by similar furnaces. The Newgate/City Brewery in Limerick city was said to utilise steam for heating its coppers in the mid-1860s, a reasonably early use of the technology (Measom 1866a, 122). Not one of the breweries visited by Barnard in the late-1880s had entirely transitioned from direct coal-firing to steam-heating. However, several were using condensed steam to aid the heating of *hot liquor* for both *mashing* and *sparging*, a system that was in use at both the Phoenix Brewery and Watkins' Brewery (Barnard 1889-91 vol. 1, 75-6; vol. 2, 367). The St. Finnbarr's Brewery in Cork were utilising a steam-heated boiling back, perhaps a wooden tun containing coiled pipes through which steam passed, for heating *hot liquor* before 1873 (Johns 1873, 7).

While steam was being used by several Irish breweries to heat *hot liquor* for *mashing* and *sparging*, it would appear that the movement towards the use of steam for boiling *wort* was a 20th-century phenomenon in Ireland. Of course, the Newgate/City Brewery in Limerick were said to utilise steam for heating their *coppers* in the mid-1860s, though the later evidence suggests that this was likely used in conjunction with direct coal firing. Experiments on steam heating for *wort* boiling had been instigated at Guinness in 1875, though they were considered a failure (Stevens 1959, 5). The

transition towards steam-heating for boiling did not resume at the brewery until the 1930s, with the conversion of the brewery's first *copper* to steam-heating being made in 1933 (*ibid*., 24). The full conversion of all *coppers* at the brewery was not completed until 1957. Hamond's (2010, 7) unpublished research on the technology at Beamish and Crawford shows that the brewery's *coppers* were completely converted to steam heating before Guinness, likely between 1912 and 1915. Elements of the steam-heating systems are maintained within both of the brewery's surviving *coppers*, outlined below. This remains the earliest evidence for the complete conversion to steam heating for *wort* boiling in an Irish brewery, a practice which, as we have previously seen, was relatively common in British breweries by the 1870s.

Brewing *coppers* have survived at two Irish breweries, two at each of Guinness in Dublin and Beamish and Crawford in Cork. The two examples at Beamish and Crawford have survived *in situ*. At Guinness, both *coppers* survive *ex situ*, one within the brewery's visitor centre, the Guinness Storehouse, and one, which has been dismantled, within the brewery's second brewhouse, Brewery no. 2. The second *copper* at Guinness, which has not been viewed, is only a partial survivor. A company tradition, now discontinued, previously saw members of staff provided with a copper plaque cut from it upon their retirement (E. Colgan pers. comm.). Neither the manufacturer, nor the date, of the surviving *coppers* at Guinness are known. Both had been originally installed at Brewery no. 2 at some point between 1878 and 1917. All coppers installed at the brewery were constructed to an identical design. The surviving example in the Guinness Storehouse is a vast vessel, said to have a capacity of 600 barrels (over 98,000l), constructed of riveted copper sheeting (plate 5.17). Originally, only its domed cap, which retains both inlet and outlet pipes, would have been visible above floor-level. The vertical sides, as it is presented today, would have protruded below the floor of the brewhouse, sitting within a brick-built setting that would have contained the automated Juckes furnace. It would appear likely, though it has not been confirmed, that physical evidence of the Juckes furnaces are retained in the basement of Brewery no. 2, which has not been surveyed.

Each of the two surviving *coppers* at Beamish and Crawford, which were surveyed by Hamond (2010, 22, 27), were manufactured by Lewellyn and James of Bristol (plate 5.16). Both *coppers* are of a similar design, with *copper* 1 being slightly larger than *copper* 2. Each is capped with a conical cap and encased in a circular brick housing. The *coppers* themselves are cylindrical, being constructed of riveted copper sheets. Both *coppers* retain elements of their steam-heating systems. Each of their bases are circled by steam pipes and manual turn-wheel valves mounted in front of the coppers likely controlled steam input. *Copper* no. 1 also retains a set of 16 internal calandria. They are both supported by individual, brick-built, rectangular settings which form a mezzanine level in the brewhouse. While visually similar to those depicted in a late-19th century etching of the brewhouse,

neither of the brick settings shows signs of the coal-fired furnaces illustrated in the etching (1889–91 Vol. 2, 357; figure 6.2). Hamond (2010, 22, 27) suggested that the settings were rebuilt when the full switch to steam heating was completed in 1912-15. Hamond (2010, 22, 27, 61) was not able to satisfactorily date either of the surviving *coppers*, though each was installed after Barnard's visit to the brewery in the late-1880s. Each appears likely to have been installed in the early 20th century, perhaps at the time of the conversion to steam heating, though it remains possible that pre-existing *coppers* were adapted for the purpose.

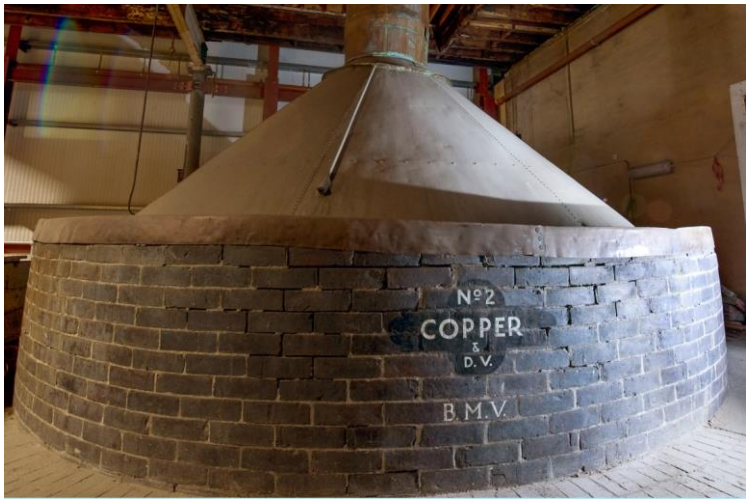


Plate 5.16. Brewing copper with conical cap at Beamish and Crawford, Cork. (courtesy Diarmuid Ó Drisceoil)

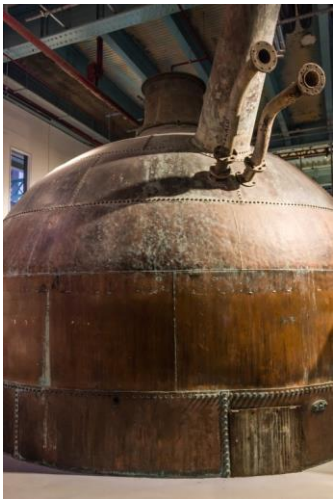


Plate 5.17. Dome-capped brewing copper, Guinness Storehouse, Dublin.



Plate 5.18. Brick setting for brewing copper, Watkins' Brewery, Dublin.

In addition to the surviving brewing *coppers*, physical evidence of the heating systems used for boiling wort has been identified at a further five sites. Perhaps the most impressive of these is the brick-built setting for a brewing copper, complete with segmental-furnace arch, that is the final surviving element of the brewhouse at Watkins' Brewery, Dublin (plate 5.18). Its survival suggests that the *coppers* used at the brewery remained directly coal-fired until its closure in *c*. 1939. The setting is due to be demolished in planned construction works at the site, though its recording by an industrial archaeologist is a condition of planning. While the *coppers* at the St. Mary's Brewery in Waterford in 1899-1901 have not survived, two mid-to-late-20th century dome-capped examples are maintained at the site, standing on what appear likely to be the original settings. Similar to the surviving settings at Beamish and Crawford, they elevated the *coppers* above the floor level of the brewhouse, allowing the transfer of *hot liquor* to the *mash tuns* by gravity. While the *coppers* do not survive, a sign, stating that one was a *wort copper*, does survive suggesting that the brewery had separate *coppers* for heating *liquor* and boiling *wort*.



Plate 5.19. Barrel-vaulted furnace arch, the Belfast and Ulster Brewery, Belfast.

Evidence for the fire-proofing of the furnaces that directly fired the brewing *coppers* is evident at two breweries dating to the 1860s. The ground floor of the Belfast and Ulster Brewery in Belfast, erected in 1864-7, features a large, barrel-vaulted space, separated by fire doors, in which the coal-fired furnace for heating the *coppers* was located (plate 5.19). The segmental arch of the furnace remains, infilled with blockwork. The brewhouse at the Mill Park Brewery in Enniscorthy, which was entirely rebuilt in the mid-1860s, utilised a similar system for fire-proofing. There, the ground floor of the brewhouse comprised several similar, brick-built barrel vaults, all supported on riveted, cast-iron

beams. The majority of these were removed in *c*. 2000 renovations, though one is retained and the scars of others are visible in the interior of the the brewhouse's north wall (plate 5.20). A historic photograph of one of these vaults, taken in 1957, shows that they contained the furnace arches for the brewing coppers (private collection, G H Lett & Co.).



Plate 5.20. Remains of barrel-vaulted furnace arches, the Mill Park Brewery, Enniscorthy.



Plate 5.21. Fragmentary remains of former barrel-vaulted spaces, the Southgate Brewery, Cork. These barrel vaults are potentially the remains of early fire-proofed furnaces for brewing coppers.

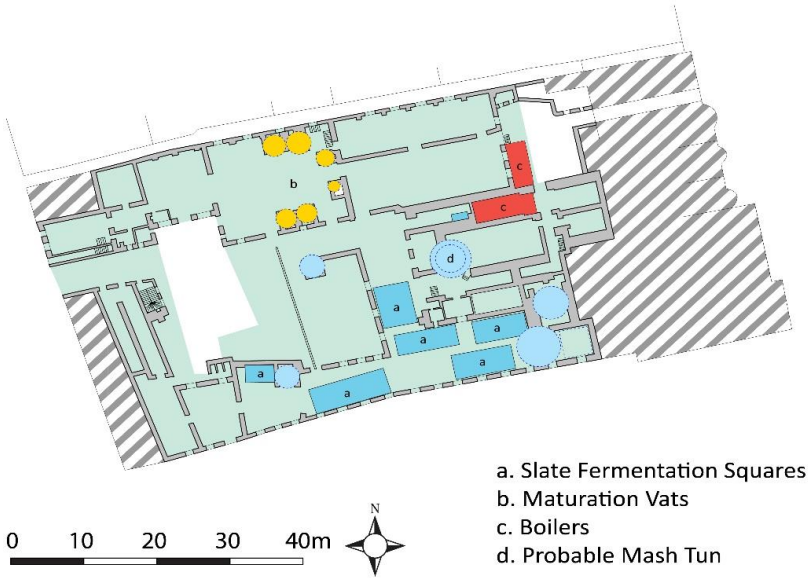


Figure 5.2. Survey of Lane's Southgate Brewery, Cork, dated 1880. The barrel-vaulted spaces, shown in plate 21, project eastwards from the middle of the eastern wall of the brewery. Source: CCCA/U18/MPD/350. Approx. scale

The evidence from Beamish and Crawford suggests that the use of barrel-vaulted spaces located below brewing *coppers* for fire proofing may have been a feature of breweries from at least the first decade of the 19th century. Located directly below the large, rectangular settings of the surviving *coppers* are six brick-built, barrel-vaulted passages that were depicted on each of the brewery surveys from 1802 (O'Callaghan & Castle 2010, 12-13). As seen on the 1839 survey, the most southerly vault contained the boiler for the brewery's second steam engine, installed in 1827 (Ó Drisceoil & Ó Drisceoil 2015, 61). While they have not been confirmed as furnace vaults, their location, directly below the brewing *coppers* as depicted in each of the surveys of the uppers floor the brewhouse from *c*. 1818, would appear to suggest their use as such. The remains of another potential pair of furnace arches for brewing coppers survive at the site of a further Cork city brewery, the Southgate Brewery, located immediately east of Beamish and Crawford. There, the fragmentary remains of two masonry barrel vaults survive at a brewery that appears to have changed little in layout between the mid-19th century and its closure in 1901 (plate 5.21). They are identified as being vaults on the only measured survey of the brewery, dated 1880, and they were then located adjacent, to the east, of the boilers that served the brewery's two steam engines, showing that they did not contain the furnaces for the steam engine boilers themselves (figure 5.2). They are depicted immediately to the east of a potential *mash tun* and it would appear likely that the brewery's *coppers*, which were

not depicted, overlaid them. Unfortunately, they can also not be confirmed as early fire proofing in an Irish brewery. However, both they and the Beamish and Crawford examples raise the possibility that, when both breweries were reconstructed in the late-18th and early 19th centuries, the fire proofing of copper furnaces was an established practice in Cork city.

5.4 The significance of the surviving plant

Historic brewing plant is quite common in Britain, where many pieces, primarily dating to the second half of the 19th century, remain in use today (Pearson 2010, 56-7). Several malt mills, all dating to the late-19th and early 20th centuries, have survived, often with their screening systems and hoppers intact. One working survivor, at St. Austell, Cornwall, has been recorded. Several late-19th century *mash tuns* remain in operation at the All Saints Brewery in Stamford, St. Austell in Cornwall and Wainfleet in Lincolnshire among others, while many more disused examples survive (Pearson 2014, 134). *Coppers* again are common survivors, with many from the 19th century remaining in operation, including a pair of open, direct coal-fired *coppers* at the Caledonian Brewery, Edinburgh (ibid., 135-9). The oldest *copper* currently recorded is one of 1779, at Brakspear's Brewery, Henley-on-Thames. Until recently an early 18th century open *copper* had survived at the Cliff Quay Brewery, Ipswich. Unfortunately, all of the site's historic brewing plant was stolen in 2012 when the site late vacant awaiting development.

In comparison, surviving brewing plant in Ireland is a scarce resource with *in situ* plant confined to just two sites, Beamish and Crawford in Cork and the St. Mary's Brewery in Waterford. Indeed, reasonable fears can be raised as to the preservation of the plant at Beamish and Crawford, with, at the time of writing, the site lying vacant since brewing ceased in 2008. The malt milling loft, which contained the earliest and most complete roller mills recorded in any context in Ireland, received major damage in hurricane-force storms in October 2017 and the fate of the plant contained within is unclear. As seen with the theft of the early plant at the Cliff Quay Brewery, Ipswich, the preservation of industrial technology within vacant sites is not a satisfactory practice. Both cases raise questions about the pre-conditions of planning permission and their impacts on the preservation of scarce heritage resources. This is further underlined when we consider that the majority of the surviving plant at Beamish and Crawford was deemed as being of national significance by Hamond (2010, 61-3) in a survey carried out on behalf of the developers as part of the pre-planning process. Given its scarcity, each piece of *in situ* brewing plant in Ireland should be deemed as being of national significance. Each piece of *ex situ* plant should be deemed as being either of national significance, in the case of prime brewing plant, or regional significance, such as the *ex situ* millstones, stillions and grain weigher at the Mill Park Brewery in Enniscorthy.

5.5 Conclusions

Relatively little can be gleaned from the available sources about the engagement of Irish breweries with the processual and technological development of core brewing processes in the first half of the 19th century. Both Beamish and Crawford and Guinness can be said to have engaged with new technologies developed in London in the early decades of the century. Guinness's early use of malt rollers, which was well-established at the brewery before 1809, is the earliest evidence for this engagement, while the brewery also engaged with further developments contemporarily with the large-scale English breweries, such as the adoption of the *sparging* process in 1840. Similarly, Beamish and Crawford are known to have installed roller milling technology before 1818, while the evidence from both breweries suggests a reasonably early engagement with technologies developed in London, such as automated *mash rakes*. However, there appears to have been a not inconsiderable lag in the adoption of these new technologies in the early period. While the dates of installation of improved mash tuns at either brewery remains unconfirmed the suggestion is that it post-dated the development of the technologies in London by a period of at least two decades and probably more.

This lag in technological transmission diminished as the 19th century progressed and the evidence suggests that Irish breweries rapidly adopted the named and patented technologies that were developed in Britain from the 1850s on. However, the evidence is again heavily weighted towards the large-scale breweries located in the major centres of population, though one regional brewery, Deasy's in Clonakilty, county Cork, was certainly engaging with improved technologies developed in Britain by at least the early 1890s. This should not be viewed as evidence for the engagement with new technologies by each of Ireland's small-scale, local and regional breweries before the close of the 19th century. This point is underlined by the case of Pim's Brewery in Mountmellick, county Laois, which continued to dry *mash* by hand until its closure in 1885. Similarly, the Mill Park Brewery in Enniscorthy continued to use brewing plant that would have been viewed as antiquated in Britain by the 1880s, such as mill stones and uncovered *mash tuns*, into the mid-20th century. While the evidence of the continuation of pre-industrial brewing has not been preserved elsewhere, it would appear likely that further breweries operating in late-19th and early 20th century Ireland, particularly the small-scale regional and local breweries, continued to produce at a pre-industrial or proto-industrial level of technology.

For the large-scale breweries where the evidence for technological advancement is rich, the improved plant installed was primarily sourced from Britain and, by and large, was manufactured either by the firms associated with its original development or the specialist brewery engineers. However, several breweries have been shown to have sourced plant from Dublin-based manufacturers, including the coppersmiths Miller and Murphy and Spence's iron works. It is, perhaps,

unsurprising that the Dublin city breweries, and indeed distilleries, given both their dense concentration and large scale, were able to support a previously undocumented range of specialist manufacturers and, in the case of Byrne, who had designed plant for the Phoenix Brewery, an independent brewery engineer. In this regard, Dublin had developed along the same path as several regional British brewing centres, like Burton-upon-Trent, Bristol and Edinburgh, all of whom sustained specialist brewery engineering firms (Pearson 2014, 118-27).

It is only in the final decades of the 19th century that brewing plant sourced from outside of the then United Kingdom, principally roller mills, was installed in Irish breweries. Guinness installed their first roller mill by Ganz of Budapest in 1886, while Beamish and Crawford were sourcing their roller mills from Germany in the first decade of the 20th century. It is tempting to consider that Guinness's choice of a Hungarian manufacturer may have been influenced by the UK miller's association's visits to Hungary in the 1870s, where they inspected improved milling technologies (Rynne 2006, 266). However, the choice of continentally manufactured mills at both breweries was probably due to the choice of power transmission; each of those installed was driven by electric motors. As seen with Guinness's first use of electric lighting, when the construction of Brewery No. 2 in 1877-9 was illuminated by lights powered by dynamos manufactured by Siemens, and in the 1920s in the construction of the Ardnacrusha hydro-electric plant, the early development of electrical power in Ireland was heavily influenced by continental engineering (Rynne 2006, 247, 431-4; Chapter 7).

Chapter 6 Brewing, process and technology (ii)- cooling, fermentation and maturation

This is the second chapter to discuss the processual and technological development of the Irish brewing industry. Picking up where the previous chapter ended, the changes seen in each of the component sub-processes of brewing that follow the core brewing processes themselves are discussed. In turn, each of the cooling and refrigeration, fermentation and maturation sub-processes are discussed in isolation. As with the previous chapter, the primary aim is to infer the levels engagement that Irish breweries had with the contemporary developments in the British brewing industry.

In addition to the primary aim, this chapter also aims to elucidate on the impacts that the maturation sub-process, a key element in porter brewing, had on the finished product. Porter, in particular during the 18th and early 19th centuries, was a matured product that catered for the tastes of the time, one that, as the 19th century progressed, was typically blended with increasing amounts of *mild*, or young beer. Insight into this important factor will be derived from both contemporary and recent sources. The maturation capacities of both Beamish and Crawford and Guinness will be compared and contrasted in an effort to infer the approximate percentage of matured beer that was blended in the finished product at key points in time. The aim is the infer whether Guinness's approach to the maturation of beer was a deciding factor in the brewery's increasing dominance of the Irish market as the 19th century progressed.

6.1 Cooling and refrigeration

Following the boiling process, the *hopped wort* must be rapidly cooled to ensure that is not contaminated by wild yeasts and bacteria, which encourage spoiling (Briggs *et al.* 2004, 356–8). Following boiling, the contents of the *copper* are transferred to a holding vessel, commonly known as the *hop back*. The *hopped wort* is then drained from the *hop back*, which retains the boiled hops, before undergoing the cooling process. While rapid cooling safeguards against contamination and potential spoilage, it also helps to separate the *wort* from the *trub*, a mixture of hop particles, proteins, tannins and lipids that cause haze and instability in the finished beer.

Traditionally, cooling was carried out in large, shallow, open vessels that were typically stored in the loft of the brewhouse where air circulation was encouraged by the installation of louvered windows, ventilation lanterns and steam-powered fans (Pearson 2014, 140-2). Open coolers could be constructed of any material; wood and iron were common though copper, a material with good heat

transfer properties, was preferred. The requirement of cooling, and its effects on the longevity of the product, had long been understood. As early as the 15th century shallow coolers are said to have been common features in commercial breweries in England (Pearson 2014, 15). Given their ubiquity in British breweries, it can probably be assumed that Irish breweries, both large and small, utilised large, shallow coolers throughout the period under consideration. Indeed, the 1759 lease for Guinness lists several old coolers within the inventory of equipment (Stevens 1959, 1). In Cork city, the surveys of the River Lee Porter Brewery, constructed in 1796-7 and closed in 1813, depict coolers within the loft of the brewhouse (figure 6.1). When Morewood, in 1838, described the contents of a typical small, hand-worked brewery, one capable of producing about 1,500 barrels a year, a cooler was included in the contents, showing their ubiquity in small, proto-industrial breweries of the period (Morewood 1838, 623-4).

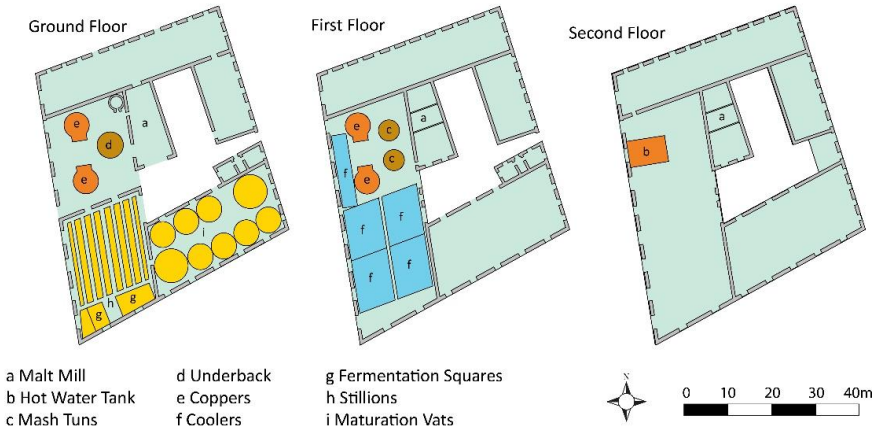


Figure 6.1. Undated surveys of all three floors of the River Lee Porter Brewery, Cork, including all brewing plant. Source: CCCA/U18/MPD/6, 7, 10 & 13. Approx. scale.

The early 19th century saw the introduction of refrigerators, which operated in conjunction with open coolers. They enabled a quicker, more efficient cooling of the *wort* that was no longer as dependant on prevailing weather conditions (Mathias 1959, 75-6; Hornsey 2003, 452-7). These refrigerators operated on the principal of heat exchange and generally consisting of a series of metal tubes through which cold water passed as the warm *wort* flowed over, though systems that operated on the opposite principal were also developed. Little is known about these early refrigerators; the terminology used by the industry in the first half of the 19th century is often ambiguous and the archival sources regularly confuse them with the *attemperators* used in fermentation, to which they bore close resemblance (Mathias 1959, 75-6). Their adoption appears to have been somewhat piecemeal, though by the 1830s their use was generally assumed in larger breweries (Mathias 1959,

75-6; Lynch & Vaizey 1960, 155; Donnachie 1979, 110). Guinness provides us with the only evidence for the use of early refrigerators in Ireland. In 1822, a 'Gregory's Cooling Apparatus' was installed in the brewery, likely an early refrigerator (Stevens 1959, 12). In 1836 two refrigerators, said to be old, were in use at the brewery and by 1838 a third refrigerator had been installed (Morewood 1838, 629-30).

Several patents specifically targeted at the brewing industry were taken out on refrigerating systems in the 1850s and 1860s (Pearson 2014, 140). Each of these systems operated in a similar, though more refined manner to the earlier systems, with thin copper sheeting overlaying the copper tubes, assisting with the transfer of heat (Pattyn & Downing 2011). Three different systems were developed, two of which saw the *wort* pass over the copper sheeting, with cooling water passing through the pipes contained within (Gourvish & Wilson 1994, 54-5). The third operated on the opposite principal, with *wort* passing through the pipes, cooled by water that flowed without. The systems that saw *wort* pass over the cooling pipes varied in their arrangement. The first to be developed was arranged horizontally, an arrangement which was space consuming and was said to be difficult to clean. The second, which was arranged vertically, was developed from at least the early 1860s. It reduced the floor space required for cooling and was said to be easier to clean. The final type, where wort flowed within the refrigerator itself, while efficient, was said to be more difficult to maintain than even the horizontal type (Southby 1885, 104-7).

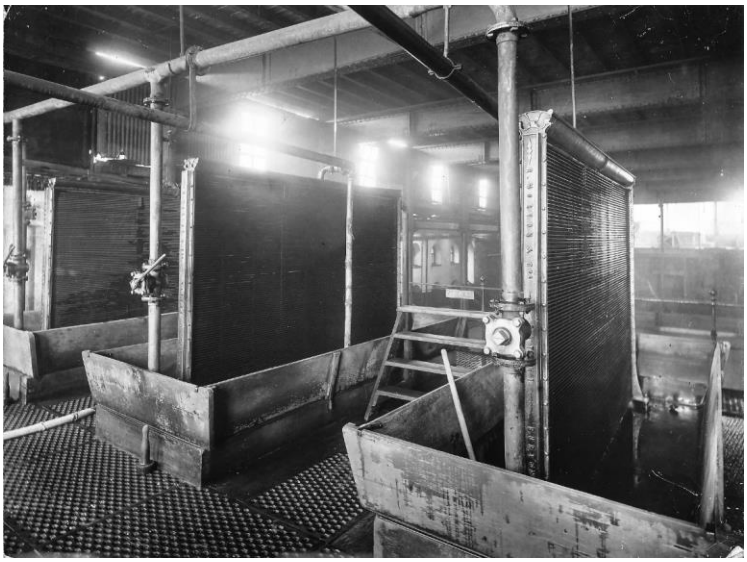


Plate 6.1. Morton's vertical refrigerators at Beamish and Crawford, late-19th century (courtesy Diarmuid Ó Drisceoil).

The most famous manufacturer of brewery refrigerators was Morton and Wilson of Stockton-on-Tees, Durham (Pearson 2014, 140). One of the firm's founders, Robert Morton, relocated to Burton-upon-Trent in 1876, founding Robert Morton & Co., one of the most influential British brewery engineering firms. Morton and Wilson had originally patented the horizontal refrigerator. Robert Morton would later manufacture vertical refrigerators, though their development is generally linked with Lawrence, an English engineer, or Baudelot, a French engineer (Southby 1885, 104-7). The refrigerators where wort flowed within were primarily linked with the manufacturing firms Ashby and Riley, both English. Historic photographs of vertical and horizontal refrigerators, installed at Beamish and Crawford and Guinness respectively, can be seen in plates 6.1 and 6.2.



Plate 6.2. Horizontal refrigerators at Guinness, Dublin. Late-19th or early 20th century (anon. 1939).

As with the external mashing machine, Irish breweries were quick to adopt improved refrigerating technologies. Each of the breweries that were visited and described in the second half of the 19th century had installed refrigerators, primarily sourced from the large, British brewery engineering firms. In 1860, Guinness installed two vertical refrigerators by Wingfield & Co. (Stevens 1959, 12). Between 1869 and 1878, the brewery installed further vertical refrigerators, manufactured by Ashby, Lawrence and Morton and Wilson. The brewery was clearly experimenting with different forms of refrigerating technology. Those by Morton and Wilson were likely to have been horizontal, the Lawrence refrigerators were certainly vertical, while the Ashby refrigerators appear likely to have operated on the principal of wort passing within the pipes, rather than over. These were all replaced by horizontal refrigerators in 1894. The brewery's choice of horizontal refrigerators went against the

perceived norm of the period; vertical refrigerators were said to be preferred by most breweries in the mid-1880s (Southby 1885, 104-7).

Beyond Guinness, each of the St. Francis's Abbey Brewery in Kilkenny city, the Southgate Brewery in Cork city and the Newgate/City Brewery in Limerick city are known to have installed refrigerators before the mid-1860s (Measom 1866a, 35-6, 122, 328). Those installed at both the St. Francis's Abbey Brewery and the Southgate Brewery were by Morton and Wilson and were almost certainly of the horizontal type. Morton and Wilson, and later Robert Morton, remained the most popular manufacturer of refrigerators installed in Irish breweries, though Barnard did not always state whether they were of the horizontal or vertical kind. The St. Finnbarr's Brewery in Cork had installed two before 1873, while each of the Mountjoy Brewery, the Anchor Brewery and the Phoenix Brewery in Dublin city and both Beamish and Crawford and the Lady's Well Brewery in Cork city, had installed refrigerators by either Morton and Wilson or Robert Morton before the late-1880s (Barnard 1889-91 vol. 1, 74, 547-8; vol. 2, 358-9, 379, 392). A historic photograph of the refrigerators at Beamish and Crawford, manufactured by Robert Morton after the firm's movement to Burton-upon-Trent, shows that those installed in the brewery were arranged vertically (plate 6.1). Three of the breweries described by Barnard were utilising refrigerators by other manufacturers. In two of the cases, Guinness, who installed refrigerators by several manufacturers, and Watkins's Brewery in Dublin, who utilised refrigerators by Lawrence, they were used in conjunction with Morton and Wilson's refrigerators (Barnard 1889-91 vol. 2, 367). Only the North Anne Street Brewery in Dublin was not using Morton and Wilson's refrigerators. There, five refrigerators manufactured by Miller were in use, one of which was horizontal and four of which were vertical (Barnard 1889-91 vol. 2, 402).

In the majority of cases the technology was entirely imported and primarily manufactured by the British firms that were associated with the refrigerator's original development. The source of origin of just two of the named manufacturing firms remains unclear, Wingfield and Miller. Neither firm is referred to in the British brewery histories. The refrigerators produced by Miller were probably manufactured in Dublin. They had been installed in just one of the breweries visited by Barnard, the North Anne Street Brewery, which was located in close proximity to the Dublin-based coppersmith Daniel Miller, whose copper works were located on Bow Street (Slater 1870). We have previously seen how Miller had constructed the *coppers* at the Mountjoy Brewery and it would appear likely, given Miller's location adjacent to Smithfield within close proximity to several breweries and distilleries, that much of the coppersmith's work was in producing plant for both the brewing and distilling industries.

Before the adoption of mechanical refrigeration, ice, sourced either locally or from Scandinavian waters, was commonly used to chill the cooling water (Lynch & Vaizey 1960, 155-6). From the early 1860s mechanical refrigerators, contemporarily referred to as ice machines, were

rapidly adopted by British breweries. Generally speaking, they operated under the principal of liquefiable vapour compression, with a refrigerant gas that, when alternatively compressed and expanded, changed state between liquid and gas, alternatively creating both a refrigerating and heating effect (Reif-Acherman 2012). The first of those adopted used ethyl-ether as a refrigerant, a system originally patented by James Harrison in 1856 and later improved by his business partner Daniel Siebe of Siebe and West, London. Ethyl-ether was not the only refrigerant used, systems utilising both carbon-dioxide and ammonia became available in the 1860s and 1870s respectively. Mechanical refrigeration was not without its drawbacks, the machines required dedicated steam engines to operate and the refrigerant used was typically both a volatile and poisonous gas.

Mechanical refrigeration was also rapidly adopted by Irish breweries, though its adoption was not as widespread as the named and patented refrigerators that had preceded it. Guinness installed their first mechanical refrigerator, an ethyl-ether machine by Siebe and West, in 1870 (Stevens 1959, 42). By the time of Barnard's (1889-91 vol. 3, 36) visit to the brewery in the late-1880s, six mechanical refrigerators were in use at the brewery, though just three were described. Two were by Siebe and West, one operated by a vertical steam engine of 110hp and the second by a horizontal engine of 120hp. The third refrigerator described was by Siddeley and Mackay of Liverpool and it was powered by a horizontal condensing engine of 50hp. Already, the brewery had begun to transition from ethyl-ether to ammonia as a refrigerant. This was probably owing to difficulties that the brewery had experienced with ethyl-ether refrigerators. In 1888 one of those installed at the brewery exploded and by 1910 each of the brewery's ethyl-ether refrigerators had been phased out, having been replaced by refrigerators that used either carbon dioxide or ammonia as a refrigerant (Stevens 1959, 42).

Of the other nine breweries visited by Barnard, only three, Watkins' Brewery, Beamish and Crawford and the Lady's Well Brewery, had installed mechanical refrigerators (Barnard 1889-91 vol. 1, 549; vol. 2, 358, 367-9). Those installed at Watkins' Brewery had been manufactured by Siddeley and Mackay, those at the Lady's Well Brewery by Pontifex and Wood of London, and those at Beamish and Crawford by Siebe and West. All were said to operate on the ethyl-ether principal. In addition, a Siebe and West ice machine was listed in the contents of Caffrey's Brewery in Dublin when it was offered for sale in 1885, showing that their use was not limited solely to Ireland's large-scale breweries.[1]

[1] *Belfast Newsletter* 04/07/1885, 1.

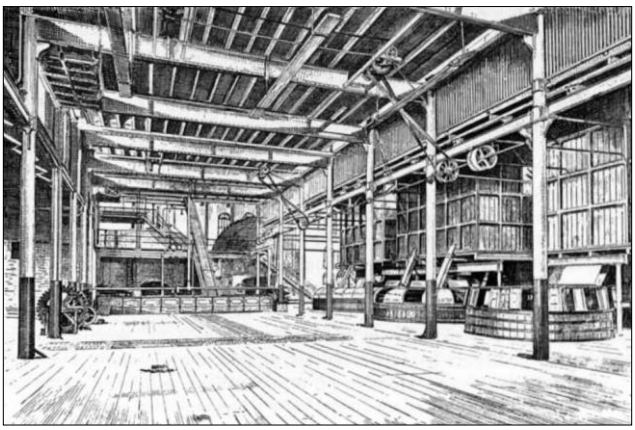


Figure 6.2. The brewhouse at Beamish and Crawford in the late-1880s. The cast-iron superstructure depicted supported the large, shallow coolers located in the loft above. This superstructure survives within the brewhouse today (Barnard 1889-91 vol. 2, 357).

Very little of the cooling plant used in Irish breweries has survived. While no open shallow coolers have survived, the loft of the brewhouse at Beamish and Crawford maintains the cast-iron support structure for its shallow coolers, installed in *c*. 1870 (Rynne 2006, 2006, 248; O'Callaghan & Castle 2010, 12; figure 6.2). The roof of the northern section of the brewhouse also features a ventilation lantern, which runs the full length of the roof's ridge. It was positioned directly above the coolers, providing ventilation. The roof, comprising timber-built queen-post trusses, is the only timber-built roof maintained at the brewery, suggesting that it is the brewery's oldest surviving roof structure, perhaps pre-dating the large-scale renovations of the brewery after 1863 (O'Callaghan & Castle 2010). There is no evidence for the use of shallow coolers at the St. Mary's Brewery in Waterford, the best preserved brewhouse in Ireland. The brewery was entirely overhauled in 1899-1901 and it may well be that the use of refrigerators had made the use of shallow coolers redundant by the time of the brewery's renewal.

The Guinness Storehouse maintains the only brewery refrigerator recorded by the survey. Rather than a traditional refrigerator, it is a 20th century horizontal plate heat exchanger, an improved version of the horizontal refrigerators installed in the brewery after 1894 (plate 6.3). It was manufactured by the Aluminium Plant and Vessel Co. (APV) of London and likely dates to *c*. 1920-30. No mechanical refrigerators have been identified as surviving in an Irish brewery context.

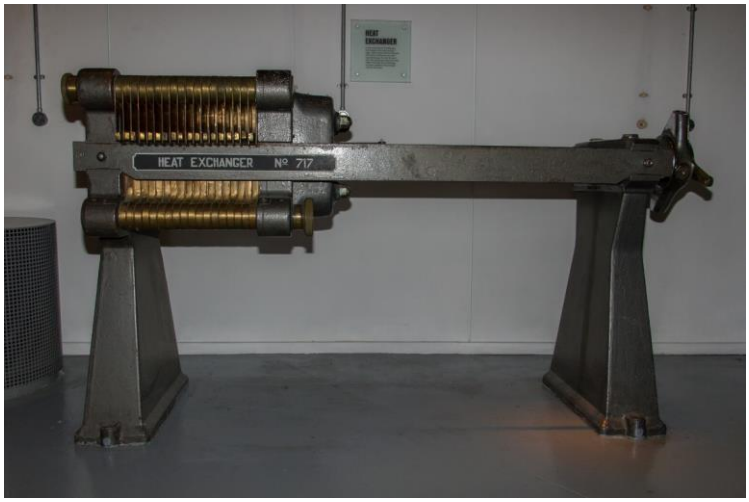


Plate 6.3. Horizontal plate heat exchanger by APV. Guinness Storehouse, Dublin.

6.2 Fermentation

Following cooling, the *wort* it is transferred to a fermentation vessel where it is inoculated, or pitched, with yeast and allowed to ferment (Briggs *et al.* 2004, 510-1). Fermentation is a biochemical process where yeast cells, typically of the *Saccharomyces* genus, consume the sugars suspended in the *wort*, expelling both ethanol and carbon dioxide. Fermentation is also a process that is entirely dependent on temperature. Too low a fermentation temperature can lead to a slow or stalled fermentation, where insufficient sugars are converted to alcohol, while too high a temperature can lead to over-fermentation. This can result in a dryer beer than desired or infections with wild yeast and bacteria which can potentially cause spoilage.

The fermentation systems applied by modern breweries vary, depending on the varieties of yeast used. Different varieties of yeasts behave in varying manners, *flocculating* or clumping, at different points in the fermentation vessel and activating at various fermentation temperatures (Briggs *et al.* 2004, 509-10). Lager yeasts, *Saccharomyces pastorianus,* sometimes erroneously *Saccharomyces carlsbergensis*, are often referred to as bottom-fermenting yeasts as they typically flocculate at the base of the fermentation vessel. They also ferment at lower temperatures than ale yeasts, *Saccharomyces cerevisiae*, which tend to flocculate at the top of the fermentation vessel. Lager yeasts were geographically confined to Bavaria until the 1840s and, throughout the 19th century ale yeasts were used almost exclusively in British and Irish brewing (*ibid.*).

In most modern breweries, fermentation is a closely regulated process that takes place within hermetically sealed fermentation vessels that are held at a pre-defined, optimum temperature,

allowing the level of fermentation to be closely controlled (Briggs *et al*. 2004, 514). This enables brewers to control the level of sweetness or dryness in the finished product while also mitigating against infection by wild yeasts. The use of closed fermentation systems did not become widespread until the 20th century. Prior to this, fermentation was carried out in a variety of vessels of varying form and function, almost always open to the air (Pearson 2014, 142-6). These were typically cylindrical, coopered vessels, essentially large casks or vats known as *rounds*; or quadrilateral vessels, often constructed of wood or stone, known as *squares*.



Plate 6.4. Attemperated fermenting square, the St. Mary's Brewery, Waterford.

While the nature of fermentation was poorly understood for much of the studied period, knowledge of the importance of temperature control was well established (Mathias 1959, 19). Following the widespread application of the thermometer to brewing in the second half of the 18th century, several inventions were applied to the fermentation process with the aim of controlling fermentation temperature. The best recorded of these was the *attemperator*, first attributed to the inventor John Long (Mathias 1959, 73-6; Hornsey 2003, 451-3). *Attemperators* consist of coiled copper pipes held within fermentation vessels through which water at a fixed temperature is passed, cooling the fermenting beer in warm weather and *vice versa*. Contemporary brewers publicly proclaimed Long's inventions as impractical and, as patented, they do not appear to have been widely adopted. However, similar systems became widespread from about 1800 on (Mathias 1959, 73–6; Nuvolari & Sumner 2013, 113–4). It has been said that it was the move to *attemperated* fermentation that enabled the growth of pale ale breweries from the 1830s, increasing the length of their brewing season (Mathias 1959, 19).

Generally speaking, fermentation in the studied period was a two-stage process (Donnachie 1979, 110-1). The first stage, often referred to as *working*, was generally carried out in large vessels where the yeast was pitched and the initial, more-vigorous stages of fermentation took place. Typically, this stage lasted several days and throughout yeast would have been skimmed from the top of the fermenting *wort*. The second phase, known as *cleansing*, aimed to separate the fermenting beer from the remainder of the yeast, ensuring the clarity of the final product. For much of the 19th century, *cleansing* involved a large amount of manual labour. Where *squares* were utilised, the yeast was skimmed from the top manually, though automated skimming systems were developed. The *rounds* system was less labour intensive. Casks or *rounds*, filled to the brim with fermenting *wort*, were placed on top of wooden troughs, often referred to as *stillions*, and, as fermentation continued, *wort* and yeast were ejected from the casks and collected in the *stillions* below. This yeast-rich mixture was then pressed to separate the residual yeast, which was stored for future use or sale to other food processing industries, such as bakeries and distilleries.



Plate 6.6. Portion of cleansing stillion, reduced in length and upside-down, the Millpark Brewery, Enniscorthy.



Plate 6.5. Cleansing stillion at the Millpark Brewery, Enniscorthy in 1957 (courtesy D. Lett).

Improvements to both cleansing systems were made as the 19th century progressed, the most famous of which are the Yorkshire Square and Burton Union systems (Buttrick 2011b; Brynildson 2011b). Each of these systems utilised physical forces, a combination of the vigorous actions of yeast and gravity, to automate the cleansing process. Their application further reduced the amount of manual labour required in brewing, though it is worth noting that the Burton Union system was said to be particularly difficult to clean and required a large floor space (Pearson 2014, 146). The Burton Union system was an advancement on the cask and *stillion* system of cleansing. It comprises sets, or pairs, of casks, suspended horizontally above floor level with a pair of *stillions* between, one above and one between the casks. The casks are linked by pipes, which ensure that each is filled to the same quantity. Protruding from the top of each cask is a swan-neck discharge pipe, from which the yeast-rich fermenting *wort* is expelled into the upper *stillion*. The *wort* is then drained from the upper *stillion*,

which retains the yeast, into the lower, from which it is redistributed into the casks of fermenting *wort*. The Yorkshire Square system, as the name suggests, saw cleansing carried out in *squares*, originally constructed of slate. These *squares* have two floors, with an aperture in the upper floor through which yeast-rich fermenting *wort* is expelled. The yeast is retained in the upper floor, from where it is skimmed, while the separated *wort* is drained via a pipe which returns it to the lower floor.

The undated surveys of the River Lee Porter Brewery show that the two-stage fermentation system was in use at the brewery (figure 6.1). The initial stages of fermentation were carried out in irregularly shaped, quadrilateral *squares*, with *cleansing* carried out in casks standing on *stillions*, which are depicted and captioned on the surveys. Both Guinness and Beamish and Crawford utilised similar systems in the early 19th century. Large vats, located adjacent to the brewhouse, are depicted on each of the 19th century surveys of Beamish and Crawford. They were almost certainly fermentation vats, used in the early stages of fermentation. The 1839 survey of Beamish and Crawford depicts the cask and *stillion* cleansing system in use in three cleansing cellars on the ground floor of the brewery. While it remains the earliest direct evidence for the use of casks and *stillions* for cleansing at the brewery it is worth noting that the initial partnership agreement between Beamish and Crawford and their partners, the brewers O'Brien and Barrett, involved the transfer of twelve 'throughs' [*sic*] from O'Brien and Barrett's previous brewery (Ó Drisceoil & Ó Drisceoil 2015, 38). These appear likely to have been *stillions*. Given the use of the system at the contemporary River Lee Porter Brewery, it would appear likely that this system was also in use at Beamish and Crawford in the 1790s.

Similarly, the 1820 survey of Guinness depicts two vat houses located directly south of the prime brewing plant, with *cleansing* rooms located directly to the east. These vat houses contained 22 vats of various sizes, one of which was depicted as a much-larger vessel than the remaining 21. These appear likely to have been fermentation rather than maturation vats given their spatial proximity to both the prime brewing plant and the cleansing rooms. Guinness are known to have used *hogsheads* (casks of 54-gallon capacity) placed on stillions for cleansing until 1834 (Stevens 1959, 15). In that year, they began the transition to larger *rounds*, of six-barrel (216 gallon) capacity. By 1838, 100 of these larger *rounds* were in use at the brewery, though the use of *hogsheads* continued (Morewood 1838, 630). It is unclear when the total conversion to the larger *rounds* was completed, though it is known that the new, larger rounds placed on *stillions* remained the primary cleansing method at the brewery until 1865 and that the practice continued at the brewery until 1886 (Stevens 1959, 15).

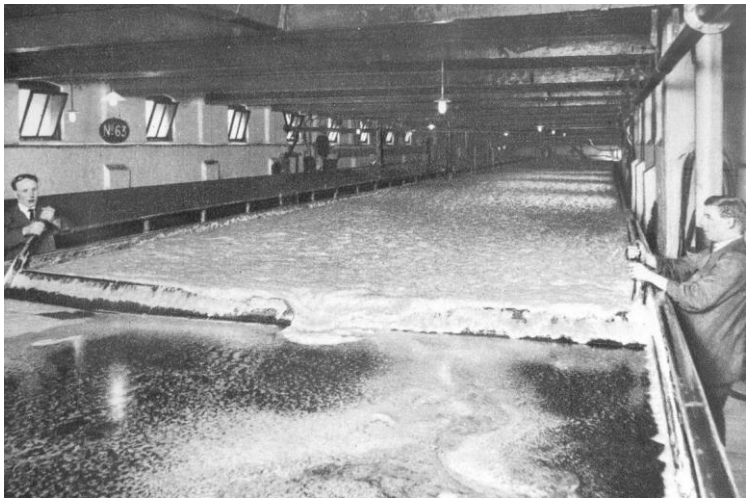


Plate 6.7. Manual yeast skimming at the Guinness Storehouse in the early 20th century (anon. 1939).

As with British breweries, most famously in the case of both the Yorkshire Square and Burton Union systems, improvements were made to the fermentation systems in several Irish breweries in the second half of the 19th century. While the two-phase system of fermentation continued, technological improvements in the *cleansing* process were made. Guinness began their transition from *rounds* on *stillions* towards *cleansing* in *squares* fitted with skimmers before 1865 (Stevens 1959, 15; plate 6.7). The transition was gradual, though by 1886 all *cleansing rounds* had been replaced by *squares*. Originally, these *squares* had been fitted with automated skimmers that removed the yeast from the top of the fermenting *wort*. It is unclear why the automated skimmers were abandoned in 1878 when manual skimming was introduced. *Attemperators* were first added to two of the *squares* in 1875, with the remainder being fitted in 1877. Guinness were not the only brewery to have utilised *attemperated squares* with skimmers for *cleansing* in the late-19th century. Indeed, their use was ubiquitous in the Dublin breweries that were visited by Barnard (1889-91 vol. 1, 74; vol. 2, 368, 379, 392-3, 402). However, both the Phoenix Brewery and Watkins' Brewery continued to utilise *rounds* on *stillions* in conjunction with *attemperated squares*, while both Watkins' Brewery and the North Anne Street Brewery had installed sets of Burton Unions, almost certainly used for the fermentation of ale.

Of the Cork city breweries, only the St. Finnbarr's Brewery appears to have engaged with improved *cleansing* systems by the late-1880s. *Hogsheads* and *stillions* had been in use at the brewery until the mid-1860s when an automated, *attemperated cleansing* system, said to have been invented by the head brewer, was installed (Johns 1873, 8). This system, which comprised large *rounds* fitted with automated skimmers, remained in use at the time of Barnard's (1889-91 vol. 4, 329) visit to the

brewery. Beamish and Crawford continued to utilise *rounds* on *stillions* for *cleansing* in the late-1880s, while the Lady's Well Brewery was utilising a combination of *squares* and *rounds*, with no reference made to either the use of *attemperators* or skimmers at either site (Barnard 1889-91 vol. 1, 548; vol. 2, 359-61). *Cleansing* at the Southgate Brewery was via large slate *squares* at the times of Barnard's (1889-91 vol. 4, 325) visit. These had been in use at the brewery since at least the mid-1860s (Measom 1866a, 328).

The two-phase system of fermentation continued into the 20th century. When Guinness erected their new, purpose-built fermentation block, now the Guinness Storehouse, in 1902-4, it was fitted with 16 fermentation vats, each of 1,400-barrel capacity and constructed of New Zealand kauri pine (Stevens 1959, 28). Cleansing continued to be carried out in *squares* fitted with skimmers; 45 of these were installed within the fermentation block, each measuring 12ft in width and 58ft in length (3.66 x 17.68m).

Elements of fermentation systems have survived at three Irish breweries, the St. Mary's Brewery in Waterford, Guinness in Dublin and the Mill Park Brewery in Enniscorthy. Only a fragment of the fermentation system at the Mill Park Brewery has survived, though it is a unique survivor in an Irish brewery context. A small section of a former cleansing *stillion* has survived within the brewery's artefactual assemblage (plate 6.5). The *stillion*, which has been reduced in length, was photographed in its entirety when brewing ceased at the site in 1957 (plate 6.6). Its survival shows that the cask and *stillion* method of cleansing remained in use in small-scale, regional Irish breweries at a late date, something that is not attested to in the documentary sources.

At Guinness, a *cleansing square* with a manual yeast skimmer survives within the brewery's visitor centre, the Guinness Storehouse (plate 6.8). It is maintained within the building in which it was originally installed though is displayed *ex situ*. The *cleansing square* has been dramatically reduced in size; when it was installed it originally measured 58ft (17.68m) in length, though it has now been reduced to just a fraction of its original length. It bears close resemblance to the *squares* used in the Yorkshire Square *cleansing* system. It is constructed of bolted-iron segments and features the double floor of the Yorkshire Square fermenters. The upper floor features a rectangular copper-lined aperture, through which the yeast-rich fermenting wort was expelled. The manual skimmer itself is of timber, framed in cast-iron, with cast-iron and timber handles.

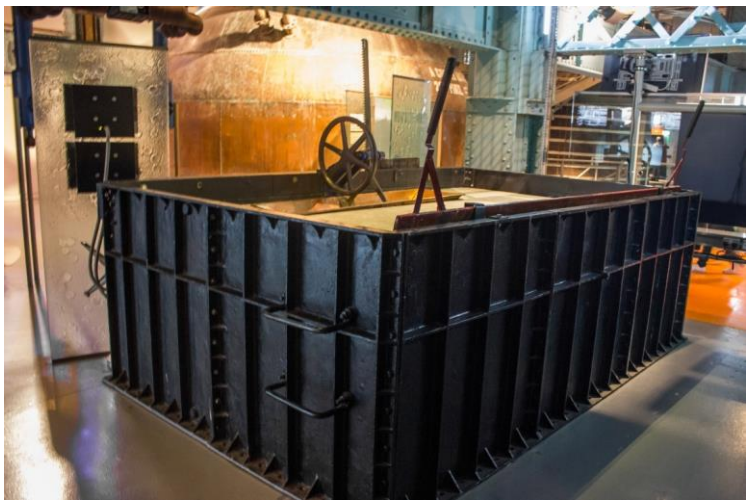


Plate 6.8. Cleansing square with manual yeast skimmer, Guinness Storehouse, Dublin. The cleansing square has been dramatically reduced in length, it was originally constructed to the same dimensions as the square in Plate 6.7.

The similarities between the fermentation *squares* used at Guinness and the Yorkshire Squares system raises the possibility that the similar systems used by the other Dublin city breweries in the 1880s were of a similar construction. However, it may be that the *squares* installed in the newly built fermentation block were of an improved design, inspired by the Yorkshire Square system, rather than a continuation of the *cleansing* systems that were widespread in Dublin breweries during the 1880s. Regardless of whether the surviving *cleansing square* in the Guinness Storehouse was of a new design or not, it does suggest that the development of the *cleansing* systems in the Dublin city breweries was heavily influenced by British practices. This is also evident in the use of the Burton Union system at both Watkins' Brewery and the North Anne Street Brewery.

The St. Mary's Brewery in Waterford maintains the most intact, and the only *in situ*, fermentation plant in an Irish brewery context. It survives with the brewery's purpose-built fermentation block, erected when the brewery was overhauled in 1899-1901. The fermentation plant is distributed across both the first and second floors of the three-storey fermentation block (plates 6.4, 6.9 & 6.10). The plant on both floors comprises timber-lined, copper-built *squares* replete with *attemperators*. As seen on the labelling of the surviving *squares*, at least 23 had been installed during the brewery's renovation. Several of the original *squares* at second-floor level have been replaced by larger *squares* of a similar design, though constructed of stainless steel, in mid-to-late 20th century renovations. The original *squares* on the second floor are deeper than those on the first. While those on the first floor stand directly on floor level, those on the second floor penetrate the floor and are supported by a cast-iron frame that comprises the ceiling of the first-floor space. It appears likely that

the larger *squares* at second-floor level were used in the initial, more-vigorous phases of fermentation. The partially fermented beer was then transferred to the shallower *squares* at first-floor level via pipework, which has partially survived. It would appear likely that the lower *squares* acted as settling tanks, the predominant *cleansing* method used in modern breweries.



Plate 6.9. Upper floor of the fermenting block, the St. Mary's Brewery, Waterford. The two fermenting squares in the left foreground are original, dating to the brewery's renewal in 1899-1901. The remainder are mid-to-late-20th century replacements.

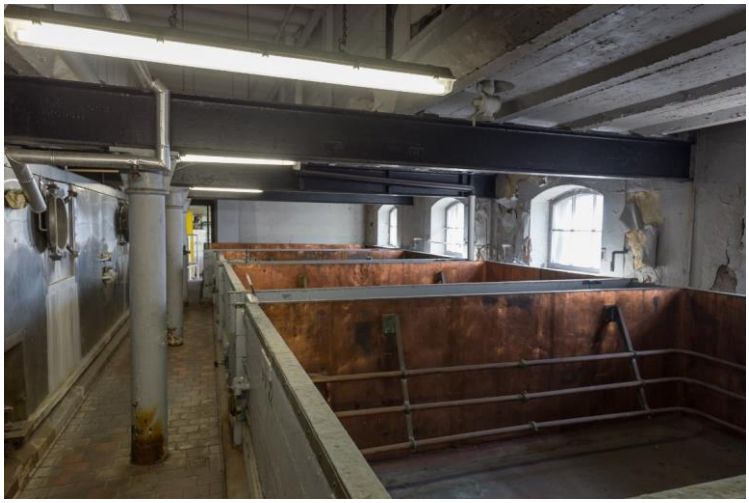


Plate 6.10. Lower floor of the fermenting block at the St. Mary's Brewery, Waterford. Note the cast-iron columns and beams that support the deeper fermenters that penetrate the ceiling from the upper level, visible in the top right.

6.3 Maturation

Following fermentation most beer is allowed to mature or condition for a period. Maturation encourages a secondary fermentation which allows the residual yeast to consume the last remaining fermentable sugars in the product (Briggs *et al.* 2004, 543–4). This is said to improve the finished flavour of the beer, mellowing the bitterness of the hops and encouraging the generation of lactic acids, while also ensuring its stability, allowing it to be stored for extended periods. Originally, maturation would have been carried out in the cask that the beer was ultimately sold in. It was the move towards bulk maturation in the early 18th century by the London porter breweries that ultimately led to the industrialisation of brewing. The move towards bulk maturation catered for the tastes of the time while also allowing the sale of product year-round.

Initially, the London porter breweries matured their porter in casks, but, from the 1730s on, large coopered vats of ever-increasing capacity became common (Mathias 1959, 58–9; Hornsey 2003, 449–50; Pearson 2014, 142). While these large vats were to become synonymous with porter brewing it is worth noting that their use was not universal. Some large porter breweries, significantly Whitbread's, chose to utilise large subterranean cisterns instead. The scale of the maturation vats reached a truly massive scale before the close of the 18th century; the largest recorded, which had a capacity of 20,000 barrels, was installed in Meux's Brewery in London in 1795. However, the trend for truly massive maturation vats was turned following a serious, fatal accident at the Horse Shoe Brewery in London in 1809 (Mathias 1959, 61–2). There, a vast porter vat failed resulting in the partial destruction of the brewery buildings and a major loss of product, as well as the deaths of eight people.

Unlike the large London porter breweries, large maturation vats were not adopted widely by ale breweries. While some ale was sold *mild*, or unmatured, *stale*, or matured ale, was also a common product. Typically, ale was matured within the cask in which it was sold, meaning that ale breweries did not require the major financial outlay in maturation facilities that was a requirement of a porter brewery in the late-18th and early 19th centuries. Ale, in casks, tended to be matured in cellars and did not require dedicated maturation facilities (Southby 1885, 143-6). As such, the remainder of the section will be dedicated to the process of maturation in porter breweries.

Changes in product formulation, principally the shift from the production of porter with only brown malt towards the use of a combination of heavily kilned black malt with pale malt, saw the required maturation time for porter decrease in the early 19th century (Mathias 1959, 62, 419-20). However, the London porter breweries continued to keep large stocks of matured porter, both for sale as a premium product and for blending with young beer to improve its flavour profile. The vatting capacities of the London porter breweries was said to have been majorly reduced by the 1840s, by which time ale had superseded porter as the most-consumed beer in England. By the late-19th century,

several of the London porter breweries had abandoned the large maturation vats that had enabled their early growth. For instance, all that remained of Whitbread's maturation vats at the time of Barnard's (1889-91 vol. 2, 209) visit was their granite supporting columns, while the iconic subterranean cisterns that had originally been used for the bulk maturation of porter were then used for maturing ale in casks. However, not all of the London porter breweries had moved away from bulk maturation. For example, Truman continued to dedicate a large amount of space within the brewery to bulk maturation in vats (Barnard 1889-91, vol. 3, 199-200). Barclay Perkins also continued the practice of bulk maturation, though they had transitioned from the use of truly massive vats, of over 20,000 barrels, to those with a reduced capacity of 1-3,500 barrels (*ibid*., 245-8).

Both Beamish and Crawford and the River Lee Porter Brewery in Cork city had dedicated a large amount of space at their respective breweries to maturation in the 1790s. The southern wing of the quadrilateral River Lee Porter Brewery was dedicated to maturation, while roughly one-fifth of the floor space of Beamish and Crawford was dedicated to maturation as depicted on the original 1792 lease map of the brewery (Ó Drisceoil & Ó Drisceoil 2015, 41; figure 6.3). Quite surprisingly, given the brewery's considerable expansion in output between 1792 and 1814, Beamish and Crawford do not appear to have significantly expanded their maturation capacity. The buildings identified as vat rooms on the 1792 lease map continued to house the brewery's maturation vats on each of the 19th century surveys of the brewery and, indeed, on the *Goad Fire Insurance Maps*, produced between 1897 and 1938.[2]

A different situation is evident at Guinness, who massively expanded their vatting capacity as the 19th century progressed. The brewery's beers were primarily blended from at least the early 19th century, with the ratio of the blend of young and matured beer being chosen based on the intended market of the finished product (Lynch & Vaizey 1960, 122-3, 128). The brewery's continued use of large-scale bulk maturation also enabled them to reinforce the economies of scale that they saw as a large-scale producer. They tended to purchase large quantities of high-quality barley at reasonable prices in years of good harvest (*ibid*. 127-8). The excess of this high-quality barley, when malted, was converted into Keeping Beer, a product that was intended for long-term maturation and was a key component in their blended porters and stouts.

[2] The *Goad Fire Insurance Maps* of Cork city are available at www.corkpastandpresent.ie (accessed 18/03/2016).

Year	No. of Vats	Total Vatting Capacity (barrels)	Annual Output (barrels)	% Vatting Capacity of Annual Output
1820	36	30,000	27,374	109.59
1865	63	75,000	331,176	22.65
1870	93	133,000	423,080	31.44
1876	138	194,000	778,597	24.92
1881	147	208,000	923,317	22.53
1890	154	232,000	1,369,383	16.94
1905	180	321,000	2,061,950	15.57
1913	229	423,000	2,828,243	14.96
1923	187	321,000	2,331,075	13.77
1933	138	230,000	1,775,225	12.96
1938	93	130,000	1,945,029	6.68

Table 6.1. Vatting capacity vs annual output at Guinness, 1820-1938. Sources: Stevens 1959, table v; Lynch & Vaizey 1960, 260; Hughes 2006, 276-9.

As recorded by Stevens (1959, table v), Guinness's vatting capacity increased from 36 vats with a total capacity of 30,000 barrels in 1820 to 63 vats with a total capacity 75,000 barrels in 1865. It had more than doubled between 1865 and 1876, when 138 vats with a capacity of 194,000 barrels were in use, and had reached its zenith by 1913, when 229 vats had a total capacity of 423,000 barrels. In table 6.1, the total vatting capacity of the brewery is compared with the brewery's output. 1820 is an anomalous year with the data suggesting that the brewery's vatting capacity exceeded its annual output. It would appear likely that for that year Stevens recorded the capacities of both the brewery's fermentation and maturation vats. The later figures show that Guinness's vatting capacity remained above 20% of annual output between 1865 and 1881. As the brewery's output expanded above 1,000,000 barrels in the 1880s, the percentage of the vatting capacity gradually declined, though it remained above 10% until the mid-1930s. Quite simply, where the London porter breweries gradually moved away from the long-term maturation of porter, Guinness continued to produce in the traditional manner.

In comparison, Beamish and Crawford maintained a much lower percentage of vatting capacity compared to annual output. The 1863 survey of the brewery's ground floor indicates the capacity of the individual vats within the brewery's vat room, which varied in capacity from between 130 and 700 barrels. In total, the brewery then had a vatting capacity of 6,390 barrels and in the same year its output equalled 77,825 barrels (Ó Drisceoil & Ó Drisceoil 2015, appendix B). This gave the brewery a vatting capacity of 8.2% of total output. This shows that Guinness maintained a much greater vatting capacity in comparison to annual output than Beamish and Crawford. In turn, this shows that the blend of Guinness's finished product contained a much-greater proportion of matured beer. This is, perhaps, the reason for the disparity in flavour recorded in the beers of the two breweries in the 1880s. Beamish and Crawford's porter was then said to suffer from 'an unevenness of condition

and flavour' and was said to lack 'the smack of Guinness' (Bielenberg 1991, 58-9). The supposed 'unevenness of condition and flavour' may well stem from the fact that porter was sold primarily un-matured by the brewery, while the 'smack' of Guinness appears likely to have been a lactic flavour, encouraged by extended maturation.

While Guinness maintained a large vatting capacity well into the 20th century, the scale of the vats installed at the brewery never approached the scale seen in London in the late-18th and early 19th centuries. Guinness's earliest vats generally varied in capacity between 300 and 350 barrels, though in the later-19th century the brewery was installing vats of 2,500-barrel capacity (Stevens 1959, 34; plate 6.12). Of the other Dublin city breweries visited by Barnard, each also maintained a large vatting capacity, with large vats also being common. For example, in the numerous vat houses at the Anchor Brewery, Barnard (1889-91 vol. 2, 380) recorded that the vats were of between 1,400 and 1,900 barrels in capacity, while several of the maturation vats at Watkins' Brewery, which were also distributed across several vat houses, had capacities of over 1,000 barrels (*ibid*., 368).

The situation in Cork city was entirely different. We have already seen how Beamish and Crawford had a preference for smaller maturation vats and the evidence suggests that this was a widespread practice in the city's breweries, at least in the 1880s. However, while the vats were comparatively smaller than those in use in several breweries in Dublin city, their scale was still large, as seen on both a historic photograph, probably dating to the late-19th century, and an undated measured survey of the vats at Beamish and Crawford (plate 6.11; figure 6.3). The maturation vats at the Southgate Brewery were said to have had an average capacity of 200 barrels at the time of Barnard's visit, while just six maturation vats were then in use at the St. Finnbarr's Brewery, each with a capacity of between 200 and 300 barrels (Barnard 1889-91 vol. 4, 325, 329). Very little is known of the vatting capacities of the breweries that were not visited by Barnard. However, even the St. Francis's Abbey Brewery in Kilkenny city, which has long been associated with ale production, had a preference for larger vats than those installed at the Cork city breweries. In the mid-1860s five maturation vats, each of 1,000-barrel capacity and dedicated to the maturation of porter, were in use at the brewery, which matured its ale in casks (Measom 1866a, 34).

The maturation vats used in the Irish porter breweries appear to have been entirely imported, likely due to the preference for vats made of straight-grained English oak staves (Stevens 1959, 34). In the 1860s Guinness were sourcing their vats from Oxley and Co. of Frome, Somerset, while the North Anne Street Brewery had sourced theirs from Carty of London (Barnard 1889-91 vol. 2, 402-3; Pearson 2014, 142).

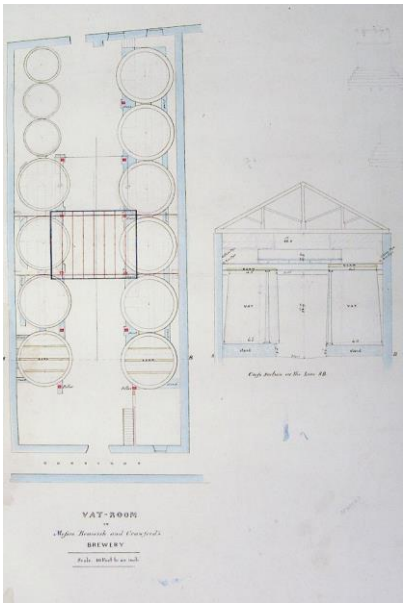


Figure 6.3. Undated measured survey of the vat room, late-19th or early 20th century Beamish and Crawford Cork (courtesy Diarmuid Ó Drisceoil).



Plate 6.11. Late-19th century photograph of the vat room, Beamish and Crawford, Cork (courtesy Diarmuid Ó Drisceoil).

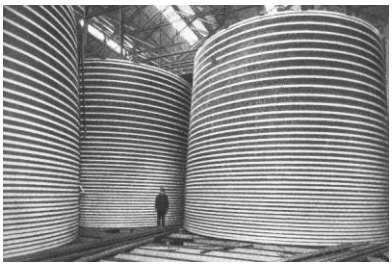


Plate 6.12. Late-19th or early 20th century photograph of a vat room, Guinness, Dublin (anon. 1939).

One maturation vat is on display *ex situ* at the Guinness Storehouse, Dublin. Dated to *c*. 1880 and constructed of English oak, it is one of several that survive across the wider brewery complex, though it is the only one that was viewed in the course of the survey (plate 6.14).[3] Of the brewery's extensive historic building stock, vat houses, constructed to house maturation vats, are the most common surviving building type, with examples dating to the period 1870-1924 surviving on Crane Street, Rainsford Street and Belview (plate 6.13). These vat houses, the full extent of which will be outlined in Chapter 8, are the amongst the few surviving brewery vat houses recorded in the course of the survey and they remain the primary physical remains of the large-scale, bulk maturation of porter in Ireland. This was a practice that had developed in 18th century London, was adopted by Irish breweries before 1800 and continued on a large scale in Dublin into the late-1930s, long after its popularity had waned in London.

[3] The NIAH (50080148) recorded that maturation vats survive *in situ* in the easternmost of the two late-18th and early 19th century vat houses that comprise the sole surviving remains of Brewery No. 1.



Plate 6.14.Maturation Vat, dated to c. 1880. Guinness Storehouse, Dublin.



Plate 6.13. Vat house no. 4, Guinness, Dublin city. Constructed between 1862 and 1865. Located on the west side of Crane Street, southwest of junction with Rainsford Street.

6.4 Conclusions

Many of the conclusions that were drawn in the previous chapter about the development of the core brewing processes and the adoption of related technologies can again be stated for the processes covered in this chapter. Early evidence for the use of improved cooling technologies is solely limited to Guinness, with the adoption of improved cooling plant confirmed at the brewery during the 1820s. In terms of fermentation plant, the two-phase system of fermentation in large *rounds* or *squares* and *cleansing* in casks on *stillions* is confirmed in Irish breweries at an early date. Similarly, the use of large maturation vats in porter brewing is confirmed in the closing decades of the 18th century. This is clear evidence of the well-documented contacts between Ireland's more-substantial breweries and the London porter brewing industry in the late-18th century. The late-19th century also confirms close contacts between the British and Irish brewing industries, which is evidenced by the adoption of the Burton Union cleansing system by several breweries in Dublin city before the late-1880s.

As with improved technologies related to core brewing processes, Irish breweries were quick to adopt the improved cooling technologies that were developed in the second half of the 19th century. Each of the brewery's that were contemporarily described had adopted improved refrigerators, with the evidence suggesting that their adoption had begun before the mid-1860s, while mechanical refrigeration was also adopted at an early date by a subset of Ireland's most substantial breweries. As with the technologies related to the core brewing processes, outlined in the previous chapter, the plant installed was primarily imported, having been typically sourced from Britain's premier brewery engineering firms. However, the installation of refrigerators by Miller, probably the Dublin-based

coppersmith, at the North Anne Street Brewery in Dublin is further evidence for the development of specialised brewery engineering firms in the city during the 19th century.

The plant installed by Guinness in the second half of the 19th century, in particular cleansing *squares* and refrigerators, can be said to have been somewhat unique. In the reversion from automated to manual skimming, the brewery displayed a certain level of technological regression, while the installation of horizontal refrigerators in the 1890s was counter to the trend for vertical refrigerators, which were assumed to have replaced the use of horizontal refrigerators at most British breweries in the 1880s. This technological regression is an interesting development at the brewery, and it may be indicative of the brewery's unique technological and processual development in late-19th century, at a time when it had attained the position of being the world's most-productive brewery. The same period also saw the significant expansion of the brewery's maturation capacity, at a time when the large London porter breweries are said to have been reducing theirs. This would appear likely to have been a factor in the firm's continued expansion in output during the period. The suggestion is that the expansion of the brewery's maturation capacity providing the brewery's products with a flavour profile that matched or exceeded their price at the point of sale. In contrast, Beamish and Crawford's maturation capacity had not been considerably expanded as the 19th century progressed, and the brewery's products were stated to have been inferior, in terms of flavour, to those of Guinness in the 1880s. While this remains a somewhat tentative suggestion, it does provide a further potential factor, unique to Guinness, that may partially explain the brewery's rise to international significance.

Chapter 7 Powering the brewery

In this chapter the primary sources of motive power used in the Irish breweries from the late-18th to the early 20th century will be outlined. The aim is to infer both the rate and regionality of industrialisation, which the adoption of steam power by a brewery can be used as a proxy for. Indeed, the adoption of steam-powered technology by the industry remains the primary focus of the chapter, though the exploitation of each of animal, water and electric power are also discussed. Throughout the chapter, the development of each the discussed sources of motive power in the British brewing industry will be outlined first. This will be followed by a discussion of the levels of engagement by Irish breweries and the levels of archaeological visibility of each form of power source. Published histories provide the primary data for the British developments, while the Irish data is principally derived from primary source analysis.

The chapter is divided into four primary sections. The first two sections will examine the use of horse and water power, each of which can be viewed as being pre-industrial forms of power that were widely used in both the British and Irish brewing industries. The third section, which is devoted to steam power, is sub-divided into four sub-sections. The first sub-section analyses the early adoption of steam engines by the London porter breweries, outlining the causative factors behind their initial adoption. The three remaining sub-sections, which examine the pace of adoption of steam-powered technology in the Irish brewing industry, are divided chronologically, examining the developments before 1820, in the period 1820-50, and in the period after 1850. The fourth and final section will briefly outline the evidence for the early electrification of the brewery in the late-19th and early 20th centuries.

Apart from the well-documented developments of the largest London porter breweries in the late-18th and early 19th centuries, this is the first regional study to examine the pace and regionality of the adoption of steam engines by the brewing industry. It broadly follows an approach that was recommended by Gourvish and Wilson (1994, 51 n71), who proposed that detailed studies of the contemporary provincial press would fill the largely absent record on the rates of adoption of the technology in Britain outside of London. The approach taken to the study of the contemporary Irish press is somewhat novel. The newspapers consulted were limited to those that have been digitised and made available by the Irish Newspaper Archive.[1] This data was accessed via keyword searching; every record that contained each of the words 'brewery', 'steam' and 'engine' were consulted. Variations of the keyword search, for example replacing 'engine' with 'power', did not expand the

[1] *www.irishnewsarchive.com*

dataset. Further data has been used to supplement the contemporary press. Large-scale Ordnance Survey maps sometimes, though not always, identify engine houses, while the preparatory works for the *Primary Valuation* make occasional reference to the utilisation of steam power. Perhaps the most useful of the supplementary datasets was compiled by the Railway Commissioners, who presented a table that outlined the dates of installation and uses of steam engines at work in Ireland's largest centres of population in the mid-1830s (BPP 1838, Appendix B No. 17, 112-3). The survey of the combined datasets is not intended to be fully comprehensive, but it has enabled both the temporal regionality and rates of adoption of steam-powered automation by the Irish brewing industry to be plotted.

7.1 Horse Power

Before the mid-1780s, when steam engines were first adopted by the London porter breweries, horse wheels provided the principal form of motive power in British breweries. In England, horse wheels had been used for flour milling from at least the late-12th century and for malt milling from at least the 14th (Watts 2002, 116). Generally, they comprised a horizontal wheel to which a horse, or multiple horses, were tethered. The motion of the wheel was then transferred, either directly or indirectly via gearing, to the machinery being powered. Early horse wheels were reasonably simple pieces of equipment though later examples, such as the horse engines designed by John Smeaton in the 1780s for the Weevil Brewery in Gosport, Hampshire, were complex (Pearson 2014, 160, figs. 6.9 & 6.10; figures 7.1 & 7.2). In that well-documented example, the horse wheel drove subterranean gearing that transmitted the rotative action of the wheel to the brewery's pumps.

Initially, horse wheels would have provided motive power for just a brewery's mills though, before the 1740s, horse wheel had been adapted to pumping purposes (Mathias 1959, 40-3). In regional British breweries, automated prime brewing plant is believed to have been primarily powered by horse wheels during the first half of the 19th century, a practice that continued into the late-19th century (Gourvish & Wilson 1994, 51-2 n71 & n75; Pearson 2014, 158-9). The use of horse power meant that, before the adoption of the steam engine, large-scale breweries could be located in prime urban locations that did not have access to water power. However, horse wheels were expensive to operate. While the financial value of a mill horse was far exceeded by that of a dray horse, the costs of their upkeep, which included feed and stabling, was comparable (Mathias 1959, 92-3).

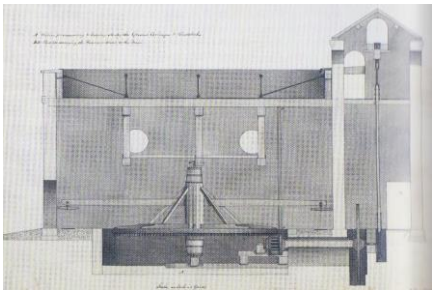


Figure 7.2. Section drawing of a complex horse engine designed by John Smeaton for the Weevil Brewery in Gosport, Hampshire (Pearson 2014, 160 fig. 6.9).

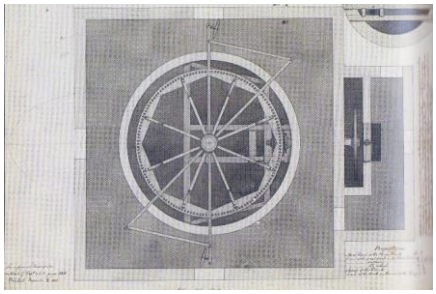


Figure 7.1. Plan of a complex horse engine designed by John Smeaton for the Weevil Brewery in Gosport, Hampshire. (Pearson 2014, 160 fig. 6.10).

As in England, the use of horse wheels in Irish breweries during the 18th century appears to have been common. They appear to have been regularly used to power a brewery's mills and, at least in some cases, pumps. For instance, a plan of the southern portion of the Beamish and Crawford site, composed in 1778 before the area was subsumed by the brewery, identified the location of a former horse mill on land then in the possession of Job Hart (reprinted in Ó Drisceoil & Ó Drisceoil 2015, 81). Hart had, in the mid-18th century, been a publican brewer, and indeed distiller, whose public house was known as the Still (Johnson 2002, 138). This shows that even small-scale publican brewers were utilising horse wheels for malt milling in prime urban locations during the 18th century. Their use in large breweries can probably be inferred, though the evidence remains reasonably sparse. The original lease signed by Arthur Guinness in 1759 listed a horse mill, which included a hopper and a pair of millstones, within the contents of the brewery (Stevens 1959, 1). In 1809, following the installation of the brewery's first steam engine, the brewery offered the horse wheel for sale (Lynch & Vaizey 1960, 154n).[2] The steam engine was initially used solely for milling purposes, suggesting that the horse wheel had not been adapted for pumping. A list of assets of another Dublin city brewery, compiled in 1793 for Sweetman's Brewery on St. Stephen's Green, included five mill horses.[3] This shows that the brewery's mill, while not specifically stated as such, was horse powered.

The only direct evidence for horse wheels being adapted for pumping purposes in an Irish brewery comes from Beamish and Crawford, though it would appear unlikely that the practice was limited solely to this one site. A lease map of the brewery, composed in 1792 at the time of its acquisition by Beamish and Crawford, stated that a horse mill was then used for malt milling and pumping water from two artesian wells and the adjacent River Lee (reprinted in Ó Drisceoil & Ó Drisceoil 2015, 41). It would appear likely that this arrangement was in place at the brewery from at

[2] *Freemans Journal* 11/12/1809, 2.
[3] NLI/Ms. 3285.

least the early 1780s, when it was converted to porter brewing by the previous proprietor, Aylmer Allen (*ibid*., 35-6). The early surveys of the brewery show that the number of horse wheels active at the site had expanded to three by 1802, two located within the mill itself and one adjacent, to the south, of the brewhouse. The number had expanded again before 1818, by which time the two located in the mill had been replaced by one large horse wheel and an additional wheel had been installed to the northwest of the brewhouse, where, as will be outlined later, the brewery's first steam engine was installed (figure 3). Horse wheels remained in use at the brewery to 1827 when the brewery's second steam engine was installed, replacing the horse wheel located to the south of the brewhouse (Ó Drisceoil & Ó Drisceoil 2015, 61).



Figure 7.3. Horse wheels at Beamish and Crawford, 1802 and c. 1818. Source: CCCA/U18/MPD/337 & 349. Approx. scale.

Evidence for the use of horse wheels in Irish breweries during the 19th century is also reasonably sparse, though this is probably a reflection of the nature of the sources available rather than an indication that they were not widely used. Only two references to their use in breweries beyond those previously mentioned have been observed. In 1822, a brewery in Lisburn, county Antrim, was offered for sale complete with a horse wheel.[4] It was probably acquired by Graham who operated a brewery in the town from at least 1824 to the 1860s (Pigot 1824; *Primary Valuation*). In Kilkenny city, a horse mill was recorded among the buildings of Sullivan's Brewery by Valuation Office surveyors in 1847.[5] Of the preparatory works of the valuation that have been viewed, it is the only specific reference made to the use of horse power in an Irish brewery. However, this should not be

[4] *Belfast Newsletter* 24/05/1822, 1.
[5] See catalogue entry KK 019-003 for full reference.

taken as evidence that horse wheels were not commonly used in Irish breweries at the time of the first Valuation Office surveys. Rather, it suggests that the surveyors did not see specific value in recording the level of horse power exploited, with only the availability of water power being used in the calculation of the valuation of a site. Indeed, many brewery buildings were simply recorded as being offices by surveyors and the horse mill at Sullivan's Brewery was recorded as being an 'office horse mill'.

In Britain, not a single brewery horse wheel has survived. They were, according to Pearson (2014, 162), 'swept away in the move to steam power and the subsequent brewery rationalisation'. However, archaeological excavations at the site of the former Weevil Brewery in Gosport, Hampshire, have revealed the subterranean pit of a complex horse engine (Moore 2012). It was one of two designed for the brewery by John Smeaton in the 1780s that were used to power the brewery's pumps. This remains the only recorded physical evidence of horse-powered automation in the British brewing industry. Unsurprisingly, a similar situation is evident in Ireland where, as was previously stated, there is little documentary evidence for the use of horse power in breweries during the 19th century, though the practice was likely widespread. It is possible, however, to at least tentatively suggest that evidence of their use is preserved in the architectural remains of one Irish brewery.



Plate 7.1. Apsidal western elevation of building at Blake's Brewery, Tuam. It potentially housed a horse wheel.

The surviving remains of Blake's Brewery in Tuam, county Galway, which is believed to have been reconstructed in the first decade of the 19th century, include an eleven-bay, two-storey building with a curious, apsidal western elevation (Claffey 2009, 7; plate 7.1). It bears many similarities in plan to a brewhouse designed by John Soane in 1790 for Simmonds of Reading, Berkshire (Pearson 2014,

158 fig. 6.7). The apsidal end in Soane's design housed the brewery's horse mill and it may be that Blake's Brewery was constructed in a similar manner. However, the elevations of the building at Blake's Brewery do not feature the distinctive, large, louvered windows that are evident in the elevations drawn up by Soane and can be considered as being indicative features of a brewhouse. This, perhaps, suggests that the building was not used as a brewhouse and was instead either a maltings or stores. Further investigations at the site, the interior of which has not been viewed, would be required to confirm either suggestion.

7.2 Water Power

Water power is known to have been exploited by British breweries throughout the 18th and 19th centuries (Pearson 2014, 155-6). Pearson highlighted that urban breweries were rarely located in positions that enabled the exploitation of water power, though its use in rural breweries, who occasionally served a secondary function as flour mills, was not uncommon. The survey has shown that much the same situation was evident in the Irish brewing industry, though urban breweries that exploited water power were, while not common, certainly not rare. Some 31 of the 258 breweries that have been identified by the survey have been confirmed to have exploited water power (table 7.1).

As with the British examples, several were situated in rural locations, though generally within the vicinity of towns. By and large, these breweries, as with their British counterparts, operated in conjunction with flour mills. Indeed, several appear to have been primarily flour mills with brewing being the secondary function of the site. Examples include two water-powered flour mills that also operated as breweries, both located *c*. 1.5km southeast of Thurles, county Tipperary, in the adjacent townlands of Turtulla and Archerstown (Slater 1846; 1856; *Primary Valuation*).[6] A small brewery also operated at the Dunnamark milling complex, located *c*. 2km northeast of Bantry, county Cork (Lewis 1837 vol. 1, 186).

[6] 1:10560 OS TY 041 1840.

Project Code	Brewery Name	Location	County
AM 032-001	The Galgorm Street Brewery	Ballymena	Antrim
AH 012-001	The Lower English Street Brewery	Armagh city	Armagh
CW 022-001	The Borris Brewery	Borris	Carlow
CN 039-001	White's Brewery	Virginia	Cavan
CK 118-001	The Dunnamark Mills & Brewery	Bantry	Cork
CK 074-002	The River Lee Porter Brewery	Cork city	Cork
CK 035-001	Walker's Brewery	Fermoy	Cork
CK 075-001	The Riverstown Ale Brewery	Riverstown	Cork
CK 141-001	McCarthy's Skibbereen Brewery	Skibbereen	Cork
LO 020-002	The Foyle Brewery	Derry/Londonderry city	Derry/Londonderry
DW 032-001	The Portaferry Brewery & Distillery	Portaferry	Down
DN 018-003	Manders & Powell's Brewery	Dublin city	Dublin
GY 094-001	The Madeira Island Brewery	Galway city	Galway
GY 094-002	The Nun's Island Brewery	Galway city	Galway
GY 094-004	The Newcastle Brewery	Galway city	Galway
KY 029-003	The Ballymullen Brewery	Tralee	Kerry
KY 029-004	The Castledesmond Brewery	Tralee	Kerry
KE 026-001	Cassidy's Distillery and Brewery	Monasterevin	Kildare
KK 019-001	The St. Francis's Abbey Brewery	Kilkenny City	Kilkenny
LS 030-001	Comerford's Brewery	Ballinakill	Laois
LS 028-001	Perry's Brewery	Rathdowney	Laois
LK 005-001	The Newgate/City Brewery	Limerick city	Limerick
TY 034-001	The Borrisoleigh Brewery	Borrisoleigh	Tipperary
TY 087-001	Grubb's Brewery	Clogheen	Tipperary
TY 041-002	Lester's Brewery, Turtulla	Thurles	Tipperary
TY 041-003	Knaggs's Archerstown Brewery	Thurles	Tipperary
TE 035-001	Falls' Brewery	Omagh	Tyrone
WX 020-001	The Millpark Brewery	Enniscorthy	Wexford
WX 007-001	The Gorey Brewery	Gorey	Wexford
WX 037-005	The Spa Well Brewery	Wexford Town	Wexford
WW 004-001	The Bray Brewery	Bray	Wicklow

Table 7.1. Water-powered breweries identified in the course of the survey. Full details in individual catalogue entries.

While rurally located, combined breweries and flour mills were not uncommon in Ireland, the majority of the water-powered breweries identified by the survey were located in, or within the immediate vicinity of towns and cities. Several of these also operated either in conjunction with, or were located adjacent to, flour mills. For example, both Grubb's Brewery in Clogheen, county Tipperary, and the Bray Brewery in county Wicklow were components of large flour-milling, malting

and brewing complexes (Ahern 2003, 204).[7] The one water-powered brewery in Dublin city, Manders and Powell's Brewery, comprised both a brewery and flour mill.[8] Similarly, the River Lee Porter Brewery in Cork city was located adjacent to the Lee Mills, which had originally been founded in 1787 by Atwell Hayes, on whose land the brewery was later constructed (Rynne 1999, 82; Ó Drisceoil & Ó Drisceoil 2015, 62). In Enniscorthy, the Millpark Brewery, which, as was outlined in Chapter 6, maintains a set of *ex situ* millstones, continued to operate as a combined flour mill and brewery into the late-19th century (Bassett 1885, 297).



Plate 7.2 Multi-storey flour mill, Grubb's Brewery, Clogheen.



Plate 7.3 Five-storey, multi-bay maltings and grain store. Grubb's Brewery, Clogheen. It directly adjoins the flour mill seen in plate 7.2.



Plate 7.4 Multi-bay, four-storey maltings, on left, meeting double-pile, three-storey flour mill, on right. The Bray Brewery, county Wicklow.

Each of these examples were located in positions that provided a reasonably secure supply of water for the brewery's water wheel. This was a situation that, as will be outlined below, not all water-powered breweries were provided with. Apart from the River Lee Porter Brewery, the measured surveys of which show that the brewery maintained its own water-powered mill, each of the examples appears likely to have milled their malt within the flour mill itself (figure 6.1). This is confirmed by the standing remains of each of Grubb's Brewery in Clogheen, the Millpark Brewery in Enniscorthy and the Bray Brewery (plates 7.2. 7.3 & 7.4). The Millpark Brewery ground both malt and flour within the

[7] 1:1056 OS Bray 1838-9 (NAI/OS140/Bray); 1870.
[8] 1:1056 OS Dublin city 1838 (NAI/OS140/Dublin); 1847; 1864.

mill which was a component of the brewhouse, while the brewery's maltings directly adjoined the mills themselves at both the Bray Brewery and Grubb's Brewery. In both cases, the brewhouse appears to have been spatially removed from the mill itself.

Several of the breweries that have been identified as being water powered were located in positions that were generally unsuited for the exploitation of water power by other industries. It would appear likely that the limited supply of water for powering water wheels in each case meant that its use was limited solely for malt milling and that it was likely supplemented by either manual or horse-driven milling. In county Tipperary, the Borrisoleigh Brewery's malt mill was located apart from the brewery complex itself, *c.* 100m to the south, on the banks of the Cromogue River.[9] The Spa Well Brewery in Wexford town appears to have utilised a spring well to drive its water-powered mill. Valuation Office surveyors, writing in 1847, noted that a steam engine was in in the process of being installed at the then-closed brewery, which itself was in the process of being converted to flour milling.[10] The surveyors remarked that it was the poor supply of water that necessitated the installation of the steam engine and that the uncertain nature of the water supply meant that it was not included in the valuation of the site. A similar situation is evident at the Skibbereen Brewery in county Cork. In 1850, Valuation Office surveyors recorded that the brewery was supplied with sufficient water power, sourced from the River Ilen on whose banks the brewery was located, to operate for just one day in every seven.[11] By then, the brewery had installed a steam engine to supplement its water supply, which will be referred to in a later section.



Plate 7.5 Sluice gate at the Dunnamark milling complex, Bantry, county Cork.



Plate 7.6 Partially surviving water-wheel pit and axle, Walker's Brewery, Fermoy, county Cork.

[9] 1:10560 OS TY 034 1840.
[10] See catalogue entry WX 037-005 for full reference.
[11] See catalogue entry CK 141-001 for full reference.



Plate 7.8 Cast-iron bracket for water-wheel axle, the Madeira Island Brewery, Galway city. The water wheel in the background is a recent replica.



Plate 7.7 Masonry mill race, a canalised tributary of the River Corrib. The Madeira Island Brewery, Galway city.

It was only in Galway city, where three of the four breweries that operated in the first half of the 19th century were water powered, that the use of water power appears to have been prevalent in breweries. This is probably due to the unique topography of the city. The many canalised tributaries of the River Corrib, which has a fall of over 4m as it passes through the city, were ideal for the large-scale exploitation of water power (Prunty & Walsh 2016, 1). However, several further examples of water-powered breweries located in large towns and cities that did not also function as flour mills have been recorded. These include, but are not limited to, the Foyle Brewery in Derry/Londonderry city, Walker's Brewery in Fermoy, county Cork, the Ballymullen Brewery in Tralee, county Kerry, and the St. Francis's Abbey Brewery in Kilkenny city.

Physical evidence for the use of water power in Irish breweries is reasonably common, though for the most part it comprises the mill races of former brewery complexes that themselves do not survive. For example, a complex system of mill races, fed by a natural falls and controlled by a series of extant sluice gates, survives at the Dunnamark milling complex in Bantry, county Cork (plate 7.5). Similarly, the mill races for each of the two combined breweries and flour mills at Archerstown and Turtulla, both located outside of Thurles, county Tipperary, are all that survives of each complex. Several water-wheel pits have also been recorded. In Galway city, the mill race and wheel pit for the undershot water wheel, complete with cast-iron axle brackets, is all that survives of the Madeira Island Brewery (plates 7.7 & 7.8). A recent, replica water wheel and sluice gate have been installed within the wheel pit. In Fermoy, county Cork, the wheel pit of the former Walker's Brewery is partially preserved, complete with its cast-iron axle, which is maintained *in situ* (plate 7.6). The wheel pit was constructed against a cliff face, probably a former quarry, and its water supply was not fed by a traditional mill race. Instead, it was fed via a subterranean passage, through which water continues to flow, from an extant pond, located in the grounds of Loretto Convent, now Loretto Secondary School. The mill race at the Millpark Brewery in Enniscorthy has been infilled, though a series of infilled

archways in the brewery's boundary walls identify its former course. While it has not been viewed, the water-wheel pit is believed to survive at the site in an area that is not currently accessible. Historic photographs show that the water wheel itself had been removed before 1957, when brewing ceased at the site, though the water wheel's axle and a cog wheel were then maintained (private collection, G.H Lett & Co., Enniscorthy).



Plate 7.9. Cast-iron water wheel, originally from the St. Francis's Abbey Brewery, Kilkenny city. Stored, in two halves, at the Straffan Steam Museum, county Kildare.

Just one water wheel from an Irish brewery context has survived. It originally powered machinery at the St. Francis's Abbey Brewery in Kilkenny and was removed in *c*. 1970 renovations, which involved the demolition of much of the historic brewery. The water wheel was dismantled for storage and was acquired by the Straffan Steam Museum, county Kildare, during the 1980s, where it is now stored (R.C. Guinness, pers. comm.; plate 79). The iron work of the water wheel has been partially restored, though it has not been fully reassembled. It is an eight-spoke, cast-iron, Poncelot-style water wheel, an efficient form of undershot wheel that was introduced to Ireland in the early 1830s (Rynne 2006, 33). The date of the wheel itself remains unclear. In 1847, Valuation Office surveyors recorded that the brewery's water wheel was breastshot.[12] It is unclear whether this was recorded in error or whether the surviving wheel was installed after 1847, which, as will be outlined below, was also the year that the first steam engine had been installed at the brewery.

[12] See catalogue entry KK 019-001 for full reference.

7.3 Steam Power

7.3.1 The adoption of steam power in the London porter breweries

As was previously stated, it was the mid-1780s when steam engines were first adopted by breweries for motive power, with the movement towards steam-powered automation being a phenomenon of the London porter-brewing industry. Acting as a trigger for the rapid adoption of steam power by the London porter breweries were the improvements made in steam-engine technology by the Scottish engineer James Watt, whose steam engines were manufactured and marketed by the Birmingham firm, Boulton and Watt. Hills (1989) provides a detailed overview of the technological development of the stationary steam engine. The early developments that led to the development of the rotative engines that were adopted by the London porter breweries will be briefly summarised below.

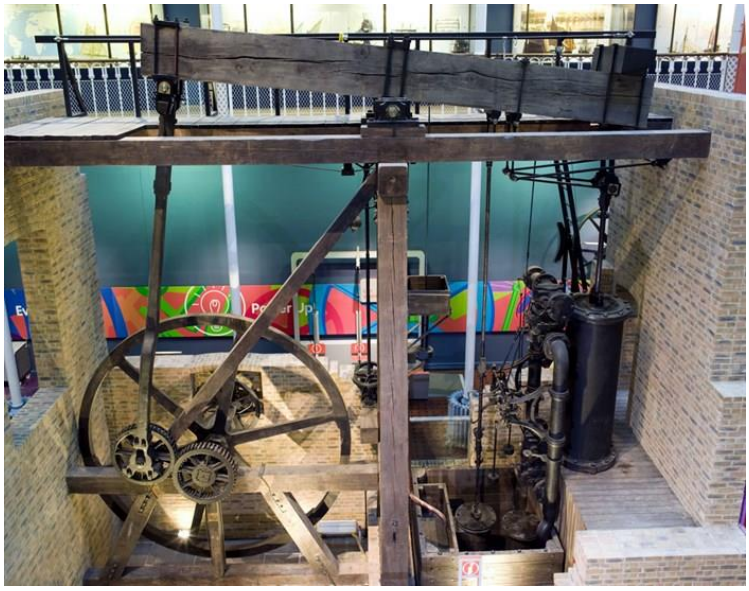


Plate 7.10. House-built Boulton and Watt beam engine at the National Museum of Scotland, Edinburgh. It was originally installed in Barclay's Brewery in London in 1786 and remained in use at the brewery until 1885. Watt's 'parallel motion' can be seen connecting the piston to the beam, on right. The 'sun and planet' gears can be seen on left.
Source: www.nms.ac.uk.

Watt's developments improved on the atmospheric beam engines that had been developed in the early 18th century by Thomas Newcomen. Early beam engines, which condensed steam within the piston chamber, pulling the piston and hence the beam via a chain, were suitable only for pumping purposes (Rynne 2006, 53-5). This was due to the rocking, reciprocal motion of the beam itself. Watt, through the development of the separate condenser and the double-acting piston, massively

improved the efficiency of the earlier engines (Hills 1989, 51-69). However, Watt's early engines were also suitable only for pumping purposes. The first patent for a true rotative steam engine was take out in 1780 by the English engineer James Pickard, who translated the motion of the beam into rotative motion using a simple crank (*ibid*., 60). To avoid Pickard's patent, Boulton and Watt developed the 'sun and planet' gears. They were essentially a work around, though they did have their advantages over the simple beam and crank arrangement, principally that they operated at twice the speed of the engine itself (Rynne 2006, 55-6). The first steam engine with 'sun and planet' gears was installed in Boulton and Watt's Soho Manufactory in Birmingham in 1782 (Hills 1989, 66). It is worth noting that Boulton and Watt did not always install the 'sun and planet' gears in their early beam engines. Mathias (1959, 85) recorded that they were supplying beam and crank engines to breweries as early as 1797, probably paying a commission to Pickard on the installation of each engine.

The first two steam engines installed in London by Boulton and Watt were installed in porter breweries. The first was installed at Goodwyn's Red Lion Brewery in 1784, less than two years after the firm's first rotative engine had been installed at the Soho Manufactory (Mathias 1959, 83-5). Whitbread's, then London's and hence the world's largest brewery, ordered their first engine from the firm just one month after the Red Lion Brewery (Mathias 1959, 83-5; Pearson 2014, 165). It was in operation by 1785 and is believed to have been the first engine to utilise Watt's 'parallel motion', meaning that it was, in effect, the first commercially delivered double-acting steam engine (Mathias 1959, 91). By 1795 only the cotton-spinning and coal-mining industries were said to have installed a greater number of Boulton and Watt engines than breweries (Mathias 1959, 83-5). By then several regional breweries, located in Kent, Liverpool, Bristol and Nottingham, had ordered engines from the firm, showing that the technology was already diffusing outwards, towards the provinces. As many as eleven London breweries had installed engines manufactured by Boulton and Watt before 1800, by which time the first Scottish brewery had ordered a steam engine from the firm.

Porter breweries, with their pre-existing horse wheels used for pumping and malt milling, were probably unique in the way in which they installed steam engines. It was common for the newly installed steam engines to be fitted in parallel with pre-existing horse wheels (Mathias 1959, 86-90; Sumner 2005). The engine would then drive the horse wheel itself, which in turn drove any automated machinery. This layout allowed steam engines to be installed during the summer months, between brewing seasons, without requiring a major overhaul to the brewhouse itself. The retention of the horse wheel also allowed for redundancy, with breweries being able to revert to horse power should any issues with the operational abilities of the steam engine arise. While it was Boulton and Watt who manufactured the engines, it was millwrights and engineers in the brewers' employ who installed them and each of the pieces of automated plant that they powered. Mathias (1959, 87) recorded that

many of the great civil and mechanical engineers of the era carried out works on the London porter breweries, including John Rennie, John Smeaton and Joseph Bramah among others.

Each of the early engines manufactured by Boulton and Watt were house-built beam engines, with the support for the beam being an integral part of the engine's housing (Rynne 2006, 56). While the retention of horse wheels enabled the reasonably swift adoption of steam engines by the London porter breweries, the requirement for space-consuming engine houses meant that several of the large porter breweries faced difficulties in their installation. For example, the installation of the first steam engine at Barclay's Brewery was delayed as the firm required a private Bill of Parliament to subsume a lane within the brewery, upon which the engine house was constructed (Mathias 1959, 91). Truman's Brewery faced even more difficulties. In 1788, the brewery cancelled an order for an engine, stating that there was no suitable place within the brewery for its installation. It was not until 1805 that they re-engaged with Boulton and Watt and the engine was not installed until 1807.

During the first decade of the 19th century Boulton and Watt had developed independent engines, which obviated the requirement for a large engine house. Rather than constructing the engine as an integral part of its housing, cast-iron columns were used as supports for the beam (Rynne 2006, 59). A further development, also of the same decade, was the side-lever type engine. These were independent engines where the beam was set below, rather than above, the piston, reducing the head height required in the space in which the engine was installed. Both developments made the installation of steam engines at space-constrained sites possible and, as will be outlined below, each of the four Boulton and Watt engines installed in Irish breweries before 1815 were of the independent type.

Steam engines proved to be incredibly economical additions to large-scale breweries. In addition to enabling the uninterrupted operation of machinery, they also allowed breweries to dispense with their mill horses. Within a year of the installation of their first engine, Whitbread's estimated that the annual savings made in feed and stabling covered the initial costs of installation (Mathias 1959, 92-3; Pearson 2014, 162). The engines also proved, at least in some cases, to have incredible longevity. At least two Boulton and Watt engines installed in London porter breweries in the 1780s operated for close to a century or more. Whitbread's first engine, installed in 1785, remained in operation until 1887, while Barclay's first engine, installed in 1786, remained in use until 1884 (Pearson 2014, 164). Both engines are maintained today as working exhibits in museum collections, the Whitbread's engine in the Powerhouse Museum in Sydney, Australia, and the Barclay's engine in the National Museum of Scotland, Edinburgh (plate 7.10).

7.3.1 Steam power in the Irish brewing industry before 1820

The historical sources have confirmed that steam engines had been installed in at least eight Irish breweries before 1820. It is, perhaps, unsurprising that the evidence is heavily weighted towards breweries located in the larger centres of population. Indeed, no firm evidence has been identified for the installation of a steam engine in an Irish brewery outside of Dublin city before 1810. By that date, some five Dublin city breweries are known to have installed steam engines. The earliest recorded was installed in Sweetman's Brewery on Francis Street before 1800 (Rynne 2006, 245). The next recorded evidence is from 1806, when the Anchor Brewery, then known as the Hibernian Brewery, advertised for technical staff to oversee the erection of a 14hp steam engine.[13] No further record of this potential engine has been identified, though it would appear likely that it was installed at the brewery shortly after.

Mathias (1959, 85), recorded that three breweries in Dublin city had ordered steam engines from Boulton and Watt before 1810. We have previously seen how Guinness had installed their first steam engine in 1809, a 10hp independent beam engine ordered from Boulton and Watt in 1808 (*ibid*.; Lynch & Vaizey 1960, 154n). Each of the remaining two Boulton and Watt engines installed by Dublin city breweries were independent side-lever engines of 6hp (Mathias 1959, 85). One was ordered in 1810 by Trevor and Keogh, proprietors of the brewery that would later be operated by Watkins on Ardee Street. The other was ordered in 1809 and it appears likely to have been installed at the site that would be later known as the Phoenix Brewery. Mathias recorded that it was ordered by a brewer named Madden. This was probably Samuel Madder, who was sometimes recorded as Madden in the trade directories. Madder operated two breweries at the time; one on the Phoenix Brewery site on James's Street and the second, the exact location of which has not been identified, nearby on Usher's Quay (Wilson 1786; 1794; 1804; 1815). It would appear likely that it was the James's Street brewery where the engine was installed; the Usher's Quay brewery was last listed in the trade directories in 1815 and had probably closed before 1820 when it was omitted (Wilson 1815; Pigot 1820).

The technology had spread beyond Dublin before 1815. In 1814, Walker's Brewery in Fermoy, county Cork, ordered a 14hp independent engine from Boulton and Watt (Mathias 1959, 85). This remains the only observed evidence for the installation of a steam engine in an Irish brewery outside of the port cities before the late-1820s. The brewery was previously highlighted as being water powered and the installation of the engine appears likely to have stemmed from the proprietor's engagements with John Rennie from 1811, who was later employed to oversee the mill work involved in expanding the brewery's motive power (Rynne 2004, 209-11). Rennie was among the engineers that Mathias (1959, 87) recorded as having carried out works on the London porter breweries. Rennie

[13] *Freemans Journal* 23/07/1806, 2.

was also a regular contractor of Boulton and Watt and had overseen the erection of the steam engine at the Albion Mill, London's first steam-powered flour mill, which opened in 1786 (Hills 1989, 72-3). In the same year that Walker ordered the engine, the Canal Brewery in Limerick city was offered for sale complete with a steam engine.[14] In somewhat of a coincidence, the brewery was acquired by Walker in 1815, though the brewery was steam powered prior to the acquisition (Lenihan 1866, 436).





Plate 7.11 (left). Beam engine house, Beamish and Crawford, Cork city.

Plate 7.12 (above). Date stone, Beamish and Crawford beam engine house.

Beamish and Crawford, then Ireland's largest brewery, did not install their first steam engine until 1818 (Rynne 1999, 49). The engine, which was a house-built beam engine, replaced one of the brewery's three horse wheels, itself installed in the northwest of the site between 1802 and 1818. The engine house, which bears a datestone and is constructed of ashlar limestone, now rendered, survives and is the only surviving physical evidence of the adoption of steam power by an Irish brewery before 1820 (plates 7.11 & 7.12). It is also the only concrete evidence of the installation of a house-built beam engine in an Irish brewery, though, given the dates of installation, it would appear likely that the engines installed at both Sweetman's Brewery and the Anchor Brewery in Dublin were also house built.

Two further breweries in Cork city were stated by unreliable late-19th century sources to have installed steam engines at an early date. Company tradition, recorded by Barnard (1889-91 vol. 4, 325), held that the first steam engine erected in the city had been installed at the Southgate Brewery

[14] *Freemans Journal* 11/08/1814, 1.

in 1798. Barnard, while a reliable narrator of the contemporary, is viewed as being unreliable when it comes to historical fact (Rynne 1999, 48). While the veracity of the date of the engine can certainly be held in doubt, it should be noted that Barnard had viewed several early beam engines in both distillery and brewery contexts. While a late-18th century date of installation cannot be implied, it would appear likely that the engine had been installed at a reasonably early date. A similar unreliable claim, recorded in 1873 by a Glasgow-based journalist, held that the first steam engine in Cork city had been installed at the St. Finnbarr's Brewery (Johns 1873, 11). The engine was no longer extant at the time of the brewery visit and the claim is not verifiable. The same author stated that the brewery was the only one in Cork city with its own well, a claim which is clearly erroneous, casting further doubt on the author's reliability. However, Valuation Office surveyors recorded that the brewery had installed an engine before 1850 and its replacement before 1873 perhaps suggests that it was a reasonably early beam engine that was replaced by a more modern example.[15]

Beyond these examples, we are reliant on the data compiled by the Railway Commissioners. While the Commissioners did not state the sites that the engines had been installed in, they did outline the functions of the engines, their horse power and dates of installation (BPP 1838, Appendix B No. 17, 112-3; table 7.2). What is immediately evident about the data is that it is not comprehensive. Not one of the brewery steam engines outlined above as having been installed before 1815 are included. Of the engines specifically listed in brewery contexts, just two, both installed in unspecified Limerick city breweries in 1818, had been installed before 1820. While the data is incomplete, it provides the only direct evidence for the adoption of steam power in Irish breweries in the 1820s.

The evidence shows that by 1820 Irish breweries had begun to engage with steam-powered technology that was initially developed in London. The Irish engagement, which likely began in the final years of the 18th century, occurred in tandem with the regionalisation of the technology in Britain. The evidence suggests that the phenomenon was confined to breweries in Dublin before 1810, before regionalising in the decade that followed. With the exception of one site, Walker's Brewery in Fermoy, steam engines appear to have been confined to breweries located in Dublin, Cork and Limerick cities before 1820. This is, perhaps, unsurprising. They were the three largest centres of population in Ireland at the time and each was engaged in the Atlantic economy. While we know reasonably little about the engines installed, four are known to have been manufactured by Boulton and Watt. The installation of one of these, installed at Walker's Brewery in Fermoy, was likely overseen by John Rennie, who is recorded as carrying out engineering work in the London porter breweries. Based on the available evidence, it can be reasonably securely stated that the early adoption of steam engines

[15] See catalogue entry CK 074-005 for full reference.

by the Irish brewing industry occurred at a rate that is comparable to the regional British brewing industries and was directly influenced by the developments in London.

Place	Description and Use	No. of	Date	Power
Cork city	Grinding malt, mashing etc.	2	1813	32hp
Cork city	Grinding malt, mashing etc.	2	1817	40hp
Cork city	Grinding malt, mashing etc.	1	1818	12hp
Limerick city	Grinding malt, brewery	1	1818	16hp
Limerick city	Grinding malt, brewery	1	1818	30hp
Cork city	Grinding malt, mashing etc.	2	1820	48hp
Cork city	Grinding malt, mashing etc.	1	1820	12hp
Limerick city	Grinding malt, brewery	1	1822	16hp
Cork city	Grinding malt, mashing etc.	2	1825	40hp
Dublin city	Brewery	1	1825	6hp
Cork city	Grinding malt, mashing etc.	1	1826	8hp
Cork city	Grinding malt, mashing etc.	1	1828	12hp
Clonmel	Grinding malt, pumping water etc.	1	1829	10hp
Cork city	Grinding malt, mashing etc.	2	1830	48hp
Limerick city	Grinding malt, brewery	1	1830	8hp
Dublin city	Brewery & corn mill	1	1834	16hp
Dublin city	Brewing etc.	1	1834	10hp
Limerick city	Grinding malt in a brewery	1	1834	4hp
Cork city	Grinding malt, mashing etc.	1	1835	20hp
Kilkenny city	Porter brewery	1	1838	16hp

Table 7.2. Steam engines installed in brewery contexts, as recorded by the Railway Commissioners. Those installed at both Cork city and Clonmel may have been installed at distilleries. Source: BPP 1838b, Appendix B No. 17, 112-3.

7.3.3 Steam power in the Irish brewing industry, 1820-50

Irish breweries continued to engage with steam-powered technology in the decades that followed 1820. The period saw the further regionalisation of the technology and its adoption in breweries located outside of the larger centres of population. However, evidence from the 1820s remains reasonably sparse and it would appear likely that it was the 1830s that saw the diffusion of the technology to breweries located outside of the largest cities, Dublin, Cork and Limerick. As will be outlined below, the evidence suggests that, while steam-powered breweries were not uncommon in Ireland by 1850, the adoption of steam engines was certainly not ubiquitous.

Of the steam engines recorded by the Railway Commissioners, just two were specifically stated to have been installed in breweries during the 1820s, one in Limerick city in 1822 and one in Dublin city in 1825. Just two further engines were recorded in Dublin city by the Commissioners, both installed in 1834. One, which had been installed in a combined brewery and flour mill, appears likely

to have been installed at Manders and Powell's Brewery. It was the only water-powered brewery identified by the survey in the city and it was also the only brewery in the city that is known to have operated in conjunction with a flour mill. The second example may well have been installed at Caffrey's Brewery, which had been founded between 1834 and 1837 and had installed a steam engine before 1843.[16] Newspaper evidence shows that at least three further breweries in the city had installed steam engines before 1850. Pim's Brewery on City Quay is known to have installed an engine before 1836, while steam engines were included in the contents of both Thunder's Brewery on Church Street New and Alley's Brewery on Townsend Street when they were offered for sale in the early 1850s.[17] It is unsurprising, given the early engagement with the technology by the city's breweries, that steam power had been widely adopted by the city's breweries at an early date. It would also appear unlikely that the use of steam engines was confined to breweries where direct evidence has been observed.

In Limerick city, the Commissioners recorded that a further three steam engines had been installed in breweries after 1820, in 1822, 1830 and 1834. It is unclear which breweries they had been installed in, though each of the Newgate/City Brewery, the John's Gate Brewery and the Thomond Brewery are known to have been steam powered before 1850.[18] The evidence suggests that the majority of the breweries that operated in the city before 1850 had engaged with steam-powered technology, showing that the city's brewing industry was then technologically advanced.

In many cases the Commissioners did not identify the function of the site that the engine was installed and instead provided the primary uses that the engine was applied to. In Cork city, some 15 engines were identified as being used for grinding malt and mashing, each installed between 1813 and 1835. While many are likely to have been installed in the city's distilleries, who were early adopters of steam engines, several of those recorded are likely to have been installed in breweries though, with two potential exceptions, it is not possible to discern at which, if any (Rynne 1999, 61-74). The two engines installed in Beamish and Crawford may well have been the two 12hp engines that the Commissioners recorded as having been installed in 1818 and the 1828. Similarly, in Clonmel, county Tipperary, an engine used for grinding malt and pumping was installed at a brewery or distillery in 1829. While there was a distillery near the town, in the village of Marlfield, the engine was likely installed in one of the town's two breweries, both of which are known to have been steam powered

[16] An engine house was identified in the south range of the Caffrey's Brewery complex on the 1843 1:1056 OS map of Dublin city.
[17] *Freemans Journal* 23/06/1845, 4; 28/07/1852, 1; 28/03/1853, 1.
[18] The John's Gate Brewery is recorded as having been steam powered before 1841 (O'Flaherty 2010, 32). Engine houses were recorded at both the Newgate/City Brewery and the John's Gate Brewery by Valuation Office surveyors in 1849; see catalogue entries LK 005-001 & 009 for full references.

before the mid-1840s (Pigot 1824; Slater 1846).[19] It is tempting to consider that it was installed in Thomas Murphy's Brewery, which was reconstructed following fire damage received in 1829 (Callan MacArdle & Callan 1902, 486). As will be seen below, steam engines were commonly installed in breweries constructed during the period.

Certainly, by the late-1820s the use of steam engines appears to have been largely limited to breweries located in Ireland's largest centres of population, the port cities of Dublin, Limerick and Cork. The Clonmel example is the first suggestion of the installation of a steam engine in a brewery located outside of the three cities, apart from the exceptional case of Walker's Brewery in Fermoy. The evidence suggests that it was the 1830s that saw the widespread adoption of the technology by breweries located outside of the three largest cities, with steam engines installed in several newly founded and pre-existing breweries before 1850.

The installation of steam engines in two breweries that had been founded in the 1830s has previously been outlined, Caffrey's Brewery in Dublin and the Thomond Brewery in Limerick. This appears to have been a common situation in breweries founded in the period. However, only one brewery established in the period is confirmed to have been steam-powered from its foundation, the Gorey Brewery in county Wicklow. The brewery, which was founded in 1832 and was offered for sale in 1836, was operated by a combination of a water wheel and a 20hp steam engine.[20] In Youghal, county Cork, Pim's Brewery also appears likely to have been steam-powered from its foundation. In the mid-1830s the brewery's machinery was said to 'of the most improved kind' and, following its closure in 1847, it was converted for use as a steam-powered corn mill (Lewis 1837 vol. 2, 727).[21] A further two breweries established in the period are known to have been steam powered, though the evidence post-dates their foundations by several decades. In Loughrea, county Galway, Fahy's Brewery was said to have been steam powered in 1864 when the brewery was offered to let after a period of vacancy of about a decade.[22] In Drogheda, Cairnes's Brewery, which had been founded in 1825, was one of two breweries in the town that were recorded as having installed steam engines before 1838 (Riordan 1920).[23] The second example, Gernon's Brewery, had been founded before 1820 (Pigot 1820).

[19] A 5hp steam engine was included in the contents of the North Gate Brewery when they were offered for sale following its closure; *Freemans Journal* 11/11/1846, 1. Valuation Office surveyors noted that two steam engines were in use at Murphy's Brewery in 1847; see catalogue entry TY 083-001 for full reference.
[20] *Freemans Journal* 08/11/1836, 2.
[21] Valuation Office surveyors appraised the then-closed brewery buildings as being of recent construction in 1847. See catalogue entry, CK 067-001 for full reference.
[22] *Freemans Journal* 01/10/1864, 1. The brewery buildings were appraised as being of recent construction by Valuation Office surveyors, writing in 1843. See catalogue entry GY 105-001 for full reference. The brewery was listed as being vacant in the 1856 *Primary Valuation*.
[23] Engine houses were recorded at both breweries by Valuation Office surveyors, writing in 1838. See catalogue entries LH 024-001 & 003 for full references.

The engagement with steam-powered technology in the 1830s outside of the port cities was not limited to newly founded breweries. In Kilkenny city, the Railway Commissioners recorded that a steam engine had been installed in a porter brewery in 1838. It would appear likely that it was installed in Read's Brewery on James's Street. We have already seen how Sullivan's Brewery, also on James's Street, continued to use a horse wheel into the mid-to-late-1840s, while the first steam engine at the St. Francis's Abbey Brewery, which was used in conjunction with water power, is believed to have been installed in 1847 (Rynne 2006, 59). According to the Railway Commissioner's data, not one steam engine had been installed in a Waterford city brewery before 1838. One of the city's breweries, the St Mary's Brewery, is known to have installed an engine before 1848, perhaps following the publication of the Commissioner's data.[24]

Evidence for the installation of a steam engine before 1850 has been observed for a further four pre-existing breweries, each located in a medium-sized or large town. Two were located in county Cork, the Watergate Brewery in Bandon and McCarthy's Brewery in Skibbereen, and one in each of county Down, the Portaferry Brewery and Distillery, and county Meath, an otherwise undocumented brewery in Navan.[25] In addition, a steam engine had been installed at the Stillorgan Brewery in county Dublin before its closure in 1857. It is unclear whether the engine was then a recent installation at the brewery which had changed hands, from Darley to Cartan, between 1845 and 1856.[26]

The period 1820-50 saw the diffusion of steam engines in the Irish brewing industry from the large port cities of Dublin, Cork and Limerick, towards breweries located in larger towns. The regional distribution suggests that the diffusion was primarily a Munster and Leinster phenomenon. Only one brewery in each of Connaught and Ulster are confirmed to have installed steam engines before 1850, while evidence for the installation of engines in breweries located in Ireland's midlands is also sparse. No evidence has been observed for the installation of steam engines in breweries located in the larger centres of population in both provinces, the cities Galway, Derry/Londonderry and Belfast. This, perhaps, suggests that the majority of the breweries located outside of Ireland's three largest cities

[24] Valuation Office surveyors, writing in 1848, noted that the brewery was worked by a condensing engine. See catalogue entry WD 009-001 for full reference.

[25] An engine house is depicted at the Watergate Brewery on the 1841 1:1056 OS map of Bandon (NAI/OS140/Bandon). Valuation Office surveyors, writing in 1850, noted that McCarthy's Brewery was powered by a combination of water power and an 8hp engine, see catalogue entry CK 141-001 for full reference. DOENI-IHR (11072) surveyors recorded that the Portaferry Brewery and Distillery was also powered by a combination of water and steam power in 1836, citing a Valuation Office *House Book*, original not viewed. The brewery in Navan was offered for sale with a 3hp steam engine in 1842, *Drogheda Argus and Leinster Journal* 19/03/1842, 3.

[26] Valuation Office surveyors confirmed Darley as the proprietor in 1845, see catalogue entry DN 023-001 for full reference. The brewery had been acquired by Cartan before 1856 and closed in 1857; *Nation* 26/04/1856, 9; *Freemans Journal* 15/12/1857, 1.

and the towns located in the barley growing regions of the south and east remained technologically stagnant before 1850.

There also appears to have been little correlation between the adoption of steam power and the success of a brewery. Of the breweries where steam engines are known to have been installed during the first half of the century, some twelve are known to have closed before the mid-to-late-1850s. These included the Portaferry Brewery and Distillery, both breweries operated by Walker in Fermoy and Limerick city, the John's Gate Brewery in Limerick city, Pim's Brewery in Youghal, county Cork, Gernon's Brewery in Drogheda and Read's Brewery in Kilkenny city, as well as several that have previously mentioned as having closed.[27] The majority of the closures can be dated to between 1840 and *c*. 1855, correlating with a period of decline in the industry, outlined in Chapters 2 and 3. This shows that the installation of a steam engine and the consequent move towards steam-powered automation did not insulate a brewery from the outside factors that drove this decline.



Plate 7.14 Two-column, independent beam engine. Originally installed at the St. Francis's Abbey Brewery, Kilkenny city. Now at the Straffan Steam Museum, county Kildare.



Plate 7.13. A-frame independent steam engine. Originally installed at the Watergate Brewery in Bandon, county Cork. Now at the Straffan Steam Museum, county Kildare.

While the historic record for the adoption of steam engines by Irish breweries in the period 1820-50 is reasonably rich, though certainly not comprehensive, the archaeological evidence is limited. The evidence is confined to just two steam engines from brewery contexts, both of which are preserved at the Straffan Steam Museum in county Kildare where they are maintained as working exhibits. Just one is confirmed to have worked in an Irish brewery before 1850. It is a two-column independent beam engine that is believed to have been installed at the St. Francis's Abbey Brewery in Kilkenny in 1847, where it continued to work until 1930 (Rynne 2006, 59; plate 7.14). The second

[27] Full details on the dates of closure are provided in the individual catalogue entries.

brewery steam engine preserved at the museum formerly operated at the Watergate Brewery in Bandon, county Cork (plate 7.13). Unfortunately, the full history of the engine remains unclear. It is an independent, A-frame beam engine that is believed to have been one-off casting rather than a production model and is likely to have been manufactured by an Irish iron foundry in the 1830s (Rynne 2006, 59; R.C. Guinness pers. comm.). It is believed to have been out of use by 1913 when the brewery was acquired by Beamish and Crawford, who converted the site into a bottling store and mineral water manufactory. Before 1913, the engine had powered line-shafted equipment within the brewery's bottling stores. While the engine may have been sourced second hand in the late-19th century, its likely date of manufacture raises the possibility that it was the steam engine installed at the brewery before 1841. It may well have been replaced by a more-modern engine in the late-19th or early 20th century, with the original engine being moved to the brewery's bottling stores where it continued to work. However, without further sources this remains a tentative suggestion.

7.3.3 Steam power in the Irish brewing industry after 1850

While the period 1820-50 saw the diffusion of steam-powered technology from the large port cities to breweries located in market towns, it was the decades that followed 1850 that saw the widespread adoption of steam engines by Irish breweries. The evidence suggests that most, if not all, of the newly founded breweries of the 1850s and 1860s had installed steam engines, probably from foundation, while several pre-existing breweries can be shown to have adopted the technology before the 1870s. The second half of the 19th century also saw larger breweries expand their steam power and, by the late-1880s, it was common for multiple steam engines to be at work in the larger breweries, each dedicated to a particular task or tasks.

As was previously stated, steam engines were commonly installed in the newly founded breweries of the 1850s and 1860s. The majority of the breweries founded in the period, both large and small, appear likely to have been steam powered from foundation, though, as was previously seen with breweries founded in the 1820s and 1830s, direct evidence for the installation of an engine generally post-dates the foundation of the brewery itself. Breweries founded in the 1850s that are known to have installed steam engines include the Lady's Well Brewery in Cork city, Read's Brewery in Dublin city, the William Street Brewery in Limerick city and two otherwise undocumented breweries; one located on Bowling Green in Galway city and one on Parkgate Street in Dublin city.[28] It

[28] A measured survey of the Lady's Well Brewery, composed in 1856 when the brewery was founded, depicts two engine houses and three boiler rooms; reprinted in Ó Drisceoil & Ó Drisceoil 1997, 31. Read's Brewery in Dublin is known to have installed a steam engine before 1861, *Irish Examiner* 25/02/1861, 2. The William Street Brewery and both of the otherwise undocumented breweries were short-lived. All three were offered

can be safely inferred that the Mountjoy Brewery in Dublin had also installed a steam engine at its foundation. The brewery, which was founded in 1852, is one of the few Irish breweries that are known to have been designed by a British brewery architect, the London-based Robert Davidson (Pearson 2014, 95). Several further breweries founded in the period are known to have installed steam engines. The dates of foundation for the majority remain unclear and the earliest evidence for their operation dates from the 1860s. These include several newly constructed breweries, such as the St. Mary's Well Brewery in Carlow town, the Belfast and Ulster Brewery in Belfast and three otherwise undocumented breweries, two located in Mullingar, county Westmeath, and one in Kilkenny city.[29]



Plate 7.15 Engine house and chimney, dating to the mid-1860s reconstruction. The Cambrickville Brewery, Dundalk, county Louth.



Plate 7.16 Engine house and chimney, dating to the mid-1860s reconstruction, on left. The chimney has been truncated and the engine house directly adjoins the truncated former brewhouse, in centre. The Millpark Brewery, Enniscorthy, county Wexford.

The period also saw the conversion of three distilleries into breweries; the Castledesmond Brewery in Tralee, county Kerry, the Riverstown Ale Brewery, outside Cork city, and the City of Dublin Brewery. The Riverstown Ale Brewery was water powered and it is unclear whether a steam engine ever worked at the site. Each of the remaining two sites had been steam powered in their previous use as distilleries and the Castledesmond Brewery is known to have used the pre-existing steam engine following its conversion to a brewery.[30] Steam engines were also commonly installed in breweries that were either partially or wholly reconstructed in the period. Engine houses and chimneys dating the to the 1860s survive at both the Cambrickville Brewery in Dundalk, county Louth,

for sale in the early 1860s, complete with steam engines, and each was said to have been founded in the late 1850s; *Freemans Journal* 05/06/1861, 1; 22/01/1863, 1; 22/02/1864, 1.

[29] *Waterford News and Star* 30/09/1864, 2; *Freemans Journal* 03/04/1865, 2; 08/05/1865, 2; *Irish Examiner* 01/05/1873, 4; *Belfast Newsletter* 16/04/1881, 1.

[30] *Freemans Journal* 07/06/1859, 1; 21/09/1863; *Kerry Evening Post* 19/08/1865.

and the Millpark Brewery in Enniscorthy, county Wexford, where the chimney stack has been truncated (plates 7.15 & 7.16).

Certainly, by the 1870s it would appear likely that the majority of Irish breweries were steam powered, though direct evidence remains elusive in many cases. Of breweries not previously mentioned, both Cherry's Brewery in New Ross, county Wexford, and the Cromac Brewery in Belfast are known to have installed steam engines before the late-1870s.[31] The earliest direct evidence for the use of steam engines at the North Anne Street Brewery in Dublin comes from the late-1880s, though it would appear likely that the brewery, one of Dublin's largest, had long engaged with steam-powered automation at that time. While steam power seems to have been prevalent by the 1870s, several breweries are known to have continued to operate either manually or by horse power. For instance, steam engines were first installed in the St. Brigid's Well Brewery in Dungarvan, county Waterford, following its acquisition by the Marquis of Waterford, who invested in new plant at the brewery (Callan MacArdle & Callan 1902, 484). It is unclear when this investment was made though the previous owner, Dower, was listed as being the proprietor of the brewery in 1881, suggesting that the brewery's first steam engines were installed after that date (Slater 1881). At least one further brewery that had not engaged with steam-powered automation is known to have produced into the 1880s. As was outlined in Chapter 6, Pim's Brewery in Mountmellick continued to mash by hand until its closure in 1885, suggesting that a steam engine was never installed at the site.[32]

As was seen in the period before 1850, there appears to have been little correlation with a brewery's engagement with steam-powered automation and its success. Of the newly founded breweries of the period 1850-70 that are known to have installed steam engines, just two, the Lady's Well Brewery in Cork and the Mountjoy Brewery in Dublin, continued to produce into the 1890s. Indeed, several were particularly short-lived. The Belfast and Ulster Brewery, the William Street Brewery in Limerick and each of the otherwise undocumented breweries, in Dublin, Galway, Kilkenny and Mullingar, produced for a period of ten years or less.[33] By and large, the only evidence for their existence is sales notices in newspapers. Clearly, the level of technological advancement did not influence their closures. Instead, it would appear likely that each had been founded as a somewhat speculative investment, perhaps aiming to meet the demands of a market that was already being met or, indeed, producing a product that there was no demand for. The closures also coincide with the period where Guinness grew to become the dominant brewery in Ireland. By 1864, the brewery was

[31] A steam engine was included in the contents of the Cromac Brewery, which were offered for sale after the brewery had closed; *Belfast Newsletter* 01/10/1878, 4. Cherry's Brewery in New Ross, who were in the process of installing a new steam engine, offered their earlier engine for sale in 1881; *Wexford People* 02/04/1881, 3.
[32] *Leinster Express* 19/12/1885, 4.
[33] See pages 178-9, footnotes 28 & 29.

producing more than half of the beer consumed in Ireland outside of Dublin (Lynch & Vaizey 1960, 201). This raises the possibility that Guinness's expansion in output after 1855, which, as was outlined in Chapter 2, was primarily targeted at the Irish market, did come at the expense of breweries located outside of Dublin. This runs counter to Lynch and Vaizey's (*ibid*.) suggestion that Guinness's expansion in the Irish market did not have a major impact on the trade of Ireland's regional brewing industries.

By the 1880s, multiple steam engines were in operation in the larger Irish breweries, typically dedicated to a particular task or tasks. Multiple engines were in use at each of the breweries visited by Barnard (1889-91), who typically provided some information on the engines themselves, though the descriptions were not always comprehensive. For instance, no reference was made to the steam engines at either of the Phoenix Brewery in Dublin or the St. Finnbarr's Brewery in Cork. The St. Finnbarr's Brewery is known to have installed three steam engines before 1873, each installed when the brewery was overhauled between 1865 and 1870 (Johns 1873, 11; Barnard 1889-91 vol. 4, 327-9). The Phoenix Brewery appears likely to have operated a multitude of engines; the movement of raw materials within the brewery was, at the time of Barnard's visit, highly automated and spread across a large site (Barnard 1889-91 vol. 1, 68-81). Barnard's (1889-91 vol. 2, 363-71) description of Watkins's Brewery in Dublin also appears to have under-recorded the number of steam engines in use at the brewery which, as with the Phoenix Brewery, appears to have been highly automated. Just one beam engine was referred to in the description, while each of the brewery's two mechanical refrigerators were operated by dedicated engines. Of the remaining breweries described, the Southgate Brewery in Cork was operated by just two engines, both beam engines of 16hp (Barnard 1889-91 vol. 4, 325). One was an antiquated beam engine, the engine that was unreliably claimed to have been installed in 1798, while the second was said to have been installed at the brewery in the 1850s and had been manufactured by McSwiney of Cork. Three steam engines were said to have been at work at the Mountjoy Brewery in Dublin (Barnard 1889-91 vol. 2, 389, 394). Two were of 30hp and were located in the brewery's primary engine house, one a beam engine and one a horizontal engine, while the brewery's cask-washing shed had its own dedicated engine.

Each of the remaining breweries described were operating a plethora of steam engines, generally dedicated to a particular task or tasks. Six engines were described at both the Anchor Brewery in Dublin and Murphy's Brewery in Cork, while eight were then in use at Beamish and Crawford in Cork and nine at the North Anne Street Brewery in Dublin (Barnard 1889-91 vol. 1, 544-9; vol. 2, 350-62, 372-83, 396-406). Included in the numbers are the dedicated engines that powered the breweries' mechanical refrigerators. Both Beamish and Crawford and the Lady's Well Brewery were operating two apiece. As was outlined in Chapter 7, neither the Anchor Brewery nor the North Anne Street Brewery appear to have engaged with the technology, at least by the time of Barnard's visit. As

was seen at the Mountjoy Brewery, each of Beamish and Crawford, the Lady's Well Brewery and the North Anne Street Brewery had dedicated engines in their cask-cleaning sheds, operating cask elevators with waste steam used for scalding casks. Small engines were commonly employed in each of the three breweries, with dedicated engines for hoisting and pumping recorded at each of Beamish and Crawford, the Anchor Brewery and the North Anne Street Brewery. At Beamish and Crawford, the brewery's engineering and mechanics departments each had dedicated engines to power their machinery. The primary engines at the two Cork city breweries were large and operated both prime brewing plant and machinery for the movement of raw materials, such as bucket elevators, conveyors, Archimedean screws and, in the case of Beamish and Crawford, two tramways for the movement of malt and coal. Beamish and Crawford's two primary engines were both horizontal condensing engines of 35hp and 40hp, installed when the brewery was refitted after 1865. The Lady's Well Brewery's primary engines comprised one 30hp horizontal engine and one 60hp vertical engine. The primary engines at both the Anchor Brewery and the North Anne Street Brewery were smaller. At the Anchor Brewery, the brewhouse was powered by three condensing beam engines of 25, 16 and 10hp, while the brewhouse at the North Anne Street Brewery was powered by two engines, one an 18hp horizontal engine and one a 12hp vertical engine. This, perhaps, suggests that the automated movement of raw materials within both breweries was at least partially powered by their smaller ancillary engines.

Barnard, unsurprisingly, recorded that the largest number of steam engines had been installed at Guinness (*ibid*., vol. 3, 2-43). There, some 51 steam engines were then in operation, providing more than 2,000hp combined. This is a larger horsepower than was recorded by the Railway Commissioners for each engine installed in Belfast before 1838, where the combined horsepower of the steam engines was said to be 1,274hp (McCutcheon 1976). It truly dwarfed the total horsepower recorded by the Commissioners in Dublin, where the combined horsepower was said to be 438hp. Some six of the 51 engines recorded by Barnard at the brewery were dedicated to mechanical refrigeration, while the brewery's wells, malt stores, maltings, engineering department, cooperage and cask-washing facilities each had their own dedicated engines. Both brewhouses at the brewery also had dedicated engines. Barnard recorded that Brewhouse no. 1 was powered by two beam engines, one of 15hp that had been installed in 1827 and one of 100hp that had been installed in 1852 and was manufactured by the Drogheda Ironworks (Steven 1958, table 3). A third engine, which was not referred to by Barnard, is known to have been installed in the brewhouse in 1871 and likely acted as a spare. It was a horizontal engine and was also manufactured by the Drogheda Ironworks (*ibid*., table 3). Brewery no. 2 was powered by two large vertical engines, each of 150hp, one of which acted as a spare (*ibid*., 26).



Plate 7.17 Engine room at the Belfast and Ulster Brewery. Note the brick-built, triple jack arched ceiling supported on cast-iron columns and the sliding fire doors.



Plate 7.18 Northern set of sliding fire doors in the engine room at the Belfast and Ulster Brewery. They are, potentially, original to the space. The second set was replaced in 1949.

Apart from the engine houses and chimneys at the Cambrickville Brewery in Dundalk and the Millpark Brewery in Enniscorthy, very little physical evidence for the widespread adoption of steam power by the Irish brewing industry after 1850 has been recorded. The former engine room of the Belfast and Ulster Brewery has been identified. It is located in the ground-floor of the brewhouse, adjacent to the barrel-vaulted, fire-proofed space that housed the coal-fired furnace for the brewery's coppers, outlined in Chapter 6. It is also a fire-proofed space. The roof of the engine room comprises three brick-built jack arches supported on cast-iron columns, while the room is separated from both the barrel-vaulted space that housed the furnace and the remainder of the brewery by two sets of sliding fire-proof doors (plates 17 & 18). The southern set of fire-proof doors bears a maker's mark, stating that they were manufactured in 1947 by Mather and Platt, while the northern set, which features differing strapwork, may well be original to the space.

The survey has identified just one surviving stationary steam engines that had been installed in an Irish brewery after 1850. It is a horizontal, non-condensing engine that was manufactured by Spence of Dublin and was installed in *c.* 1896 in the brewery's Cooke's Lane Maltings, located on the north side of James's Street, where it was used to power elevators, conveyors and screening plant (Bowie 1980; E. Colgan pers. comm.; plate 7.19). The engine, which is preserved at brewery's visitor centre, the Guinness Storehouse, though is not on general display, is believed to be the only surviving engine of its type that was manufactured by a southern Irish iron foundry, with other similar surviving engines of the type having been manufactured by foundries located in Belfast (Rynne 2006, 65).



Plate 7.19. Horizontal non-condensing engine by Spence of Dublin. Installed in Guinness's Cooke's Lane maltings in c. 1896. Guinness Storehouse, Dublin.

7.4 The electrification of the brewery

The electrification of the brewery in Ireland had begun in the 1880s. Indeed, the construction of Guinness's Brewery no. 2 from 1877-9, which was illuminated by electric lights powered by Siemens dynamos, remains the earliest recorded use of electric lighting in Ireland (Rynne 2006, 247). It was in 1883, when a Swiss-designed Burgin dynamo was installed, that the first permanent installation of electric lighting was made at the brewery, confined initially to just the offices (Stevens 1959, 50). While Stevens did not record the expansion of the brewery's use of electrical power in the 1880s, by the time of Barnard's (1889-91 vol. 3, 36-7) visit, a total of 526 electric lights had been installed across the wider complex, illuminating each department. Beyond Guinness, little direct evidence for the use of electric lighting in the late-19th century has been observed. Barnard (1889-91 vol. 2, 548) recorded the use of electric lighting at just one further Irish brewery, the Lady's Well Brewery in Cork. However, the use of electric lighting was probably widespread by the end of the century and the installation of electric lighting at the Lough Gill/Sligo Brewery before 1899 shows that its use was not solely confined to Ireland's largest breweries.[34]

Despite the installation of electric lighting in breweries in the 1880s, it was not until the late-1890s that electrically driven motive power was applied to prime brewing plant, while the first fully electric brewery in England was erected in 1903, the Brampton Brewery in Chesterfield, Derbyshire (Pearson 2014, 173-4). Both Guinness and Beamish and Crawford were early proponents of the

[34] *Sligo Champion* 20/09/1899, 8.

technology, Guinness particularly so. As was seen in Chapter 5, the first pieces of electrically driven brewing plant installed at Guinness were the mills and equipment of Kieve no. 17 (Steven 1958, 3-4). Installed in Brewery no. 1 in 1899, they acted as protypes for the equipment installed in Brewery no. 2 when it was expanded between 1900 and 1928. Their installation precipitated the transition from single-phase to three-phase electrical power. Indeed, the company appears to have under-estimated the power requirements of the plant. Single-phase generating plant, manufactured by Willens and installed in two phases in 1898 and 1899, was immediately replaced by higher capacity three-phase generating plant in 1899, manufactured by Browett Lindley (Stevens 1959, table ix). While each piece of plant installed at the brewery from 1900 was electrically powered, the pre-1900 plant continued to be powered by steam engines. Indeed, the brewery's full transmission to electric power was not completed until 1947 (Stevens 1959, 26).

Beamish and Crawford's use of the new technology post-dated Guinness's, though not by a significant period of time. The earliest use of electrical power at the brewery recorded by Hamond (2010, 7) dates to 1906-7 when, as was also seen in Chapter 5, the brewery installed electrically driven roller mills. Unfortunately, Hamond did not outline the further adoption of electric power at the brewery and, while the surviving mash tun, installed in the 1910s, was electrically driven, the extant electrical motors at the site were dated to the mid-20th century by Hamond (2010, 20, 44).

Unfortunately, little more can be said about the early electrification of the industry beyond these few examples. However, it can be stated that Ireland's largest breweries were at the forefront of the movement towards the electrification of the wider brewing industry. While neither Beamish and Crawford nor Guinness had wholly electrified at an early date, this may have been influenced by both the logistical difficulties and costs that would have been involved in overhauling their late-19th century plant. Indeed, as was outlined in Chapters 5 and 6, Guinness tended to adopt a mixed progressive and conservative approach to brewing plant during the second half of the 19th century. Newly installed plant at the brewery tended to be of the most recent design, while older plant, which in some cases was worked for a half century or more, was only updated or overhauled as necessity required.

As with stationary steam engines of the second half of the 19th century, very little evidence for the early electrification of Irish breweries has been recorded in the course of the survey. While electric motors have survived at each of Guinness, Beamish and Crawford, the St. Mary's Brewery in Waterford city and the Mill Park Brewery in Enniscorthy, each appears likely to post-date 1930. Guinness provides the only direct physical evidence of early electrification recorded. A gas engine, similar in form to a horizontal steam engine, is preserved *ex situ* at the brewery's visitor centre, the Guinness Storehouse, though as with the horizontal steam engine by Spence of Dublin, it is not on

general display (plate 7.20). The engine, manufactured by Crossley Brothers Ltd. of Manchester, was installed in the brewery's racking room in 1895 and was used to power dynamos that in turn powered an electrical light system (E. Colgan pers. comm.). While no further evidence of the early electrification of the brewery has been recorded, it would appear likely that fabric dating the late-19th and early 20th century electrification of the brewery, such as cabling and junction boxes, survives within the wider brewery complex

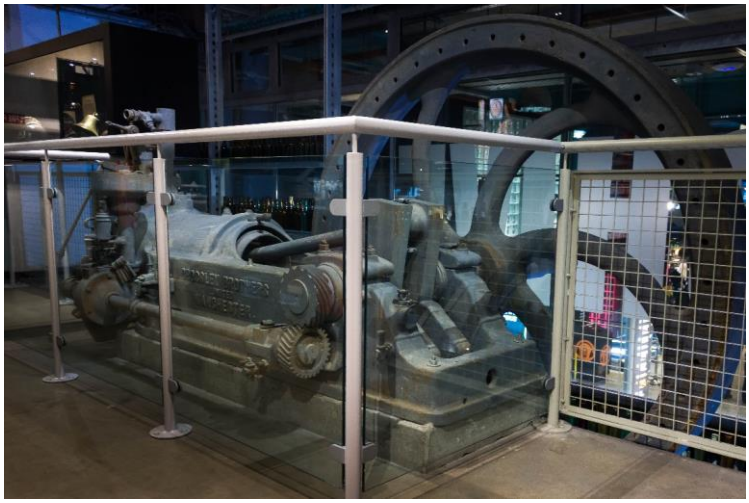


Plate 7.20. Gas engine, manufactured by Crossley Brothers Ltd., Manchester. Dating to 1895 and used power an electrical light system. Guinness Storehouse, Dublin.

7.5 Conclusions

The development of motive power sources in the Irish brewing industry appears to have broadly followed the well-documented developments in Britain. Prior to the adoption of steam engines, Irish breweries were typically powered by horse wheels and, where available, water power was also exploited. Indeed, both forms of motive power continued to be exploited by Irish breweries following the advent of steam-powered automation, with pre-industrial technology continuing to be used at some Irish breweries to at least the 1880s.

The diffusion of steam-powered technology to the Irish brewing industry from London appears to have begun in the late-1790s, with the evidence suggesting that it was confined to just Dublin city before *c*. 1810. This positions the pace of adoption of steam-powered plant by the Dublin city breweries on a par with that of several regional British brewing centres. The 1810s saw the diffusion of the technology to breweries in both Cork and Limerick cities, while it was also the decade where the first brewery located outside of the large port cities, Walker's Brewery in Fermoy, county

Cork, is confirmed to have installed a steam engine. The installation of the engine at Walker's Brewery was likely overseen by John Rennie, who had previously worked in the London porter breweries, suggesting that London remained the source of the diffusion and that the technology had not spread outwards from Dublin. It is not until at least the late-1820s that further evidence for the installation of steam engines in breweries outside of the large port cities has been observed. It would appear likely that it was the 1830s that saw the beginnings of the widespread adoption of the technology by Irish breweries, many of which were new foundations of the period. The use of steam engines in breweries was then largely confined to Munster and Leinster. Just one steam-powered brewery has been identified as operating in either Connaught and Ulster before 1850.

In the decades that followed 1850, the installation of steam engines in Irish breweries appears to have been common. In the period, both newly founded and re-constructed breweries commonly engaged with the technology, though the use of steam-powered automation did not become ubiquitous. Indeed, technological advancement appears to have had little influence over the levels of success of a brewery. Many of the breweries where steam engines had been installed in the 1830s or in the period 1850-70 closed during periods of decline in the industry. This, perhaps, suggests that many of the newly founded breweries of the 1830s and the period 1850-70 had been founded on a somewhat speculative basis and were not supplied with enough trade to cover the initial costs of the installation of the engine and any steam-powered plant that it powered.

By the late-1880s, Ireland's largest breweries had fully engaged with steam-powered automation, while electric power, initially used only for lighting, was also beginning to see use. Multiple steam engines were common in the larger breweries of the period, many of which were dedicated to particular tasks. By then, the largest breweries were highly automated, resulting in lower labour costs and hence lower production costs. This would have reinforced the economies of scale of large-scale production, resulting in either a lower price at the point of sale or a higher profit margin for the proprietors. Guinness, then the world's largest brewery, would have felt the greatest economies of scale. The sheer scale of steam-powered automation at the site, where 51 steam engines produced over 2,000hp combined in the late-1880s, was likely to have been one of the driving factors behind the incredible profit margins seen by the firm during the period (Dennison & MacDonagh 1998, 3-5). These profit margins enabled the brewery to continually expand its markets, often undercutting its competitors at wholesale price. They also enabled the firm to continually invest in new technologies in the brewery which, in turn, further reinforced the pre-existing economies of scale. Indeed, the brewery's early use of electric power to drive prime brewing plant, initiated in the late-1890s, should be viewed as a symptom of this quest for increased efficiency through technological investment. The

technological advancement of the brewery is just one of many reasons behind its incredible growth in the second half of the 19th century, though the extent of its influence should not be underestimated.

Chapter 8 The physical development of the brewery in Ireland

In this chapter the physical development of the brewery as a site type in Ireland will be discussed. The topic was previously covered by Rynne (2006, 244-6), whose study will be expanded upon, reinforced, and at times challenged. The primary data for the chapter is derived from the major survey of Irish breweries, with both the cartographic and physical record being utilised in the expansion of Rynne's study. The primary aim is to gauge the levels of both indigenous developments and outside influence, primarily from Britain, on the physical development of the brewery as a site type in Ireland, while the key trends in brewery architecture at various points in the extended period under consideration will also be identified. The physical development of Guinness, Ireland's largest brewery for much of the studied period, is largely omitted from the discussion, though it is referred to at key points, where relevant. The development of the Guinness site, which is unique in both its scale and international significance as the world's largest brewery in the late-19th century, will instead be covered in the chapter that follows.

The chapter is divided into three primary sections. The first section introduces each of the component parts of the wider brewery complex, alluding to building form, the factors that led to the individual buildings at times unique architectural signature, and outlining the rates of survival for each building type. The second and third sections, which are separated chronologically, will look at the evolution of the brewery complex in the periods before and after 1850. Outlined will be the primary forms that brewery complexes took on at various points in the extended period, which in turn will be contrasted with the evidence from Britain, which relies heavily on previous works by Pearson (1999; 2014; 2016). The cartographic record provides an unrivalled and detailed record of brewery form. This is due to the fact that the majority of sites that show a good level of survival have been significantly altered, while the majority of sites have either been partially or primarily cleared following the cessation of brewing, which by and large had occurred more than a century ago. This is particularly true for the period before 1850, where the cartographic record is relied upon heavily for the discussion of both the form and evolution of the brewery complex.

8.1 The components of a brewery complex

The modern brewery developed from both the medieval common brewhouse, which had developed as early as the late-12th century in England, and the country house brewery, common in England from at least the 16th century (Pearson 2014, 16-22). Both forms of early brewery comprised a single, purpose-built building, the architecture of which was defined by the sub-processes of

brewing. Single-building breweries remained reasonably common in Ireland in the early 19th century, though their rate of survival is poor. One extant example is Hackett's Brewery in Birr, county Offaly, which probably dates to the early decades of the century. Based solely on surviving features, it appears to have been a simple two-storey maltings with a fragmentary malt kiln that directly adjoins to the south (plate 8.1). However, cartographic evidence confirms that it was a single-building brewery that was later expanded when a new maltings was constructed adjacent in *c.* 1830 (figure 8.1).[1] Further examples of small, single-building breweries, each no longer extant but identified cartographically, include the Dingle Brewery in county Kerry and the Clifden Brewery in county Galway among others.[2]



Plate 8.1. Rare surviving single-building brewhouse, probably dating to the early 19th century. Hackett's Brewery, Birr, county Offaly



Figure 8.1. Hackett's Brewery, Birr, county Offaly, depicted on the OS Manuscript Townplans; NAI/OS140/Parsonstown 1838.

While single-building breweries were not uncommon in the early 19th century, by the late-18th century the majority of Irish breweries, both small and large, were true complexes, comprising multiple buildings dedicated to a particular task or tasks. Generally speaking, each component building was a specialist building type in its own right. Before the physical development of the brewery complex as a site type is discussed, the functions and primary architectural features of each of the individual component structures need to be introduced. The buildings can be divided into four general categories. The core brewery typically comprised one or more buildings that may have been dedicated to one or more of the component sub-processes of brewing. In addition to the core brewery, a brewery complex was likely to have contained buildings related malt production and handling, the brewery maltings, and coopering and cask handling, the wider cooperage. Brewery complexes often contained a variety of ancillary buildings, the most common of which were brewers' houses, stables and coal stores, but in the largest breweries may also have included buildings such as workshops for mechanics, carpenters and wheelwrights, while the largest breweries also maintained in-house laboratories in the

[1] The 'new mill' that is captioned on the OS Manuscript Townplan was described as being a 'large store' by Valuation Office surveyors in 1854, several years after the closure of the brewery. It was then in partial use by a nearby distillery, also operated by Hackett, and its form is suggestive of a maltings rather than a mill.
[2] OS 1:10560: GY 035 1839; KY 043 1841.

later period. Maltings architecture and the architecture of buildings related to malt processing, such as malt kilns and grain stores, have been outlined in detail in Chapter 4 and do not warrant further discussion. While several architectural features of core brewery buildings were discussed in Chapters 5 and 6, they were primarily discussed in terms of their direct relationship to the various component sub-processes of brewing. As such, a general overview of the architecture of the core brewery will be outlined here, before both the wider cooperage and ancillary buildings are discussed



Plate 8.3. Historic photograph of the brewhouse at the Mill Park Brewery, Enniscorthy, county Wexford, taken in 1957. Courtesy D. Lett.



Plate 8.2. The much-altered remains of the the brewhouse at the Mill Park Brewery, Enniscorthy, county Wexford.

Within the core brewery, each of the primary stages of the brewing process itself were carried out. The component stages of the brewing process are outlined in detail in Chapters 5 and 6, which introduced several of the architectural features that can be expected in a building dedicated to each individual process. From at least the late-18th century, the various stages of brewing may have been divided between several component buildings that typically adjoined, though were occasionally disassociated. Early examples of core breweries are reasonably uncommon survivors, though the *House Books* that were compiled in preparation of the *Primary Valuation* contain unrivalled detail on the makeup, if not the exact layout, of many early brewhouses. For example, the core brewery of the Glen Brewery in Kinsale county Cork, surveyed in 1850 by Valuation Office surveyors, comprised separate structures that housed the brewery's coppers, mill and cooling plant, each recorded as being a 'shed'.[3] A similar arrangement is evident at Gernon's Brewery in Drogheda, county Louth, where the core brewery, surveyed in 1838, was recorded as comprising a separate mashing house, copper shed and vat house among other structures.[4] The trend for core breweries that were divided into various component structures continued into the second half of the 19th century. For example, historic photographs of the much-altered 1860s brewhouse at the Mill Park Brewery in Enniscorthy, county

[3] See catalogue entry CK 112-001.
[4] See catalogue entry LH 024-003.

Wexford, show that it comprised two adjoining buildings that had been constructed in a single phase but were architecturally distinct (plates 8.2 & 8.3). While it was common for the component processes of brewing to be divided between two or more buildings, purpose-built, single-building brewhouses contained within a wider brewery complex were constructed throughout the 19th century. Wickham's Gibson's Lane Brewery in Wexford town is an extant example that probably dates to the early 19th century (plate 8.5). Further extant examples include Thomas Murphy's Brewery in Clonmel, county Tipperary, which dates to *c*. 1830, and both the Belfast and Ulster Brewery in Belfast and the St. Mary's Well Brewery in Carlow town, each constructed in the 1860s (plates 8.4, 8.28 & 8.36).[5]

Core brewery buildings tend have a distinct architectural signature that, when historic fabric survives, can provide insight into their former uses. As is outlined in Chapter 5, the interiors of buildings that housed brewing coppers may have featured vaulted areas at ground-floor level, forming fireproofed spaces that contained the furnaces that fired the brewing coppers. Extant examples have been recorded at Beamish and Crawford in Cork city, dating the late-18th century, and at both the Mill Park Brewery in Enniscorthy, county Wexford, and the Belfast and Ulster Brewery in Belfast, both dating to the 1860s. While this was a common arrangement, it was not the only potential arrangement and not every brewery sought to fireproof the furnaces that fired their coppers. For example, the undated plans of the River Lee Porter Brewery in Cork city, which closed in 1813, indicate that the interior of the brewhouse was a full-height space with the coppers located on raised platforms rather than on a distinct floor level (figure 6.1). A similar arrangement survives at the St. Mary's Brewery in Waterford city, a brewery that was entirely overhauled in 1899-1901. As was also outlined in Chapter 5, the coppers themselves were replaced by mid-to-late-20th century examples that stand on freestanding settings which, while rendered, would appear likely to have been installed in the brewery's overhaul in 1899-1901. The suggestion is that they were coal fired and were not fireproofed and if so evidence of their former furnaces should be maintained within the settings themselves.

[5] Thomas Murphy's Brewery was reconstructed in *c*. 1830 following fire damage received in 1829 (Callan MacArdle & Callan 1902, 486; Rynne 2006, 246). While Pearson (1999, 46, 182) stated that the Belfast and Ulster Brewery had opened in 1869, further sources state that construction of the brewery had begun in 1864 and works and had been completed by 1867 (PRONI/D1905/1/1; Boyle 2007, 48). The St. Mary's Well Brewery had been founded before 1865; *Freemans Journal* 03/04/1865, 2.



Plate 8.5. Single-building brewhouse at Wickham's Gibson's Lane Brewery in Wexford town, on right. Probably dating to the early 19th century.



Plate 8.4. Single-building brewhouse at the St. Mary's Well Brewery in Carlow town, constructed in the early 1860s.

Ventilation is another distinctive characteristic feature of a brewhouse, one that was also introduced in Chapter 5. Roof ventilators were typically located directly above the large shallow coolers that were the predominant form of cooling technology utilised until the late-19th century. Two distinct forms of roof ventilator have been recorded. Ridge ventilators, which span the entirety of the apex of the roof structure, have survived at Beamish and Crawford in Cork city and the St. Mary's Brewery in Waterford city, while a smaller, more-simple ventilator, square in plan, is maintained at Wickham's Gibson's Lane Brewery in Wexford town. Large windows, which would have been louvered rather than glazed, were also commonly used for ventilation within a brewhouse. One late-18th century example is the River Lee Porter Brewery in Cork city, which was constructed with double-height windows on both the southern and western elevations of the brewhouse itself. The brewhouses at both the St. Mary's Brewery in Carlow town and the Belfast and Ulster Brewery in Belfast, both dating to the 1860s, feature large windows in their upper floors. In each of these three cases, the original roof structures have not survived, leaving the possibility that cooling was further aided by roof ventilators, an arrangement that can be seen at Wickham's Gibson's Lane Brewery in Wexford town.

When the component sub-processes of brewing were divided between separate buildings, ventilation also appears to have been a reasonably a common feature in fermentation blocks, where it probably served to dispel the carbon dioxide produced by the fermenting yeast. This can be seen at the fermentation block constructed in 1899-1901 at the St. Mary's Brewery in Waterford city, which features a ridge ventilator that is now glazed (plate 8.7). In Chapter 6 it was proposed that, in this case, the cooling process may have also been carried out in the upper floor of the fermentation block, perhaps following the adoption of mechanical refrigeration. The majority of the surviving buildings of the Cambrickville Brewery in Dundalk, county Louth, feature a variety of different roof ventilators (plate 8.6). Unfortunately, interior access to the buildings has not been attained and, as such, their

former uses have not been identified, though it would appear likely that the ventilated buildings housed the brewery's mills, coppers and fermentation plant.



Plate 8.7. Fermentation block at the St. Mary's Brewery, Waterford city, constructed in 1899-1901.



Plate 8.6. Ventilated core brewery buildings at the Cambrickville Brewery, Dundalk, county Louth.

The layout and arrangement of the core brewery was defined by the principal in which raw materials and product were moved within, with breweries generally said to have operated on either a pumped or gravitational principal. Breweries that operated on the gravitational principal, which were often referred to as being vertically arranged, tended to locate the plant for each of the component sub-processes of brewing in such a way that gravity could be used for the transfer of both liquid and solids from top to bottom (Mathias 1959, 38-42; Pearson 2014, 27). This arrangement was common in English breweries during the 18th century, and it was assumed in the majority of breweries in the middle decades of the century. The vertical arrangement eventually led to the distinctive Victorian tower breweries that are a common survivor in England, with one significant survivor being the Hook Norton Brewery in Oxfordshire, constructed in 1898-1900 and still at work today (Pearson 2014, 79-81, 100).

The plans of the River Lee Porter Brewery confirm that the vertical arrangement was being applied to purpose-built breweries in Ireland at the close of the 18th century (figure 6.1). While the arrangement is reasonably difficult to identify based solely on external architectural features, contemporary sources confirm that the Belfast and Ulster Brewery in Belfast, constructed in the 1860s, was vertically arranged.[6] Typical examples of Victorian tower breweries are rare in Ireland, with the Castlebellingham Ale Brewery in county Louth, which likely dates to *c.* 1870, being one of only two survivors (plate 8.9).[7] The second survivor is Guinness's experimental brewery, a late example that was constructed in 1904 (Dennison & MacDonagh 1998, 85; plate 8.8). While the rate of survival is reasonably poor, it appears likely to mask a trend for the construction of more-typical tower breweries

[6] *Irish Examiner* 01/05/1873, 4.

[7] A full descriptive survey of the brewery was not possible. NIAH surveyors dated that standing remains to *c.* 1870 (NIAH: 13826015). Cartographic evidence confirms that the brewery was reconstructed between the 1835 1:10560 OS and the 1908 1:2500 OS; LH 015.

in the second half of the 19th century in Ireland. For example, the brewhouse constructed at Murphy's Lady's Well Brewery in the 1850s, which does not survive, was erected as a three-storey tower that an engineering plan of the brewery, dated 1856, confirms was vertically arranged. Each of the previously discussed single-building brewhouses, such as Wickham's Gibson's Lane Brewery in Wexford town and the St. Mary's Well Brewery in Carlow town, would also appear likely to have been constructed on the vertical principal, which, as in England, appears to have been commonly applied to Irish breweries constructed over an extended time period, from the late-18th century through to the early 20th century.



Plate 8.9. The Castlebellingham Ale Brewery, county Louth. A rare example of a Victorian tower brewery in Ireland, likely constructed in c. 1870.



Plate 8.8. The experimental brewery, Guinness, Dublin city. A tower brewery constructed in 1904.

While the vertical arrangement of both the plant and buildings was labour efficient, the prevailing opinion in the late-19th century was that it was best suited to breweries that had a reasonably modest output (Pearson 2014, 80-1). The majority of large breweries tended to operate on the pumped principal, where both brewing plant and buildings were primarily arranged horizontally adjacent to each other. The horizontal arrangement appears to have been the result of the expansion of motive power in London's large porter breweries during the late-18th century, outlined in Chapter 7. Early 19th century etchings of Whitbread's Chiswell Street Brewery in London depict the arrangement at what was the world's largest brewery at the close of the 18th century (Pearson 2014, 29).[8] Horizontally arranged breweries, where possible, also utilised aspects of the gravitational arrangement, in particular for the movement of liquids (Pearson 2014, 80-1). This can best be seen in the large cast-iron water tanks that were commonly located on the roofs of brewery buildings.

[8] At least three different editions of the etching were composed, each of which were based on original drawings by John Farey Jr. that were composed in the 1810s. Two editions have been recently reprinted by Pearson (1999, 26; 2014, 159) and Sumner (2005, 73).



Plate 8.11. Rooftop rivetted cast-iron water tank at Beamish and Crawford, Cork city.



Plate 8.10. Rooftop rivetted cast-iron water tank at the City of Dublin Brewery, originally constructed as a distillery by John Busby in 1836.

Two examples of rooftop water tanks have survived at Beamish and Crawford in Cork city. One is a vast water tank that spans the entirety of the roof of the brewery's former fermentation block and was said to have the capacity to hold as many as 32,000 gallons (145,475 litres) of water that was used for cleaning and firefighting in the late-1880s (Barnard 1889-91 vol. 2, 358; plate 8.11). The second, which is located above the brewery's 1818 engine house, was used to store water for the brewery's steam engine boilers. A further example, dated to 1836, survives atop the City of Dublin Brewery in Dublin city, which was originally constructed as a distillery (plate 8.10). As with Whitbread's in London, Beamish and Crawford had primarily utilised the horizontal arrangement for much of the period under consideration. However, in *c*. 1870 the brewery significantly constructed a malt-milling loft that projected from the upper-floor of the core brewery, showing that the firm was adapting its product flow towards a more-vertical arrangement. The surviving core brewery buildings at the Cambrickville Brewery in Dundalk, county Louth, also appear to have operated on a combination of both the pumped and vertical principals, suggesting that when the brewery was reconstructed in the mid-1860s it was intended to have a reasonably considerable output.

Vat houses, as their name implies, contained the large maturation vats that were a near-requirement for porter brewing, as is outlined in Chapter 6. They were typically purpose-built buildings that directly adjoined the brewhouse, though in some cases they were disassociated from it. Vat houses were constructed on a scale that is suggestive of a multi-storey building. However, internally they were single-height spaces, providing the headroom required for large maturation vats, with upper-floor access provided by raised platforms or stages. This arrangement is evident the 1839 plan of the upper floor of Beamish and Crawford, which depicted such a freestanding stage within the brewery's vat house.[9]

[9] The plan is reprinted in Ó Drisceoil & Ó Drisceoil 2015, 100.



Plate 8.13. Much-altered late-18th or early 19th century vat house, the Watergate Brewery, Bandon, county Cork.



Plate 8.12. Vat houses, dating to the late-19th and early 20th centuries, arranged on either side of Belview. Guinness, Dublin city.

Vat houses have proven to be reasonably uncommon survivors. Beamish and Crawford's vat house, which had been in use as such from before 1802, was demolished in recent clearance works at the site. As was outlined in Chapter 6, a large number of vat houses have survived at the Guinness site, forming the predominant surviving historic building type at the brewery (8.12). While the surviving vat houses were constructed across a period of some six decades, between the 1860s and the 1920s, they are architecturally similar, in form if not style, with each being un-fenestrated.[10] One late-18th or early 19th century example, identified as being a vat house by cartographic evidence, survives in a much-altered condition at the Watergate Brewery in Bandon, county Cork (plate 8.13). While the building is now partially fenestrated, it would appear likely that the windows were a reasonably recent insertion and that, as with the later examples at Guinness, it was also constructed as an un-fenestrated building. In the cases of both Guinness and the Watergate Brewery, the vat houses were disassociated from the core brewery buildings, unlike the vat house at Beamish and Crawford. Where the vat houses were located apart from the core brewery, the fermented beer would have been pumped through what were, at times, particularly impressive systems of pipework. For example, at the Mountjoy Brewery in Dublin, established in 1852, Barnard (1889-91 vol. 2, 393) recorded that the fermented beer was pumped a total of 60m (200ft) through such a system to the brewery's vat houses. As was stated in Chapter 6, ale breweries did not typically mature their beer in large vats and instead had a preference for maturation in casks, typically stored in cellars. A barrel-vaulted basement, probably used for the maturation of ale in casks, survives beneath the late-19th century offices at Smithwick's St. Francis's Abbey Brewery in Kilkenny city.

[10] Of the purpose-built vat houses at the brewery, the brewery's detailed engineering plans show that the earliest, located on the south side of Rainsford Street, were reconstructed between 1862 and 1865, while the most recent, located on the north side of Belview, were constructed between 1906 and 1924 (*James's Gate Brewery, Historical Plans*. Guinness Archives, Guinness Storehouse, Dublin).

The cooperage

In the largest breweries, the wider cooperage may have been extensive, often comprising a significant proportion of the brewery complex and containing the cooperage itself, cask-cleaning sheds, cask yards and engine houses (Rynne 2006, 247). However, the cooperage of a smaller brewery may have comprised little more than a workshop, while it would appear likely that many smaller breweries did not maintain a cooperage itself and instead outsourced the manufacture and repair of casks. Indeed, Beamish and Crawford did not manufacture the majority of their own casks until the close of the 19th century, with the brewery's cooperage being used primarily for the repair of casks until it was expanded in 1896 (Ó Drisceoil & Ó Drisceoil 2015, 156). In this case, the move towards the in-house manufacture of casks appears to have been motivated by a dispute between the brewery and the Cork Coopers Society (*ibid*., 162-4). Pearson (2014, 83) stated that as much as 90% of the work of a brewery cooper was in repair rather than manufacture and Beamish and Crawford's policy of out-sourcing cask manufacture was probably one of convenience rather than necessity. This is reflected in the scale of Beamish and Crawford's cooperage which, despite the fact that the brewery's coopers primarily repaired and maintained casks, was extensive and, as is seen in the plans of the brewery, was regularly expanded throughout the 19th century. As the brewery expanded its footprint to the south, subsuming neighbouring properties, including a salt and lime works located to the southeast of the brewery, the footprint of the cooperage was expanded into these areas, with large cask yards opened and facilities such as cask cleaning sheds constructed.



Plate 8.15. The cask-making shop at Guinness in the early 20th century (Anon. 1933).

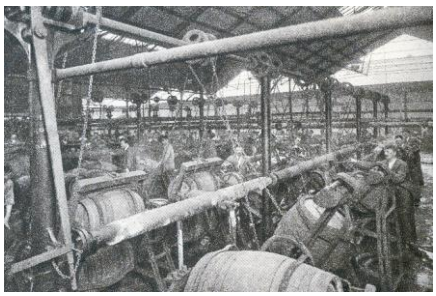


Plate 8.14. The cask-cleaning shed at Guinness in the early 20th century (Anon. 1933).

Historic images of the cooperages at both Beamish and Crawford and Guinness show that the individual buildings were essentially semi-permanent structures, constructed around a cast-iron framework and open to the elements (plates 8.14 & 8.15).[11] It would appear likely that the form of both cooperages was driven by the requirement of light for the handcraft of coopering. Elements of

[11] A late-19th century image of the cooperage of Beamish and Crawford is presented on the cover of Ó Drisceoil & Ó Drisceoil's (2015) history of the brewery.

neither cooperage have survived, probably due to the semi-permanent nature of their construction. The best physical evidence for the trade of coopering in an Irish brewery context is the extensive range of historic cooper's tools that are on display at Guinness's visitor centre, the Guinness Storehouse. The cooperages of the largest breweries were incredibly busy places where, despite the increasing use of mechanised machinery as the 19th century progressed, a significant number of both skilled and unskilled labourers were employed. Bass of Burton-upon-Trent employed as many as 400 in their wider cooperage in the late-1880s, a number that was exceeded by Guinness, whose wider cooperage employed 450, a number that included 60 skilled coopers (Barnard 1889-91 vol. 3, 29-39; Pearson 2014, 83). This was in direct contrast with the brewhouse of an industrial brewery where steam powered machinery had displaced the unskilled labour that was required for the production of beer.

Ancillary buildings



Plate 8.17. Probable stables, the Mill Park Brewery, Enniscorthy, county Wexford.



Plate 8.16. Beamish and Crawford's decorative 1902 stables on Bishop Street, Cork city.

In addition to core buildings related to malt production and processing, brewing itself and cask handling, a brewery may also have had some combination of ancillary structures which in the majority of cases show a poor level of survival. It would appear likely that all breweries maintained some stabling facilities, both for housing their dray horses and, when horse wheels were used, their mill horses. It can be assumed that brewery stables were primarily modest structures and few potential stables have been identified in the course of the survey. The probable stables at the Mill Park Brewery in Enniscorthy, county Wexford, has been identified through the survival of a drinking trough set into an exterior wall (plate 8.17). One particularly fine example has survived on Bishop Street in Cork city. It is a purpose-built stables that was erected by Beamish and Crawford and which replaced the brewery's previous stabling facilities, which had been located on nearby Cove Street (Ó Drisceoil & Ó Drisceoil 2015, 234-5). Designed by the English architects Houston and Houston and dating to 1902, it is an architecturally significant building, composed in a combination of Arts and Crafts and the Tudor revival style that was particularly common in English breweries of the period (Pearson 2016, 94; plate 8.16).

The largest breweries may also have contained various workshops for ancillary trades. The 1863 plans of Beamish and Crawford locate these workshops to the north of the core brewery, each located in buildings that were separated from the brewhouse by Lamley's Lane.[12] The 1863 plans identify both carpenter's and coppersmith's workshops, while at the time of Barnard's (1889-91 vol. 2, 361) visit to the brewery, this area also contained mechanic's workshops. As with a brewery's stabling facilities, it can probably be assumed that these workshops were modest buildings. Not one ancillary workshop has been confirmed by the survey, though the probability remains that workshops have survived in breweries that are not as well documented as Beamish and Crawford. Indeed, the non-specialised nature of the architecture of these workshops and ancillary buildings makes their identification unlikely without cartographic or historic sources to confirm their former uses.



Plate 8.19. Brewer's house, the Phoenix Brewery, Dublin city.



Plate 8.18. Brewer's house, Watkins' Brewery, Dublin city.

Unlike the remainder of a brewery's ancillary buildings, the most common surviving element of a brewery complex are brewers' houses, many of which are the sole surviving buildings of historic brewery complexes. A similar situation is evident in Britain where breweries pre-dating *c.* 1830 are reasonably rare, with the brewer's house being most-common surviving building type of commercial breweries of the Georgian period (Pearson 1999, 40). The commonality of their survival is probably related to the ease in which they have been reused without major adaptation; the majority of those identified are in domestic use today. While many appear to have served as the primary residence of either the owner or head brewer, it would appear likely that, particularly in the second half of the 19th century, they had evolved to serve as a brewery's offices. Two particularly fine examples survive in Dublin city, at the sites of the Phoenix Brewery on James's Street and Watkins' Brewery on Ardee Street (plates 8.18 & 8.19). The brewer's house at the Phoenix Brewery was likely erected in the late-18th century, perhaps by Samuel Madder who had acquired the brewery in 1788, while the Watkins' Brewery example likely dates to the early decades of the 19th century (Callan MacArdle & Callan 1902,

[12] The 1863 plans are reprinted in (Ó Drisceoil & Ó Drisceoil 2015, 101-2).

473-4; Lynch & Vaizey 1960, 90).[13] Both are typical Georgian townhouses, faced in brick with doors featuring fanlights, that had been constructed in styles that were contemporarily fashionable. In effect, they acted as the public face of the breweries that they served, presenting a contemporarily modern, street-facing façade to the industrial buildings that that were arranged to their rear.



Plate 8.21. Modestly composed brewer's house, the Borrisoleigh Brewery, county Tipperary.



Plate 8.20. Modestly composed brewer's house, the Quay Brewery, Thomastown, county Kilkenny.



Plate 8.23. Ornate office building, the Cambrickville Brewery, Dundalk, county Louth. Constructed in the mid-1860s redevelopment of the brewery.



Plate 8.22. Simple office building at the Mill Park Brewery, Enniscorthy, county Wexford. Constructed in the mid-1860s redevelopment of the brewery.

Similar brewer's houses have been recorded at many brewery sites outside of Dublin city, including, but not limited to Blake's Brewery in Tuam, county Galway, and Pim's Brewery in Mountmellick, county Laois. However, the majority of regional examples appear to have been more restrained in their architectural styling. For example, those that survive at both the Borrisoleigh Brewery in county Tipperary and the Quay Brewery in Thomastown, county Kilkenny, present modest three-bay facades with little in the way of architectural embellishment (plates 8.20 & 8.21). Brewer's houses appear to have been limited to breweries that were constructed before the late-1830s, with purpose-built offices replacing the traditional brewer's house in breweries that were constructed after

[13] The NIAH (50080325) dated the Phoenix Brewery example to *c*. 1760 and nit may well pre-date Madder's acquisition of the brewery in 1788. The NIAH (50080666) dated the Watkins's Brewery example to *c*. 1820, though it may well pre-date this by a not insignificant period.

that date. Surviving examples of purpose-built offices include, but are not limited to, the Cambrickville Brewery in Dundalk, an ornate example, and the Millpark Brewery in Enniscorthy, county Wexford, a more-modest example with no architectural pretension (plates 8.22 & 8.23).

8.2 The physical development of the brewery in Ireland before 1850

While each brewery essentially developed along a unique and individual path, constrained by local topography, financial investment and the commercial success of the brewery itself, four predominant forms of brewery arrangement were common in Ireland during the late-18th and early 19th centuries. The least common was introduced in the previous section, the single-building brewery, a form that was uncommon contemporarily and has a poor rate of survival today. Another reasonably uncommon form of brewery, at least in the 1830s and 1840s, was the farmhouse brewery, though several examples of this type have survived in a fragmentary condition, as at Bantis, near Cloughjordan in county Tipperary, and the Shrule Brewery, on the outskirts of a village in county Mayo. The final two forms, denoted here as the burgage-plot brewery and the courtyard brewery, were the predominant forms. As will be outlined below, both forms appear to have been a reaction to local topography, whether urban, suburban or rural, and both typically share several distinctive features, in particular a central courtyard, a feature that was also common in farmhouse breweries. It is worth noting that breweries that cannot be categorised within one of these four forms were also reasonably common in the late-18th and early 19th centuries. One example is Manders and Powell's Brewery in Dublin city, a brewery that had been established before 1815 and which the OS Manuscript Townplans identified as having been situated in a former barracks that had been adapted for brewing.[14] As was outlined in Chapter 7, it was the only brewery in Dublin city to exploit water power and was operated in conjunction with a flower mill, which itself may have pre-dated the brewery. The case of Manders and Powell's Brewery shows that breweries were often situated in buildings that had been re-purposed and adapted to brewing in the early period, rather than in purpose-built premises. While the evidence is far from conclusive, it can probably be assumed that a similar situation was evident at many further Irish breweries of the period, with a number of further examples outlined in the sections that follow.

[14] OS 1:1056: NAI/OS140/Dublin 1838. The trade directories suggest that the brewery had been founded after 1804, when Robert Manders was listed as brewing on Pimlico, and before 1815, the first time that the James's Street Brewery was listed (Wilson 1804; 1815).

Burgage plot breweries

Perhaps the earliest form of urban brewery was the burgage plot brewery. These breweries were situated in prime urban locations, on burgage plots situated to the rear of street-facing buildings, located centrally within a town or city. Both the cartographic and historic records provide the best evidence for burgage plot breweries, which in general have a poor rate of survival, probably owing to their location on prime urban sites that were later reused and redeveloped. Leasehold evidence shows that Ireland's largest breweries from the late-18th century, Beamish and Crawford and Guinness, had evolved as such and brewing at both sites can be dated to at least the late-17th century (Lynch & Vaizey 1960, 69-70; O'Brien 2000). The burgage plot brewery remained common in Ireland's towns and cities for much of the 19th century and many are depicted on the first edition of the OS. While dates of foundation have not been provided for the majority, where they have been the breweries had been founded at an early date. In addition to Guinness and Beamish and Crawford, early foundations included both the Phoenix Brewery and the North Anne Street Brewery in Dublin city, where brewing pre-dated the early-mid-18th century in both cases (Barnard 1889-91 vol. 2 397-8; Callan MacArdle & Callan 1902, 473-6; Magee 2015, 114-5). Given the poorly documented nature of the majority of the burgage plot breweries that have been identified in the course of the survey, it is unclear whether they continued to be established in the late-18th and early 19th centuries, or whether the form is indicative of a brewery that had been founded at an early date. Further site-specific research, focussing on the contemporary press and the Registry of Deeds among other historic sources, would be required to confirm or refute either suggestion.

A common feature of burgage plot breweries is their often-organic form, which was defined by two primary factors. Both the plan of the brewery buildings and brewery's footprint were defined both by local property boundaries and a brewery's ability to expand and subsume neighbouring properties as both need and opportunity arose. Indeed, the majority appear to have expanded beyond the limits of the original burgage plots before the first edition of the OS was compiled, though smaller breweries that were confined to the limits of restricted burgage plots were also depicted. The OS Manuscript Townplans depict many burgage plot breweries. In Drogheda, county Louth, two burgage breweries were located within close proximity on the south side of West Street (figure 8.3). The easternmost of the two, McCann's Brewery, was a small brewery that was constrained to the limits of the former burgage plot, while the westernmost, Gernon's Brewery, was larger and would appear likely to have expanded considerably in the decades that had preceded. Indeed, historical sources confirm that the brewery had been partially reconstructed, probably in the 1830s.[15] A similar situation

[15] Valuation Office surveyors, writing in 1838, had appraised the brewery buildings as being of mixed quality, with a mash house, vat house, maltings and engine house appraised as being of 1a rating, suggesting that they were then recently constructed, see catalogue LH 024-003. When the brewery was offered for sale in 1843, it

is evident in Sligo town, where two burgage plot breweries were depicted on both sides of Water Lane, formerly Brewery Lane (figure 8.2). Both breweries, which appear likely to have expanded beyond the limits of the original burgage plots, share similarities. The most substantial buildings were constructed on a north-south axis, radiating from street-facing buildings on the north side of Castle Street, and both featured a central courtyard, perhaps formed as the breweries expanded. Unfortunately, neither is extant and little is known about either brewery's 18th century histories, though malting is confirmed to have been carried out at the site of the western brewery, which was operated by J. & J. Anderson in the early-to-mid-19th century, from before 1748 (Gallagher & Legg 2012, 5, 17-18). The suggested expansion remains unconfirmed and further research, perhaps focussing on the Registry of Deeds, would be required to confirm both its phasing and temporality.



Figure 8.3. Two burgage plot breweries located to the south of West Street in Drogheda, county Louth. Depicted on the OS Manuscript Townsplans; NAI/OS140/Drogheda 1835.

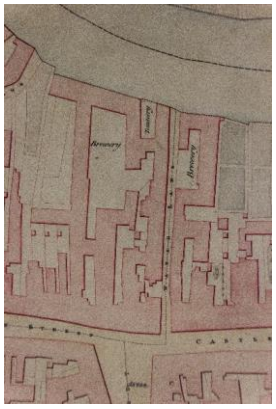


Figure 8.2. Two burgage plot breweries located ither side of Water Lane in Sligo town. Depicted on the OS Manuscript Townsplans; NAI/OS140/Sligo 1837.

The late-18th and early 19th century expansion of two burgage plot breweries in Cork city is reasonably well documented, Beamish and Crawford's Cork Porter Brewery and the Southgate Brewery. O'Brien (2000) conducted extensive research on Beamish and Crawford's complex series of historic leases, identifying that the site of the 19th century brewery had been the location of several breweries and maltings in the early 18th century. The brewery that was acquired by Beamish and Crawford in 1792 had been formed around a nucleus of buildings that had been acquired and expanded by the Allen family in the decades that had preceded. The earliest depiction of the brewery is a lease map composed in 1792 and the brewery's first detailed survey, composed in 1802, confirms

was said to have been completely overhauled in the three years pervious, suggesting that further construction had been carried out at the site in *c.* 1840; *Drogehda Argus and Leinster Journal* 22/07/1843.

that the brewery continued to expand in the decade that followed its acquisition by Beamish and Crawford. The complex nature of the leases, which is compounded by various property disputes in the general area in the 19th century, means that a detailed overview of the pre-1792 expansion of the brewery is not possible (Welply 1957). In figure 8.4, the footprint of the brewery as it stood in 1792 has been overlaid on the 1802 plan. As can be seen, the 1792 brewery bore several similarities with the burgage plot breweries located on Water Lane in Sligo town. In particular, the long axes of the buildings corresponded to the limits of former burgage plots, which had been subdivided in this case. The brewery itself had been constructed around three courtyards, with the primary courtyard, Cramer's Square, located in the site's northeast. As the brewery expanded to the north before 1802, it subsumed several pre-existing buildings whose footprints also respected the boundaries of former burgage plots. The brewery's second set of detailed plans, composed in *c.* 1818, show that it had been partially reconstructed after 1802, with building clearance and reconfiguring resulting in an expanded courtyard that replaced the three smaller courtyards that were present in 1792.



Figure 8.4. The early development of Beamish and Crawford, Cork city, after detailed plans of the brewery composed in 1802, on left, and c. 1818, on right (CCCA/MPD/U18/289 & 337). The area highlighted in orange on the 1802 plan marks the footprint of the brewery as depicted on a 1792 lease map, reprinted in Ó Drisceoil & Ó Drisceoil 2015, 41.

While Beamish and Crawford's expansion in the period was exceptional, with the brewery being Ireland's largest by output between the 1790s and 1833, a similar expansion occurred at a lesser scale in close proximity to the site, on the opposite side of South Main Street. There, the Southgate Brewery had been formed through the amalgamation of four breweries in the late-18th and early 19th centuries (Ó Drisceoil & Ó Drisceoil 2015, 165-8). In this case, all four breweries had been constructed

on a sub-divided burgage plot located to the south of the defunct Murrough's Lane, located between South Main Street to the west and Grand Parade to the east. As with Beamish and Crawford, the amalgamated brewery expanded further in the early 19th century, acquiring property to the north of Murrough's Lane between 1810 and 1814, after which the lane was subsumed within the brewery itself. In both cases on South Main Street, the breweries had essentially expanded to become a variant, or perhaps precursor, of the courtyard brewery.

As was previously stated, burgage plot breweries show a poor rate of survival. While extensive fabric of the late-18th century burgage plot brewery at Beamish and Crawford has been preserved within the 19th century brewery, it was extensively remodelled in successive redevelopment of the core brewery in the 19th and 20th centuries. The early plans of the brewery show that between 1802 and *c*. 1818, the brewery had subsumed and built over several of the laneways that had formerly separated the brewery buildings. The vestiges of these laneways survive today as east-west oriented corridors that bisect the ground floor of the historic brewery (O'Callaghan & Castle 2010, 23-4). As was stated in Chapter 4, the surviving maltings of the Newcastle West Brewery in county Limerick is amongst the few surviving remains of the smaller burgage plot breweries that had been common in Ireland during the late-18th and early 19th centuries. In this case, cartographic evidence shows that the brewery itself, which is no longer extant, was located on the opposite side of a laneway, Brewery Lane, to the extant maltings.[16]

Courtyard breweries

While burgage plot breweries remained common in Ireland well into the 19th century, the courtyard brewery, a form that was identified by Rynne (2006, 245-6), appears to have been the most-prevalent form of brewery constructed in Ireland from at least the late-18th century to the late-1830s. Unlike burgage plot breweries, courtyard breweries show a reasonably good level of survival, as complete or partially extant complexes and in fragmentary condition. In many ways, they bear similarities to the expanded burgage plot breweries of the late-18th and early 19th centuries, comprising buildings arranged around a central courtyard. However, the majority of courtyard breweries were less-organically arranged, with the brewery buildings typically forming a conjoined complex of structures that completely encompassed the central courtyard. Extant examples of this form include the River Lee Porter Brewery in Cork city, where the brewery buildings form a sub-square, quadrilateral complex arranged around the central courtyard, and Robinson's Brewery in Birr, county Offaly, where the brewery buildings had formerly been arranged around two central courtyards, the northernmost of which is extant and around which the brewery's maltings survive.

[16] OS 1:1056: NAI/OS140/Newcastle 1841.

Also common were courtyard breweries with a more-organic arrangement, where the brewery buildings did not entirely encompass the courtyard, or where organically arranged returns formed secondary or tertiary courtyards. Extant examples of this form typically do not preserve the courtyard arrangement and these breweries are generally only identifiable as such through cartographic evidence. For example, the Watergate Brewery in Bandon, county Cork, was constructed around two central courtyards (figure 8.6). While the buildings surrounding the primary, western courtyard were regularly arranged, those surrounding the lesser, eastern courtyard were organic in their form, while further buildings were located to the south, disassociated from the core brewery. Drinan's Brewery in Cork city is another example where the brewery buildings were arranged somewhat organically around two central courtyards, while the Garryowen Brewery in Limerick city is an example of a courtyard brewery that did not subscribe to a regular, quadrilateral form (figure 8.5). There, the brewery buildings, while arranged reasonably regularly, were arrayed around a large L-plan courtyard. A likely interpretation for these organically arranged courtyard breweries is that they had been constructed in two or more phases, while property boundaries no doubt had a significant impact on the form of each individual brewery.



Figure 8.6. OS Manuscript Townplan depiction of the Watergate Brewery, Bandon, county Cork. NAI/OS140/Bandon 1841.

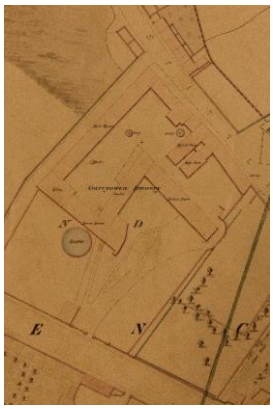


Figure 8.5. OS Manuscript Townplan depiction of the Garryowen Brewery, Limerick city. NAI/OS140/Limerick 1840.

Unlike burgage plot breweries, which were located centrally in a town or city, courtyard breweries tended to be located away from an urban centre's core. They were typically constructed in suburbs or in a town or city's outskirts, on sites that had not seen intensive development prior to the establishment of the brewery itself. This is clearly evident in Limerick city, where the first edition of the OS depicted courtyard breweries in the suburbs of Garryowen, the previously mentioned

Garryowen Brewery, and Monamuck, the Thomond Brewery.[17] Similarly, in Cork city, both Drinan's Brewery and the River Lee Porter Brewery were located outside of the medieval city, in 18th century suburbs, while a similar situation is also evident in Birr, county Offaly, where Robinson's Brewery was located in a peripheral area of the town. However, several exceptional cases have been identified where courtyard breweries were constructed in central locations in villages and towns. One key example is in the village of Oranmore, county Galway, where Kelly's Brewery, which does not survive, was constructed on Main Street in the 1820s or 1830s.[18] A late-18th century example is Walker's Brewery in Fermoy, county Cork. There, a large courtyard brewery, said to have been amongst Ireland's largest breweries in the first decade of the 19th century, was constructed with considerable street frontage centrally within the town (plate 8.24). Contemporary sources stated that the brewery had been established by John Anderson who was responsible for the town's late-18th century reconstruction and expansion, explaining the brewery's central location within the town (Townsend 1810, 490-1).



Plate 8.24. The much-altered, two-storey, eight-bay, north range of Walker's Brewery, Fermoy, county Cork.

Several purpose-built courtyard breweries that date to the late-18th and early 19th centuries have been identified by the survey. Historically documented courtyard breweries of the period include the River Lee Porter Brewery in Cork city, constructed in a single phase in 1796-7, and Deasy's Brewery in Clonakilty, county Cork, likely constructed in *c.* 1805 (Rynne 2006, 245).[19] While these two examples were purpose-built courtyard breweries, the case of the Cambrickville Brewery in Dundalk, county Louth, shows that breweries arranged in a defined manner around a central courtyard may not have

[17] OS 1:10560: LK 005 1840.
[18] The courtyard form of Kelly's Brewery is evident on the first edition of the OS; 1:10560: GY 095 1838. Valuation Office surveyors, writing in 1844, appraised the brewery buildings as being of recent construction, suggesting that they had been constructed in the 1820s or 1830s. See catalogue GY 095-001.
[19] For the likely date of construction of Deasy's Brewery see Chapter 4, note 11.

always been purpose built. In this case, the first edition of the OS depicted the brewery as comprising four ranges of adjoining buildings that were regularly arranged a central courtyard, with several more-organically arranged returns.[20] The brewery complex, which was largely reconstructed in the mid-1860s, has been suggested to have been a former cambric mill that was adapted to brewing before the mid-1780s, rather than a purpose-built brewery (Callan MacArdle & Callan 1902, 480; O'Sullivan 1961, 60). While it can certainly be suggested that the courtyard arrangement had been influenced by the evolution of the expanded burgage plot breweries of the late-18th and early 19th centuries, the case of the Cambrickville Brewery suggests that the arrangement may have also been influenced by wider trends in industrial architecture in the period.

Rynne (2006, 245) highlighted the prevalence courtyard breweries in Cork city, with survivors including both the River Lee Porter Brewery and Drinan's Brewery. The form was also particularly common in county Cork. There, in conjunction with the fine surviving example at Deasy's Brewery in Clonakilty, elements of former courtyard breweries survive at both the Watergate Brewery and the Hill Street Brewery in Bandon and Walker's Brewery in Fermoy. The survey has confirmed that courtyard breweries were constructed throughout Ireland in the late-18th and early 19th centuries and examples dating to the period have been identified in all four provinces.[21] Examples in Munster include the partially extant Dungarvan Brewery in county Waterford and O'Keefe's Brewery in Thurles, county Tipperary, which does not survive. In Connaught, fabric of former courtyard breweries survives at the Bridge Street Brewery in Ballinasloe, county Galway, and each of Graham's Brewery in Westport and Fair and Hearne's Brewery in Ballina, both in county Mayo. In Leinster, partially surviving examples include the Quay Brewery in Thomastown, county Kilkenny, and the Spa Well Brewery in Wexford town. Examples in Ulster include the Newtownards Brewery in county Down, where just the northern range of the brewery complex, which was probably constructed in 1818, survives (Lewis 1837 vol. 2, 435). Cartographic evidence also confirms the courtyard arrangement at both the Donaghmore Brewery in county Tyrone and Henry's Newry Brewery in county Down among others.

While each of the previous examples are likely to have been constructed before *c*. 1820, courtyard breweries continued to be constructed in Ireland during the 1820s and 1830s. Kelly's Brewery in Oranmore, county Galway, is one example that has previously been mentioned, while further examples include Cairnes' Brewery in Drogheda, dating to 1825, and Caffrey's Brewery in

[20] OS 1:10560: LH 007 1835.

[21] Dates of foundation have not been confirmed for each of the examples that follow, though in the majority of cases the breweries had been listed in *Pigot's Directories* of 1820 or 1824. The exceptions are Graham's Brewery in Westport and Fair and Hearne's Brewery in Ballina, both in county Mayo. The standing remains of Graham's Brewery are vernacular in style and appear likely to date to the late-18th century. In Chapter 4 it was proposed that malting may have pre-dated brewing at the site, which is known to have begun before 1837 (Lewis 1837 vol. 2, 699). The standing remains of Fair and Hearne's Brewery would appear likely to date to the early 19th century, though both an earlier or later date of foundation remain possible for the brewery itself.

Dublin city, dating to the mid-1830s (Callan MacArdle & Callan 1902, 479).[22] Of these three examples, just fragments of one survive, sections of the interior walls of a maltings at the Cairnes' Brewery site, which have been preserved within a recent commercial development. The best-surviving example that dates to the 1820s or 1830s is Cowperthwaite's Brewery in Cork city, where the original buildings were constructed around three sides of the central courtyard (plate 8.25).[23]



Plate 8.25. The probable brewhouse of Jones and Cowperthwaite's Brewery, Cork city.

While Rynne (2006, 246) stated that courtyard breweries continued to be constructed in Ireland into the 1840s, the example cited, the Watergate Brewery in Bandon, county Cork, actually pre-dates the date provided. Rynne dated the courtyard brewery complex to 1843, following a date stone that survives on a gate lodge in the northwest of the site. However, both the historic and the cartographic record confirm that the majority of the brewery complex pre-dates this, with the surviving maltings and grain stores likely dating to the late-18th century, as is outlined in Chapter 4. The 1843 date appears likely to refer to the date of construction of the gate lodge itself, which in 1848 was identified as being of recent construction by Valuation Office surveyors.[24] As such, the trend for purpose-built courtyard breweries appears to have largely ended in the mid-to-late-1830s, coinciding with the decline of the industry in the period. However, the courtyard arrangement was applied to a small subset of breweries that were constructed after 1850. Murphy's Lady's Well Brewery in Cork city

[22] A 'stuff factory' was recorded at the site of Caffrey's Brewery in the 1828 *Valuation of Dublin* (BPP 1833). It would appear likely that the brewery had been founded between 1834, when it was omitted from *Pettigrew and Oulton's Dublin Directory*, and 1837, when it was depicted on the first edition of the OS; 1:10560: DN 018 1837.

[23] Cowperthwaite's Brewery, which is poorly documented, was listed just once in the consulted 19th century trade directories, in *Slater's Directory* of 1846. The architecture of the probable brewhouse, in particular the use of good quality hand-made red brick in window reveals, suggests an 1830s date of construction. The NIAH (20503284) dated the brewery buildings to *c*. 1840 while the buildings were depicted on the first edition of the OS; 1:10560: CK 074 1840-1.

[24] See catalogue CK 110-001.

is an example of a courtyard brewery that was established in the 1850s. In that case, the courtyard form was defined by pre-existing buildings, a mid-18th century foundling hospital, which were re-purposed for brewing and malting following the hospital's closure in 1854 (Ó Drisceoil & Ó Drisceoil 1997, 29-30). One purpose-built example dating to the 1860s has been identified, the Belfast and Ulster Brewery in Belfast. There, cartographic evidence shows that the brewery buildings had been arranged around a regularly arranged courtyard, though just the south and west ranges of the brewery survive.[25]

Given the reasonably poor rates of survival in both Britain and Ireland, it is difficult to gauge the level of influence that trends in British brewery architecture had on the form and arrangement of Irish breweries before *c*. 1830. Burgage plot breweries appear to have been a somewhat natural progression, with their form being limited by local urban topography, principally property boundaries, and the ability of the brewery to expand by subsuming neighbouring sites. The courtyard brewery also appears to have been a form that was influenced by urban and suburban topography, with the majority constructed on sites in a town or city's periphery. The courtyard form was likely influenced by both the expanded burgage plot breweries of the late-18th century and the rational of the arrangement itself, which provided easy access to the component structures of the brewery complex to wheeled transport. However, two significant cases show that Irish brewery architecture in the first half of the 19th century had been influenced by trends in Britain.

Rynne (2006, 245-6) highlighted the similarities that can be seen in the late-18th and early 19th century brewery buildings that survive at Beamish and Crawford and contemporary depictions of Whitbread's Chiswell Street Brewery in London (plate 8.26). In both cases, the core brewery buildings were arranged adjacent to each other, comprising adjoining multi-storey blocks that were dedicated to the component sub-processes of brewing. In this arrangement, the breweries operated on a combination of both the pumped and vertical principals, while the layout also enabled the transmission of motive power horizontally between the various structures (Rynne 2006, 245-6). As was previously highlighted, the core brewery at Beamish and Crawford had essentially evolved in the late-18th and early 19th centuries with many of the component buildings, the majority of which were not purpose built, having been subsumed and re-adapted by the brewery as its footprint expanded. The similarities between the layout and arrangement of the core brewery buildings at Beamish and Crawford and Whitbread's are surely not coincidental, with London-trained brewers believed to have been working at the Cork city brewery in the final decade of the 18th century (Mathias 1959, 44-5; Bielenberg 1991, 55-6; Rynne 2006, 245-6). Indeed, the piecemeal expansion of the brewery in the late-18th and early 19th centuries had also occurred at several of London's large porter breweries, who

[25] OS 1:10560: AM 061 1901.

similarly expanded through the acquisition and absorption of neighbouring sites and buildings (Pearson 1999, 31-2). As such, the late-18th and early 19th century brewery buildings at Beamish and Crawford are suggestive of direct influence from the London porter brewing industry in the architecture of Ireland's largest brewery in the period.



Plate 8.26. The core brewery at Beamish and Crawford, Cork city, viewed from the west. The late-18th and early 19th century brewery buildings comprise the three and four-storey buildings in the background. The 1818 engine house is in the left midground, adjoining it to the right is a two-storey building of unknown purpose, constructed before 1863, while the two-storey mono-pitch buildings in the centre and right midground are cleansing cellars, erected in 1870-1.

The second case is Thomas Murphy's Brewery in Clonmel, county Tipperary, which was rebuilt in *c.* 1830 having damaged by fire in 1829 (Callan MacArdle & Callan 1902, 486; Rynne 2006, 246). There, the core brewery was reconstructed as a single, six-storey, L-plan block with a considerable footprint, having street-facing elevations of nine and 14 bays (plate 8.28). The brewery, the form of which is unique in an Irish context, bears many similarities in its form to Goding's Lion Brewery in Lambeth, London (Pearson 1999, 34-5). The core brewery of the Lion Brewery, while smaller in scale, was also constructed as a single block brewery in 1836-7 and was demolished in 1949. Both breweries featured architectural embellishment, with Thomas Murphy's Brewery featuring a crenelated pediment, while the Lion Brewery was designed in an intricate, classical revival style. The Lion Brewery had been designed by the architect Francis Edwards, who had trained under John Soane, who is considered to be among the first British brewery architects with commissions dating from at least the 1780s (*ibid*.; Pearson 2014, 37-8; 2016, 11-12). Given the similarities in form of the two breweries, it would appear likely that Thomas Murphy's Brewery had been designed by an architect familiar with the trends in brewery architecture in England and, as such, it can be viewed as being evidence of increased influence from the both British brewing industry and wider trends in British industrial architecture. While the form of Thomas Murphy's Brewery is unique for the period in an Irish brewery context, it is reflected in the architecture of several Irish distilleries of the period, perhaps implying

that the Irish distilling industry had closer industrial contacts with their British counterparts than Irish breweries. One example that was later converted to brewing is John Busby's Distillery in Dublin city, which had been constructed in 1836 and was converted to brewing in 1865, when the City of Dublin Brewery was incorporated (plate 8.27).[26] Comparisons can also be drawn with the surviving Daly's Distillery on John Street in Cork city, established in 1820 (Rynne 1999, 72-3).



Plate 8.28. Thomas Murphy's Brewery, Clonmel, county Tipperary. A purpose-built brewery with a crenelated pediment, constructed in c. 1830.



Plate 8.27. The City of Dublin Brewery, Fumbally Lane, Dublin city. Originally a distillery, constructed in 1836, that was converted to brewing in the 1860s.

In the cases of both Beamish and Crawford and Thomas Murphy's Brewery, there was an attention to architectural detail and aesthetics that was reasonably uncommon in Irish breweries in the early 19th century. In the majority of breweries of the period that have been viewed, architectural detailing was primarily limited to the functional, with only window and door reveals provided any aesthetic attention. An exception to this is the brewer's house, which, as was previously outlined, were often contemporarily fashionable buildings, typically taking on the form of a Georgian townhouse. An early case for the treatment of industrial buildings to improve their aesthetics can be seen at Beamish and Crawford. When the brewery was reconfigured and partially reconstructed between 1802 and *c*. 1818, the buildings that encompassed the expanded courtyard were re-faced as part of the redevelopment. This reconfiguring and refacing provided the impression of a late-Georgian terrace, with the buildings refaced in brick and ashlar limestone and re-fenestrated in a symmetrical style that was prevalent in both domestic and commercial urban architecture in the period (plates 8.29 & 8.30). This attention to the aesthetics of the brewery's courtyard was, perhaps, due to the fact that the brewery essentially had no public face, with the brewery itself obscured from the street by a terrace of buildings until the early 20th century. Two further examples of a brewery presenting an architecturally embellished public façade, each dating to the early 19th century, have survived on James's Street in Dublin city. There, the decorative gateways to both Guinness and Manders and Powell's Brewery have survived (plates 8.31 & 8.32). These cases show that architectural

[26] *Freemans Journal* 11/12/1865, 2.

embellishment, and consequently some pride in the public perception of a brewery, was clearly a consideration for a small subset of Ireland's largest breweries in the first half of the 19th century. As will be seen in the section that follows, breweries of the second half of the 19th century tended to pay more heed to their public appearance.



Plate 8.30. Late-19th century photograph of the primary courtyard at Beamish and Crawford, Cork city. Courtesy Diarmuid Ó Drisceoil.



Plate 8.29. The remains of the primary courtyard at Beamish and Crawford, as seen in October 2016. The building on the left has since been demolished.



Plate 8.32. Decorative gateway and gate lodges, providing access to the 'north deck' of Guinness's Brewery, Dublin city. The buildings appear to date to the early 19th century, having been depicted on the 1820 plans of the brewery.



Plate 8.31. Decorative gateway, the sole surviving element of Manders and Powell's Brewery, Dublin city.

8.3 The physical development of the brewery in Ireland after 1850

In Chapter 3, it was highlighted that the foundation of new breweries and both the reconstruction and expansion of pre-existing breweries resumed in the 1850s following a brief hiatus that coincided with the decline of the industry in the late-1830s and 1840s. The 1850s saw the

foundation of two considerable breweries, the Mountjoy Brewery in Dublin city and Murphy's Lady's Well Brewery in Cork city. Rynne (2006, 246) recorded that the brewhouse of the Lady's Well Brewery, designed by English brewery engineer Gresham Wiles, was the only confirmed case of an English architect or engineer designing an Irish brewery in the 19th century. However, recent research by Pearson (2014, 95) has confirmed that the Mountjoy Brewery, established in 1852, had been designed by Robert Davison, who was a founding partner of one of Britain's major brewery architecture firms, originally Davison and Scammel, later Davison, Innskipp and Mackenzie. The brewery was constructed on a greenfield site, a former orchard and pleasure garden that was located on the south bank of the Royal Canal, and comprised two major blocks of adjoining and disassociated structures (Barnard 1889-91 vol. 2, 387). Just fragments of the brewery have survived, including a limestone warehouse in the northeast of the site and several ancillary structures, located in the western extremity of the site (plate 8.34).



Plate 8.34. Limestone warehouse, one of the few surviving elements of the Mountjoy Brewery, Dublin city.



Plate 8.33. Mid-18th century foundling hospital buildings, the sole surviving element of the 1856 Lady's Well Brewery, Cork city.

In contrast to the Mountjoy Brewery, the Lady's Well Brewery had been constructed on a site that had seen former use as a foundling hospital. Indeed, a survey of the brewery dating to 1856 confirms that the majority of the buildings of the foundling hospital had been re-repurposed for tasks such as malting.[27] As was stated in the previous section, the courtyard arrangement of the former hospital was maintained. New construction at the site included a three-storey brewhouse, which replaced much of the west range of the former hospital, while engine houses, the brewery's cooperage and a large vat room were constructed within the extensive courtyard itself. As such, the Lady's Well Brewery is a late example of a courtyard brewery, though it was not deliberately composed as such, with its layout and arrangement being defined by pre-existing buildings that were re-purposed. All that survives of the 1856 brewery is the east wing of the foundling hospital, dating to

[27] The survey is reprinted in Ó Drisceoil & Ó Drisceoil 1997, 31.

the mid-18th century, which had been re-purposed as both a maltings and offices when the brewery was first opened (plate 8.33).

Unlike the two previous examples, the majority of new breweries founded in Ireland in the 1850s and 1860s appear to have been constructed on a much more modest scale. The 1850s saw the foundation of several particularly small breweries, including the likes of the New Road Brewery in Galway city and Carroll's Brewery in Tuam, county Galway, both of which appear to have been simple, single-building breweries, neither of which have survived. Perhaps more common, though also showing a poor rate of survival, were reasonably small local breweries that were established in Ireland's larger towns in both the 1850s and 1860s. Substantial remains of just one of these breweries have been recorded, the St. Mary's Well Brewery in Carlow town, which pre-dates 1865 (plate 8.4).[28] The brewery's maltings and malt kiln, which were described in Chapter 4, were located directly adjacent to the brewhouse itself, which was discussed briefly in the first section of this chapter. The layout of the brewery buildings suggests an efficient movement of raw materials, with the maltings directly adjoining the malt kiln which in turn directly adjoins the modestly proportioned brewhouse. It was an arrangement that, as was suggested in Chapter 4, implies that the brewery produced a significant proportion, if not all, of its own malt.

The 1860s also saw the partial or total reconstruction of several of Ireland's larger regional breweries. This is confirmed in the standing remains of the Mill Park Brewery in Enniscorthy, county Wexford, and each of the Cambrickville Brewery in Dundalk and the Castlebellingham Ale Brewery, both in county Louth. Both the Mill Park Brewery and the Cambrickville Brewery were partially reconstructed, with both breweries having retained buildings that dated to the late-18th and early 19th centuries.[29] In contrast, cartographic evidence suggests that the Castlebellingham Ale Brewery had been entirely reconstructed, though the standing remains were only briefly viewed and it remains possible that ancillary buildings that pre-date the reconstruction of the brewery survive at the site. Both the Cambrickville Brewery and the Mill Park Brewery maintained their previous courtyard arrangements, though the courtyard was opened at the Mill Park Brewery, where the northern range was cleared and several ancillary buildings, including offices and stables, were constructed, each extant. The brewery's early 19th century maltings appears to have been the only element of the pre-1850 brewery that were maintained, while a new brewhouse, malt kiln, barley stores and engine house were constructed at the site, each of which survives today. It would appear likely that the Cambrickville Brewery had similarly retained its late-18th or early 19th century maltings, though the

[28] *Freemans Journal* 03/04/1865, 2.

[29] The reconstruction of both sites is evident when the first editions of the 1:10560 OS (LH 007 1835; WX 020 1840) is compared with the published 1:1056 editions, composed in 1886 for Enniscorthy and 1888 for Dundalk.

buildings have not survived. They were cleared in the late-19th century to make way for a newly constructed northern range, which itself has been cleared since. As with the Mill Park Brewery, the brewhouse itself was entirely reconstructed, while an engine house, a large malt store and a decorative office building, each dating to the mid-1860s redevelopment, have also survived at the site.

While similarities can be drawn between the redevelopments of both the Cambrickville Brewery and the Mill Park Brewery, the architecture of each redevelopment deviates with the core brewery itself being the primary differentiator. The core brewery at the Mill Park Brewery is less substantial than that of the Cambrickville Brewery. The Enniscorthy example was a modest, two-storey, double-pile brewhouse which, while much altered in recent redevelopments, can be said to have been horizontally arranged (plate 8.2). Both milling and mashing were carried out in the eastern block, which directly adjoined the brewery's water-wheel pit, while boiling is confirmed to have been carried out in the northern block where one furnace arch is maintained and the scars of several more are evident. A historic photograph of the brewhouse confirm that the eastern block formerly featured a ridge ventilator, confirming that it also contained the brewery's cooling plant (plate 8.3). In contrast, the core brewery at the Cambrickville site comprised several adjoining structures, each standing to between two and four storeys in height, with each likely dedicated to an individual sub-process of brewing. While it is not known whether the reconstruction of the brewery had been overseen by an architect or whether it had been designed by an employee of the brewery itself, it shows clear evidence of influence from the British brewing industry. In particular, the ornate office building was composed in a style that was then fashionable in English breweries, featuring elements of Queen Anne Revival style (plate 8.23).

Two further significant survivors from the phase of brewery construction in the period have survived, the previously mentioned Castlebellingham Ale Brewery in county Louth and the Belfast and Ulster Brewery in Belfast (plates 8.9 & 8.36). Unfortunately, a full descriptive survey of the Castlebellingham site was not possible, though it would appear likely to date to *c.* 1870. It was previously highlighted as being a rare Irish example of the Victorian tower brewery and its appearance certainly suggests that its erection was overseen by an architect or engineer with some familiarity of the trends seen in British brewery construction in the period.[30] It features modest decoration and, as such, can be said to have been part of the contemporary trend in Britain for decorative breweries, one that had begun as early as the 1830s when the likes of the previously mentioned Lion Brewery in Lambeth, London were constructed, and which accelerated in the 1870s and 1880s (Pearson 1999, 101-20)

[30] NIAH surveyors dated that standing remains to *c.* 1870 (NIAH: 13826015). Cartographic evidence confirms that the brewery was reconstructed between the 1835 1:10560 OS and the 1908 1:2500 OS; LH 015.



Plate 8.36. Former brewhouse at the Belfast and Ulster Brewery, Belfast. Constructed in 1864-7 in a classical revival style, featuring polychrome brick and sculpted masonry detailing. The mono-pitch building in the mid foreground is a c. 1970s addition.



Plate 8.35. Decorative offices at the Belfast and Ulster Brewery in Belfast, demolished in the c. 1970s. Elements of the sculpted masonry have been preserved. DOENI/McCutcheon/S8.

In contrast, the construction of the Belfast and Ulster Brewery is reasonably well documented. The brewery was designed by the Belfast-based architect Alex McAllister and was constructed between 1864 and 1867.[31] It is the most-decorative brewery that was constructed in Ireland during the 19th century, composed in a classical style with a particularly distinctive office building that was demolished in the 1970s (plates 8.35 & 8.36). While Pearson (1999, 46, 182) recorded that just fragments of the brewery had survived, the entirety of the brewhouse and a much-altered maltings or stores have survived at the site. The brewhouse is a single-building example that maintains a barrel-vaulted furnace arch and a jack-vaulted engine room at ground-floor level, described in Chapters 5 and 7 respectively. Externally, the brewery is classically ornate, featuring blind arcading that is decorated with polychrome brick and sculpted masonry detailing that Pearson (1999, 182) proposed may have been composed by the sculptor Thomas Fitzpatrick. While the building was designed by an Irish architect that, as far as has been ascertained, had no previous experience in designing breweries, it can also be said to have been heavily influenced by the trend for ornate breweries in Britain. No Irish brewery would again approach the level of architectural detail seen at the site until the early 20th century. Indeed, it appears to have been one of the final new breweries constructed in Ireland in the 19th century, with the evidence suggesting that the establishment of new breweries was particularly uncommon in Ireland in the 1870s and 1880s, as was highlighted in Chapter 3. This can be said to be the primary reason for the comparative rarity of ornate breweries in Ireland as opposed to in Britain.

[31] While Pearson (1999, 46, 182) stated that the brewery had opened in 1869, further sources state that construction of the brewery began in 1864 and works and had been completed by 1867 (PRONI/D1905/1/1; Boyle 2007, 48).

The 1880s in particular was at a time when the British brewing industry was expanding, while the wider industry in Ireland contracted (Pearson 2014, 51-2).

In conjunction with the trend for the construction of new breweries and the reconstruction of pre-existing breweries in the 1860s and 1870s in Ireland, the period also saw the physical expansion and renewal of several of Ireland's larger urban breweries. The best-documented of these renewed urban breweries were located in Cork city, where each of Beamish and Crawford, the St. Finnbarre's Brewery and the Lady's Well Brewery saw considerable investment in both building stock and plant in the period (Rynne 1999, 49-57). While each of the breweries were largely overhauled, the level of reconstruction was at a lesser scale to the cases previously outlined in both Dundalk and Enniscorthy, with the Cork city breweries being expanded rather than rebuilt. In both the cases of Beamish and Crawford and the St. Finnbarre's Brewery, the renewal and overhaul followed a change in either ownership or management; the St. Finnbarre's Brewery was acquired by John Arnott in 1861 and Beamish and Crawford saw a significant change in the management structure of the brewery in 1863 (Ó Drisceoil & Ó Drisceoil 2015, 120-1, 126-38, 180-3). The St. Finnbarre's Brewery was twice overhauled, in 1863 and 1870, with the 1863 renewal seeing the physical expansion of the brewery, with new buildings constructed in both the south and west of the site before 1869.[32] The brewery was largely cleared in *c*. 1909 to make way for an extant, purpose built technical college, now the Crawford School of Art, which maintains fragments of the 1860s buildings (Rynne 1999, 53).



Plate 8.37. Beamish and Crawford, Cork city, as seen in October 2016. The building in the left and centre midground has since been demolished. The malt-milling loft rises centrally from the core brewery block.

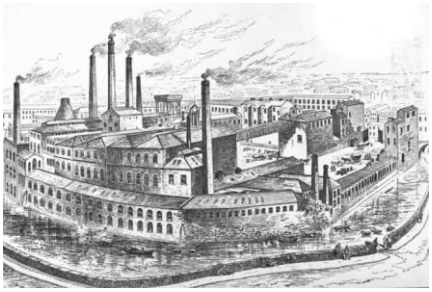


Figure 8.7. Beamish and Crawford, as depicted in an 1880s etching. The malt-milling loft can be seen rising from the core brewery block in the left background. Originally in Barnard 1889-91 vol. 2, 350.

Beamish and Crawford's post-1863 redevelopment was, perhaps unsurprisingly, carried out on a grander scale and several significant elements have survived. The overhaul of the brewery had actually been instigated prior to 1863, with a new malt store, located in the southeast of the brewery's courtyard, and two steam-powered tramways for the movement of both coal and malt depicted on

[32] OS 1:1056: NAI/OS140/Cork city 1841-2; 1869; 1893.

the 1863 plans of the brewery. In the phase of renewal that followed the new partnership agreement in 1863, the firm spent as much as £100,000 on the renewal of brewing plant and new construction at the site. Several significant structures dating to this phase of renewal have survived. New buildings were constructed to the west of the core brewery, where extant two-storey, mono-pitch cleansing cellars were erected on a former quay. Perhaps the most-significant of the newly erected buildings was an extant two-storey-plus-attic malt-milling loft that was constructed atop the core brewery itself. It projects from the upper floor of the brewhouse, located in the same position that the brewery's mills had been located since the late-18th century. Its construction shows that the brewery was adapting its product flow, moving away from the pumped principal towards a vertical arrangement. Hamond's (2010, 5, 34-7) unpublished research on the brewery's late-19th century Improvement Books dated the construction of the new cleansing cellars to 1870-1 and also suggested that the malt-milling loft had been entirely reconstructed in the early 20th century. However, the buff-coloured brick used in the construction of the mill loft appears to match that used in the cleansing cellars and its form is identical to depictions of the brewery in the late-19th century, perhaps suggesting that it was may also erected in the early 1870s or that it had been reconstructed in exactly the same form as the previous mill loft (plate 8.37; figure 8.7).

While Beamish and Crawford had made significant investment in both plant and new building stock during the period, the constrained nature of the brewery site meant that its physical expansion was limited. In contrast, the footprint of the Lady's Well Brewery expanded considerably during the 1870s and 1880s, subsuming a large property that adjoined the brewery to the south between 1869 and 1892.[33] The brewery subsequently invested heavily in new building stock in this area, culminating in the substantial late-1880s maltings that was described in Chapter 4. Unfortunately, no physical evidence of the brewery's expansion in the period prior to the construction of the maltings has survived, with the façade of an ornate office building, constructed in 1892, being the only other surviving building in the area that the brewery had expanded into (Ó Drisceoil & Ó Drisceoil 1997, 51-2; plate 8.39). The ability to considerably expand the brewery site has to be seen as one of the factors that led to the Lady's Well Brewery's ascension to become the largest brewery in the city and the second largest in Ireland by output at the beginning of the 20th century (Chapter 3).

[33] This phase of expansion can be seen on the 1869 and 1892 editions of the 1:1056 OS maps.



Plate 8.39. The façade of a former ornate office building at the Lady's Well Brewery, Cork city.



Plate 8.38. Limestone warehouse, Watkins' Brewery, Dublin city.

Physical evidence of substantial breweries expanding post-*c.* 1860 has also survived at two sites in Dublin city, Watkins' Brewery and the North Anne Street Brewery. At the Watkins' Brewery site, cartographic evidence confirms the expansion of the brewery to the east and southeast between 1847 and 1864.[34] Two elements of this phase of expansion have survived, a limestone warehouse in the site's southeast corner and a fragment of the brewery's copper house, comprising just the heavily constructed brick-built setting for a brewing copper (plate 8.38). The North Anne Street Brewery appears to have been largely reconstructed between 1847 and 1864, though the core brewery itself has not survived. What has survived is a large maltings, described in Chapter 4, that was erected to the east of the site in the 1880s. The maltings had replaced the entirety of a terrace of buildings that faced east onto Beresford Street, just one of which formed part of the brewery as it was depicted in 1838.[35] The period also saw the physical expansion of several regional breweries, though only fragments of these expanded breweries have survived. This can be seen at Thomas Murphy's Brewery in Clonmel, county Tipperary, where the brewery had expanded west of Dowd's Lane between 1841 and 1874.[36] Fragments of the buildings constructed in this phase of expansion survive both as boundary walls and as the exterior walls of recent buildings. Smithwick's St. Francis's Abbey Brewery in Kilkenny city also expanded in the period, though the only surviving element of this phase of expansion is an ornate office building, constructed in 1882.[37]

[34] OS: 1:1056: Dublin city, 1847, 1864.

[35] The brewery appears likely to have been originally sited to the rear of this building, 11 Beresford Street, the address provided in the late-18th and early 19th century trade directories (Wilson 1780; 1786; 1794; 1804). The brewery appears to have expanded considerably before 1838 when it was depicted as having a major street frontage on North Anne Street. 11 Beresford Street was explicitly included within the boundaries of the brewery. OS: 1:1056: NAI/OS140/Dublin city 1838.

[36] The brewery's expansion west is evident on the 1:10560 OS, composed in 1841 and 1874 (NAI/OS140/Clonmel 1841)

[37] As can be seen on the 1:1056 OS, composed in 1841 and 1871, the brewery appears to have been entirely reconstructed (NAI/OS140/Kilkenny). The date of construction for the office building was provided by the NIAH (12000085), which did not cite a source.

While the foundation of new breweries was particularly uncommon in the 1870s and 1880s, Chapter 4 highlighted a brief resurgence in the establishment of new breweries in the 1890s. While the trend is primarily confirmed by both the numbers of brewer's licenses issued and fleeting references in newspapers and trade directories, such as the foundation of a short-lived lager brewery in Dublin the early 1890s, the locations of two breweries founded at the close of the decade have been confirmed by the survey (Slater 1894). Both were located in the northeast, the Great Northern Brewery in Dundalk, county Louth, and McConnell's Brewery in Belfast, a city that also saw a pre-existing brewery, the Smithfield Brewery, move production to a newly constructed brewery, the Mountain Brewery. Unfortunately, the rates of survival for these sites is particularly poor, with a decorative office building at the Great Northern Brewery being the only surviving structure recorded.

The Great Northern Brewery, while not first brewery in Ireland to affect a direct rail link, which Guinness had done in the 1870s, is the only Irish brewery to be deliberately constructed adjacent to a railway. At inception, the brewery was provided with its own siding, which is depicted on the 1907 1:2500 OS. Just two further Irish breweries are known to have affected such a direct link with the rail network, the Cambrickville Brewery, also in Dundalk, and the Watergate Brewery in Bandon, county Cork, though no physical evidence of any of these railway sidings has survived. Dundalk acted as a major rail junction that provided access to the primary lines operated by the Great Northern Railway Company (Ireland), and consequently each of Ulster's lesser rail lines.[38] As such, the commonality of direct rail links in the town show the importance of the Ulster trade to the Dundalk breweries, and both breweries managed considerable stores in Queensbridge, Belfast, which were similarly linked with the rail network (Callan MacArdle & Callan 1902, 480-2). Burton-upon-Trent had been the first town in England where breweries were provided a direct link with the rail network (Pearson 2014, 185-8). As early as 1855, a horse-drawn tramway had been opened linking Tooth's Crescent Brewery with the railways and from 1860 an intricate network of narrow-gauge railway was developed in the town, linking each of the town's substantial breweries. The development of this network has to be seen as being the precursor for the trend seen in the late-19th century in Ireland and it is, perhaps, surprising that Dublin's other substantial breweries did not affect similar links to the railways as Guinness had.

The turn of the 20th century saw considerable investment in both plant and new buildings at the St. Mary's Brewery in Waterford city. Based on date stamps on brewing plant and cast-iron columns, this phase of investment can be dated to 1899-1901.[39] The brewery's fermentation block, which is referred to in an earlier section, replaced an earlier vat room and was the primary investment

[38] McCutcheon (1980, 95-222) provides a detailed overview of the development of Ulster's rail network.
[39] See Chapters 4 and 5.

in new building stock, while the brewery's late-18th century brewhouse, mill house and maltings were renewed. In Chapters 4 and 5 it was highlighted that the surviving plant in the brewhouse had been sourced from some of Britain's premier brewery engineering firms and, while it remains to be confirmed, the sourcing of the plant from British engineering firms may suggest that the overhaul of the brewery had been overseen by a specialist brewery engineer or architect.



Plate 8.40. The Counting House, Beamish and Crawford, Cork city.

In Cork city, Beamish and Crawford also overhauled their brewing plant in the early 20th century, a period that also saw significant new construction at the site, though not of the core brewery itself. In the first section of this chapter, the brewery's new stables, which had been constructed in 1902 and designed by English architects Houston and Houston, were briefly described. As with the North Anne Street Brewery in Dublin city, Beamish and Crawford had acquired the terrace of street-facing buildings that had formed the brewery's eastern boundary during the closing decades of the 19th century. These buildings were subsequently demolished and in 1918 the firm commissioned Cork-based architects Chillingworth and Levie to design a new public-facing façade for the core brewery buildings that were, for the first time, visible to the public (Ó Drisceoil & Ó Drisceoil 2015, 269-73).[40] Chillingworth and Levie, who had previously designed several public houses for the brewery, composed a highly ornate office building, known as the Counting House, in a mix of Tudor revival and Flemish styles (plate 8.40). The architectural detail, while not extraordinary in the wider context of the then United Kingdom, is unique in an Irish brewery context.

The timing of its design and construction is also significant, coinciding with the Irish War of Independence of 1919-21. It can, perhaps, be said that the architecture of the Counting House displays an optimism for the future for the industry in Ireland that is somewhat surprising for the period. While

[40] Pearson (2016, 94) erroneously recorded that the Counting House had been designed by Houston and Houston.

the period had seen substantial investment in building stock in British breweries, the Counting House at Beamish and Crawford is a unique investment for an Irish brewery that, perhaps, can be said to reflect the political outlook of the firm's chairman, Richard Henrik Beamish, at the time of its construction. Beamish, initially a unionist, was a prominent figure in local politics in the period (Ó Drisceoil & Ó Drisceoil 2015, 211-6, 261-8). Despite his initially unionist outlook, he directly campaigned for a fiscally and legally independent Ireland, governed within the British Empire, and in the 1921 local elections stood as an independent pro-Treaty candidate, supporting the Anglo-Irish Treaty of 1921. He was a successful independent candidate in the 1923 general election, eventually joining Cumman na nGaedhaal, and his political outlook appears to have been one of reform, with the protection of business interests and a reduction in corruption being the primary drivers in his shift from unionism. Beamish clearly saw a bright future for a fiscally and politically independent Ireland and this is, perhaps, one of the reasons that such a significant investment was made in the aesthetics of the brewery that he managed. As was outlined in Chapter 3, the optimism for the future of the industry that the architecture of the Counting House can be said to display was misguided, and the 1920s and 1930s in particular were years where the wider industry in Ireland contracted significantly.

8.4 Conclusions

Generally speaking, the physical evolution of the brewery in Ireland during the extended period under consideration can be said to have followed a similar trajectory to the developments in Britain. The majority of Irish breweries of the late-18th and early 19th centuries developed along independent lines. Factors such as location, the success of an individual firm and the ability to expand its physical footprint defined the form and layout of individual brewery complexes, which in the majority of cases appear to have developed in a somewhat piecemeal manner. The most-common forms of brewery in Ireland during the period were the burgage plot brewery, an early form that does not appear to have been constructed after *c.* 1820 and perhaps earlier, and the courtyard brewery, a form that was being constructed from at least the late-18th century and in many, though certainly not all, cases can be said to have been purpose built. Given the poor rates of survival in Britain for the period before *c.* 1830, it is difficult to gauge the influence that contemporary trends in Britain had over the layout and arrangement of Irish breweries during the early period. However, the few surviving Irish brewhouses of the late-18th and early 19th centuries certainly suggest influences from the British brewing industry. In particular, both the vertical arrangement of the brewhouse and the prerequisite for ventilation are features that appear to have been common in Irish brewhouses of the late-18th and early 19th centuries. These probable influences from the British brewing industry are further underlined by the similarities in maltings architecture seen in both Britain and Ireland in the

same period, outlined in Chapter 4. While burgage plot breweries do not appear to have been established after *c*. 1820, the courtyard arrangement was commonly applied to breweries founded in the 1820s and 1830s and continued to be applied in a small subset of new breweries that had been established in the 1850s and 1860s.

A small subset of Irish breweries constructed before 1850 can be said to have been directly influenced by contemporary trends in brewery architecture in Britain. The late-18th and early 19th century brewery buildings at Beamish and Crawford can be directly compared to historic drawings of Whitbread's Brewery in London, while the architecture of Thomas Murphy's Brewery in Clonmel is suggestive of the engagement of a British industrial architect or engineer in its design. Both of these sites also display an early attention to architectural aesthetics, which may be viewed as being further evidence of engagement with the contemporary trends in Britain. This early attention to aesthetics also shows that the public perception of a brewery was a consideration for a small subset of Ireland's larger breweries in the period. As the 19th century progressed, Irish breweries engaged further with the trend for ornamental breweries seen in Britain, a trend that had begun in the 1830s and which accelerated in the 1880s. This is also suggestive of increasing engagement with the British brewing industry, a point that is underlined by the engagement of British architects and engineers to design the two most-substantial breweries constructed in Ireland during the 1850s, the Lady's Well Brewery in Cork city and the Mountjoy Brewery in Dublin city. However, unlike Britain where new brewery construction accelerated in the 1880s, the foundation of new breweries in Ireland was then uncommon and it is in the treatment of pre-existing brewery buildings and in new construction at pre-existing brewery sites that this engagement is most evident in Ireland. While the foundation of new breweries in Ireland was particularly uncommon in the period 1870-90, the period did see major investment in the expansion and reconstruction of many of Ireland's most-significant breweries, each of which can be said to have been directly affected by the contemporary trends in brewery architecture in Britain.

The architecture of the brewery in Ireland can, as such, be viewed as having developed along similar lines to British breweries. This is an unsurprising conclusion given the close links between the industries in both islands, with both islands forming a single political union for much of the period under consideration and British brewers, in particular those trained in London, being commonly employed in Irish breweries from the late-18th century. That is not to say that Irish breweries did not make a major contribution to the evolution of brewery architecture. However, it is Guinness, the world's largest brewery in the late-19th century, that made the greatest contribution, particularly in the decades that followed 1870, and these developments will be highlighted in the chapter that follows.

The Dublin city brewing industry

Guinness, as the most-productive brewery in the world in the late-19th century, is unique, not just in an Irish context but intentionally. As Lynch and Vaizey (1960, 243) stated, in the course of a little over a century the firm had expanded from being 'a small poky brewhouse on the outskirts of Dublin to a six-million pound joint-stock company', one that eventually rose to become the world's largest brewery by output in the 1880s. The sound management of the firm by successive generations of the Guinness family, as well as appointed senior managers such as members of the Purser family, was highlighted by Lynch and Vaizey (1960, 242-50) as being the primary factor in the brewery's phenomenal rate of expansion in the 19th century. Of the unique management decisions, the brewery's concentration on the wholesale rather than the retail trade was highlighted, as was the firm's repeated response to changing market dynamics throughout the 19th century, in particular the growth of the brewery's trade in both Britain and Ireland during the railway age. Bielenberg (1998, 103-4) agreed with much of this assessment, though highlighted the unique makeup of the Irish brewing industry in the second half of the 19th century as being a further contributing factor. The decline of the Irish brewing industry in the late-1830s and 1840s, outlined in Chapter 3, had left Guinness with a large market with little in the way of competition, while in contrast Britain's major breweries were competing in a far more saturated market, one that was served by a large number of local and regional breweries.

While it would be remiss to downplay the impact that each of these factors had on the ascension of Guinness to becoming the world's largest brewery, this thesis has highlighted several further factors that contributed to the brewery's rise to international significance. In particular, the brewery's engagement with improved technologies was highlighted in each of Chapters 5, 6 and 7. These factors can certainly be said to have been driven by the brewery's management, reinforcing Lynch and Vaizey's interpretation that the brewery's rise to international significance was primarily due to sound management decisions. A further factor that could also be ascribed to sound management, and in particular the brewery's reaction to changing market dynamics, was the expansion of its fermentation capacity after 1870, outlined in Chapter 6. This expansion of the brewery's maturation capacity occurred in the period where London's large porter breweries, and indeed Beamish and Crawford of Cork city, were reducing their maturation capacities. This was proposed as being a product differentiator, one that provided the brewery's products with a flavour profile that catered for the tastes of the time, one that was contemporarily seen as matching or exceeding its price point. However, in Chapter 4 the brewery's tariff-free access to both a suitable and sufficient water supply was highlighted as being a likely contributing factor in the brewery's growth,

one that further reinforced the economies of scale that both the brewery's output and technological advancement were realising. This is a clear locational advantage that the brewery held over those located apart from its immediate vicinity, the Liberties area of Dublin city, where the greatest concentration of breweries in Ireland had been located from the 18th through to the early 20th century.

In this chapter, the expansion of Guinness will be discussed in relation to the advancement of the industry in Dublin's Liberties as a whole. The primary aim is to identify further locational factors that influenced Guinness's growth to become Ireland's and later the world's most-productive brewery. The chapter is divided into three primary sections. The first two sections serve to highlight the fact that Guinness's early advantages in terms of location were not unique. The history of the industry in the Liberties area of Dublin is briefly outlined in the first section, with the aim being to provide a framework in which Guinness's locational advantages can be contextualised. In the second section, the locational advantages that breweries located in the Liberties area held over both local and distant competitors will be highlighted, with a particular focus on access to markets both local and distant, raw materials and transport systems. While the section highlights the changing locational advantages that the Liberties breweries as a whole were provided, the micro-locational advantages of the Guinness site will also be highlighted. The third section focusses on the physical development of the Guinness site. Outlined will be the physical expansion of the brewery from 1820 to the early 20th century, with particular reference to surviving building stock. This section will serve to further underline the micro-locational advantages that the brewery held over its local competitors, while it will also contextualise the physical development of the brewery within the context of the wider Irish brewing industry.

9.1 An overview of the development of the brewing industry in Dublin's Liberties

There is a particularly long history of brewing in the Liberties area of Dublin, formerly an extra-mural suburb that is located to the southwest of the Medieval city. Guinness is one of twelve brewery sites have been identified in the area during course of the survey, while historical sources confirm the existence of many more breweries in the Liberties during the 18th and early 19th centuries. Of the twelve sites that have been confirmed, six were located in the north of the area, on and within the vicinity of the east-west axis that is formed by Thomas Street and James's Street, with further breweries located to the east, on Francis Street, and to the northeast, on Usher's Street (figure 9.1). The remaining six were in the south of the area, on and within the vicinity of New Market and Ardee Street.

Brewing is confirmed to have a particularly long history in both of these brewery clusters. The area around James's Street is said to have developed as a concentrated brewing centre by the early

18th century and Guinness, whose earliest leases confirm that brewing pre-dates 1670 at the site, was one of many small breweries then producing in the area (Lynch & Vaizey 1960, 69-70; Lennon 2008, 6). The brewery that would be known as the Phoenix Brewery in the mid-to-late-19th century, also on James's Street, also has a long history. It appears likely to have been the direct continuation of the Hope Brewery, which had been operated by the wider Sweetman brewing family in the early decades of the 18th century.[1] While both breweries are amongst the earliest brewery foundations that have been identified by the survey, their history is suggested to have been much shorter than that suggested for a brewery located within the southern cluster, Watkins' Brewery on Ardee Street, though the veracity of the claim of early foundation has not been tested. There, Callan MacArdle and Callan (1902, 474-5) recorded a company tradition that held that brewing had been carried out unbroken at the site from the mid-16th century, while the site itself was said to have been the location of the brewhouse of the Medieval monastery of St. Thomas (Barnard 1889-91 vol. 2, 365).

Of the remaining sites that have been identified in the Liberties, the majority are known to have produced in the 18th century. Both the Anchor Brewery on Usher Street and Sweetman's Brewery on Francis Street had been established by the mid-18th century, while a further three of the Liberties breweries are known to have operated in the closing decades of the 18th century (Wilson 1766; Callan MacArdle & Callan 1902, 474). Two were located in the south of the area; the Byrne's Hill Brewery on Ardee Street was first listed in the consulted trade directories in 1786, while Conlan's Brewery on New Row was first listed in 1794 (Wilson 1786; 1794). The third, Hughes's Brewery on Usher Street, was located in the north of the area and was also first listed in 1794. One further site, Manders and Powell's Brewery in James's Street, appears likely to have been foundation of the early 19th century. It was first listed in the directories in 1815 while one of the proprietors, Robert Manders, had been listed as brewing a separate site on Pimlico in 1804, suggesting that the brewery on James's Street was founded in the interim period (Wilson 1804; 1815).

[1] The brewery has long been said to have been founded in 1788 by Samuel Madder, a brewer originally from England (Callan MacArdle & Callan 1902, 473-4; Lynch & Vaizey 1960, 90). However, the trade directories show that three breweries, two of which pre-dated 1786, had produced at the site in the late-18th century (Wilson 1786). Brewing at the site is confirmed to pre-date 1780, when James Sweetman, a member of the wider Sweetman brewing family, leased a brewery on the corner of James's Street and Watling Street to Edward Reynolds, who was listed as brewing from 89 James's Street in 1786 (Magee 2015, 114-5). The brewery appears likely to have been the brewery that had been known as the Hope Brewery in the early 18th century, though the Sweetman family operated several breweries and maltings in the immediate vicinity during the period and this has not been confirmed.

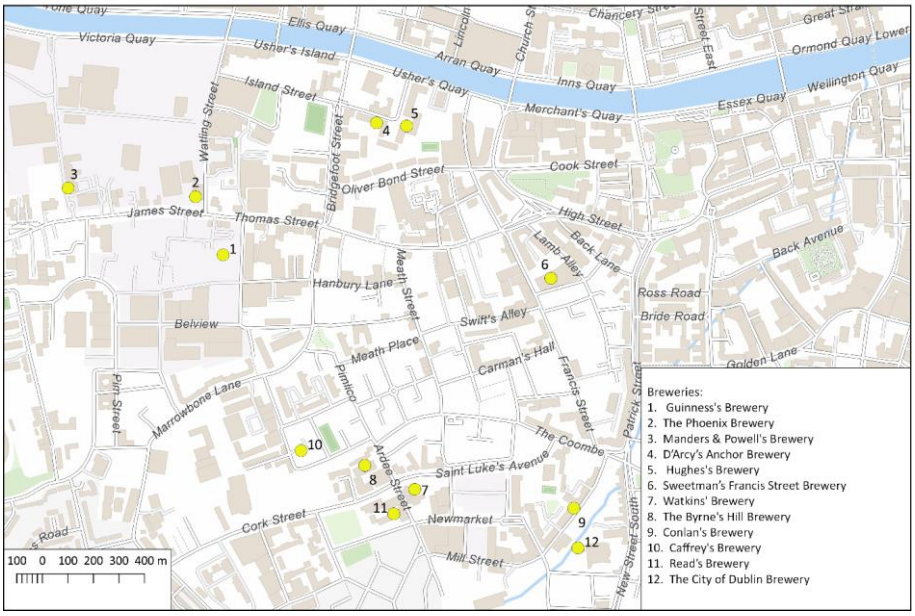


Figure 0.1. Brewery sites identified by the survey in the Liberties area of Dublin city.

Each of the remaining three brewery sites identified in the Liberties that have not previously been discussed had been founded after the mid-1830s, each located in the southern cluster. However, one of the three sites, the City of Dublin Brewery, had a particularly long, though not unbroken, history of brewing. Samuel Madder, the previous proprietor of the Phoenix Brewery, had operated a brewery at the site in the early 1820s (Pigot 1820; 1824). It appears likely that Madder's brewery incorporated the premises of either one or both of the breweries that had been operated by the Poole and Farrell families in the area between 1760 and 1815 (Wilson 1760; 1766; 1780; 1786; 1794; 1804; 1815). Brewing had ceased at the site before the 1828 *Valuation of Dublin*, by which time the brewery had been converted to distilling by John Busby, who leased the premises from Madder (BPP 1833). Busby's Distillery continued at the site until at least the mid-1850s and it reverted to brewing in *c*. 1865 when the City of Dublin Brewery was incorporated.[2] The final two sites identified were Caffrey's Brewery on Summer Street, established in the mid-1830s, and Read's Brewery on Ardee Street, probably founded in the early 1850s.[3]

[2] Busby's Distillery was recorded in the 1854 *Primary Valuation*. The City of Dublin Brewery was incorporated in 1865; *Freemans Journal* 11/12/1865, 2.
[3] Caffrey's Brewery was likely founded after 1834, when it was omitted from *Pettigrew and Oulton's Dublin Directory*, and before 1837, when it was depicted on the 1:1056 OS; NAI/OS140/Dublin 1837. Read's Brewery

1794 Name	1794 Address	1815 Name	1815 Address	1794 Name	1794 Address	1815 Name	1815 Address
Poole, Jacob	Blackpitts	Poole, William	Blackpitts	Cox, Ambrose	83 James's St.	____	____
____	____	Robinson, William	Blackpitts	Magee, James	90 James's St.	____	____
Farrell, James	Blackpitts	____	____	____	____	Kelly, John	103 James's St.
Murphy, Michael	Blackpitts	____	____	Grehan, Peter	134 James's St.	____	____
Reilly & Doherty	Brabazon St.	____	____	Andrews, Thomas	110 Lower Coombe	____	____
Hart, John	City Basin	____	____	Atkinson & O'Reilly	15 Marrowbone Lane	____	____
____	____	Macken, John & Co.	22 Cole Alley	Hendrick, John	Mount Brown	____	____
Andrews, Joseph	Cork Bridge	____	____	Mulligan, Sylvester	Mount Brown	____	____
Thwaites, George	Cork Bridge	____	____	Rooney, W. & Co.	61 New Market	____	____
Thwaites, William	5 Cork St.	Andrews & Hughes	5 Cork St.	____	____	Casey, M. & Co.	41 Pimlico
Andrews, Joseph	60 Cork St.	____	____	Talbot, John	11.5 Poole St.	Talbot, John	11 Poole St.
____	____	Lowry, Michael	Crane St.	____	____	Purser, John	19 Rainsford St.
Murray, Patrick	102 Francis St.	O'Donnell, C. T. & Co.	103 Francis St.	Doyle, J. & B.	4 South Earl St.	____	____
____	____	Davis, James	4 Hanbury Lane	Tighe, Laurence	156 Thomas St.	____	____
Jennett, Christopher	28 James's St.	____	____	Sutter, Robert	19 Usher's Quay	Sutter, Robert	19 Usher's Quay
Parvisol & Dillon	35 James's St.	____	____	____	____	Madder, Samuel	34 Usher's Quay
Brophy, Patrick	64 James's St.	____	____	Hines, W. & J.	7 Ward's Hill	____	____
Kirwan, Thomas	73 James's St.	Maziere, A. & Co.	73 James's St.	Armstrong, Andrew	66 Watling St.	____	____

Table 0.1. Unlocated breweries in Dublin's Liberties, as listed in Wilson's Dublin Directory of 1794 and 1815. Listings of breweries included in the survey are omitted.

As was previously stated, a large number of additional breweries had been located in the Liberties during the 18th and early 19th centuries, though their locations have not been confirmed. This is best seen in the breweries that were listed in *Wilson's Dublin Directory*, with the additional, unlocated Liberties breweries that were listed in both the 1794 and 1815 editions provided in table 9.1. At least seven further breweries operated on James's Street alone in the period, though the number is suggested to have contracted considerably in the years prior to 1815, when just two unlocated breweries were listed as operating on the street. Breweries were also densely concentrated in the area around New Market, with several breweries listed as operating on streets such as Cork

had been founded before the 1854 *Primary Valuation*, the earliest identified historical reference to the brewery.

Street and Blackpitts in 1794. Again, the suggestion from the directory evidence is that the industry had also contracted in this area in the period to 1815, though it is worth noting that omissions from the directories cannot be taken as evidence of a brewery's closure. For example, Rooney's Brewery on New Market was omitted from the 1815 edition of *Wilson's Directory* though it was later listed in *Pigot's Directory* of 1820.

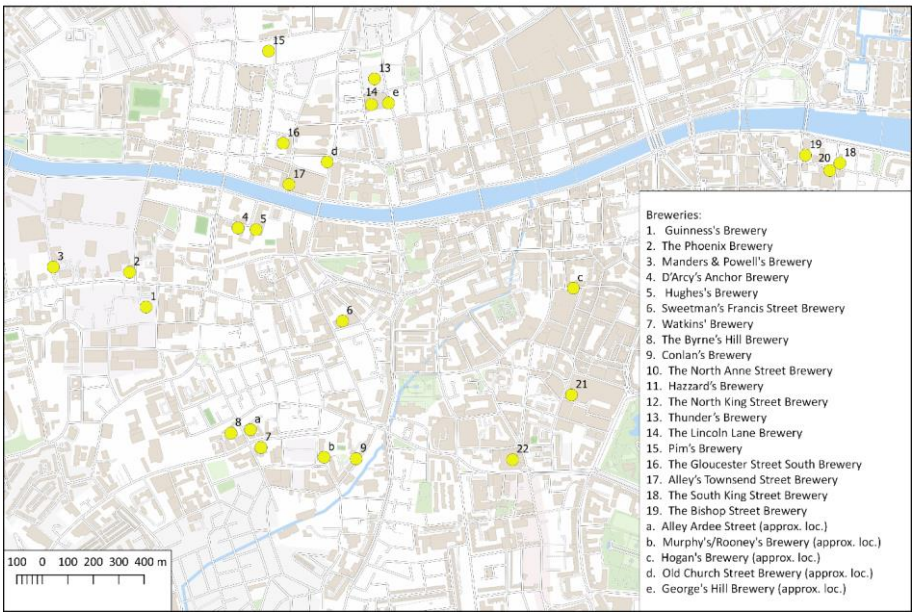


Figure 0.2. The distribution of breweries in Dublin city in 1828. Source: the 1828 Valuation of Dublin (BPP 1833).

While the contraction of the number of breweries in the Liberties in the period 1794-1815 can only be suggested based on the directory evidence, there is firm evidence for a decline in the number of breweries in the area after 1815. The number of breweries in the Liberties had reduced to eleven by the time of the 1828 *Valuation of Dublin*, the locations of which are depicted on figure 9.2 (BPP 1833). As many as 24 breweries in total were recorded in the city in the *Valuation*, with the Liberties area having by far the densest concentration. The 1830s saw the foundation of Caffrey's Brewery on Summer Street, the only confirmed new brewery established in the city during what was a period of expansion for the wider Irish brewing industry, as is outlined in Chapter 2. The city's breweries were affected by the period of decline that followed from the late-1830s and the number of breweries in the city had been reduced to eleven by the time of the 1854 *Primary Valuation*, eight of which were located in the Liberties (figure 9.3). Two of the breweries then producing in the city were foundations of the early 1850s, the previously mentioned Read's Brewery on Ardee Street in the Liberties and the

Mountjoy Brewery, established in 1852 to the north of the core city, on the south bank of the Royal Canal (Riordan 1920). Of the breweries located outside of the liberties, just two that had produced prior to the period of decline of the industry in the late-1830s and 1840s remained in operation, the North Anne Street Brewery near Smithfield Market on the city's north side and Alley's Brewery on Townsend Street, located within the vicinity of City Quay, near the southern docklands to the east of the core city. Alley's Brewery appears likely to have closed shortly after the *Primary Valuation*, perhaps in the early 1860s. The industry in the city had essentially centralised towards the Liberties before the mid-1850s and the probable factors that influenced this centralisation will be outlined in the section that follows.

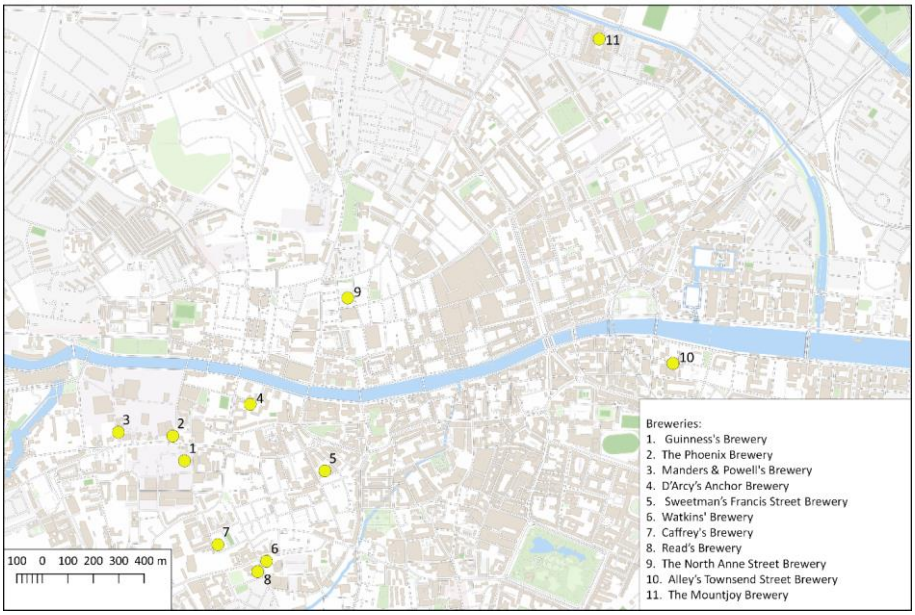


Figure 0.3. The distribution of breweries in Dublin city in 1854. Source: the 1854 Primary Valuation.

The industry remained highly concentrated in Dublin's Liberties until the 1870s (figure 9.4). Following the establishment of the City of Dublin Brewery before 1865, as many as nine breweries were in production in the area. The evidence suggests that just three further breweries were then located in the city, the previously mentioned North Anne Street Brewery and Mountjoy Brewery and a further new foundation of the 1860s, the Greenmount Brewery, which was located to the south of the core city, on the southern bank of the Grand Canal (Slater 1870).[4] The decades that followed 1870

[4] *Freemans Journal* 31/01/1867, 4.

saw a considerable decline in the number of breweries in the area. Read's Brewery appears likely to have been the first brewery closure of the period, having potentially closed after sustaining damage in the massively destructive New Market fire of June 1875.[5] The 1880s was a decade that saw a number of brewery closures; the City of Dublin Brewery had closed before 1883, Caffrey's Brewery before 1885 and Manders & Powell's Brewery before 1889.[6] Just one further closure in the area is confirmed in the 19th century, with Sweetman's Brewery on Francis Street closing in *c*. 1892-3 (Magee 2015, 125). While the closures in the period 1870-1900 had been significant in their volume, the Liberties continued to support four breweries at the beginning of the 20th century. Of these, the Phoenix Brewery was the first to close in 1905, while the Anchor Brewery continued to produce until 1926.[7] The final brewery to close in the area was Watkins's Brewery, where production is believed to have ceased in 1939 (Findlater 2013). Therefore, it was not until the mid-20th century that Guinness was the sole brewery producing in Dublin's Liberties, while the Mountjoy Brewery on the city's north side outlived each of the remaining Liberties breweries, itself closing in 1956.[8]

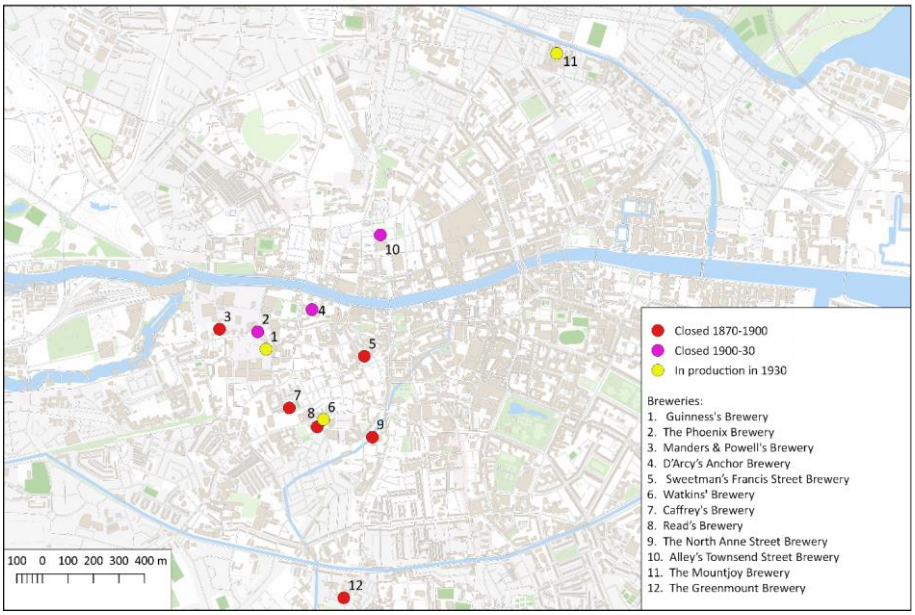


Figure 0.4. The distribution of breweries in Dublin city, 1870-1930.

[5] *Freemans Journal* 26/12/1872, 2; *Irish Examiner* 21/06/1875, 3.
[6] *Freemans Journal* 06/08/1883, 8; *Belfast Newsletter* 04/07/1885, 1. Manders & Powell's Brewery was identified as being an old brewery on the 1889 1:1056 OS map of Dublin city.
[7] *Irish Independent* 14/06/1905; 24/12/1926.
[8] *Irish Independent* 01/12/1956, 20; 31/12/1957, 6.

9.2 The locational advantages of breweries located in Dublin's Liberties

In the previous section, the development of the brewing industry in Dublin's Liberties was outlined. Highlighted was the dense concentration of breweries in the area throughout the extended period under consideration, with the Liberties being the premier brewing quarter of both Dublin city and Ireland as a whole well into the 20th century. While the scale of production that Guinness achieved was exceptional, the Liberties area of the city clearly held several advantages over other areas of Dublin city where brewing had been reasonably common before the late-1830s. In this section, these various advantages, several of which have been alluded to in previous chapters, will be highlighted, as will the micro-locational advantages that Guinness held over the remaining Liberties breweries.

Rynne (2006, 244) highlighted the main locational concerns for a large brewery during the mid-to-late-18th century. These were 'immediate access to an urban population, a barley supply, and … some form of water transport for the supply of bulky raw materials'. As was highlighted in Chapter 4, access to a supply or varied supplies of water that was both suitable and sufficient in volume to meet production needs was also a key locational concern. However, unlike many industries of the period, the use of horse-powered machinery meant that the majority of breweries were not constrained by the requirement for access to a suitable supply of water to power their plant, a point highlighted in Chapter 6. As will be outlined below, the Liberties area of Dublin can be said to have met each of these key locational concerns for much of the period under consideration.

9.2.1 Factors that led to the early concentration of brewing in the Liberties

Access to a large urban population was something that was not unique to the breweries located in Dublin's Liberties, with each of the city's breweries having unfettered access to a large local market throughout the studied period. The city had seen a population explosion from the early 17th century, with an estimated increase in population from some 10,000 in 1610 to 150,000 by 1756 (Lennon 2008, 10). While it is rightly pointed out by Goodbody (2014, 1-2, 10) that the early estimates of the city's population should be treated with some caution, the estimates suggest a decline in the city's population from the mid-18th century, followed by a further period of population growth from the 1780s to *c.* 1800. Despite an apparent population decline in the early years of the 19th century, the city's population continued to expand until the 1830s, reaching a recorded high of over 232,000 in the 1841 census. In the mid-18th century, Dublin is said to have been amongst the most-populous cities in Europe, while it was the second most-populous city in the then United Kingdom during the 19th century (Goodbody 2014, 1). In terms of access to a large local market, breweries located in Dublin's Liberties held no recognisable advantage over those located elsewhere in the city. However, breweries located in the city can certainly be said to have held a major advantage in terms of access to a large local market over those located elsewhere in Ireland, or indeed in the majority of towns and

cities in Britain, with the obvious exception of London. This can be seen as one of the primary reasons for the reasonably well documented transmission of skilled labour between the London and Dublin brewing industries during the late-18th and 19th centuries, outlined in Chapter 2. Indeed, the earliest references to porter brewing in Ireland belong to breweries located in the Liberties. Both the breweries that had been operated by Andrews and Thwaites, which had begun porter brewing the 1760s, were located in the southern cluster of breweries in the Liberties, on New Row South and within the vicinity of Cork Street respectively (Lynch & Vaizey 1960, 44-6).

One clear advantage that breweries located in the Liberties held over those elsewhere in the city was highlighted in Chapter 4, access to both a suitable and sufficient water supply. The early institutional involvement in the development of the city's key southern potable water supply from the late-12th century was briefly introduced in the chapter, with the supply being diverted from the rivers Poddle and Dodder via an artificial waterway, the City Watercourse (Clarke 2002, 7, 28). Also highlighted was the construction of a large basin to the south of James's Street in the early 18th century, which secured the supply of potable water for the city's south side (Lennon 2008, 6). The availability of this supply of water has to be viewed as being one of the primary factors in the development of the Liberties, and in particular the east-west axis of Thomas Street and James's Street, as a concentrated brewing quarter in the early 18th century. While access to this supply was not unique for Guinness, from a micro-locational perspective the brewery was located directly adjacent, to the northeast, of the basin constructed in the early 18th century. This certainly suggests that access to the supply for the brewery was more convenient than for many of the other breweries located in the area.

The vagaries of Guinness's early leases, which provided tariff-free access to the water supply, were also highlighted in Chapter 4. It would be remiss to assume that the situation was unique, or indeed exceptional, for a brewery located in the area without further leasehold evidence form the remaining Liberties breweries. However, it can certainly be said that this tariff-free access to potable water was a contributing factor in the dramatic expansion in output that the brewery witnessed from the 1790s on. Guinness not only had access to both a sufficient and suitable supply of water that enabled the expansion of the brewery's trade, the tariff-free nature of the supply also further reinforced the economies of scale that the brewery realised as its scale of production increased.

Breweries located in Dublin's Liberties also had reasonably easy access to the industry's second-most voluminous raw material from an early date, barley, both malted and raw. The area to the east of Thomas Street had served as an extra-mural marketplace at the close of the Early Medieval period and from the early 17th century has been known as Cornmarket, underlining the importance of the grain trade (Clarke 2002, 2; Lennon 2008, 13). This area of the city was essentially the meeting point of two of Ireland's great Medieval routeways. These were the Slighe MOr, the major routeway

from Connaught along which both James's Street and Thomas Street were formed, and the Slighe Dála, the major routeway from Munster which terminated at the Coombe (Henderson 2001, 9; Hickey 2008, 7). Connecting the two routeways was the predecessor of Francis Street, and it was to the east of the junction of Francis Street and Thomas Street that the early marketplace had formed. It would appear likely that it was along these routeways that Dublin's supply of grain from neighbouring regions was sourced throughout the Medieval period and well into the 18th century. As such, the Liberties' location, to the southwest of the Medieval city and at the terminus of these routeways, can also be suggested to have been one of the primary factors in the early concentration of brewing in the area. This suggestion is further reinforced by the locations of the breweries themselves. The southern cluster of breweries in the early 19th century, centred on New Market and Ardee Street, was at the terminal point of the Slighe Dála, while the northern cluster, centred on the east-west axis of Thomas Street and James's Street, was dispersed along the terminal point of the Slighe MOr.

As the 18th century progressed, the trade in grain moved away from the city's southwestern suburbs towards the quays that were developing to the east of the core city, perhaps instigated by bounties that were introduced in 1759 to secure city's supply of grain (Lynch & Vaizey 1960, 41). Both the coastal and British trade appear likely to have replaced the road-borne trade in grain that had previously supplied the Liberties grain markets, eventually culminating with the opening of a new Corn Exchange on Burgh Quay in 1816-18 (Goodbody 2014, 7-8). This shift in the grain trade from the southwest of the city towards the eastern quays would no doubt have been a limiting factor on the growth of the Liberties breweries, which until the final decades of the 18th century had no access to bulk transport systems. The growing importance of the grain trade in the eastern quays during the late-18th and early 19th centuries is underlined by the fact that in 1802 Guinness was primarily sourced its barley from Britain (Lynch & Vaizey 1960, 129). However, the coastal trade, principally from Ballinacurra in the east of Cork county, was also important, while the brewery had already begun to exploit bulk transports systems to source their barley from Ireland's interior via the Grand Canal.

Access to bulk transport systems may have provided a brewery with two primary advantages, access to both raw materials and distant markets. In this regard, breweries in Dublin had access to port facilities throughout the period under consideration, though the Liberties area of the city was situated in a position that made access to the city's eastern quays inconvenient. This situation changed in the closing decades of the 18th and the early decades of the 19th centuries, when Dublin city was linked to the River Shannon in Ireland's west via two canals. Of the two canals, it was the Grand Canal that was both a commercial success and proved to be important in the development of Dublin's brewing industry, with its location favouring the breweries located in the Liberties.

9.2.2 How the Grand Canal impacted on the makeup of Dublin city's brewing industry

The canal age in Ireland had begun at an early date, with the Newry Canal, situated in the northeast, being the earliest summit-level canal in either Britain or Ireland (Rynne 2006, 339). Works on the Grand Canal, which eventually linked Dublin city with both the navigable rivers Shannon and Barrow, had begun as early as 1755, though progress was initially slow (Delany 1986, 74-88). While the canal had been extended west to Sallins in county Kildare by 1784, and from there south to meet the Barrow at Athy, also in Kildare, in 1791, the through route to the Shannon itself was not realised until 1804. Works on the Shannon itself, which had also been instigated in 1755, were also slow to progress (Delany 1986, 48-56). It was only following the extension of the Grand Canal to the river in 1804 that the works, much of which had stalled in the 1770s, began to progress sufficiently. The middle and lower reaches of the river were navigable from 1814, while the impending completion of the Royal Canal, which linked the Upper Shannon to Dublin in 1818, necessitated the acceleration of works on the upper reaches of the river which were completed in 1820. Despite the completion of the links between the river with the two canal systems, trade remained depressed on the Shannon system until the late-1820s (Delany 1986, 57-8). This was due to the topography of the river which traversed 15 lakes along its course. Heavily laden canal boats could not traverse these natural obstacles and, initially, goods had to be trans-shipped at each lake to be carried on either pole boats or sailed lighters. This particular problem was not addressed until the late-1820s when steam-powered boats, which were used to tow canal boats across the lakes, were introduced to the system, resulting in an immediate increase in trade on the river.

While the Grand Canal was a resource that was available for each of Dublin's breweries to exploit, its primary terminus was located in the Liberties, providing an obvious advantage to the breweries that were located within its immediate vicinity. The principal terminus, James's Street Harbour, was situated adjacent to the early 18th century fresh-water basin that had been constructed to the south of James's Street itself, located immediately southwest of the Guinness site. The harbour was completed in 1786, some 18 years before the canal's extension west to the Shannon was realised (Delaney 1995, 26-7). In 1790, works began in providing a direct link with the canal, whose termination to the west of the city was deemed unsatisfactory, and the quays located to the east of the city (*ibid*., 28-9). Known as the Circular Line, it extended from Kilmainham, to the west of James's Street Harbour, to Ringsend in the city's south docklands and was completed, in conjunction with a new harbour, in 1796 (*ibid*., 51-3; Rynne 2006, 351-2). The Dublin city facilities of the Royal Canal had developed along similar lines, with the canal's primary terminus, Roadstone Harbour on the city's north side, opened for traffic in 1814. This was followed by the opening of the City Line, which extended the canal east of

the city and was also developed in conjunction with a new harbour in the city's northern quays, Royal Canal Dock.

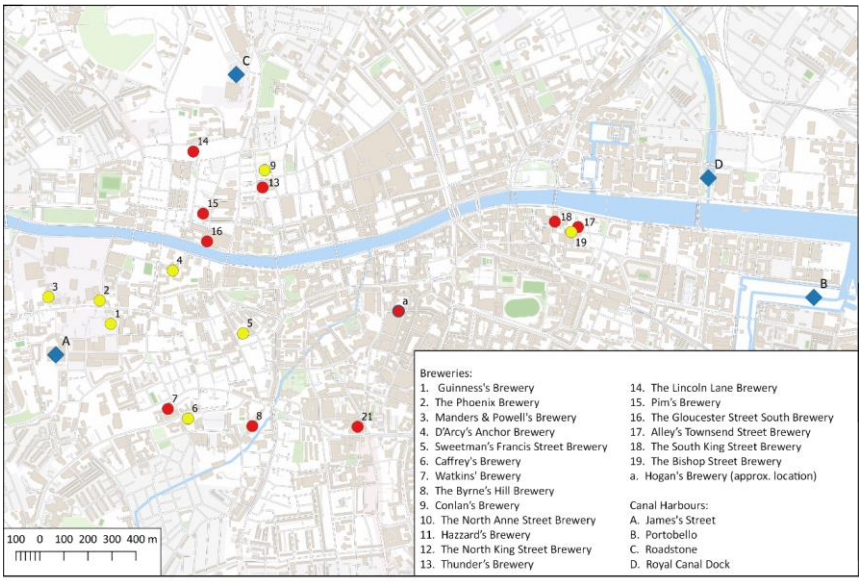


Figure 0.5. Dublin city's breweries and canal harbours. All breweries were in operation in c. 1837. Those marked in yellow survived produce after 1850.

In figure 9.5, the locations of the city's four canal harbours are depicted along with the locations of each brewery that is known to have produced in the city in *c*. 1837 (BPP 1833). As can be seen, the breweries in the Liberties were each located in reasonably close proximity to the Grand Canal's James's Street Harbour, while those located in the Smithfield area were located in close proximity the Royal Canal. As was stated in the previous section, the North Anne Street Brewery was the only brewery on the city's north side that survived the period of decline in the industry in the late-1830s and 1840s. This certainly suggests that access to the Grand Canal was a contributing factor in the success of the Liberties breweries in that period. As was previously stated, the Grand Canal was the more commercially viable of the two canals and its success can be ascribed to two key factors. These were its course, in particular the towns that it served and the quality of the land that it traversed, and the type of trade that it acquired. Indeed, these two factors are inter-linked, with land quality appearing to have been a major factor in the form of goods that traversed the canal. The Grand Canal, its branch lines and the connected Barrow and Shannon systems traversed what is today one of Ireland's richest barley growing regions. As was highlighted in Chapter 4, many of the towns on the line of the canal itself and the linked Barrow system had developed as malting centres from the 1830s

and, indeed, in several cases earlier. Chapter 2 highlighted the region's highly developed network of local breweries in the mid-1830s, many of which were located in small town and villages, suggesting that it was an area with a long-standing tradition of beer consumption. In contrast, the Royal Canal traversed Ireland's northern midlands, land that is primarily associated with both peat extraction and pastoral agriculture today. As such, the Grand Canal served dual purposes. In addition to providing Dublin's breweries with an expanded market, it also provided access to one of the industry's key raw materials, barley in both malted and raw form. In contrast, the Royal Canal appears to have primarily served as a vector for Dublin's breweries to expand their markets.

The importance of the Grand Canal for Dublin's breweries was highlighted in Lynch and Vaizey's history of Guinness. The trade in both malt and barley on the canal had begun at an early date, with shipments of malt from Mountmellick in county Laois to Guinness confirmed in the 1790s (Lynch & Vaizey 1960, 129). While, as was outlined in Chapter 4, the brewery continued to exploit British barley supplies throughout the 19th century, the trade in malt along the Grand Canal and Barrow Navigation increased in volume as the 19th century progressed. This can be seen in the development of independent maltings that operated on a particularly large scale in towns such as Mountmellick, county Laois, Athy, county Kildare, and Tullamore, county Offaly, among others. The Circular Line of the canal also appears likely to have been an important carrier of raw materials for the Liberties breweries. It provided a direct link with the port infrastructure to the east of the city, through which barley, hops and coal from Britain and malt from the coastal trade, from the likes of Wexford town and Ballinacurra in east Cork, could be sourced.

The Grand Canal was also exploited by Guinness to expand their markets from an early date. In 1807, roughly one-quarter of Guinness's output was being sent to Shannon Harbour, where the Grand Canal meets the River Shannon (Lynch & Vaizey 1960, 123). Further sales were recorded in towns and cities in the midlands and the west of Ireland, such as Boyle, Athy, Loughrea, Athlone and Limerick city, each accessed via the canal and Shannon Navigation. This early exploitation of the canal to expand the brewery's markets in Ireland is significant in that it provided a readily accessible outlet for the brewery beyond the limits of its traditional market. Indeed, Chapter 2 highlighted the south midlands region, which the canal traversed, as being one that had a highly developed network of small-scale, local breweries, many of which were located in small towns and villages. It was suggested that the Grand Canal had been a major influence on the closures in the region during the late-1830s and 1840s, with breweries in the region being the most-heavily affected by the decline of the industry in the period. It would appear likely that further Dublin breweries, and in particular those located in the Liberties, had also exploited the canal to expand their markets at a similarly early date, though no record of this has been preserved.

The Circular Line also gave access to the city's eastern quays, providing easy access to export markets which, as was also highlighted in Chapter 2, were exploited by Dublin's breweries, in particular the British market from the mid-1820s on. As such, James's Street Harbour acted as a vector for breweries in the Liberties to expand their markets in both Ireland and abroad, with Guinness's exploitation of the British market in particular being an important factor in the brewery's rise to become Ireland's largest by output in 1833 (Chapter 2). While Guinness were not alone in their exploitation of the canal, which must be viewed as being a major factor in the apparent success of the Liberties breweries during period of decline that the industry witnessed in the late-1830s and 1840s, it was the brewery that was best located to exploit the canal, with James's Street Harbour being located immediately adjacent to brewery itself. While the Grand Canal was an asset that was likely exploited by each of the breweries located in the Liberties, Guinness's location meant that the brewery was uniquely situated to exploit this asset to its fullest and, as with access to water supply, it appears to have been one of the unique locational factors that led to the brewery's early dominance of the Irish market. While the trade in both porter and malt on the canal continued well into the 20th century, its importance to Guinness as a vector for access to distant markets declined as Ireland entered the railway age.

9.2.3 How access to the rail network favoured the expansion of breweries located in Dublin city

While the Grand Canal had enabled Guinness and the remaining Dublin city breweries to expand their markets beyond the city itself, it was not until the railway age that Guinness's true dominance of the Irish market was realised. Between 1855 and 1860 Guinness's sales in both Dublin and the rest of Ireland more than doubled (Lynch & Vaizey 1960, 199-200). In the same period, exports to Britain increased by 40%, resulting in what was effectively a shift in trade from the British market, which had previously been worth more than half of the brewery's sales in value, towards the Irish market, principally via the expansion of the brewery's trade beyond Dublin city. The 1860s saw Guinness's overall sales more than double, from 198,478 barrels in 1860 to 423,080 barrels in 1870. While the decade saw increased sales in both the British and Dublin city markets, it was the expansion of the Irish market beyond Dublin that saw the highest level of growth. By 1864 Guinness were supplying more than half of the beer consumed in Ireland outside of Dublin city (Lynch & Vaizey 1960, 201). By then, Guinness's main agencies were supplied by rail rather than canal, with the agencies located on the canal network declining in importance from the early 1850s (Lynch & Vaizey 1960, 146, 208-9).

The railway age in Ireland began in earnest in 1834 when the Dublin to Kingstown (Dún Laoghaire) line was opened. From there, the development of the rail network proceeded at a slow pace through the 1830s, though the rate of railway construction increased as the 1840s progressed.

While just 31.25 miles (50km) of track had been laid by 1842, it had increased to 123 miles (198km) by 1846 and to 400 miles (643km) by 1850, while a further 300 miles (480km) of track were then under construction (Nowlan 1973, 98; Middlemass 1981, 5; Rynne 2006, 361). Railway construction tended to be instigated by parliamentary acts, which laid out the routes to be followed and provided powers for the managing companies to acquire land. Capital was, in the most part, raised privately by the managing companies though the state did make significant contributions, particularly in the late-1840s and early 1850s (Nowlan 1973, 100-1). A symptom of the private nature of railway construction in Ireland was the sheer number of companies that managed the various lines. As many as 75 individual railway companies operated in Ireland between 1834 and 1900, though the majority were eventually subsumed by one of the three companies that operated Ireland's premier routes (Rynne 2006, 361).

The sheer scale of railway construction after 1850 is evident when we consider that as many as 3,412 miles (5,491km) of track had been laid by 1906 (Rynne 2006, 361-2). While as many as 29 railway companies then managed the overall network, as much as 75% of the traffic was carried by the three largest, the Great Southern and Western Railway (GS&WR), the Midland Great Western Railway (MGWR), and the Great Northern (Ireland) Railway (GNR). Both the GS&WR and the MGWR had begun as competing companies in the 1840s, with the GS&WR laying out the Dublin to Cork route and the MGWR laying out the Dublin to Galway and Sligo routes. The GNR was essentially an amalgamated company that was formed in 1876 following the merger of the companies that operated the Dublin to Drogheda, Dublin to Belfast, and the Dundalk to Enniskillen lines (Middlemass 1981, 61-3).

Dublin city essentially acted as the core of the network, with each of the principal routes radiating from the city, each accessed by one of four railway stations. By 1860, direct lines connecting each of Cork, Galway and Belfast cities to Dublin had been completed, with branch lines servicing each of Kilkenny, Waterford and Limerick cities. The line from Dublin to Sligo town was completed in 1862, though the final line to radiate south from Dublin proceeded at a slower pace despite the early opening of the Kingstown line. Operated by the Dublin Wicklow and Wexford Railway (DW&WR), it was extended to Bray in the mid-1850s and on to Enniscorthy in the early 1860s, though it was not until 1872 that trains ran directly from Dublin to Wexford town (Middlemass 1981, 8).

While the majority of the main rail lines had been completed by the early 1860s, little interconnectivity had been achieved on the network by then. Only in the northeast, where two lines had been developed linking Derry/Londonderry city with both Dundalk and Belfast, had such efforts been realised. The development of the network after the mid-1860s addressed this shortcoming in the network, though many important links were not realised until a late date. For instance, many of

the large towns and cities on Ireland's west coast lacked interconnectivity until the final decades of the 19th century, with the final link between Cork, Limerick, Galway and Sligo not being affected until 1894 (Middlemass 1981, 23). Similarly, engineering difficulties prevented direct connections in the south and southeast. The long-mooted direct link between Wexford town and Waterford city was not completed until 1904, while the direct link between Cork and Waterford cities was never realised, though the cities had been linked, via a branch line, through Lismore, Fermoy and Mallow in the 1870s (Middlemass 1981, 8).

In terms of the carriage of freight, the expanding rail network provided further opportunities for the transport of goods in Ireland's interior, operating in direct competition with both the Grand Canal and Royal Canal. The Royal Canal was actually acquired MGWR in 1845 and, while they continued to operate direct passage on the canal until 1886, the levels of trade had declined by then in favour of rail transport (Delany 1992, 152-62). Of Ireland's inland waterways, only the Grand Canal and the Shannon Navigation remained truly relevant as freight carriers in the face of competition from the railways. This was partly due to protracted negotiations between the Grand Canal Company and both the GS&WR and the MGWR. These negotiations resulted in the Grand Canal Company being permitted to operate its freight trade at a cost advantage of 10-15% below that offered by the railway companies (Delany 1995, 163-84). While these agreements broke down in the 1870s and 1880s, the fact that the Shannon Navigation was not in direct competition with the railways, coupled with the fact that the Grand Canal had retained a significant trade in heavy, non-perishable goods, meant that both waterways continued to prosper to some degree into the 20th century.

The lack of interconnectivity between the various rail lines can certainly be said to have favoured breweries located in Dublin city. While Dublin's breweries had reasonably easy access to each of Ireland's four primary rail lines, the fact that each line was provided with its own terminus in the city, each of which lacked inter-connectivity, meant that through passage between the various lines was difficult for Ireland's regional breweries. This point is underlined by the case of MacArdle and Moore's Cambrickville Brewery in Dundalk, county Louth, which, as was outlined in the previous chapter, had instigated a direct link with the railways at the close of the 19th century. At the beginning of the 20th century, the brewery held contracts to supply the canteens of the various military barracks at the Curragh in county Kildare (Callan MacArdle & Callan 1902, 481-2). Given the lack of interconnectivity in the rail network, the brewery was forced to use three separate rail companies to supply the contracts, with the trans-shipment of beer in Dublin city being a necessity. This undoubtedly added to the transport costs, placing the brewery at a significant disadvantage. In contrast, breweries located in Dublin had easy access to each of Ireland's premier lines, with the Liberties breweries in particular being well positioned to exploit Ireland's expanding rail network.

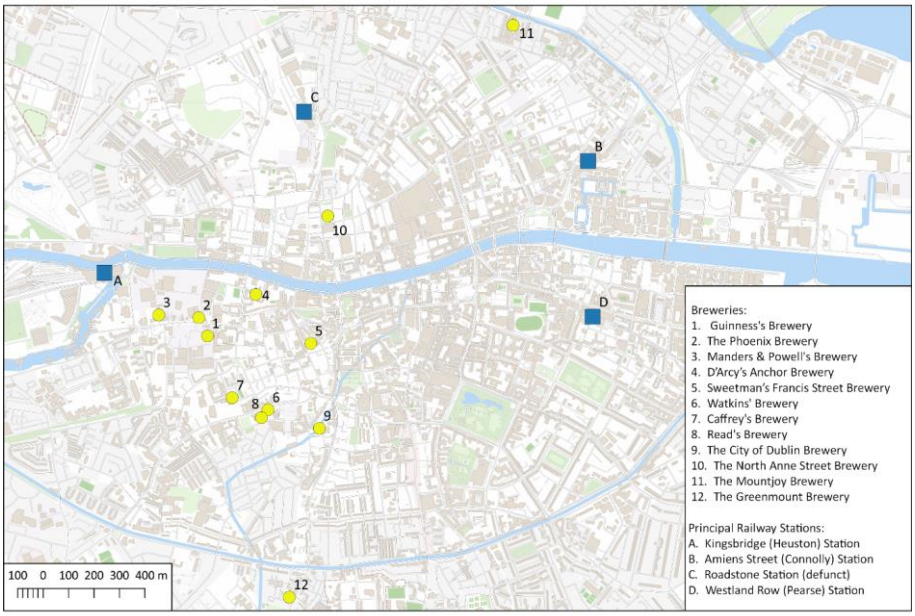


Figure 0.6. The locations of each of Dublin's four primary train stations, depicted in conjunction with the distribution of breweries in the city in 1870.

The locations of each of Dublin's four railway stations are depicted in figure 9.6, in conjunction with the locations of each of the city's breweries in the period 1870-1900. As can be seen, the terminus for the GS&WR, Kingsbridge (now Heuston) Station was located immediately west of the Liberties, while the terminus for MGWR, Broadstone Station (now the headquarters of Bus Éireann), was located immediately adjacent to Broadstone Harbour on the city's north side. Each of the remaining two stations, the DW&WR's Westland Row (now Pearse) Station on the city's south side and the GNR's Amiens Street (now Connolly) Station on the city's north side, were located to the east of the core city, within the vicinities of the eastern quays. The spatial separation of the railway stations is clearly evident, with both the River Liffey and the core city acting as north-south and east-west barriers respectively, while the individual rail lines had no direct connections to the city's eastern quays. This spatial separation was partly alleviated in the later-19th century, with plans for the connection of the various stations being proposed from the 1860s (Mulligan 1990, 30-1). The M&GWR opened a line of track, following the City Line of the Royal Canal, that linked Broadstone Station with docks at North Wall (Rowledge 1995, 68-9). This was followed by the Phoenix Park Tunnel, which opened in 1877 linking the GS&WR's Kingsbridge Station with the M&GWR's North Wall line and was used for the passage of freight to and from the quays. The north-south connection of the city's eastern station was

not realised until 1890, when the City of Dublin Junction Railway was completed, linking the lines of the GNR and the DW&WR via the Loopline Bridge (*ibid*., 70; Mulligan 1990, 32).

Despite these efforts to bridge the gap between the various rail lines that radiated from the city, the through passage of goods remained inconvenient, as was highlighted by the previously outlined case of the Cambrickville Brewery in Dundalk. The situation was clearly advantageous to Dublin's breweries, who were provided easy access to Ireland's premier rail lines. It could also be said that it favoured those located in the Liberties, who were located within the immediate vicinity of Kingsbridge Station and who, via the Circular Line of the Grand Canal, also had reasonably easy access to the city's eastern suburbs and quays. Of the breweries located in the area, Guinness were again the best located to exploit Ireland's expanding rail network and, as was mentioned in the previous chapter, it was the only brewery in the city that affected a direct link with the railways. This link was made following the brewery's significant expansion to the north side of James's Street in the early 1870s, where the brewery had acquired a significant tract of land (Lynch & Vaizey 1960, 183). The plot extended from the rear of premises located on the north side of James's Street as far north as Victoria Quay, and its north-western boundary was directly adjacent to Kingsbridge Station. It was remarked in the previous chapter that it is somewhat surprising that Dublin's remaining large-scale breweries did not affect such a similar rail link. The likelihood is that their sites were, by and large, unsuitable for such a direct rail link, with Guinness's connection to the rail network being the result of the brewery's ability to expand into land that was located directly adjacent to a railway station. It would also appear likely that it was also a question of financial investment. In Chapter 3, when the scale of breweries operating at the beginning of the 20th century was considered, it was highlighted that those located in Dublin, with the exception of Guinness, were then producing below capacity, essentially meaning that they were not realising any potential economies of scale. This is a reflection of Guinness's increasing dominance in both the Dublin city and wider Irish markets in the second half of the 19th century and it implies that, as the brewery's output expanded, the profitability of Dublin's remaining large breweries diminished. This, perhaps, suggests that a significant investment, such as the opening of a direct rail link, would have been imprudent for a firm that was not realising full profitability.

Guinness's expansion to the north also provided the brewery with extensive quay frontage, the full potential of which was maximised in the late-19th century. The brewery acquired a fleet of steam-powered river barges that were used to transport both raw materials and finished product to and from the city's eastern quays (Rynne 2006, 245). The brewery's major expansion in the 1870s had enabled its continued growth to become the world's most-productive brewery in the 1880s. While each of its locational advantages were shared with the remaining Liberties breweries before the 1870s, it was the phase of expansion in the 1870s that provided Guinness with a unique locational

advantage compared to the remaining Liberties breweries. The physical expansion of the brewery, which is covered in detail in the next section, can be said to have been one of the primary reasons for the brewery's exponential growth in the decades that followed 1870. However, as will be outlined in the next section, the brewery had significantly expanded its footprint in the decades that had preceded, an expansion that has to be viewed as being a major factor in the brewery's rise to become the world's largest during the 1880s.

9.3 The physical expansion of Guinness's James's Gate Brewery

9.3.1 Guinness's Brewery in the 18th century

The brewery that was acquired by Arthur Guinness in 1759 was already a long-standing concern, with brewing confirmed to pre-date 1670 at the site (Lynch & Vaizey 1960, 69-70). In 1759 the brewery's site extended from James's Street, where it had a frontage of some 89 ft (27m), for some 400ft (122m) south to Rainsford Street, where a secondary entrance was located. In addition to the brewery and its ancillary buildings, the site acquired by Guinness also comprised a 'commodious' dwelling house, gardens with a fish pond and a summer house. The dwelling house is believed to have been rebuilt in *c.* 1770 and, while it was extensively remodelled in *c*. 1870 when it was converted to offices, it is the earliest recorded structure that survives in the wider brewery site (plate 9.1).[9]



Plate 0.1. The residence of the first Arthur Guinness. Constructed in c. 1770 and overhauled in c. 1870 when it was converted for use as offices.

Unfortunately, little is known about the late-18th century expansion of the brewery, though detail on the phasing of the expansion in the period could be provided by a detailed study of the brewery's historic leases. One phase of early 19th century expansion is confirmed by the trade

[9] NIAH: 50080274.

directories. Between 1804 and 1815 Guinness had acquired a neighbouring brewery, previously operated by Ambrose Cox, located at 83 James's Street, the location of the brewery's primary entrance today (Wilson 1804; 1815).

9.3.2 The physical expansion of the brewery between 1820 and 1870

The earliest detailed plans of the brewery were composed in 1820 and have been provided, redrawn, in figure 9.7. The brewery can be said to have been an expanded burgage plot brewery, bearing resemblance in its form and layout to those referred to in the previous chapter, such as the two breweries located in Water Lane in Sligo town, or indeed Beamish and Crawford, then Ireland's largest brewery by output. The core brewery itself, which was located to the east of the primary courtyard, comprised a series of linear buildings, arranged north-south, following the lines of the burgage plot that the brewery had originally been established on. The northern section contained the brewery's mill, coppers and likely the mash tuns, while three north-south arranged buildings projected south, housing the brewery's fermentation and cleansing plant. Two of these three north-south arranged structured have survived, those depicted centrally and to the east, and together comprise the only surviving elements of the original core brewery, later known as Brewery No. 1 (plate 9.2). They were originally constructed to house the brewery's fermentation vats and were later used to house maturation vats. Both date to either the late-18th or early 19th century, the period where the brewery was engaging with the first phase of industrialisation and during which it had expanded to become Dublin's largest by output. The 1820 plans identified the westernmost of the two vat houses as being an old vat house, while the easternmost was identified as being a new vat house, with hop storage in the upper floors. This shows that the brewery was being continually expanded or reconstructed throughout the late-18th and early 19th centuries, an unsurprising situation given its expansion in output in the period, when the brewery's sales increased from over 10,000 barrels in 1800 to over 66,000 in 1814 (Lynch & Vaizey 1960, App.).

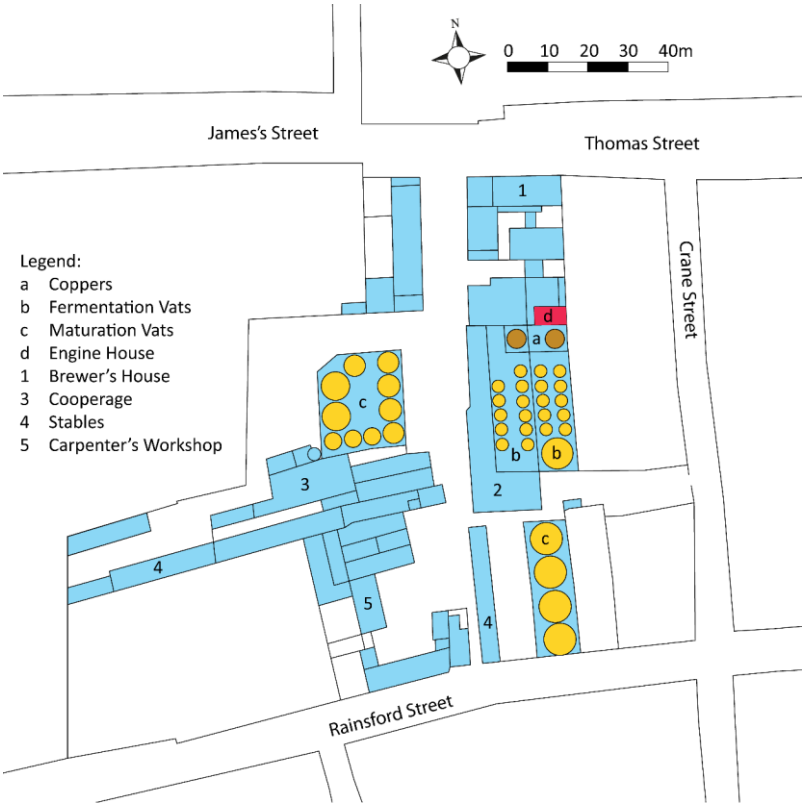


Figure 0.7. Guinness's Brewery in 1820. Approx. scale.
Source: James's Gate Brewery, Historical Plans (Guinness Archives, Guinness Storehouse, Dublin).



Plate 0.2. Vat houses, dating to the late-18th and early 19th centuries.
The sole surviving elements of Guinness's original brewhouse, Brewery No. 1.

To the south of the core brewery a further vat house, containing maturation vats, was depicted, again with a north-south axis. To the west, on the opposite side of the brewery's primary courtyard and probably in the area that had previously housed the brewery formerly operated by Cox, was an additional vat house, again housing maturation vats. To the south and west of this vat house was a complex of organically arranged buildings, which may have formerly been Cox's brewery, which in 1820 comprised Guinness's cooperage and ancillary buildings, such as workshops and stables.

The next set of detailed plan of the brewery were composed in 1862 and the phasing of the brewery's post-1820 expansion, as is provided in the detailed plans of the brewery, is depicted in figure 9.8.[10] By then, the core brewery itself had been considerably extended to the north and northeast, with newly constructed buildings, which haven't survived, then housing the brewery's coppers. To the south of the core brewery, the vat house depicted in 1820 had been replaced by a larger vat house, organically arranged, that extended along Rainsford Street. While the vat house depicted to the west of the primary courtyard in 1820 remained in use, each of the ancillary buildings depicted in this area had been replaced by an expanded cooperage. The footprint of the wider brewery complex had also been expanded to both the east and west, an expansion that is depicted in figure 9.8, where the phasing of the expansion of the brewery between 1820 and 1924 is overlaid on the 1907 1:2500 OS. The most-significant surviving structure from this phase of expansion is located apart from the core brewery itself, a purpose-built hop store that was erected on the south bank of James's Street Harbour in the 1850s or early 1860s (Chapter 4). While the brewery's footprint had expanded and the brewhouse itself had been considerably extended, the redevelopment of the site is not indicative of the growth that the brewery's trade had witnessed in the decades between 1820 and 1862. In that period, the brewery had grown to become Ireland's largest by output in 1833 and is said to have been producing as much as half of the beer consumed in Ireland outside of Dublin in 1864 (Lynch & Vaizey 1960, 199-200; Bielenberg 2009, 80). It would appear likely that the space-constrained site was then a limiting factor on the brewery's future growth, which was enabled as the physical expansion of the brewery continued throughout the 1860s and 1870s.

[10] *James's Gate Brewery, Historical Plans*, Guinness Archives, Guinness Storehouse, Dublin.

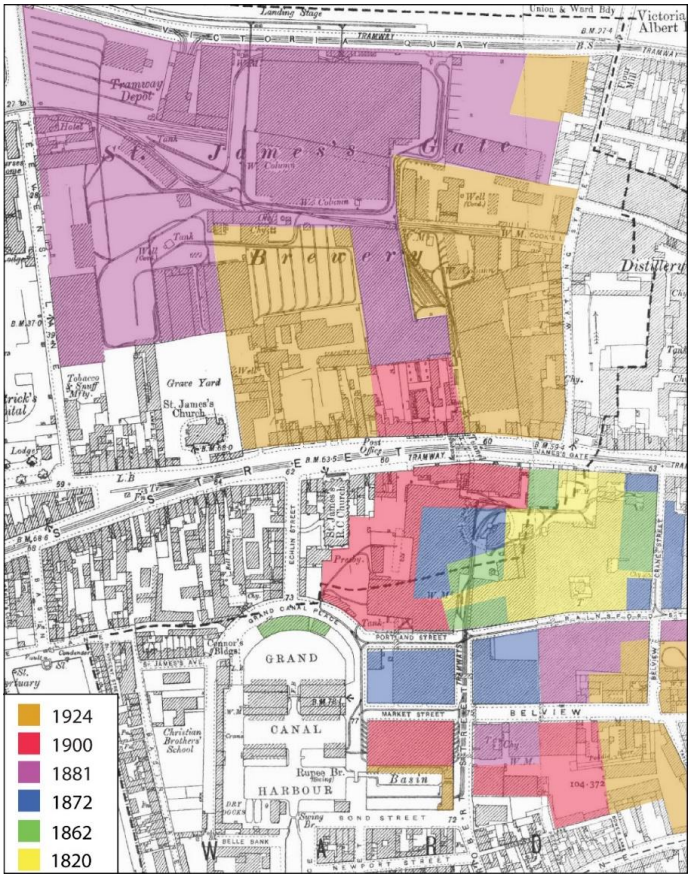


Figure 0.8. The phasing of Guinness's expansion from 1820 to 1924. Derived from James's Gate Brewery, Historical Plans (Guinness Archives, Guinness Storehouse, Dublin). Overlaid on the 1907 1:2500 OS: DN 018.

9.3.3 The physical expansion of the brewery after 1870

The post-1870 development of the brewery is well-covered by detailed plans that were composed at irregular intervals, often annually, until 1924 (figure 9.8).[11] Before 1872, the brewery had further expanded to the west, east and south. While the hop store on Grand Canal Place was the first building constructed outside of the boundaries of the core brewery, it was in the 1860s that Guinness began to subsume significant plots of land located beyond the streets that formed its southern and eastern borders. The brewery acquired the land on both sides of Crane Street, to the north of the junction with Rainsford Street, before 1872 and the newly acquired land was used to further increase the brewery's maturation capacity. New vat houses, each extant, were constructed on both sides of

[11] *James's Gate Brewery, Historical Plans*, Guinness Archives, Guinness Storehouse, Dublin.

Crane Street, those on the west side between 1862 and 1865 and those on the east side between 1865 and 1872 (plate 9.3). The brewery had also acquired a plot of land to the south of Rainsford Street between 1865 and 1872, on which a further vat house and a new stables were erected. In the same period, the core brewery had also expanded to the west, with the brewery's cooperage being relocated to this area, while further vat houses were constructed in place of the previous cooperage. In Chapter 6, Guinness's maturation capacity, and consequently the quantity of matured beer that was blended in the finished product, catering for the tastes of the time, was proposed as being a factor in the brewery's growth in the period. The expansion of the brewery's maturation capacity during the 1860s and early 1870s may well have played a significant role in its acquisition of the majority share in the market for beer in Dublin city during this period, as is outlined in Chapter 3.



Plate 0.3. Vat house, located on the east side of Crane Street, northeast of the junction with Rainsford Street. Constructed between 1865 and 1872.

While the brewery had considerably expanded its footprint between 1820 and 1872, it was in the years that immediately followed 1872 that the most-significant physical expansion had occurred. The brewery acquired a significant plot of land to the north of James's Street in the early 1870s, extending from the rear of premises that faced south onto James's Street as far north as Victoria Quay (Lynch & Vaizey 1960, 183). It was here that the brewery constructed its significant Cooke's Lane maltings, no longer extant, which was completed in 1877 (Dennison & MacDonagh 1998, 93-4). The brewery's cooperage was also relocated to this area, freeing space for the continued development of the core brewery itself. While the capacity of the original brewhouse was doubled between 1871 and 1876, when new plant was installed, the brewery's trade also doubled in the same period (Lynch & Vaizey 1960, 239). Consequently, a new brewhouse, Brewery No. 2, was constructed to the west of the core brewery's primary courtyard, with construction taking place in 1877-9 (Dennison & MacDonagh 1998, 10; plate 9.4). Unlike the previous brewhouse, which remained in production until

the 1930s, Brewery No. 2 was a purpose-built brewhouse rather than one that had been extended in a piecemeal manner as land was acquired and the brewery's trade increased. Brewery No. 2 was also extended significantly throughout the late-19th and early 20th centuries, with extensions occurring in each of 1886, 1901, 1902, 1907, 1915 and 1917 (Stevens 1959, 20). Underlining the scale of these phases of expansion is the fact that the brewhouse had housed four mash tuns in 1879, increasing to 24 by 1917. Unfortunately, Brewery No. 2, which has been vacant for several decades and awaits redevelopment, has not been surveyed. However, it would appear likely that it is a particularly early example of a modular industrial building, one that had been designed with the intention to extend, and, as such, it must be viewed as being a particularly important piece of Ireland's industrial heritage, one that warrants further detailed study.



Plate 0.4. Guinness's Brewery No. 2. The original brewhouse is the rectangular structure in the foreground, constructed in 1877-9. The late-19th and early 20th century extensions comprise the heavy block of buildings with sawtooth roofs that project from the rear.

While the acquisition of the site to the north of James's Street had enabled Guinness to move space-consuming activities such as coppering away from the core brewery itself, providing the space to construct a new brewhouse, it also posed a considerable engineering problem for the firm. The plot of land was spatially separated from the core brewery, both by James's Street and the premises located on the north side of the street, which included two breweries, Manders and Powell's Brewery and the Phoenix Brewery. Compounding this spatial separation was the significant fall in land between the core brewery itself and Victoria Quay, which was situated some 50ft (15m) below the level of the core brewery itself (Geoghan 1889, 327). To mitigate against these significant physical barriers, the brewery developed an extensive network of narrow-gauge railways that traversed the entirety of the extended brewery complex, significant fabric of which survives throughout the brewery and in the streets adjacent (plate 9.6). Guinness hired Samuel Geoghan, an engineer whose previous experience was in railway construction in the Middle East, as their head engineer in 1874 (Dennison & MacDonagh

1998, 7). It was Geoghan who oversaw the development of the narrow-gauge railway at the brewery and each of the brewery's major engineering works until 1901 when he retired. In order to facilitate the movement of people, rolling stock and product, a series of tunnels were excavated below James's Street, linking both sites. The first, completed in 1877, was a spiral tunnel, constructed with a gradient of 1:40, that was designed for use by the railway (Geoghan 1889, 329; Rynne 2006, 247). Through this tunnel extensive beer mains were laid, enabling the transmission of fermented and matured beer from the brewery's vat houses towards the cooperage and racking facilities that had been constructed in the northern site. A second tunnel was completed in 1895 and remains in use today, facilitating the movement of both pedestrians and finished beer.[12]



Plate 0.6. Narrow-gauge rail tracks on Rainsford Street.

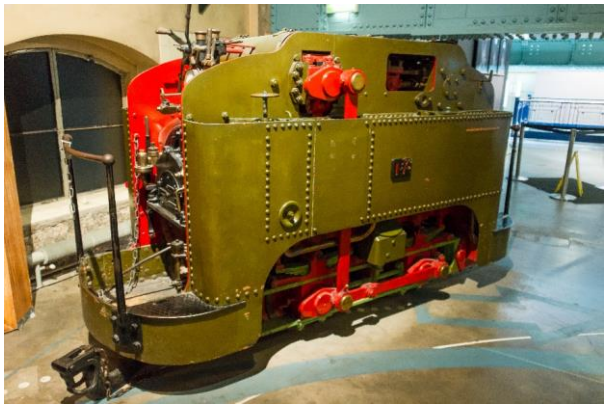


Plate 0.5. Locomotive no. 17, designed by Samuel Geoghan and constructed by Spence's Iron Works of Cork Street, Dublin city, in 1902.

Geoghan's contribution to the narrow-gauge railway system was not confined to the engineering of the track itself. In 1882, Geoghan was granted a patent for a steam-powered locomotive, with a prototype constructed that year by Avonside Engineering Co. of Bristol (Stevens 1959, table X; Rynne 2006, 247). A further 22 locomotives were constructed for the brewery between then and 1921, with those ordered after 1891 being by manufactured Spence of Dublin. One of these locomotives, no. 17 which was constructed in 1902 by Spence, is on display in the brewery's visitor centre, the Guinness Storehouse (plate 9.5).

As can be seen in figure 9.8, the core brewery site, to the south of James's Street, continued to expand after 1870. Between 1872 and 1881 the brewery had continued to expand to the south, acquiring further land to the south of Rainsford Street, where further vat houses were constructed, and also to the south of Belview, where stabling facilities were installed. Expansion to the south continued throughout the late-19th and early 20th centuries, with further vat houses constructed on

[12] NIAH: 50080142.

both the north and south sides of Belview between 1904 and 1926, both on newly acquired land and replacing the 1870s stables (plate 9.7). The 1870s and 1880s also saw the construction of a second purpose-built hop stores, extant and referred to in Chapter 4, which was located southeast of the junction of Crane Street and Rainsford Street. The brewery's plans confirm that this hop store was erected in two phases in the late-1870s and early 1880s. This continued expansion of the brewery's maturation capacity and storage facilities is clearly indicative of its continued, exponentially increasing output in the period. Many of the vat houses survive, some in a much-altered fashion, and bear similarities in form to the earlier examples on Crane Street. While these vat houses are not architecturally exceptional, the late-19th and early 20th century saw the construction of two nationally, and arguably internationally, significant buildings in the land that the brewery had acquired during the period.



Plate 0.7. Vat houses located on the south side of Belview. Constructed in at least two phases between 1900 and 1924.

The first of these significant buildings is the Robert Street Store, a malt store that was constructed on the infilled northern half of the City Basin in the early 1880s, being completed in 1884 (Rynne 2006, 247; plate 9.8). It is an immense malt store, said to have been the largest in Europe in the late-1880s, and it had the capacity to store some 90,000 bushels of malt (Barnard 1889-91 vol. 3, 12-13; Pearson 2016, 94). Constructed of Portland cement and faced in polychrome brick, it is said to have had 'the tallest load-bearing brick walls in the world' at the time of its construction (Rynne 2006, 247). It was designed by the Irish engineer Robert Worthington, who was engaged at the behest of Samuel Geoghan. It bears many similarities in form, though not design, to the second of these significant buildings, the Market Street Storehouse, now the brewery's visitor centre, which was completed in 1904 (Rothery 1991, 11-12; plates 9.9 & 9.10). It is a purpose-built fermentation block that stands to eight storeys in height and, as with the Robert Street Store, is faced in polychrome brick though is embellished with finely carved granite detailing in its lower levels. Designed by A.H. Hignett,

who had assumed the role of chief engineer at the brewery following Geoghan's retirement, it is the first steel-framed building that was constructed in Ireland, and its design closely following the Chicago school of skyscraper architecture (*ibid*.; Rynne 2006, 247; Pearson 2016, 94).



Plate 0.8. Guinness's Robert Street Store, a purpose-built malt store constructed in 1880-4. At the time of its construction it is said to have been both the largest malt store in Europe and also the building with the tallest load-bearing brick walls in the world.

Rothery highlighted the building's open internal steel framework as a unique feature of a building designed in the period, with most buildings constructed in a similar style tending to have their internal framework encased in cement as a fireproofing method. However, it is in the brick facing that the building can be said to take on an architectural significance beyond Ireland. Each of the north, south and east elevations feature a detailed polychrome brick facing that, while not bearing the load of the building itself, bear their own loads. As such, they do not form a true cladding. However, the western elevation is less architecturally elaborate and when the building was constructed it was intended to be the first of two identical buildings which together were to form a symmetrical structure, with the current west elevation originally intended to be a temporary installation. Unlike the remaining elevations, Rothery (1991, 17-20) identified the brick wall of the west elevation as being unable to support its own weight, making it a particularly early example of a true brick cladding, the weight of which was supported on the building's internal steel framework. This makes it a rare

example of such a cladding for the period outside of Chicago, which Rothery proposed is likely to have been the first such use of a cladding on a building in either Britain or Ireland.



Plate 0.10. Guinness's Market Street Storehouse, viewed form the southeast.



Plate 0.9. Guinness's Market Street Storehouse, viewed from the southwest. The western elevation, on left, is said to be a particularly early examples of a true brick cladding which has been proposed as being the earliest use of such a cladding in Britain or Ireland.

9.4 Conclusions

From a locational perspective, the Liberties area of Dublin provided access to each of the locational factors that were a requirement for a successful brewery. In the early period, in particular before the late-18th century, the area provided access easy access to the industry's two principal Irish-produced raw materials. Barley was accessed via road-borne transport from neighbouring regions to the city's southwest, while water was sourced from the freshwater cistern that served the city's potable water needs until the development of the Vartry Reservoir in the late-19th century. In addition, as a suburb of a large and expanding European city, Dublin's breweries as a whole were also provided with access to a large local market for beer. These factors combined can be said to be the primary reasons for the early development of the Liberties area of Dublin as a concentrated brewing centre.

During the 18th century, the city's principal grain markets moved from the southwestern suburbs towards the quays that were developing to the city's east. This is likely to have been a limiting factor on the development of breweries located in the Liberties until the closing decades of the century when the Grand Canal, whose principal terminus was located in the Liberties, was extended to meet the city. The Grand Canal quickly developed as a vector for breweries in the Liberties to access raw materials and to expand their markets. The canal provided access to Ireland's interior, and in particular some of Ireland's most-productive barley producing regions, via the canal, its branch lines and the linked navigable rivers Barrow and Shannon. It also provided access to both the coastal and export markets, with access to the city's eastern quays being provided via the Circular Line of the

canal. The Grand Canal is proposed as being one of the primary factors behind the apparent success of the Liberties breweries during the period of decline that the industry witnessed in the late-1830s and 1840s. During that period, while the Liberties breweries appear to have expanded their markets, the areas traversed by the canal had witnessed the greatest number of brewery closures.

These were the locational advantages that breweries located in the Liberties area held over competitors, both local and distant, until the mid-19th century. Guinness was clearly not unique in a broader context, with each of these locational factors shared with the reasonably large number of breweries that also produced in the area. However, Guinness's rise to become Ireland's most-productive brewery in the 1830s can, perhaps, be said to have been due to the micro-locational advantages that it held over its local competitors. The brewery was located immediately adjacent the freshwater basin that had been constructed in the early 18th century and the vagaries of the brewery's leases provided tariff-free access to this supply. This micro-locational advantage was further reinforced when James's Street Harbour was constructed directly adjacent to the fresh water basin in the closing decades of the 18th century. While each of the breweries located in the Liberties had reasonably easy access to the Grand Canal, Guinness was the best sited of the Liberties breweries to exploit the asset to its fullest, with the canal harbour having been essentially opened in the brewery's back yard. Quite simply put, what was a good location for a brewery in 1670, a site that provided convenient and tariff-free access to a suitable and sufficient water supply, became a better location in the late-18th century, when access to distantly sourced raw materials and markets beyond the brewery's immediate vicinity was provided by the Grand Canal.

The physical development of the brewery also provides one further micro-locational advantage that Guinness held over its local competitors, the ability to expand when required. The earliest evidence for the physical expansion of the brewery is its acquisition of the neighbouring brewery operated by Cox in the early 19th century and the brewery's ability to expand its boundaries until the early 1860s has to be seen as a factor in its rise to become Ireland's largest by output in the 1830s. While the physical expansion of the brewery to *c*. 1870 was not insignificant, it was the brewery's acquisition of a large plot of land on the north side of James's Street in the early 1870s that can be said to have been exceptional. This plot of land enabled the brewery to move space consuming activities, such as coopering, away from the core brewery itself, while it also enabled the brewery's direct connection to the rail network, providing it with a distinct locational advantage over its local competitors. This direct link with the railways may, potentially, have been a factor in the brewery's increasing dominance of both the Dublin city and Irish markets in the 1870s. In Chapter 3, the breakdown in the trade agreements between the remaining Dublin city breweries in the 1860s was proposed as being a factor in Guinness's acquisition of the dominant share in the city's market for

beer in 1870s. The breakdown in the agreement appears to have enabled Guinness to undercut the prices offered by the remaining Dublin city breweries, with the economies of scale that were being realised by Guinness enabling it to cut its profit margins in times of reduced trade. These economies of scale were further reinforced as the brewery continued to expand its Irish trade in the second half of the 19th century, with direct access to the rail network enabling this expansion of the brewery's Irish trade.

The movement of space-consuming activities to the plot on the north side of James's Street also provided the space to construct a new brewhouse, Brewery No. 2, in the late-1870s. While the exponential growth of the brewery's output had begun in the 1850s, the continued advancement of the brewery's annual output, which increased from a little over 100,000 barrels in 1850 to more the 2,000,000 barrels in the first decade of the 20th century, was enabled by this physical expansion in the 1870s (Chapter 3). While the physical expansion of the brewery can certainly be said to have been the result of sound management practices, it must also be viewed as being somewhat fortuitous. Without the availability of neighbouring properties to expand into, the brewery's output would have essentially limited by the constraints of the site itself. One area that brewery management can be said to have had a major impact was in the employment of managers, engineers and architects whose input ensured that the brewery's technology was both up-to-date and, at times, revolutionary. The employment of Samuel Geoghan, a relative of the Purser family who had been involved in the management of the brewery from the late-18th century, is perhaps the most obvious example. Geoghan oversaw the construction of the brewery's narrow-gauge railway network, overcoming immense engineering difficulties in the process, and during his time as chief engineer at the brewery significant construction was carried out. Brewery No. 2 was proposed as being an early example of a modular industrial building, one that had been designed with the intention to extend. The contemporarily advanced architecture of both the Robert Street Store and the Market Street Storehouse provide further evidence of the brewery's engagement with revolutionary building techniques. In Chapters 5 and 6, the brewery's engagement with new brewing technologies was highlighted as being somewhat conservative until the 1860s, after which time Guinness readily experimented with improved brewing plant. The same can be said about the brewery's engagement with architectural trends, with the brewery's post-1870 architectural investment being at the cutting edge of contemporary practice.

Sound management has to be viewed as being a major contributing factor in Guinness's rise to become the world's most-productive brewery before the close of the 19th century. However, the brewery's location provided it with several distinct advantages over its local competitors, advantages

that were maximised by the sound decision making of the firm's management throughout the extended period under consideration.

Chapter 10 Conclusions

10.1 Answering the posed research questions

Over the course of the preceding eight data chapters, answers have been sought for each of the ten research questions that were posed in Chapter 1. These research questions can be divided thematically, with the questions posed being concerned with each of the following themes; the regionality of the industry; the technological development of the industry; brewery architecture; the locational constraints of the industry; and finally, the unique factors that led to Guinness's rise to international significance. In the first section of this concluding chapter, answers to the questions posed for each of these themes will be provided.

10.1.1 The changing regionality of the Irish brewing industry

The changing regionality of the industry was outlined in Chapters 2 and 3. In the closing decade of the 18th century, commercial brewing had been primarily focussed in Ireland's south and east, and in particular in eastern Leinster within the wider vicinity of Dublin city. In contrast, retail brewing had been common in areas such as the west, southeast and parts of the midlands, where commercial breweries were either uncommon or entirely absent. Over the course of the next four decades, commercial brewing essentially de-regionalised and, by the beginning of the 1830s, commercial breweries were operating throughout Ireland. In the same timeframe, retail brewing essentially failed, with no retail brewing licenses issued in Ireland in the 1830s. While a fine-grained temporal overview of the changing regionality of the industry in this early period has not been provided, the number of breweries operating within the wider vicinities of both Dublin and Cork cities had contracted significantly. Indeed, it was in areas to the south and west of Dublin city that are suggested to have seen the greatest number of brewery closures during the period.

The early 1830s was a period of expansion for the industry and the suggestion is that it was in the south of Ireland, in southern Munster and Leinster, that the greatest number of new breweries were then established. Indeed, while direct evidence is largely absent, several new brewery foundations of the 1820s have been identified in the course of the survey and this may suggest that the well-attested trend for new brewery foundations in the 1830s had actually begun in the 1820s. This period of expansion was followed by a significant period of decline for the industry, one that had begun in the late-1830s and which continued through the 1840s. While brewery closures during this period of decline for the industry have been identified throughout the island of Ireland, they were heavily weighted towards midlands areas, particularly those traversed by both the Grand Canal and Royal Canal. In direct contrast, brewery closures in the period were least

common in the Ulster counties. The closures in the midlands areas prior to 1850 had essentially seen the failure of brewing in midlands areas to the north of the Royal Canal and the period effectively marked the beginning of the re-regionalisation of the industry, which continued through the second half of the 19th century.

While the 1850s and 1860s had previously been highlighted as a period of expansion for the industry, a counter trend for brewery closures in the same period was identified in Chapter 3. Neither trend displayed any particular regionality and instead the newly established breweries of the period were primarily confined to large towns and cities, while it was in the smaller centres of population, small towns and villages, that the breweries that had failed were primarily located. In contrast, the decades that followed 1870 witnessed the continued re-regionalisation of the industry. Between 1870 and 1885 the industry considerably contracted in both the northeast and in the west of Ireland, resulting in the failure of the industry in both Limerick and Derry/Londonderry cities. This regional contraction continued in the late-19th and early 20th centuries. The industry had entirely failed in Galway city by the mid-1890s and by 1920 the industry was largely confined to Ireland's east and south. Indeed, with the exception of two breweries in Belfast city, each brewery operating in Ireland was then located in Munster and Leinster.

This changing regionality of the industry, which has not been identified in previous studies, has been used as a basis to re-evaluate the causative factors that led to periods of both expansion and decline for the industry. Between the early 1790s and 1830, the greatest contraction in the number of breweries had been in the wider vicinities of both Cork and Dublin cities. It would appear likely that the brewery closures in these areas were the direct result of the expansion of the breweries in these cities that had engaged with the first phase of industrialisation. In the same period, commercial brewing had expanded in areas where it had been either uncommon or entirely absent in the early 1790s. Unfortunately, a fine-grained overview of the temporality of these regional trends has not been confirmed, though the expansion of the industry in both Connaught in and in southeast Leinster is confirmed to have begun in the 1790s and continued through the early 19th century. What is unclear is what drove these regional trends. Was it simply a case of a small number of commercial breweries replacing a greater number of retail breweries? Alternatively, the trend may be indicative of changing consumption patterns, with the production of porter, in particular, being believed contemporarily to have been suited only to reasonably large units of production (Sumner 2008).

The regionality of the industry's decline in the late-1830s and 1840s can be used to both reinforce the traditional interpretation, which viewed the decline as being the result of the popular temperance movement of the period, and to provide an alternative. The lesser decline witnessed in

the Ulster counties, where the temperance movement of the 1830s and 1840s is said to have received less support owing to religious differences can be used to reinforce the traditional interpretation. Indeed, the delayed decline of the industry in Ulster, where most breweries failed in the period 1870-85, was highlighted in Chapter 3 as being reflective of the reinvigoration of temperance societies in the province at that time. However, the greatest number of brewery closures in the late-1830s and 1840s were located in the midlands areas that were traversed by both the Grand Canal and Royal Canal and, indeed, it was breweries located in smaller centres of population in these areas that were most likely to have failed. This was proposed as being a continuation of the trend that had begun in the period 1790-1830, when the greatest number of brewery closures had occurred in the areas to the south and west of Dublin city. As such, the large number of brewery closures in midlands areas in the late-1830s and 1840s appear likely to have been affected by the Dublin city breweries' expansion of their markets westward with the canals acting as a vector for this expansion. That is not to downplay the impacts that the popular temperance movement had on many of the brewery closures of the period, a point that is further reinforced by several comments made contemporarily by Valuation Office surveyors. However, it would appear likely that these impacts simply accelerated a somewhat inevitable decline for the industry in areas that were directly linked to Dublin city by the canal network.

Commented [RC1]: differences

The industry's contraction in the second half of the 19th century meant that by the beginning of the 20th century Irish breweries were primarily confined to the areas that are now Ireland's most-productive barley-producing regions. At face value, this can be viewed as evidence for the industry's close spatial relationship with its primary Irish-produced raw material. However, it raises several further questions, each related to land use. In particular, it remains unclear whether the contraction of the industry in areas that do not today produce a significant volume of high-quality barley is indicative of changing land-use patterns in Ireland.

10.1.2 The technological development of the industry

The evidence for the processual and technological development of Irish breweries was outlined in Chapters 5, 6 and 7. In Chapter 7, the available evidence for the adoption of steam-powered plant, which is used as a proxy for engagement with industrialisation, by Irish breweries was provided. The earliest evidence for the adoption of steam-powered plant in the Irish brewing industry belongs to the first decade of the 19th century and appears to have been confined to Dublin city. In the 1810s, steam engines are confirmed to have been installed in breweries located in both Cork and Limerick cities. In addition, Walker's Brewery in Fermoy, county Cork, was identified as being the first brewery located outside of these large port cities to have installed a steam engine, during the same decade. As such, the early industrialisation of brewing in Ireland can be said to have

Commented [RC2]: surely 'steam-powered plant'?

been largely confined to each of Dublin, Cork and Limerick cities. However, the significant example of early industrialisation at Walker's Brewery in Fermoy may suggest that several further breweries had also engaged with the trend. The available evidence suggests that it was during the 1820s and the 1830s that steam-powered plant began to be commonly applied in Ireland's regional breweries, many of which were new foundations of the period. In this period, the adoption of steam-powered plant appears to have been primarily confined to the Munster and Leinster counties, with only one steam engine confirmed to have been installed in a brewery in either of Connaught or Ulster prior to 1850, the Portaferry Brewery and Distillery in county Down. After 1850, steam-powered plant was again commonly installed in both newly constructed and pre-existing breweries. However, the continuation of either pre or proto-industrial brewing technology is confirmed at Pim's brewery in Mountmellick, county Laois, as late as the mid-1880s. This shows that not all Irish breweries had industrialised by the late-19th century.

Commented [RC3]: as above

Similar to steam engines, the evidence, which is generally sparse, for improved brewing technologies in the early 19th century is primarily confined to Ireland's most-substantial breweries of the period. In Chapter 5 and 6 it was suggested that, at least until *c*. 1840, there was a gap in the adoption of newly developed brewing technologies of about two decades following their initial development. Certainly from *c*. 1860 on, this lag in adoption had been eroded and, of the Irish breweries that were contemporarily described, each can be said to have been reasonably up-to-date in terms of the technologies used. However, both surviving plant and historic photographs confirm that the Mill Park Brewery in Enniscorthy, county Wexford, continued to use somewhat antiquated brewing plant, such as mill stones and open coppers, into the mid-20th century. This suggests that more of the smaller regional breweries that survived to produce into the 20th century in Ireland may also have been using similarly antiquated brewing plant. While the improved technologies used in Ireland's substantial breweries during the second half of the 19th century were primarily imported, Dublin city's breweries and distilleries have been shown to have supported a range of specialist manufacturers, comprising brewery engineers, coppersmiths and iron works. This is a situation that is also evident at several British brewing centres, such as Bristol and Burton-upon-Trent, and the dense concentration of the breweries in Dublin makes this situation unsurprising.

10.1.3 Brewery architecture

In Chapters 4 and 8 the principal architectural features of Irish breweries were outlined. Chapter 4 provided an overview of maltings architecture, while the various arrangements and architectural features of Irish brewery complexes were provided in Chapter 8. In both the architecture of the core brewery and the brewery maltings, clear influences from the British brewing and maltings industries are confirmed from at least the late-18th century. This can be seen in the

layout and arrangement of the River Lee Porter Brewery in Cork city, where the vertical arrangement of brewing plant is confirmed, and in the similarities, previously highlighted by Rynne (2006, 245-6), that are evident when the late-18th and early 19th century brewery buildings at Beamish and Crawford in Cork city are compared with contemporary depictions of Whitbread's Brewery in London. Early influences from Britain are also confirmed in maltings architecture, with maltings that ascribe to Patrick's (1996; 2004) Newark and Ware Patterns appearing to have been reasonably common in Ireland from at least the late-18th century. While similarities between maltings architecture in England and Ireland are confirmed at an early date, several surviving brewery maltings in Ireland confirm the development of two indigenous forms, each of which had developed in the closing decades of the 18th century. Both forms, the Irish multi-storey maltings and the courtyard maltings, can be said to have been indigenous developments of both the Newark and Ware styles that were identified by Patrick.

In terms of brewery form, the earliest form of urban in brewery that has been identified in Ireland is the burgage plot brewery. These breweries were located in central positions in towns and cities and were largely constrained to the dimensions of pre-existing property boundaries. Both Beamish and Crawford and Guinness had essentially evolved from burgage plot breweries, with production at both sites confirmed in the late-17th century. By the 1830s, the majority of burgage plot breweries had expanded beyond the original limits of the burgage plots on which they had developed. However, several examples that remained constrained to the proportions of their original burgage plots have been identified, such as McCann's Brewery in Drogheda, county Louth. There is no evidence to suggest that burgage plot breweries were being founded after *c*. 1820 and probably earlier. It may be that many more of those that have been identified had been founded at a similarly early to both Beamish and Crawford and Guinness, though evidence to reinforce this suggestion is largely absent.

From at least the late-18th century the courtyard arrangement was the principal form of brewery constructed in Ireland. Previously identified by Rynne (2006, 245-6), courtyard breweries were generally constructed in the outskirts of a town or city, in areas that had not previously seen intensive development. Several courtyard breweries, including the River Lee Porter Brewery in Cork city, are confirmed to have been purpose built. However, the case of the Cambrickville Brewery in Dundalk, county Louth, which has been suggested to have been established in a former cambric mill that was converted to brewing, suggests that this may not always have been the case. The construction of courtyard breweries had largely halted in the late-1830s, though the arrangement was applied to a small subset of new breweries that were established after 1850. Of these, the arrangement of Murphy's Lady's Well Brewery in Cork city was defined by pre-existing buildings that

were adapted to brewing, though the Belfast and Ulster Brewery in Belfast was a newly constructed brewery that was composed in the courtyard arrangement in the mid-1860s.

While specialised brewery engineers and architects had emerged in England as early as the 1780s, there is no evidence to suggest the involvement of either in the construction of breweries in Ireland prior to *c*. 1830. The particularly significant Thomas Murphy's Brewery in Clonmel, the form of which bears many similarities to English breweries of the period, was highlighted in Chapter 8 as being likely to have been designed by such a specialist engineer or architect in *c*. 1830. However, it is not until the 1850s, when English engineers are confirmed to have designed both the Mountjoy Brewery in Dublin city and Murphy's Brewery in Cork city, that Irish breweries are confirmed to have engaged with English brewery architects and engineers. The standing remains of two breweries in county Louth, the Cambrickville Brewery in Dundalk, extensively remodelled in the mid-1860s, and the Castlebellingham Ale Brewery, dating to *c*. 1870, are particularly suggestive of the engagement of Irish brewing firms with British specialists. This is suggested by both breweries' form, and in particular that of the Castlebellingham example, which is a rare Irish example of the tower breweries that were then common in Britain.

With the exception of several particularly large maltings and a number of ornate brewery offices, few standing remains that can be dated to the decades that followed 1870 were identified in the course of the survey. This is primarily due to the fact that the establishment of new breweries had largely halted in Ireland in *c*. 1870, while the 1880s in particular is said to have been a period of expansion for the industry in Britain. While physical evidence is quite rare for the late-19th century, several Irish breweries are confirmed to have engaged with the trend for ornate breweries in England, a trend that had begun in the 1830s and matured in the 1880s. One further area where Irish breweries can be said to have been directly influenced by their English counterparts was in the direct connection of several Irish breweries to the rail network in the closing decades of the 19th century. While engagement with this trend was reasonably rare in Ireland, having been confined to just four breweries, it was quite clearly influenced by the development of the extensive railway network in Burton-upon-Trent after 1850, which saw each of the town's breweries affect direct connection to the railways.

Clear evidence for contact between the British and Irish brewing industries can be seen in the standing remains of Irish breweries and can be said to have begun before the close of the 18th century. However, most Irish breweries can be said to have developed along independent lines, with their physical development constrained by factors such as location, which in particular effected their ability to expand, and the relative success of the brewing firm. The levels of contact between Irish breweries and their British counterparts is certainly suggested to have increased as the 19th century

progressed. By and large, the more-substantial Irish breweries that were either established or reconstructed after 1850 can be said to have followed British trends in brewery architecture. However, the significant St. Mary's Well Brewery in Carlow town shows that not all Irish breweries of the period can be said to have been influenced by contemporary developments in Britain. In that case, the architecture of the brewhouse, a modest example, bears a remarkable resemblance to the early 19th century brewhouse that survives at Wickham's Gibson's Lane Brewery in Wexford town.

10.1.4 The locational constraints of the industry

Rynne (2006, 244) highlighted the key locational concerns for an Irish brewery, which were 'immediate access to an urban population, a barley supply, and … some form of water transport for the supply of bulky raw materials'. In Chapter 4, access to a water supply that was both suitable and sufficient was also highlighted as being a further locational constraint for the industry. Rynne's locational constraints are certainly true when the makeup of the industry in the early 20th century is considered. By and large, breweries were then located in barley-producing regions, in large towns or cities that were typically located in coastal areas or on navigable waterways. While access to a barley supply is a clear constraint of the industry, it remains unclear whether the changing regionality of the industry in the 19th century can be associated with changing land-use patterns, a point that was previously alluded to.

In terms of access to a large local market, Chapter 2 highlighted that, in the 1830s, this was not a locational constraint for an Irish brewery. In that period, breweries situated in small towns and villages were reasonably common. However, access to a large local market can be said to have been a deciding factor in the success of a brewery in the period of decline that followed. By 1850, brewing in Ireland's small towns and cities had primarily failed and, as was highlighted in Chapter 2, the few breweries that remained in production in these smaller centres of population appear to have served distant markets. Indeed, the few examples of small town and village-context breweries that survived to produce into the 20th century, principally the Castlebellingham Ale Brewery and Perry's Brewery in Rathdowney, county Laois, are confirmed to have exploited much-greater markets than were available locally.

10.1.5 The unique factors that led to Guinness's rise to international significance

In Chapter 8, the development of the industry in Dublin city was outlined, with particular reference to Guinness. The purpose of the chapter was to identify any unique factors, in terms of both location and the physical development of the brewery, that may have impacted its ascension to become the world's most-productive brewery before the close of the 19th century. The chapter served to highlight the locational advantages that the Liberties area of Dublin city, which contained Ireland's densest concentration of breweries throughout the extended period under consideration.

The Liberties area of the city provided easy access to the industry's principal raw materials. Water was sourced from the City Basin, itself located immediately southwest of the Guinness site, while until the mid-18th century the Liberties area had housed the city's principal grain markets. While the grain markets moved towards the quays that were developing to the east of the city during the second half of the 18th century, the opening of the Grand Canal's James's Street Harbour in the late-18th century provided direct access to Ireland's best barley-producing land, located along the line of the canal and the inter-linked Barrow Navigation. While the canal acted as a vector for breweries in the Liberties to source raw materials, it also served as a vector for them to expand their markets beyond the limits of the city. While each of the Liberties breweries were provided with reasonably access to the area's water supply and the canal itself, Guinness's location was the most-convenient of all of the Liberties breweries. While previous scholars, and in particular Lynch and Vaizey (1960, 242-50), have highlighted the sound management of successive generations of brewery managers as being the primary factor in the brewery's rise to prominence, the brewery was clearly provided with a locational advantage over its immediate neighbours. That is not to downplay the impacts that sound management had on the development of the firm and it must be said that the brewery's management made the most of what were not inconsiderable locational advantages. Quite simply, what was a good location for a brewery in the late-17th century became a better location as time progressed.

Another locational advantage that Guinness's management maximised was highlighted when the brewery's expansion in the 19th century was outlined. While the brewery's expansion in the period 1820-70 was not extraordinary, the firm was provided with unparalleled opportunities to expand post-1870. The most-significant expansion followed the acquisition of a large plot of land on the north side of James's Street in the early 1870s. It was following this acquisition that the brewery was able to affect a direct link to the railways via the neighbouring Great Southern and Western Railway's (GW&WR) Kingsbridge (now Heuston) Station.

Commented [RC4]: followed

The expansion to the north side of James's Street also marked the beginnings of the brewery's engagement with large-scale civil engineering and construction works, which in many ways were revolutionary. These works began under the direction of the brewery's chief engineer, Samuel Geoghan, who designed the extensive narrow-gauge railway network that linked each section the brewery's vast site. Under Geoghan's direction, tunnels were excavated beneath James's Street in a considerable engineering feat that linked the breweries' spatially removed premises, while a new brewhouse, Brewery No. 2, was constructed in the late-1870s. This brewhouse marked the beginnings of a phase of investment in building stock at the site which continued until the early 20th century, with several nationally, and arguably internationally, significant buildings constructed.

These included Brewery No. 2, which appears to be an early example of a modular industrial building, one that was designed with the intention to expand. Similarly important is the Robert Street Store, a vast purpose-built malt store that is said to have had the tallest load-bearing brick walls in the world at the time of its construction. This phase of revolutionary building works continued through to the first decade of the 20th century, culminating in the construction of the Guinness Storehouse. It is the first steel-framed building to have been constructed in Ireland, closely following the techniques that were developed in the Chicago school of skyscraper architecture, and its western wall is a particularly early example of a true brick cladding, one that does not support its own weight.

In Chapters 5, 6 and 7 the brewery's often unique and experimental engagement with processual and technological change in the same period was highlighted. While the brewery was engaging with considerable engineering and revolutionary building works in the 1870s, it was also beginning to experiment with various form of improved brewing technology, perhaps best seen in the various forms of improved refrigerators that were installed during the decade. While the brewery was particularly forward looking when it came to technological improvements and in the application of steam-powered plant, it took a somewhat conservative approach in its position on the maturation of beer. The brewery's maturation capacity was considerably expanded between the 1870s and the 1920s, while the large London porter breweries were reducing theirs in the same timeframe. This further reinforced the brewery's significant economies of scale, enabling it to purchase high-quality barley at reasonable prices during times of good harvest. This excess barley was converted into Keeping Beer, which was later blended with young beer to improve its flavour profile. The brewery's engagement in the 1870s with improved brewing technologies, in conjunction with its continuation of the traditional maturation of porter, appears likely to have been considerable factor in the exponential growth that it witnessed in the second half of the 19th century. Economies of scale were reinforced by an automated product flow that minimised labour costs, while the comparatively greater proportion of matured beer in its final blends would have provided the products with a flavour profile that matched or exceeded their price point. These economies of scale also enabled the brewery to reduce its profit margins, a factor that Lynch and Vaizey (1960, 214) highlighted as being a factor in the brewery's domination of the Dublin city market after 1870.

10.2 Areas for future research

While this thesis has provided answers to each of the key research questions that were posed, it is apparent that there is a wide scope for future related studies that would further expand

our knowledge of both the industry's development in the period under consideration and its potential societal impacts.

As a fine-grained overview of the industry's development in the period 1790-1830 has not been provided by the current methodology, it is proposed that detailed local and regional studies may further our knowledge of the industry's development in this key period. As the period has no comprehensive cartographic record, this work would primarily be focussed on the historic record. Sources such as the Registry of Deeds, the contemporary local and regional press and contemporary secondary sources, such as the county Statistical Surveys that were published by the RDS in the early 19th century, may provide further detail on the industry's development at both a local and regional scale. Detailed regional and local studies focussing on the temporality of the de-regionalisation of commercial brewing in the period would also be beneficial. These studies could focus on areas such as the southeast and the west of Ireland, with the aim being to provide a tight temporal framework for this process of de-regionalisation. A counter-study may aim to further understand the impacts of the industrialisation of brewing in the large port cities, Dublin, Cork and Limerick, in the same period. While the current thesis has confirmed that many of the brewery closures of the period were located within the wider vicinities of these cities, the temporality of the industry's contraction in the period remains to be outlined. This study would focus on many of the same sources that could be used to further our knowledge on the industry's expansion in other regions during the same period, supplemented by further detailed studies of contemporary trade directories. These inter-related studies would further enlighten our understanding of the overall impacts that the French wars had on the wider Irish brewing industry, with the industry's expansion and contraction in the years before and after 1815 confirmed solely by overall production figures and the few surviving sales figures for breweries of the period.

It remains unclear whether the changing regionality of the industry during the 19th century reflects changing land-use patterns. In order to test this hypothesis, an interdisciplinary study of barley production in Ireland would be required. From a historical perspective, the county Statistical Surveys published by the RDS in the early 19th century provide anecdotal evidence for changing land-use patterns in the period. More comprehensive evidence is available for the later period. Official statistics for agricultural land use at a county level were first recorded in Parliamentary Papers in 1847 (BPP 1848). Taking just one example from a superficial overview of these official statistics, the reduction in barley-production in county Fermanagh in the second half of the 19th century is clearly evident. In 1847, a modest 571 acres of land were under barley cultivation, a figure that had declined to just 116 by the beginning of the 20th century, a reduction that is said to have greatly impacted the trade of the county's only brewery, located in Enniskillen (Callan MacArdle & Callan

1902, 488). The official statistics on land use would enable a detailed overview of agricultural change in Ireland in the second half of the 19th century at a county level. This, in turn, could be compared to the changing regionality of the brewing industry, provided in this thesis, and any future industrial archaeological surveys of related industries, such as independent malting and distilling. For the earlier period, where official statistics are not available, changing land use could be implied through an archaeological study of Irish farming, focussing on identifying the archaeological signatures of different forms of land use in the late-18th and early 19th centuries.

While land use may well have impacted the industry's changing regionality, this changing regionality may also signify changing consumption patterns. For example, the expansion of commercial brewing in the west of Ireland in the late-18th and early 19th centuries may have, potentially, been due to changing consumption patterns predicated both by legislative reforms that encouraged brewing over distilling and disruptions to shipping, which may have hampered the import of wine. Alternatively, it may simply have been due to the increasing centralisation of brewing towards ever greater units of production, with a lesser number of larger scale commercial breweries replacing a greater number of small-scale retail brewers. Examinations of import records and a detailed study of the development of the distilling industry in the region during the period may further out knowledge of the causative factors that led to this trend.

One significant area of the industry's overall development has not been explored in this thesis is the industry's involvement in the retail trade. Guinness's primary focus on the wholesale rather than the retail trade was among the sound management decisions that Lynch and Vaizey (1960, 225-8) proposed as being key to Guinness's acquisition of the dominant position in the market for beer in Ireland. In contrast, each of the significant breweries in Cork city and several of their counterparts in Cork county were heavily involved in the direct retail of beer, with the breweries managing an extensive network of tied houses in the second half of the 19th century (Ó Drisceoil & Ó Drisceoil 2015). This system was, in effect, a trade protection measure. In this regard, Guinness were exceptional for a large brewery in the then United Kingdom. The majority of British breweries also engaged with the tied house system of brewery controlled public houses, particularly in the closing decades of the 19th century (Gourvish & Wilson 1994; 267-313). The tied house system appears to have been more common in Ireland than has previously been suggested. For example, at the beginning of the 20th century MacArdle and Moore's Cambrickville Brewery in Dundalk are said to have had direct control over many of the public houses in the town, and indeed elsewhere, in neighbouring counties and Belfast (Callan MacArdle & Callan 1902, 481). Indeed, several of Dublin city's breweries are also known to have engaged with the trend to some degree (Lynch & Vaizey 1960, 141, 216, 225, 227). This included Guinness, who owned a small number of public houses in

the city until the late-1870s. Based on the scant evidence that is available outside of Cork city, where Ó Drisceoil and Ó Drisceoil (2015) have carried out extensive research on the city's tied houses, the suggestion is that several of Ireland's most-substantial early 20th century breweries had engaged with the trade-protectionist policy of brewery owned and controlled public houses.

There remains a wide scope for follow on studies in Cork city and elsewhere, with the evolution of the public house in Ireland remaining an under-studied topic, particularly in comparison to Britain where extensive studies on various aspects of the public house have been carried out over last several decades (e.g. Clark 1983; Girouard 1984; Pearson 1989; Brandwood, Davison & Slaughter 2004). At present, Historic England (formerly English Heritage) are in the process of recording and listing an extensive number of historic public houses, with the aim being to preserve their standing remains but also to further expand our knowledge of their development. Two inter-disciplinary pilot studies have been carried out under their aegis in the recent past, recording the historic public houses of both Bristol and Leeds. An extensive report for the Bristol project has been produced which, through a combination of historical and cartographic studies and field survey, has recorded the standing remains of the city's historic public houses, both those that remain in use as such and those that have been re-purposed (Fisher & Preston 2015). While the Bristol project was primarily carried out in an effort to quantify the built heritage of the city's public houses, similar projects may be carried following a similar methodology with more research-oriented aims.

The application of this methodology in Ireland may be used to identify both locational and architectural trends in towns and cities where either the free or tied trade in beer was most prevalent. Comparative studies, focussing on several towns and cities, are the most likely to provide further detail on the trends that may either impacted, or been impacted by, the likes of changing consumption patterns, legislative reforms and social ideologies, in particular the advancement of teetotalism, among many other potential areas for future research. With regards to the development of the Irish brewing industry, the identification of the tied house system in towns where it has not previously been documented may be difficult, principally due to the dearth of archival records from the majority of Ireland's historic breweries. Historical sources, in particular the records of the Valuation Office, may provide some detail on the ubiquity of the system, while shared architectural features may, potentially, signify a building's control by a particular brewery at a particular point in time. Indeed, the methodology could be expanded beyond the study of public houses towards an examination of the archaeological signatures of various forms of commercial activities in Ireland's historic towns and cities. Such studies, carried out from an archaeological perspective, would mark a new beginning for the study of Ireland's urban archaeology and built heritage of the industrial era.

Glossary of Technical Terms

Attemperator	Metal tubing contained within a vessel through which cooling or heating liquid is passed. Commonly installed in both fermentation and maturation vessels.
Cask	A wooden stave-built vessel of various standardised volumes. See standard cask volumes.
Cleansing	The secondary phase of fermentation, where residual yeast is separated from the fermenting beer.
Copper	A large vessel used for boiling liquids, commonly constructed of copper in the past. Most modern coppers are now constructed of stainless steel.
Couch Frame	A frame, the dimensions of which were defined by legislation, in which the couching sub-process of malting was carried out.
Couching	A sub-process of malting which involves heaping the steeped grains in piles in order to instigate the first phases of germination.
Diastase	The collective name for the various naturally occurring enzymes in barley that enable the conversion of starches into sugars.
Flocculation	The process where yeast clumps in the fermentation vessel. Lager yeasts, *Saccharomyces pastorianus* or sometimes erroneously *Saccharomyces carlsbergensis*, are often referred to as bottom-fermenting yeasts as they typically flocculate at the base of the fermentation vessel. In contrast ale yeasts, *Saccharomyces cerevisiae*, tend to flocculate at the top of the fermentation vessel.
Flooring	A sub-process of floor malting where water-swollen grains are spread across a floor surface at a varying depth for an extended period.
Grains	In brewing grains only ever refers to the grist following mashing, after the conversion and extraction of sugars. A valuable by-product of brewing that is commonly sold for livestock feed.
Green Malt	A term used to describe un-kilned malt.
Grist	Following milling the coarsely ground malt is referred to as grist.
Hop back	A holding vessel used as an intermediary vessel following the boiling process from which the boiled hops are separated from the hopped wort.
Hopped wort	Term used to describe wort following its boiling with hops.

Kieve	Another name for a mash tun, primarily associated with the Irish brewing industry. The term remains in use today at Guinness, Dublin.
Liquor	All water used in the actual brewing of beer was referred to as liquor. Where the word water was used it is assumed that it was used for cleaning or cooling purposes.
Mashing	Mashing is the process of converting starches in cereals into sugars via a heat-dependent biochemical reaction.
Mashing Machine	An external, cylindrical machine in which the grist is mixed with hot liquor prior to being transferred to the *mash tun*. The most-famous mashing machines were patented by Steel and Maitland.
Mash Rake	In the early period a mash rake was a simple wooden rake that was used to manually mix the grist and hot liquor within the mash tun. From the late-18th century mechanical, automated mash rakes were developed.
Mash Tun	A vessel where the mashing process was carried out.
Mild	A term used to describe young or un-matured beer.
Rounds	Cylindrical fermentation vessels, typically coopered.
Parti-gyling	In parti-gyling several different beers of varying characteristics are produced from one batch of malt. The process involves blending various beers produced from the successive mashes produced in traditional *infusion mashing*. It was largely replaced by the *sparging* process in the 19th century, though remains in use today in some traditional English breweries.
Sparging	The practice of spraying hot liquour over the grist as the initial *mash* is drained. *Sparging* largely replaced the practice of consecutive *mashing* in *infusion mashing* during the mid-nineteenth century.
Spent grains	Another term for grains.
Steep	A vessel in which the steeping cub-process of malting is carried out.
Steeping	A sub-process of malting that involves soaking grains for an extended period with the aim being to encourage the initial phases of germination.
Squares	Quadrilateral fermentation vessels, typically constructed of wood or stone and later of copper, iron or steel.
Stale	A term used to describe aged or matured beer.
Sweet wort	Term used to describe wort following the mashing process, prior to its boiling with hops.

Trub	A mixture of hop particles, proteins, tannins and lipids that remain in hopped wort following boiling. Trub causes haze and instability in finished beer.
Tun	A tun may refer to either a large coopered vessel of indeterminate size, or a cask of standardised size. See standard cask volumes.
Withering	A sub-process of malting that sees green malt heaped in piles for a period of several hours prior to kilning with the aim of reducing its moisture content.
Working	The initial, more-vigorous phase of fermentation, taking place after the hopped wort is inoculated with yeast.
Wort	A sugar-rich suspension that is produced in mashing, prior to fermentation. See also sweet wort and hopped wort.

Standard Cask Volumes

Cask	**Gallons**	**Litres**
Pin	4.5	20.457
Firkin	9	40.914
Kilderkin	18	81.828
Barrel	36	163.656
Hogshead	54	245.484
Puncheon	72	327.312
Butt	108	490.968
Tun	216	981.936

Bibliography

Ahern, M. 2003 *The Quakers of County Tipperary, 1655–1924*. Unpublished PhD Thesis. National University of Ireland, Maynooth.

Andrews, J.H. 1986 Irish Historical Towns Atlas no. 1, Kildare. Royal Irish Academy. Dublin.

Andrews, J.H. & Davies, K.M. 1992 *Irish Historical Towns Atlas no. 5, Mullingar*. Royal Irish Academy. Dublin.

Anon. 1886 *Cork Industrial Exhibition 1983; Report of the executive committee and statement of accounts*. Purcell and company. Cork. www.corkpastandpresent.com, accessed 24/03/2019.

Anon. 1939 *Guinness, Dublin*. John Waddington Ltd. Leeds.

Barnard, A. 1887 *The Whisky Distilleries of the United Kingdom*. Harpers.

Barnard, A. 1889-91 (in 4 vols.) *The Noted Breweries of Great Britain and Ireland*. Sir J. Causton and Sons. London.

Bassett, G.H. 1885 *Wexford county guide and directory*. Sealy, Bryers & Walker. Dublin.

Bielenberg, A. 1991 *Cork's Industrial Revolution 1780-1880: Development or Decline?* Cork University Press. Croydon.

Bielenberg, A. (1998). 'The Irish Brewing Industry and the Rise of Guinness, 1790-1914' in Wilson, R.G. & Gourvish, T. (eds.) *The dynamics of the international brewing industry since 1800*. Routledge. London. 105-122.

Bielenberg, A. (2009). Ireland and the Industrial Revolution: The impact of the industrial revolution on Irish industry, 1801-1922. Routledge. Oxon.

Bowie, G. 1980 'Surviving stationary steam engines in the Republic of Ireland'. *Industrial Archaeology Review*. 2:1. 168-74.

Boyle, S.A. 2007 *Irish Historical Towns Atlas no. 17, Belfast Part 2, 1840 to 1900*. Royal Irish Academy. Dublin.

Bradley, J. 2000 *Irish Historical Towns Atlas no. 10, Kilkenny*. Royal Irish Academy. Dublin.

Briggs, D.E. 1998 *Malts and Malting*. Blackie Academic. London & New York.

Briggs, D.E., Stevens, R., Young, R. & Hough, J.S. 1981 (2nd ed.) *Malting and Brewing Science, Volume 1: Malt and Sweet Wort.* Chapman and Hall. London & New York.

Briggs, D.E., Boulton, C.A., Brookes, P.A. & Stevens, R. 2004 *Brewing Science and Practice*. Woodhead Publishing Ltd. Cambridge.

Brandwood, G.K., Davison, A.P. and Slaughter, M. 2004. *Licensed to Sell: The history and heritage of the public house*. English Heritage.

Brynildson, M. 2011a ‘Hop Isomerization’. in Oliver, T. (ed.) *The Oxford Companion to Beer*. Oxford University Press. New York.

Brynildson, M. 2011b ‘The Burton Union system’ in Oliver, T. (ed.) *The Oxford Companion to Beer*. Oxford University Press. New York.

Brynildson, M. 2011c ‘Mashing’ in Oliver, T. (ed.) *The Oxford Companion to Beer*. Oxford University Press. New York.

Buchanan, R.H. & Wilson, A. 1997 *Irish Historical Towns Atlas no. 8, Downpatrick*. Royal Irish Academy. Dublin.

Buttrick, P.K.A. 2011a ‘Parti-gyle.’ in Oliver, T. (ed.) *The Oxford Companion to Beer*. Oxford University Press. New York.

Buttrick, P.K.A. 2011b ‘Yorkshire Square.’ in Oliver, T. (ed.) *The Oxford Companion to Beer*. Oxford University Press. New York.

Callan MacArdle, T. & Callan, W. 1902 ‘The Brewing Industry in Ireland’ in Coyne, W.P. (ed.) *Ireland, Industrial and Agricultural*. Browne and Nolan Limited. Dublin, Cork and Belfast.

Claffey, J.A. 2009 *Irish Historical Towns Atlas no.20, Tuam*. Royal Irish Academy. Dublin.

Clark, P.A. 1983 *The English Alehouse: A Social History, 1200-1830*. Addison-Wesley Longman Ltd. London.

Clarke, H.B. 2002 *Irish Historical Towns Atlas no. 11, Dublin, Part I, to 1610*. Royal Irish Academy. Dublin.

Coote, C. 1801 *Statistical survey of the King's County.* Graisberry and Campbell. Dublin.

Cornell, M. 2003 *Beer: The Story of the Pint*. Headline. London.

Cowman, D. 1983 ‘Drink (in the Waterford area to *c*. 1840)’ in *Decies*, 22. 15-28.

Coyne, W.P. (ed.) 1902 *Ireland, Industrial and Agricultural*. Browne and Nolan Limited. Dublin, Cork and Belfast.

Davies, K.M. 1998 *Irish Historical Towns Atlas no. 9, Bray*. Royal Irish Academy. Dublin.

Day, R. 1895 ‘Silver notes in the County Cork’ in *Journal of the Cork Historical and Archaeological Society.* 1:1. 33-4.

Delany, R. 1986 *A celebration of 250 years of Ireland’s inland waterways*. Appletree Press. Belfast.

Delany, R. 1992 *Ireland’s Royal Canal*. Lilliput Press. Dublin.

Delany, R. 1995 *The Grand Canal of Ireland* (2nd ed.). Lilliput Press. Dublin.

Dennison, S.R., & MacDonagh O. 1998 *Guinness 1886-1939, From Incorporation to the Second World War*. Cork University Press.

Donnachie, I. 1979 *A History of the Brewing Industry in Scotland*. John Donald Publishers Ltd. Edinburgh.
Dublin Civic Trust 2008 *Pre-1923 Survey of the Industrial Archaeological Heritage of the County of Waterford.* Unpublished industrial archaeological survey for Waterford County Council. www.waterfordcouncil.ie, accessed 24/03/2019.

Findlater, A. 2013 *Findlaters; the Story of a Dublin Merchant Family*. Self published. Dublin. www.findlaters.com, accessed 03/08/2018.

Fisher, F. & Preston, R. 2015 *The Nineteenth and Twentieth-Century Public House in Bristol*. Unpublished report for English Heritage. www.historicengland.org.uk, accessed 21/03/2019.

Francis, G. 1864 *The Magazine of Science and School of Arts.* Vol. 5. www.books.google.ie, accessed 03/08/2018.

Frazer, W. O., 2005 *Archaeological Building Survey, Main Street, Graiguenamanagh, Co. Kilkenny* Unpublished archaeological building survey report by Margaret Gowan & Co. Ltd. for David Hughes. Kilkenny County Council Planning Dept. ref: 042003.

Francis, G. 1864 The Magazine of Science and School of Arts. Vol. 5. www.books.google.ie, accessed 03/08/2018.

Fullarton, A. 1844 (in 4 vols.) *The Parliamentary Gazetteer of Ireland*. Fullarton & Co. Dublin. www.archive.org, accessed 24/03/2019.

Gallagher, F. 2008 *The streets of Sligo: urban evolution over the course of seven centuries*. Self published. Sligo.

Gallagher, F., & Legg, L.M. 2012 *Irish Historic Town Atlas no. 24, Sligo*. Royal Irish Academy. Dublin.

Geoghegan, S. 1889 'Description of tramways and rolling stock at Guinness's Brewery' in *Proceedings Institution of Mechanical Engineers*. Vol. 39, 1. 327-40.

Gerraty, S., Morris, M. & O'Ferrall, F. 2010 *Irish Historical Towns Atlas no. 22, Longford*. Royal Irish Academy. Dublin.

Giacometti & Duffy, S. 2007 *Kildare Industrial Archaeological Heritage Project*. Unpublished industrial archaeological survey for Kildare County Council. www.archaeologyplan.com, accessed 23/02/2016.

Giacometti, A. & Duffy, S. 2008 *Longford Industrial Heritage Survey*. Unpublished industrial archaeological survey for Longford Local Authorities Heritage Section. www.longfordlibrary.ie, accessed 02/01/2016.

Giacometti, A. & McGlade, S. 2009 *Meath Industrial Heritage Survey*. Unpublished industrial archaeological survey for Meath County Council. www.meath.ie, accessed 02/01/2016.

Gillespie, R. & Boyle, S.A. 2003 *Irish Historical Towns Atlas no. 12, Belfast Part 1, to 1840*. Royal Irish Academy. Dublin.

Girouard, M. 1984 *Victorian Pubs*. Yale University Press. New Haven and London.

Goodbody, R. 2014 *Irish Historical Towns Atlas no. 26, Dublin Part 3, 1756 to 1847*. Royal Irish Academy. Dublin.

Gourvish, T.R., & Wilson, R.G. 1994 *The British Brewing Industry, 1830-1980.* Cambridge University Press.

Green, E.R.R. 1963 *The Industrial Archaeology of County Down*. Her Majesty's Stationery Office. Belfast.

Hamond, F. 1990 *An Industrial Archaeological Survey of County Kilkenny*. Unpublished industrial heritage survey for Kilkenny County Council. www.kilkennyheritage.ie, accessed 24/03/2019.

Hamond, F. 1998 'Ireland's industrial heritage – where now?', in Hamond, F. (ed.) *Taking Stock of Ireland's Industrial Heritage*. The Industrial Heritage Association of Ireland. Dublin. 40-4.
Hamond, F. 2005 (in 2 Vols.) *Mills of County Laois, An Industrial Heritage Survey*. Unpublished industrial heritage survey for Laois County Council. www.laois.ie, accessed 24/03/2019.

Hamond, F. 2009 (in 2 vols.) *Mills of County Offaly, An Industrial Heritage Survey*. Unpublished industrial heritage survey for Offaly County Council. www.offaly.ie, accessed 24/03/2019.

Hamond, F. 2010 *Survey of the Machinery at the Beamish & Crawford Brewery*. Unpublished industrial archaeology report for Jack Coughlan & Assoc. Cork City Council Planning and Development Department. Application no. 1034698.

Hamond, F. & Friel, C. 2007 *An Industrial Heritage Survey of Railways in Counties Monaghan and Louth*. Unpublished industrial heritage survey for Monaghan County Council and Louth County Council. www.louthcoco.ie, accessed 24/03/2019.

Hampson, T. 2011 'Calandria' in Oliver, T. (ed.) *The Oxford Companion to Beer*. Oxford University Press. New York.

Henderson, E. 2001 *Thomas Street, D8: A study in the past, a vision for the future*. Dublin Civic Trust

Hickey, G. 2008 *Meath and Francis Street, D8: A study in the past, a vision for the future*. Dublin Civic Trust.

Hills, R.L. 1989 *Power from steam, A history of the stationary steam engine.* Cambridge University Press.

Holden 1809 *Holden's Limerick Directory*. Transcribed digital copy. www.limerickcity.ie, accessed 24/03/2019.

Horner, A. 1995 *Irish Historical Towns Atlas no. 7, Maynooth*. Royal Irish Academy. Dublin.

Hornsey, I. 2003 *A History of Beer and Brewing.* The Royal Society of Chemistry. Cambridge.

Hughes, D. 2006 *A Bottle of Guinness Please, The Colourful History of Guinness.* Phimboy. Berkshire.

John Cronin & Associates 2016 '14 - Cultural Heritage – Architectural Heritage' in Newgate Properties Ltd. 2016 Applemarket Centre, Waterford City, County Waterford; Environmental Impact Statement (Vol. 2) Main Report. Waterford County Council Planning Dept. ref. 16175.

Johns, J. 1873 *The celebrated brewery of Sir John Arnott & Co., Cork. The Irish Porter Breweries (Sketch no. 2).* Special Collections, Boole Library, University College Cork. MP677.

Johnson, G. 2002 *The Laneways of Medieval Cork*. Cork City Council.

Joyce, J. 2005 *Graiguenamanagh, a town and its people* (3rd ed.). Graigue Publications. Graiguenamanagh.

Keohan, E. 1924 *Illustrated History of Dungarvan*. Waterford News Ltd. Waterford. www.waterfordcoco.ie, accessed 24/03/2019.

Lenihan, M. 1866 *Limerick, its history and antiquities*. Reprinted 1991 by Mercier Press. Cork. www.limerickcity.ie, accessed 09/08/2018.

Lennon, C. 2008 *Irish Historical Towns Atlas no. 19, Dublin Part II, 1610 to 1756*. Royal Irish Academy. Dublin.

Lewis, S. 1837 (in 2 vols.) *A topographical dictionary of Ireland*. S. Lewis & Co. London.

Loftus, W.R. 1869 *Loftus's Almanack for Brewers' Distillers' and the Wine and Spirit Trades*. Simpkin, Marshall & Co.

Lucas, R. 1787 *The Cork Directory for the Year 1787*. Transcribed copy for Cork city, reprinted in *Journal of the Cork Historical and Archaeological Society*, 2:72:216 (1967). 135-157.

Lucas, R. 1788 *A General Directory of the Kingdom of Ireland.* Transcribed copies, reprinted in *The Irish Genealogist*, 3:10, 392-416 (1965; Waterford & Kilkenny) & 3:12, 529-537 (1967; Limerick city).

Lynch, P. & Vaizey, J. 1960 *Guinness's Brewery and the Irish Economy*. Cambridge University Press.

Magee, S. 2015 'Sweetman's breweries in eighteenth century Dublin.' in *Dublin Historical Record*, 68, 1. 113–126.

Malcolm, E. 1986 *Ireland sober, Ireland free: drink and temperance in nineteenth-century Ireland*. Gill and Macmillan. Dublin.

Mathias, P. 1959 *The Brewing Industry in England 1700–1830*. Cambridge University Press. Cambridge.

McCullough, C. & Crawford, W.H. 2007 *Irish Historical Towns Atlas no. 18, Armagh*. Royal Irish Academy. Dublin.

McCutcheon, W.A. 1976 'The stationary steam engine in Ulster' in O'Danachair, C. (ed.) *Folk and Farm*. RSAI. Dublin. 127-50.

McCutcheon, W.A. 1980 *The Industrial Archaeology of Northern Ireland*. Her Majesty's Stationery Office. Belfast.
McGee, F. 2018 *The Archives of the Valuation of Ireland, 1830-65.* Four Courts Press. Dublin.

Measom, G.S. 1866a *The Official Illustrated Guide to the Great Southern and Western Railway*. C. Griffin and Co. Dublin.

Measom, G.S. 1866b *The Official Illustrated Guide to the Midland Great Western, and Dublin Drogheda Railways.* C. Griffin & Co. London.

Middlemass, T. 1981 *Irish Standard Gauge Railways*. David and Charles. Great Britain.

Moore, M, 2012 'Historic brewery excavations at the former Royal Clarence Naval Victualling Yard in Gosport'. *Brewery History*. 148. 16-40.

Morewood, S. 1838 *A Philosophical and Statistical History of the Invention and Customs of Ancient and Modern Nations in the Manufacture and Use of Inebriating Liquors.* W. Curry Jun. & Co. & W. Carson. Dublin & Edinburgh. www.archive.org. Accessed: 03/09/2018.

Mulligan, F. 1990 *One hundred and fifty years of Irish railways*. Appletree Press. Belfast.

Murtagh, H. 1994 *Irish Historical Towns Atlas no. 6, Athlone*. Royal Irish Academy. Dublin.

Nowlan, K.B. 1973 'The Transport Revolution: The Coming of the Railways' in Nowlan, K.B. (ed.) *Travel and Transport in Ireland*. Gill and Macmillan. Dublin.

Nuvolari, A. & Sumner, J. 2013 'Inventors, patents, and inventive activities in the English brewing industry, 1634-1850.' in Business History Review. 87 (Special Issue 01), 95-120.

O'Brien, A.E. 2000 'Early brewing activity in Cork city: some leasehold evidence' in *Journal of the Cork Historical and Archaeological Society*. 2:105. 199-206

O'Callaghan, G. & Castle, J. 2010 'Chapter 12: Architectural Assessment.' in Malachy Walsh and Partners *Environmental Impact Assessment for the Brewery Quarter Cork City, Vol. 2*. Cork City Council Planning and Development Department. Ref. no. 1034698.

Ó Dálaigh, B. 2012 *Irish Historical Towns Atlas no. 25, Ennis*. Royal Irish Academy. Dublin.

Ó Drisceoil, Diarmuid, & Ó Drisceoil, Donal. 1997 *The Murphy's Story: The History of Lady's Well Brewery, Cork*. Murphy Brewery Ireland Ltd. Cork.

Ó Drisceoil, Donal, & Ó Drisceoil, Diarmuid. 2015 *Beamish and Crawford: The History of an Irish Brewery*. Collins Press. Cork.

O'Flaherty, E. 2010 *Irish Historical Towns Atlas no. 21, Limerick*. Royal Irish Academy. Dublin.

O'Flanagan, P. 1988 *Irish Historical Towns Atlas no. 3, Bandon*. Royal Irish Academy. Dublin.

O'Mahony, C. 1999 'Industry at Crosse's Green' in *Journal of the Cork Historical and Archaeological Society,* 2:104. 59-68.

O'Sullivan, H. 2006 *Irish Historical Towns Atlas no. 16, Dundalk*. Royal Irish Academy. Dublin.

Oliver, T. (ed.) 2011 *The Oxford Companion to Beer*. Oxford University Press. New York.

Pattyn, J. & Downing, J. 2011 'Baudelot Cooler' in Oliver, T. (ed.) *The Oxford Companion to Beer*. Oxford University Press. New York.

Patrick, A. 1996 'Establishing a Typology for the Buildings of the Floor Malting Industry' in *Industrial Archaeology Review*, 18, 2. 180-200.

Patrick, A. 2004 (in 2 vols.) *Strategy for the Historic Industrial Environment Report No. 1: Malting in England.* An unpublished report by the Brewery History Society for English Heritage. www.historicengland.org.uk. Accessed 03/09/2018.

Pearson, L. 1989 *The Northumbrian Pub: An Architectural History*. Sandhill Press Ltd. United Kingdom.

Pearson, L. 1999 *British Breweries: an architectural history*. The Hambledon Press. London.

Pearson, L. 2010. *Strategy for the Historic Industrial Environment: The Brewing Industry*. An unpublished report by the Brewery History Society for English Heritage. www.historicengland.org.uk. Accessed 03/09/2018.

Pearson, L. 2014 *Built to Brew: The History and Heritage of the Brewery*. English Heritage. Swindon.

Pearson, L. 2016 *Victorian and Edwardian British Industrial Architecture*. Crowood. Wiltshire.

Pettigrew & Oulton 1834 *The Dublin Almanac and General Register of Ireland.* Pettigrew & Oulton. Dublin.

Pettigrew & Oulton 1840 *The Dublin Almanac and General Register of Ireland.* Pettigrew & Oulton. Dublin.

Pigot, J. 1820 *A Second Edition of the Commercial Directory of Ireland, Scotland and the Four Most Northern Counties of England*. J. Pigot & Co. Manchester.

Pigot, J. 1824 *City of Dublin and Hibernian Provincial Directory*. J. Pigot & Co. Manchester.

Prunty, J. & Walsh, P. 2016 *Irish Historical Towns Atlas no. 28, Galway*. Royal Irish Academy. Dublin.

Reif-Acherman, S. 2012 'The early ice-making systems in the nineteenth century.' in *International Journal of Refrigeration*. 35. 1224-1252.

Riordan, E.J. 1920 *Modern Irish Trade and Industry*. E.P. Dutton & Co. New York.

Rothery, S. 1991 *Ireland and the new architecture*. The Lilliput Press. Dublin.

Rowledge, J. W. P., 1995 *A regional history of railways, volume XVI, Ireland*. Transport Atlantic. Great Britain.

Rynne, C. 1999 *The Industrial Archaeology of Cork City and its Environs.* The Stationary Office. Dublin.

Rynne, C. 2006. *Industrial Ireland 1750-1930, an archaeology*. Collins Press. Cork.
Rynne, C. 2004 'Technological Innovation in the early 19th Century Irish Cotton Industry-Overton Cotton mills, County Cork, Thomas Cheek Hewes and the origins of the suspension waterwheel' in Casella, E.C., & Symonds, J. (eds.) *Industrial Archaeology. Future Directions*. Springer. USA. 205-16.

Sheehan, E.H. 1976 *Nenagh and its Neighbourhood (revised and enlarged edition)*. The Record Press Limited. www.askaboutireland.com, accessed 24/03/2019.

Simington, R. C. 1942 *The Civil Survey 1654-1656: County Waterford, Vol. VI, with appendices. Also Valuations, 1663-1664, for Waterford and Cork Cities.* The Stationery Office. Dublin. www.corkpastandpresent.com, accessed 24/03/2019.

Simms, A. & Simms, K. 1990 *Irish Historical Towns Atlas no. 4, Kells*. Royal Irish Academy. Dublin.

Slater, I. 1846 *National Commercial Directory of Ireland*. I. Slater. Manchester.

Slater, I. 1856 *National Commercial Directory of Ireland*. I. Slater. Manchester.

Slater, I. 1870 *National Commercial Directory of Ireland*. I. Slater. Manchester.

Slater, I. 1881 *National Commercial Directory of Ireland*. I. Slater. Manchester.

Slater, I. 1894 *National Commercial Directory of Ireland*. I. Slater. Manchester.

Southby, E.R. 1885 (2nd ed.) *Practical Brewing*. E.R. Southby. London. www.archive.org. Accessed: 03/09/2018.

Steele, M. 2011 'Steel's Masher.' in Oliver, T. (ed.) *The Oxford Companion to Beer*. Oxford University Press. New York.

Stevens, F.D. 1959 *History of Engineering at St. James's Gate*. Unpublished manuscript. Guinness Archives, Guinness Storehouse, Dublin.

Sumner, J. 2005 'Powering the porter brewery.' in *Endeavour*. 29:2. 72-77.

Sumner, J. 2007 'Michael Combrune, Peter Shaw and Commercial Chemistry: the Boerhaavian Chemical Origins of Brewing Thermometry.' in *Ambix*. 54:1. 5-29.

Sumner, J. 2008 'Status, scale and secret ingredients: the retrospective invention of London porter' in *History and Technology*. 24:3. 289-306.

Sumner, J. 2013 *Brewing Science, Technology and Print, 1700-1880*. [Kindle Edition] Pickering & Chatto. UK.

Thomas, A. 2005 *Irish Historical Towns Atlas no. 15, Derry~Londonderry*. Royal Irish Academy. Dublin.

Townsend, B. 1997 *The lost distilleries of Ireland*. Neil Wilson Publishing. Kindle edition.

Townsend, H. 1810 *Statistical Survey of the County of Cork*. Graisberry and Campbell. Dublin.

Vaizey, J. 1960 *The brewing industry, 1886-1951: an economic study for the Economic Research Council*. Pitman.
Watts, M. 2002 *The Archaeology of Mills and Milling*. Tempus. Great Britain.

Welply, W.H. 1957 'The art and mystery of brewing (in Cork)' in *Journal of the Cork Historical and Archaeological Society*. 2:62:196. 102-110.

West, W. 1809 *The Cork Directory*. Transcribed digital copy. www.corkpastandpresent, accessed 24/03/2019.

Wilson, P. 1760 *Wilson's Dublin Directory for the Year 1760*. Peter Wilson. Dame Street, Dublin.

Wilson, P. 1766 *Wilson's Dublin Directory for the Year 1766*. Peter Wilson. Dame Street, Dublin.

Wilson, P. 1780 *Wilson's Dublin Directory for the Year 1780*. Peter Wilson. Dame Street, Dublin.

Wilson, R.G. & Gourvish, T. (eds.) 1998 *The dynamics of the international brewing industry since 1800*. Routledge. London. 105-122.

Wilson, W. 1786 *Wilson's Dublin Directory for the Year 1786*. In Watson, S. 1786 *The Treble Almanack for the Year 1786*. W. Wilson. Dublin.

Wilson, W. 1794 *Wilson's Dublin Directory for the Year 1794*. In Watson, S. 1794 *The Treble Almanack for the Year 1794*. W. Wilson. Dublin.

Wilson, W. 1804 *Wilson's Dublin Directory for the Year 1804*. In Watson, S. 1804 *The Treble Almanack for the Year 1804*. W. Wilson. Dublin.

Wilson, W. 1815 *Wilson's Dublin Directory for the Year 1815*. In Watson, S. 1815 *The Treble Almanack for the Year 1815*. W. Wilson. Dublin.

Parliamentary Papers

Journals of the House of Commons of the Kingdom of Ireland (*JHCKI)*

JHCKI 1797a (vol. 15) 'An Account of the Number of Strong Beer, Small Beer, and Retailing Brewers in the Different Districts in Ireland, as they stood at Michaelmas, 1790' in 1796-1800 *The Journals of the House of Commons of the Kingdom of Ireland* (in 19 vols). J. and A.B. King. Dublin. App. cxci-cxcii.

JHCKI 1797b (vol. 15) 'An Account of the Number of Strong Beer, Small Beer, and Retailing Brewers in the Different Districts in Ireland, as they stood at Michaelmas, 1791' in 1796-1800 *The Journals of the House of Commons of the Kingdom of Ireland* (in 19 vols). J. and A.B. King. Dublin. App. cxcii.

UK Parliamentary Papers (BPP)

BPP 1812 *Report from the Committee on the Petition of Brewers of the Cities of Dublin, Cork, and Waterford.* H.C. 1811-12. 222. V.17. 5.

BPP 1827 *Account of the total quantity of malt, stated by quarters, made in each of the three kingdoms, in each year from 5th April 1786 to 5th April 1827.* H.C. 1826-7. 490. XVII.475. 17.
BPP 1828 *Account, number of barrels of beer exported from England to Ireland and to Scotland; from Ireland to England and to Scotland; and from Scotland to England and Ireland: 1809-1828*. H.C. XVIII.471. 18. 440.

BPP 1832 *An account of the number of brewers, licensed victuallers, and persons licensed to sell beer by retail, in the United Kingdom; distinguishing the number of each, and the number who brew their own beer, and showing the total quantity of malt used by such parties respectively in each collection, from 5 January 1831 to 5 January 1832*. H.C. XXXIV.27. 34.

BPP 1833 *Summary, and the documents therein referred to, relative to the new valuation of the city of Dublin*. H.C. XXXV.123. 35.

BPP 1838a *Accounts relating to hops and malt, and to the number of persons licensed as brewers, victuallers, &c., for the year 1837*. H.C. XLV.177. 45.

BPP 1838b *Second Report of the Commissioners appointed to consider and recommend a general system of Railways for Ireland*. H.C. 1837-8. 145. XXXV, 449.

BPP 1848 *Return of Agricultural Produce in Ireland for the year 1847*. Cmd. 923. LVII.1. 57.

BPP 1872 *Census of Ireland 1871. Part 1, Area, Houses and Population, also the ages, civil condition occupations and birthplaces, religion and education of the people. Vol. 1, province of Leinster*. H.C. C.662.

BPP 1873 *Census of Ireland 1871. Part 1, Area, Houses and Population, also the ages, civil condition occupations and birthplaces, religion and education of the people. Vol. 2, province of Munster*. H.C. C.873. 1873.

BPP 1874a *Census of Ireland 1871. Part 1, Area, Houses and Population, also the ages, civil condition occupations and birthplaces, religion and education of the people. Vol. 3, province of Ulster*. H.C. C.964.

BPP 1874b *Census of Ireland 1871. Part 1, Area, Houses and Population, also the ages, civil condition occupations and birthplaces, religion and education of the people. Vol. 4, province of Connaught*. H.C. C.1106.

BPP 1903-15 Brewers' licences. Return of the number of persons in each of the several collections of the United Kingdom licensed as brewers, and of the quantities of materials used in brewing, from 1 October 1901 to 30 September 1902, &c. H.C. 157. LIV.399. 54. Produced annually to 1915.

BPP 1920 *Eleventh report of the Commissioners of His Majesty's Customs and Excise. For the year ended 31st March 1920. Being the 64th report relating to the customs and the 63rd report relating to the excise*. H.C. Cmd. 1082. XIII.399. 13.

Archival Sources

The Cork City and County Archives (CCCA)

CCCA/U18/MPD	The Beamish and Crawford Collection; maps, plans and drawings

The Department of the Environment, Northern Ireland (DOENI)

IHR	The Industrial Heritage Record
McCutcheon	The McCutcheon Photographic Archive

The Guinness Archives

James's Gate Brewery, Historical Plans

The National Archives of Ireland (NAI)

NAI/OS140	Ordnance Survey of Ireland, Manuscript Townplans

The National Library of Ireland (NLI)

NLI Ms. 3285	Daybook of P. & J. Sweetman, brewers, of Dublin, Sept. 1793 - Sept. 1795.

The National University of Ireland, Galway (NUIG), James Hardiman Library Archives

NUIG/BUS1	The Madeira Island Brewery, sale book of

The Public Records Office of Northern Ireland (PRONI)

PRONI/D556/536	Wallace Papers Lease concerning the Hercules Street Brewery, Belfast
PRONI/D607/C/128C	Downshire Papers lease concerning the Hillsborough Brewery
PRONI/D1255/22/1	Messrs. Martin and Henderson, Solicitors Papers Lease concerning the English Street Brewery, Downpatrick
PRONI/D1326/19/7	Papers of L'Estrange & Brett, Solicitors, Belfast papers concerning McConnell's Brewery, Belfast
PRONI/D1390/40/6	Falls & Hanna Solicitors Papers Papers concerning the Enniskillen Brewery
PRONI/D1905/1/1	L'Estrange and Brett Papers

	Papers concerning the Belfast and Ulster Brewery
PRONI/D2587/3B/3	Macaulay, O'Neill & Martin Solicitors' Papers Papers concerning the Brook Street Brewery, Coleraine
PRONI/D4108/3/1/24	Salters' Company Irish Estate Records Papers concerning Gaussen's Brewery, Ballyronan
PRONI/T1009/109	Wallace Papers Lease concerning the Lower English Street Brewery, Armagh City
PRONI/Val/2/D/1/9	Undated Valuation Map of Ballymoney
PRONI/Val/2/D/5/11b	Undated Valuation Map of Londonderry
PRONI/Val/2/D/5/15	Undated Valuation Map of Coleraine
PRONI/Val/12/E/102/1	Undated Valuation Map of Hillsborough