

George Packham, Miller and Millwright, 1792-1872*

J.S.P. Buckland

(i) Life



Fig. 1: George Packham (Miller, 3 Sept 1877).

Most of what I know of George Packham (fig 1) comes from the *Miller*, 3 September 1877, pp. 337-339, in one of a series of articles titled "Commercial lives of celebrated deceased millers." He was born in Shortbridge township, Fletching parish, Sussex, 14 April 1792, one of the nine children of a miller. After school at Horsted Keynes, he was apprenticed for seven years to a Mr. Sudds, millwright of Lewes. About the end of his apprenticeship he married, and, towards the end of the Napoleonic wars, he also took

* Transcription of typescript by J S P Buckland (1935-2006) held by the Mills Archive (JSPB-1125727). The transcription was produced in November 2021 by Andrew Ryan, Anne Harrison, Ann Grimmer, Guy Boocock and Nathanael Hodge.

an old mill at Horsted Keynes. He spent a lot of money on improving it. The collapse in prices after 1815 probably ruined him; his improvements had left him in debt; so he made over all his effects to his creditors, and moved to London as a journeyman in the old Society of Millwrights. This is the body the young Scottish millwright William Fairbairn (1789-1874) fell foul of in 1812, after he had been promised work by John Rennie at his Blackfriars Bridge works. There were then three millwrights' societies in London, the old, the new, and the Independent. These, Fairbairn claimed in his days of prominence and prosperity, by their corruption and excesses caused "the almost ultimate extinction of the name of millwright as a distinct profession."¹

Twelve months later, he and a fellow workman left to try their fortunes in France. They had not a word of French, "and when the two Englishmen required such a commodity as a fowl or a joint of mutton for dinner, they had to draw a picture of it". They lodged at Eu (Seine-Maritime), a small town near the mouth of the Bresle, nineteen and a half miles from Dieppe. The château of Eu was inherited by the Duke of Orleans on the death of his mother in June 1821. From 1830 to 1848, he was Louis Philippe, King of the French. He paid his first visit to the château since 1791 in late August 1821, found it in a very bad state of repair, and thereafter spent vast sums on it and its estate; it became and remained a favourite residence of his. In the 1820s he was keeping a low profile politically, and was engaged in consolidating his family fortunes. Therefore he did not neglect the industry and commerce of the district,

and he was engaged in the utilisation of the local water power for industrial purposes with very little prospect of success. Having time on his hands, and being naturally interested in everything connected with mill work, our English millwright was standing one day watching the proceedings of the French workmen.

And while he was making unflattering criticisms of their work, an English voice asked him, "Could you do it in a better style?" Though much surprised, Packham at once replied "Yes". The questioner was the Duke's English valet, a Mr. White, who will appear again below, under 1848. An interview with the Duke (who had fluent English) ensued, who "was so impressed with the straightforward replies and practical good sense of the stranger that he at once entrusted him with the superintendence of the work." On the mill's completion, the Duke asked Packham to become its tenant. Packham said he would like to, but had no capital, whereupon the Duke lent him 30,000 francs without asking any security.

That is the *Miller's* account. Louis-Philippe's architect, P.F.L. Fontaine (1762-1853), in c.1845, gave a somewhat different version: There were two estate watermills near the castle, on the main current of the river Bresle.

They scarcely brought in the sum of two thousand five hundred francs, were in the worst possible state of construction, and would perhaps have been allowed to crumble into ruins, when an English mechanic, a plain workman, a practical and very experienced man, having realised the advantages of the site, and also the state of things, took a lease of that one of the two mills that the former lessee had given up, and fitted it up on a new system of mechanics. The prompt success, of which his talents and probity formed the basis, soon enabled the undertaker to lease the second mill, and put him within reach of creating, in an excellent position, before the eyes of the Prince, one of the finest and most remarkable works in the département. Nowadays the Packham mills, for one must call them by the name of their author, are renowned throughout Lower Normandy, where they have already served as patterns for several other mills.²

The establishment which rapidly sprang up under Packham ground corn, baked ships' biscuits, expressed oil seed, and sawed and planed planks. The original capital loan was repaid; within ten years of his arrival, his creditors at Horsted Keynes were paid back in full; the rent for the Eu works rose from £60/year to £1710 in 1841; and the last enlargements under Packham were completed in 1846. He was a successful man (we hear no more of his fellow workmen).³ Before 1848, he had retired from the management of the works,⁴ and he seems to have lived both at Eu and at Brighton.

An old friend of his was William Catt (1780-1853), of the Bishopstone tide mills, near Newhaven, and of the Albion Steam Mills, Edward St., Brighton, who had risen from the beginnings as humble as his own to become the largest flour miller, not only in Sussex, but in southeast England. He became too, a substantial landowner in Kent and Sussex. His holdings included the manor of Denton, near Newhaven, which gave him the advowson of the living of the parish of Denton. Under Catt, the tide mills' storage area for impounding tidal water was very greatly increased to about twenty acres (eight ha), and the number of stones rose from four or five pairs to sixteen, driven by three c.15' (4.6m) diameter undershot wheels. A small white painted smock mill, typical of the developed 19th century design of such mills in Kent and Sussex, of which the recently re-preserved Woodchurch mill, Kent, is a wholly delightful example, worked the hoisting tackle, including an elevator. Its smock body and cap must be about the same size as St. Margaret's Bay mill, Kent, of 1928-29. It had a fan, and anticlockwise patent sails also very typical of the area, with their "flat twist" weather, and narrow leading sides with shutters in the outer bays and lead boards in the rest. All is long gone.⁵ About 1846, Packham introduced Catt to Louis-Philippe, either at Eu or the Tuileries, depending on the account; I feel the former is more likely. The king greeted him with "Good morning

Mr. Catt, I understand that you wish to see the King. I am the King, and I am very glad to make your acquaintance!"⁶

In February 1848, revolution broke out in Paris, at a time when Packham was engaged in putting up machinery for new waterworks at La Ferté-Vidame (Eure-et-Loir), a château of the Orleans family.⁷ He went to Paris to see the king about it,

on the day that the famous Reform Banquet was to have taken place. Mr. Packham called at the Tuilleries (*sic*), scarcely expecting to see the king, who, however, saw him in his breakfast-room, and expressed his belief to his visitor that they would be able to cope with the Revolution.

Louis-Philippe said to him, "Don't be uneasy, Packham, don't be afraid of a revolution, we have 80,000 National Guards inside the barrier, and plenty of troops outside."

The Duc de Nemours and several generals coming in, Mr. Packham left, His majesty saying, "I hope I shall see you, Packham, at Ville d'Eu by the end of the week, when we shall have a better opportunity of talking about these things."⁸ On leaving the palace Mr. Packham saw the mob tearing up the pavement and erecting barricades in the Champs Elysees. The Revolution *had* broken out, and it was with some difficulty Mr. Packham, three days afterwards, succeeded in getting out of Paris and crossing over to England where, on the second day after his arrival in Brighton, he received a mounted messenger from Louis-Philippe requesting him to come immediately to His Majesty at Newhaven.⁹

The Times account, datelined Newhaven, 3 March, which their reporter had from Packham himself, says that he was a long-standing protégé of the king's, and was with him "on the memorable Tuesday appointed for the Reform Banquet up to within an hour of the outbreak of the revolution."¹⁰ The king and his queen fled to England aboard an English steam boat, which disembarked him at Newhaven on the morning of 3 March, where they put up at the Bridge Inn. William Catt of the Bishopstone tide mills was one of the first to greet him there,¹¹ and offered to put him up at his own house, but this was declined. The king then enquired of Packham, continued *The Times* and learning he was at Brighton, "expressed a desire to see him immediately." On a messenger reaching him there, Packham "immediately posted to Newhaven with a gentleman named White, who had been in the household of Louis-Philippe many years."

A self-appointed deputation from Brighton went to greet the king, travelling by a special afternoon train; Packham, though not part of it, acted as master of ceremonies.

"Gentlemen from Brighton, I presume," said the king with his usual frankness, in the purest English. "Oui, oui your Majesty," was their reply in French and the vernacular, a long standing joke against them.¹² Howarth's biography does not mention this incident,

but says Louis-Philippe was subjected to addresses in Latin and French by the pupils of the Lewes free grammar school.¹³ Later the same day, *The Times's* correspondent was introduced by Packham to the king, who was reading an English paper between receiving guests.

Packham too, offered to put up the royal couple in his Brighton house. The king again said no, but before they parted, gave Packham all his money to change into English coin, and to buy him clothes, "of which," he said smiling, "I am very short." (This was later embroidered into a tale that he had had to borrow a suit of clothes from Packham).¹⁴ Packham, White, and the king's valet then returned to Brighton by post chaise. The *Journal du Havre*, 5 March 1848, notes that the king was seen by "M. Packham, well-known at Dieppe and Eu, and whom he had caused to come from Brighton".¹⁵

From this time, Packham retired to his English home from at least 1843,¹⁶ 1 St. George's Place, Brighton, where he lived till his death. He designed the unusual Twineham windmill during this time. He stayed fit and active, and did not, claims the *Miller*, look his age. He died at his Brighton address on 20 September 1872, aged 80, and was buried in Keymer churchyard. Effects under £6000 (his fortune from the Eu mills was only moderate, according to the *Miller*). The sum was settled at £6002 15s, which paid £60-0-4d in death duties.¹⁷ The will of George Packham of Brighton, gentleman, is dated 17 December 1861. Executors and trustees, his son-in-law John Wood, of Twineham, and his friends Charles Hodson of Brighton, miller, and John Kemp of Brighton, chemist and druggist. To his sister Maria, £30/year for life (sole sibling mentioned). To his grandson, George Packham Manguet, 40,000 "francs Stock in the Moulins Packham Company at Eu in France", and in case Packham has no, or not enough stock in the company at his death, the legacy is to be made up out of the residuary estate. Rest of his real and personal estate to be sold by the trustees and invested for the benefit of his two daughters, Harriet, wife of James Wood of Hockley (*sic* - Ockley), Keymer parish, and Charlotte, wife of the said John Wood. Proved at Lewes by Wood and Hodson, 12 November 1872. Hodson was a miller in West Hill Rd., Brighton (*Kelly's Sussex*, 1862). What else I know of the family will be found in fig 2.

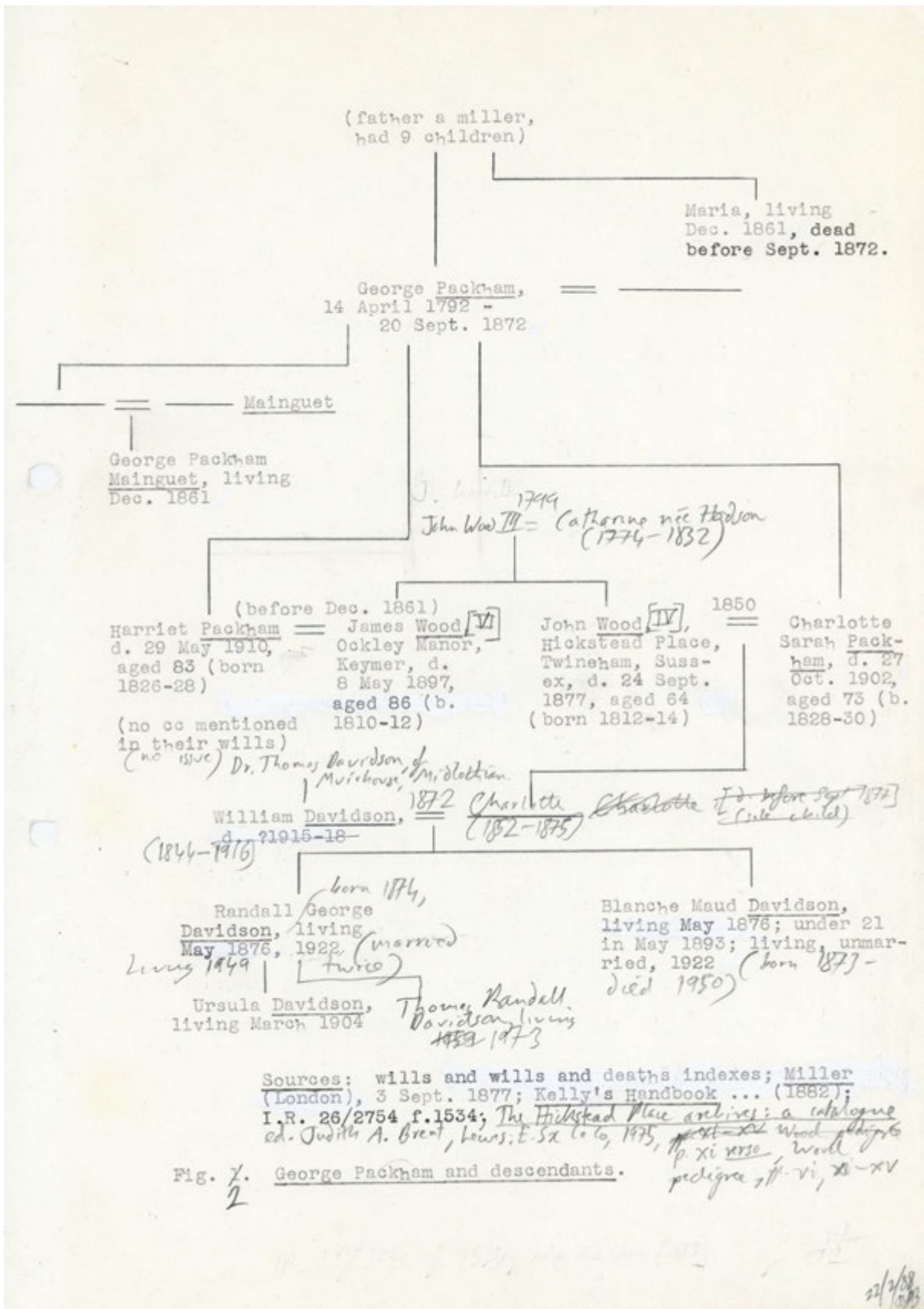


Fig. 2: George Packham and descendants.

(ii) The Moulins Packham

The account in the *Miller* leads one to infer that Packham left for France within a year or so of the end of the Napoleonic Wars; but he cannot have reached Eu before 1821, so something has been telescoped in his history. In fact, the date must be 1824, for on the 27 December 1824 an agreement was made between Louis Bartholémi Joseph Badouix, Director of the Domains of the Duke of Orleans, and George Packham of Fletching, Sussex, miller (his birthplace). In this document, Packham is granted the previous miller's house at Eu. He is to change the Eu millwork to the English system, with three pairs of stones for flour production (a key condition). He is to complete the conversion within three months, the Duke is to pay 6900 francs of this, Packham the rest. The Duke will lease the mill to Packham at 1800 francs/year for 14 years from 1 April 1825, the entry fine is 450 francs. The Duke's architect (i.e. Fontaine) and agent are to visit Packham during the first three days of April to make an inventory and valuation of the mill. Packham is to pay for the repair and upkeep of the mill; and is to set up a conduit by which the Duke may take the Bresle water to the château of Eu, for not over 2000 francs provided by the Duke. Witnesses, Henry Turner, A.T. Nicholas.¹⁸

A further agreement between the same parties, dated 12 September 1825, postpones the start of the lease to 27 October 1825. The money provided by the Duke has been raised to 16,493 francs, and Packham's rent to 2000 francs; Packham is to train a French apprentice in the management of the mill (an important new condition); and the architect's visit is postponed to October.¹⁹

The mills were very well established by the time of the earliest mention I have of them, a description of 1828. The author, Estancelin, says that the Duke of Orleans, to stimulate the commerce and industry of the district, had set up below the walls of the château,

industrial establishments, which have already filled the principal object that their creator [i.e. the Duke] originally proposed to himself. These works have inspired the happy idea of erecting similar or analogous ones elsewhere. There are, for the workmen of the region, schools where their intelligence and their skill find examples which they would only be able to find far from their homes.

The works comprise:

1stly, a corn mill, whose work is admirable, and rivals the best mechanisms of this kind; 2dly, a saw mill, which can cut up over fifty thousand stères [m³] of wood per year [1.77 x 10⁶ ft.³]; 3dly, an engineering workshop, in which Monsieur Packham, builder and director of these works, makes hydraulic engines, improved agricultural instruments, and works of all kind, in wood and in cast iron. Monsieur Packham is engineer-mechanician to his Royal Highness.²⁰

Estancelin is an adulatory, not to say sycophantic writer on Louis-Philippe, but others confirm that the works served as a model for local millwrights. They therefore complemented one function of the superb French publications of engineering designs around the 1820s-40s, which was to publicise in precise detail the best English millwrighting and engineering practice; I am not aware that Packham's mills featured in them.



Fig. 3: Moulins Packham, Eu (pre-1914 postcard) (collection JSPB).

In 1836, the works occupied several acres. They comprised a large mill building, four floors high to the eaves, with three waterwheels. Fontaine's drawing of Eu, with the weatherboarded mill in it, in 1836, shows the mill to be essentially the same structure as in the two n.d., but pre-1914 postcards reproduced as figs. 3 and 4. It is a design of large English nineteenth century merchant milling flour mill. In 1836, there was an external wheel, quite broad, either low breast or undershot, with two sets of clasp-arm arms; the wheel in the postcard view, though it will be a replacement, is much the same. In 1836 this wheel drove three pairs of stones via a layshaft parallel to the wheelshaft. Below them, on the ground (meal) floor were two large circular bake-ovens. An internal wheel (whose tail-race archway is seen in the postcard) spurwheel drove three pairs of stones. A narrower internal wheel, immediately upstream of it, drove via a 90° gear, a layshaft which passed under the roadway along the mill's upstream side to a much lower saw mill building on the other side of the road. On another part of the site was a long oil mill building, with (shown in 1845) an internal wheel in one arm. In the middle of the site, Packham had a quite modest house with a large garden.²¹



Fig. 4: Moulin Packham, Eu (pre-1914 postcard) (collection JSPB).

George Packham previously can have been no more than a journeyman millwright, but was clearly no ordinary one; and it speaks volumes for his talents, and perhaps shows too what he had learnt of the most advanced practice during his year in London, that he was able to turn master millwright and design and build such major plants. He is one of a number of technically trained Englishmen who made their careers in France after 1815. He may be too, Fontaine's "English engineer" who built the château's waterwheel worked pump house, clearly shown in Fontaine's drawing of 1836, and in the site plans.

Between 1840 and 1845 the works were expanded further. The saw mill was removed to new buildings beyond the extended oil mill; a wheel between them seems to have worked both. On the oil mill side, this drove a large pair of edge runners. The oil mill's internal wheel drove two pairs of edge runners, one each side. The old saw mill building (altered or rebuilt) has a row of four circular bake ovens installed between 1840 and 1841. The two larger ones in the corn mill remain, but the external wheel now layshaft drives four pairs of stones, not three. The large internal wheel now has two short layshafts at 90° to the wheelshaft, each driving two pairs of stones. The third wheel has been replaced by a larger internal wheel at 90° to the other two, spurwheel driving four pairs of stones, making twelve pairs in all. Judging from the plans, its tailrace is the narrow channel visible in the downstream postcard, which perplexes me. There is a large timber yard.

In 1845 a works railway (man or horse hauled), running close to Packham's house across its garden, and complete with one-truck turntables, took trucks between the oil mill to three loading/unloading points on the Bresle basin on the downstream side of the corn mill.²² The straightened course ("the new canal") of the Bresle leads straight to the port of Le Tréport, two or three kilometres off. None of the plans in Fontaine seem to show the engineering works of 1828.

An account of Eu published in 1839, refers to "the encouragement accorded industry by the establishment of the two Packham mills, so called from the name of the skilful English mechanic who invented them." A footnote adds:

Mills, one of which supplies to the building industry an immense quantity of planks sawn with marvellous rapidity, with the help of a new apparatus, whilst the other delivers annually for the food supply nearly a million Francs worth of flour, and to the marine the most excellent biscuits.²³

From the site plans, I think the "appareil nouveau" is reciprocating saws, not the circular saws patented by the elder Brunel in 1808, and used by him at his Battersea saw mills which were burnt down in 1814. There were probably few saw mill of any consequence in France at that time, but the *Almanach-Bottin* volumes for 1839 and 1850 show that the Packham mills had competition from both steam and water-worked saw mills at Dieppe.

In the 1840s, Augustin Rollet, director of naval victualling at Rochefort, says Packham used English sized stones, 1280-1300mm (50½"-52") in diameter, turning at 110-120 r.p.m., each pair normally ground 1.41 hectolitres corn/hour, and sometimes even 2.40 hectolitres/hour. The flour was considered of good quality. For baking, the flour and water reached the dough mixer (pétrin) without manual help. The mixer was like those at the naval victualling establishments at Portsmouth and Plymouth. The ovens only held 40 kg. maximum, so in order to make 19 metric cwt. (1900kg.) of ships' biscuits/24 hours, at least forty firings were required; the labour for this was six men and two boys. The ovens were fired on coal and sawdust. Production (running) costs were 1 franc 67 centimes/100kg. of biscuits. First quality ships' biscuits were sold at 56 fr./100kg., second quality at 50 fr., third quality at 42 fr. Packham's costs were the cheapest in France by far, though his biscuits were not of the best quality. His costs were estimated to be slightly cheaper than in England, where labour was dearer. His baking equipment was less perfect than that at Portsmouth and Plymouth, and was really inferior to Rochefort's.²⁴

Fontaine in c.1845 said that the mills' prosperity was assured by the help and encouragement of Louis-Philippe, who had,

right from the beginning, wished to take part in the success of he who was able, in an undertaking of this sort, by his conduct and industry, to merit his confidence. Thus it is that Packham was entrusted with the execution of the magnificent marquetry-work parquet floors of all the rooms of the château, and with yet other works. Thus it is that, always master of his manufactory, free to manage its progress as he willed, this skilful mechanic has, on every occasion, obtained the assistance and the funds necessary for the amelioration and improvement of the different parts of his enterprise.²⁵

In 1844, yet another writer, in an extremely high-flown passage, says much the same of the king's patronage of "M. Georges Packam". He refers to the oilseed crushing edge runners; and says the works were making barracks of huts (*baragues*) to serve as tents for the French colonising troops in Algeria. And tells us, what we did not otherwise know, that the mills employed English mechanics.²⁶

The *Miller* says that under Packham an establishment rapidly sprang up, consisting of a twelve pair corn mill; a biscuit manufactory comprising six large ovens, two of them revolving, an improvement patented by Packham, and using 350-450 sacks of flour per week; and an extensive oil mill which crushed 50 quarters of seed per day; and a saw mill and planing machine, which worked 50 tons of Norway planks into flooring ready to be put down, and planking and deals of various descriptions, weekly. This will be the works as they were around 1840. There is no English or U.K. patent in his name; and a French one has eluded me, though he could have patented in France with perfect propriety, English baking machinery as a patent of importation. However, on 4 May 1839 he did apply for a French patent of invention for a machine to make parquet flooring, which on 4 April 1840 was granted him for five years.²⁷

The original mill, says the *Miller*, the nucleus of the complete works, had a rental of £60; this had risen to £1710 in 1841. By 1846, five more pairs of stones had been added, and warehouses, &c., erected on the canal from Le Tréport. These must be in a separate mill, not on the 1845 plan. We can be sure it was waterworked, for the works being almost under the walls of the château, Louis-Philippe would certainly have forbidden a coal burning steam engine.

The *Almanach-Bottin* does not help one to discover when the Packham works were founded, for it is not till the number of Eu entries is expanded severalfold in the volume for 1836, that they first appear. The bare name "Packham" appears under "Corn and flour merchants", and under "Saw mill for planks."²⁸ The entry is unchanged for 1837, 38, 39. In 1844, the entry is: "Flour (manufacturer), mechanical saw mill, baker of ships' biscuits, oil, manufacturing works, Scandinavian timber, G. Packham."²⁹

According to the *Miller*, the mills were formed into a company just before the 1848 Revolution. This is not confirmed by the younger rival to Bottin, the *Annuaire général du commerce* of Firmin Didot frères, Paris, for 1847, 48, 49, 50, where “Packham” appears under ships' biscuits, flour mills, water-worked saw mill for planks, oil mill, coal, corn and flour, plaster. I have not seen the *Almanach-Bottin* for 1847-49, but in the volume for 1850 (published in 1849 as it contains a calendar), the entry reads:

Moulins Packham (Company of the), manufacturer of oils, and refining, corn mill, baker of ships' biscuits, mechanical saw mill, machine to make planks, dealer in coal and slates, G. & H. Packham, Derambure, Mainguet & Co.³⁰

H. Packham is, possibly, the nephew running the business with others, mentioned in *The Times*, 4 March 1848. Derambure owns property near the mills, on the site plans. The loss that Packham and the company suffered in the Revolution, was, says the *Miller*, from £6000 to £7000; but the works, “under the skilful management of his son-in-law, M. Mainguet, speedily recovered their former prosperity.” Were these losses simply occasioned by the disruption of trade? Were the English workmen there forced to quit their jobs, and find their way home as best they might, as so many were?³¹ The estate of Louis-Philippe at Eu was confiscated, along with his other *biens*, by decree of 22 January 1852, and was not returned to the family till after the Franco-Prussian war of 1870.³² How would this have affected the lessees?

The 1851 Bottin entry is identical to 1850. The first of the merged Bottin and Didot directories of France, the *Annuaire et almanach du commerce, de l'industrie ... (Firmin Didot et Bottin réunis)*, 60th year, 1857, Paris: chez Firmin Didot frères, fils et cie, has “Moulins Packham (company of the): Packham (H.), Derambure, Mainguet & Co”, and Packham or H. Packham, usually associated with the others, under the different heads of the earlier Didot volumes. The 1859 *Annuaire-Almanach ... (Didot-Bottin)* entries are the last to list the name Packham, or (in one case) H. Packham, in the firm Packham, Derambure, Mainguet & Co, under ships' biscuits, flour mills, oil mill, Scandinavian timber, coal and slates, distillery, plaster, Moulins Packham Co. In 1860, the entries are the same, except that the firm is now Derambure, Mainguet & Co, and “Packham” appears only in the name of the mill.³³ In 1870 they have gone too, the Moulins Packham and its various activities are run by Mar & Co. In 1880, the entry is: “MOULINS PACKHAM, corn mill, 12 pairs of stones, saw mill, biscuit bakery, oil mill, stores of coal and slates: E. Mathorel.” Mar & Co are listed separately as ships' biscuit bakers, flour mills, steam saw mills, &c. In 1885 appears: “MOULINS PACKHAM. HANSEN AND CO. / Milling, biscuit baking, Scandinavian wood, coal, slates, mechanical saw mills, depot at Le Tréport.” In 1887 and thereafter there is no Moulins Packham, but the L. Tunc listed under flour mill (*minoterie*) and plank sawing would seem to have taken over that part

of the business. Their last mention is in *La grande encyclopédie*, Paris, xvi, accessioned BM 29 March 1893, under “Eu”: “Moulins Packham, vast industrial establishment, comprising a mechanical saw mill, an oil mill, a ships' biscuit bakery”, information probably already out-of-date. The name stuck though, as it is the caption of the two pre-1914 postcards of the corn mill.

(iii) Twineham and West Ashling mills

(a) Twineham

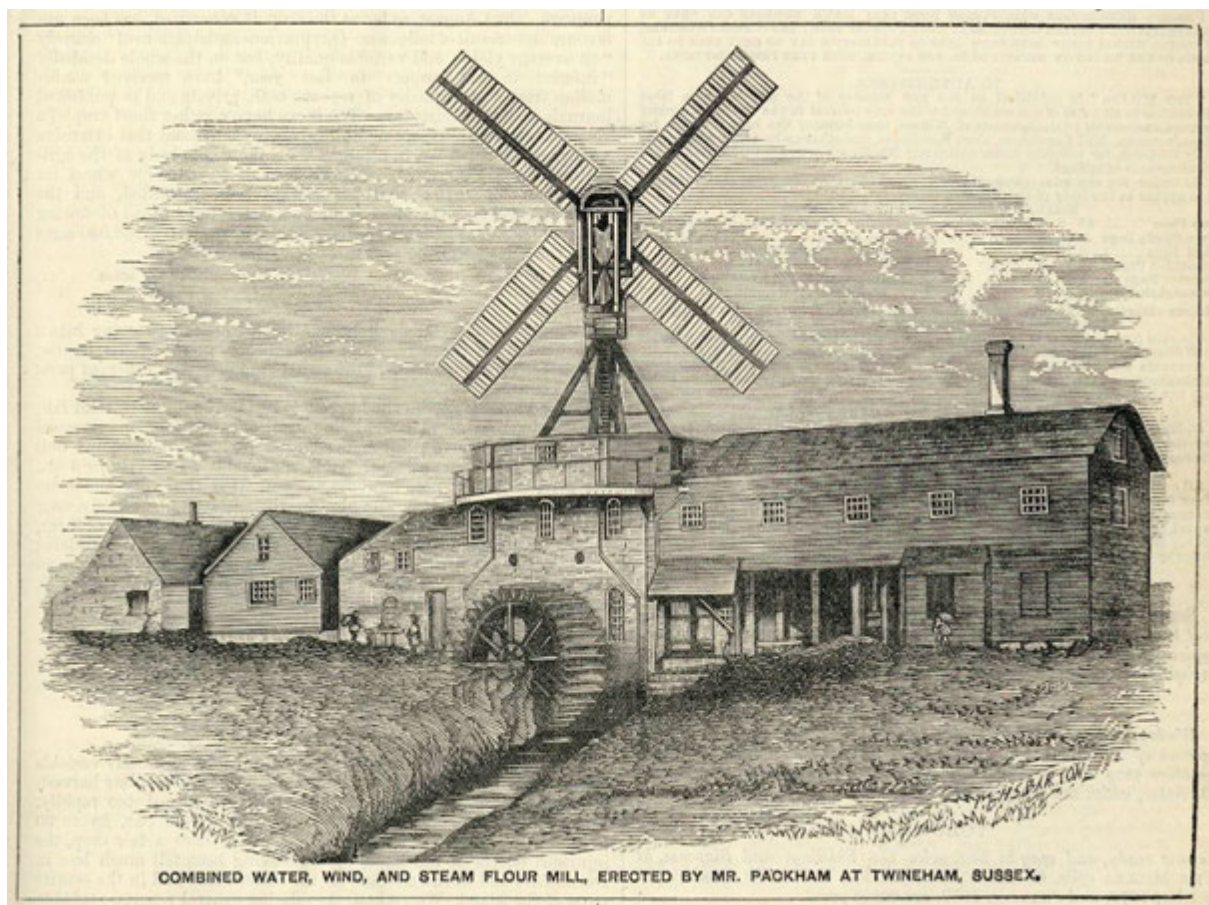


Fig. 5: Twineham wind, water & steam mill (Miller, 3 Sept 1877).

Twineham mill, Sussex (fig. 5), was designed by Packham during his retirement, for his son-in-law John Wood Esq.,³⁴ a, then the principal landowner of the parish, and later lord of the manor. It was a wind, water and steam mill. The windmill is very like West Ashling mill of c.1859 (below). The usually very well-informed H.E.S. Simmons says baldly “Built in 1851,” though with no reference. This date is highly plausible though, for John Wood had married Packham’s daughter Charlotte Sarah only the previous year.³⁵ The water and windmill were probably coeval with each other. A variant version is by Simmons in his typescript “Sussex Windmills Survey: historical notes”, which was

apparently written about the mid 30s with publication in view. This says the mill is “Believed to have been originally intended for water power only”, but thanks to the sluggishness of the mill stream, and the absence of a mill pond of any size, the windmill was installed “to save and hold up the head of water.” A few years later a steam engine was added “as the only reliable method of working.”

Simmons has put together a detailed description of the mill, only some of which may have come from the wood engraving (fig. 5). This shows a rectangular brick mill building, 3 floors high, with a flat square top with chamfered angles, and stage round. This could equally well be the original design, or an early conversion. The windmill has four long “quarter bars”, or shores as Simmons more appropriately calls them, four double shuttered sails and a fantail.

The steam engine is probably housed in the weatherboarded building on the right, which is doubtless the saw mill building. This much from the engraving. Simmons says the windmill was reached by ladder as at W. Ashling. Iron post, and iron tie rods for the four shores. Patent sails, carried on grooved (i.e. flanged) cross, without stocks. Five pairs of stones, smutter and silk flour machine; smutter in saw mill part. Arched iron bridges with separate tenter bars (i.e., a fixed locating bridge and straight tenting bridge below it). Acacia wood cogs in pit wheel. Same stones wind, water and steam worked, the upright shaft running right up into the windmill. Saw mill probably only steam worked; it was open to the west. “Wind and water probably all built at once.”

This mill seems to have been the sole one at Twineham. There is no miller in Kelly’s *Six counties* directories for 1845, 1851, 1855, but in the 1859 volume appears James Wood, miller and farmer. He is not in the parish as a farmer in 1855, and has gone from it in 1862. In 1862, 66, there is Arthur Robert Thompson, miller and baker. The mill and other buildings were insured for £1000 in June 1870. The brick built mill was then wind, water and steam worked, five pairs of stones were used, there was a ten h.p. engine with boiler, a smutter, a ground floor saw shop, a millwright’s shop, steam powered lathe, a two forge smithy, a miller’s cart, bakehouse, coal store, &c. In 1870, 74, Kelly’s *Sussex* directories list Gorringe & Son, millers and bakers, Gorringe is Clem Gorringe, according to Simmons. The *Sussex Advertiser*, 12 October 1875, announces the sale of the household furniture, miller’s van, poultry &c, on the premises at Twineham, on 15 October, “by order of Mr. Gorridge, who is quitting.”

The mill is advertised in the *Miller*, 7 February 1876: “To let Hookers flour mill containing 5 pairs of stones, wind, steam and water. Situated 4 miles from Burgess Hill (railway station). Good mill house, smiths shop, bakehouse etc. Apply Mr. Wood, Hickstead.”³⁶ (Hickstead Place, Twineham, is John Wood’s address). There is no miller in Kelly’s 1878 directory. It was leased to somebody from Lady Day 1879, perhaps to the George

William Bailey, "miller (wind & water), Hooker's mill" in Kelly, 1882 (it is only from about this time that Kelly's directories state the type of corn mill). Bailey gave up the lease on Lady Day 1886.

John Smith, the Grove Iron Works, Carshalton, Surrey, submitted a specification and estimate for work on Twineham mill, dated 3 March 1886, to Charles Packham, Cobbs mill, Hurstpierpoint, Sussex. The work itemised, included repairs to the mill dam; a new 17' diameter by 6' 2" wide iron breast wheel (much bigger than the one in the engraving; Simmons calls it a 12' wheel) on a wrought iron shaft; the wheelshaft to have an iron flange to fit the old pitwheel, which, with the (upright) shaft and the wallower was to be retained. New flooring, "eel trap", new smutter, new purifier, worm conveyor, one pair 8" diameter by 12" long "Smooth Chilled Iron Rolls for middlings", one centrifugal dressing machine with silk.

To repairing Horizontal Steam Engine and put in working order. Examine Striking gear of Wind Mill Sails and put same in proper working order and execute all necessary repairs to gearing. Recog mortise wheel.

Simmons note omits the estimated cost, but the previous tenant quit, claiming repairs would cost £200. Grove Iron Works was a large engineering and millwrighting firm which made Wolfe compound rotary beam engines, and a cross compound horizontal engine. It continued in business till c. mid 1950s when it was burnt down (per D.H. Jones).

Evidently enough work was done for Charles Packham to take out a yearly lease of the mill from 24 June 1886, from John Wood's widow, on 31 July 1886. This is too late to catch Kelly's Sussex, 1887, which lists no miller; but in 1890, there is Charles Packham, "miller (steam), Hookers mill; & at Cobbs' mill, Hurstpierpoint". Under Hurstpierpoint he is "miller (water & steam) & corn merchant, Cobbs mill; & at Hookers mill, Twineham". But this extension to his business proved unprofitable, for in 1895 as in 1887 he is at Cobbs mill only. Packham is a common enough Sussex name, and I do not know if Charles and George Packham were related. It seems that Charles Packham only had the steam plant restored, confirmed by Simmons who says the mill ceased being water worked "when Ditchling main water laid on 1886-7. Wind stopped soon after, in 1887."

From 1895, Twineham mill disappears from Kelly's directories. Brunnarius says a photograph of c.1895 shows it with the windmill gone, and says that Mr. Ernest Hole of Burgess Hill dismantled the plant c.1900. Simmons's n.d., undoubtedly 1930s, photograph of the remains shows a low brick shed, and traces of the watermill walls adjoining it, apparently two sides of an octagon; other derelict bits of the mill buildings remained. Traces remain today.³⁷

(b) West Ashling

The large brick built wind and watermill of West Ashling is in the parish of Funtington, Sussex. There seems to be some confusion over the origin of the watermill parts. A brick and tiled water corn mill with kiln at West Ashling, was insured for £1400 in December 1799; and for £1800 in January 1801, including its plural waterwheels. In June 1825, there was “a new Paper Mill at West Ashling”. In January 1830, Thomas Warren had recently become its occupier. On 7 February 1834, the *Bucks Gazette and Beds Chronicle* advertised:

To be sold. A newly erected and substantially built paper mill, with a constant supply of water, situate at West Ashling, in the county of Sussex, 3 miles from the sea at Bosham, 5 miles from Emsworth and Chichester. Apply Robert Weale, solicitor, Midhurst.

On March 10, 1834, the *Sussex Advertiser*, reported the loss of an arm to a man working at Warren’s paper mill, Ashling, near Chichester. William Warren was the occupier in 1838.

In the 1930s, H.E.S. Simmons, thinking the mill was built in 1834, wrote:

... in fact the idea of establishing a paper-mill here was probably an experiment to try and attract the paper-millers of the Home Counties – such as Buckinghamshire, where the new mill was advertised just prior to its being ready for occupation – because they were being hampered and driven out of the established paper making centres by the great machinery riots of the ‘thirties. But eventually, by grouping themselves together and abandoning isolated mills, the paper-makers held their ground, entrenching themselves finally at High Wycombe, where Ford’s Blotting Mills are situated, and at Hemel Hempstead, the home of Dickinson’s, and elsewhere.

Surely this very interesting suggestion retains its validity for 1825? In May 1850, the mill had just come into the occupation of Robert Chorley, paper maker. In 1850, it was still working as a paper mill, but its two beating engines were out of use.

Wailes says the windmill drove three pairs of stones dated 1859, and thought the big brick windmill extension to the main watermill building might well be the same date.³⁸ The windmill is dated to 1861, according to an old man’s memory recorded by R. Thurston Hopkins in 1931, by association with a memorable local point, the dramatic collapse into itself, without loss of life, of the 6000 tons of the Chichester cathedral tower and spire, on February 21, 1861. “The appearance of the fall was that of a large ship quietly but rapidly foundering at sea.” Perhaps the windmill’s erection date has

become rounded to this event, and the actual date is 1859. Is the windmill coeval with the watermill's conversion to corn milling, or is it later?

Brunnarius says the windmill was built by Armfields of Ringwood, Hampshire.³⁹ He gives no reference, and the statement is not from Simmons's notes. And it is unlikely. The firm is not in Kelly's *Hampshire*, 1859. In J.G. Harrod's *Hampshire*, 1865, under Ringwood, is Armfield's predecessor, William Munden, millwright, engineer and machinist, iron and brass founder, agricultural implement maker, and millstone maker, Vale of Avon iron works, Christchurch St. Between 1878 (William White) and 1880 (Kelly), the firm becomes Munden, Armfield & Co; Armfield is Joseph John.

In the *Miller*, 3 January 1881, appears the advertisement:

To be let with immediate possession. Corn Mill, West Ashling, near Chichester, with 6 pairs of stones, 3 driven by wind, 3 by water. Golays patent stone dressing machine etc. Tenders to Mr. George Chorley, Engineering Works, Midhurst.

It was re-advertised in the *Miller*, 7 August 1882.

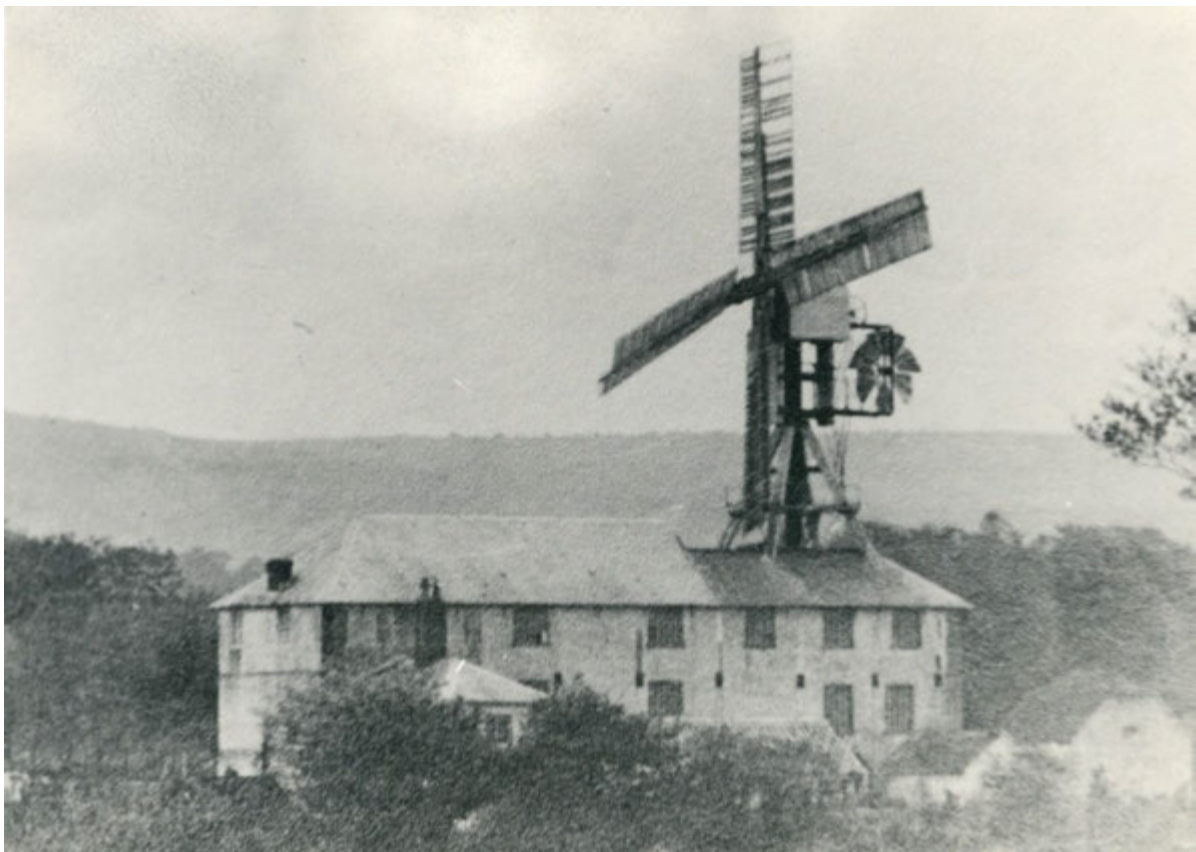


Fig. 6: West Ashling before 1914 (n.d. postcard, detail, JSPB's collection)

I find Kelly's directories under Funtington very confusing until 1899, when the entry Hackett & Sons, millers (wind and water), West Ashling, first appears; and again in 1903, 1905, 1909, 1911. In 1913 and 1915, the entry is Francis John Hackett, miller (water).

Simmons traces his name through to 1938, says that the watermill stopped work in 1941, and Hackett died in 1944. On the evidence of Kelly's directories, the mill ceased to be wind-driven between 1911 and 1913; but it might be a question of an unrevised entry. Fig. 6 is a detail of a very well focused commercial postcard photographic print, which shows the mill complete, but disused for several years: the shutters missing only from the top sail, and the sag of the two horizontal sails are tell-tale signs that give this away clearly. The mill building is 21.5mm long in the card, the span of the vertical sails is 19mm. My copy is n.d., and not unduly old; the c.1900 date for it in Brunnarius, fig.197, is simply too early. Brunnarius says (but not from Simmons) that the sails were removed early on in the First World War; and if so, the mill certainly stopped work before 1913, and probably before 1911. Fig. 7 (detail of an n.d. card, the mill building is 39.5mm long), shows it with the whips off, and with an external waterwheel which was replaced by a turbine in, according to Simmons, c.1920, or at least as recently as between the wars. It was housed in a corrugated iron lean-to.

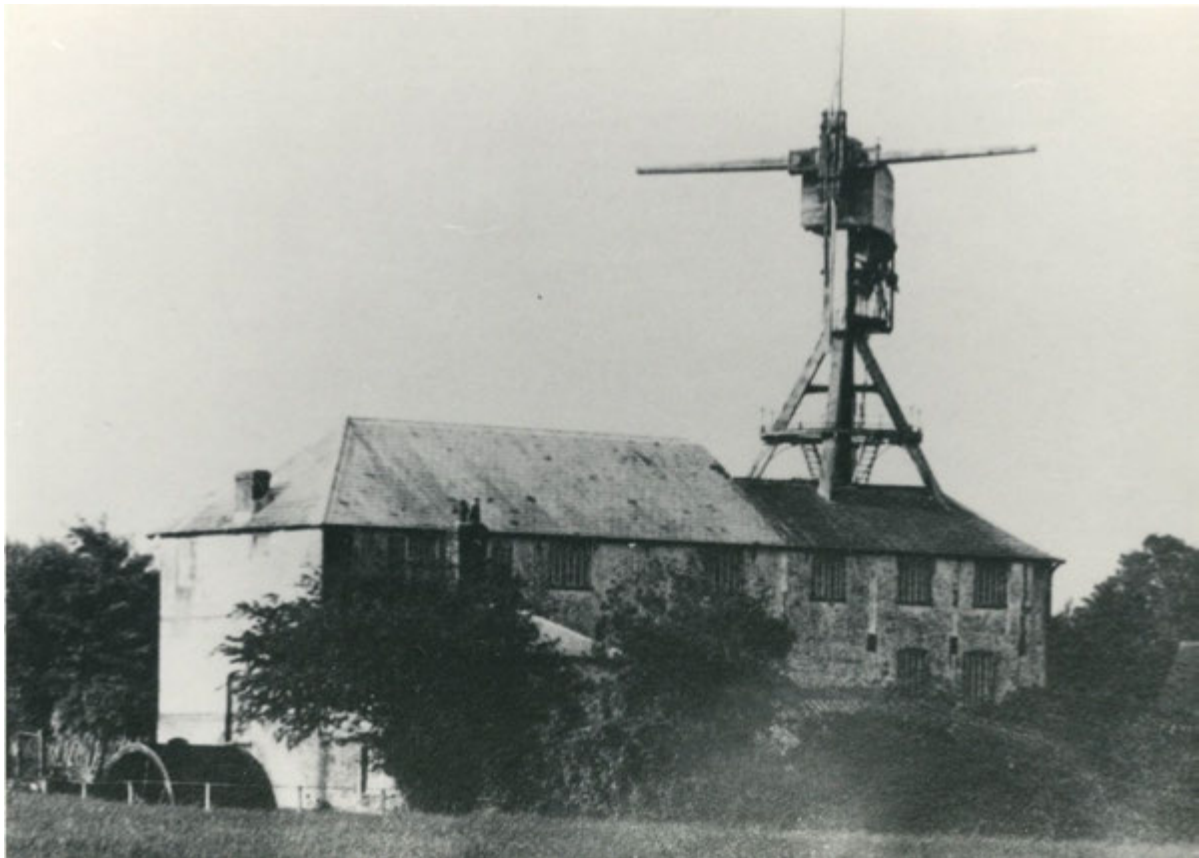


Fig. 7: West Ashling c.1920s (n.d. postcard detail, JSPB's collection) (Waterwheel replaced by a turbine c.1920).

Simmons's field notes are dated 1 September 1946. So far as the watermill is concerned, he thought the former wheel had layshaft driven the stones. The vertical turbine shaft drove three pairs of stones via a 1:2.4 belt reduction drive (so if the stones went at

about 120 r.p.m., the turbine would do 290 r.p.m.). Round stone vats, iron horses, wooden portable stone crane “very well made”, wood hurst posts, iron bridges, sackhoist, silk reel.



Fig. 8: West Ashling windmill, August 1952 (ph. JSPB)

In August 1952, the main watermill part of West Ashling was lived in. The ground floor of the windmill extension seems to have been used as a stable. There was no ladder up to the next floor, but I glimpsed machinery through gaps in the floor boards. Rising above the roof was the windmill proper. This comprised a hollow post built up out of curved iron “boiler plates”, rivetted together. There were two openings in the post, one with a small door. The post was carried by four massive, long, steeply sloped wooden quarter-bars which died into housings or sockets on a large cast iron ring round it. It bore a very small, semi-skeletal buck, whose top was weatherboarded, and whose lower part comprised a massive vertical beam front and rear, joined by two pairs of spanning iron girders which just missed the post. There was an empty rectangular iron fan frame, its top and bottom formed by the sets of girders. Some of the fly tackle remained, but even

the flyspindle had gone. The fan wheel is shown with clarity in Major and Watts (1977), fig. 6.

A narrow circular stage was sprung off the quarter-bars. Access to the windmill was by two ladders from the roof to the stage, by a further ladder hung from the fan frame, and by a ladder from thence up to the rear of the buck. One and a half stocks of the patent sails remained, in a heavily clamped iron poll. Most of the striking gear remained, including the Y-wheel for operating it. Windmill wholly unpainted.

Simmons has typed out technical notes from H.R.H. (Mr. Hawksley). There was a longitudinal crown tree from which the two vertical beams depended. The two top girders ran along the sides of the crowntree. The lower two go to a ring bearing on the post. (In Simmons's photograph of 27 January 1935, neg. no. 1016, this must be on top of the massive housing for the quarter-bars). The fan drove a horizontal shaft to which the hand gear is geared, on which is a worm driving a cross shaft with a second worm on it meshing with a large toothed ring round the post. This gear train (except for the hand gear) and its two small iron worms are clearly shown in Simmons's photograph. The ring round the post is seen in Brunnarius, fig. 198. A 5' (1524mm) diameter iron driving gear wheel on the windshaft, "and the brake works on a separate wheel with iron spokes and wooden rim behind cog wheel." Iron brake similar in arrangement to Patcham tower mill, with five rollers attached to mill head to hold it in place. "Pan for front stock and canister for back one." (Simmons's photographs show one heavily clamped stock in front of the other, but I cannot see the construction of the poll).

Simmons's field notes, 1 September 1946, says there are brick piers in each corner of the windmill part, reaching almost to first floor level. By my understanding, this makes the length of the quarter bars inside the building greater than the exposed parts; they are closer to smock mill cant posts than to post mill quarter bars. These are 13" (330mm) square at their feet. As they must be tied together at the bottom, either they foot into cills as in a smock mill, spanning between the piers, or, as the post extends down to the stone floor (where it is wooden), and it must be anchored, there were long cross trees at about ceiling level. The upright shaft is 6" (152mm) diameter at the top, and 6½" (165mm) at the bottom; it must be iron. Three pairs of 4' (1219mm) stones arranged in one line either side of upright shaft, round vats, portable stone crane.

Simmons describes a layshaft drive to the stones from the great spur. There are two iron layshafts, driving respectively two pairs and one pair of stones. I think he is describing two horizontal layshafts, underdriving the stones, an adaptation of watermill gearing to a windmill, but there is confusion in his use of terms. The *spurwheel*, six T-section iron arms, wood cogs, 5' 6" (1676mm) diameter, drives two all iron *bevels*, 2' (610mm) diameter. The 4" (102mm) square iron shaft of one of these has two iron, wood cogged

spurs, 4' 6" (1372mm) diameter on it, driving 18" (457mm) diameter stone nuts. The other *bevel*, similar shaft, drives one stone nut. Nuts are lifted out of gear by rod and ring. Round stone spindles, 3" (76.2mm) diameter. The upright shaft is carried on a timber sprattle, 14½" (368mm) wide by 16" (406mm) deep.

Hawksley gives the gear count for these two stages as 82:34 and 72:28, and also gives the head wheel to wallower count as 62:30. This makes the sails to stones r.p.m. ratio 1:12.8, which is extremely high (around 1:4 to 1:8 would be a normal range, I think), the sails would only turn at 9.4 r.p.m. when the stones did 120. Why such a high gear ratio was chosen I simply cannot imagine, though it must be why the third gear step between sails and stones was put in. It must have meant there was too much load on her to run in a light wind.

In 1946, Simmons noted that early on in the Second World War, attempts were made to dismantle the plant for scrap. One windmill stone spindle had been cut through above the nut, which had gone, and the "spur wheel" was broken in half. Attempt abandoned on account of the dangerous state of the flooring. "Roof has now caved in and wet has penetrated so much as to make the floors absolutely rotten." The mill was considered for preservation by West Sussex County Council in 1954,⁴⁰ but it was turned down, and the windmill was demolished in 1955 or the late 1950s.

(iv) The place of Twineham and West Ashling: Angmering and Iwade

Twineham and West Ashling windmills are almost identical. If George Packham did not design the windmill part of West Ashling, it must nevertheless be a close copy of the windmill part of Twineham. I wonder if they used the same castings? Their only significant difference is that at Twineham the mill sails and waterwheel drove the same set of stones, doubtless via a dog clutch on the upright shaft and slip cogs on the pit wheel, to disengage one drive or the other; while at West Ashling, sails and wheel drove separate sets of stones.

Twineham may owe its inspiration to several small farm windmills and windpumps, whose designs were published in France in the 1820s and 30s, even though it diverges greatly from them. It and West Ashling are late one-off hollow post mills, designed as such in order to separate the motor from the building containing what it drives. This separation of function reached its fruition with the use of windwheels to drive light farm machinery in a shed or barn. In Europe, Germany seems to have developed this use the furthest. A fine German design, with a 4½m (14¾') diameter windwheel on a 16m (52½') high tower, rising above an impressive range of farm buildings, and belt driving a water pump, a pair of crushing rolls, a straw chopper and turnip cutter, was published in

1915.⁴¹ A photograph of a similar one was published in 1924; its steel windwheel rose above a very long double range of uniform farm buildings, and pumped water, chopped straw and turnips, and crushed, ground and threshed grain.⁴²

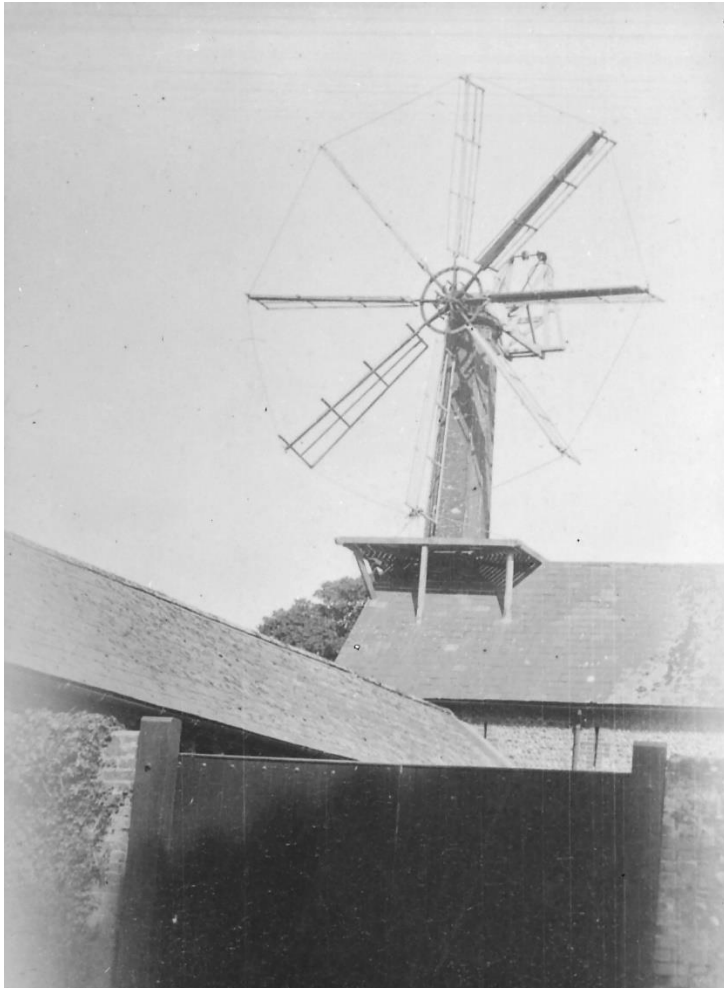


Fig. 9: Angmering, Sussex, c.1920s (collection JSPB).

A direct Sussex precursor on a barn roof was the little eight-sailed windmill at Preston Place Farm, East Preston, Angmering parish (near Littlehampton) (figs 9, 10, 11), built for the Warren family, who were local landowners;⁴³ doubtless for the Reginald Augustus Warren, Esq., one of the six chief landowners of the parish in Kelly's *Six counties* directory, 1859 (non-resident). It is sail-less in the photograph in Hemming (1936),⁴⁴ but it still had its little square stage, which it lost in 1952. It was fan winded (Brunnarius, fig. 199). It had eight feathering blades, 8' long by 2' wide (2.44m by 610mm), which (ignoring the fan) makes it remarkably like the successful little self-acting, tail-vane winded model of the New Englander, Daniel Halladay (born Marlboro, Vermont, 1826 - died an old man),⁴⁵ which he patented in the U.S. in 1854,⁴⁶ and in the U.K. and in France⁴⁷ in 1855. The U.K. one, dated 23 February 1855, is a communication taken out in the name of William Henry Zahn.⁴⁸ At the New York State Agricultural Society's annual exhibition, held at the city of New York in October 1854, this "most valuable newly

invented machine for the farmer” was awarded the highest, a diploma and silver medal, and was illustrated and described in the Society's journal.⁴⁹ Over the eight months of the four illustrations, there are detail changes in the design, doubtless the result of experience.

The four solid blades pivot round the arms, have a broader trailing side, and are feathered by the action of the wind on them. A linkage joins the pivoting arms forwards to a cross mounted on the front end of an open sleeve on the sail side axle. The sleeve seems to comprise two end discs joined by four bars, which clear the hub of the sail arms, and between which the blade arms project. This allows the sleeve to slide on the axle, and to have some degree of rotation round it. The rear disc of the sleeve has a continuous groove in its rim, in which runs the forked end of a bent lever linked to a second, horizontal lever, whose long arm ends in a heavy weight. As the blades feather, the sleeve is twisted forwards along the axle against the weight, which it raises. A further system of linkage goes from the bent lever to the ground. The weight tends to close the blades against the wind, and a piston on the ground, acting upwards, tends to feather them with the wind and against the weight by levering the sleeve forwards. The piston is a counterweighted water pressure piston in a short branch off the force pipe from the pump worked by the blades. The static water pressure under the piston can be increased by throttling the water flow in the pipe just beyond the branch, thereby building up a back pressure tending to raise the piston, and so allowing the blades to blow open more easily. For grinding, churning, thrashing, says Halladay, a ball governor bevel geared off the sail axle should be used instead (but this would not be patentable). The sail axle ends in a crank driving down to the pump. The head is so mounted that the crank is at the centre of the winding circle. The head slides in a little cast iron ring or curb with raised sides, but, surprisingly, no keep flange. Halliday says that though the drawings show four sails, the number can be increased as desired. All this from the 1855 patents.

Brunnarius says Angmering was erected in 1853, but on the authority of the very unreliable R. Thurston Hopkins, in c.1930.⁵⁰ Simmons also says 1853, but he has clearly copied Hopkins. If the date be put only two or three years later, the idea that it is a license-built example of the original Halladay Standard windmill of 1854 and 55, and made in the U.S.A. in fair numbers in the 1850s and 60s,⁵¹ is very tempting. If so, was it the sole British example? The tailvane is incidental to Halladay's design, so its replacement by the English fantail is unremarkable.

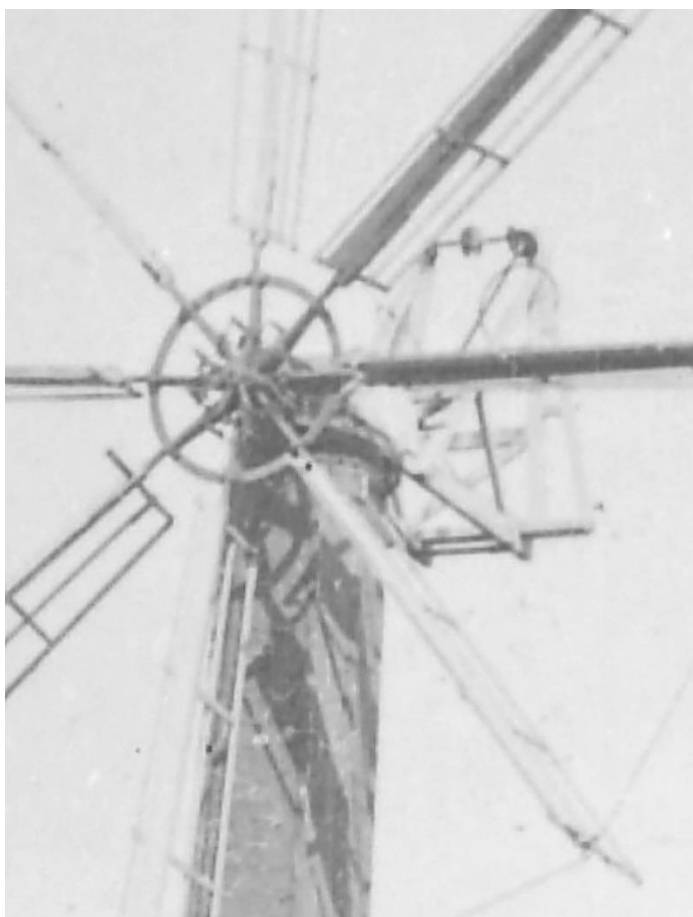


Fig. 10: Angmering, Sussex, c.1920s (detail) (collection JSPB).

I have seen a photograph of Angmering in working order, probably taken c.1900-1910, which has the light pivoting frames of the blades feathered, and with cloth spread permanently over them, just like the larger Halliday mills with sail spans of up to 16' (4.9m).⁵² The sail frames were removed in September 1933 (Simmons). In 1952, the mill differed only from Simmons's photographs of 1933 and 1934,⁵³ which show it sail-less and with the fantail completely gone, in that the square roof stage has gone too, removed in 1942 (Simmons). My 1952 notes say the iron hub wheel, c.4' (1200mm) in diameter, comprised a narrow rim and eight spokes coned forwards; and a spindle ending in a tiny wheel or knob projected forward from it. This knob had carried the hub linkage to the sails. The linkage, as shown in fig. 10, a photograph probably of the 1920s, is not the same as in the four bladed mill of the French and U.K. patent drawing of 1855, but (so far as I can see) is closely related to it. In 1952, the mill head was still covered with its little transverse pent roof; the fan rack was visible below it; it turned on a narrow, boarded pillar or stalk, with chamfered angles.



Fig. 11: Angmering windmill, August 1952 (ph. JSPB).

The mill worked up to c.1915 (Hemming), a really long life for such a structure, at which date a Tangye gas engine replaced it (Simmons). The upright shaft from the sails drove a lineshaft in the barn below, which drove a water pump for the house and farm, and chaff cutting and oat crushing machines. In 1935, the pump then in use, which had come from a London fire engine, had been installed nearly fifty years previously, by a Mr. Parsons, then still living in the village. It was removed at the same time as the stage, in 1942. Two thirds of the upright shaft then remained. Simmons found the mill still standing in March 1954, but mill and farm are now long gone.

Much later, and well after the general introduction of the windwheel pump into England, the engineering and millwrighting firm of F. Littlewood & Sons, Swale Iron Works, King's Mill St., Milton Regis (near Sittingbourne), Kent, had a successful local line in little wood-and-iron wind pumps, reminiscent of what the smaller of the original design of Halladay mills must have looked like. In 1961, one survived at Iwade, near Kingsferry Bridge, very derelict. There is a good photograph of it in Jenny West, *The windmills of Kent* (1973), fig. 40. It had the remains of four feathering solid wood blades, spanning some 12', and weight-controlled via a striking rod. The swivelling sail arms were mounted on an open cast iron bub looking much like the Angmering one. There was a metal tailvane with a vee'd end to damp down weathercocking. The head is carried on a simple wood frame consisting of two uprights with the rod from the

eccentric running down between them and also joined by two sets of outside ladder rungs boxing the rod in. The uprights are only some 14' high, and are carried on light crossed members on stub piers and bracing struts. The iron head turns on a live curb of rollers fixed in the lower, fixed curb; there are positioning rollers and a keep flange. The pump drive was from an eccentric, cast open, on the blade axle, with a throw of, say, 6" (150mm). This mill supplied a house and cattle troughs, superseded by mains water. It was the sole survivor. These mills were kept in repair by the firm till about 1939-45. Sometimes they ran wild in a gale, because the shepherds who had charge of them had hung a heavy lump of scrap iron in the striking chain. The overhauling and painting of these wind pumps was done by dismantling them, carrying them to the Swale Iron Works, replacing worn bearings &c there, carrying them back and re-erecting them. I think they were only made in the one size.

In 1961, Swale Iron Works had an old pattern room, whose wood patterns, beneath a thick layer of dust, included that for the mills' eccentric. The oldest surviving account book of 1893-1907 included a lot of erection and repair work on the wind pumps, millwrighting (almost all on windmills), pumpwork, well-borings, brewery work, mechanical work generally. A typical entry, August 1893, for C.& H. Maxted (?), reads (p.57):

Clearing out borehole in March Nr Kings Ferry Road			
Labour	5	5	0
Hire of Tools & Cartage	1	10	0
the New 4 Sweep Mill with 6 foot Sweeps With 4" pump 30 feet of 2" Suction & discharge pipe Fitted & Fixed complete As per agreement	30	0	0
	<hr/>		
Paid £36 " 15 " 6	36	16	0
22 Aug. Repairs to do	2	10	0
	<hr/>		
	39	5	0

Repairs carried out in 1894 on this or another wind pump, include "One New Steel Eccentric Strap".⁵⁴

An early one-off predecessor of West Ashling and Twineham was the hollow post Wimbledon Common mill, Surrey (London Borough of Merton), from its building in 1816-17 till its rebuilding in 1893. Both the Sussex hollow post mills are more than just

oddities though. They represent a passing phase in a design trend whose fruition was to be the shop or factory produced windwheel, now itself well over a century old. In America, where it first developed on a large scale, an experienced manufacturer of windmills wrote in the 1920s, that "The United States did for the windmill what it has done for the automobile. Both have been put on a manufacturing basis where the many can use them."⁵⁵ The windwheel arose as the large European windmill declined, and undoubtedly, by 1900 more power was generated by wind than at any previous time in the past; but at the same time this was an ever declining, and ever more insignificant percentage of the total power production of the world. Angmering represents a phase in the same design trend, though as events were to turn out, a direct one. But nevertheless, West Ashling and Twineham were not necessarily failures, for had not windmills with four long sails become obsolete within a few years of their being built, they might have become an established local type.

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[signed JSP Buckland]

Notes

- 1) *The life of Sir William Fairbairn, Bart.*, ed. William Pole, 1877 (photolitho reprint, 1970), pp.89-90, 92-3.
- 2) Pierre François Léonard Fontaine, *Château d'Eu*, Paris, n.d. (plates dated between 1836 and 1845), pp.12-13.
- 3) *Miller*, London, 3 Sept. 1877.
- 4) *The Times*, 4 March 1848, p.8a.
- 5) Mark Antony Lower, *The worthies of Sussex*, Lewes [printed], 1865, pp.217-219 (portrait); Rex Wailes, in *Trans. Newcomen Soc.*, xix (1938-9), p.11 (using *Engineer*, 12 July 1901), pl. 4/1; Sue Farrant, in *Sussex Archaeol. Collns.*, cxiii (1975), pp.199-202; *Miller*, 1 May 1876, p.96b, for his importance as a miller; John Kenneth Major and Martin Watts, *Victorian and Edwardian windmills and watermills from old photographs*, London: Batsford, 1977, fig. 43 (best photo for the windmill); Brunnarius, pp.170-171, fig. 193; PROB 11/2170/qu. 256, W of William Catt, merchant, dated 28 Oct. 1852, proved 4 April 1853, for Denton and the Brighton steam mill.
- 6) *Miller*, 3 Sept. 1877, p.339; *The Times*, 4 March 1848, p.8a; Mark Antony Lower, *The worthies of Sussex*, Lewes [printed], 1865, p.219.
- 7) This is confirmed by *The Times*, 4 March 1848, p.8a, which says that the king and queen, during their flight from Paris, went via La Ferté-Vidame, "where Mr. Packham has been building a mill on some private property of Louis-Philippe."
- 8) Thomas E.B. Howarth, *Citizen-king: the life of Louis-Philippe*, London, 1961, pp.272-4, gives a typical structured day in the life of the king at the Tuileries, "which was more an open house than a court". After dinner at 6 p.m., the king held his famous reception, at which, with great ease and familiarity, he talked with the guests, who might range from marshals of France to provincial mayors.

9) *Miller*, 3 Sept. 1877.

10) *The Times*, Sat., 4 March 1848, p.8a.

11) *Miller*, 1 May 1876, p.96; *The Times*, 4 March 1848, p.8a.

12) *Miller*, 3 Sept. 1877.

13) Page 330. Howarth reports the *Spectator's* complaints of his continuing to know all sorts of obscure gentlemen by name, and of his glad-handing the natives (p.331).

14) *The Times* for the story; the *Miller* for the embroidered version (stated as such).

15) Cit. Adolphe d'Houdetot, *Honfleur et Le Havre: huit jours d'une royale infortune*, Paris, 1850, p.57.

16) *Leppard & Co's Brighton and Hove directory*, 1843 ed. (forward dated 26 July 1843).

17) I.R. 26/2754 f. 1534.

18) Judith A. Brent (ed.), *The Hickstead Place archives: a catalogue*, Lewes: E. Sussex Co. Co., 1975, doc. no. 1019.

19) *Ibid.*, doc. no. 1020.

20) Louis Estancelin, *Histoire des comtes d'Eu*, Dieppe and Paris, 1828, p.395 and n. The subscribers include (p.455), "PACKHAM, Mécanicien anglais à Eu."

21) Fontaine, plates 3, 11 (his perspective view of château from the Bresle side, showing the corn mill), 38, all 1836.

22) Ibid., plates, mostly unnumbered, around plate 38, but dated 1840, 1841, 1845.

23) Jean Vatout, *Souvenirs historiques des résidences royales de France*, iii (Chateau d'Eu), Paris, 1839, page. 392.

24) Augustin Rollet, in *Bulletin de la Société d'Encouragement pour l'Industrie Nationale*, 41st year, Paris, 1842 (April 1842 issue), p.141 and folding table opp. p.146; Augustin Rollet, *Mémoire sur la meunerie, la boulangerie et la conservation des grains et des farines ...*, Paris, 1847, pp. 147, 498-499. Rollet (1847, pp.486-8), attributes the successful mechanisation of large scale ships' biscuit production to an employee of the Portsmouth Royal Victualling Works, Thomas Tassell Grant, in 1830. Packham's is a copy of his plant, and that at Rochefort an improvement. (For Sir Thomas Tassell Grant (1795-1859), FRS 1840, see DNB).

25) Fontaine, pp. 13-14.

26) Désiré Le Beuf, *La ville d'Eu*, Paris, 1844, pp.610-611. Packham is not among the subscribers, but these include "MAINGUEZ (sic), gendre de M.Packam, à Eu"; and two Derambure's, (i), président du tribunal de commerce à Eu", and (ii), propriétaire a Eu.

27) *Seizième supplément du catalogue des spécifications ...* (of patents granted 1840), Paris, 1841, p.231 ("à Pakham, mécanicien à Eu"); *Description des machines et procédés consignés dans les brevets d'invention ...*, IS lvi, Paris, 1845, pp. 477-8, pl. 31, where he has become the sieur Guillaume Packham at Eu. It is a belt-driven device on an iron frame, but he omitted to accompany the drawings with an explanatory text. Thus the official view, but, rather, the text got lost, for the Hickstead Place archives contain both the saw mill plans, dated 12 April 1839, submitted with a request for a five year patent; and the key to the plans, with instructions for operating the saw mill, both signed by A.A.M. Billault (1805-63), then briefly under secretary of state at the Dept. of Agriculture and Commerce, on 4 April 1840. Also, the five year patent certificate for it, of the same date. (Judith A. Brant (ed.), *The Hickstead Place archives ...* (1975), doc. nos. 1024-1026).

28) Sébastien Bottin (1764-1853), *Almanach du commerce de Paris, des departemens de la France, et des principales villes du monde*, 39th year, 1836, Paris, n.d., p.850.

29) *Almanach-Bottin du commerce de Paris ...*, 47th year, 1844, p.1520, “- Farines (fab.), scierie mécaniq., fab. Biscuits de mer, huile, atelier de const., bois du nord, G. Packham. -”

30) *Almanach-Bottin ...*, 53rd year, 1850, p.1605, “Moulins Packham (société des), fab.d'huiles et épuration, moulin à blé, fab. de biscuits de mer, scierie mécanique, machine à faire du plancher, commerce de charbon de terre et ardoises, G. et H. Packham, Derambure, Mainguet et co. -”. (Bottin is under Directories - II - Local - France; Didot and the combined vols. under PP Paris, *Annuaire général ...*; 1850, 51 are in the Guildhall Library).

31) See *The Times*, Wed., 8 March 1848, p.6f; Fri., 17 March 1848, p.8e.

32) *La grande encyclopédie*, xvi, Paris (?1893), “Eu”. (Vavin, *Compte de la liquidation de la liste civile et du domaine privé du roi Louis-Philippe ...*, le 30 décembre 1851, Paris , 1852, does not include Eu).

33) *Annuaire-almanach du commerce, de l'industrie... (Didot-Bottin)*, 63rd year (i.e., of Bottin), 1860, Paris, n.d., p.2124.

34) *Miller*, 3 Sept. 1877.

35) *Kelly's Handbook to the titled, landed and official classes*, 8th ed., London: Kelly & Co, 1882, p.906 (Mrs. Charlotte Wood).

36) Cit. Martin Brunnarius, *The windmills of Sussex*, Chichester and London, 1979, p.173.

37) *Ibid.*

38) Rex Wailes, *The English windmill*, London, 1954, p.83.

39) Brunnarius, p.173.

40) *Sphere*, 27 March 1954, p.464.

41) H. Schwarzer, *Landwirtschaftliche Maschinenkunde* ("Agricultural machinery science"), Berlin, 1915, folding fig. 70 opp. p.76. This is the steel "Herkules" windwheel of the Vereinigte Windturbinen-Werke, G.m.b.H., Dresden-Niedersedlitz. The wheel is a standard "solid wheel" design with fixed, concave steel blades. It is winded by a tailvane, and a small side vane gradually turns it out of wind against a coiled spring as the wind grows stronger. The fig. is there to show the mill's versatility (p.77), and was doubtless supplied by the makers.

42) Ludwig Hammel, *Die Ausnutzung der Windkräfte ...* ("The utilisation of the powers of wind"), 3d. rev. ed., Berlin, 1924, p.111 (not identified).

43) Brunnarius, p.175, fig. 199; the same photo in John Kenneth Major and Martin Watts, *Victorian and Edwardian windmills and watermills ...* (1977), fig. 86.

44) Peter Hemming, *Windmills in Sussex*, London, 1936, fig. 70, p.119.

45) See T. Lindsay Baker's splendid *A field guide to American windmills*, Univ. of Oklahoma Press (Norman), [?1985].

46) U.S. patent 11629 dated 29 Aug. 1854, to Daniel Halladay of Ellington, Connecticut, "Improved governor for windmills". The patent, assigned to the U.S. Wind Engine and Pump Co. Batavia, Illinois (Halladay's company) was extended on 29 August 1868 (*U.S. Index of Patents, vol. 3, Subjects Q-7, 1790-1873* (spine-title), p.1855).

47) France, *Brevets d'invention*, 2S xlviij, Paris, 1864, pp.88-91, pl. 23, patent no. 13409/19 April 1855, for 15 years, au sieur Halliday, d'Ellington (États-Unis), pour un régulateur perfectionné pour moulins à vent.

48) No. 402 of 1855, dated 23 Feb. 1855. Nowhere is the name Halliday mentioned, but the drawings are identical with the French patent's. The only hints that Zahn is not the inventor are the words "A communication" in the title, and the fact that he says *the* invention, not *my* invention. Zahn is not in Kelly's P.O. London Directories under any heading. He is not a patent agent. In 1852, nos. 13 and 14 Norfolk St., Strand, are a common lodging house. In 1855, 56, 60, no. 13 is occupied by Richard Allerton, surveyor and land agent; no. 14 is a branch office of the Inland Revenue. There are many lodging houses in Norfolk St., including (in 1855), nos. 12, 15. Zahn's signature at the end of the specification is witnessed, 22 Aug. 1855, by John Avery, 32 Essex St., Strand, who *is* a patent agent. The specification says letters patent were granted Zahn, 23 Feb. 1855, 18 Vict., on condition a specification was filed within six calendar months. The letters patent having been sealed on 17 Aug., this Zahn did, on the very last day, 22 Aug. The specification says see the letters patent for the term of the patent and all other conditions. But with the U.K. patent act of 16 & 17 Vict. c.83, letters patent for inventions ceased being enrolled on the patent rolls (C 66 class) (checked), nor is Zahn's one in the Warrants for the Great Seal (Chancery) for 18 Vict. (C 83/344 (1-3)). After 1853 "they were merely entered in a register kept at the Patent Office" (Guide to the PRO, i, (1963), P.23). Up to 1888, expired specifications for U.K. patents granted under the act were transferred to the PRO; but in 1907, in its everlasting unwisdom, the PRO sent them all back to the Patent Office (*Second Report of the Royal Commission on Public Records ...*, ii/1 (1914) (Cd. 7544), p.12; ii/3 (1914) (Cd. 7546), p.33. Q.5426). Therefore, there is no trace of post-1852 patents in the Public Records of this kingdom; and, undoubtedly, they survive only in the printed specifications, now all but as rare as the lost originals. I doubt the printed copies now exist outside the ex-BM (Colindale) set, now in the Science Reference Library Holborn (the successor to the Patent Office library), and the set somewhere in Kent from which xeroxes are made, presumably the old Patent Office set. Conceivably, a foreign patent office retains a set. (The situation is as bad with the 1617-1852 English patents as published in the 1850s, but the originals survive in the PRO (Chancery Lane)). The core of Zahn's specification is found in *Patents for inventions ... abridgements of specifications, class 10, period 1855-66* (1905), p.2.

49) *Trans. N.Y. State Agricultural Soc.*, xiv for 1854, Albany, N.Y., 1855, pp.49-54. Granted to Halliday (sic), McCray & Co, Ellington, Conn.

50) Robert Thurston Hopkins (d. 23 May 1958, aged 75), *Windmills*, Haywards Heath, Sussex: Charles Clarke Ltd., price 1/-, (1930 or 31) (a booklet), p.23, as cited in Peter Hemming, *Windmills in Sussex*, London, April 1936, p.119, and Brunnarius, p.175. I once saw a copy. It had (I remember) soft or paper covers, and (say my notes) on p.4 is a "Bad and risible sketch of an improbable little jib sailed tower mill, with loinclothed individual cavorting in front of it", indeed unforgettably funny. In Hemming, fig. 70, is a photo of the mill sailless and with stage.

51) T. Lindsay Baker [?1985].

52) Ibid. *Trans. N.Y. State Ag. Soc.*, xiv for 1854, p.53: "The iron frames for the fans or wings are covered with thin boards or sail-cloth, according to the size of the machine."

53) There is a slight confusion in Simmons's notes. SIMNS 1/69 (detailed Sussex windmill notes), p.26, and in SIMNS 1/77 (Sussex Windmills Survey: hist. no, A-B), pp.21-2, both say sail frames remained up to Sept. 1933. But he photographed the mill in Oct. 1931 (not in reference prints), and in March 1933, July 1934, which both show it without sails or fantail.

54) Access to the account book, the old pattern room, and information generally, courtesy of Mr. C.W. Littlewood, a grandson of the founder, in 1961.

55) Cit. Walter Prescott Webb, *The Great Plains*, Boston, Mass., 1931, p.340.