

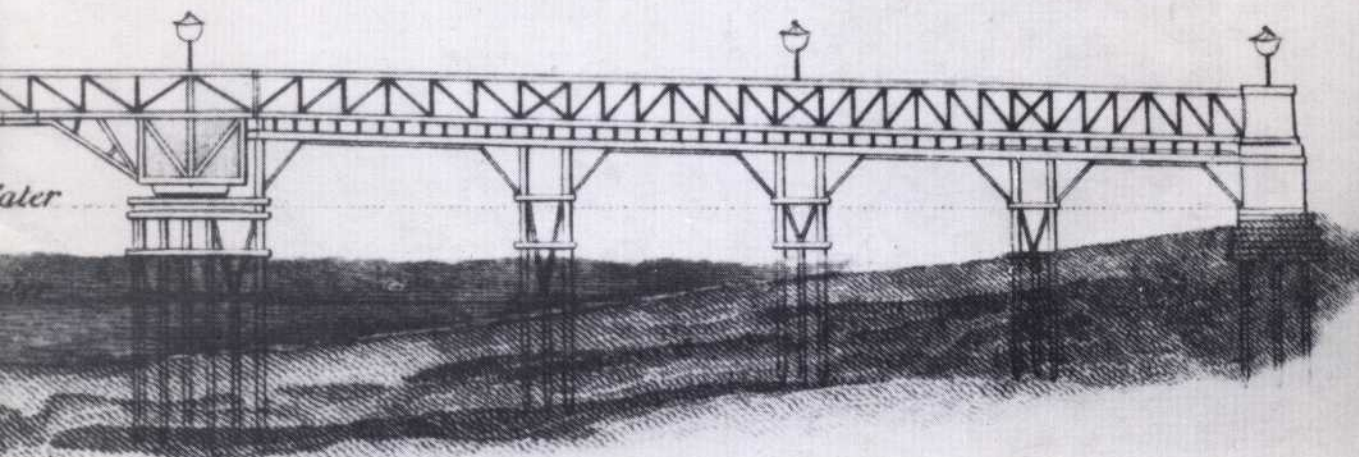


SUSSEX INDUSTRIAL HISTORY

Winter 1973/4

at Little Hampton in the County of Sussex.

Section of the River.



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PHILLIMORE

50p.

THE FUTURE OF THIS JOURNAL

As the Editor explains on the Title Page opposite, costs have risen far faster than have subscriptions since this journal was launched in 1971. Each of the six issues published has made a bigger loss than its predecessor and although a profit was never anticipated a mounting loss cannot be borne, even by a non-profit-making organisation.

Although experience has proved that there is not enough support for a journal of this kind devoted purely to industrial archaeology in Sussex, the publishers believe that by cutting the word 'industrial' from the title and broadening the scope to include articles on the recorded history, the general archaeology and the vernacular architecture of the County, there *could* be a viable quarterly, 'popular academic' journal. Approaches have been made to the various specialist groups and societies in Sussex whose support would be critical to such a venture, but as this last issue of *Sussex Industrial History* goes to press the outcome is still undecided. The envisaged *Sussex History* would be a shared platform for those bodies not able to produce a periodical independently – and since *Notes and Queries* ceased publication this has been true of *all* the organisations devoted to the history of our County – but, as politicians know, coalitions are difficult to organise!

However, there are signs that such an arrangement may be achieved during 1974 and the purpose of this announcement is twofold: firstly to alert existing subscribers to the possibility, indeed probability, of a successor journal appearing; and secondly to canvass support for the concept, by publicising its potential, among the membership of those groups that are still reluctant to join such a scheme. Apart from the fanatical pre-historians, all other groups are interdependent and so cannot be totally indifferent to the current research and thinking of the rest. The most horny-handed 'digger' must relate his finds to the written record; the most paper-orientated archivist must acknowledge the increasing debt owed to the excavators; and those who scramble about lofts or attempt to date and explain surviving buildings cannot ignore the work of those whose research is into records or under the ground.

Between the two 'halves' of Sussex there must surely be an adequate number who would subscribe to *Sussex History*, provided that agreement can be reached on the choice of general editor and on the sharing of space between the different interests it would encompass. The publisher of this journal is prepared to finance and produce such a successor, but needs to be assured of a flow of material worthy of publication. To the groups active in the field the choice seems to lie between no publication or shared publication. As we go to press with this final issue of *Sussex Industrial History* we are very hopeful that we can follow it with an early announcement that the wiser choice has been made and that the first issue of *Sussex History* will be close on its heels.

SUSSEX INDUSTRIAL HISTORY

Journal of the Sussex Industrial History Society

SIX

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The cover shows the design of the proposed (but never built) bridge at Littlehampton, 1821-2, from West Sussex Record Office, Add. MS. 12231, by courtesy of the County Archivist.

Edited by John Farrant, 12 Dudwell Road, Woodingdean, Brighton, BN2 6RE.

This is the last issue of *Sussex Industrial History* to appear under the Phillimore imprint. Sales have alas not been sufficient to make the journal financially viable. The Sussex Industrial Archaeology Society thanks Phillimore & Co., Ltd., for its generous and patient support, without which *S.I.H.* would probably never have seen the light of day and certainly not with the quality of production to which we have become accustomed from Phillimore. Copies of Nos. 2 to 5 are still available, price 40p for No. 2 and 50p each for the others, from Phillimore, Shopwyke Hall, Chichester, PO20 6BQ. The Society (which until December 1972 was called the Sussex Industrial Archaeology Study Group) hopes to continue publication of articles on the county's industrial history, in some form or other. Enquiries about membership (subscription, £2 p.a.) may be addressed to the General Secretary, A. J. Haselfoot, M.A. C.Eng., F.I.E.E., Albion House, 11 Cobourg Place, Hastings, TN34 3HY.

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JOHN H. FARRANT

Civil Engineering in Sussex around 1800, and the Career of Cater Rand

WHEN ITS HISTORY can be adequately written, Sussex will be seen to have undergone great changes in the last quarter of the 18th and the first years of the 19th century. For example, population was growing fast; the coastal towns and villages adopted as watering places were 'booming'; in agriculture, the arable acreage, especially of wheat, rose in response to the enlarged local and national market; and coal, that symbol of the Industrial Revolution, was widely substituted for indigenous fuels. A major contribution to the infrastructure which supported these changes was made by engineering works – indeed of substantial works which existed in Sussex when the first steam railway (from London to Brighton and Shoreham) was started in 1837, the great majority had been effected in the previous 60 years. All the river navigations and canals (bar 16th-century improvements on the Arun) were built between 1785 (the Arun to Newbridge) and 1827 (the Adur to Baybridge), while improvements were made in the drainage of many of the levels (or low lands bordering the rivers). Major works were effected on Shoreham and Rye harbours, while additions and alterations were made to piers built in the 1730s at the other two estuarine harbours of the county, Littlehampton and Newhaven. Brighton Chain Pier, to encourage the cross-Channel packet traffic, was built in 1822-3. Turnpike roads there were in some number by 1780, but the following decades saw a substantial increase in mileage and, after 1800, an improvement in quality. The building and maintenance of bridges by the county justices advanced apace, while bridges near the mouths of the Adur and Ouse were built under local Acts. Public gas works appeared in the second decade of the 19th century. And numerous other schemes never went beyond the drawing boards (or fertile minds) of engineers, amateur and professional.

Engineers were thus a key group in advancing economic development. The stimulus for this article was the frequency with which the name of Cater Rand occurred in connection with engineering projects in East Sussex between 1775 and 1825, but its justification lies more in the absence of published research on local civil engineers in Sussex or elsewhere. So if a minor figure is perhaps accorded over-generous treatment, it is in the attempt to begin building up a general picture and to stimulate further research; and if the sum total of works completed to his plans or under his direction was small, the projects with which he was involved provide a cross-section of the types of engineering work, with the exception of roads, contemplated or executed in Sussex around 1800. By way of introduction, Section I briefly discusses the backgrounds of the engineers responsible for that work.

I

A relatively small number of men supervised the majority of large engineering projects and, especially during the canal mania of the 1790s, each might be responsible for several works concurrently in different parts of the country.¹ The first generation of 'civil engineers', working in the third quarter of the 18th century, made little appearance in Sussex, though John Smeaton (1724-92) reported on Rye harbour in 1763-4 and on the lower Ouse in 1768; but most of the great names of

the second generation worked in the county. The one most involved was William Jessop (1745-1814): between 1783 and 1806 he was principal engineer for the Upper Ouse, Lower Ouse and Western Rother (and possibly the Arun) Navigations and for works at Rye and Littlehampton harbours, and also drew up several plans which were not executed. Second to him was John Rennie (1761-1821) who produced a considerable volume of reports relating to Sussex between 1797 and 1810, though only two were implemented, for the Portsmouth Arundel Canal and the Royal Military Canal.² Besides these famed engineers, there were also those of the second rank, but nevertheless competent (such as Daniel Alexander, surveyor to Trinity House and to the London Dock Company, who reported on Rye Harbour in 1813 and 1817), and the largely unsuccessful (such as Ralph Dodd of London (1756-1822) who proposed for Brighton, a harbour, 1806, a water supply scheme, 1810, and a pier, 1819.³

Jessop, Rennie and their contemporaries found a demand for their services which allowed them to concentrate on civil engineering to a degree rarely found in the previous generation, though specialisation was only on a broad class of projects. But plurality of appointments was so extensive by the time constructional work on any significant scale began in Sussex, that the appointment of a site engineer had become the norm. 'The business of the Resident Engineer', Rennie wrote in 1795, 'is to attend to the whole of the works and to see that they are executed according to the plans furnished by the Principal Engineer'. If no resident engineer was appointed it fell to the contractor to take all the operational decisions as work proceeded. But a national market also developed for the resident engineer and the contractor. The proprietors of the Upper Ouse Navigation tried unsuccessfully to get an engineer from the Birmingham area, so employed a single firm of contractors, the Pinkertons, who worked on a host of Midland navigations; after their default, the proprietors sought an engineer from the West Country. After the initial works were complete, the man responsible for maintenance might be a local man with no technical skill: the expenditure of the U.O.N. in 1823-33 started, 'as a mere river digger, and was 'not a Man of Science'.⁴

Generally there was no body of engineers who had some degree of technical competence and scientific knowledge and who lived and worked in a single locality. Some, through practical experience, acquired a certain degree of competence: William Clegram, master of a cross-Channel packet boat until 1816, was resident engineer for Shoreham harbour, 1816-21, and Brighton Chain Pier, 1822-3, and earned sufficient regard for Thomas Telford to nominate him as first superintendent for the Gloucester & Berkeley Canal, in 1826. Land surveyors were usually local men and might be employed to draw up the line of a canal or navigation as determined by the principal engineer. In respect of the (earlier) turnpike roads they played a more significant role because the engineering knowledge required was negligible, for few trusts improved the alignment of their roads.⁵ When methods of constructing the carriageway was revolutionised, a body of specialist engineers followed: in 1817, the Lewes Turnpike Trust adopted McAdam's system and he recommended a trained surveyor for appointment, a man who presumably had worked with him in the West Country.⁶ There was also the growing body of county surveyors, though architectural work (law courts, workhouses, gaols) usually predominated over engineering work (road bridges being the main if not only item). John Johnson, surveyor to the county of Essex, 1782-1821, was an architect resident in Camden Town who had very limited success with bridges and was commissioned to design County Hall, Lewes, in 1801.⁷ John Cowper, a local architect and builder, was appointed clerk of works, then keeper of the completed building, and finally, in 1815, 'Surveyor of County Buildings and Bridges' for East Sussex.⁸

It is against this background of the embryo engineering profession that the interest of Cater Rand's career lies. He does appear as a local man of some scientific knowledge who was involved in a variety of engineering works, several of which presented problems of some complexity.

II

By April 1734, Cater Rand's grandfather, also named Cater, was established in Lewes as a schoolmaster, probably having come from Colchester, Essex, where he owned property. In or before 1744, he set up a school of his own at 160 High Street, one door east of St. Michael's church, as a tenant of the Pelham family. He died in 1748 and the school was continued by his son Charles, and then after his death (in 1763) by Charles's widow, Lucy (née Verrall).⁹ Cater Rand was born in 1749, the eldest child to survive infancy, and followed in the family mould as a schoolmaster. In 1775 he married Mary Scrase, daughter of the master of the *White Hart*, and acquired (probably as tenant) 161 High Street. They had six children – two sons and four daughters. Both sons entered the service of the East India Company and predeceased their father; three daughters married Army officers and the fourth also went out to India. Mary died in 1782, when their eldest child was no more than six years old. Cater died on 21 December 1825 and was buried at St. Michael's.¹⁰

It was probably in 1773 that Cater took the school over from his mother. In October that year he published a ready reckoner for the value of gold according to the quantity and price per ounce, as the Government had recalled light-weight gold coin that summer; the title page describes him as 'writing-master and Accomptant'.¹¹ More important, he announced, in December, changes in the school's curriculum:¹²

AT LEWES, in SUSSEX, YOUTH are commodiously Boarded, Educated, and Qualified for all Manner of Business, By CATER RAND And PROPER ASSISTANTS. Mr. RAND, with an ardent Desire of opening the narrow confined Ideas of Youth, (which is too much neglected) intends going through a COURSE of LECTURES in EXPERIMENTAL PHILOSOPHY, Three Evenings a Week with the first Principles of Religion, Taste, and Learnings, and elevate their Minds, as they advance in Years, above the low Pursuits of sensual and tasteless Amusements.

An advertisement a year later emphasised the use of the latest experimental equipment, his pupils being

taught the various Branches of the Mathematics, with the Use and Construction of the latest improved Instruments, &c. to facilitate and expedite the Theory and Practice of the Mathematical Arts, which immediately concern us, and are indispensably necessary in the common Affairs of Life, by ocular Demonstration, in a Series of Lectures, and the Learners own Practice on the Globes, Orrery, Conic Sections, Hadley's Quadrant, Theodolite, Sector, Scale, Sliding-Rule, Charts, Maps, Diagrams, &c. &c. and on a large Philosophical Apparatus, consisting of Electric Machines, Air Pump, the Mechanical Powers, Microscopes, Telescopes, Hydrostatic Balance, and many other Contrivances, to render the Mathematical Arts easily attainable.

In the next year, a laboratory was added.¹³ English, writing and genteel pursuits like dancing found no place in the curriculum, which was thus firmly centred on mathematics and its practical applications. The subject had appeared in some of the London academies around 1720, but the provinces lagged behind. Though Rand was not of the calibre of Charles Hutton, F.R.S., whose school in Newcastle was opened in 1760, or of Benjamin Donn of Bristol, 1765, he was probably an innovator so far as Sussex was concerned. If the advertisements are to be relied upon in detail, he offered a deeper and wider-ranging training in the subject than given at the 'mathematical academies' which taught navigation at Brighton and

Shoreham in mid-century, or by other local teachers, such as William Clowes at Chichester, Richard Thornton at Horsham and Thomas Weller at Heathfield, who included it along with conventional subjects.¹⁴

The course of lectures was also available to the public, and in early 1774 comprised three on pneumatics, four on electricity and three on astronomy. In the winter of 1775-6, the lectures numbered 14 and encompassed, in addition, geography, mechanics, optics and hydrostatics, and in 1776-7 were increased to 20 with magnetism, hydraulics and chemistry added. Hitherto, science teaching had been offered to the gentle folk of Lewes only by itinerant lecturers, such as Mr. Silk who visited the town in 1761, and Mr. Pitt who, in 1776, asserted that 'no travelling Philosopher, with such an extensive Set of Instruments, hath been in these Parts these twenty or thirty Years'.¹⁵ The synopsis of Rand's first series of lectures reveals no originality, and the level of his knowledge and reading is indicated by the scientific books which he presented to the Lewes Library Society on his (belated) election in 1802, as they were among the most popular of the late 18th century: James Ferguson's *Lectures on Select Subjects* (first published in 1760), Richard Kirwan's *Elements of Mineralogy* (1784) and William Herschel's *Catalogue of . . . Stars* (1786). From its foundation in 1789, the library actually provided a better range of scientific reading than these titles suggested, while Rand became an assiduous reader of periodicals such as the *Philosophical Magazine* and, on the basis of reviews, proposed books for purchase, thus keeping abreast of new literature.¹⁶

The school continued until 1807 or 1808, and in 1809 – his 60th year – Rand relinquished the High Street houses and retired to a small, newly-built house which he had purchased at 2 North Street. But mention of the school later than the 1770s has been found only in administrative records, and his active promotion of science education is no longer in evidence. A change of direction is apparent when, in 1779, he purchased 161 High Street and established himself as a bookseller, dealer, chapman, and agent to the New Fire Office. However in 1784 he was declared bankrupt, and the house, along with his household furniture, was auctioned, though he remained in occupation as tenant of the Pelham family.¹⁷ He was still an undischarged bankrupt in 1808, which may explain his small part in public affairs: his only contribution to town business was to sit on the committee for establishing a new market, and, even then, having been appointed a commissioner under the enabling Act of 1791, he did not attend a meeting until 1806.¹⁸

The sale of books and stationery was one of several trades commonly associated with schoolteaching, as illustrated by an advertisement of 1771, for Walter Gale who taught writing, arithmetic, mensuration and the Italian method of accounts at Mayfield and

By whom Gentlemen may have true and accurate Surveys and Maps of their Estates made; Inscriptions neatly cut in Stone; be supplied with and Grave Stones well wrote, and have Books in plain Binding bound. At his House he sells all sorts of Books and Stationery Ware; and by whom Clerks are assisted.¹⁹

Rand, like Gale (and Thornton and Weller), also acted as surveyor, and at least from 1790 tended to give that as his occupation.²⁰ No land survey work by him of the usual sort – estate and enclosure surveys – has been found, but possibly he limited his part-time practice to that more specialised work of which evidence survives. His surveys of waterways called for the use of angle-measuring instruments, the method of surveying which was more accurate and skilled than that with chain but for the latter reason less practised.

Indeed, his appreciation of the theory and practice of surveying is shown by his patent of 1799 for 'an improved military telescope', which he originally had

constructed for the private use of Thomas Pelham but which received favourable comment from the Duke of York and was marketed commercially. The invention developed the stadiometer, rediscovered by William Green and published in 1778, as moveable hairs in the focus attached to a micrometer enabled the distance of an object of known size to be determined or, if two observations of a known distance apart were made, of an object of unknown size. The application emphasised was the measurement of ranges for artillery fire, but Rand declared the intention of adapting the micrometer for surveying, by adding a table of allowances for use when the object viewed was not perpendicular to the axis of the telescope, and by fitting it to a theodolite.²¹

The invention may have stemmed from Rand's employment by the Board of Ordnance as 'Surveyor of the Forts, on the Coast of Sussex', a post which he held in 1790 when the county's defences were mainly seven small batteries built 30 years before. No evidence has been found of his involvement in the building of the Martello towers in 1805, so he may have relinquished office by then. In 1813, he referred to 'many years of public Employment' with the Board, and implied that it occupied much of his time, by distinguishing 'my professional engagements' and use of 'my leisure in works of Civil Engineering'. 'Since leaving my Situation in the Ordnance, and engaging myself more at large in Civil Engineering', he continued, 'I have been much engaged in works of Drainage.'²²

So we come to Rand's activity as a civil engineer, which, as he said, was mainly concerned with water control, but various schemes on dry land may be mentioned first. Of these, the most significant may be the Offham incline plane railway, opened in 1809 to connect chalk quarries with lime kilns and wharf on the Upper Ouse Navigation. The original conception of this, the first railway in Sussex, was attributed to Rand, even if as completed it was entirely the design and construction of the Butterley Iron Company of Derbyshire, in which William Jessop was one of the original partners. On what was not the only occasion that Rand fell foul of the Jessops, William junior countered Rand's proposals:

It was not without due consideration that the Plan recommended for your incline plane was constructed and the experience of my Father and myself inclined us to adopt this mode as liable to the fewest objections. But if you be induced to prefer the mode printed out by Mr. Rand, I can only say that I think I may venture to predict that you will be disappointed in your expectations; and I must beg to decline the furnishing any Plans that may involve us in the discredit which I think will attach to it.²³

Rand was connected with at least one other railway project. When the plans for a new entrance to Shoreham harbour were published in 1815, Rand immediately proposed that either canals or railways should connect the harbour with Brighton and Worthing, its main markets. But only after the entrance was opened in 1819 and much of the benefit was being lost through the inadequate road to Brighton, did pressure for improvement build up. Early in 1821 public meetings agreed on the need for a new road and for an iron railway, and though the latter proposal was soon dropped, notice of application for a turnpike Act was given in the autumn. A competing scheme was then advanced by the Hon. John Lindsay, for a 'double granite road of kirb stone' as far as the eastern end of Shoreham harbour, and for a granite harbour at Hove. The railway, he claimed, would cost £3,000 as against £7,200 for the road, and would be similar to that from Plymouth to Dartmoor – presumably meaning the seven-mile Haytor granite tramway near Bovey Tracey which was opened in September 1820 (Figure 1). Lindsay was seeking markets for granite from the Channel Island of Herm, of which he had purchased the lease in 1815; it was probably Rand who suggested the Shoreham scheme. On the island,

KEY

- 1 Bridge over the Arun, 1822
- 2 Railways or canals, Shoreham to Brighton, 1815
- 3 Shoreham harbour, 1800, 1815
- 4 Adur navigation and Bramber levels, from 1807
- 5 Granite railway, Shoreham to Brighton, 1821
- 6 Cliff crane, for rescues from shipwrecks, 1787
- 7 Newhaven harbour, from 1773
- 8 Granite railway, Newhaven to London
- 9 Lower Ouse Navigation, and Lewes & Laughton Levels, from 1791

- 10 Lewes bridge, 1808
 - 11 Ottham incline plane railway, 1807-9
 - 12 Glyde Reach and canals to Horsebridge and Edley, 1791-2
 - 13 'Coal' in Newick, Heathfield/Waldron, and Bexhill
 - 14 Cuckmere levels, 1802
 - 15 Cuckmere navigation, 1812-13
 - 16 Pevensy levels, 1813
 - 17 Pett level, 1815
 - 18 River Rother and levels, 1812, 1816-17
- F Forts under the Board of Ordnance in 1790

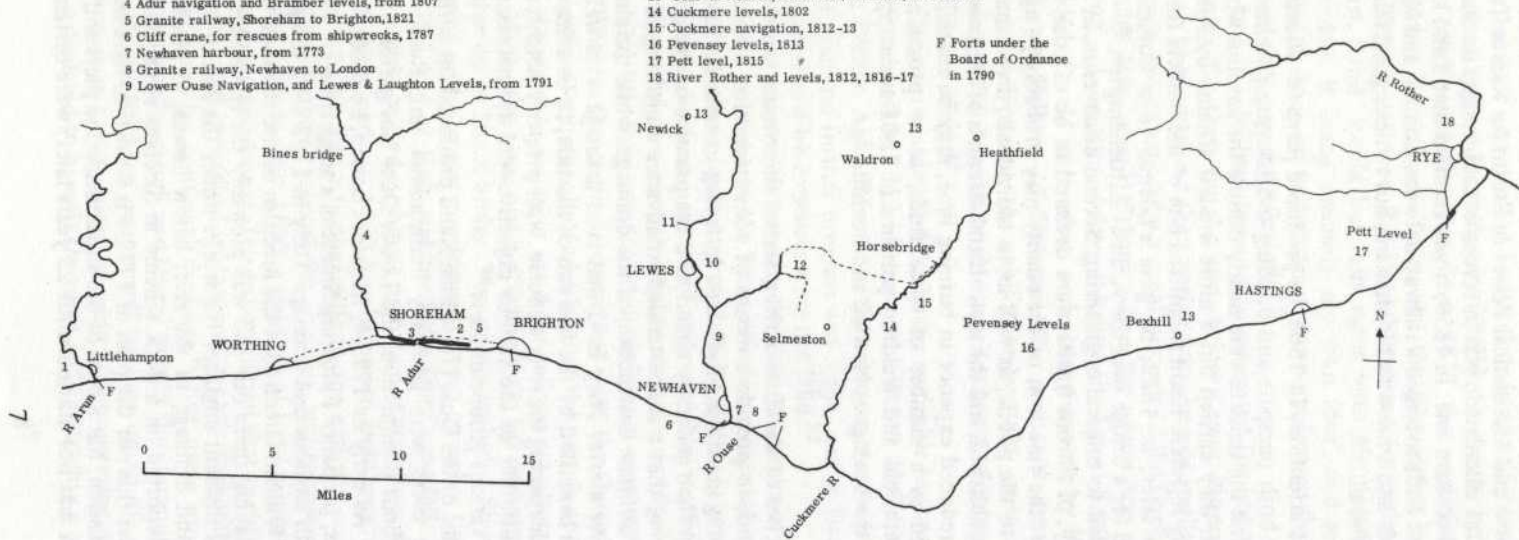


FIGURE 2: Sketch map to show the engineering projects with which Cater Rand was associated.

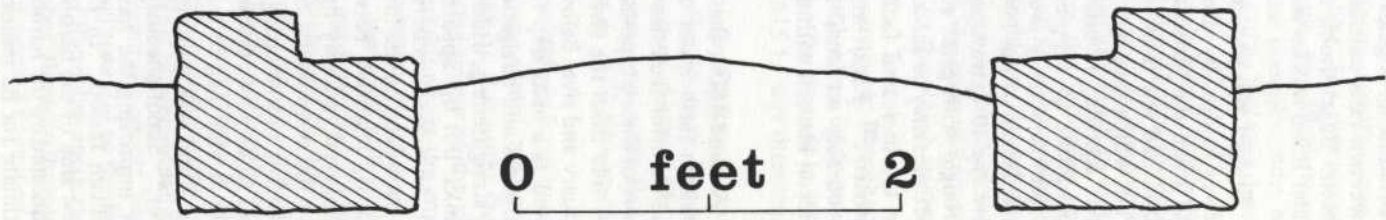


FIGURE 1: Cross section of the track of the Haytor granite tramway.

Lindsay had built a double line railway, from observation of which Rand calculated the 'Comparative Value of Horse and Mechanical Power of Steam for Rail or Tram Roads of Iron or Granite'; as his calculation was in favour of steam, they no doubt wanted steam engines on the Shoreham line. In 1859, it was recalled that Rand kept specimen rails outside his house and envisaged a railway between London and Newhaven: 'Sages shook their heads and smiled at his chimera, but . . . our good friend Cater Rand was no visionary after all'.²⁴

Bridges also engaged Rand's attention. In 1808, he produced plans for widening Lewes bridge, by dismantling both parapets and building overhanging pavements. But when the justices found that the tenders were nearly double the amount which Rand had led them to expect, they carried out a more modest scheme by Amon Wilds which they had previously rejected. Rand submitted one of the tenders for his own scheme. Fourteen years later, in 1822, he gave evidence to a Commons committee in support of a Bill for a bridge over the Arun at Littlehampton.²⁵

Rand's activity even extended to mineral engineering. Several discoveries, in the first decade of the 19th century, of fibrous lignite were declared to be of coal, and gave rise to extravagant hopes: 'the fine iron of the county may probably be again wrought with great advantage to the public, as well as to individuals; divers manufactories may be successfully established, and the agricultural interests of the county by the increased facility and reduced expence in burning lime, may be materially assisted'.²⁶ Rand was involved in a number of these finds, as he pronounced favourably on 'coal' from Heathfield and Waldron parishes in 1801 and supplied Gideon Mantell with details of the borings at Newick and Bexhill.²⁷

III

Around 1800, the tidal reaches of the Sussex rivers served three main purposes: to drain fresh water off the land, to provide a means of communication by barge, and to offer facilities for shipping in estuarine harbours. In trying to cater for one or more of these purposes, engineers had generally abandoned the practice of excluding the tide from the river, observing that a sluice tended to advance the silting of the estuary and river below, to the ultimate destruction of the drainage, while the sluice acted as a mud trap for the river above. They held that land drainage — as well as harbours and navigation — was benefited by the free run of the tide, to be achieved by straightening, widening and deepening the river's course, with properly heightened banks. But the apparent compatibility of the various objectives did not necessarily preclude conflicts between the various groups of users.²⁸

However, on the lower reaches of the Ouse (for which Rand produced his earliest plans), relations between the users were generally harmonious, and Rand was employed variously by the harbour commission, the Lower Ouse Navigation Trust and the commission of sewers. As early as 1773-4, he later claimed, he produced a plan for reorientating the piers, probably following Smeaton's suggestion of 1768 that to do so would benefit both harbour and drainage. Only in 1792 were the piers rebuilt and then to the plan of William Green (not the inventor of the stadiometer), but Rand was responsible for laying them out and was probably the resident engineer.²⁹ Simultaneously, he was resident engineer for works under the Act of 1791 for improving the navigation and drainage of the river below Lewes, to plans by William Jessop.³⁰ In 1797, he reported on a dock scheme in Sleepers Hole, on the west side of the harbour. Neither this nor the plan of 1773-4 is known to have been requested by the harbour commission, but a plan of the shoal inside the piers and an estimate for its removal (which was not started until 25 years later) were certainly

commissioned. In 1810 he was directed to assist John Rennie in his inspection of the harbour and this led to Rand revising and extending the Admiralty survey of Seaford Bay by John Murray (1805). No doubt he was employed for similar work on other occasions, but from 1819 the commissioners employed a consultant engineer on a regular basis, and the first report by Josias Jessop (another son of William) occasioned Rand's publication of a polemic pamphlet, for two reasons. First, Rand 'could but fully agree with Mr. Jessop, as to the Pier Work recommended, it being precisely my own Idea', and secondly the commissioners had failed to keep an undertaking not to implement the report until he had seen Jessop about the proposed pilework.³¹

In 1787, William Jessop also estimated for improving Glynde Reach, a tributary joining the Ouse on the east, below Lewes. No sooner had the Act for the lower Ouse been obtained than notice was given of application for an Act to improve the Reach and extend it by a canal through to the Cuckmere valley and north to Horsebridge Mill, near Hailsham; when the notice was renewed in the following year, 1792, a branch canal from Edley to the Lewes-Eastbourne road near Selmeston was added. Levels were taken and plans prepared by Rand, probably at the behest of Thomas Pelham of Stanmer: the proposed canals ran close to much Pelham property. However, the application was not pursued, though the commissioners of sewers did follow through a small scheme of improvement to the Reach between 1796 and 1803.³²

Plans for making the Cuckmere navigable beyond the tideway up to Horsebridge were revived in 1812, perhaps on account of the recently authorised enclosure of the Dicker. Again Rand was the surveyor, producing the plan for deposit in 1813, but again no further progress was made, and in December 1815 he was threatening legal action if his expenses were not paid.³³

Rand was also retained by the Commissioners of Sewers for the Cuckmere Levels in 1802 to ascertain the most effective means of improving the drainage. His proposals, however, were expected to benefit only some 180 acres at a cost of £13 an acre, which must have been unacceptable to the landowners, and, with Rand's advice, works on a much smaller scale were ordered; though in 1806 he was complaining that they had not been carried out as intended.³⁴

Whereas the engineer concerned with the Cuckmere Levels did not have to consider the requirements of a harbour at the mouth nor, to any large extent, navigation of the river, he found in the Adur valley a situation comparable to that in the Ouse. In 1800, Rand was making, evidently in his own time, a detailed survey of the river Adur up to Mock bridge. The survey included Shoreham harbour where the engineering problem was considerably more complex than at Newhaven, as the piers of 1731-3 had at least stabilised the Ouse's outfall. However, the Adur still flowed eastwards behind a shingle spit; two miles along the spit a cut protected by piers had been made in 1760 but had soon been overrun by shingle, and by 1800 the river's outlet was a further mile to the east and continually shifting. So inadequate had the harbour become for its trade, and so slow were the harbour commissioners to act, that in May 1800 a meeting of local inhabitants and traders invited William Jessop to report on it. Jessop considered that the river should continue moving eastwards until it reached its 'natural' mouth four miles from New Shoreham, and be kept open by continual dredging.³⁵ But some promoters found the report 'much too vague & general' and feared that 'if the Harbour is allowed to travel to the Eastward, the Brighton people will swallow up all the trade'. So Rand was encouraged to produce a rival report, which a further meeting, in September, thought thoroughly calculated to benefit the town and the county's trade. He proposed to reopen the

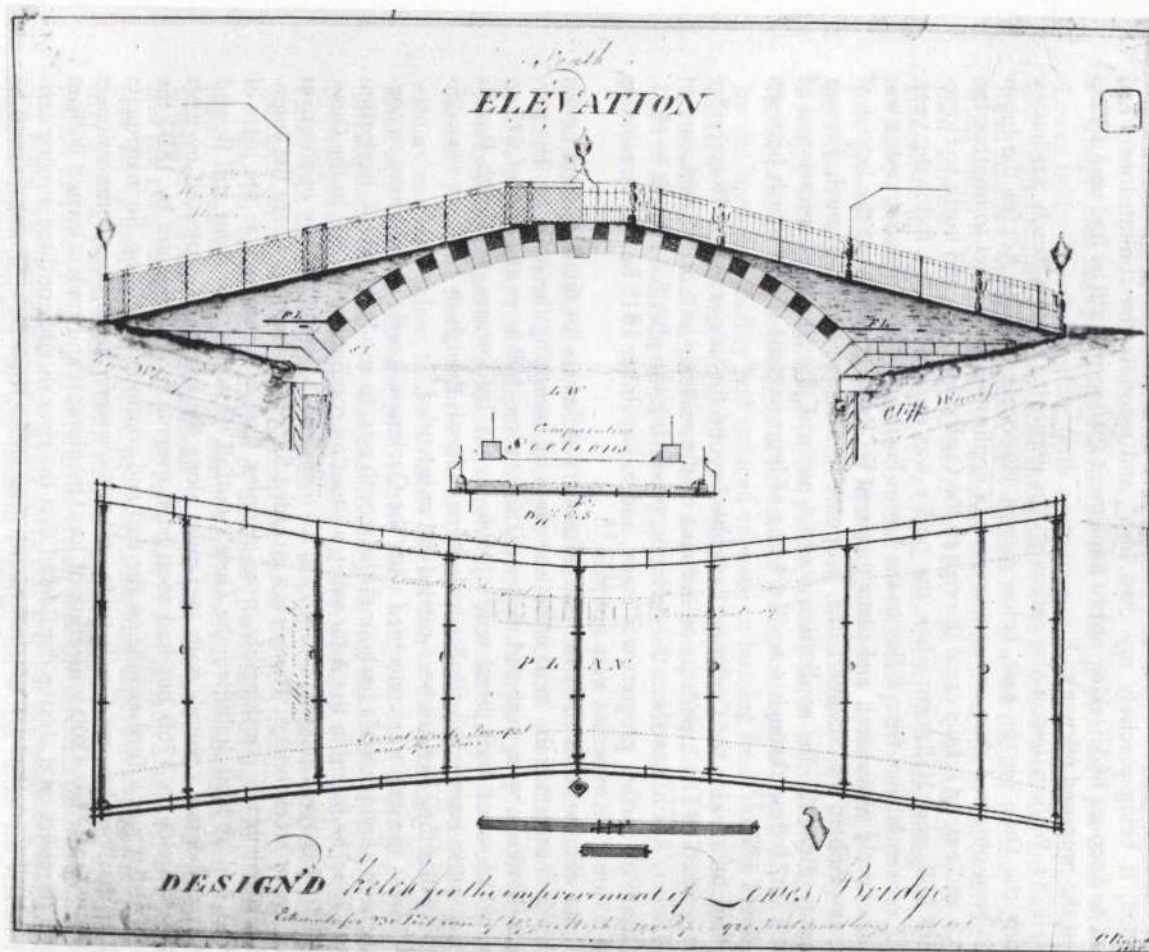


FIGURE 3: Cater Rand's sketch for the improvement of Lewes Bridge, 1808.
Reproduced from East Sussex Record Office, QDP/15, by courtesy of the County Archivist.

1760 cut, with the eastern arm blocked by a dam (surmounted by a tide mill), and estimated the cost, £20,890 16s. 8d., with a precision markedly lacking in Jessop's report. He argued, though without direct reference, that Jessop's plan would lead to silting and that anyway 'the present and probably increasing commerce of the country, will warrant a bold expenditure, in execution of substantial works'.³⁶ Jessop responded, in a private letter to Lord Egremont, with the legitimate statement that he thought he was asked to produce a cheap scheme, and the mocking remark: 'As his [Rand's] Philosophy soars far above my knowledge or Comprehension, so may his mechanical Ability'. Yet it was substantially Rand's plan which was put forward by William Clegram in 1815 and generally approved by William Chapman, even if he amended it (in a way which was largely unsuccessful) before implementation. In 1815 Rand again produced an alternative plan, though no details are known.³⁷

If he found no employment with the harbour commission, Rand was more successful with regard to the river. In 1806, a Bill to improve the drainage and navigation below Bines bridge was read a first time; the associated plan was surveyed by James Creasey. For the following session a new plan was deposited, this time surveyed, reported and estimated by Rand, and the Bill passed into law. As Creasey died early in 1807, Rand's appointment as surveyor may have been a matter of persistence bringing its reward. It is a fair assumption that Rand also had the direct supervision of the works, which began in April 1808 (and soon ran into financial difficulties); the Adur navigation may then be regarded as the most important engineering work for which Rand was fully responsible.³⁸

In later years the Commissioners of Sewers for the Rape of Bramber made use of his services for surveys and reports,³⁹ but most importantly as one of 'two skilful persons, one to be chosen by the Commissioners of the harbour, and the other by the Commissioners of Sewers . . . such two persons being skilled in river embankments' under the Shoreham Harbour Act of 1816. The harbour commission was required to secure the river banks against damage from the 'more speedy and extensive flow of the tide' following the opening of the new mouth, and the two engineers (Rand and Richard Buck) were to issue three certificates, one before the work began on the height to which the banks should be raised, the second one month before the new mouth was opened that the banks had been duly heightened, and the final certificate two years after the opening, declaring the banks to be satisfactory and so discharging the harbour commissioners from further liability.⁴⁰ His field notebook shows Rand conscientiously carrying out his duties. The greatest difficulty arose over the final certificate which Rand would not sign (there had been flooding in 1819 and 1820), and recourse had to be had to an arbitrator.⁴¹

Rye harbour, more than any other, was damaged by the erection of sluices on the three rivers draining through it, and there was a long history of hostility between the harbour commission and the Corporation of Rye on the one hand, and the various commissions of sewers on the other. Only in the 1830s were reasonable working relations established, but that was not before two influential commissioners of the upper levels had considered the possibility of dispensing with the most important sluice — Scot's Float — and allowing the tide free run, which would also facilitate navigation. One or both of them employed Rand early in 1812 to report on the possibility of doing so, and he found in favour of an open channel, though the works would cost £27,000. Then in March the sluice 'blew up' in an exceptionally high tide; 600 acres were flooded, though the harbour was greatly improved and the commissioners as a body decided on re-erecting the sluice. In the ensuing controversy, Rand printed a pamphlet stating the advantages of an open channel

and in 1817 gave evidence to that effect in an action brought by the sewer commission against some of the harbour commissioners. In 1816 or 17 he was employed by the harbour commissioners in making surveys of the salt marshes adjacent to the harbour, probably in connection with plans (not effected until the 1830s) for their enclosure.⁴²

This account of Rand's involvement in harbour and navigation works is probably fairly complete, but is certainly not with regard to drainage works, as allusions to activity in Pevensey Levels (1813) and Pett Levels (1815) have been found. Nevertheless, it is clear that he was the leading (or only) local hydraulic engineer. As Lord Sheffield heard from his Lewes solicitor when planning to drain land at Newhaven in 1811, 'if your Lordship wants a workman, there is a man in Piddinghoe . . . but if you want an Engineer I believe there is none in the Neighbourhood but Mr. Rand'.⁴³

IV

The total of works completed through Rand's agency was small. But if the majority of schemes with which he was associated came to nothing, he was a fertile source of ideas and generally advanced the application of engineering to useful purposes in Sussex. The Offham incline plane was probably, like the granite tramway, the application to a local need of an invention of which he learnt through the growing scientific press. His schemes were usually realistic in scale as regards the likely costs and benefits – in contrast to the monumental proposals of, say, John Rennie for Newhaven and Hastings harbours. He worked with a knowledge of local circumstance which was denied to eminent outsiders – whether of emerging needs (as at Shoreham) or of physical characteristics (he realised the significance, for instance, of the westward set of the tide two hours before high water on parts of the Sussex coast). But therein lay a source of conflict between him and his like, and engineers of greater standing. Of Josias Jessop's appointment at Newhaven, Rand wrote: 'where the professional abilities of an Engineer *may* be found necessary to be called in . . . call in a man . . . well informed . . . with all the *localities* of the *situation* that fall under his eye'. William Stevens, harbour master at Newhaven from 1827 to 1864, expressed similar sentiments, having in mind the engineers who reported in the two decades before he took up office:

. . . small tidal harbours and the small amount of money that could be devoted to their improvement were insignificant to large Engineers, who wanted more means and greater extension of plans to conform to their tastes. Newhaven Harbour was too insignificant to engage sufficient of their attention to ensure laying down of proper plans. They hastily viewed the harbour for a tide or two, and then as hastily drew their conclusions, and upon them based alterations which were not sufficiently matured to ensure success.⁴⁴

Within the old tradition of multi-occupation surveyors, Rand with some success made the transition from work which finished up in a map, to civil engineering. But the days of such men were numbered, as the function of the consulting engineer was established and the scale of activity required full-time clerks of works. And as a proponent of science education, Rand had the misfortune to be overshadowed by the rising generation in Lewes which included the geologist Gideon Mantell, the mathematician J. W. Woolgar and the other founders, in the month before Rand's death, of the Lewes Mechanics Institution.

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JOHN HOARE

Railway Architecture in Sussex

RAILWAY ARCHITECTURE, as a theme for study, may seem to possess an inherent contradiction. There is a self-evident functionalism in the structures associated with the engineering of the permanent way; signal-boxes, tunnels, bridges and viaducts all fulfil a specific purpose. The same distinctiveness is not apparent in those structures which have graced our stations since the earliest days of the railways in a wide variety of sizes and styles.

In the early period, whether stations are humble or grand, their design is only in a limited sense related to specifically railway functions. Their characteristics tend to be either domestic or expressive of monumental achievement. Although few English stations were built and owned by anyone other than the operating companies, the resulting buildings generally still fail to develop a distinctive railway appearance. The high level of staffing of stations in the Victorian period, an obvious reflection of the social and economic life of the age, normally ensures that a house accompanies the passenger platform, with either a single-storeyed booking hall attached or the use of part of the ground floor as offices. It is these domestic quarters which tend to be the main constituent of our railway architecture, at least in the small stations. Frequently the house is the only permanent and surviving structure of rural stations of the early period. The small awning for passenger cover, as seen in Sussex in the extension of the eaves of some South Eastern Railway stations of 1851, slowly develops into a lavish provision for passenger comfort, typified by the lengthy canopies and waiting and refreshment rooms erected by the London, Brighton & South Coast Railway in the 1880s. Growth in both scale and number of station structures summarises the Victorian picture. The recent contraction of the 20th century is equally obvious, as a reduction in service in all respects tends to reduce those stations left open to a status barely superior to that of a bus stop. In a sense this can be seen as a development towards a stricter functionalism in railway architecture at the expense of other considerations.

In his valuable *Introduction to Railway Architecture*,¹ Christian Barman suggests that the railway builders had to consider three factors, function, relationship to the visual environment, and the expression of the greatness of their new conquest of space. It is instructive to examine local building within this framework of ideas. Early building certainly shows a sense of continuity with the past, borrowing and adapting many styles to the new purposes, and expressing the massiveness of the new achievement without offending against tradition. The Italian manner, so characteristic of the first generation of railway stations, appears in the wayside stations of both the London & Brighton Railway and the S.E.R. Subsequently Gothic, as at Battle, is sometimes used as the sociable style and indeed is better suited to the surroundings. The real challenge to the engineer in railway architecture came, however, in the construction of the great train shed so typical of the important town. Sussex can only show the superb later roof at Brighton, as the overall roof was not favoured by its railway companies. After the first confident years, the quality of design declined and one has to relate the architecture of the railway not only to function and sociability, but also to the state of a company's

finances and to competitive pressures. The limited activity of the L.B.S.C.R. in the 1870s and the subsequent extravagant developments reflect these factors.

This survey of Sussex railway architecture is based upon such general considerations. Its objective has been to record as completely as possible the major structures and as many minor buildings as possible. In the process a number of interesting features appeared, some relating to railway history—in particular the irregular development of Sussex railways—others to company architecture. This article concentrates upon a possible classification of railway buildings in the county based upon style and date.

The broad historical picture of Sussex railways is clearly significant for their architecture, although it is unwise to place too much reliance upon the opening date of a particular line where its stations are concerned. The earliest phase was the responsibility of the L.B.R. which was amalgamated to become the L.B.S.C.R. during the 'mania' which added over 90 miles to the Sussex system. The succeeding story is largely that of the L.B.S.C.R. Even nominally independent branches were short-lived subsidiaries. Typical was the Brighton, Lewes & Hastings Company whose Act provided for the line to be constructed and then sold to the L.B.R. A quieter period followed the 'mania' while the S.E.R. opened its two lines to Hastings during 1851-2. Further L.B.S.C.R. expansion followed steadily through to 1869. During this period the London & South Western Railway made its small incursion into the county with its Midhurst branch. Then, for a decade, no new line and few station buildings were constructed. The years of economy preceded a last dramatic expansionary burst by the L.B.S.C.R., as nearly 50 miles of track and 21 complete new stations were opened between 1879 and 1883. Sussex railways had virtually reached their greatest extent, although there was substantial expenditure on new passenger amenities up to 1914. During this period stations in most of the large or growing coastal resorts were enlarged or rebuilt while a major effort went into new works at Newhaven Harbour. One major engineering work was the Crowhurst Marsh viaduct (South Eastern & Chatham, opened 1902), 417 yards long, which was demolished in 1969.

Mileage of railway open at given dates (to the nearest mile)

	L.B.S.C.R.	S.E.R.	L.S.W.R.	K.E.S.R.	Total
1841	29	—	—	—	29
1849	121	—	—	—	121
1859	170	41	—	—	211
1869	231	41	7	—	279
1879	232	41	7	—	280
1889	286	41	7	—	334
1902	286	45	7	8	346

The amalgamations of 1923 left no immediate mark. Even electrification during the 1930s involved little structural alteration, apart from new signalling. Six totally new stations appear to have been built and some lesser alterations made.

Major changes have occurred in the last decade as a result of both closures and of the policy of reducing maintenance costs through reducing station facilities. During the six years of the present writer's interest, 19 stations have been destroyed, two viaducts blown up and other buildings reduced in size or substantially altered, so that recording is a matter of urgency. This particular information will almost certainly be incorrect by the date of publication! Signal-boxes, crossing-keeper's

cottages and railwaymen's houses, the latter two categories of great interest as they frequently date back to the opening of a line, are perhaps the most vulnerable of all structures.

SCHEME OF CLASSIFICATION

1 London & Brighton, 1840-46

Only in the first phase of growth (1840-1) did the Brighton Company pay for the service of a recognised architect, David Mocatta, as well as an engineer, John Urpeth Raistrick. This is one reason for the attractiveness of the first works. Mocatta, a pupil of Sir John Soane, was happiest working in the Italianate manner. Of the stations, the only major work was Brighton on its huge artificial platform; part of its facade survives beneath later additions. The characteristic of the other buildings would appear to have been a humble classicism, heavy in its details with rendered walls and unoriginal ornaments. It appears that Brighton alone was originally two-storeyed, although the present two-storeyed building on the east side at Three Bridges certainly retains door-frames and windows on the ground floor which look authentically Mocatta. The stations were of a simple plan² with no residential accommodation. There are partial remains at Balcombe and Hassocks, and the present Shoreham station, constructed in 1892, reputedly contains original material concealed beneath a later skin. The first station at Lewes, opened in 1846, was similarly Italianate in style but two-storeyed. It was wilfully destroyed recently. It seems probable that Raistrick designed this building in Friars Walk, as *The Railway Times* on 28 June 1846 reported that 'Mr. Raistrick is the Engineer-in-Chief. . . and Mr. Fabian of Brighton is the contractor for the permanent station at Lewes'.³ This procedure of design in the company engineer's office and work by a contractor soon became standard practice on the L.B.S.C.R.

The most memorable remaining structures of the early period are the viaducts, in particular the Ouse Valley with its decorative pavilions at each end and the dominant curve of the London Road viaduct in Brighton, the strangest feature is the extraordinary towers on the north portal of Clayton tunnel. There is no documentary evidence to support the probability that Mocatta designed the ornamental features.

2 Flint and brick style, 1845-47

This is a highly distinctive style, although by no means exclusive to the railway, as it appears in other local building of the period. It is characterised by the use of the local material, flint, for slightly recessed walling between courses of red brick. The windows are often in a quaint leaded light style and the low-pitched roofs made of slate. A fair number of examples remain as dwellings although some are threatened, particularly as the manning of crossings ceases. The former Arundel & Littlehampton station, used as dwellings since 1864, is an excellent example, including a goods shed and platform buildings in its complex; so are the former stations at Worthing and Woodgate and the cottage at Ferring. The interesting old station at Drayton was demolished by West Sussex County Council in 1970. As no stations from this period fulfil their original functions, their survival without some protection and long-term use must be uncertain.

3 South Eastern Railway (Tress), 1851-52

The S.E.R. provided Sussex with its finest series of stations in the work of



18

PLATE 1: Hassocks: former station building, 1841.



PLATE 2: Woodgate: station for Bognor from 1846 to 1864.



PLATE 3: Three Bridges: row of railway cottages c.1850.



PLATE 4: Rye: S.E.R. station, 1851.

William Tress, architect, of Finsbury Square, London. No two of his stations in Sussex are identical although many share a family resemblance in their dignified Italianate styles, whether in brick, as at Wadhurst, or stucco, as at Stonegate. An interesting feature is the overhanging eaves of single-storey offices which provide limited protection for waiting passengers. These roofs are supported by some of the earliest iron brackets in Sussex stations. There are a fine portico at Rye, imitating the Florentine Renaissance, and elegant proportions at St. Leonards. In a contrasting Gothic style are three stations. Etchingham is constructed of ragstone in Tudor style. Battle, the best small station in Sussex, was built in a consciously medieval style to harmonise with its environment. It has been only slightly altered since its opening and contains a superb booking-hall with a baronial fireplace and timber roof. This series of stations has recently been sympathetically redecorated by British Rail.

4 Early roadside stations of the L.B.S.C.R., 1845-60

From the period when R. Jacomb-Hood held the office of engineer, there are certain common features in all houses built by the company, whether as houses for station-masters, cottages for crossing-keepers or terraces for railwaymen. Typical elements are gothic windows, steeply-pitched roofs, often converting the upper floor windows into partial dormers with guttering at times extending across the front of the panes, and plain square mouldings around the windows and doors. At level crossings the cottage wall on the track side is often faced with grey tiles, otherwise most walls are stuccoed. As always, certain buildings show variations on the period theme. Probably the most attractive in a period of small buildings is Rowfant, a Sussex example of a landowner's station, with decorative bargeboards and ornamental chimneys. Many stations of this period have later ticket-offices, as it appears that a house was the only substantial early construction, e.g. Billingshurst.

5 Mid-Victorian stock brick designs, 1860-c.1880

It appears that the office of F.D. Banister, the engineer of the L.B.S.C.R. from 1860 to 1895, contained certain fairly standard station plans which were put out to tender. Even different builders produce little variation.⁵ None could achieve outstanding results from the designs of what Michael Robbins has called 'the bad period' in railway architecture,⁶ although the combination of polychrome brickwork and modern decoration can produce attractive results. A splendidly proportioned goods shed design was erected in the 1860s; possibly the best, at Steyning, was recently demolished but examples remain at Littlehampton and Seaford. So far as the stations are concerned, three categories of accommodation are evident:

A A large rectangular two-storeyed building, usually stuccoed, providing a house, booking-office, hall and waiting-rooms all under one roof. These are found at the more important stations constructed in this period. The original terminal at Littlehampton was similar to the surviving station at Arundel.⁷

B A two-storeyed house joined to single-storeyed passenger facilities. The latter comprise a recessed booking-office and hall with a veranda and valancing filling the recess, and waiting rooms. Decorated bargeboards, valancing and coloured courses of brick provide the variations on this simple plan. The earlier examples tend to have windows with segmental arched heads, the later to have round-headed windows. The distinctively shaped chimney persists throughout. This is a widespread

type of L.B.S.C.R. building, being employed with few variations in Kent, Surrey and Sussex for 25 years. Good examples in Sussex are at Buxted and Warnham.

C Single-storeyed station offices. In three examples the offices are situated on a road below or above the track and are unconnected with the platform structures. The absence of a contemporary house is sometimes explained by the survival of earlier accommodation, as at Burgess Hill and Glynde.

These stations generally had platform canopies of modest size on the booking-office side, normally supported by cast iron columns. An iron footbridge connects with the second platform with its small shelter. This provision increases in area with the later Victorian designs, but changes little in style, only the ornamentation varying.

6 Cuckoo-Line Style, 1879-83

A refreshing new style of station building, first seen on the Cuckoo line between Eridge and Hailsham, accompanied the short expansionary burst of the L.B.S.C.R. between 1879 and 1883. All the new stations on this line, and on the Midhurst to Chichester and East Grinstead to Haywards Heath/Lewes routes, are in a country cottage style in total contrast to the often sombre brick structures which preceded them. Unfortunately these buildings have suffered greatly from the closure of all the lines concerned, and it is likely that only those now owned by the Bluebell Railway, Horsted Keynes and Sheffield Park, will remain complete.

These are a number of characteristic features, not necessarily found in every structure. The main building generally has a tile-hung upper storey and a timbered porch. At Hassocks flower designs are cut through the porch woodwork. External walling is sometimes plastered with designs in relief, flowers again being the favourite motif. Timber is used to present a half-timbered appearance not even remotely traditional. Coloured glass adds to this fanciful atmosphere. Long platform canopies with varied valancing protect the passenger, whose comfort was frequently increased by the presence of a buffet even in as remote a place as Horsted Keynes. An interesting feature of some canopies was their support by a complex timber framework in place of the conventional cast iron.

This style is perhaps the best Sussex example of a conscious effort to harmonise station buildings with the local environment. In addition to detail and lavish provision for passengers these stations are some of the best building on the L.B.S.C.R.

7 Major constructions, c. 1877-95

The advent of a country design had no effect upon the mainstream of station development as illustrated by new constructions in the growing coastal towns. Stations such as Hove and West Worthing are the lineal descendants of the earlier models at Kemp Town and Seaford, larger and more elaborate but scarcely in better taste. It was, however, evidently general practice in the 1880s to use plaster and artificial stone for the exterior. Shoreham station, rebuilt in 1892, is on one storey only but shows the same style and detailing.

This decade appears to have been significant for a consumer-consciousness among the L.B.S.C.R. directors, who spent lavishly on the provision of station facilities. Among major rebuildings, two merit particular note, the splendid curved overall roof at Brighton set up like two parallel naves, and the way in which the roof and carriage ramp are used to unite the two sides of the junction station at Lewes.

8 Late Victorian and Edwardian brick, c. 1890-1914

There is a distinctiveness about this group of stations which is not easy to

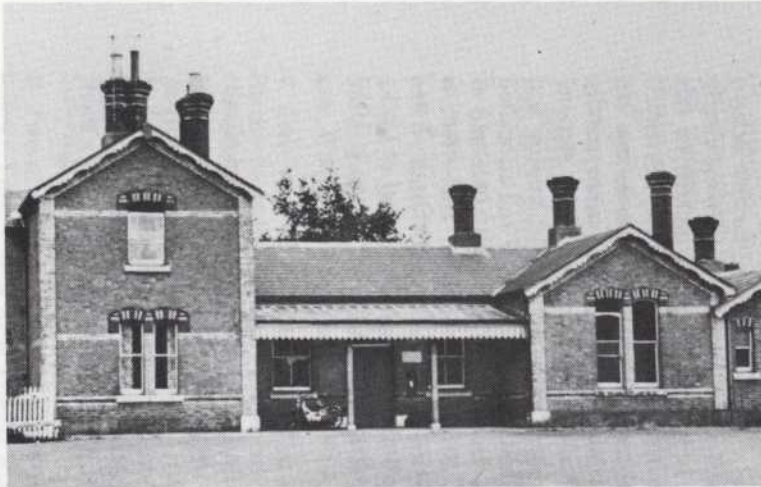


PLATE 5: Forest Row: station, 1866.

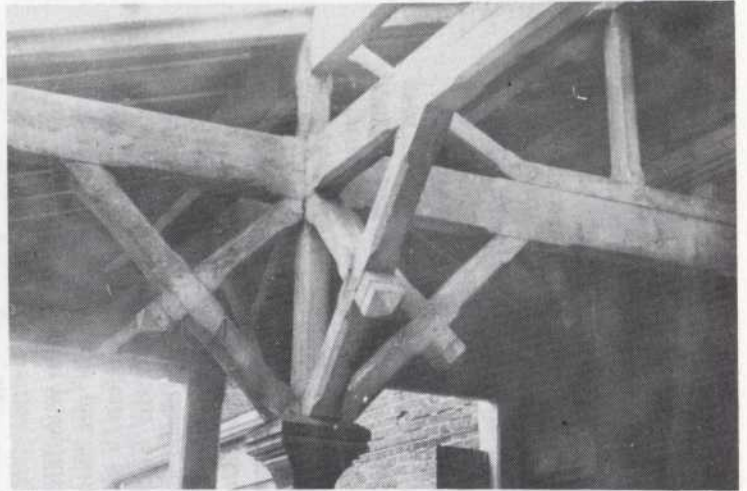


PLATE 6: Sheffield Park: canopy support 1882.



PLATE 7: Portslade: station, 1881.



PLATE 8: Christ's Hospital: platform side of buildings, 1901.

characterise, a clear move towards abandoning the imitation of past styles. These are unmistakably brick buildings without any of the earlier attempts to disguise the fact. Platform arrangements are less distinctive although the valances tend to be simpler (with undulating curves and a beaded edge now common instead of the earlier cut-away patterns) as do the iron supports, while the glass now carries names rather than colours. Company differences in Sussex are far from great; sash windows with rounded tops and red brick are general. The S.E.C.R. terminus at Bexhill West, now disused, is impressive, but the best building of the period, Christ's Hospital station, has just been demolished by British Rail. This splendid polychrome structure, described by Ian Nairn as 'one of the best examples in southern England of an unaltered Late Victorian railway building', is a serious loss.

Many small earlier stations were enlarged during the decades between 1880 and the outbreak of the Great War. Billingshurst, Faygate, Lancing and Isfield all show variations on this evolutionary growth with early station houses lost among later development. This work is generally undistinguished, as are the smaller stations built in this period, e.g., Uckfield, Angmering and Goring presumably belong to this latter group as examples of a humble brick design dating from c. 1890. Crowhurst and Sidley represent the more attractive stock design of the S.E.C.R. Managing Committee. One distinctive feature of a number of L.B.S.C.R. stations is the curved brick arch containing double doors and side windows in platform shelters and booking offices; there are good examples at Bosham.

9 Timber buildings

Timber buildings represent a rather obvious class of their own, humble designs whose brickwork is restricted to the essentials of a chimney and which were clearly adequate for the communities they served. It is convenient to include in this category basic buildings like those of the Kent & East Sussex Railway, extended to Robertsbridge in 1902, which make liberal use of corrugated iron. As one can reasonably assume that any of these stations would have been rebuilt more soundly on demolition, their designs probably date back to the opening of the stations concerned. Only two stations in this list present difficulty, Littlehampton and Petworth, the latter the terminus of the line when it opened in 1859 and associated with one of the county's great estates. Even today in use as a coal office and in need of paint, Petworth's timber station is strangely impressive. The effect is achieved by a central block with slightly projecting wings, fanciful chimneys, and timbers set at different angles to produce a patterned surface. In the case of Littlehampton temporary work following the demolition of the 1863 building in 1937 has become permanent and there is not even a facade!

10 Basic halts

This large group of 'bus-stop' stations generally date from the introduction of rail-motor services in the Edwardian era. Facilities were basic and the cost of establishment minimal; the L.B.S.C.R. directors voted £1,230 in 1905 for five halts between Brighton and Worthing.⁹ Such ephemeral structures could be as quickly closed as opened and no evidence remains of the appearance of some. At certain halts the ticket-selling booth is the only structure on the platform, in other examples a small shelter is provided.

11 Modern designs

There is nothing distinctively Sussex about any of the post-1920 structures, as the county was no longer served by a company largely working within its boundaries. To the Southern Railway is owed a small group of buildings typical of the architecture of the 1930s, a period when stations were at least unmistakably contemporary and aimed to attract the customer to the newly electrified service. The most avant-garde design is at Horsham.

Within the next few years the national and economical styles of British Rail will have made their mark. The completed station at Crawley represents a new tradition, a money-making office block which services rail passengers on the ground floor. The industrialised building systems being employed in the current building programme are producing inconspicuous stations which are certainly functional but little else. Little attempt is made to blend with the surroundings, and the confident display of the years of railway dominance is a missing element in contemporary work.

SUSSEX STATIONS CLASSIFIED

This survey is principally the result of observation, although documentary sources are valuable in providing certain guidelines. Acknowledgment must be made, in particular, to the usefulness of R.H. Clark's *A Southern Region Record* (Lingfield, 1964) for its reliable dating of line and station openings. However, the available L.B.S.C.R. sources provide only limited information about building developments so that much is left to deduction from the visual evidence. Where a station obviously has sections dating from different periods, reference may be made to two classifications or the station recorded in the section which dates its main structure. Stations which fit into standard patterns do not present much problem. Out of 148 stations and halts recorded in Sussex it has been possible to classify, at least provisionally, all but four which have vanished completely.

(D) indicates total destruction – which, with the exception of Elsted, Singleton and the vanished halts, has occurred while the survey was in progress.

1 *London & Brighton, 1840-46*

Balcombe, Brighton (part), Hassocks (part), Three Bridges (part).

2 *Flint and brick style, 1845-47*

Arundel & Littlehampton, Drayton (D), Kingston-on-Sea (D), Lancing, Newhaven Town, Woodgate for Bognor, Worthing (old station), Yapton.

3 *South Eastern Railway (Tress), 1851-52*

Battle, Etchingam, Frant, Robertsbridge, Rye, St. Leonards Warrior Square, Stonegate, Wadhurst, Winchelsea.

4 *Early roadside stations of the L.B.S.C.R., 1845-60*

Barcombe Mills, Berwick (house only), Billingshurst (house), Burgess Hill (house), Cooksbridge, Crawley (D), Faygate (house), Glynde (house only), Hailsham (D), Isfield, Pevensey & Westham, Polegate (old station, D), Pulborough, Rowfant.

5 *Mid-Victorian stock brick designs, 1860-c.1880*

A Rectangular two-storeyed building, inclusive of offices: Arundel, Henfield (D), Kemp Town, Littlehampton (D, 1937), St. Leonards West Marina (D), Seaford, Steyning (D).

B Two-storeyed house, single-storeyed offices: Amberley, Bramber (D), Buxted, Falmer, Ford, Forest Row, Grange Road, Groomsbridge, Hartfield, Partridge Green, Southwater, Warnham, West Grinstead, Withyham.

C One-storeyed offices, no contemporary house: Burgess Hill, Eridge, Glynde, Preston Park.

D Two-storeyed house and offices, humble but similar to L.B.S.C.R. design: Rudgwick (D), Slinfold (D); and L.S.W.R. version at Elsted (D), Rogate.

6 Cuckoo line style, 1879-83

Ardingly (part D), Barcombe, Cocking, East Grinstead (D), Hassocks (D), Heathfield, Hellingly, Horam, Horsted Keynes, Kingscote, Lavant, Mayfield, Midhurst L.B.S.C.R. (D), Newick & Chailey (D), Rotherfield, Sheffield Park, Singleton (part D), West Hoathly (D).

7 Major constructions, c.1877-95

A New buildings, lineal descendants of type 5A: Hove, London Road Brighton, Polegate, Portslade, Shoreham, West Worthing.

B Extensive enlargements and alterations: Brighton, Eastbourne, Lewes, Newhaven Harbour.

8 Late Victorian and Edwardian brick, c.1890-1914

Angmering, Bexhill Central, Bexhill West, Bognor Regis, Bosham, Christ's Hospital (D), Crowborough, Crowhurst, Goring, Sidley (D), Southwick (D), Three Bridges, Uckfield, Worthing.

9 Timber buildings

L.B.S.C.R.: Fittleworth, Hampden Park, Petworth, Plumpton, Selham, Wivelsfield. S.E.R.: Ore, West St. Leonards. K.E.S.R.: Bodiam, Northiam. S.R.: Littlehampton.

10 Basic halts

Aldrington, Bishopstone Beach, Collington, Doleham, East Worthing, Fishbourne, Fishergate, Holland Road (D), Ifield, Junction Road (D), Littlehaven, Mountfield, Norman Bay, Nutbourne, Pevensey Bay, Snailham, Southease & Rodmell, Southbourne, Three Oaks; and presumably these which have disappeared, Glynde Gap, Hartington Road, High Rocks, Lyminster, Roffey Road, Rowan, Shoreham Airport, Stone Cross.

11 Modern designs

A Southern Railway, 1923-39: Barnham, Bishopstone, Cooden Beach, Durrington, Hastings, Haywards Heath, Horsham.

B British Rail: Chichester, Crawley, East Grinstead (under construction), Hassocks, Preston Park.

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- 1 Christian Barman, *An Introduction to Railway Architecture* (1950).
- 2 David Cole, 'Mocatta's Stations for the Brighton Railway', *Journal of Transport History*, vol.3 (1957-8).
- 3 C.E. Lee, 'The Lewes Station Mystery', *Railway Magazine*, Jan. 1950.
- 4 Barman, *op. cit.*, pp.22-3.
- 5 An example is the buildings at Hove (contract to Robert Abraham, 19 June 1878: British Transport Historical Records, LBS 1/77) and at London Road, Brighton (contract to John W. Sawyer, 14 Mar. 1877, B.T.H.R., LBS 1/77). These structures are virtually identical in their original form.
- 6 Michael Robbins, *The Railway Age* (Harmondsworth, 1965), p.65.
- 7 The evidence for this statement is a comparison between postcards of Littlehampton station c.1900 and the present condition of Arundel.
- 8 Ian Nairn and Nikolaus Pevsner, *Buildings of England, Sussex* (Harmondsworth, 1965).
- 9 B.T.H.R., LBS 1/82.

JOHN A. BAGLEY

Shoreham and Ford: A History of Two Sussex Airfields

THE ACCOUNT which follows makes no claim to completeness, but the author feels that the industrial archaeology of aviation is a sufficiently neglected topic to justify some notes on two airfields which, between them, illustrate many of the significant phases in the development of aerodromes in Great Britain.

SHOREHAM

Shoreham is one of the oldest aerodrome sites in England, probably dating back to May 1910 when Mr. H. H. Piffard began testing a biplane which he had built in Ealing.¹ By early 1911 a recognised aerodrome existed on the west side of the River Adur just to the north of the railway bridge; on 6 May of that year there was a race from Brooklands to Shoreham which was won by Gustav Hamel on a Bleriot monoplane.² In June, a row of 10 wooden hangars was built at the foot of the railway embankment, and the airfield—at this stage about 500 yards square—was officially opened on 20 June with a party attended by the Mayors of Brighton, Hove and Worthing.³ In July, Shoreham was a control point in the 'Circuit of Europe', which was the most ambitious air race so far staged.⁴ In January 1912 the Brighton-Shoreham Aero Club was formed, and a wooden club-house was built in the south-east corner of the airfield, with tennis courts and a croquet lawn. Early in 1913 the Club was reconstituted as the Sussex Aero Club by Mr. C. L. Pashley and his brother; the redoubtable 'Pash' remained associated with flying training at Shoreham virtually up to his death in 1971. A smaller club-house and three more hangars were added in October 1912 when the Avro Flying School moved down from Brooklands. A few aeroplanes were built at Shoreham in this period: the Pashley brothers built a three-seat biplane for club training, and the Avro company used the river for testing float-plane versions of its Type H biplane. Two or three examples of the highly unorthodox Lee-Richards Annular Monoplane were built in 1913-14, and two more conventional biplanes were built by a Chinese engineer, Mr. T.K. Wong.⁵

In September 1914, the aerodrome with all its buildings and equipment was requisitioned by the War Office for the Royal Flying Corps, which continued in occupation until the end of the war. No. 14 Squadron was formed there in February 1915 and moved to Egypt in November, after which the airfield was used as the South-Eastern Area Flying Instructors School. By the end of the war, the line of original sheds along the southern boundary had been supplemented by three hangars each 120 feet by 50 feet, presumably of the standard pattern typified by the well-known 'Black Sheds' at the eastern end of the main runway at Farnborough. The airfield was at this time about 1,000 yards by 600 yards, bounded to the north by the Upper Brighton Road and on the west by Salts Farm Road. After the war, the airfield was de-requisitioned, all the buildings were shortly cleared away, and the field reverted to cattle-grazing.

A year or two later the Sussex Aero Club was briefly re-founded in a field on the south side of the railway, probably on the west side of Salts Farm Road, but this proved abortive. In 1925, the Gnat Aero Company was formed by Mr. F. G.

Miles, (originally in the Star Model Laundry at Portslade) who took over the lease of this field and established a flying school with C. L. Pashley as instructor.⁶ The five aeroplanes were housed in a barn and in a canvas Bessoneau hangar of wartime vintage acquired from a defunct film studio in the neighbourhood. In 1926 the whole operation, including the canvas hangar, was moved to another field on the west side of Salts Farm Lane, just to the north of the railway line and adjacent to the pre-war aerodrome. Here another hangar and a club-house were erected, and the Southern Aero Club was founded. Shortly afterwards, F.G. Miles's brother George joined the organisation; the Gnat Aero Company was reconstituted as Southern Aircraft Ltd., and the construction of the first of a series of six single-seat biplanes called the Southern Martlet was started. The first Martlet flew in July 1929, and the last in May 1931.⁷

During 1930, the municipal authorities of Brighton, Hove, and Worthing formed a joint committee to establish a municipal airport for the three towns, and engaged Sir Alan Cobham to survey possible sites.⁸ F.G. Miles was convinced that the old pre-war aerodrome was the only possible location and enlisted his father's support to buy the field for £7,000.⁹ In August 1933 his judgment was proved correct: the joint Airport Committee acquired the site for £10,000, and a further £31,000 was sanctioned for its development.¹⁰ Construction of the terminal building and a large metal hangar alongside it began in November 1934; the terminal, built in cement-faced brickwork, was designed in a typical contemporary style by S.H. Tiltman, L.R.I.B.A. However, the airfield was evidently being used some time before this: the Prince of Wales flew in on 4 July 1933, and the first scheduled service between Shoreham and the Isle of Wight was operated from 1 October 1932 by Portsmouth, Southsea and Isle of Wight Aviation Ltd., although it probably used the small Miles field at first. Its service continued until mid-1935: according to the timetable up to four flights a day were scheduled, but probably far fewer were actually flown.¹¹

In 1935, the Croydon-based company, Olley Air Services Ltd., was appointed to manage the aerodrome, and a semi-official opening party was held on 21 September, although the official opening ceremony, commemorated by a plaque in the main entrance lobby, did not take place until 13 June 1936.¹² By this time the Miles-operated flying school in the adjacent field had closed down, and the Southern Aero Club was reconstituted as the South Coast Aero Club under the management of Brooklands Flying Club Ltd. Early in 1936, it moved into a new wooden club-house which was built in the south-east corner of the airfield very close to the site of the pre-war clubhouse.

Olley Air Services flew daily services on the route Croydon-Shoreham-Deauville from 13 July 1935 until the end of August. On 1 July the Southern Railway opened Shoreham Airport Station opposite the air terminal, which remained open until 15 July 1940.¹³ In May 1936 Channel Air Ferries Ltd. was formed as a Shoreham-based subsidiary of Olley Air Services; it operated a daily service to Ryde in the Isle of Wight from 23 May until the end of September, and it also operated the Croydon-Deauville service from 11 July 1936 until the end of August. From 27 May until 15 September, Railway Air Services flew twice daily on a circuitous route from Liverpool to Shoreham via Birmingham, Bristol, Southampton and Portsmouth.

In 1937, similar services were operated, and in addition Jersey Airways operated a daily service to Jersey from 31 May until 10 October. During 1937, a total of 1,429 regular service flights used Shoreham aerodrome, and 6,308 passengers were counted. Similar services were operated by the same companies in 1938, but towards the end of the season Channel Air Ferries and Railway Air Services combined some of their flights, and in December the two companies joined to form Great Western

& Southern Airlines Ltd. with headquarters at Shoreham. The new company started regular services on similar routes on 3 April 1939.

The expansion of the R.A.F. Volunteer Reserve in 1938 caused the formation of No. 16 Elementary & Reserve Flying Training School at Shoreham, together with the Martin School of Air Navigation. Standard Air Ministry wooden huts were built as classrooms in the space between the clubhouse and the terminal building; some of these are still to be seen today.

The aerodrome was taken over again by the Air Ministry on the outbreak of war; the internal airline services ceased to operate but the Shoreham-Jersey service resumed after a short break and continued until June 1940. In addition, Shoreham became the terminal for flights to Britain by the neutral Belgian, Dutch and Danish airlines, which were moved out of Croydon for security reasons; these services naturally ceased when the Germans invaded the three countries. During 1940, the airfield was extended by closing Salts Farm Lane and taking in an area on the west side, including F.G. Miles's old landing field.

From October 1940, Shoreham housed an Air-Sea Rescue unit of the R.A.F., initially a detachment of No. 225 Squadron, which was expanded to become No. 277 Squadron.¹⁴ The Elementary Flying Training School moved out to Derby in 1941 when German intruders made training so close to the French coast unduly hazardous. Shoreham became a satellite of the fighter bases at Kenley and Tangmere from the spring of 1944, and housed No. 345 Squadron until D-day. The Air-Sea Rescue Squadron moved out to make way for its Spitfires, but returned in October 1944 until it was disbanded in February 1945. To accommodate the wartime inhabitants, numerous huts and other temporary structures sprang up around the airfield perimeter. Now remaining are a couple of 'Blister' hangers (both extended since the end of the war); various pill-boxes, air-raid shelters and a rifle range along the river embankment; and a curious hemi-spherical building in the north-west corner. The building (which may well be the last surviving example) housed an anti-aircraft gunnery trainer: the inside walls were painted black, and an optical projector on a balcony produced an image of an attacking aeroplane which was tracked by the trainee-gunner using a dummy gun mounted at the centre of the floor.

Shoreham aerodrome was transferred by the Air Ministry to the control of the Ministry of Civil Aviation on 12 March 1946, under the Labour Government's policy that airfields for an internal airline network should be publicly-operated. However, Shoreham never regained even its pre-war status as an airport for scheduled services. British European Airways never used it, and although independent airlines were allowed to operate as 'associates' of B.E.A. from May 1948, the first such service from Shoreham was by Island Air Services Ltd. to Deauville for three months in the summer of 1940.¹⁵ From 12 May 1951, East Anglian Flying Services Ltd. ran a Shoreham-Jersey service; from April 1953 it was granted a licence to operate the route Ipswich-Southend-Rochester-Shoreham-Jersey for seven years, and in May 1955 it received a six-year licence for a Portsmouth-Shoreham-Le Touquet service. The company's Doves did in fact operate services through Shoreham for the next few years but all scheduled services had ceased by 1959, if not earlier.

Meanwhile, the aerodrome had reverted to the control of the Joint Airport Committee on 15 August 1951, which leased it to F. G. Miles Ltd. This was a new company started by F.G. Miles after the collapse of his Reading-based Miles Aircraft Ltd., and it moved into Shoreham from Redhill in 1952, bringing a repair and overhaul business which soon blossomed into a fair-sized aircraft manufacturing

business, with subsidiaries in plastics and electronics. The first new aircraft design to fly from Shoreham was the Miles M.77 Sparrowjet on 14 December 1953, followed by the M.100 Student on 15 May 1957.¹⁶ More profitable work came from building plastic structures of various kinds—an experimental glider wing graced the central hall of the old terminal building for many years, and a derelict mould for making airfield radar aerials is still to be seen at one side of the main car park—and particularly from the manufacture of elaborate simulators for training aircrew on new types of aircraft. The company occupied most of the existing buildings on the airfield, and also took over the Aero Club which had re-started in 1946 and now reverted to its former name as the Southern Aero Club.

Major new building operations started after the aircraft business of F.G. Miles Ltd. was absorbed into Beagle Aircraft Ltd. in October 1960;¹⁷ a prefabricated modern drawing office took the place of various wartime huts between the terminal building and the Aero Club, and then a new factory building was erected on the west side of the pre-war hangar to build the Beagle range of aircraft. After building about 180 of the single-engined Beagle Pup trainer, as well as a number of B.206 twins and several other prototypes, Beagle Aircraft Ltd. was liquidated in February 1970.¹⁸ The factory was then unoccupied until November 1971 when the Miles influence returned to Shoreham again, this time in the shape of George Miles's company, Miles Aviation & Transport Ltd., from Ford.

FORD

The airfield which lies between the villages of Yapton and Ford was opened about the beginning of 1918 as a Training Depot Station of the Royal Flying Corps, and two night bomber Squadrons (No. 148 and 149, equipped with F.E. 2b.s) were formed there in March 1918; they were despatched to France in April and June.¹⁴ The official name of the airfield was Ford Junction (after the nearest railway station), but it was usually referred to as Yapton aerodrome by the R.F.C. It had the usual buildings of a Training Depot Station: headquarters building, Officers' Mess and Quarters, barrack block, workshops and garages, and seven hangars. These were of the standard pattern of the period: 100 feet wide by 170 feet long with doors at each end. Brick pillars supported a curved wooden roof on timber bowstring trusses, generally known as Belfast trusses. As on numerous other airfields, there were three pairs of hangars plus a single one. The whole group of buildings was compactly arranged on the outskirts of Yapton village, facing the flying field which was almost exactly 2,500 feet square, bounded on the north by the derelict Portsmouth & Arundel Canal, and on the south and east by straight boundaries drawn across the fields.

Three of the 1918 hangars, and some of the smaller buildings, still survive: one hangar is a Government store and the other two are occupied by engineering firms. Behind these three hangars is the base and part of the walls of another one, apparently of similar construction but with unusual dimensions—75 feet wide by 380 feet long. This building probably dates from mid-1918, when Ford Junction was one of a chain of airfields transferred to the United States Navy as training bases for a heavy bomber wing which was to train in southern England before joining the Inter-Allied Independent Air Force in France.¹⁹ The main aircraft assembly and repair base was at Eastleigh, which was occupied in July 1918, and the training bases were at Southborne, Tangmere, Ford Junction, Rustington and Goring-by-Sea,²⁰ although it is believed that Ford Junction was the only station which became operational, and then only with a handful of trainers loaned by the Royal Air Force in place of



PLATE 1: One of the remaining aircraft hangars built c. 1918 at Ford aerodrome, now used by an engineering company.

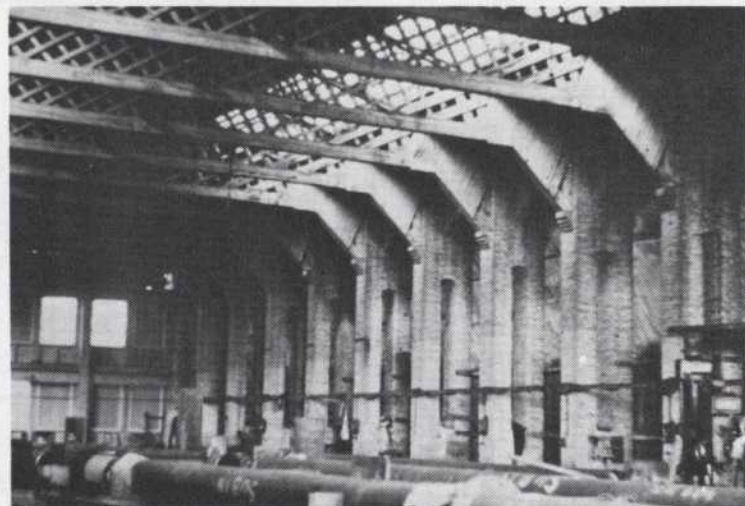


PLATE 2: Interior of 1918 hangar at Ford showing wooden 'Belfast truss' roof supported on brick pillars.

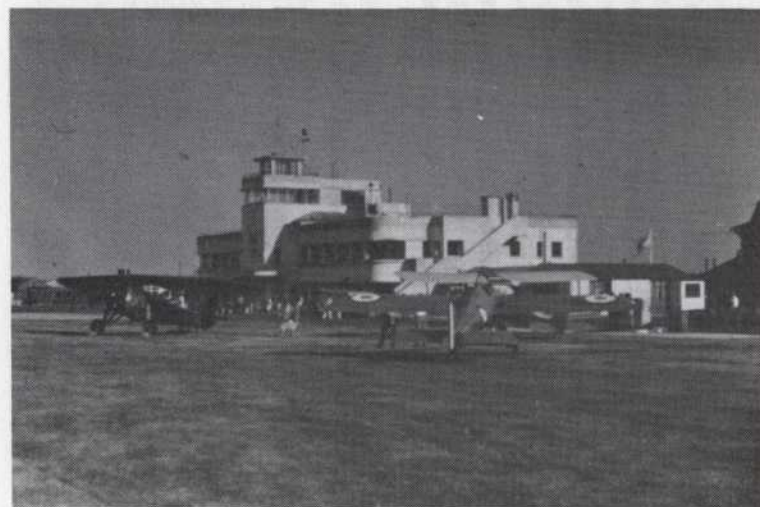


PLATE 3: Air terminal of Shoreham Municipal Airport, built 1934-35.

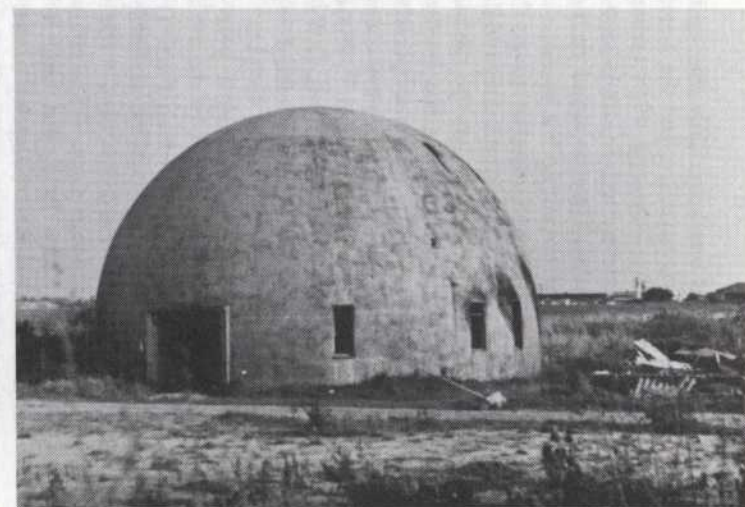


PLATE 4: Anti-aircraft gunnery trainer on north side of Shoreham aerodrome.

the intended bombers. With the signing of the Armistice in November 1918 the whole plan was cancelled, and the Americans soon departed. The R.A.F. re-occupied the station in February 1919; several squadrons were disbanded there, whilst No. 97 Squadron moved from France in March to re-equip with D.H.10 aircraft for service in India. They departed in the autumn, and the last R.A.F. unit seems to have closed at the end of the year.

The airfield then reverted to grazing, and the buildings were used for various agricultural activities, until the middle of 1930 when a small company known as D.W. Aviation (owned by the well-known pilot Dudley N. Watt) moved from Brooklands and took over the southernmost pair of hangars. D.W. Aviation was primarily a joy-riding concern operating Avro 504Ks along the south coast beaches, but it had recently built a biplane trainer with unusually docile flying characteristics and a very low landing speed.²¹ The recently-formed National Flying Services Ltd. had expressed an interest in this D.W.2 design for training at its several flying clubs, and the move to Ford was intended to provide space to build the D.W.2 in quantity. However, this never came to pass: D.W. Aviation remained a small joy-riding company which faded away a year or two later.

In 1931, the executives of the Ford Motor Company at Dagenham were charged with finding a site at which Ford Trimotor airliners shipped from the associated American company could be assembled for sale in Europe, and some happy inspiration suggested Ford Junction – thenceforth officially known as Ford Aerodrome – as the appropriate place.²² The company took over the two hangars and some other buildings in July 1931, but only a handful of Ford Trimotors were imported before the American company ceased building airliners in 1932. The operation of the aerodrome then passed to Rollason Aviation Ltd. who moved its small flying school down from Croydon in June 1932 when elementary training flights were banned from the then London Airport. Rollason Aviation operated the South Downs Aero Club, subsequently the Yapton Aero Club, which continued to fly at Ford until November 1938 when it was banished to Portsmouth.

In 1934, control of the airfield passed to Sir Alan Cobham's company, National Aviation Displays Ltd., and it became the headquarters for his 'flying circus' which toured the country during several summers. By 1936, Sir Alan Cobham had formed Flight Refuelling Ltd. to develop methods of mid-air refuelling intended to extend the range of transport and bomber aircraft. Ford thenceforth became the base for experimental flying, which culminated in transatlantic flights by Imperial Airways flying-boats in 1939 and 1940: the flying-boats were refuelled over Ireland and Newfoundland by Handley-Page Harrow tankers fitted out by Flight Refuelling Ltd.²³

All these activities used the original buildings near Yapton village, but in December 1937 the airfield was re-acquired by the Air Ministry under the Expansion Scheme. The 1938 Air Estimates included an allocation of £109,000 for a hutted camp and hangars for the School of Naval Co-operation to be formed at Ford. This entirely new station was built on the eastern side of the airfield, whose boundaries were now extended to the roads on the south and east. The huts were standard Air Ministry wooden huts, and the hangars were the 'Bellman' type – these were introduced in 1938 as a mass-produced all-steel shed covered with special easy-fix corrugated sheeting intended to make the sheds readily transportable. The Bellman hangar was 95 feet wide by 180 feet long, and was replaced after 1940 by the 'T.2' shed, 115 feet wide by 240 feet long, one of which survives at Ford just to the east of the 1918 hangars. Some of the wooden huts of the 1938 station are still to be

seen, now forming part of H.M. Prison, Ford; the Bellman hangars have been cleared away.

The School of Naval Co-operation, along with the rest of the Fleet Air Arm, was transferred to the Admiralty in January 1939, and Ford was commissioned as H.M.S. *Peregrine*; the characteristically elaborate flagstaff outside the Prison headquarters probably dates from this period. By the outbreak of war, the station housed the Royal Navy's Air Observers' School, equipped mainly with Percival Proctors, whilst Flight Refuelling Ltd. continued its experimental activities on the Yapton side of the airfield. On 18 August 1940, Ford was heavily bombed by the Germans, under the impression that it was an R.A.F. fighter base, and a number of hangars were destroyed on both sides of the airfield. Flight Refuelling Ltd. was evacuated to Cheltenham, and the Air Observers' School was transferred – part went to Arbroath in Scotland, and part to Trinidad in the West Indies.

One flight of No. 23 Squadron equipped with Bristol Blenheim night fighters moved into Ford in September 1940, presaging the return of the station to the R.A.F. in October. For the rest of the war, Ford was primarily a home for night fighters: the Blenheims were replaced by Douglas Bostons and Havocs (including some with searchlights in the nose) and then by Bristol Beaufighters and De Havilland Mosquitos. Tarmac runways were laid out in 1941,²⁴ and the usual collection of 'temporary' buildings of various kinds were erected around the airfield during the war. A considerable number of these are still extant, including several blister hangars.

Ford became the home of the Fighter Interceptor Unit,²⁵ formed at Tangmere in April 1940 and moved to Shoreham in August after a heavy air-raid. It arrived at Ford in January 1941 with the task of developing operational techniques for radar-equipped night fighters; night fighter squadrons were formed or re-equipped and trained at Ford before moving to other bases. As targets over England declined, the squadrons turned to intruder flights over Europe, both by night and day. In the spring of 1944 the F.I.U. and the night fighters moved out temporarily to make way for squadrons of Mustang and Spitfire fighter-bombers supporting the invasion of France. The F.I.U. returned in August, was renamed Fighter Interception Development Squadron in October, and was transferred to Tangmere in February 1945.

By this time, the Royal Navy had returned to Ford, and in August 1945 the station reverted to Admiralty control and became H.M.S. *Peregrine* again. Thenceforth its principal function was to serve as a shore base and training establishment for squadrons temporarily disembarked from aircraft carriers, whilst the original 1918 buildings housed the Service Trials Unit which introduced new types of aircraft into naval service.²⁶ Flight Refuelling Ltd. also returned to Ford after the war, and converted several Lancaster bombers into tankers which were used to support a series of experimental services to Bermuda by British South American Airways between May and October 1947.

Flight Refuelling Ltd. transferred its activities to Tarrant Rushton aerodrome in Dorset in June 1948, and most of the naval squadrons also moved out to allow the airfield to be re-constructed. Between mid-1948 and 1951 the runways were re-laid in concrete and extended for jet fighters, and three large new steel hangars were built. However, the main living accommodation throughout the post-war period remained in wooden huts of various vintages; the building of a new Petty Officers' Mess in 1956 was probably intended as the first stage of a rebuilding programme, but this was not to be. The Naval Estimates for 1958 announced plans to concentrate the activities of the Fleet Air Arm at a smaller number of bases, and H.M.S. *Peregrine* at Ford was closed early in 1959.

As already mentioned, the main part of the station near Ford village was transferred to the Prison Commission; the control tower and the Bellman hangars in that area were demolished, but most of the other buildings were retained, including one small hangar of Admiralty design which seems now to house the heating plant. On the western side of the airfield, the runway was cut through to allow restoration of the main road (A2024) from Littlehampton to Yapton, and the 1918 barracks, headquarters and Officers' Mess buildings were demolished and the site used for housing. Other buildings on the airfield were designated as an industrial estate: the major occupants being Kendellstone Ltd. which uses the two large hangars of 1951 on the north side for manufacturing concrete blocks. The other 1951 hangar, in the south-east corner, was used by Miles Aviation & Transport (R. & D.) Ltd. from about 1964 until 1971, which also leased the remaining parts of the runways. This company, managed by Mr. G.H. Miles, has been concerned with aircraft overhaul and modification and has also built several replicas of historic types of aircraft for film purposes.²⁷ When it moved to Shoreham in November 1971, flying ceased at Ford for the fourth time; it remains to be seen whether this proves to be the final closure.

REFERENCES

I am indebted to Mr. D.L. Brown, Mr. J.J. Halley, and to the Fleet Air Arm Museum at Yeovilton for verification of various details, but for the most part this article is based on secondary sources. For this reason, I have cited references only in cases where these provide significant extra information on the particular topic. The dates quoted have mostly been taken from contemporary issues of the weekly aviation magazines, *Flight* and *The Aeroplane*.

- 1 R. Dallas Brett, *History of British Aviation 1908-1914* (1934), p. 8. Dallas Brett implies that Piffard's tests were made at the site of the present aerodrome, but I have so far failed to confirm this. Some details of Piffard's aeroplane, and a subsequent float-plane built at Shoreham in 1912, will be found in Peter Lewis, *British Aircraft 1908-1914* (1962.) 392-3.
- 2 Dallas Brett, *op. cit.*, p. 22; also *Flight*, Vol. 3, 13 May 1911, pp. 414-5.
- 3 *Flight*, Vol. 3, 1 July 1911, pp. 570-1.
- 4 Dallas Brett, *op. cit.*, p. 29; also *Flight*, Vol. 3, 8 July 1911, pp. 595-8. The course for this race was Paris-Liège-Utrecht-Brussels-Calais-London-Calais-Paris. Dover and Shoreham were intermediate stops between Calais and London on the outward leg (2 July) and on the return (5 July). Of 43 pilots who started the race, 9 finished, several of whom had replaced their aircraft after crashes en route!
- 5 For details of these aircraft, see Lewis, *op. cit.*, pp. 79, 342, 381, 543-4. The activities of the Avro Flying School at Shoreham are covered in A.J. Jackson, *Avro Aircraft Since 1908* (1965), pp. 31-70.
- 6 D.L. Brown, *Miles Aircraft since 1925*, (1970), p.3. I have been unable to locate this field exactly; Mr. Brown tells me that it was near the Manor House, owned by one Stephen Easter.
- 7 D.L. Brown, *op. cit.*, pp. 45-52. The last surviving Miles Martlet is now owned by the Shuttleworth Trust at Old Warden aerodrome near Biggleswade, and is being rebuilt to flying condition.
- 8 Municipal councils were given powers to establish aerodromes in 1920, but none were founded until it was agreed in 1929 that aerodrome works could qualify for grants from the Unemployment Grants Committee. In most cases (as at Southampton and Portsmouth) the main incentive for a municipal aerodrome was the expectation of attracting an aircraft factory to the site, but this did not happen at Shoreham. F.G. Miles was the obvious candidate, but he had joined forces in 1933 with Phillips & Powis Ltd. to start a factory at Reading to build the very successful Miles Hawk series of light aircraft.
- 9 D.L. Brown, *op. cit.*, pp. 18-19.
- 10 *The Aeroplane*, Vol. 45, 6 September 1933, p. 426.
- 11 Information on pre-war airlines services is taken from the Air Ministry *Annual Reports on Progress of Civil Aviation*. Weekly statistics on the number of passengers carried by the

- Isle of Wight service were published for some time (in 1933) in *The Aeroplane*.
- 12 *The Aeroplane*, Vol. 49, 25 September 1935, p. 392
- 13 H.P. White, *Regional History of the Railways of Great Britain*, Vol. 2, Southern England (Newton Abbot, 1969), 100-101. The station was originally opened in 1910 with the name of Bungalow Town Halt, but had been closed when the line was electrified in January 1933.
- 14 For information on military activities, I am indebted to Mr. J.J. Halley, leader of Air-Britain's Airfield Historical Research Group. They have transcribed and collated a large amount of information from records in the Air Historical Branch of the Air Ministry and other sources.
- 15 *The Aeroplane*, Vol. 80, 1 June 1951, p.668. There does not seem to be a convenient source for information on the routes operated by the smaller post-war airlines, comparable to the Air Ministry Annual Reports cited above. The details given here are taken from various issues of *Flight* and *The Aeroplane*.
- 16 D.L. Brown, *op. cit.*, pp. 346-52.
- 17 The electronics and plastics manufacturing activities were hived off to separate companies before the amalgamation, and have continued under various names, centred on F.G. Miles Engineering Ltd., Riverside Works, Old Shoreham Road, Shoreham.
- 18 P.R. March, 'Epitaph to the Beagle Pup', in *Aircraft Illustrated*, Vol. 4 (1971), 68-73.
- 19 The U.S. Navy's Northern Bombing Group operated from bases in France with De Havilland 4 light bombers in the closing weeks of the war, but the proposed heavy bomber wing never became operational. The Assembly & Repair Base at Eastleigh did receive engines and airframes for repair, but the larger part of its purpose was to assemble American-built bombers, which did not materialise before the end of the war.
- 20 Of the other stations, Tangmere was an existing R.A.F. station (and remains so today), but Southborne, Rustington and Goring-by-Sea were built for the Americans. At Southborne (grid reference SU 768063) an industrial estate grew up on the site, and a few 1918 buildings can still be identified, whilst most of the airfield itself is now used as school playing-fields. Rustington (TQ 057024) was developed as Rustington Sea Estate from the mid-1920s onward, and the tall water-tower is the only obvious remnant of the original airfield buildings. However, the estate roads still follow the alignment of the original camp roads in part, and Mr. H. J. F. Thompson has pointed out to me that a bungalow at 2 Sea Avenue is in fact a conversion of the original guard-room, and that a house now called 'Nortons' (1 Pretson Avenue) is built round the erstwhile Officers' Mess. Four of the hangars formerly at Rustington were acquired by Osborne's, the Littlehampton boatbuilders, and about 1922 were re-erected side-by-side on the banks of the Arun, at Arun Wharf, River Road; they are now occupied as warehouses by Ockendens Ltd., builders' merchants. At Goring-by-Sea (TQ 115033) nothing remains; the whole airfield site has been covered within recent years by a housing estate.
- 21 *Flight*, Vol. 22, 23 May 1930, pp. 555-8.
- 22 *Flight*, Vol. 23, 16 Oct. 1931, pp. 1044-6. This article makes it clear that the possibility of building Ford Trimotors at Ford was seriously considered at this time.
- 23 *Flight*, Vol. 68, 23 Dec. 1955, p. 943-6, gives a short history of Flight Refuelling Ltd.
- 24 Hard runways were introduced at nine R.A.F. stations in 1939, but it was not until March 1941 that it became official policy to have paved runways at fighter bases. The standard for night fighter airfields was then established as one 1,400 yard main runway in the direction of the prevailing wind and two 1,100 yard subsidiary runways. Ford is unusual in having only two runways, presumably because the existence of two large groups of hangars made it too difficult to lay out a third. The NE/SW runway was finally 2,000 yards long, extending across the A2024 road, and the NW/SE runway was 1,500 yards long, but I do not know the original dimensions.
- 25 C. Martin Sharp and Michael J. F. Bowyer, *Mosquito* (1967), pp. 452-3.
- 26 *The Aeroplane*, Vol. 91, 12 July 1957, pp. 45-6.
- 27 Allen Wheeler, *Building Aeroplanes for 'Those Magnificent Men'* (1965) pp. 44-59.

POSTSCRIPT: Since this article went to press, I have been in correspondence with Mr. Fred D. Fagg, jr., who was stationed at Ford Junction from 26 Sept. to 17 Nov. 1918. Ford Junction was in fact occupied by the U.S. Army Air Force, rather than the Navy. Two bomber squadrons were based there, and would have made raids on German targets (making a refuelling stop at Dover) if their Handley-Page bombers had been delivered. In fact, they made training flights over southern England using trainers obtained from the British and French services. Mr. Fagg confirms my belief that the other airfields mentioned in note 20 were not occupied by the Americans before the end of the war.

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