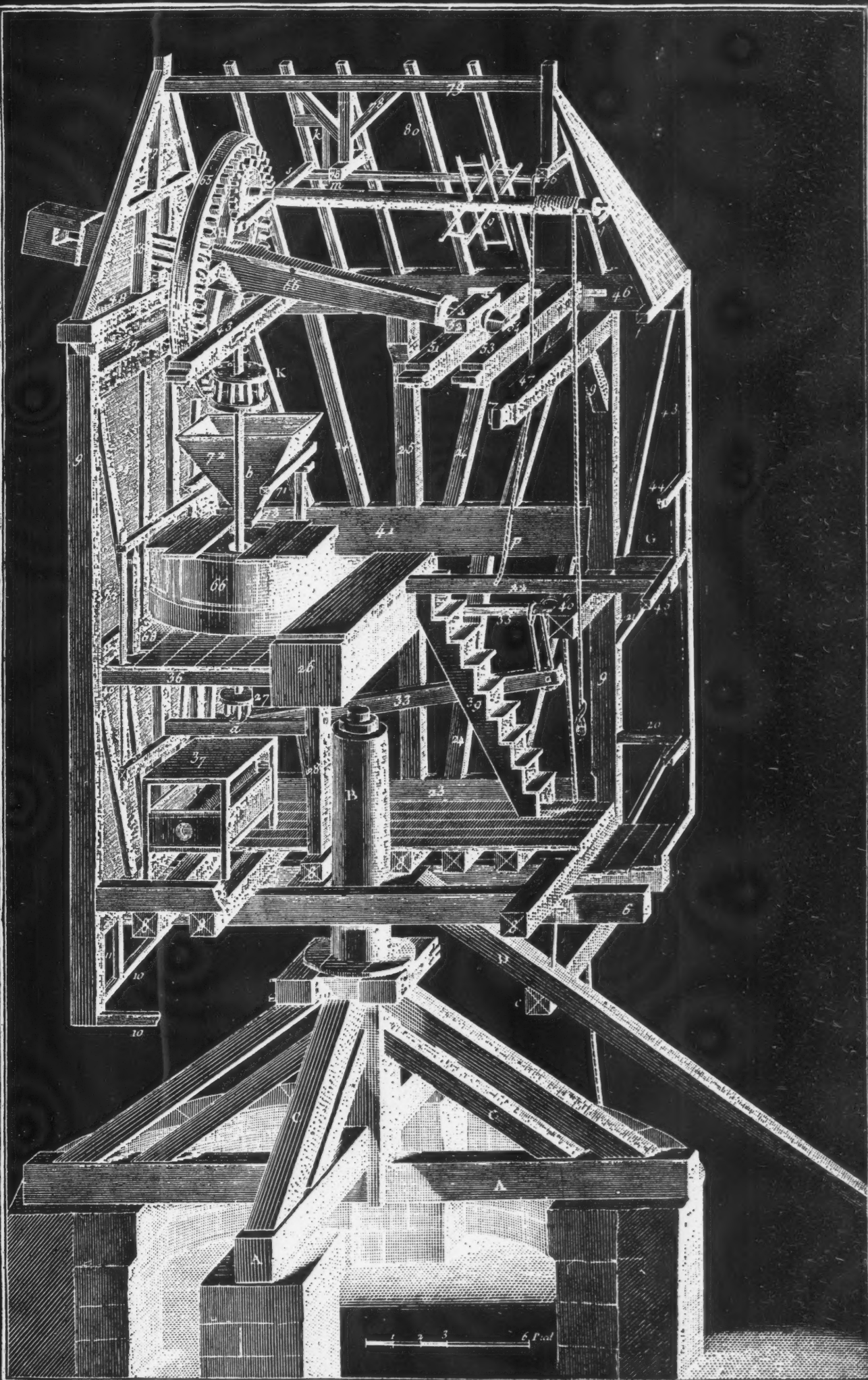




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Windmills in England

WRITTEN AND ILLUSTRATED BY REX WAILES 62-88

WINDMILLS IN EARLY ENCYCLOPÆDIAS (Diderot & d'Alembert 1765, Krünitz 1820, van Natus 1734) 65-68

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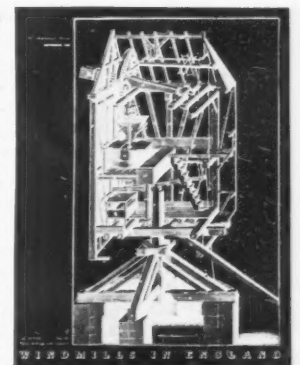
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Vol. XCIII No. 585

THREE SHILLINGS AND SIXPENCE

THE COVER.

Diderot and d'Alembert's *Encyclopédie* with its exquisitely engraved folio plates has once already been used for a cover. The nerve-man of the November 1944 cover is the work of the same group of skilful and careful artists to whom this drawing of the inside of a windmill is due. There is still today no better drawing of a windmill in existence. What it shows is a sixteenth century post mill which is explained in more detail on page 65.



SEPTEMBER 1945



Pakenham Mill, Suffolk

WINDMILLS IN ENGLAND



This number has been written by Rex Wailes. The author has also selected all illustrations and taken most of the photographs from which they were reproduced. He is a mechanical engineer and the leading expert on windmills in this country, adviser on windmills, amongst other things, to the Society for the Protection of Ancient Buildings. He has for years travelled round to visit windmills in Britain and abroad, and to study the economic and technical possibilities of their survival. To him a windmill is neither a beauty spot nor a memorial of a quaint past, but a piece of workable machinery, as functional as a clock in its body and fittings. The problem, however, lies in that it is—at least in England—nearly always a piece of old-fashioned machinery, incapable of standing the competition of power-milling. At the end of the number the reader will find Mr. Wailes's suggestions as to how a new lease of life might be given to certain English windmills.

"Along the flat horizon there arise the frequent venerable towers of churches. He sees at the end of airy vistas the revolution of the windmill sails. He may go where he pleases in the future, he may see alps and pyramids, and lions, but it will be hard to beat the pleasure of that moment. There are indeed few merrier spectacles than that of many windmills bickering together in a fresh breeze over a woody country, their halting alacrity of movement, their pleasant business making bread all day with uncouth gesticulations, their air gigantically human, as of a creature half alive, put a spirit of romance into the tame landscape. When (the traveller) sees them first he falls immediately in love, and from that time forward windmills keep turning in his dreams."

R. L. STEVENSON, *"The Foreigner at Home."*

preamble

"FITNESS or the proper adaptation of means to an end is the great source of the relative beauty of forms." Thus, Sir Thomas Dick Lauder in 1842, quoted in THE ARCHITECTURAL REVIEW in April, 1944. It explains the attraction of windmills to many laymen. But why, if so many like them, do so few know about them? Their origin, development and future in this country should be the concern of a much wider circle than is at present the case. To the average town-dweller the windmills are merely part of the landscape and mean nothing in particular unless his attention has been especially directed to them. Yet the appeal of the windmill is many sided—æsthetic, economic, mechanical, structural and historical—and like the steam locomotive "there is no mistaking its purpose or the means by which it does its work."*

distribution and decline

In their hey-day there may have been as many as ten thousand windmills at work in England at one time.

* W. J. Gordon: *Our Home Railways*.

To-day there are less than one hundred, including the marsh mills used for drainage on the Broads of Norfolk.

The location of this once mighty army was conditioned by two main considerations: first by the existence of good corn country and secondly the necessity to drain land. The corn windmills were naturally most plentiful where land was fairly level and water power lacking; that is, broadly speaking, east of a line drawn from Newcastle to Portsmouth. A fair number were to be found scattered over the remaining Midlands and Southern Counties, and they were fairly numerous also in Somerset, Wirral, the Lancashire Fylde and Anglesey, the granary of Wales. To-day they are to be found at work only in Lincolnshire, Nottinghamshire, Norfolk, Suffolk, Cambridgeshire and Kent, while Sussex has only three, Yorkshire and Essex two each and Derbyshire, Leicestershire and Surrey one each. Of the two thousand or more that once drained the Fenland less than half a dozen dwarf examples remain; the rest have been ousted by steam, oil and electricity. The corn windmill has been driven out of existence by other sources of power at the very time when it was at its best. In addition, agricultural depression, the depopulation of the countryside, restrictive legislation and the competition of the big port mills have killed the trade of the windmill to such an extent that between the two German Wars they went out of use at the rate of about one a month. As to the millwrights capable of repairs and renewals to windmills there are not a dozen firms left in the country.

origin

The windmill was unrecorded in Western Europe at the time of Domesday Book, and the mills mentioned

therein were either watermills or cattle mills. The earliest references to windmills in England occur late in the twelfth century, when they were evidently a curiosity. Each is specifically distinguished as "molendinum ad ventum" as opposed to the usual "molendinum." Under the laws of milling soke mills could only be erected by the lord of the manor, and all corn had to be ground in the manorial mill. This encouraged the erection of costly water and windmills by eliminating wasteful competition and price cutting. It was responsible for an early and amusing account of the infringement and of the subsequent demolition of the offending windmill in *The Chronicles of Joycelyn*, quoted in translation by Carlyle in his "Past and Present," and is one of the earliest authentic references to a windmill in England (see this month's *Anthology*).

One hundred years later the windmill begins to appear in illuminated manuscripts; a distinction only given to familiar objects.* Mediæval representations of windmills occur also in other works of art. Thus there are a carved bench-end at Thornham, Norfolk, a memorial brass at King's Lynn, Norfolk, a stained glass quarry at Stoke-by-Clare, Suffolk, a boss in Norwich Cathedral, and a carving in granite at Launceston, Cornwall, to name but a few, 2, 3, 4, 5, 6.

the post mill

The windmill as we know it seems to have appeared in Western Europe at the beginning of the twelfth century; but early references are scarce, many are apocryphal and they do nothing to throw light on the origin of the windmill. The early representations make it clear, however, that the earliest European windmill is of the type known as the "post mill," 7, also page 65. A box-like timber body, carrying the sails and containing the machinery is mounted on a massive upright oaken "post," 8, 9, on which it can turn. The weight is taken by diagonal "quarter-bars" mortised into it about half-way up and held to the two horizontal "cross-trees" below by bird-mouth joints. To steady the post it is quartered over the cross-trees, which rest on piers but are not fixed to them in any way.

Socketed on top of the post like the top stroke of a T is the "crown-tree," on which the body of the mill is built and with which it is free to turn round. Page 65 shows the body raised off the post revealing the form of the bearing. Two horizontal "side girts" rest on the end of the crown-tree; these carry a corner post at each end. The sides of the mill are formed by uprights and braces, the roof is framed up in the usual manner and two stout horizontal "sheers" run fore and aft on either side of the post below the bottom floor to support the central upright in the "breast" of the mill and to steady the body of the mill about the post by forming a bearing or carrying a "collar," which turns round it and prevents the mill from swaying. The whole framing of the mill is covered with weatherboards, which were occasionally

plastered inside and, in England, often painted white. The early mills were lighted by shuttered openings in the weatherboarding; later, glazed windows were used and in some cases were of considerable size. Access to the mill body is obtained by a ladder running from a platform at the tail of the bottom floor to the ground. The inclined windshaft in the top of the mill carries the sails, and the mill is turned into the wind by means of a "tail pole" fastened to the sheers and passing through the ladder. The substructure is protected from the weather by a "roundhouse," which has no structural significance though it serves as a useful storage space. In a very few cases the roundhouse has an iron-faced "curb" on the top, on which run rollers fixed to the bottom of the lower floor of the mill body, in order to prevent it from pitching, 72. Roundhouses are usually of brick, with boarded and felted roofs; but examples were to be found in wood, stone, and even clay lump, while roofs were tiled, slated, or occasionally thatched. The roundhouse is not attached by its rafters to the post of the mill; the weatherboarding of the mill body is therefore usually extended downwards to form a petticoat, 87, which overlaps the top of the roundhouse roof. In some cases, however, a small round petticoat is provided, 62, while in others, where there is no roof to the roundhouse, a built-out petticoat itself forms the roof, 72 and 19. The most satisfying æsthetically were some in West Suffolk of brick and flint with tiled roofs, looking as though they had grown out of the ground on which they stood, 64. In most cases the roundhouse was a later addition; but in some nineteenth century East Suffolk post mills they are coeval with the mill, 67, contain three floors and are as high as the body of the mill proper, 66.

Early post mills were small, the pent roof was straight and the weatherboarding, which covered the framework, was wide. The only example of this sort surviving in England stands at Bourn in Cambridgeshire, 81. From its appearance I decided that it was of early seventeenth century date. After independent research had confirmed that it was in existence in 1636 the mill was bought and repaired by Mr. Alfred Bossom, M.P., and presented to the Cambridge Preservation Society. This was done out of funds raised by the exhibition of Epstein's *Genesis* in the house known as *Finella*, Cambridge.

Mills of a later date have curved roofs to accommodate larger gears and corn bins in the top. The oldest of this kind still at work in this country is at Outwood in Surrey and was built in 1665, 86. It was given a pair of new sails in 1931 at the expense of the Windmill Section of the Society for the Protection of Ancient Buildings. A few years later I was able to present it with a couple of good second-hand sails from the post mill at Fornsett End, Norfolk, which had been pulled down.

Porches give great character to a post mill, but many mills have none, 81 and 94. The simplest porch is no more than a narrow lean-to, 28, 62, 63, 64, 68 and 84, some have pent roofs, 7, some have a flat curve, others

* The earliest known illustration of a windmill is to be found in the so-called Windmill Psalter in the Morgan Collection.



3



4



5



6

WINDMILLS IN MEDIAEVAL ART

3, boss in Norwich Cathedral cloisters. 4, carving in granite on the exterior of St. Mary Magdalene Church, Launceston, Cornwall. 5, stained glass quarry in Stoke-by-Clare Church, Suffolk. 6, bench-end in Thornham Church, Norfolk. The head-piece on the previous page is from the Flemish memorial brass to Adam De Walsoken, St. Margaret's Church, King's Lynn, Norfolk.

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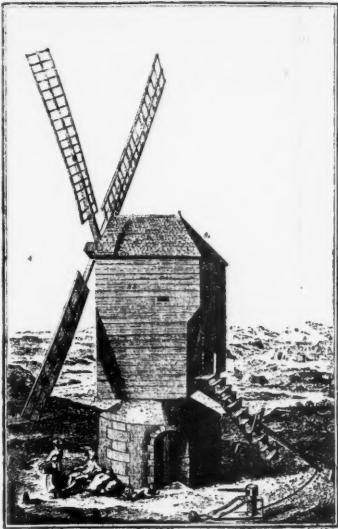


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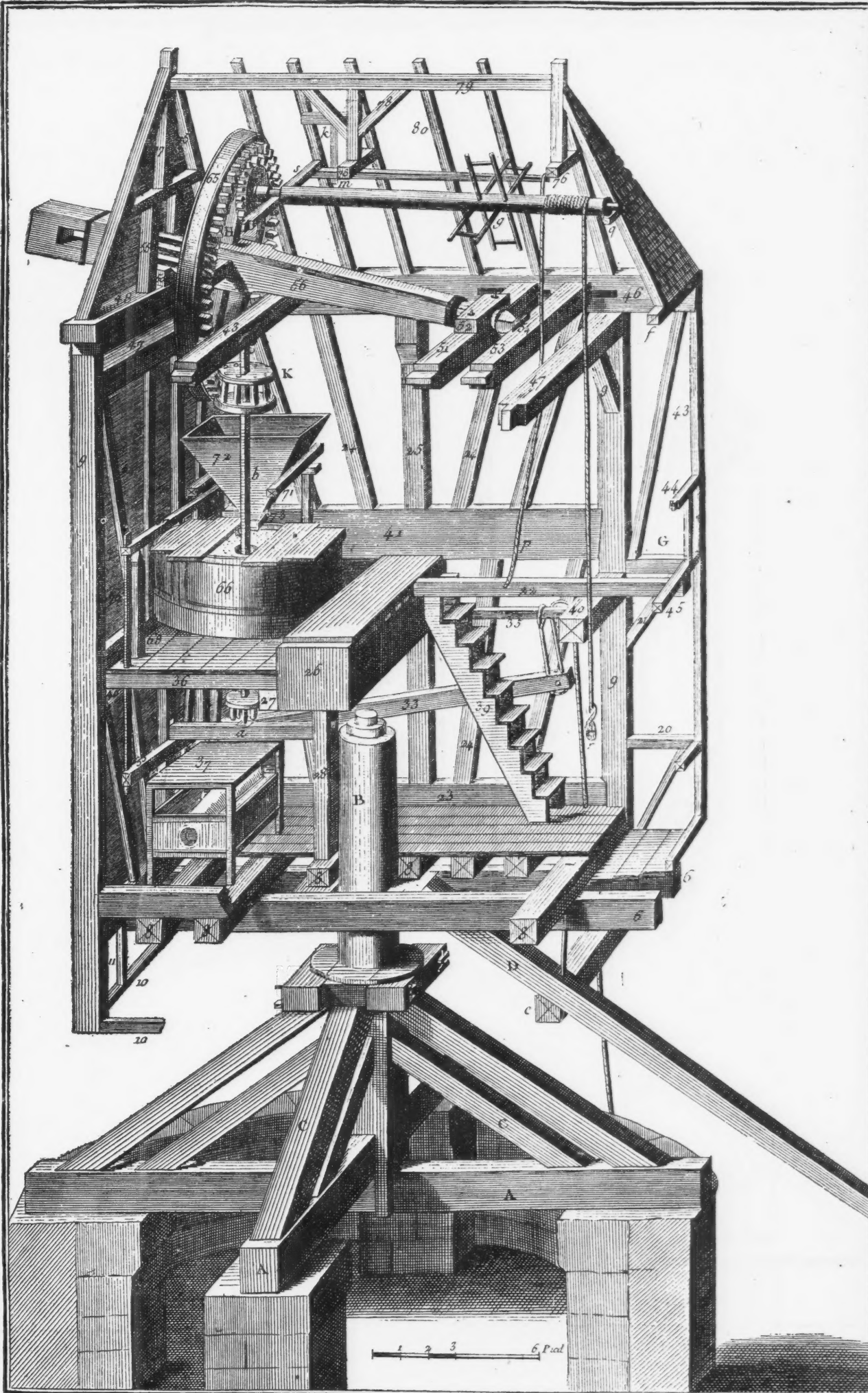


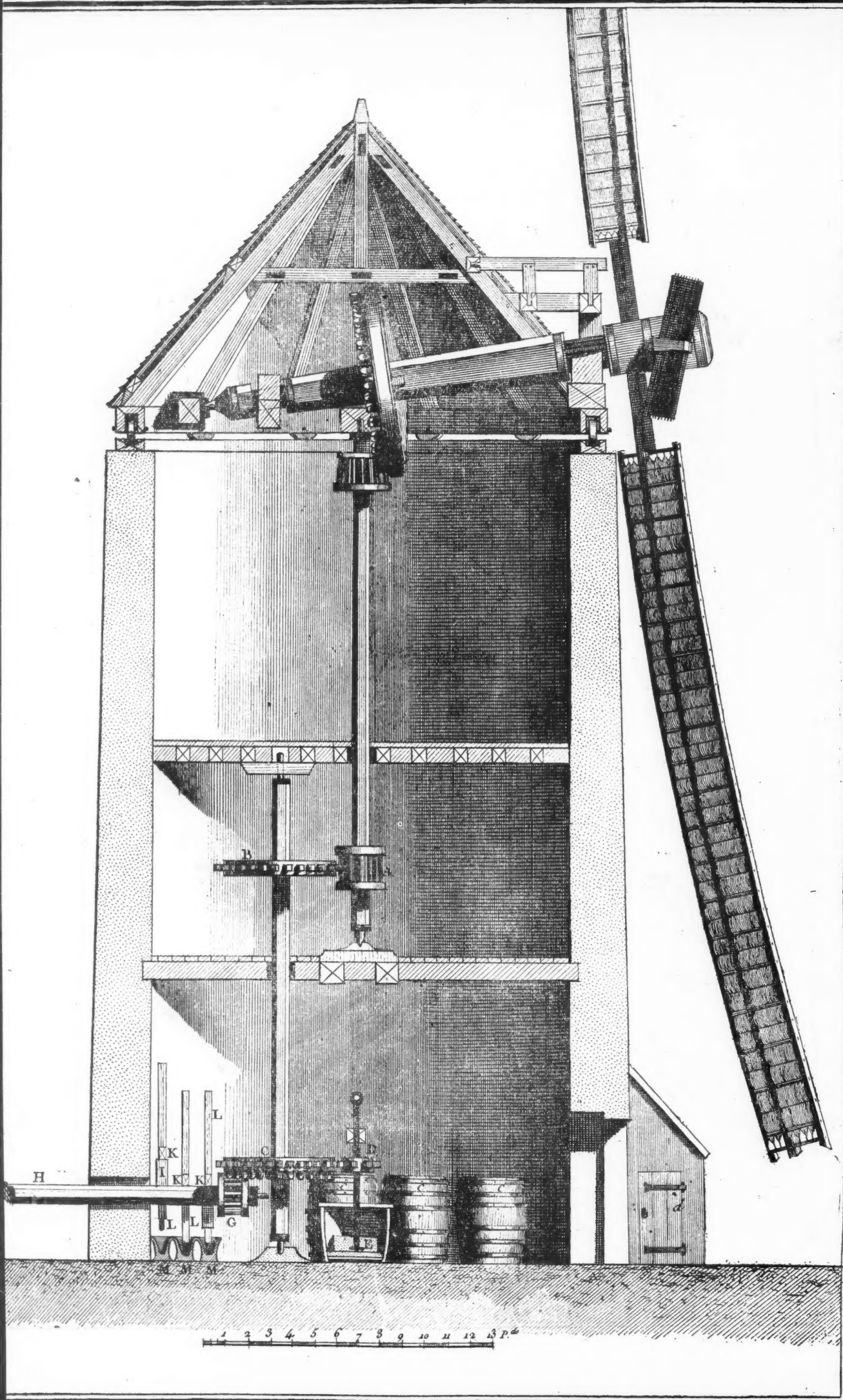
DIDEROT'S WINDMILL

No English work gives a complete description or scale working drawings of any normal type of windmill, and for such illustrations continental sources must be relied upon. The earliest technical description of a "post mill" is to be found in an early eighteenth century French work accompanied by some rather crude diagrams. The whole description is quoted in Diderot's "Encyclopédie des Sciences," 1765, and the diagrams are completely and accurately redrawn. They show a seventeenth century post mill of the general type illustrated in nineteenth century prints of Paris. The sails have a constant angle of weather and the cloths are laced in and out of the sail bars, and are spread by being pulled outwards from the centre like a curtain. This type of sail has survived down to the present day on Cape Cod, U.S.A.; but elsewhere was superseded by what in England is called the "common sail" with a twist or "weather" in it somewhat in the manner of a propeller. A feature common to all continental mill design is that the ladder does not rest on the ground and form a back-stay for the mill as in England, but is held up off the ground by the tailpole.

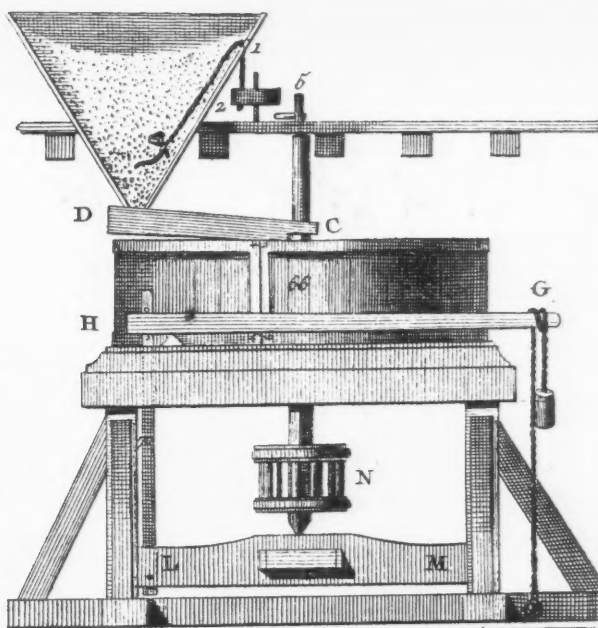
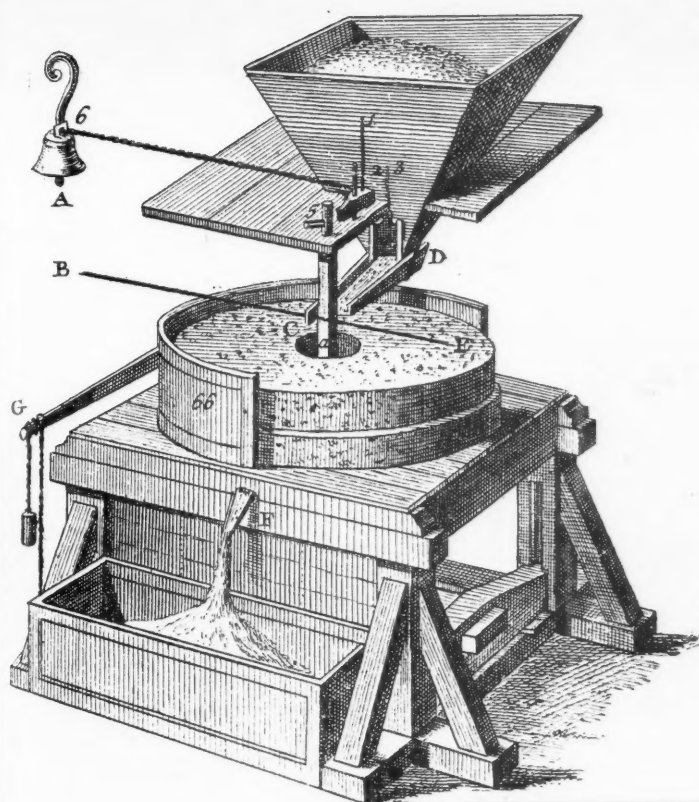
The perspective section shows the body raised up off the post B, and the sails and ladder removed. The stepped bearing on the top of the post is well shown as is the collar below the bottom floor which normally fits between the "sheers," 6. Below it are the quarterbars, C, which are doubled as in the normal continental practice, unknown in England. It will be seen that the crosstrees, A, supporting the quarterbars, rest on the stone piers and are not attached to them in any way, while the round house, which encloses the substructure, has no structural significance.

The mill drives a single pair of stones, 66, "overdrift" direct from the "brakewheel," H, no bins are provided for storage, the sacks of corn being raised to the "stone floor" by means of the "sack hoist," M, and shot into the hopper, 72, by hand. This sack hoist is also driven by the brake wheel when required and the object resembling a skein-winder, G, towards the rear of the sack hoist shaft, is for the operation of the hoist when there is no wind. The corn when ground into meal passes direct to a flour dressing machine or "bolter," 37, of a type long obsolete. The construction of the mill body built up from the "craintree," 26, "sidegirts," 41, and corner posts, 9, is most ingenious, and if correctly constructed is well balanced and not difficult to turn by means of the tailpole, D.





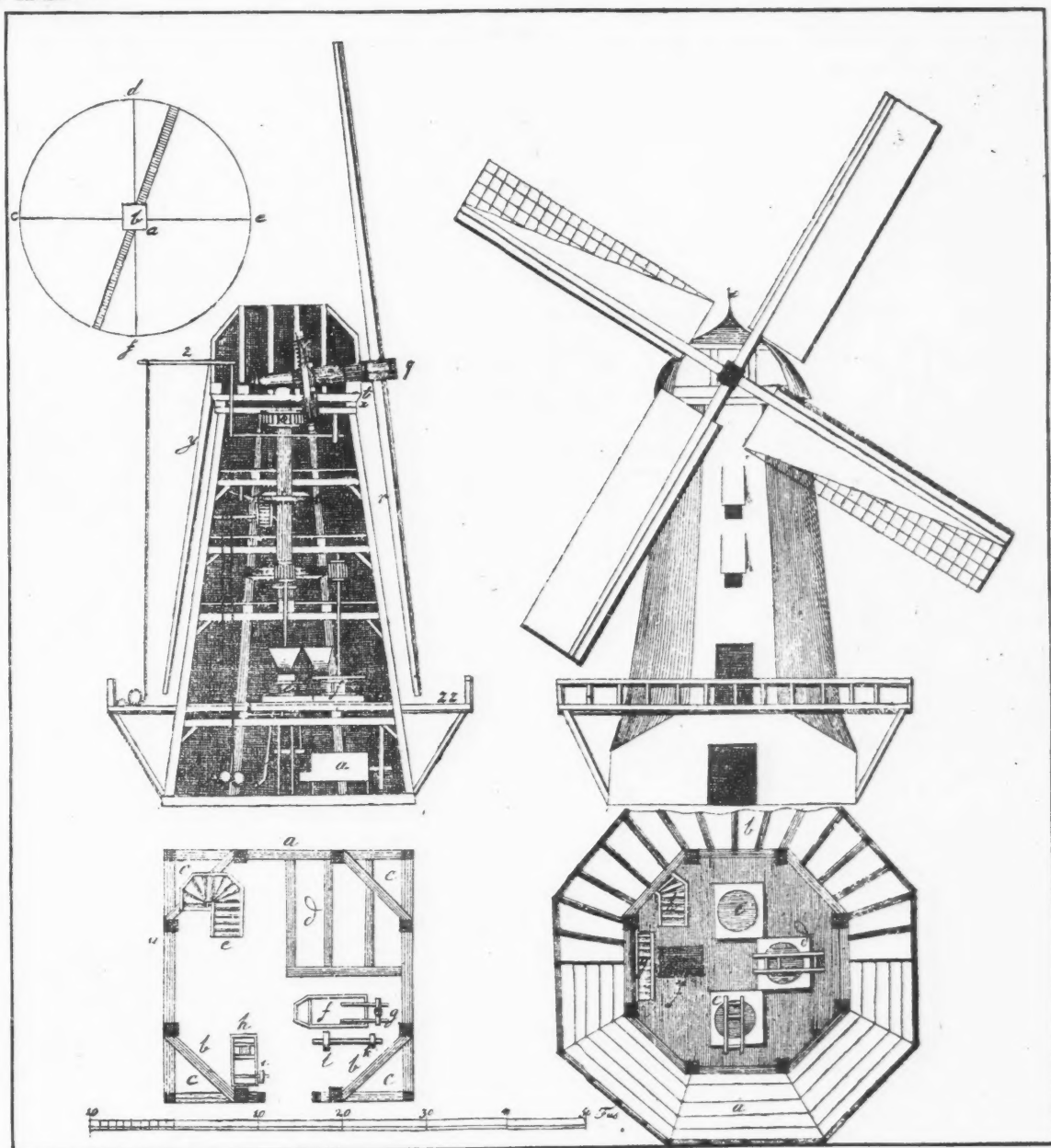
The "tower mill" shown here is also taken from Diderot. It is not a corn mill, but was used to operate a mortar mill and a mixer. The "cap," which is conical with a gable at the breast, is mounted on a "curb" on top of the mill towers and this arrangement is known as a "live curb," as opposed to a "dead curb" where blocks instead of rollers are used. The windshaft is set at an angle to the horizontal so that the effect of the wind pressure may be taken by a thrust bearing at its tail. It also enables the sails to clear a tower with a considerable batter. The "neck journal" at the front of the windshaft was formed, as can also be seen in the case of the post mill, by letting strips of wrought iron into the shaft to form a bearing surface. Had the journal not been armoured in this way the timber would have worn through rapidly. The brake wheel drives a "wallower" (the first driven wheel in a mill) and lower down the "upright shaft" another "lantern pinion" drives another "trundle gear." Later, bevel gears replaced the lantern wallowers, and spur gears replaced the lantern pinion and its mating wheel. The arrangement of the gearing is similar to that found in English "marsh mills" used for drainage purposes.



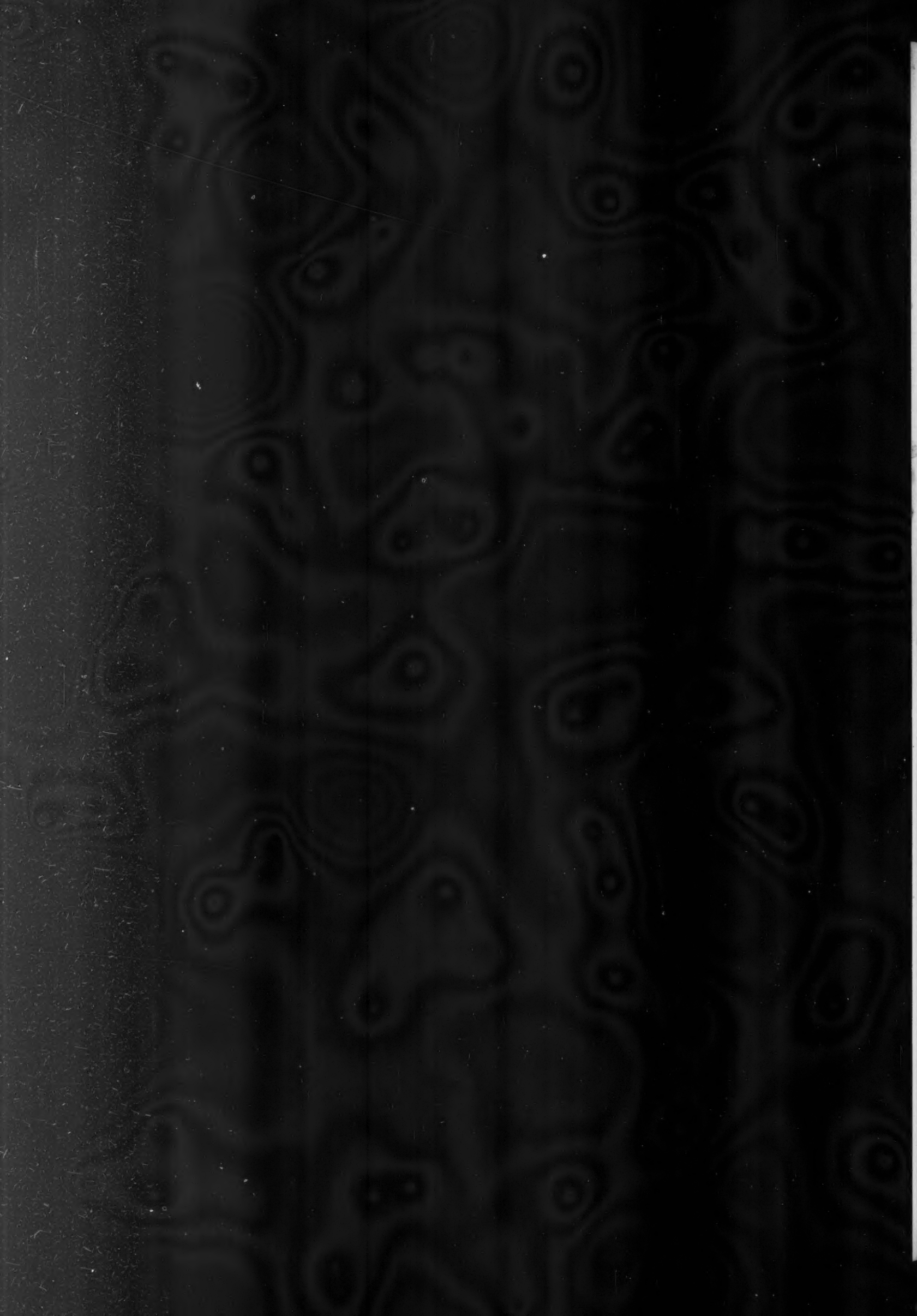
Above, a pair of "under drift" stones mounted on a frame or "hurst." The grain in the hopper passes down the inclined "shoe," D, vibrated by the "damsel," a, against which it is held by a cord, B, E, and a spring not shown, the flow of the corn being controlled by the sliding "gate," 4. The grain falls into the eye of the "runner" or top stone, passes outwards in grinding and escapes at the periphery as meal. As the stones are enclosed by the "vat," 66, the meal makes its escape through a hole in the hurst and down a spout into the meal bin. The stone is driven through the "stone nut," N, mounted on the "stone spindle," which has its bearing on the hinged "bridge tree," L, M. By varying the weight on the lever, G, the bridge tree can be raised or lowered and the gap between the stones altered to regulate the fineness of grinding according to the varying speed of the mill.

So long as there is grain in the hopper it presses on a small piece of leather fixed at one end to the hopper and at the other end attached to a string, which passes through a hole, 1, in the side of the hopper. The other end of the string holds a small cam, 2, to which a bell, A, is attached by a cord, 6. So long as there is sufficient grain in the hopper its weight is sufficient to hold the cam up out of the way of the striker, 5, fixed to the top of the damsel and revolving with it. When the grain falls low however, the weight of the bell pulls the arm downwards, it is hit by the striker and the bell is rung as a warning to the miller.

The lower figure is taken from a German book—Krinitz's Encyclopedia of 1820—and shows a "smock mill" arranged for corn grinding. It is octagonal on a square base and has a stage round the stone floor. The stones are overdriven from a "great spur wheel" mounted on the upright shaft on the floor above, while above that again is a down-turned face gear driving the sack hoist. The cap turns on blocks and is therefore said to have a dead curb. It is turned by the tail pole, y, while the brake is operated by the lever, 2, and a rope depending from it.

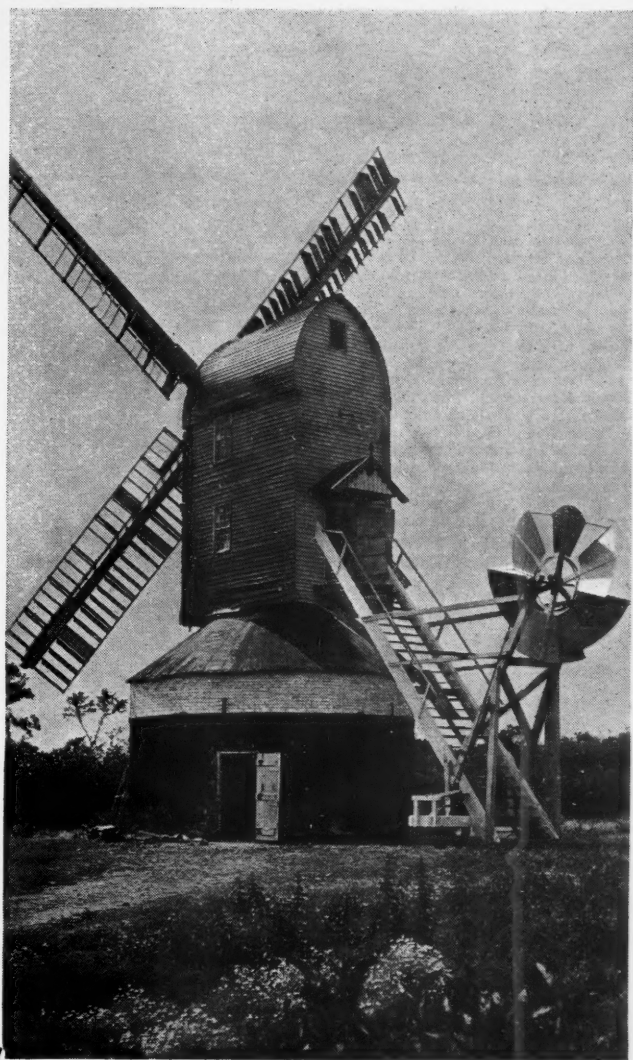


This illustration is from van Natus's mill book of 1734 and shows a typical mill for draining the polders by means of a "scoop wheel." The drawing is complete and to scale, and mills to this design are still at work in the Netherlands to-day, some with sails modernised and made very much more efficient by the application of aerofoils.



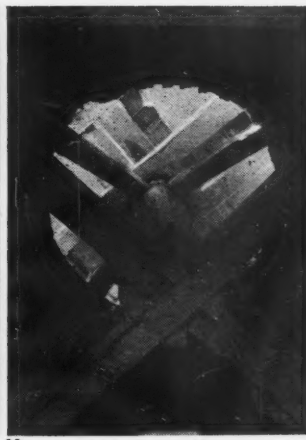
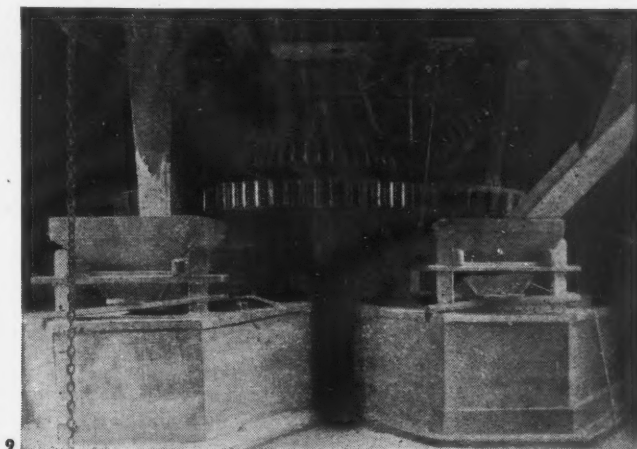
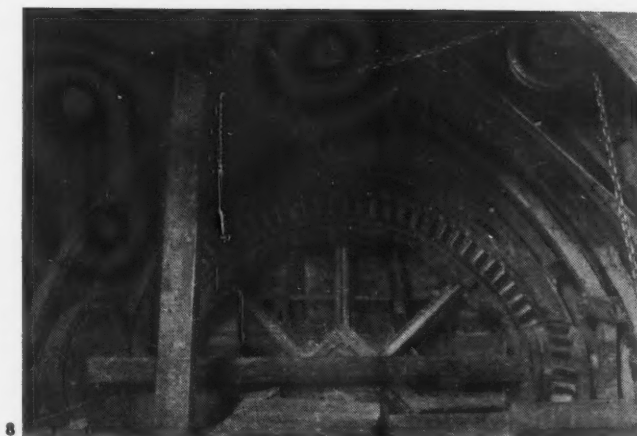
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A POST MILL AND ITS MACHINERY

7, Worlingworth Mill is a characteristic East Suffolk post mill. The wooden "buck" or body contains the machinery and the brick roundhouse below protects the substructure, 11, which here is viewed from the ground looking upwards. The "post" can be seen quartered over the "cross-trees" supported by the four "quarter-bars." The post, 10, extends through the lower floor of the buck and sockets into the "crown-tree" which is braced to the timbers below the floor with iron bars; behind it are the meal bins. On the floor above are the stones, 9, over-driven through the "stone nuts," here out of gear, by a "great spur wheel" mounted on an upright shaft. Above it is the "wallower." Grain in the bins on the top floor, 8, is fed through spouts into hoppers above the stones, warning being given by a "bell alarm" if it runs low. The brake wheel, mounted on the "windshaft" in the top of the mill, drives the wallower and a skew-gear for the drive to the flour dressing machine, while the "sack-hoist" is driven by belt from the windshaft. To show a complete mill the photograph of the brake wheel, 8, is from Parham Mill, while that of the stones, 9, is from Saxtead Green Mill.



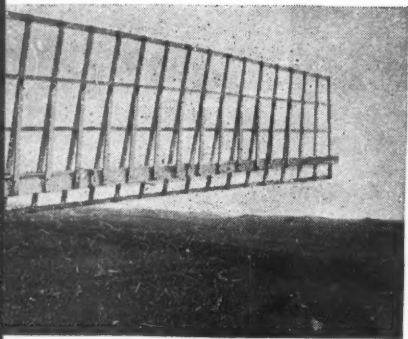
are bonnet shaped, 30, 61 and 66. Perhaps the most attractive were some to be found in Norfolk and West Suffolk extending right across the tail of the mill and having a balcony of the same width, 65.

The internal economy of the early post mills is simple. A geared wheel is mounted on the windshaft and is known as the "brake wheel" from the fact that a contracting brake to stop the mill acts on its rim, 8. The brake-wheel drives the "wallower," and this drives a pair of stones direct. Grain from the hopper passes between the stones, is ground and passes down to the floor below as meal. Exactly the same type of power transmission was used in early watermills, with the difference that the power was transmitted upwards instead of downwards, a sluice-gate taking the place of a brake. It seems probable that the post mill is an adaptation of the watermill to circumstances where wind but no waterpower was available. Although none now remains in England, a variant of the post mill,

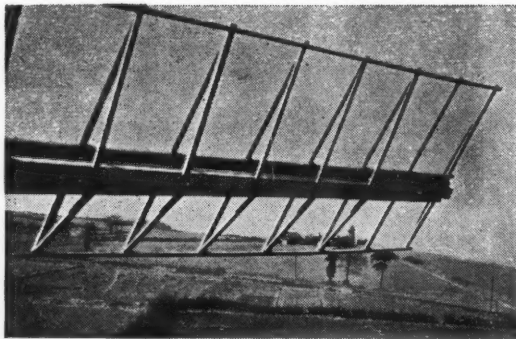
known as the "sunk post mill," existed at one time. Here the whole of the substructure, comprising the post, cross-trees, and quarter-bars, was buried in the ground, presumably for the sake of greater stability. The remains of such a mill have been found here and there, the latest being at Sandon Mount, Hertfordshire.

the tower mill

The effort required to turn the body of a post mill round is considerable, and the next step was the introduction of the "tower mill," 1, 75, 83, also pages 66 to 68. This consists of a fixed tower, which enables more floor space to be provided for machinery and grain storage. A small top or "cap" carries the sails, windshaft and brake wheel only, and is turned to face the sails into the "eye of the wind." The top floor under the cap is known as the "dust floor," and others are known as the "bin floor," "stone floor" and "meal floor," self-explanatory terms. The origin and date of this improvement is



2



13

The common sail, 12, on the Melin y Bont, Bryn-du, Anglesey, is typical of those on mills found in the North-West. The apparent taper is the effect of the pronounced "weather." The inclination of the mortises for the "bars" should be noted, as this is the method by which the "weather" of the sails is obtained. The patent sail, 13, is on the smockmill at Dalham on the Suffolk-Cambridgeshire border. The mill is now preserved as a landmark and the shutters have been removed for safety. The "bays" into which the sail is divided are clearly shown and through one the derelict smock mill of Ashley can be seen just across the border in Cambridgeshire. The patent sails on Stretham Mill, Cambridgeshire, 15, are shown in good order complete with their striking gear; "clamps" are fitted to the front pair. The eight-sailed mill at Heckington, Lincolnshire, 14, originally stood at Boston and was bought and transferred to an empty tower mill by the late owner when Boston docks were constructed.

unknown, but the earliest illustration of tower mills dates from the middle of the fourteenth century. In England the earliest are on a fifteenth century quarry, 5, in Stoke-by-Clare Church, Suffolk, and the early sixteenth century carving, 4, on St. Mary Magdalene Church, Launceston, Cornwall, which have been mentioned before. The earliest reference to a tower mill in England seems to be a rhyme probably of sixteenth century origin.

"Glatton round hill,
Yaxley stone mill,
And Whittlesey Mere
Are the three wonders of Huntingdonshire."

Of surviving early tower mills one on the roadside between Norman Cross and Yaxley was pulled down within the last twenty years; while one on Sark, Channel Islands, bears a sixteenth century date. In England one of the oldest is at Chesterton in Warwickshire, 55, commissioned by Sir Edward Peto as an observatory in 1632. The conversion to a windmill probably took place during the early eighteenth century, and the structure is thought to have been the work of a pupil of Inigo Jones.

Tower mills built of timber and weatherboarded are usually octagonal, but may be six, ten or twelve sided, and are known as "smock mills," their tapering towers and many sides resembling the old-fashioned countryman's smock. They are as a rule built on brick bases which may be anything from a few feet to a couple of stories high. The corner posts, suitably braced and tied, extend upwards converging to give a considerable taper or batter to the tower, 92. To the top is fixed a circular iron faced track or "curb," built up of timber and on this well greased curb the cap turns. The cap is built up on top of a heavy horizontal timber frame, below which blocks or rollers are fixed to run on the curb. The cap is usually centred by means of "truck wheels" on vertical spindles attached to the cap frame and running against a vertical track on the inner side of the curb. In the north-west, however, a flanged iron ring was some-

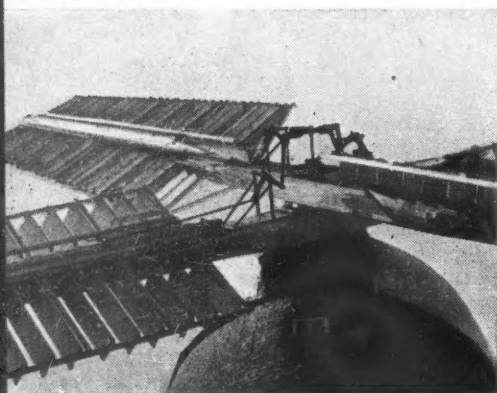
times fixed to the top or dust floor of the mill and the cap was centred by means of a device resembling an inverted table with a hole in the centre to fit over the ring, the "legs" being cross-braced to each other and attached to the cap frame.

In some cases in East Anglia the cap turns on a "shot-curb." An iron track is fixed to the bottom of the cap frame as well as the top of the curb, and between the two tracks runs a set of rollers, closely spaced and held in place by two concentric rings in which the roller ends bear. It is in effect a roller thrust-bearing, and can be compared to the ball-bearing collar on the post of Sprowston Mill, Norwich.

Towers of timber are very vulnerable to the weather, which gets in at the corners and rots the corner posts. Round brick towers are now more common in this country and, if the windows on successive floors are spiralled round the tower and not placed one immediately above the next, they will stand for many years without need of structural repair. Sometimes, however, foundations are not sound and the tower eventually leans, and in some cases has been jacked upright and underpinned. A distorted tower means a distorted curb; the cap will not turn and the sails are damaged when they are "tail-winded," i.e., when the wind takes them from the back. In Anglesey, 69 and 70, and the north-west, towers were often of stone, while towers of clunch and clay lump have been built in Eastern Counties.*

Caps are the distinguishing feature of tower mills, each area having its own traditional designs, 1, 29, 31, 33, 34, 35, 36 and 96, though now that so many mills have disappeared it is not always easy to tell what was the tradition for a given area. The most characteristic are the Kentish wagon shape, 90 to 93, the boat shape of Norfolk, 33, and the north-west, 69, 70, and the ogee of Lincolnshire, 31, 35, 76, 77, and the north-east. There are of course many variations, some even traditional to a small area, such as the Newmarket type, 34, of pepper-pot cap with an acorn-like finial. The Lincolnshire ogee cap with its ball finial suffers from the great disadvantage that in many cases it does not cover the front and rear of the cap frame, which is thus liable to suffer from the weather. The very rounded boat-shape

* A clunch-built mill at Waltham, near Grimsby, Lincolnshire, was undergoing repairs during a spell of very wet weather. One afternoon, after having had lunch in the miller's house, the millwrights went out to find that the walls of the mill had quietly collapsed and the mill had sunk down upon itself.



4, 15

Norfolk cap, an early nineteenth century innovation, is probably the best design from the point of view of construction, protection, and aerodynamic efficiency. Both the cap and the tower of a mill may sometimes have a stage built round them, 29, 31, 33, 74, 76, 77, 79, 85, 88, 89 to 93. In the case of the cap it is used for ease of access to the outside and to the sails; in the case of the tower it is generally at the level of the floor on which the stones are situated, and is used for the adjustment of the sails. The stage round the tower usually improves the appearance; but that round the cap may spoil its lines and certainly spoils the slip-stream behind the sails.

the composite mill

A few examples of the "composite mill," 53, existed in the Eastern Counties, although none now remain at work. In each case the mill consisted of a post mill body which had been removed from its substructure and mounted on a short tower, having a curb at the top, on which it turned. While the body of the composite mill at Banham, in Norfolk, was being moved from elsewhere the wagon on which it was being transported became bogged. It had not reached its destination at the top of the ridge, but the tower was built there and the mill body mounted on it.

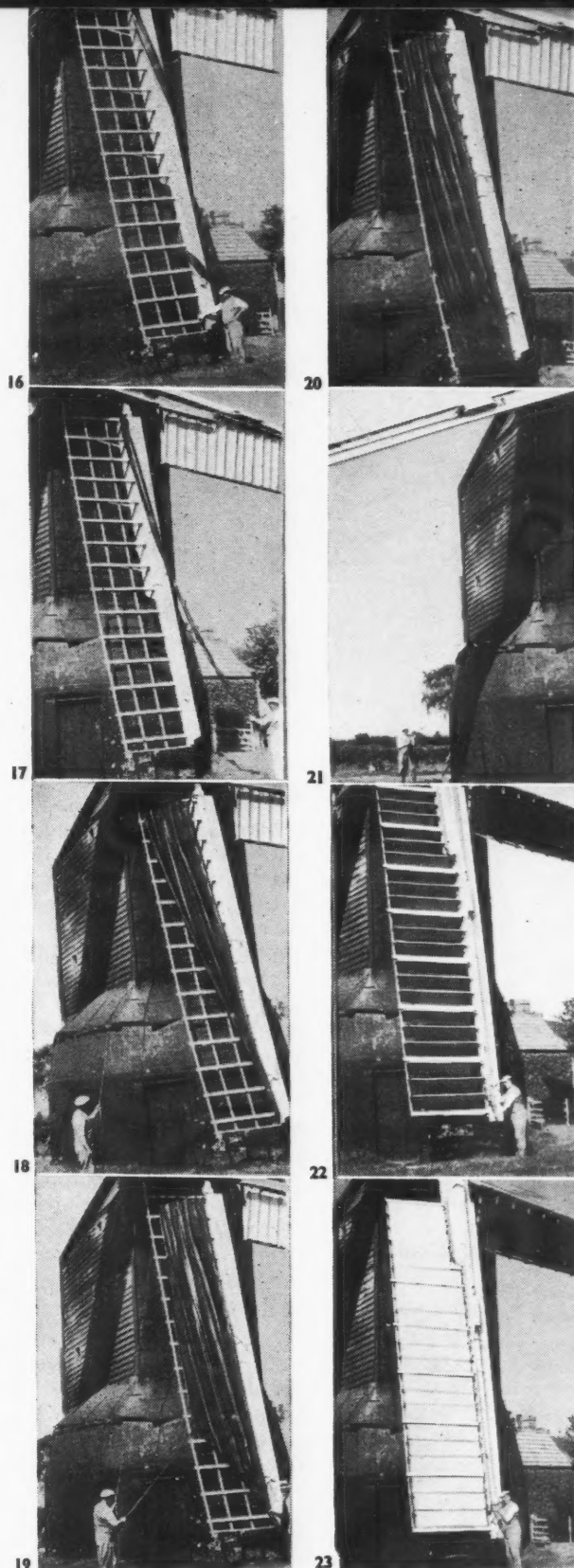
moving windmills

A mill was always considered a portable object and there are numerous instances of post mills being moved to new sites. Perhaps the best known is one celebrated in a contemporary print which was a post mill moved from the site of Regency Square, Brighton, in 1797. The sails and machinery were removed, the mill mounted on rollers, and eighty-six oxen loaned by neighbouring farmers with their steady pull moved the mill slowly but surely to its new position, near Withdean, a distance of over a mile. Smock mills, like post mills, were also regarded as portable property. The Nettlebed mill, burned down in 1912, originally stood below Watlington, Oxfordshire. In 1823 or 1824 the machinery was removed and the mill was hauled on two timber carriages by sixteen horses. At the top of the hill both carriages broke down, and the mill rolled over and over, and stopped just at the place they wanted to fix it.

Of tower mills that have been moved Heckington, 14, is the best known. Standing on what is now the site of Boston Docks, Lincolnshire, the mill was bought, dismantled and re-erected in a burnt-out tower at Heckington near Sleaford, the owner doing the work himself with the aid of direct labour.

winding the mill

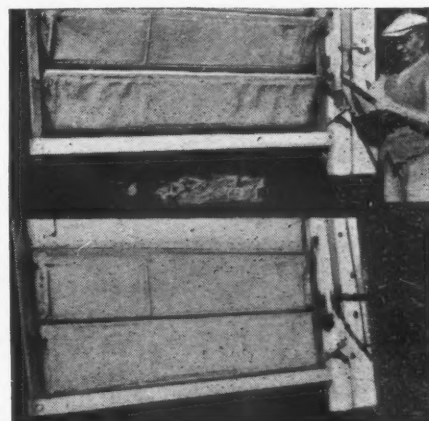
To get the most power from a mill it is necessary that the sails should always face square into the "wind's eye." This "winding" of the mill was first accomplished by pushing the whole body of a post mill round by means of the "tail pole," which projected downwards through the ladder, 43. Normally the ladder rested on the ground and acted as a back stay while the mill was at work. Before turning the mill the ladder was raised off the ground by depressing a lever pivoted on the tail pole and connected to the ladder by a chain. The lever could be held down—and the ladder held up—by means of an iron pin, while the miller pushed against the tail pole either with his back or with his shoulders against a yoke which projected below it at its extremity. In the case of the early tower mill caps a number of posts was set round the mill, a portable winch was anchored to one of them, a chain run out to the tail pole and the cap was drawn towards the winch by winding up the chain. An improvement on this was to fix the winch to the tail pole, 75, and later, to fix a geared rack to the



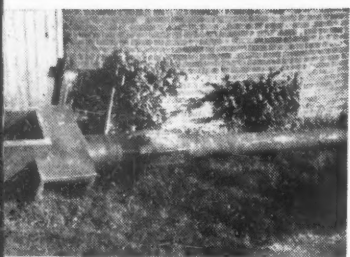
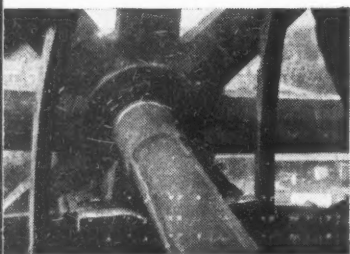
SETTING AND FURLING SAILS

Keysoe Mill, Bedfordshire, has two common and two spring sails.

16. The cloth is wound up and wrapped round the frame of the common sail.
17. The miller unrolls the cloth.
18. He spreads it to "sword point" by means of one of the "pointing lines."
19. He spreads it further to "first reef."
20. It is spread to "full sail."
21. The miller releases the brake by means of the rope hanging out of the side of the mill to bring down the next sail for adjustment.
22. A spring sail, with the shutters open. The miller is about to adjust the tension of the spring.
23. The shutters closed.
24. The adjusting mechanism.



24



26, 27

WINDSHAFTS

The "poll end" cast solid with the windshaft is the most usual mounting for sails and in this picture of one taken out of Great Mill, Wickhambrook, Suffolk, 27, the neck journal can be seen behind the poll end and behind that the ribs on which the brake-wheel was hung. In Lincolnshire and the North a cast iron "cross" is hung to the front of the windshaft with keys instead of a poll end as can be seen, 25, in one at Swineshead North End Mill, Lincolnshire, the arms of the cross are of Tee section and the sails are bolted and strapped to them. The wooden clamps on the front of the sail "backs" prevent the straps from cutting in. An open bearing and a plain "brass" is used on the neck journals as at Heckington, 26. In the old days these brasses were often cast from melted down clock faces, candlesticks and pestles and mortars.

curb at the top of the mill, 69, 70. A chain wheel at the side or back of the cap was connected to the rack through gearing and an endless chain hung down from it to the ground or to a stage round the mill. By pulling this chain the cap could of course be turned. A method of turning the mill into the wind automatically was patented in 1745 by Edmund Lee. In the case of a tower mill a wind wheel of from five to eight vanes, 47, is set at right angles to the sails at the tail of the cap and connected through gearing to the rack on the curb. So long as the sails face squarely into the wind this automatic "fantail" remains stationary; but when the wind veers it strikes the sides of the vanes and revolves the fantail, which turns the cap square into the wind once more. This fantail is also applied to post mills and is usually mounted on the ladder, 30, 46, 50, 61, 62, or the tail pole, 87, in which case it drives wheels in a carriage running on a track round the mill. Occasionally it is mounted on the top of the mill, 65, 94, in which case the drive is sometimes taken vertically downwards, and then in at right angles to a worm wheel mounted on the post.

windmill sails

The earliest mill sails, page 66, were simple wooden frameworks consisting of a number of evenly spaced horizontal bars mortised through a stout back-bone or "whip," and held together on either side by a "hemlath" running the full length of the sail. Two stouter timbers called "stocks" were mortised at right angles through the end of the windshaft and wedged in place, and to each a couple of sails were bolted and strapped. Sailcloths, laced in and out of the sail bars, could be set by being drawn outwards from the whips to the hemlaths and the sails had a constant angle of weather.

Later, sails were improved by being given "weather"—a twist, 16 to 20, something like that of a propeller—and sail area only on the driving side of the whip; while a "leading board" inclined at an angle—ideally $22\frac{1}{2}^\circ$ —on the driving side helped to hold flat the sailcloth now spread over a framework and not laced in and out of it. This is known as the "common sail" and each millwright had

POST MILL AND TOWER MILL

The postmill at Great Chishall, Cambridgeshire, 28, was fitted with a new post about 70 years ago. The tower mill at Debenham, Suffolk, 29, is typical in outward appearance of such mills built by the once famous firm of millwrights, Whitmore and Binyon, of Wickham Market.

COUNTRY MILL AND TOWN MILL

Wetheringsell postmill, Suffolk, 30, was blown down in 1881 and rebuilt. The 5-sailed Maud Foster Mill, Skirbeck, Boston, 31, is the last of the mills in this town to work by wind.

his own design arrived at empirically, John Smeaton, of lighthouse fame, being the first to investigate sail design on a scientific basis.

In 1772 Andrew Meikle, who is credited with the invention of the fantail, introduced the "spring sail," 22 to 24, 64, 75, 78, 88, 91. For canvas he substituted a number of small hinged shutters, like those of a venetian blind. All the shutters in a sail are connected together and are controlled by a spring whose tension can be varied according to the power required. Should the wind pressure increase beyond the required point the shutters hinge open and "spill the wind." The spring of each sail has to be tensioned separately, but this done the regulation is automatic. A further step forward was the invention, by Captain Stephen Hooper in 1789, of the "roller reefing sail," 32, 71. In place of shutters are substituted small roller blinds, the bottom of one blind being attached to the next by webbing straps or "listings." All can be operated simultaneously by two "airpoles" to each sail, which are connected in front of the windshaft through cranks and levers to a spider coupling. The windshaft is drilled right through the centre* and a "striking rod" passed through it. The rod is connected at the front to the spider coupling and at the back to a chain wheel by means of a rack on the end of the striking rod engaging with a pinion on the chain wheel spindle. By pulling the endless chain which hangs over the chain wheel down to the ground the striking rod can be moved backwards and forwards like the boss carrying the ribs of an umbrella. The blinds open or close at will; but the method is not automatic and although all the sails can be set at the same time without stopping the mill the blinds and their listings are more liable to damage than the shutters of a spring sail, which are of wood or of painted canvas on wire or wooden frames.

In 1807 Sir William Cubitt invented what has ever since been called "patent sail," 15. He combined the shutters of the spring sail with the remote control of the roller reefing sail, and weights, 39, are hung on one side or the other of the endless chain according to whether the shutters are to be kept open or closed, 1. The mass of the weights is altered according to the different velocities at which it is desired to "spill the wind," and all this can be accomplished on all the sails simultaneously without stopping the mill. In place of a rack on the end of the striking rod a sliding block is often used, and to it is attached a rocking lever projecting from the tail of the cap. From this a chain is hung down and then looped up over a pulley fixed to a part of the fan supports

* This was done while the mill was at work, the drill being lengthened 18 ins. at a time.





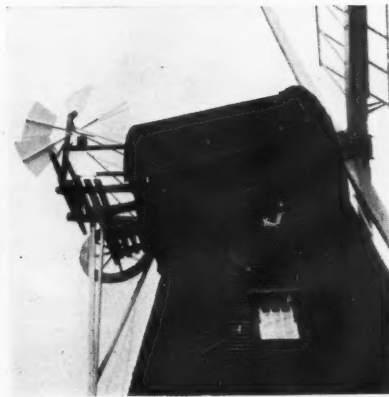
32



33, 34



35, 36



The hinged shutters in the leading boards of the "roller reefing sails" on Tollerton Mill, Yorkshire, 32, act as air brakes.

Sutton Mill, near Stalham, 33, has a typical Norfolk boat-shaped cap. The gallery round the cap is convenient for repairs but bad for airflow. Smock mills in the neighbourhood of this one, 34, at Newmarket, had a characteristic cap and were probably the product of one firm of millwrights. The cap of the six-sailed Myer's Mill, Alford, 35, is typical of Lincolnshire. Kentish smock mill caps resemble the tops of post-mills like this one, 36, at Herne.

The roof construction of a cap varies according to its shape. An exterior view of this one at Diss, 37, is to be seen in 80. Caps house the windshaft on which the "brakewheel," 38, is mounted. A large wooden contracting brake acts on the rim of this wheel which drives the "wallower." The wooden friction ring below the wallower is for driving the "sack hoist." The Vee-shaped cuts in the "cants" forming part of the rim of the brakewheel show that it has come from elsewhere. It probably had wooden spokes instead of the present "clasp arms," and was mounted on a large wooden windshaft through which these spokes were mortised. Wooden shafts were commonly three times the diameter of the iron ones which replaced them.

37



38

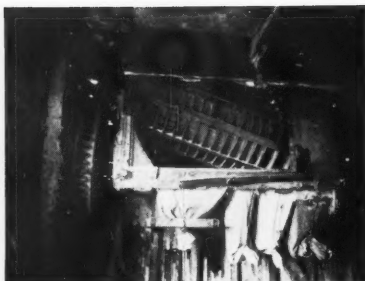


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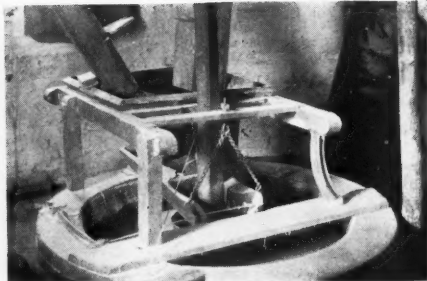
39, Nesting weights for the striking chains of the patent sails, Wellingore Mill, Lincolnshire. 40, Bedstone at Union Mill, Cranbrook, Kent. 41, wire machine at Keysoe Mill, Bedfordshire. 42, stones at Heckington Mill, Lincolnshire.



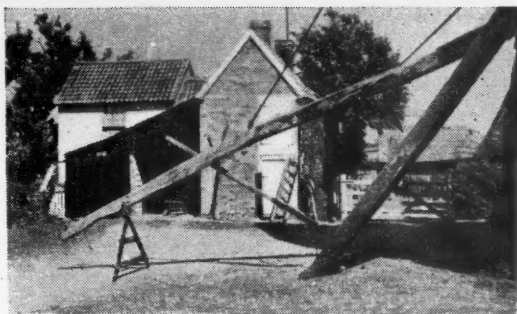
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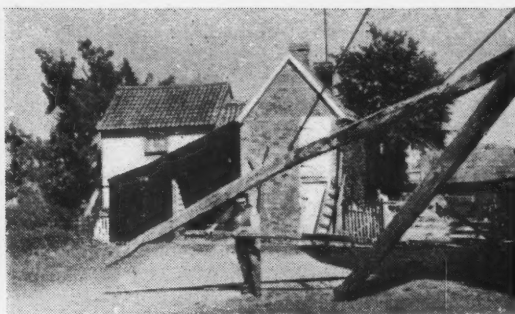
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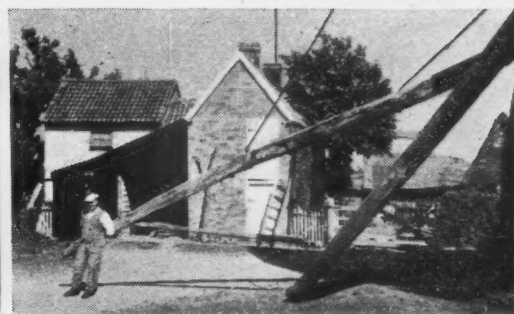
42



43, Keysoe Mill, Bedfordshire, at rest, the tail pole supported in a crutch and a ladder rests on the ground.



44, The miller raises the ladder by means of the lever.



45, He pushes the mill round into the "eye of the wind" by means of the tail pole.

and back to the top of the lever. In this way it is possible to move the lever up and down by pulling on one side or the other of the looped chain, and the setting of the shutters is done in the manner already described. Patent sails can be single, like common sails, or double, like the early cloth spread sails; but the single shuttered sail is probably the most efficient although not the most usual.

In 1769 John Smeaton introduced cast iron into millwork. Wooden shafts were replaced by iron ones one-third of the former diameter, 27, and usually an iron "poll end" is cast at the front end of the shaft. This resembles two boxes at right angles without any ends and through them the sail stocks are passed and wedged or pinched into position. In the north-east and north-west, however, the front of the shaft is plain, and a cast iron "cross," 25, 26, is hung on to it with keys. Stocks are dispensed with and the sail whips, somewhat stouter than those used in the south and now termed "backs," are bolted and strapped to the arms of the cross. This method obviates the use of heavy and costly timber stocks which, if they break, will throw what may be a sound sail and necessitate the removal of the opposite sail when the stock is renewed. With the cross the removal and refitting of a sail is considerably simplified, and by increasing the number of arms the number of sails can be easily increased, which is not the case with a poll end. So in Lincolnshire, where the cross is almost universal, five- six- and eight-sailed mills, 14, 31, 35, 71, 76, 77, were built and a few still remain. John Smeaton built the first five-sailed mill at Newcastle-on-Tyne, and this number of sails is probably the most efficient. But a six-sailed mill is far more convenient, as if one sail of a five-sailer is damaged the whole mill is out of action until it is replaced, whereas a six-sailer can be run with four, three, or two sails if necessary. Eight single-sided sails is probably the limit to the number that can be usefully employed, as a windmill can be overcrowded with sail just as can a sailing ship. Four mills have also been built with annular sails; the best known of these was at Haverhill, Suffolk, 54, built about 1860. It had a sail 50 ft. diameter with 120 shutters and about the same power output as an ordinary four-sailed mill.

It should be noted that all windshafts carrying the sails are inclined at an angle to the horizontal of from ten to fifteen degrees. This is primarily to throw some of the weight back to a thrust bearing at the tail of the shaft inside the mill, and hence to balance the weight about the "neck" or front bearing. It also enables the sails to clear a tapering tower or the roundhouse of a post mill.

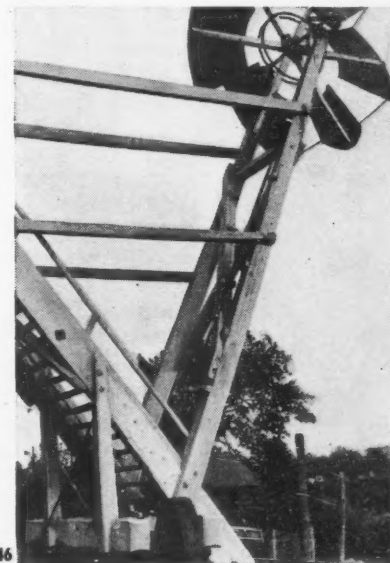
windmill gearing

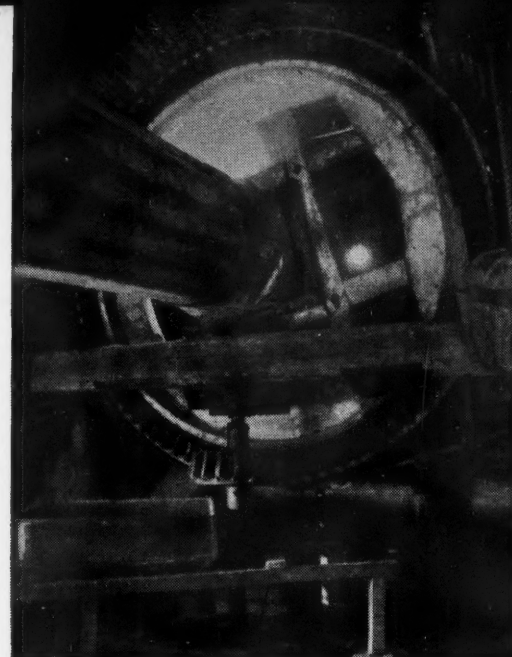
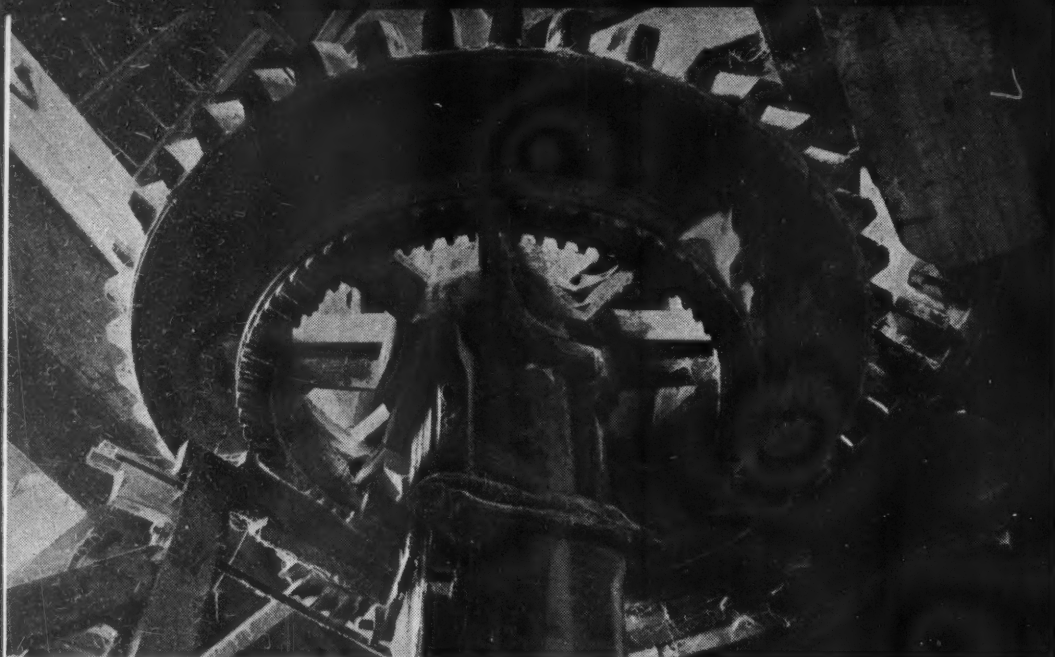
While gearing to-day is a highly specialised form of engineering, few modern engineers are acquainted with the work of early millwrights in this direction. The windmill, since it makes use of an uncontrollable source

of power, presents more interesting applications of early gearing than any other mechanism. The earliest windmills, like the earliest watermills, possessed no gearing; but this was probably introduced into millwork with the invention of the Roman watermill, described by Vitruvius. It required a change in the direction of the drive, and the gearing of the post mill is substantially the same as that of the Roman watermill, but with the drive coming down from above instead of up from below.

In a windmill the first gear is the "brake wheel," which is mounted on the windshaft to which the sails are fixed. Early windshafts were of wood and the brake wheels were of the "compass-arm" type, page 65, with arms mortised right through the windshaft, weakening it where it needed strength. Later came the "clasp-arm" wheel, 49, with four arms forming a square at the centre through which the windshaft passed. All these wheels were of wood and very massive, the rims built up of cants and strakes and with heavy wooden contracting brakes, 38, acting on their rims. Then when John Smeaton introduced cast-iron into mill work iron windshafts, iron wheels, or wheels with iron hubs and spokes and wooden rims, or in the case of brake wheels, iron cogs cast in segments and bolted on to the rims, 38, all came into use. The first driven wheel in a mill is called the "wallower" and the first wallowers were wooden "lantern pinions" with staves instead of cogs fixed between top and bottom flanges and mounted on a vertical shaft. From these developed the "trundlewheel," in which the top flange was dispensed with and the staves shortened. Finally the wallower was built as a bevel wheel either of wood or of iron or of both. In post mills with stones fore and aft no wallower is required, and the stones are driven direct through a pinion from the brake wheel, 49, in front and the "tail wheel," also mounted on the windshaft, at the rear. When the stones are mounted side by side in the breast of a post mill, 9, and in the case of tower mills, 48, 51, the

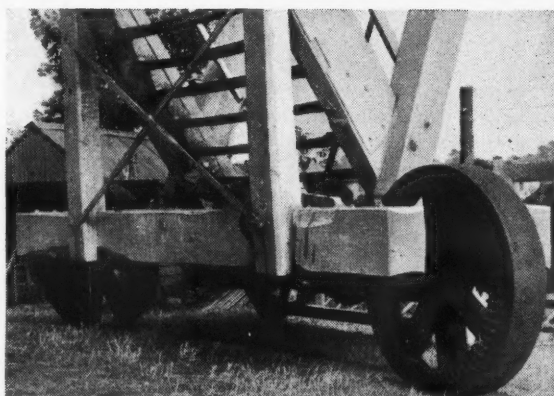
46, Fantail and fan carriage, Friston post mill, Suffolk. 47, Fantail, Wellingore tower mill, Lincolnshire. Each arm is socketed into a cast iron hub, two wrought iron rings connect and stiffen them and a balancing weight can be seen on one blade.





DETAILS OF GEARING

The underside of the iron wallower of Denver Mill, Norfolk, 48, to which is fixed a bevel ring. This drives the sack hoist, which can be seen behind and slightly to the left of the upright shaft. The brake-wheel, 49, of Laughterton post mill, Lincolnshire, drives a pair of stones direct. It is mounted on a large wooden windshaft and has an iron brake. A close-up, 50, of the wheels and driving gear at the bottom of the fan carriage, 46. In Pakenham Mill, Suffolk, 1, the "great spur wheel," 51, mounted on the bottom of the upright shaft, has iron arms and a heavy wooden rim. In addition to the main set of wooden cogs driving the stone nuts there is an iron internal gear inside the rim driving one pair of stones.



drive is taken through the wallower at the top of the "upright shaft" to the "great spur wheel" at the bottom of the upright shaft, which drives the stones through pinions known as "stone nuts." To get the increase of speed required the great spur wheel is often very large and varies in construction as much as the other gears.

The first stone nuts were lantern pinions, spur gearing being a later development. When the stones are overdriven the nuts are mounted on vertical spindles or "quants," 42, also page 67, which drive the "runner stones" from above; when underdriven the stone nuts are mounted below the "bed stones" on the "stone spindles," on which the runner stones are balanced. To disengage the stone nuts from the great spur wheel in the case of "overdrift" stones the quant is released from its top bearing and allowed to fall sideways. In the case of "underdrift" stones, however, the nut is either lifted out of gear with the great spur wheel or else several "slip-cogs" are removed.

Drives for auxiliary machinery are usually taken by a star wheel or a skew gear from the brake wheel, 8, in the case of post mills and from a geared bevel fixed to the great spur wheel or independently to the upright shaft in the case of tower mills. Sack hoists are similarly driven, page 67, but in addition belt drive from the windshaft is used in the case of post mills, 8, and friction drive from a friction ring below the wallower in the case of tower mills, 38.

Gearing is also used to turn the sails of the mill into the eye of the wind, and the invention of the fantail was made possible by the use of cast-iron gearing, a number of small bevel and spur gears being used on both

tower and post mills. The only use of the worm is found in connection with the winding gears, the earliest worms and the cogs of the racks they engaged being of wood. The most usual timber used for cogs is hornbeam, which is both tough and porous; certain apple wood is better but nowadays is almost unobtainable. To prepare a cog the blanks are first sawn from the plank and placed in a wooden jig or "cog box" in which they are shanked, the shanks are shaped and fitted to the mortise gear, the face and sides turned in a lathe and then pitched out and trimmed by hand, usually to an epicycloidal shape. They are held in place by two main methods; either the shanks are drilled and pins are driven in, or the shanks are dovetailed and wedges driven in between them. A wood to wood drive using well-shaped gears correctly lubricated is very quiet and will last for many years; but if speeds are high, wood to iron is more usual.

stones

Grain is usually stored in bins above the stone floor and is fed through a spout to a hopper, 42, also page 67, supported on the stone casing by a wooden frame or "horse." From there it passes down an inclined "shoe" held at its upper end freely and at its lower end by a spring against the quant, in the case of overdrift stones, or in the case of underdrift stones, against a three- or four-cornered removable extension of the stone spindle called a "damsel."* As the quant or damsel rotates it vibrates the shoe, the grain is shaken down and grain flow can be controlled by a "gate" in the shoe or by altering its

* So called because it makes more noise than anything else in the mill.

angle of inclination. The grain falls into the "eye" of the runner stone, is caught by the "furrows" and as it is ground passes outwards to the edge. It escapes as meal into the space between the stones and their casing and falls down a spout to the meal floor below, 40.

A piece of leather is fixed low down inside the hopper and to it is attached a string which passes through the side of the hopper to a bell. So long as there is grain in the hopper, it presses on the leather and keeps the string taut. When the weight of the bell overcomes the weight of the grain on the leather the bell falls by its own weight against some moving part of the machinery and warns the miller that the grain is running low. The gap between the stones can be altered to ensure a constant degree of fineness of grinding irrespective of the speed of the mill. This is effected by raising and lowering the "bridgetree," on which the stone spindle carrying the runner stone is mounted, by means of a system of levers. In early days this was done by hand; later, centrifugal governors were used to carry out this "tentering" automatically.

Two kinds of stones are in general use: the Derbyshire "peak stone," a millstone grit taking its name from the Peak District where it is quarried in one piece from the living rock, and the "French burr" stone, a freshwater quartz much harder than the peak stone. It is quarried at La Ferté-sous-Jouarre in the Paris basin in small blocks, which are shaped like the stones of an arch, built up to the required diameter and cemented together with plaster of Paris. "Blue stones" or "cullin stones" are used nowadays only in the North for barley, oats and rye. They are a lava of a bluish-grey colour once sold from Cologne (hence their name) and quarried at Neider Mending in the Rhineland. Local stones were also used in places though not to any great extent, and nowadays composition stones of emery and cement are widely used.

machines

After being ground, wheat meal intended for conversion to flour was passed through a bolting machine or "bolter" to dress off the bran. A few of these machines are still to be seen though none is in operation to-day in windmills. They consist of an inclined wooden shaft to which radial arms are fixed. These arms carry light bars running parallel to the shaft, they form the reel and just clear some stout beaters fixed to the casing

of the machine. A seamless woollen bolting cloth, rather larger in diameter than the reel, was tied to it top and bottom. The reel revolved and the cloth sagged outwards with the weight of the meal admitted at the upper end. It hit the fixed beaters and the flour passed through the cloth into the casing, leaving the bran to tail out at the lower end.

Another method was to use a wire machine, 41. This consists of an inclined fixed wooden skeleton cylinder lined with wire mesh of varying degrees of fineness. Down the centre of the cylinder passes a wooden shaft carrying several rows of longitudinal brushes. As the shaft revolves the brushes force the flour and the middlings through the wire mesh into the casing and the bran tails out at the end. Another machine found in the north-west was the groat machine. Oats were roasted in a kiln and passed between a pair of stones with a gap between them equal to the length of an average oat. This split the husks, which, with the kernels or groats, passed down into the groat machine. Here they were put through a wire machine which brushed out the red dust produced in the roasting and as they tailed out they were subjected to a blast of air from a four-bladed wooden blower or fan. The heaviest groats fell down into a nearby spout, the lighter ones into a spout further on and the husks were blown through into the "husk cupboard."

millers and millwrights

What of the builders of the windmills, these millwrights, the ancestors-in-trade of the present-day mechanical engineer? They are for the most part unknown, 102, they worked in small country places, 100, 103, and most of them, like their monuments the windmills, have gone without leaving a trace. Some few still remain, 101, their businesses established anything up to two hundred years ago. Some have left the millwrighting business and become production engineers, and a number who did this a hundred years or more ago failed to survive when the centres of industry shifted or foreign markets were closed to them. The ingenuity of the millwrights is constantly shown not only in the design of windmills, arrived at empirically over a long period of years, but also in the smaller details such as bell-alarm and sack-hoist operation, the variations in the striking gear of patent sails and "gadgets" such as the sack loader, 95. They left few records and no

FOUR SPECIALITIES

A marsh mill at Tunstall, Norfolk.



52

A composite mill at Laver, Essex.



53

The annular sailed mill at Haverhill, Suffolk.

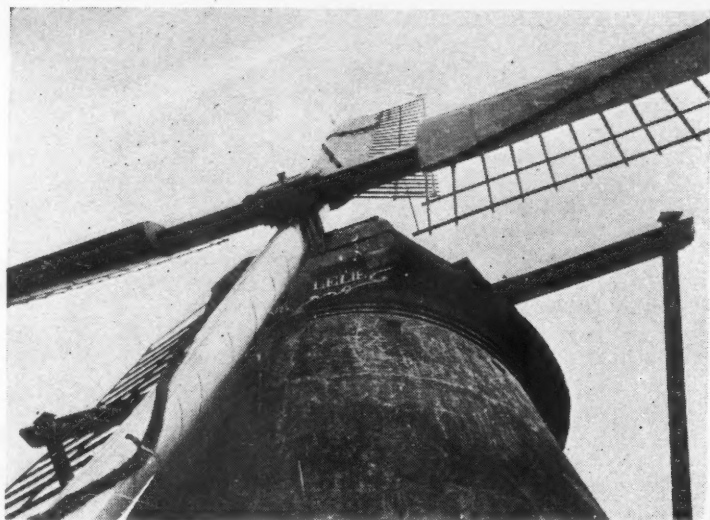


54

A converted observatory at Chesterton, Warwickshire, dated 1632.



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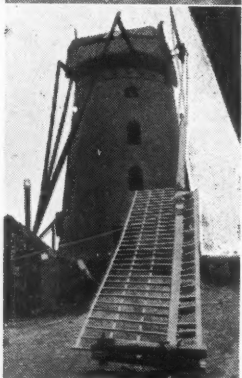
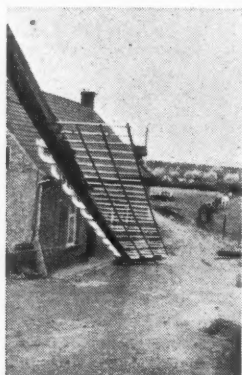
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Dekkerised sails, Kouderkerke Mill, Isle of Walcheren. By streamlining sails and fitting roller bearings to the windshaft the output of mills such as these has been enormously increased. This Dekker system could easily be applied to English mills carrying sails mounted on a cross in the Lincolnshire fashion. In Holland the bars of the sail are mortised directly into the stocks which are often of steel, and no whips are used.



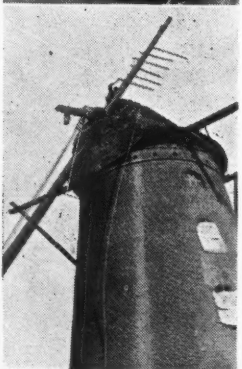
57

Dekkerising the Moulin de St. Arnould, Terdegheem, Steenvoorde, Nord. The stock is built up of steel plate and riveted, the mortises for the bars being lined with sheet metal.



58, 59

In both these photographs sails are built up on the ground. One is then dismantled and the stock drawn slowly through the poll-end of the windshaft, horses being harnessed to the rope tackle.



60

The bars are fixed in place by the millwright during the process. The ribs on the leading edge support the aerofoil.

DEKKERISING

drawings; only a small proportion of their work survives and it should be recorded before it is too late, for it is work to be proud of, ingenious, honest and expressive of the best tradition of their craft.

Those who work and repair windmills, 97, 98, 99, are usually men of considerable force of character with a capacity for hard work. They had to be tough physically, too, and usually were as the following will show. At Billington, Norfolk, a post mill once stood where the tower mill now stands. In the sixties it was tail-winded and blown over forwards. The miller was in the breast of the mill at the time on the lower floor, and although he fell with the mill the post protected him from fatal injury. His man was not so lucky; coming up the ladder at the back he was thrown into the debris and died of his injuries. The late Mr. John Bryant, 102, millwright, of Colchester, who died in February, 1944, was working on the sails of Great Holland Mill, Essex, when the miller closed the shutters, trapping his fingers, and took off the brake. The sails started to turn and the ladder and tools, falling with a clatter on the bake-house roof, brought the baker running out. He stopped the mill when a revolution and a half had been made leaving the sail, on which the millwright was trapped, in the top position and the millwright, of course, upside down. After the sail had been got to the bottom position Mr. Bryant was helped down but he could not straighten his fingers and had to drive sixteen miles home in his trap with the reins round his arms.

marsh mills

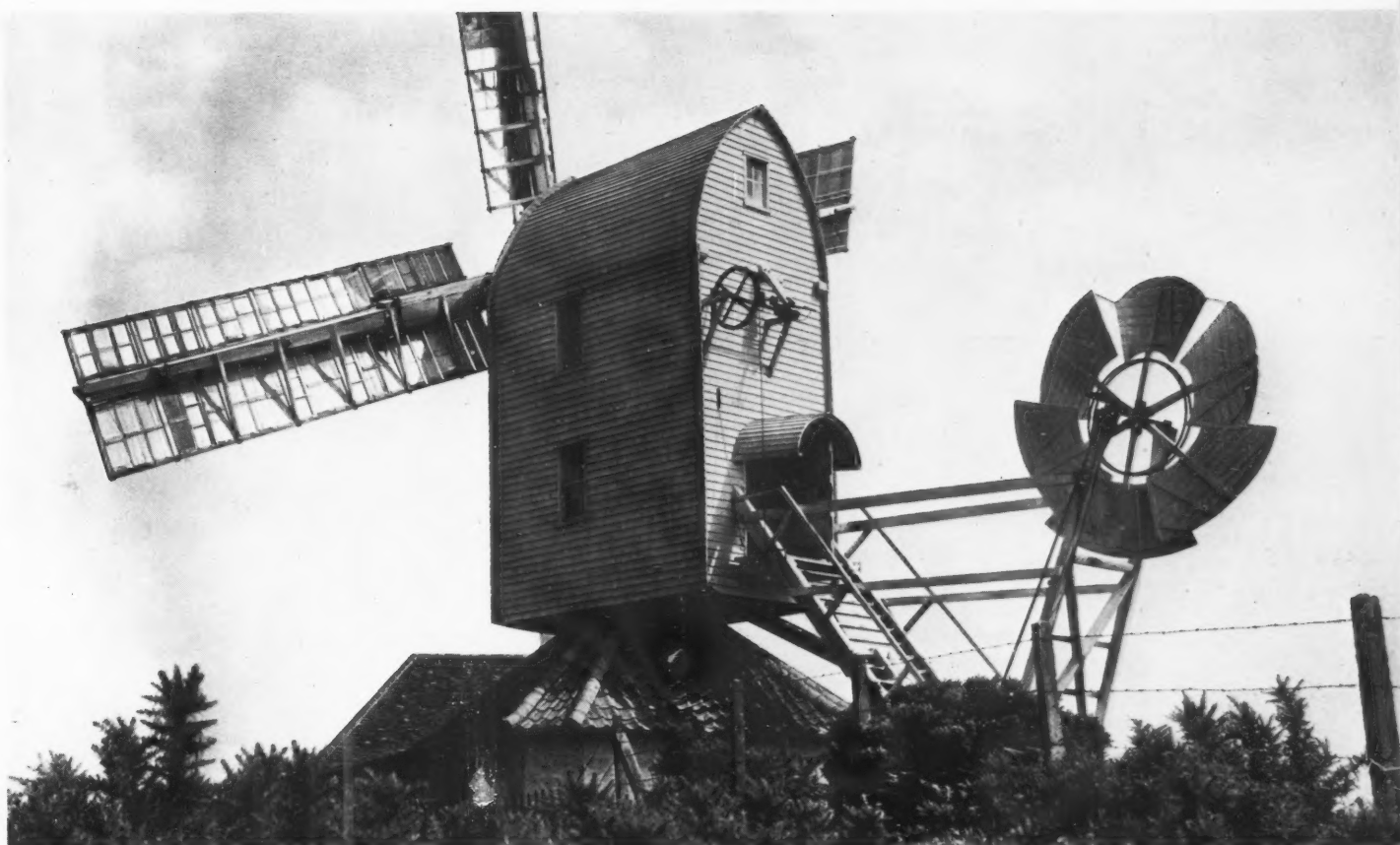
Two only of the typical large marsh mills of the nineteenth century were in use until quite recently; that at Soham Mere, which still retains two of its sails, and the Betty Mill, Nordelph, whose sails have been removed. At the latter the marsh man and his family actually had their living and sleeping quarters in the body of the mill. The smoke from their fire escaped into the mill and found its way out as best it could. In gusty weather the family would retire to the adjoining engine house to escape the smoke blown back into the room.

Marsh mills, 52, also page 68, used for draining the land drove large wooden "scoop wheels," like paddle wheels, in a close-fitting casing, which raised the water a height equal to about two-fifths of their diameter. The drive was effected through a pair of wheels at the base of the upright shaft, the driven wheel being mounted on the scoop wheel shaft.

These mills in the Fens have from time to time been converted into grist mills, and examples could at one time be seen at Christchurch in Cambridgeshire, Dyke in Lincolnshire, Freckenham in Suffolk, and Salter's Lode in Norfolk, to mention a few. All were smock mills, and in the case of Dyke there was a tradition that it was moved from a neighbouring fen "in Boney's time," while Freckenham first ground grist in 1801.

On the Norfolk Broads marsh mills are more numerous since the Broads, unlike the Fens, have not been dried out and sunk as they were drained; but electrically driven centrifugal pumps are replacing the mills as a result of the spread of the "Grid," and it seems probable that even here the disappearance of the windmill as a prime mover is only a matter of time unless something can be done cheaply to improve its efficiency.

REGIONAL SURVEY



Suffolk

The difference in character of post mills which is effected by such things as the shape of the porch and the position of the fan-tail is well illustrated here. Thorpeness Mill, 61, was erected at Aldringham in 1803. It ground corn until it was moved in 1924 and adapted to pump water for the village of Thorpeness. The roundhouse is modern. The striking gear for the patent sails can be seen outside the mill to the left of the porch both here and at Syleham Mill, 62, which still grinds corn.





63



64



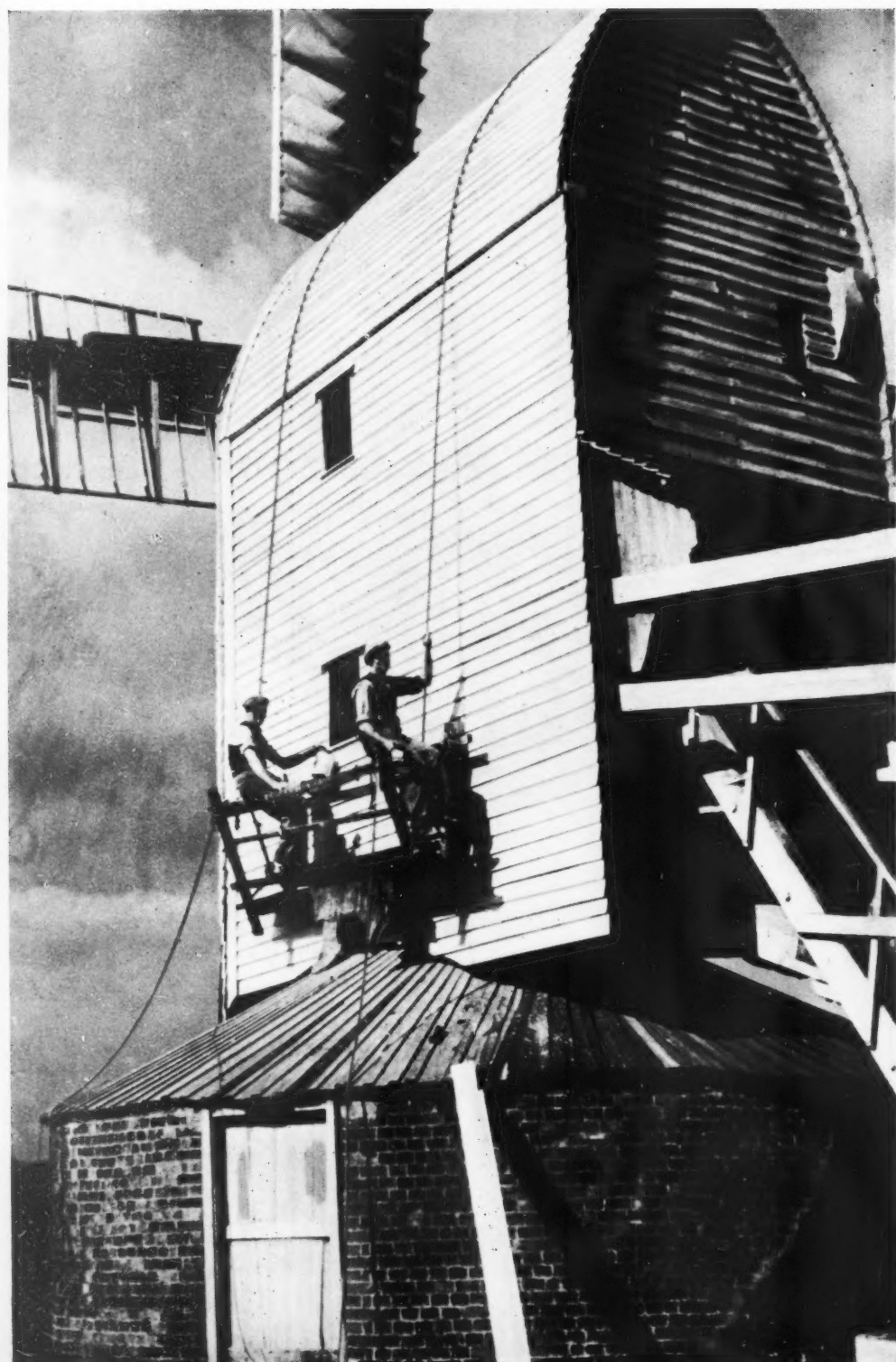
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66



67



68

Suffolk. Nowhere in the world was the post mill brought to such a high pitch of perfection as in Suffolk in the nineteenth century, with patent sails, fantails and the most up-to-date gearing and equipment then available for windmills. The West Suffolk mills often had attractive flint and brick roundhouses as at Drinkstone, 64, and fine porches as at Stanton, 65, while the typical East Suffolk mills, like those at Saxtead Green, 66, and Pettaugh, 67, were on the whole somewhat larger and had higher roundhouses, often with three floors, and as high as the white painted mill body itself. The oldest is Drinkstone Mill, dating from 1685, which stands close to Woolpit Mill, 63, 66, and most unusually turns clockwise. See also 1, 5, 7 to 11, 13, 27, 29, 30, 34, 46, 50, 51, 54, 57 and 58.

Anglesey. Cemaes Bay Mill, 69, is typical of Anglesey, and to some extent of the mills of the North-West in general. The weather of the sails is so pronounced that the lower sail appears to be acutely tapered. The cap is turned by the endless chain hung from the wheel at the rear. To prevent it swinging a chain is hitched to one of the wooden cleats on the mill tower. The stonework platform prevents people or animals approaching the sails too closely. Anglesey was the granary of Wales and at least 35 sites of windmills can be found. None now remains at work, the last to work being Stanley Mill, Tre-Arddur Bay, 70, now destroyed. See also 12.



69

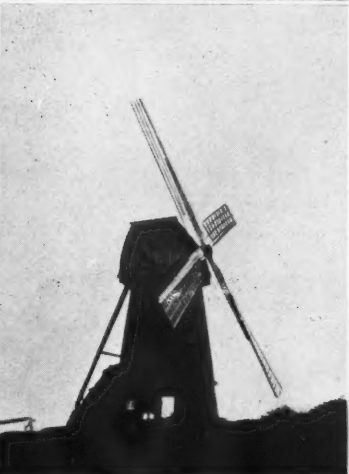
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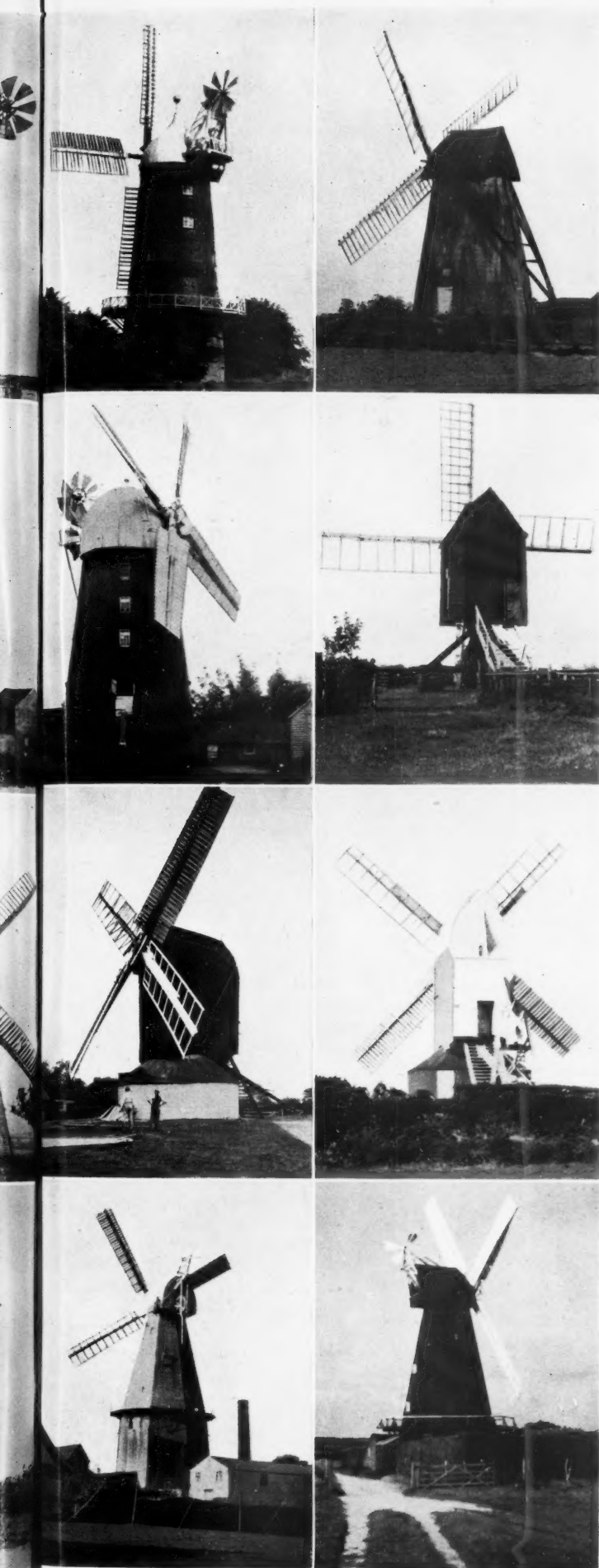


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93





Yorkshire

Only two mills now work by wind in Yorkshire, and of these the five-sailed mill at Seaton Ross, **71**, is the last mill in the county to work with roller reefing sails, **32**. It stands on the site of an old post mill, some of whose timbers are incorporated in the present structure.

Derbyshire

Cat and Fiddle Mill, Dale Abbey, is the last mill to work by wind in Derbyshire. It is situated close to the Nottinghamshire border and with its small roundhouse and covered platform at the top of the ladder it is typical of the post mills of both counties. It has a stone bearing for the "neck" journal of the windshaft, a practice not uncommon in French Flanders to-day. It is owned and kept in working order by The Stanton Ironworks.

Nottinghamshire

The tower mills of Nottinghamshire are first cousins to those of Lincolnshire with their ogee caps and sails fixed to a cross instead of a poll-end, like that at Coddington, **73**. The tower was probably raised when patent sails were fitted, as was often the case when it was no longer necessary to stop the mill to set the sails.

Leicestershire

The Leicestershire tower mills were also mainly of the Lincolnshire type. This one at Harby, **74**, was wrecked in a gale shortly before the war and only one mill in the county is now at work by wind.

Lincolnshire

There are more corn mills at work in Lincolnshire than any other county at present. The post mill at Friskney Tofts, **78**, built in 1730, was blown down in 1939, and only two are now at work by wind; while there are no smock mills at work at all. The last survivor of the early tower mills at Lutton Goums, **75**, was built in 1746 and was pulled down in 1942. It stood on an artificial mound which was probably the site of a still earlier post mill. The tower mill is more highly developed in Lincolnshire than anywhere else and a number of multi-sailed mills were built. Of these six-sailers were most favoured and could, if necessary, be run with four, two or even three sails as at Metheringham, **76**. The last mill to be built in Lincolnshire was Trader Mill, Sibsey, **77**, in 1877. It was built by Saundersons, of Louth, on the site of an old post mill. See also **14, 25, 26, 31, 35, 39, 42, 47, 49**.

Norfolk

Not all the Norfolk mills have the typical Norfolk boat-shaped cap, **33**. Denver Mill, **79**, has an ogee cap with horizontal instead of vertical boarding, while Diss Mill, **80**, had a domed cap of large size with an interesting framing, **37**. But Norfolk is best known for its marsh mills on the Broads, **52**. See also **2, 3, 6, 33, 38, 48**.

Cambridgeshire

Although the date of erection is unknown Bourn Mill, **81**, was standing in 1636, and is the oldest in England. It was bought and repaired by Mr. Alfred Bossom, M.P., with money raised by the exhibition of Epstein's "Genesis," and was presented to the Cambridge Preservation Society. Its small size and straight pitch roof mark it as an old mill. Starting life as a smock mill, Downfield Mill, Soham, **82**, was wrecked in a storm and rebuilt as an eight-sided tower mill. The cap and fantail arrangement are typical of the local tradition. The last of the large marsh mills, characteristic of the Fens, to work by wind stands at Soham Mere, **83**, built by the father of Mr. Hunt, **101**, seventy-six years ago; it is hoped to preserve it as a landmark this year. The scoop wheel, which lifts the water and is housed in the casing behind the mill, is over 20 feet diameter, and the sails are about 80 feet span. See also **15, 28**.

Hertfordshire

Hormead Mills, **84, 85**, stand side by side. The post mill had a sixteen-sided wooden roundhouse, the smock mill was built in the 1860's. It was an old joke to say that windmills should not be built close together in case there was not enough wind to run both! No mills now work by wind in Hertfordshire, which does not seem to have had any traditional type of its own.

Surrey

The oldest working windmill in the country is a post mill standing at Outwood, Surrey, **86**, and was built in 1665. It is also the last mill in the county to work by wind. Here it is being fitted with a pair of sails brought from a demolished post mill at Fornett End, Norfolk.

Sussex

Although as a rule fantails were not favoured on post mills in Sussex, Argos Hill Mill, **87**, has one mounted on the end of the tail pole. Small shutters in the outer half of the leading edges of the sails, and leading boards on the inner half were characteristic Sussex practice. Its built-up post of pitch pine instead of solid oak is unusual. Only one post mill is now at work in the county. Earnley Mill, **88**, is the only smock mill at work in Sussex to-day. It has two spring sails and two cloth-spread common sails, quite a usual arrangement at one time. Polegate Mill, **89**, is the last of the Sussex tower mills to work by wind. It is unusual in being partly tiled and, like some other Sussex mills, has a five-bladed fantail.

Kent

The smock mill was predominant in Kent, with a cap like the top of a post mill and Headcorn Mill, **90**, can be considered typical with its low wooden stage. The use of this can be seen at Kingsdown Mill, **91**, which had two spring and two common sails which were set from the stage; it also had a unique seven-bladed fantail. It was moved from Farningham in 1880 at a cost of £800 and last worked in 1928. Union Mill, Cranbrook, **92**, which is 72 feet high to the ridge of the cap, was built in 1814 by Hills, of Ashford, and is still at work, the finest smock mill in England. The wheel on the left side of the cap at one time carried an endless chain for turning the cap by hand. Black Mill, Barham Downs, **93**, was built in 1834 by John Holman, of Canterbury, and is a very good example of Holman's tradition in mill building. It stands on the site of an earlier mill. See also **36, 40**.



94

Essex

As in the case of other counties, windmills in Essex have suffered an eclipse and now there are but two at work where once there were over one hundred. Of these the post mill at Ramsey, 94, is one. Built about one hundred years ago by Whitmore & Binyon, the Suffolk millwrights, this mill was owned by Scotts, the biscuit makers of Ipswich, and before the war was grinding for them. The mill is in the Suffolk tradition. Post mills in Essex usually had lower roundhouses and were turned by a tailpole. South Essex had a tradition in smock mills of which Upminster Mill, 95, 96, is typical, especially the cap. Built about 1800 it is an unusually large mill for its height and was bought for preservation by the Essex County Council just before the war. The sack loading device hanging down from the stage is unusual. The deep petticoat to the cap is an excellent feature. See also 53.



95, 96

86

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87

MILLERS 97, Mr. Elmer, of Woolpit Mill, Suffolk. 98, Mr. Davey, of Legbourne Mill, Lincolnshire. 99, Mr. Aldred, of Saxtead Green Mill, Suffolk.



97



98



99



100



101



102

MILLWRIGHTS 100, The late Mr. Robert Martin, senior, of Beccles, Suffolk. 101, Mr. T. B. Hunt, of Soham, Cambridgeshire. 102, The late Mr. John Bryant, of Colchester, Essex.

the future

It is the low efficiency of the windmill that not only reduces its power output, but prevents it from working in light winds. In 1924, as a result of a competition held by De Hollandsche Molen (the Dutch Windmill Society), the Dutch millwright Dekker successfully overcame much of this trouble by inventing a special roller bearing which could be applied to the front or "neck-journal" of the windshaft, and by applying aerofoils to the leading edges of the sails, 57. In 1925 a windmill fitted with the "Dekker system" was given a year's trial by the Research Institute of the Government Aeronautical Service at The Hague. It was found that it gave three times the power output of a normally equipped mill, and that in the case of a Dekkerised mill in Amsterdam on only one day in the year was there insufficient wind to turn the mill. Owing to their construction it is not possible to fit the aerofoils to sails built on whips and fixed in pairs to stocks; but when single shuttered sails and an iron cross are used, as in Lincolnshire, the Dekker system can be applied without difficulty. In Holland no whips are used and the bars of the sails are mortised directly into the stocks, which are held in poll-ends as in England. The stocks are often built up of steel and the method of construction and erection of a pair of Dekkered sails in French Flanders in 1938 can clearly be seen, 57 to 60.

The Dekker system was taken up with enthusiasm in the Netherlands and Belgium, and within four years of its introduction more than fifty windmills had been Dekkerised. A modification of the Dekker system is that of van Bussel of which few details are at present available. As it does not involve the complete enclosure of the whip it might be possible to adapt it to sails mounted on stocks; if so its most immediate application would be to the drainage mills of the Norfolk Broadland. Both systems would save much-needed fuel. With a prosperous agricultural community in this country and fair trading conditions for the small miller, the utilisation

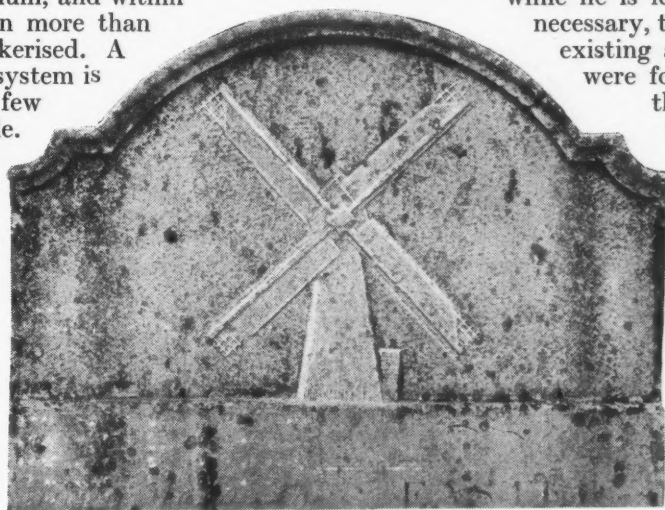
of the Dekker system would pay handsomely. So far no approach has been made to millers over here to adopt the system; but we may hope that the younger among them will be quick to avail themselves of its undoubted advantages when restrictions are removed. It seems possible that with the great advance in the technique of building aluminium rectangular tapered booms for aeroplanes it should be possible to adapt it to the needs of windmills particularly in view of the scarcity and high cost of pitch pine, which is the only available timber suitable for sails under normal peacetime conditions. A cheap and compact method of storing electricity has yet to be found and it is likely that any such discovery will be too late for the salvation of the old-fashioned windmill in the role of a generator of electricity.

Two further post-war possibilities are envisaged. A mutual insurance scheme for windmillers to cover storm damage to their mills. Damage to sails is the most common and the most expensive. Should a pair of sails have to be renewed the result is a three figure bill and only too often a bad storm spells the death of several windmills. As a corollary to this it will be necessary to initiate an energetic apprenticeship scheme to ensure that the race of millwrights does not die out with the present generation. At the present time a boy can not only obtain but really earn much higher wages on a farm than a millwright can economically afford to pay him while he is learning his trade. It will be necessary, therefore, to call in the help of

existing apprenticeship charities which were founded to assist similar cases though in different trades. If the Society for the Protection of Ancient Buildings takes the lead in such matters it should have the fullest possible support from all who have an interest in the windmills of England.

acknowledgments

Photographs: 2, 3, 6, 7, 25, 26, 33, 37, 48, 52, 61, 62, 71, 73, 75, 103 were taken for the author by Hallam Ashley, F.R.P.S.; Major T. B. Paisley has kindly permitted the reproduction of 28 and 56; while 65 is from a photo taken by the late K. J. Tarrant in the possession of the author.



103, TOMBSTONE "TO THE MEMORY OF WILLIAM BEETEN GENT FORMERLY MILLWRIGHT AND CONTRACTOR DIED IN JULY 1822."

A GLOSSARY which can be read with advantage

the post mill

- The post mill** is so called because the body containing the machinery is mounted on a
- post.** This is supported by four diagonal
- quarterbars** whose lower ends rest on two
- cross trees** placed at right angles to each other.
- The crown tree** is socketed on to the top of the post on which it turns.
- The side girts** rest on either end of the crown tree and on them the framing of the body is built up.
- The sheers** run from the breast to the tail of the mill below the bottom floor of the mill and on either side of the post.
- The collar** is fixed below the sheers and encloses the post forming a bearing to steady the body of the mill.
- The tailpole** extends from the back of the sheers to the ground and is used to turn the body of the mill to face the sails into the wind.
- The round house** encloses the substructure of the mill and forms a storage place, but is usually of no structural significance.
- The petticoat** is a downward extension of the weather-boarding of the body over the top of the roundhouse.
- The brakewheel** is so called because a contracting brake acts in its rim. It is mounted on
- the windshaft,** which carries the sails and it drives
- the wallower,** which is the first driven gear in the mill.
- A sunk post mill** is one with its substructure buried in the ground.

the tower mill

- The tower mill** consists of a fixed tower containing the machinery while only the top or
- cap** is turned to face the sails into the eye of the wind.
- The dust floor** is the top floor of a tower mill excluding dust and dirt from the mill. Below it is
- the bin floor** to which the grain is raised before being ground on
- the stone floor** between the stones. Afterwards it passes down by spouts to
- the meal floor** into sacks or meal bins.
- A smock mill** is a tower mill with a polygonal wooden tower having a resemblance to a countryman's smock.
- Truck wheels** serve to centre the cap in relation to the tower.
- A shot curb** consists of rollers running in two concentric rings between tracks on the bottom of the cap and the top of the tower.

A mill is tail if the wind strikes the sails from behind.

the composite mill

A composite mill consists of a postmill body on a short tower.

winding the mill

The fan tail is an automatic device to keep the sails into the eye of the wind.

windmill sails

- The whip** is the backbone of the sail, which is built up of
- bars** mortised into the whip and laths connecting the bars.
- The hemlath** connects the bars at their outer ends.
- A stock** carries two sails, the whips being bolted and strapped to it.
- The weather** of a sail can be compared to the twist of a propeller.
- The leading board** is fixed to the leading edge of a single-sided sail.
- The common sail** is cloth spread and is the earliest type now used in England.
- The spring sail** has shutters like a venetian blind instead of sail cloth. These are spring controlled and when open
- spill the wind.**
- The roller reefing sail** has roller blinds instead of shutters. They are connected by webbing straps called
- listings** and are simultaneously opened and closed by bars called
- airpoles** which are all connected by cranks, levers and a spider coupling to
- the striking rod.** This passes through the wind shaft and can be moved backwards and forwards from ground level by means of a chain, thus opening and closing the roller blinds.
- The patent sail** has a similar remote control, which is self regulating and shutters are used instead of blinds.
- The poll end** is the double socket at the end of the windshaft through which the stocks are passed.
- The cross** is an alternative method of fixing sails. Stocks are dispensed with, whips are increased in size and called
- backs** and are bolted to the cross, which is keyed on to the windshaft just in front of the
- neck** or front journal bearing.

windmill gearing

- A compass arm wheel** is one whose spokes are mortised through the shaft on which it is mounted.
- A clasp arm wheel** has spokes forming a square at the centre through which the shaft passes.

A lantern pinion is a gear wheel having top and bottom flanges connected by staves which serve as cogs and it is driven by

a trundle wheel whose crudely shaped cogs are often little better than pegs; this is the primitive type of gear.

The tail wheel is mounted at the rear of the windshaft in a post mill and drives a pair of stones.

The upright shaft is introduced if the drive to the stones is indirect. At the top is the wallower and below is

the great spur wheel which drives the stones through spur pinions known as

stone nuts. If the stones are over driven (or over-drift) the nuts are mounted on

quants which drive

the runner stones, the grinding taking place between these and the stationary

bedstones. If the stones are under driven (or under-drift) the nuts are mounted on

the stone spindles on top of which the runner stones are mounted.

A cog box is a wooden jig used to cut out the blanks for wooden cogs for gears.

the stones

- The horse** is the stand supporting the grain hopper. From it is hung the inclined
- shoe** down which the grain falls to the stones. The flow of grain is maintained by
- the damsel** which knocks the shoe and the volume of flow is controlled by
- the gate** in the shoe. Grain falls into
- the eye** of the runner stone, passes into
- the furrows** of the stones, and is ground as it passes outwards.
- The bridge tree** is the beam carrying the thrust bearing for the stone spindle. It is hinged and by raising and lowering it alters the gap between the stones and is known as
- tentering.** This enables the degree of fineness of the meal to be regulated.
- Peak stones** are solid stones quarried in the Peak District of Derbyshire.
- French stones** are built up of stones quarried in France.
- Blue stones or cullin stones** are solid German stones shipped from Cologne.

machines

- The bolter** was used for separating flour from bran by beating it through woollen bolting cloth. In a
- wire machine** it was brushed through wire gauze.
- The groat machine** separates groats from dust and husk.

ANTHOLOGY

The Earliest Windmill on Record

We said withal there was a terrible flash of anger in Samson; witness his address to old Herbert the Dean, who in a too thrifty manner has erected a windmill for himself on his glebe lands at Haberdon. On the morrow, after mass, our Lord Abbot orders the Cellarius to send off his carpenters to demolish the said structure *brevi manu*, and lay up the wood in safe keeping. Old Dean Herbert, hearing what was toward, comes tottering along hither, to plead humbly for himself and his mill. The Abbot answers: "I am obliged to thee as if thou hadst cut off both my feet! By God's face, *per os Dei*, I will not eat bread till that fabric be torn in pieces. Thou art an old man and shouldst have known that neither the King nor his Justiciary dare change aught within the Liberties without consent of Abbot and Convent; and thou hast presumed on such a thing? I tell thee it will *not* be without damage to my mills; for the Townsfolk will go to thy mill and grind their corn (*bladum suum*) at their own good pleasure; nor can I hinder them, since they are free men. I will allow no new mills on such principle. Away, away; before thou gettest home again thou shalt see what thy mill has grown to!"—The old Dean totters home in all haste; tears the mill in pieces by his own *carpentarii*, to save at least the timber; and Abbot Samson's workmen, coming up, find the ground already clear of it.

Easy to bully down poor old rural Deans, and blow their windmills away; but who is the man that dare abide King Richard's anger; cross the Lion in his path, and take him by the whiskers! Abbot Samson too; he is that man, with justice on his side . . .

THOMAS CARLYLE (*Past and Present*, Book II, Chapter 15, 1843)

MARGINALIA

This Month's Anthology

This month's Anthology is a translation of Carlyle's from Jocelyn de Brakelond's *Chronicon*, Chap. 43. It refers to an event of 1191. Bennett & Elton in their *History of Corn Milling*, Vol. II, Section II, Chapter 13, comment on the passage as follows:

"Easy to bully-down poor old rural deans and blow their windmills away," moralises Carlyle; but the dean was not unjustly bullied-down after all. As will be clearly seen later, he had no right to use the wind to the detriment of Abbot Samson or any other millowner; his mill was, therefore, illegal, and it was in accordance with the law that it was "blown away" by his injured monastic lord. The record of this windmill of 1191, as already stated, is the earliest now known. The circumstances attending its erection are precisely such as might be expected to accompany the establishment of a practical novelty. Dean Herbert, though an old and no doubt a wise man, apparently knew nothing of the legal responsibility he incurred in erecting it; though a few years later such knowledge was common to every rustic on the country side.

The designation applied by Jocelyn to the mill is *molendinum ad ventum*. Its later ordinary designation was *m. ventriticum*, though several variations of the term occur; e.g., *molendinum ventosum* (1350), *m. auerium* (1377), *m. ventile* (1490).

Mr. Wailes also emphasizes in a note to Bennett & Elton's comment that by the law of milling soke no mill was allowed to be set up in opposition to the manorial mill, because a mill was a complicated piece of machinery and, if too many of them had been erected, the survival of any one—in this case Abbot Samson's—might have been very doubtful. In the later Middle Ages, with the increase of population, the law became obsolete.

The New Ministers

The following of Mr. Attlee's team will be responsible for jobs of work of special interest to our readers:—

MINISTER OF WORKS: Mr. George Tomlinson, aged 55, started as a worker in a cotton mill; later an

official of the Weavers' Trade Union.

MINISTER OF TOWN AND COUNTRY PLANNING: Mr. Lewis Silkin, aged 56, a solicitor, chairman of the L.C.C. Town Planning Committee. His criticism of delays in housing and of the Coalition Government's lack of interest in planning has more than once been quoted in these pages.

MINISTER OF HEALTH: Mr. Aneurin Bevan, aged 48, started as a miner, prominent in the South Wales Miners' Federation.

PRESIDENT OF THE BOARD OF TRADE: Sir Stafford Cripps. His attitude to the continuation of controls is known. How will he decide on design control and the future of utility products?

Corbusiana

Le Corbusier has written several books during the war and is at present busy on some two or three more. He is one of the eight members of the Comité Supérieur d'Urbanisme et d'Architecture appointed by the Ministry of Reconstruction. He is moreover replanning the region of La Rochelle and acting as consultant on the plans for Algiers. That looks as if at last, after the Pessac and Vichy disappointments, he may get a real chance to show what he can do on a large scale.

Middlesbrough Survey and Plan

A year's intensive work on the survey and planning of the County Borough of Middlesbrough culminated on July 16 with the opening of an exhibition at the Middlesbrough Town Hall by the Marquess of Zetland. The work has been carried out under the direction of Max Lock (famous for his Hull Survey) by a team which included town planners and architects, sociologists, geographers, model-makers and perspective artists. The Ministry of Information's Wartime Social Survey and the Association for Planning and Regional Reconstruction

were responsible for the social survey.

Middlesbrough is a town with a population of about 138,000 occupying a little over 7,000 acres; well suited in size to the region it has to serve. It is fortunate in that its industry is naturally zoned south of the river and north of the railway, clearly separated from housing and the central parts of the town. This is due to the fact that it is dependent mainly on heavy industry which is tied to the river for the purposes of transport. There is a good interrelationship of the most important parts of the town, such as the station, the shopping centre, and the business centre. As far as transport is concerned, a fairly efficient radial road system with a background of straightforward gridiron planning exists. Beautiful country is near at hand to the south.

At present, Middlesbrough is far too much dependent upon one industry. It was founded in 1830 for the purpose of exporting coal, but its rapid growth was really due to the discovery of iron ore in the Cleveland Hills, and steel melting and rolling now employs over 6,000 of its insured workers. The plan proposes the modernisation of this industry, and in addition, zones sites for more light industries and for service industries to cater for local needs.

The weak link in the main road along Tees-side occurs in Middlesbrough itself, where, as in most other towns, there is little attempt made to segregate different types of traffic. The plan proposes segregation into four types: through traffic, industrial traffic, main town traffic and local traffic, with business, shopping, civic and cultural precincts free of traffic altogether. A superbly made model of the town centre which includes these precincts had a prominent place in the exhibition.

Perhaps the most vital part of the plan to the people of Middlesbrough lies in the proposals for housing, neighbourhoods and open space. This is understandable when it is realized that, at present, 10,000 or over one-third of the houses are over 70 years old; 17,000 or over two-thirds are without baths; 6,400 or over a quarter are

crowded at more than fifty to the acre including street area; and, as well, the central areas which contain 71,150 people or 52 per cent. of the people in the town have only 8 per cent. of the open space, whereas the southern fringe contains only 12 per cent. of the people, but has 52 per cent. of the open space. The maldistribution of amenities generally between the central areas and the inner and outer suburbs is the crux of the whole planning problem in Middlesbrough, and in their survey, which covers nearly every aspect of the town and of the life of its people, and in their plan which is both visionary and practical, the Middlesbrough team have taken the town a large part of the way towards the solution of its problem.

London Planning—No Progress

REGIONAL PLAN: This has at last been published complete in book form and an exhibition was opened by the new Minister on August 14. The book will be discussed separately in a later issue.

COUNTY PLAN: This has been out for two years last July. What has happened since? Much committee work behind the scenes; but nothing visible to the eyes of those who want to see a beginning made with the reconstruction of London on coherent and progressive lines. The Town Planning Committee and the Finance Committee of the L.C.C. have now published a first report. It states that "the work of reconstruction cannot wait." It also makes it clear that the major issues of the plan (such as industrial location) cannot be solved with a national decision on acquisition of land and compensation. It had been obvious to anybody familiar with the Abercrombie-Forsyth plan that the powers envisaged in the Uthwatt Report were a minimum not an optimum for the successful achievement of the plan. Now the L.C.C. only urges a certain number of road schemes to the value of about fifteen million pounds at 1939 prices, approval in principle to the Westminster precinct project, and possibly the Bloomsbury precinct too, approval in principle of the three density zones and of neighbourhood planning, and also the acquisition of 3,000 acres costing between thirty and forty million pounds for the purpose of increasing open spaces to 2½ acres per thousand of population wherever present provision is less. (The plan demands 4 acres).

CITY PLAN: The Common Council of the City is getting restless about the delays in reaching decisions over the City plan. A new (and more hopeful) stage was, however, reached on July 25, when Mr. W. S. Morrison, the then Minister of Town and Country Planning, refused to approve of it and recommended to the City the appointment of a first-rate consultant. The City naturally took offence at this, and complained that the Ministry had taken twelve months to reach a decision. Mr. Morrison in a convincing letter to *The Times* answered that the time had by no means been wasted, as is in fact true. Much valuable work on the City of London, it appears, is being done within the Ministry. The letter was an excellent farewell gesture of Mr. Morrison's.

The Plan for Manchester

The plan for Manchester has been published, will shortly be reviewed in these columns, and is now on show at the Manchester City Art Gallery. It is the work of the City Surveyor, Mr. R. Nicholas. Manchester has done its plan proud. The display is lavish and instructive, and conferences of the Town and Country Planning Association and the Town Planning Institute helped to back its message.

The plan covers an area of 700,000 inhabitants, or if the affected border

areas are included, about 1,300,000, although statistics show that if present birth and mortality forecasts are accurate the total population in 1991 will be under 500,000.

Features of the plan are a new central station by Holy Trinity Church, with access from the Manchester as well as the Salford side, electrified suburban traffic, an underground railway, a city circle road to relieve the centre from through traffic, the erection of four bus stations, and the increase of open spaces to seven acres per thousand of population (the minimum demanded by the National Playing Fields Association).

A.A. Students' Exhibition

The most notable feature in the exhibition of the last year's work of the A.A. students is the number of models of a very high standard of workmanship; the most encouraging feature is the growing attention which is being paid to landscape design.

So far as the models are concerned, there is only one thing to be regretted, and that is the lack of any agreement as to the best symbols for tree-forms. The variations are particularly noticeable where different models show solutions to the same problem; often they turn the process of comparison into a test of the imagination.

Landscaping shows an almost complete adherence to the principles of Sharawadgi, and the careful study that is now made of trees in the students' early years proves its value in the

intelligent planting shown in the projects done later.

The prize for the most ingenious piece of construction goes to the fifth year student who has designed a very successful entrance to the central buildings of a proposed holiday camp at Virginia Water in the form of an inverted octagonal pyramid.

Against the background of the many obstacles to wartime education, and particularly in view of the depleted fourth and fifth years, the exhibition promises well for the future of the A.A. It is encouraging to see the buildings being put to such good use in the Summer holidays, during which a refresher course has been arranged for some of our transatlantic allies. It is to be hoped that this will soon be followed by one for the urgently-needed British architects and architects-to-be.

Two Housing Exhibitions

At the same time London could see two popular exhibitions on rebuilding and refurbishing Britain, one at Dorland Hall, designed for the *Daily Herald* by B. Katz, the other shown by the *News of the World* in Selfridge's basement. Their message was more or less the same, and not a new one: slums and the countryside, flat and house development between the two wars, and the possibilities of a better future by means of prefabrication and new labour-saving devices. The *Daily Herald* does it with all the competence of one of the best M.O.I. exhibition architects,

the *News of the World* does it more humbly. The *Daily Herald* show leads you from item to item, and interest never flags, the *News of the World* show is rather muddled, and far from clear in its policy. Never mind; masses of people will see it, and the more often the story is repeated, the better.

A specially noteworthy feature of the *Daily Herald* Exhibition is a design quiz put up by the Council of Industrial Design—a promising first appearance of the new body in the exhibition world.

After Hove—Poole

If Hove is bewitched by the vision of modernistic super flats and wants to get rid of its Regency squares and terraces, Poole seems to be bitten by the scorpion of street widening. Professor Richardson in *The Times* warned against a project which would involve the destruction of the Customs House and the Harbour Office. We are liable to forget how wide-spread the Ruskinian disregard of the Georgian achievement still is. If the two buildings in question were of the fifteenth century no such ruthless scheme would have a chance of approval by a Municipal Council. But as they are only a hundred or a hundred and fifty years old, and there are plenty of buildings surviving everywhere of that age, what can two more or less matter? That two such buildings can make a whole district, just because they are right in their siting, proportions and character, the blind cannot see.

No Act of Grace for Well Walk

It was reported in the January issue that some Georgian houses in Well Walk, Hampstead, survivors of the days of Hampstead Spa, were to be pulled down to make room for 62 municipal working-class flats in a taste "in harmony" with the neighbourhood. Protests were filed and an enquiry held. The outcome is that the Minister of Health has sanctioned the Council's application for a compulsory purchase order, and building will go ahead. Burgh House is going to survive somewhere behind the flats.

The Churches of 1950

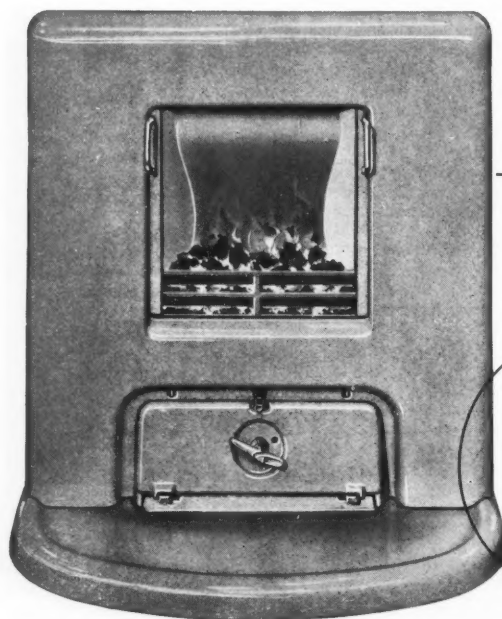
What will the churches of 1950 look like? Compared with the general progress of architecture in Britain between 1930 and 1940, church building has progressed very slowly. Nor is this conservatism or lack of direction confined to this country. There are hardly more than one or two dozen new churches anywhere on the Continent which succeed in combining a contemporary with a Christian spirit.

After this war the rebuilding of hundreds, and, if we include Germany, where Christian teaching is so eminently important, probably thousands of churches will be a very urgent task. How will it be tackled? For this country the Ecclesiastical Commissioners have recently appointed a Church Building Advisory Panel. Mem-

[continued on page lviii]

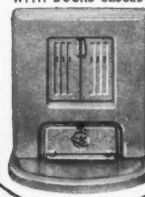
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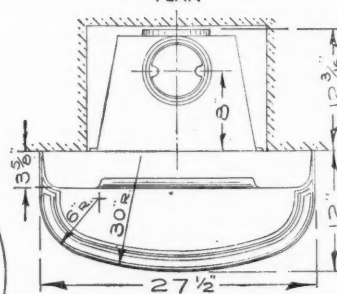


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M-W.56

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bers are Chancellor R. G. S. Bankes (Chairman), the Bishop of Kensington, Canon E. F. Edge Partington, the Rev. Noel Perry-Gore and Messrs. W. H. Ansell, Romilly B. Craze, N. F. Cachemaille Day, F. C. Eeles, Edward Maufe and Bernard A. Miller.

National Parks Committee

Following the suggestion of Mr. John Dower's recent report to the Minister of Town and Country Planning, a National Parks Committee has now been appointed under the chairmanship of Sir Arthur Hobhouse, with the following membership: Lieutenant-Colonel E. N. Buxton, Mr. John Dower, Mr. Leonard K. Elmhirst, Mr. R. B. Graham, Dr. Julian Huxley, Mrs. Lindsey Huxley, and Mr. Clough Williams-Ellis.

Reinforced Concrete Association

The Association has brought out a pamphlet on recent progress which gives a very useful summary of development in such matters as codes of practice, standards, official publications, magazine articles and so on. It is published from 94, Petty France at 1s. 6d.

Domestic Users Panel

The Minister of Works has appointed a Domestic Users Panel to advise him on matters relating to fitments, com-

ponents and other internal arrangements in small houses from the standpoint of domestic convenience. The Chairman is the Dowager Marchioness of Reading. Among the eleven members are Mrs. D'Arcy Braddell, Mr. Grey Wornum, Sir Harold Bellman and Lady Brunner.

Sir Charles Tennyson

Mr. Charles Tennyson, known for many years to readers of THE ARCHITECTURAL REVIEW as Chairman of the National Register of Industrial Art Designers and the Central Institute of Art and Design, has been knighted by H.M. the King. Sir Charles, who is a grandson of the poet, has been secretary of the Dunlop Rubber Company since 1928. His first connection with industrial design was via the chairmanship of the Industrial Art Committee of the F.B.I. set up in 1921.

Peter Ray

After more than four years as one of the design team responsible for M.O.I. exhibitions, Peter Ray has resigned to take up private practice as a designer, especially of exhibitions, typography and books.

Mr. Ray designed many of the exhibitions held on the Charing Cross Underground site—among them Transport into Action, African Front, John Olsen, and the National Health Service. He also collaborated in the design of many of the M.O.I. touring and major exhibitions, among them America

Marches, at Dorland Hall, Colonies, R.A.F. into Action, and Meet Canada. He was mainly responsible for the conception, and was in charge of presentation of Britain's Aircraft exhibition, now running on the John Lewis bombed site in Oxford Street.

CORRESPONDENCE

Recording Bomb Damage

The Editor,

THE ARCHITECTURAL REVIEW

Sir,—My attention has been drawn to Mr. Clifton-Taylor's letter in your June issue. The National Buildings Record has under consideration the publication of a list of historic buildings damaged or destroyed during the war, with an indication of the extent of the damage and the date on which it occurred. Mr. Clifton-Taylor's letter endorses opinions which we have received from other quarters regarding the desirability of such a publication.

Yours faithfully,

WALTER H. GODFREY,
Director, The National Buildings
Record.

The Future of Aerodromes

The Editor,

THE ARCHITECTURAL REVIEW

Sir,—Among all the welter of election promises and post-war planning schemes, I haven't noticed any proposals of what to do with the hundreds of aerodromes for which there will soon be no further use. Only a few of them can hope for a useful

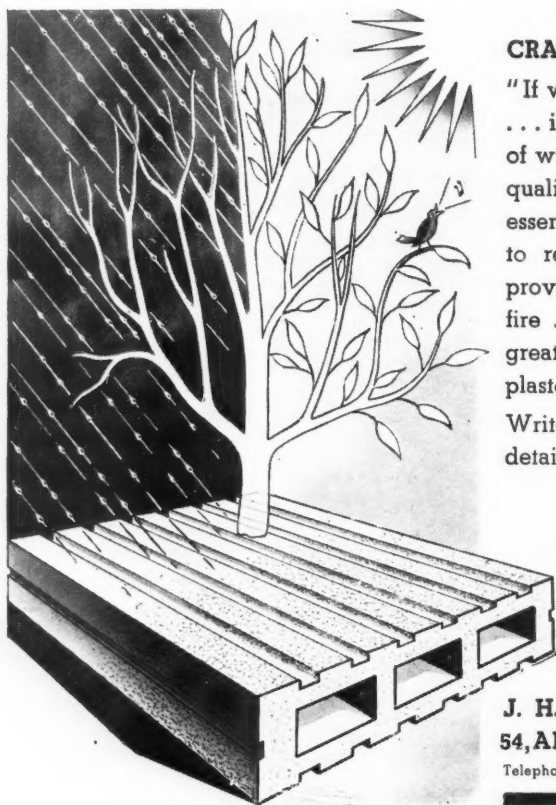
future as service or municipal airports and flying clubs. The majority, if allowed to remain in their present form, will continue to sterilize thousands of acres of good agricultural land. And a number of their more permanent assets such as roads, drainage and water supply systems, etc., will be wasted; for these, unlike the hangars and other buildings, cannot be taken away and reused elsewhere.

Like so much of England's reconstruction and development, the future of these unemployed aerodromes must await a Government decision on overall policy. But any number of ideas for their use immediately spring to mind. Some aerodromes might provide the foundations for new agricultural and village colleges. Others might serve as the living and service centre for a group of small farm holdings worked on a co-operative basis (for this the Russian collective farm layouts might provide useful experience). Other aerodromes might best be built up as new satellite towns. No one idea would be applicable to all surplus aerodromes: what we need is a mass of different ideas to stimulate local initiative.

Architects are the technicians best trained to supply such a stimulus. To bring the ideas out into the open, and to gain public support and enthusiasm, I suggest that you, Sir, should persuade one of the national dailies, in co-operation with the Architectural Press, to organize a public competition, with suitable prizes, to bring forth ideas for unemployed aerodromes. Of course the conditions should be widely publicised and the closing date set far enough ahead, so that those in the forces overseas would have a fair chance to contribute.

Yours hopefully,

GEOFFREY H. V. BAKER, F./O.
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