

## I.

OLD WINDMILLS IN SCOTLAND, WITH SPECIAL REFERENCE  
TO THE WINDMILL TOWER AT DUNBARNEY, PERTH-  
SHIRE. BY THOMAS McLAREN, F.S.A.Scot.

*Read January 27, 1945.*

Old Dunbarney House,  $1\frac{1}{2}$  miles west of Bridge of Earn, is the property of Colonel A. Gomme-Duncan, M.C., F.S.A.Scot. About 540 yards south-west of the mansion house stands a stone tower. It is marked "Old Windmill" on the O.S. Map.<sup>1</sup> The site is elevated slightly above the alluvial plain that stretches alongside the River Earn.

The tower is about 19 feet in height, and tapers from 20 feet 3 inches in diameter, at the ground level, to 17 feet at the top (Pl. I, 1). The wall is 3 feet thick, but at a height of 4 feet above the ground it is increased in thickness to form a projection of 6 inches on the inside of the wall. This has possibly been done to give more space on the main floor of the mill. There are two doorways at ground level, one facing east and the other west, each 7 feet high and 3 feet 3 inches wide at bottom, narrowing to 2 inches less in width at the lintels. The jambs, therefore, incline slightly inwards, and are checked to suit the thickness of the door, which was hinged to open outwards. From these doorways stone steps, formed in the thickness of the wall, led down to the main floor of the mill where the grinding-stones were placed. Through these openings the miller could pass out of the mill, quickly, when the wind sails required adjustment and the speed had to be checked. The ends of the beams which carried the main floor and the millstones rested on a stone bench 14 inches wide, extending round the basement, except on the south side, where the arch of an underground chamber joined the tower.

This underground structure, with a stone arched roof, no longer exists. It was the receiving and dispatching room, opening into the basement of the tower under the main floor. It was 12 feet in width and extended about 24 feet outwards from the tower.

The arched roof of this chamber was covered with soil to the level of the ground at the doorways, thus forming a terrace around the tower, from which the sails could be easily adjusted by the miller no matter what direction they might be facing. This clear space also left the tower fully exposed to any wind. The underground building has long since been removed, and only the arch in the tower remains to indicate its position.

<sup>1</sup> Ordnance Survey, 6" scale, Perthshire. Sheet No. CX. N.W.

The space it occupied is now almost entirely filled in with soil and undergrowth (Pl. I, 2).

On the lintels of the two doorways in the tower are roughly incised emblems, the meaning of which is difficult to explain (fig. 1). These



Fig. 1. Inscriptions over east and west doorways of tower.

markings are about two inches in height and seem to have been cut in a casual manner, not vertically but sloping forward towards the right.<sup>1</sup>

There is no date on the tower, nor on the mansion house, but the doo'cot at the side of the approach to the house bears the date 1697 and the initials J.C. (John Craigie).<sup>2</sup>

The masonry of all three buildings is the same in appearance, the dark red sandstone used in their erection having been taken from the Dunbarney quarry in the field adjacent to the house and near the mill.

A reconstruction of the old mill at Dunbarney is given in fig. 2. It shows as nearly as possible the general arrangement of the various parts, and the intricate mechanism of a mill of that period.

There were *three floors*. In the *basement* the grain was received, and the meal—after being sieved and graded—dispatched. On the *main floor* were the millstones. (The internal diameter of the tower was so limited that there was room for only one set of moderately sized stones.) The sacks of grain were raised up through a hatchway in the floor and emptied into the hopper over the stones. From the hopper the grain passed down into a shoe which could be vibrated and adjusted to feed the stones according to the speed of the driving-wheel. The meal was collected in the box which enclosed the stones and passed down a chute into the meal sack or bin in the basement. The *upper floor* contained the wind shaft and the gear connecting it to the main downward shaft. The axis of the wind shaft was inclined to a vertical angle of 8° to 15° above the horizontal, so that the sails would take the impulse of the wind and sweep in a plane well clear of the lower part of the tower.

<sup>1</sup> Mr James S. Richardson thinks they may be talismanic, but without seeing them he is not prepared to pass a definite opinion.

<sup>2</sup> The name of John Craigie of Dunbarney appears as a witness to documents dated 1664, 1667, and 1672—*A History of the Family of Moncreiffe* by Frederick Moncreiffe and William Moncreiffe, 1929.

A large toothed wheel was attached to the wind shaft which was driven by the sails. This wheel, and even the cogs, were of wood, and on its edge was fitted a band brake of pliable wood. The speed of the drive could be regulated by it, the miller at the ground level being able to do so by means of a rope attached to levers. Later this type was superseded by a shoe brake. The vertical driving-wheel operated a basket pinion of wood fixed to the top of the downward shaft. At the lower end of this shaft, a large spur wheel was fitted, smaller in size than the brake wheel. It in turn drove another pinion on a smaller shaft, or spindle, which propelled the grinding-stone.

The cap or revolving hood carrying the wind shaft to which the sails and driving-wheel were attached, revolved on rollers in a track with guides to keep them in position. The cap was turned round, by hand, to face the wind by means of a long pole which reached to the ground where it could be brought into position by the use of a small winch and ropes the ends of which were attached to rings or short posts set at intervals around the mill. Although later a fan was attached to the tail of the wind beam so that the cap could be turned automatically,<sup>1</sup> the original method of turning the cap by a tail pole is still in use in Holland to-day.

The wind sails, usually four in number,<sup>2</sup> consisted of lattice frames of wood, on which canvas or sail cloth was stretched or furled, covering partially or wholly the frames, the extent being known by the names "sword-point," "dagger-point," or "full-sail," according to the strength of the wind (fig. 3). The sails had to be set or shortened, by hand,<sup>3</sup> a very difficult operation in bad weather and especially in a strong wind. It should be remembered that windmills and sailing-ships belonged to the same era, and it required as much courage to handle the one as the other. The angle which the surface of the sail makes with its plane of revolution is called its "weather." It varied from 7° at the extremity to 18° at the end nearest the wind shaft. The caps were covered with a frame-work of wood and weather boarding shaped like an inverted boat. Some were of an ogee form.

From time immemorial until wind- and water-driven mills were introduced, corn was ground with a saddle stone or quern,<sup>4</sup> and such gear formed part of every farmstead.

With the dawn of feudalism came the importance of corn milling in

<sup>1</sup> In 1750 Andrew Meikle, a Scottish millwright, who invented the threshing-machine, solved the problem of turning the caps of windmills automatically by designing a set of small sails fixed at the end of a long arm or tail beam, and revolving in a plane almost at right angles to that of the main sails.

<sup>2</sup> John Smeaton, who designed the first Eddystone lighthouse, and the stone bridge over the Tay at Perth (1771); erected mills in England with five sails. Some mills were operated with six sails.

<sup>3</sup> In 1772 a spring sail was invented by Andrew Meikle, formed with wooden shutters hinged and operated by means of springs and tension rods.

<sup>4</sup> *Proc. Soc. Ant. Scot.*, vol. xii. pp. 261-262.

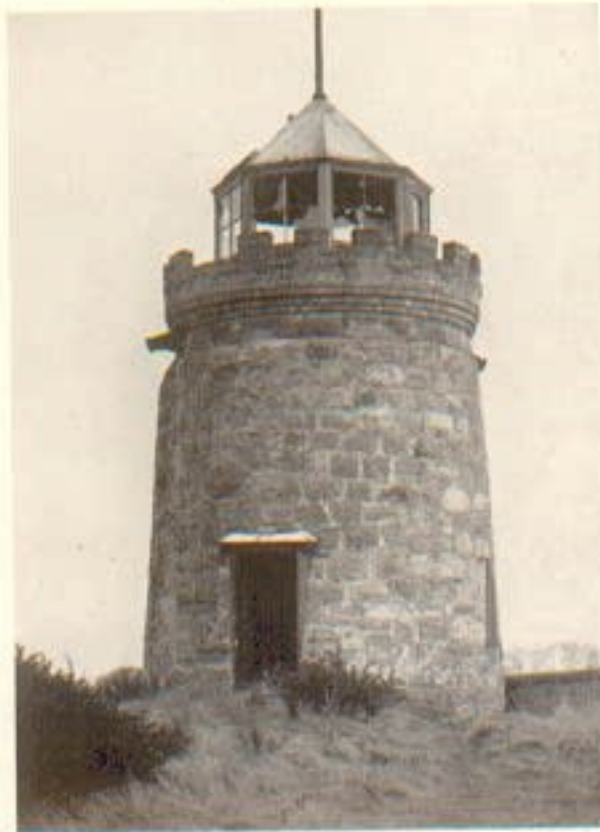


1.



2.

Dunbarney Windmill tower.



3.

Windmill tower at Dysart.

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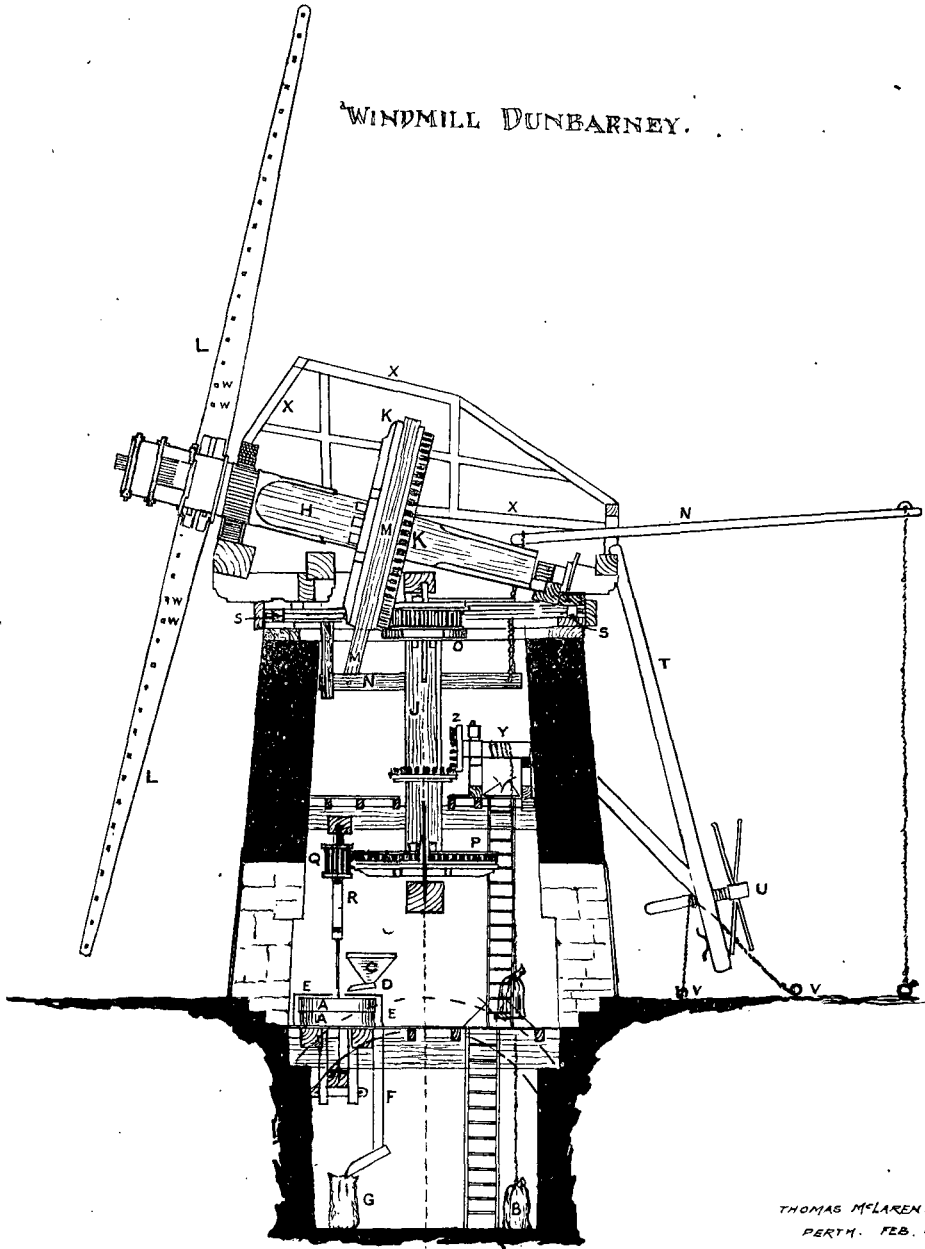
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View of Dunkeld.



Arch at Dysart.



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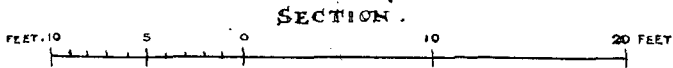


Fig. 2.

the economy of the countryside, and the servitude of "thirlage", which gave the landowners the sole right to build corn mills, and bind their vassals to have their corn ground at a particular mill, on payment of duties called "multures" and "sequels".<sup>1</sup> Prior to 1784 when the village of Kintillo, adjacent to Dunbarney, belonged to the Craigies, "its inhabitants were *thirled* to the windmill that stood a little to the west of Dunbarney House, and of which the remains may still be seen."<sup>2</sup>

At the beginning of the seventeenth century, windmills in Scotland were considered important adjuncts to a community. In 1600 King James VI by a Royal Charter conferred the privilege and power of building within the burgh, "more milns as well *wind* as water milns for the common and public utility and profit of the burgh."<sup>3</sup>

Views of towns in Slezer's *Theatrum Scotiae*, published in 1693, show windmills at Aberdeen, Montrose, and Dunkeld. The view of Dunkeld

REFERENCES TO LETTERS ON FIGS. 2 AND 3.

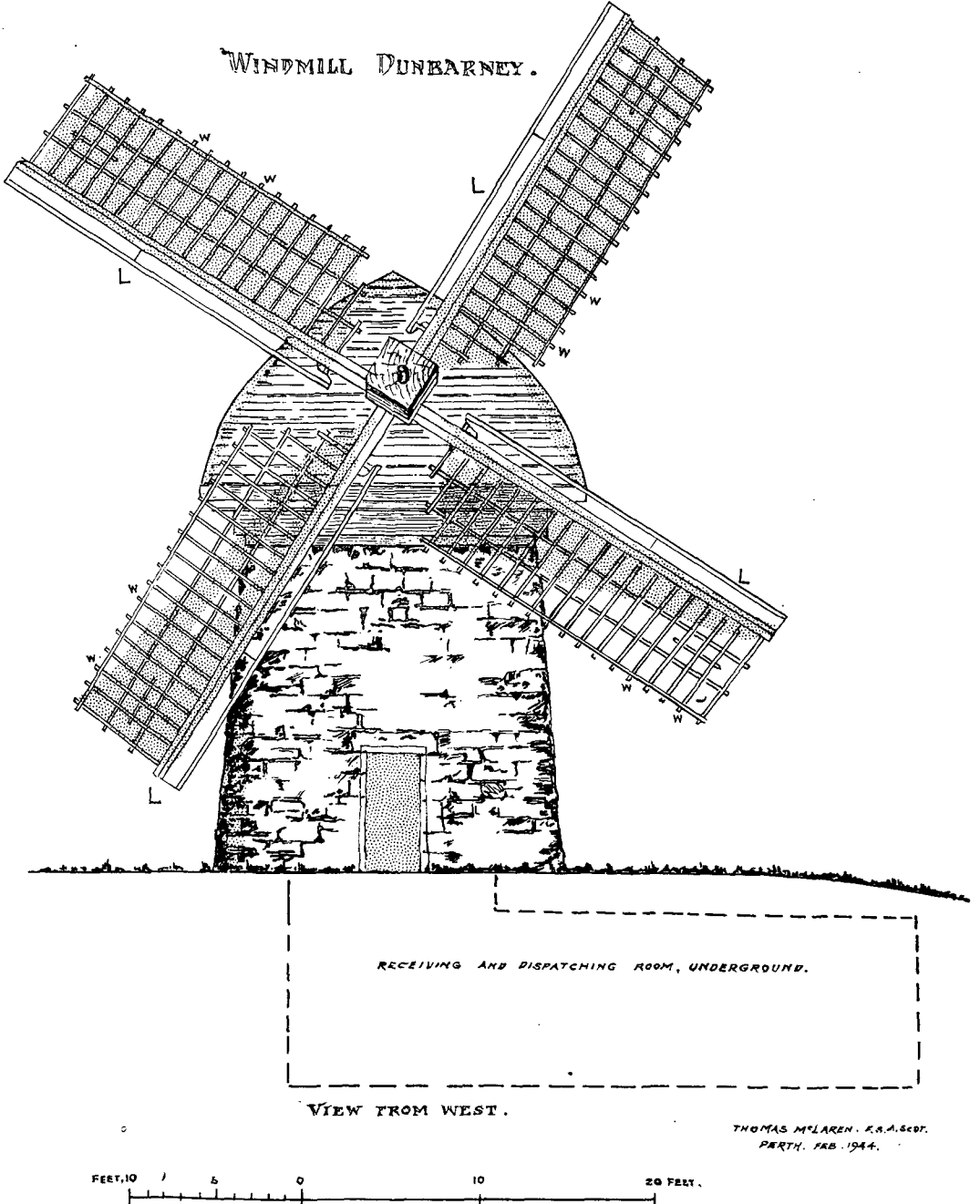
- A. Millstones.
- B. Grain sack.
- C. Hopper.
- D. Shoe.
- E. Box enclosing millstones.
- F. Chute for meal.
- G. Meal sack.
- H. Wind shaft.
- J. Main downward shaft.
- K. Toothed driving-wheel.
- L. Wind sails.
- M. Brake.
- N. Brake levers and rope.
- O. Basket pinion.
- P. Spur wheel.
- Q. Pinion.
- R. Shaft or spindle driving millstone.
- S. Rollers on which cap or hood revolves.
- T. Tail pole.
- U. Winch.
- V. Rings or posts for securing tail pole.
- W. Sail frames covered with canvas.
- X. Roof of cap or hood.
- Y. Hoist for raising sacks of grain.
- Z. Pinion driving hoist off main shaft.

<sup>1</sup> *Handbook of Law of Scotland*, Bell, sec. 1272.

<sup>2</sup> *New Statistical Account*—Dunbarney Parish, written 1842.

<sup>3</sup> Charter of Confirmation of the whole Rights and Privileges of the Burgh of Perth, granted by King James VI, 15th Nov. 1600.

WINDMILL DUNBARNEY.



THOMAS MCLAREN, F.R.S. SCOT.  
PERTH, FEB. 1944.

Fig. 3.



shows the mill very distinctly on what appears to be the rising ground west of the Cathedral, known as the Bishop's Hill (Pl. II, 1). John Slezer settled in Scotland in 1669, so these mills must have existed between that date and the publication of his work.

From the foregoing records it seems reasonable to ascribe the erection of the windmill at Dunbarney to the middle or latter part of the seventeenth century. The date 1697 and the initials of a laird of that period on the doo'cot adjacent to his mansion and the mill tend to justify that assumption.

By the middle of the nineteenth century the whole valley of Strathearn "was studded with plantations; one effect of which, according to the testimony of old people, has been to abate very sensibly the violence of the blasts."<sup>1</sup>

The site of Dunbarney mill being surrounded by flat lands, the planting of trees would tend to break the wind and render the mill useless. It must therefore have ceased to operate towards the end of the eighteenth century, after giving service for over one hundred years. About that time three water-driven mills were introduced on the little stream that passes through the adjoining lands,<sup>2</sup> and doubtless the windmill was superseded by them.

The earliest form of windmill was of the "post mill" type. Examples can be seen in England, but there is no record of any in Scotland. This mill was constructed entirely in wood, and supported in the centre by an upright post, accurately balanced so that the body of the mill could be easily turned round the post, for the sails to face the wind. This type of construction varied little for centuries. Between the years 1575 and 1650, the Dutch adopted tower mills. They were invented by a Fleming whose name is unknown.<sup>3</sup> The body of the mill was rigidly fixed and only the top portion or cap turned with the sails. It was originally built of wood, and was octagonal in shape. In England it was called a "Smock Mill", owing to its resemblance to the smock or overall worn by rural workers. The superstructure and machinery being almost entirely of timber, these mills were easily set on fire by friction, when the sails "raced" in a gale. To obviate this the exterior or shell of the mill was built of stone or brick, and in Scotland the stone towers of this type of mill are all that remain.

Windmill towers, traces of which still exist, can be seen at Dumfries; at Myrehead, near Manuel, Stirlingshire; at Monckton, Ayrshire; at Dysart, Fife; and at Balgone, near North Berwick.

At Dumfries the old windmill tower was altered in 1834 to form part of a Museum and Observatory on Corberry Hill.

The towers which compare most closely with the one at Dunbarney in size and design are those at Dysart and Balgone.

<sup>1</sup> *New Statistical Account*—Dunbarney Parish, written 1842.

<sup>2</sup> *New Statistical Account*—Dunbarney Parish.

<sup>3</sup> *History of Corn Milling* by Bennet and Elton, vol. ii., Tower Mills.

The Dysart tower (Pl. I, 3) has been formed into a sort of outlook tower, commanding an extensive view across the Firth, but its original rôle is still preserved in the name of the road nearby—"Windmill Road".

In Pl. II, 2, the arched opening in the basement of the tower corresponds with the one at Dunbarney, only it is on the north instead of the south side.

The lower portion of the tower at Balgone is similar to the windmills at Dunbarney and Dysart. It has two doorways also, facing east and west. The underground chamber is still complete and extends southwards some distance out from the tower. After it was abandoned as a mill the tower was heightened to form a dovecot. It is marked on Forrester's Map of Haddingtonshire, published in 1799, as a "pigeon cot".

All the authorities dealing with tower or Dutch mills describe them in a general way, but in the *Moolenboek*, Amsterdam, 1736,<sup>1</sup> the precise details of their mechanism are given. By reference to this excellent work the preparation of the drawings shown in figs. 2 and 3 has been made possible. The interior of the mills was very dark, and the creaking of the timber gearing, when in motion, deafening. Their maintenance was heavy and use intermittent. The miller had to work night and day, when the wind blew, to complete his orders, for when the wind dropped, often for days on end, nothing could be done. The inconstancy of the wind is aptly portrayed in the Scots riddle by a poet of some distinction who died recently:

"Blaw wind, blaw;  
And let me mak my bread:  
For whan ye are awa  
It's hungry I maun bide." <sup>2</sup>

And in his "Poems in Scots for Children," the clatter of the mills is thus depicted:

"An auld man stands abune the hill;  
Crick-crack, crick-crack,  
He's unco comfie gin he's still:  
Crick-crack, creeshie.  
But when his airms flee round and round:  
Crick-crack, crick-crack:  
He deaves the clachan wi his sound.  
Crick-crack, creeshie." <sup>3</sup>

In 1793 John Beatson, F.R.S.E., London, invented a horizontal windmill and published an essay on its advantages over the vertical type. A model of one was exhibited, at that time, in Burntisland. Horizontal windmills

<sup>1</sup> See Bibliography at end of article.

<sup>2</sup> *Riddles in Scots* by William Soutar, The Moray Press, Edin. and London, 1937.

<sup>3</sup> *Seeds in the Wind*, Poems in Scots for Children, by William Soutar, Andrew Dakers, Ltd., London, 1933.

were erected in England, but proved uneconomical except for certain purposes.

The driving-wheels of the earlier water-mills in the Shetlands and in Lewis were placed horizontally in the bed of the stream.<sup>1</sup>

A mill of this primitive type, in working order, in the Isle of Lewis, was offered to the National Trust for Scotland in April 1943.<sup>2</sup>

There were numerous water-driven mills in Scotland, both horizontal and vertical, but few windmills, and no record of the working parts of the latter has been preserved locally. Only the bare stone towers of a few remain.

The author wishes gratefully to acknowledge the kindness of friends who have helped him in the study of this subject, and especially those who supplied information and measurements, by correspondence, when it was impossible to visit sites owing to restricted transport services. The lack of such facilities also precluded him from investigating other windmill structures that may possibly exist in Scotland.

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<sup>1</sup> *Proc. Soc. Ant. Scot.*, vol. ii. pp. 257-295.

<sup>2</sup> *Antiquity*. vol. xii. p. 284.