

PART OF LINCOL.



HISTORY OF DEEPING FEN

AND

PODE HOLE

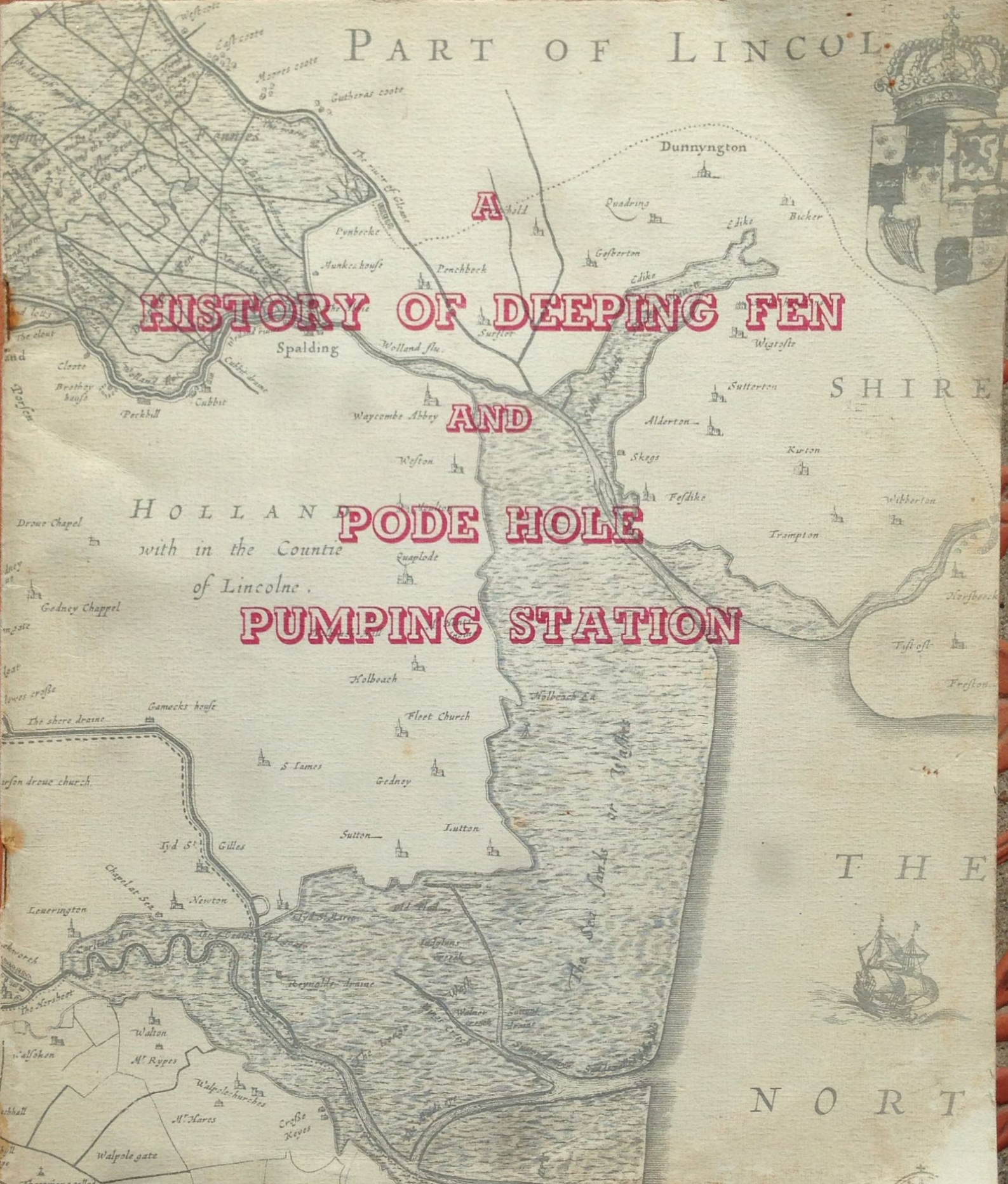
PUMPING STATION

HOLLAND
with in the Countie
of Lincolne.

SHIRE

THE

NORTH



Phone
2458.

Mrs B Rout
124 Winsover Road Spalding

DEEPING FEN, SPALDING AND PINCHBECK
INTERNAL DRAINAGE BOARD

A

HISTORY OF DEEPING FEN

AND

PODE HOLE PUMPING STATION

Compiled by W. D. Miles, A.M.S.E., Engineer to the Board

TO COMMEMORATE THE

OFFICIAL OPENING

OF

THE DEEPING ST. NICHOLAS PUMPS

BY

THE LORD BISHOP OF LINCOLN

THE

RIGHT REVEREND KENNETH RICHES D.D.

ON THE

16th JULY, 1965

FOREWORD

It is the usual custom to prepare an information pamphlet or booklet on the occasion of the Official Opening of a civil engineering work of any magnitude and this was my original intention when I first put pen to paper to describe the new Deeping St. Nicholas Pumps at Pode Hole. However, to me a fenman, the history of fen drainage is a fascinating subject and I soon found that I was compiling a History of Deeping Fen. I now wish more time was available to compile a more comprehensive history as I feel that there is so much information which should be recorded—but I hope the work so far will prove of interest to the reader.

The contents of the book can be summarised as follows:—

- | | |
|-------------|--|
| PAGES 2— 4 | The names of the Adventurers, Trustees and Members of the Board. |
| PAGES 5— 7 | The Map of the Great Fenns dated 1632 by Henry Hondius and the Inscriptions on this Map. |
| PAGES 8—25 | The History of Deeping Fen. |
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| PAGES 37—58 | The History of Pode Hole. |
| PAGES 58—60 | Rainfall and Run-off in a fen area. |

DEEPING HOUSE,
WELLAND TERRACE,
SPALDING.

W. D. MILES



T. R. PICK, ESQ., O.B.E.
THE CHAIRMAN
OF
THE DEEPING FEN, SPALDING & PINCHBECK
INTERNAL DRAINAGE BOARD
since the 4th November, 1948.

M. R. RIDDINGTON, ESQ., M.A.
THE VICE-CHAIRMAN
OF
THE DEEPING FEN, SPALDING & PINCHBECK
INTERNAL DRAINAGE BOARD
since the 4th November, 1948
AND
THE CHAIRMAN OF THE FINANCE
COMMITTEE OF THE BOARD
since the 1st November, 1950.



DEEPING FEN, SPALDING AND PINCHBECK
INTERNAL DRAINAGE BOARD

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W. H. MARTIN

Engineer:

W. D. MILES, A.M.S.E.

SOME OF THE ADVENTURERS, TRUSTEES AND MEMBERS OF THE BOARD OF DEEPING FEN

1600 The First Adventurer:—

Thomas Lovell Esquire (A man skilful in Works of that Nature).

1605—1630

approx. Adventurers:—

The Right Hon. William Earl of Exeter. Elizabeth Countess of Exeter. The Right Hon. Thomas Earl of Berkshire. Lady Elizabeth wife of the above. Charles Lord Howard of Charlton. The Right Hon. Robert Lord Bruce, Baron of Wharleton in the Kingdom of England and the Earl of Elgin in the Kingdom of Scotland. Lady Diana wife of the above. The Right Hon. Anne Countess of Stamford. Thomas Lord Grey of Groby.

1632 Adventurers:—

Sir Philibert Vernatti, a Dutchman. The Earl of Bedford. Sir Robert Bevill. Sir William Russell.

1664 Undertakers or Adventurers:—

Edward Earl of Manchester. William Earl of Devonshire. John Lord Barkley of Stratton. Anchatile Grey, Esq. Henry Grey, Esq.

1801 General Commissioners:—

John Cragg of Threckingham. William Golding of Donington. Edward Hare of Castor. George Maxwell of Fletton.

1869—

1876 Trustees:—

The Right Hon. The Lord Kesteven. The Hon. M. P. Bertie. Lord Carrington. J. G. Campaign, Esq. Robert Everard, Esq. H. Hawkes, Esq. George Hill, Esq. William Hunt, Esq. Edmund Pawlett, Esq. Edmund Rubbings, Esq. George Shillaker, Esq.

1912 Trustees:—

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1925—

1926 Trustees:—

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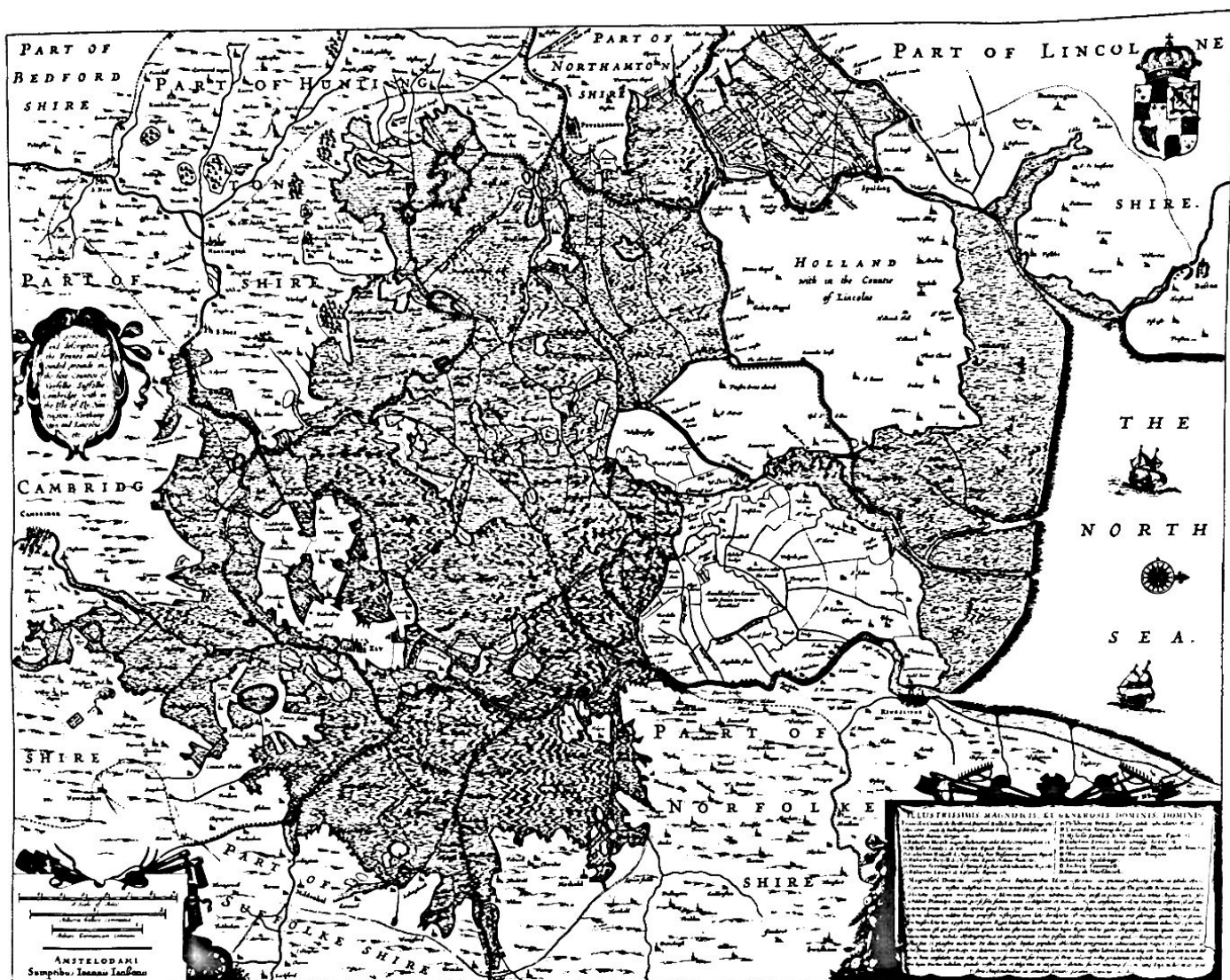
1939 Constitution of the Board.

Members:—

Marquis of Exeter. L. Atkinson, Esq. A. H. Carter, Esq. W. F. Clayton, Esq. R. Cooke, Esq. F. W. Dennis, Esq. L. L. Perkins, Esq. T. A. Pick, Esq. T. R. Pick, Esq. T. H. Richardson, Esq. R. Riddington, Esq. A. H. Smith, Esq. H. C. C. Tinsley, Esq. E. E. E. Welby-Everard, Esq. A. W. White, Esq. S. Worth, Esq.

1957 Members of the Board:—

F. C. Allen, Esq. J. W. E. Banks, Esq. G. F. Birch, Esq. H. J. T. Carter, Esq. A. E. Chappell, Esq. E. D. Cooke, Esq. R. Cooke, Esq. P. K. Dennis, Esq. E. Fisher, Esq. G. A. Griffin, Esq. L. L. Perkins, Esq. T. R. Pick, Esq. T. F. Richardson, Esq. T. H. Richardson, Esq. H. C. C. Tinsley, Esq. G. H. Wade, Esq. A. R. Ward, Esq. R. P. Watts, Esq. P. H. E. Welby-Everard, Esq.



The above map is reproduced by courtesy of Mr. Frank Allen of Messrs. Gwynnes Pumps Ltd. The map is dated 1632 and is believed to be one of the copies of the map from which Sir Cornelius Vermuyden prepared his plans for the drainage of the Great Level of the Fens.

The map in Mr. Allen's possession is beautifully coloured and is approximately 2 feet x 1ft. 6ins. in size. It came into his possession through friends living in France. On the back of the map is printed in the French language the following description of the Fens:—

DESCRIPTION OF THE MARSHLAND, CALLED THE FENNS

Situated in England on the borders of six neighbouring Counties or Shires, to wit Norfolk, Suffolk, Cambridge with the Isle of Ely, Huntingdon, Northampton and Lincoln.

These Fenns, or marshland as I have already described them, lie between the aforesaid six Counties, and the North Sea, on the East coast of England; about fifty English miles from London. Formerly they were completely dry, and very

good land, as related in writing by a certain William of Malmasburny who lived in the year 1200, and who states that the said country was in his time a real paradise, a very heaven for kindliness and beauty, that it was also covered with such beautiful trees, with such smooth, tall, unknotted trunks, that they seemed to touch the stars themselves. The country was as flat and level as the sea, and was covered with exceptionally beautiful green grass, whence it happened that anyone walking there had no fear of tripping on any hummock or mound. There was not the smallest piece of low-lying land which did not bear well. Here you could see the earth covered with apple trees, and there planted with vines, growing so high that they had to be fastened with small stakes. For at that time vines were very plentiful in England. The aforesaid regions from time to time (by the overflowing of the rivers, as well as by the lack of initiative of the inhabitants who were reduced to a state of impoverishment by war and other difficulties, being in no way protected by, and provided with dykes to deal with them as they should) are increasingly flooded, causing great damage and misery to several people. For it is a by no means small parcel of land which is now infertile, comprising as it does, in length, the distance between Suffolk and Waynflet (Wainfleet) in the Shire of Lincoln, 68 English miles, and including also the land putting out, you could easily add another twelve miles. In width it is occasionally 30, more often 20, very rarely 10 miles. This marshy country also includes several towns, such as the Episcapal city of Ely, Croyland, Spalding, Wulsey (Whittlesea), Wisbech, and many villages and houses, as one can see from the map, with several beautiful towns, such as Cambridge, St. Ives, King's Lynn, etc., quite close to its boundaries. It is to be remarked that during dry summers, as those of 1619 and 1620 in this district, this part of the country was for some time almost completely dry, so that an enormous amount of hay was gathered from it. Which goes to show the fertility and good heart of this land. Moreover it is for the most part flooded with only two feet of water, in some places less, and sometimes it is dry, but in rainy years it is completely under water, this water coming chiefly out of three or four Rivers, to wit the Ouse, Welland, Nene, and Grant, and also smaller ones: which aforesaid rivers, not being controlled by dykes, overflowed in rainy seasons, and flooded the low-lying country round about, growing yearly worse, doing great harm to land owners, and bringing fear to neighbouring places. Wherefore also at various times they sought to remedy it to drain and restore to its former beauty this very beautiful and fertile country. This matter was not undertaken by common people alone, but by the greatest in this land, even by some Kings, among the chief of which were Dame Marguerite, Countess of Richmond, later John of Gaunt, Duke of Lancaster, then the Count of Arundel, and again in former times, there was King James the Sixth and others. But this work, (because of one hindrance or another and affairs of state arising, also most often because the local land owners and many of those interested throughout the six neighbouring counties were unable to agree, on will or the fact that the right method of draining had not been attempted) has been left unattended, to the great displeasure of several people. For it must be understood, that this territory is such, and so situated, that if these aforesaid Rivers were provided with dykes on both sides, and raised, or widened, or if in addition, by making some more canals and conduits, the waters were pushed back, it would drain itself completely dry, with no assistance of and from mills or similar devices. To this end and for such a worthy and profitable piece of work, for the greater prosperity of the Realm, and of many thousands of poor subjects, some most noble and gracious Lords have formed a company and common purse, by whose foresight and most worthy conduct there is no doubt that it will be guided and brought to a happy end, by the help of God, to their immortal praise, honour and advantage. The names of these most noble and generous Lords, who have undertaken to fulfill this Royal task (having previously consented and agreed with all those concerned and the land owners) are written on this map, to whom also the map is most rightly dedicated.

THE FOLLOWING INSCRIPTION, IN LATIN, APPEARS ON THE FACE OF THE MAP

To the Illustrious, magnificent and noble Lords and Masters,

Francis, Duke of Bedford, Baron Russel de Thornhauge etc.

Oliver, Duke of Bullingbroke, Baron S. John de Bletsow etc.

Edward, Baron Gorges etc.

D. Robert Heath. Chief Justice of the Court of Common Pleas etc.

D. Myles Sandys of Wilberton. Knight Baron, etc.

D. William Russell of Chippenham. Knight Baron Treasurer of the King's Ships etc.

D. Robert Bevill of Chesterton. Knight of the Order of the Bath etc.

D. Thomas Tyrningham of Tyrningham—Knight Baron of the Order of the King's Bedchamber etc.

D. Robert Lovet of Licombe. Knight etc.

* *D.* Philibert Vernatti—Knight of the Order of the King's Bedchamber etc.

* *D.* Cornelius Vermuyden—Knight.

D. Myles Sandys of Wilberton (Junior) Knight etc.

D. William Sames—Dr. of Common and Civil Law etc.

D. Antony Hammond of St. Albans of the Order of Armour-bearers.

D. Oliver of St. John of the Order of Armour-bearers.

D. Samuel. Spalding.

D. Andrew. Borrowell.

D. John from Haesdonck.

My noble lords, I offer your graces this impression of your ideas, and present to the public view in pictorial form the district which by your industry will shortly change its appearance—the long and wide tract called The Great Fenns, now the delight of the waves, a receiver of waters and the Element of fishes, yet none the less situated, in, as it were, the middle and more useful part of the whole of England; enclosed by six fine counties, and taken by itself fit to become one of the richest and greatest of the Realm. Your decision is to imitate the first and greatest task which most good and almighty God did upon earth, parting the waters that flowed all over it, and making it an habitation fit for mankind. The fame of your proposal has now been widely published, its execution will be no less glorious than profitable to the state of the Realm. This action will be praised by posterity as a Royal deed. King James of blessed memory had resolved to undertake the same task; the task was “reserved” for you, who by the station which you hold, are the hands and arms of this Realm. Therefore destroy, noble lords, as quickly as possible the outlines of this picture of expanses of water so that at the first opportunity I can reproduce for you a more exact and indeed geographical picture, which the ditcher may traverse on foot or by wagon. Thus a rich harvest will please the people of England, attract the admiration of foreigners and I, one of the latter, will share in this happiness. Meanwhile I pray Almighty God to bless this your undertaking; I ask fervently that you will look kindly on this humble work of mine hoping that in his own good time if God so wills, I shall be of service to you in fashioning a greater and more accurate picture of this area, when by your care and diligence it has been reconstituted and has received its new and greatly improved appearance.

Ready to be of service to your worships in everything.

Henry Hondius.

The following History of Deeping Fen has mainly been taken from "A History of the Fens of South Lincolnshire" by W. H. Wheeler, M.I.C.E. first published in 1868. The Author made a very careful study of the old Acts and Decrees of Deeping Fen dating back to the reign of Elizabeth I.

HISTORY OF DEEPING FEN

Boundary

The Deeping Fen, Spalding and Pinchbeck Internal Drainage District is a tract of marsh and low fen land, lying between the Welland and the Glen, and bounded on the north and west by the River Glen, on the south and east by the River Welland, and on the south and west by the high lands in Deeping, Langtoft and Baston; it also includes a small tract of fen land, lying between the Car Dyke and Bourne Eau, on the north side of the Glen and also Croyland and Cowbit Washes, a reservoir for flood waters, on the east and south side of the River Welland.

At one time the central part of the district, or that known as Deeping Fen, was nothing more than a large mere, or lake, at the bottom of which grew and accumulated the aquatic plants which afterwards formed the peat of which the surface of a large part of the fen is still composed.

Croyland

Although the boundaries given above do not include Croyland or its Abbey, their history is very mixed up with that of Deeping Fen and the first works of reclamation were undertaken by the Abbots of Croyland.

Saint Guthlac

St. Guthlac, the founder of Croyland, was a descendant of the Iclings, a noble family of Mercia. He was born in 673. The early part of his life was spent as a military chief, but at the age of 24 he surrendered his home and paternal wealth and entered a monastery. Resolving to become an anchorite and seeking for a desolate and unknown place, he went with a Fenman called Tatwine, who conducted him in a boat to Croyland, where he landed on St. Bartholomew's Day in 697.

The Biographer of St. Guthlac gives, in the following description, some idea of the fens at the beginning of the eighth century:—

"There is in the middle part of Britain a hideous fen of huge bigness, which, beginning at the banks of the river Grante, extends itself from the south to the north in a very long tract, even to the sea: oft-time clouded with moist and dark vapours, having within it divers islands and woods, as also crooked and winding rivers. When, therefore, that man of blessed memory, Guthlac, had found out the desert places of this vast wilderness, and by God's assistance had passed through them, he enquired of the borderers what they knew thereof, who relating several things of its dreadfulness and solitude, there stood up one among them, called Tatwine, who affirmed that he knew a certain island, in the more remote and secret parts thereof, which many had attempted to inhabit, but could not for the strange and uncouth monsters and several terrors wherewith they were affrighted: whereupon, St. Guthlac earnestly intreated that he would show him that place. Tatwine, therefore, yielding to the request of this holy man, taking a fisher's boat (Christ being his guide through the intricacies of this darksome fen) passed thereunto, it being called Croyland, and situate in the midst of the lake, but in respect of its desertness formerly known to very few: for no countrymen, before that devout servant of Christ, St. Guthlac, could endure to dwell in it, by reason that such apparitions of devils were so frequently seen there."

Goggushland

The fen land adjoining the Abbey was called Goggushland and was regarded as a sanctuary of the church. This fen the monks, having license from the King, enclosed for their own use, making the ditches about it bigger than ordinary for the avoiding of dischord.

The monks endeavoured to reclaim the fen by banks and drains but "though they had ample possessions in the fens, yet they yielded not much profit, in regard that so great a quantity of them lay for the most part under water". Ingulphus relates that Abbott Egelric so improved a portion of the marshes as to be able to plough and sow them with corn. In dry years he tilled the fens in four places, and for three or four years had the increase of a hundred fold of what seed soever he sowed, the monastery being so enriched by these plentiful crops that the whole country thereabout was supplied therewith.

Road to Spalding

Abbott Egelric also constructed a road from Croyland to Spalding, the foundation of which was made of wood covered with gravel, 'a most costly work, but of extraordinary necessity'.

1066

In William the Conqueror's reign, Richard de Rulos who was then Lord and Owner of part of Deeping Fen, "and was much addicted to good husbandry, such as tillage and breeding of cattle", took in a great part of the common fen adjacent and converted it into several, for meadows and pastures. He also made an Inclosure from the Chapel of St. Guthlac of all his lands up to the Car-dyke, excluding the River Welland with a mighty bank; because almost every year his meadows lying near that stream were overflowed. Upon this bank he erected tenements and cottages and in a short time made it a large town, whereunto he assigned gardens and arable fields. By thus embanking the river he reduced the low grounds, which before that time were deep lakes and impassable fens, (hence the name Deep-ing or Deep Meadow), into most fruitful fields and pastures; and the most humid and moorish parts to a garden of pleasure. Having by this good husbandry brought the soil to that fertile condition, he converted the chapel of St. Guthlac into a church, the place being now called Market Deeping. By the like means of banking and draining he also made a village dedicated to St. James in the very pan of Pudlington, and by much labour and charge reduced it into fields, meadows and pasture, which is now called Deeping St. James.

1381

In the reign of Richard II, a dispute occurred with the men residing in Kesteven, as to the boundaries of the fens, and a Commission was issued by the King. A perambulation having been made, ten crosses were erected to show the division. But within two years these were all thrown down and carried away by the Kesteven men, for which act sundry of them were hanged, some banished, and some fined in great sums.

16th Century

In the beginning of the 16th century this part of the country is thus described by Camden, in his History of England:—

"Allow me, however, to stop awhile to describe the extraordinary situation and nature of this spot, so different from all others in England, and this so famous monastery (Croyland) lying among the deepest fens and waters stagnating off muddy lands, so shut in and environed as to be inaccessible on all sides except the north and east, and that only by narrow causeys. Its situation, if we may compare small things with great, is not unlike that of Venice, consisting of three streets, divided by canals of water, planted with willows, and built on piles driven into the bottom of the fen, and joined by a triangular bridge of admirable workmanship, under which, the inhabitants report, is a pit of immense depth, dug to receive the confluence of waters.



THE TRIANGULAR BRIDGE AT CROYLAND

Photo 1965

Here the river Welland divided into two streams, one leading to the river Nene.
The present stone structure cannot be later than 1390 or earlier than 1360.

Beyond this bridge, where, as the poet says, 'the soil cements to solid ground,' antiently stood the monastery so famous, in a much narrower space, all round which, except where the town stands, it is so moory that you may run a pole into the ground to the depth of 30ft., and nothing is to be seen on every side but beds of rushes, and near the church a grove of alders. It is, notwithstanding, full of inhabitants, who keep their cattle at a good distance from the town, and go to milk them in little boats, called skerries, which will hold but two persons; but their chief profit arises from the catching of fish and wild fowl, which they do in such quantities that in the month of August they drive 3,000 ducks into one net, and call their pools their fields. No corn grows within five miles of them. Higher up that same river lies Spalding, surrounded on all sides with rivulets and canals, an handsomer town than one would expect in this tract among stagnated waters. From hence to Deeping, a town ten miles off, the meaning of which is deep meadow, for the plain below it, extending many miles, is the deepest of all this fenny country, and the receptacle of many waters; and, which is very extraordinary, much below the bed of the river Glen, which runs by from the west, confined within its own banks."

Petition to Queen
Elizabeth

In the reign of Queen Elizabeth a petition was presented to the Queen by the inhabitants of Deeping and the other towns having right of common in the fens, viz., Deeping, Spalding, Pinchbeck, Thurlby, Bourne and Croyland, setting out the lost condition of these fens, owing to the decay of the banks of the Welland and the Glen and the condition of the sewers and watercourses, and

that by properly draining the same these fens might be greatly improved; and praying the Queen to direct a Commission of Sewers to make enquiry and undertake such works as they should deem necessary for their recovery, and recommending a Mr. Thos. Lovell as the Undertaker, he being "a man skilful in like works, wherein he had been beyond the seas much used and employed, as one fit and much desired by the inhabitants, to undertake the draining of the said fens".

**Lovell's Scheme of
Reclamation 1603**

The First Adventurer

In compliance with the prayers of the memorialists, a Commission of Sewers was issued, which sat at Bourne, and also at Market Deeping. The Court directed that a sum of £12,000 should be levied upon the inhabitants of certain towns in Holland and Kesteven, and on the Commoners in the fens. This tax not being paid, the Commissioners "well tendering the great profit that would arise to all persons concerned, and to the commonwealth in general if the said lands were drained, they therefore granted to Thomas Lovell a concession of the right to drain these fens, on condition that the same should be done solely at his own expense, within a period of five years. As recompense, he was to have a third part of the reclaimed land, but only on condition that he should maintain the works in a state of efficiency, and perfect the drainage of the fens so that they should be firm and pasturable, both in summer and winter. Lovell at once commenced operations and expended the whole of his fortune, about £12,000. A third part of the fens containing 10,036 acres was allotted to him, and also, by order of the Court of Sewers, 5,000 acres additional as a further recompense. This arrangement was subsequently confirmed by an Act obtained in the reign of James I. Owing however to the 'unreasonableness of the times and riotous letts and disturbances of lewd people casting down his banks,' and otherwise destroying his works, the fen again returned to its original condition.

A petition presented to the Court of Sewers stated that both Spalding and Pinchbeck were at that time in a miserable plight, three parts of the latter being 'depopulate and forsaken' through the state of the Glen, which Lovell had undertaken to improve and make 6ft. deep and 40 feet wide, from the beginning of Surfleet.

**Schemes of Ayloff, Thomas
and others, 1618**

Subsequently Deeping Fen, South Holland and the other low lands in this district were included in a great scheme for draining all the fens lying in the counties of Huntingdon, Cambridge, the Isle of Ely, Norfolk and Lincoln. Sir William Ayloff, Anthony Thomas, with other Adventurers, made an offer to King James I, to drain all the fens lying in these counties. The Undertakers signified that as far as the Lincolnshire Fens were concerned they intended to commence their works by opening the Outfall of the Nene and Welland, and to make these rivers navigable to Wisbech and Spalding. These proposals meeting with the King's approval, he recommended them to the Court of Sewers in order that they might aid the Undertakers in expediting such contracts as they should make.

Difficulties however arose in the collection of taxes and the awarding of a proportion of the land drained to the Undertakers and no progress was made.

1629

In 1629 a decree was made by the Court of Sewers, levying a tax of six shillings an acre on "all the marsh, fenny, waste and surrounded grounds" in order to do this general draining notwithstanding which decree, no part of the said tax was paid, nor any prosecution of the work. At another Sessions of Sewers held at Lynn an offer made by Sir C. Vermuiden was accepted to carry out the work, but "the country being not satisfied to deal with Sir Cornelius, in regard that he was an alien, they intimated their dislike to the Commissioners." Finally the works for reclaiming Deeping Fen appear to have been carried out separately from those in the Bedford Level, and "divers gentlemen became Adventurers for the exsiccation thereof." Amongst these was Sir Philibert Vernatti, a Dutchman, from whom the Vernatt's Drain and sluice received its name. In

Vermuiden 1631

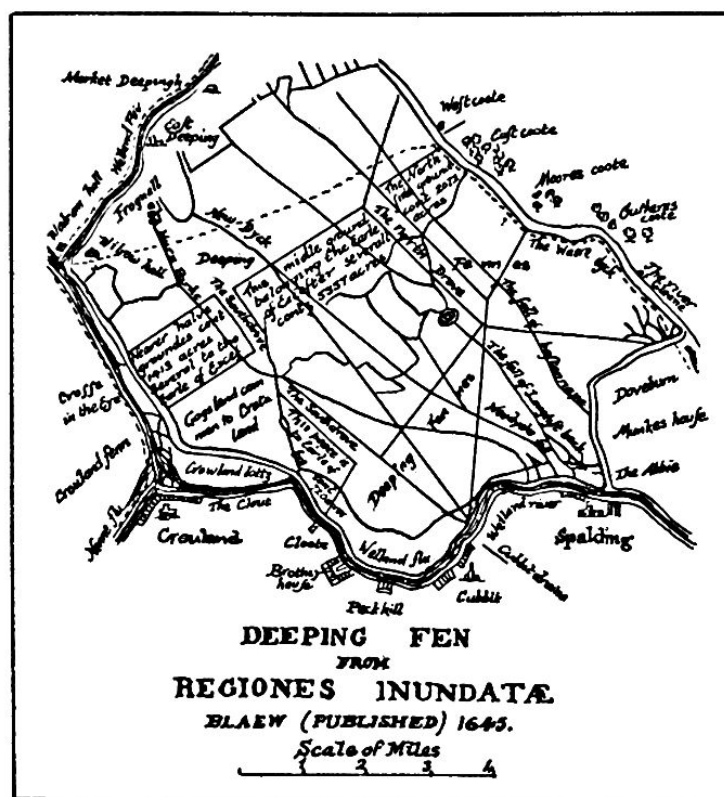
Vernatti

1632 a decree of the Court of Sewers was confirmed, for conferring on the Earl of Bedford, Sir William Russell, Sir Robert Bevill and others, the concession for draining Deeping Fen, South Fen and Croyland. The works carried out by them in Deeping Fen included the widening and deepening of the Welland from Waldram Hall (near St. James Deeping) to Spalding and thence to the Outfall; the cutting of the Slaker Drain (the Counter Drain) about 20ft. in breadth, to ease the River Glen. This drain continued from Dovehirne, along the course of the Star Fen Graft and joined the Vernatt's. Hill's Drain branched off from North Drove Drain, and passed through Spalding Common to the Welland below Lock's Mill, where was 'a great sluice'. The Vernatt's Drain was cut from Pode Hole to the Welland, which it joined about $1\frac{1}{2}$ miles below Spalding, or 3 miles above its present Outfall; the South Drove Drain was carried from Cranmore Common to the Welland near Cowbit. The Adventurers also improved Exeter Drain (the Wheat Mere Drain) from Cowbit tunnel to the sea, below Spalding. A large sluice was erected on the Welland near Lock's Mill. Numerous partition dykes were also made. The North and South Drove were then more than a quarter of a mile wide, with large drains on both sides of the drowes.

In the days of Vermuyden and Vernatti to the early part of the 20th century, the embanking of the rivers and the cutting of new drains was undertaken by hand labour methods. A vast number of men were engaged when The Fens were first drained including Dutch workers and Scottish and Irish prisoners of war who were doing forced labour. In 1634, 600 men were engaged on making the River Welland 40 feet broad and 6 feet deep from Fossdyke Slough to Waldram Hall (Deeping St. James). To give some idea of the magnitude of these works, the following photograph is reproduced by courtesy of the Black Sluice Internal Drainage Board showing improvement of the South Forty Foot Drain undertaken in 1910.

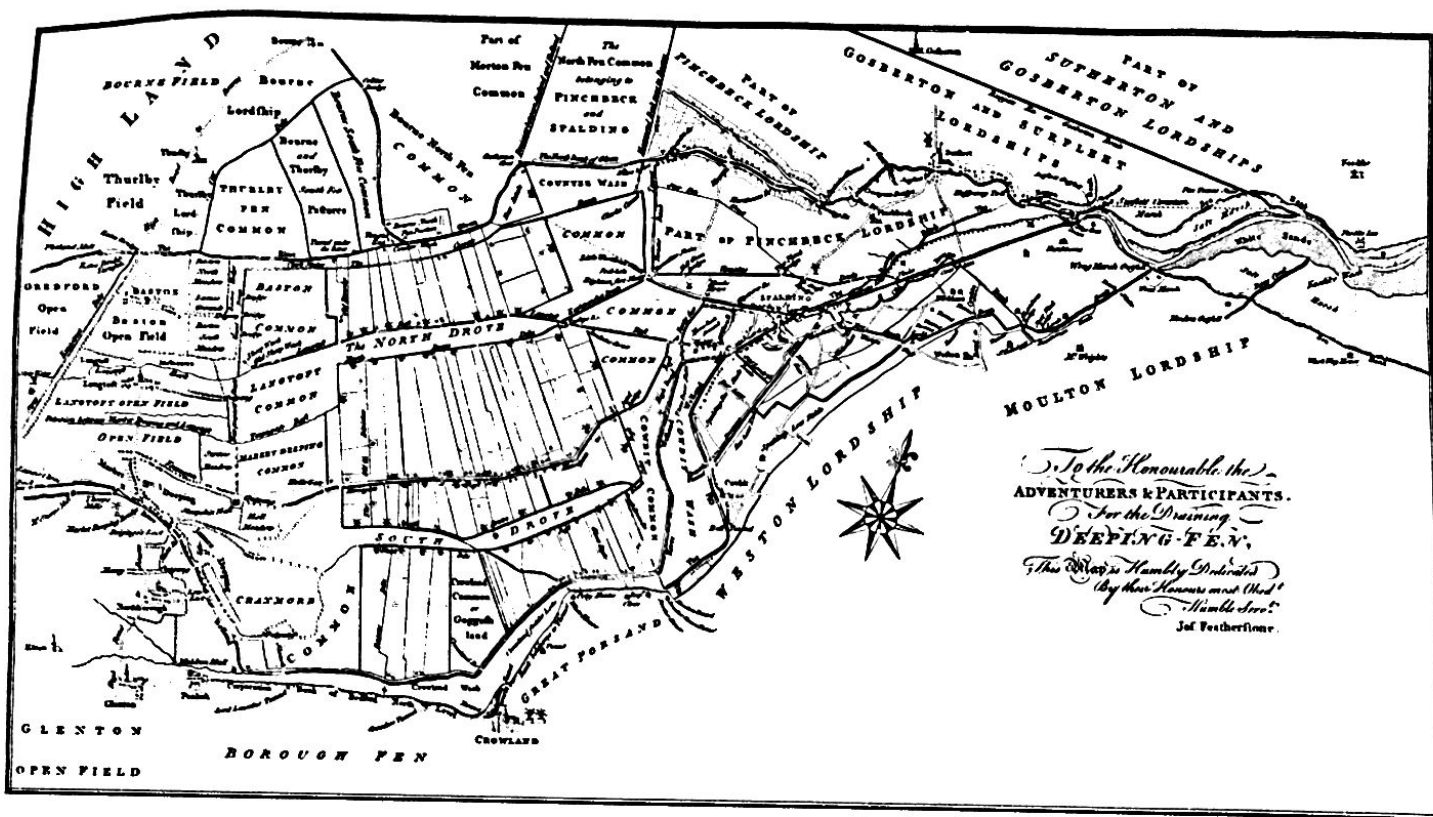


The accompanying illustration taken from Blaeu's map of the *Regiones Inundate* will show the condition of the fen at that time and before the above works were undertaken. It is interesting to note that the Vernatt's Drain and Pote Hole, as a central point, did not exist and the drainage outfall for Deeping Fen was into the River Welland above the town of Spalding and via the Westload. Also the River Welland followed the old course of the "New River" and divided into two streams at the Triangular Bridge at Croyland, one branch leading past the Abbey and discharging thence into the river Nene, the other continuing to Spalding.



The writer is of the opinion that the above Map, although dated 1645, is of Deeping Fen in the Year 1630-31 and this is confirmed by the preceding Map dated 1632 by H. Hondius.

In 1637 the fens were declared drained no doubt as a result of the works undertaken by Sir Philibert Vernatti and others, which are illustrated by the accompanying map as surveyed by Vincent Grant about the Year 1670 (J. Featherstones' Map 1763). A new outfall had been made for Deeping Fen, i.e. the Vernatt's Drain, which was more or less a by-pass of Spalding. However the main outfall still remained into the Welland above Spalding (Lock's Mill) where a number of Wind Engines lifted the water from Hill's Drain, assisted by a side cut called the West Load, which outfalled into the Welland just below Spalding.



1639

In 1639, the Commissioners of the Bedford Level, sitting at Wisbech, decreed that, although the lands in Deeping Fen were much improved, yet that they were still subject to inundation in winter, and a tax of 30/- an acre was ordered to be levied and to be expended in completing the drainage.

A. Burrell, 1642

In a pamphlet written by Andrewes Burrell in 1642, it is stated that the Earl of Bedford had expended £23,000 in draining Deeping Fen. In commenting on the scheme recommended by Vermuiden for diverting the Glen and the Welland to the Nene, so that the three rivers should have one common outfall to the sea, Burrell says "the most considerable danger is the condition of the stuff whereof the banks of the new river must be made. In regard that the greatest part of the Level is a light moor, which hath no solidity in it; for being dry, it is spongy that it will both burn and swim, and is so hollow that a bank, which is this year large and firm to the eye, in four or five years will shrink to less than half the proportions which it had at the first making."

Dugdale

Dugdale says that by the works above enumerated the land was so well drained that in summer the whole fen yielded great quantities of grass and hay, and would have been made winter ground in a short time, but that the country people, taking advantage of the confusion throughout the whole kingdom, which ensued soon after the convention of the long Parliament, possessed themselves thereof; so that the banks and sewers being neglected by the Adventurers it became again overflowed.

Brotherhouse Bank 1650

Note:

Vermuiden's Scheme was declared completed about 1652

In 1650 the Commissioners of the Bedford Level in carrying out the works for the drainage of that district, in order to protect the North Level from the waters of the Welland, constructed a bank, extending from Peakirk to Croyland, and thence to Brotherhouse, where it unites with the Holland Bank. This bank was made 70ft. broad at the bottom and 8ft. high, and a road is maintained on its top forming a communication between Peakirk and Spalding.

In the reign of Charles II, an Act of Parliament was passed, which, after reciting the above facts and repealing the grant made to Lovell, enacted that the Earl of Manchester, the Earl of Devonshire, Lord Barkley, Anchatile Grey and Henry Grey should be declared to be the Undertakers for draining the fen, then computed as containing 10,000 acres in trust for such persons and intents as are mentioned in the Act. They were to accomplish the draining in seven years, so that they should be 'firm and depasturable for cattle at all times of the year', except as to two or three hundred acres, or thereabouts, in the said fen called Deeping Fen and Goggushland and forty acres in Thurlby Fen and Bourne South Fen, which were to be left for 'lakes and sykes for the receipt of waters within the same.' They were for ever to maintain the works and the banks environing the fens and the bank on the east side of the Welland from Brotherhouse to Spalding High Bridge; also the bank on the north side of the Glen from Gutherham Cote to Dovehirne; also to keep the rivers Glen and Welland maintained with sufficient diking, roding, scouring and banking; the Welland from the Outgang at the east end of East Deeping unto the Outfall into the sea, and to preserve and maintain the navigation thereof free of toll; they were to make and maintain all necessary bridges not exceeding 12ft. in width, over all drains whereby passage may be had into the fens. To prevent the banks being injured by cattle and horses, it was provided that no person should at any time between Michaelmas and the first day of May drive any horses, cattle or sheep upon any of the banks without paying certain tolls, and owners of horse boats were not to land any horsemen or horses and cattle upon the said banks, between the same times, except at Waldram Hall, Baston, Spoute, Dovehirne, Cloote, or Croyland, without a licence; no swine were to be allowed to be put on the fens between the banks and the ditches, nor on any other part of the fens, without being ringed, under a penalty of twopence for each hog. Any inhabitants that might hereafter be upon any part of the third part allotted to the Trustees, or upon the Five Thousand Acres, and unable to maintain themselves, were to be provided for by the Adventurers and not allowed to be chargeable to any of the parishes; no water was to be taken out of the Glen or Welland, or any of the drains, without leave of the Trustees.

Pode Hole Sluice

Under this Act, however, the Commissioners of Sewers, had the power to shut down the Sluice at Pode Hole, and to stop the Vernatt's Drain for two months in every year, in order to drain the lands in Pinchbeck and Spalding.

"Taxable Lands"

"Free Lands"

The Trustees were to have one-third of the fens, amounting to 10,036 acres, this being afterwards known as 'the taxable lands', and the Five Thousand Acres, originally allotted to Lovell, in recompence for the money already expended, and in consideration of the work to be done in 'inning and draining the said fen.' This area was afterwards known as 'the Free Lands'. The Trustees were to enclose the lands granted to them. If the reclamation was not completed within the seven years, or if the Trustees afterwards failed to maintain the works, so that the fen was 'good and depasturable ground for cattle at all times in the year,' the lands were to pass over to the Court of Sewers, who were to apply the rents in preserving the lands adjoining from being surrounded and drowned. The Trustees were to pay £100 to the Court of Sewers, towards the repair and maintenance of the South Dozens and Hawthorne Banks. The Owners for the time being of a share of not less than 250 acres of the 10,036 acres were authorised to hold meetings for the better government and orderly management of the work of draining the fens. Three Adventurers were to have power to act under the Common Seal, and to make bye laws, and tax the Owners by an equal acre tax for the purpose of carrying on the work. In default of payment of the tax levied, the Adventurers were to have power to sell the land taxed. A Commission was appointed to determine the boundaries of the land to be inclosed.

22 Chas. ii, 1671

This Act was amended five years later and the time for completion was extended for a further period of three years, as, owing to 'the unseasonableness of the weather and other unavoidable accidents,' the works had not been completed. It was also enacted that the Adventurers should hold a public meeting annually at Spalding, on the Thursday next after the second Sunday in April, at which the acre tax was to be levied for payment on the 10th of October following. In default of payment a penalty not exceeding a third part of the tax was to be imposed. If the tax and penalty were not paid before the April following, the Adventurers could make an order at the annual meeting for the sequestration and sale of so much of the land as would satisfy the tax and penalty.

Time for Annual Meeting
II Geo. ii, c. 39, 1738

The time for holding the annual meeting was altered by a subsequent Act, by which two meetings were directed to be held on the Thursdays next after Midsummer and Michaelmas days. The time for laying the rates was altered by an Act, passed in the reign of George III, by which they were directed to be paid in two instalments, due respectively on the 22nd of May and the 11th of November.

Capt. Perry. 1729

In consequence of the wet seasons and the imperfect condition of the drainage, many Owners of the taxable lands were unable to pay the rates, and, being in arrear, half the lands were sequestered by the Trustees under the powers of the Act of 1664. In 1729 these lands were sold, for £4,000, to Capt. Perry, an Engineer who had been engaged on embanking works on the Thames. The proceeds were to be laid out on works in the fen.

Condition of the Fen in
1738
II Geo. ii, c. 39

The Amending Act of 1738 recites that the lands granted to the Adventurers "had long since been fenced and inclosed, and were drained and kept drained for some years, yet that notwithstanding all the endeavours that had been used to preserve and keep the said fens drained, the same have for several years last past been and now are, so overflowed with waters, through the defects of their Outfalls to the sea and other causes, that little or no profit can be made of them to the great loss and damage of the Owners, as well of the said free lands as of taxable lands, and to the impoverishment of the Commoners, having right of Common in the rest of the fens, being about 15,000 acres, and for which causes about 4,000 acres of the taxable lands had become forfeited for non-payment of the draining taxes charged thereon; and may be sold by the said Adventurers, or any three of them, so qualified as aforesaid; and that the said fens could never be made profitable, unless some new methods were taken to recover the same, which, according to a scheme and estimate made thereof by skilful and able engineers, would cost about £15,000; and that it had been enacted that the Court of Sewers could seize and appropriate all the rents of the Adventurers' lands unless they were kept properly drained." In order to prevent this loss an agreement had been come to with the Owners of the said 5,000 acres of free lands, by which they undertook to raise one-third of the £15,000 required, by an acre tax of 20/-; £6,000 was to be found by a similar rate on the 6,000 acres of taxable lands, and when this sum was expended, then the remaining 4,000 acres, which had become forfeited for non-payment of the drainage taxes, were to be sold by the Adventurers, or so much thereof as was necessary to make up the £15,000, and the money applied to the perfecting of the draining of the level and its future preservation.

Bourne and Thurlby
Fen Pastures

Bourne and Thurlby Fen Pastures, containing 366 acres, part of the 'Free Lands,' were exempted from payment of this tax, on the ground that they had been embanked and kept drained at the sole charge of the Owner, Sir John Heathcote.

Erection of Scoop
Wheels 1741

Two large scoop wheels, worked by windmills, known then as 'Dutch Engines' were erected in 1741, at one end of the main drain, for lifting the water off the fen into the Vernatt's Drain. The wheels were 16ft. in diameter, with 13ins. scoops. An Archimedean screw was at first worked by one of the larger mills, but was subsequently abandoned

Wind Engines

The total lengths of the rivers and drains in the district is given on a map (Vincent Grant 1670), published by Jos. Featherstone, in 1763, as $99\frac{1}{2}$ miles; and of the banks, $66\frac{3}{4}$ miles. On the same map are shown 50 windmills for lifting the water into the main drains.



From the Album of Watercolour Paintings by H. Burgess in the Spalding Gentlemen's Society.

Act of 1774
14 Geo. iii, c. 23

In 1774, a third Act was passed for amending the previous Acts. The Preamble of this Act recites that such part of the River Welland as lies within the town of Spalding and between Hawthorn bank and the Outfall, had become very much contracted and that unless the Adventurers were empowered to cleanse the river, the fens and low grounds could not be effectually drained and improved.

Extension of the Vernatt's
Drain and new sluice at
Surfleet

They were authorised, and afterwards erected a sluice at the end of the Vernatt's Drain, 110ft. on the south side of the Outfall of the Glen, having a clear water-way of 30ft.; and a new sluice near the existing Podehole Sluice, the water-way of which was to be 3ft. less than that of the sea sluice; and to continue by a new cut the Vernatt's Drain, which then joined the Welland about $1\frac{1}{2}$ miles below Spalding, down to the intended Outfall sluice at the Reservoir, having a bottom width of 20ft.; also to make and continue the drain called Langtoft Roft, 30ft. wide; North Drove Dike, 20ft. wide; Black Dike Roft, 30ft.; South Drove Dike, 20ft.; the 18ft. Drain, 40ft. wide; the bottom of all these drains to be level with the Floor of the Pode Hole Sluice. The powers given by the Act of Charles, to the Commissioners of Sewers, to shut down the Sluice at Pode Hole, and to stop the Vernatt's Drain for two months in every year, in order to drain the lands in Pinchbeck and Spalding, were to cease when the new works were completed, and they were not to be allowed to stop the sluice for more than 28 days in a year, nor for more than three days together, within the space of 14 days. The powers of the Court of Sewers relating to the Vernatt's Drain and the sluices at Pode Hole were repealed by the Welland Act of 1794 and also by the Deeping

Pode Hole Sluice

Fen Act of 1801. The Commissioners were also authorised to rebuild Surfleet Bridge, over the Glen and also to enlarge Cross Gate Bridge to a width of 30ft. Gravel Drain was to be scoured to Swine's Meadow and a dam made at the south end, to convey the water into the Counter Wash; the south bank of the Counter Drain was to be repaired and enlarged and widened, and the drain from the end of Gravel Drain to Pode Hole, to be deepened for the purpose of conveying the upland waters along Vernatt's Drain to the sea.

Tunnels

Any Owners who had tunnels through Deeping Bank, Barston Bank, the Counter Bank, and Gravel Drain Bank, were, before the 30th of September in every year, to stop up the same 'with dove-tail or other piles' and keep them stopped till the first of the following May.

Welland Act

34 Geo. ii, c. 102, 1794

In 1794, an Act was passed for improving the Welland and for the better drainage of the fen-land, through the same. By this Act the management of the river was entrusted to a Commission, consisting of the Owners of land paying taxes, and Representatives of Spalding, Boston and Stamford. A new cut was to be made for the Welland from the Reservoir to Wyberton Roads and the tide excluded by a sluice with a navigable lock. It marks the time when the Welland was placed under a separate Commission. The contemplated works were only partially carried out, the new Cut terminating at Fossdyke Bridge and the construction of the sluices being abandoned. There was a clause in the Act for compelling the Adventurers of Deeping Fen to improve the Vernatt's Drain and providing that when it was enlarged it should be supported by the Adventurers, as also the South Dozens Bank; and that the powers given to the Court of Sewers, under the Act of 14 Geo. iii, as to closing the sluice doors for 28 days, and their jurisdiction over the Pode Hole Sluice and Vernatt's Drain should cease. This matter was also subsequently dealt with in the Deeping Fen Act.

Vernatt's Drain

Condition of the Fen in 1798

Stone, in his review of the survey of the Agriculture of Lincolnshire, remarks, with respect to the condition of Deeping Fen, at this time: "The drainage of Deeping Fen is chiefly effected by three wind engines, above Spalding, that lift the Deeping Fen water into the Welland, the bed of which is higher than the land to be drained, assisted by a side cut called the West Load, which falls into the Welland just below Spalding, and which district in violent floods, in a calm when the engines cannot work, is reduced to a most deplorable condition, more especially when the banks of the Welland give way, or overflow, as happened in 1798."

Arthur Young, in his survey of Lincolnshire, which was published at the end of the last century, speaking of Deeping Fen, says: "Twenty years ago the land sold for about three pounds an acre; some was then let at seven and eight shillings an acre; and a great deal was in such a state that nobody would rent it. Now it is in general worth twenty shillings an acre, and sells at twenty pounds. Ten thousand acres of it are taxable under Commissioners, and pay up to twenty shillings, but as low as two shillings; the average is about four shillings, including poor rate, and all tithes free."

Report of Jessop, Rennie, Maxwell & Hare. 1800

At the beginning of the 19th century a joint report was obtained from Messrs. W. Jessop, J. Rennie, G. Maxwell and E. Hare, as to the means to be adopted to improve the drainage of these fens. This report was submitted to a Meeting of the Proprietors of lands in the fen, held at Spalding, on the 26th September, 1800. They recommended that the Cut, authorised by the Welland Act, from Shepherd's Hole through the Salt Marshes of Surfleet and Algarkirk, as far as Fossdyke, should be proceeded with. The other works recommended were mainly those which were afterwards carried out by the General Commissioners appointed under the Act of 1801. They further recommended that a New Drain should be made to relieve the Glen from Baston to Pinchbeck Bars; and

that proper engines should be erected at Pode Hole to lift water into the Vernatt's. A supplemental report was appended, signed by W. Jessop and John Rennie, stating that they considered the erection of engines at Pode Hole as absolutely necessary for relieving the internal main drains, and advised the use of steam for this purpose, on the ground that although wind engines could be made of better construction than those hitherto in use, yet in calm weather such engines were frequently useless when most needed.

Inclosure of Deeping Fen
41 Geo. iii c. 128, 1801

In 1801, application was made to Parliament, and an Act obtained, for draining, dividing, and allotting the tract of land now generally known as Deeping Fen, the whole of which, with the exception of the Adventurers' lands, was Common. The following is the area of land dealt with by the Act.

Area of Inclosed Land	<i>Acres</i>
Market Deeping Common, Deeping St. James Common, Langtoft Common, Baston Common, Cowbit Common and Heath, Spalding Common, Pinchbeck South Fen	13,500
Pinchbeck North Fen	3,500
Droves and Waste Lands	800
Crowland Common otherwise Goggushland, Commonable by occupants in Crowland only	1,200
Deeping Fen taxable and free lands under the control of the Adventurers. (The powers of the Commissioners only extended to the draining and not the allotting of this land). Fen lands in Bourne and Thurlby on the north of the Glen, and inclosed lands in Spalding and Pinchbeck lying between the Glen and the Welland	15,000
	34,000

The Allotment

George Maxwell of Fletton, Edward Hare of Castor, John Cragg of Threckingham and William Golding of Donington were appointed General Commissioners for executing the works of Drainage, and for dividing and allotting the Commons into Parochial or other parts and shares. The separate share of each parish was first to be determined. The Commissioners were to be allowed two-and-a-half guineas a day each for their services and travelling expenses.

The Commissioners were directed by the Act, before making any Allotment, to set out 120ft. of land next the banks of the rivers, for the purpose of selling such land to the Adventurers. They were to set out such carriage roads as they deemed necessary of the width of 40ft.; and it was forbidden to erect any trees near the fences of these roads, at a less distance than 50 yards apart. The boundary between Holland and Kesteven along the North and South Droves, which had long been a subject of dispute, was to be settled by the Commissioners, and their decision was to be final and binding. As the rate to be levied on Crowland Common and the Washes and other lands under the Welland Act of 1794, had not been raised and paid, the Commissioners were to sell so much of the Common land as would raise a sum sufficient to pay the arrears of the tax, and hand the proceeds over to the Welland Commissioners. They were also directed to sell so much of Pinchbeck North Fen and other lands, as would raise a sum sufficient to discharge all taxes due to the Black Sluice Commissioners in respect of the North Fen. Sufficient of the Common land was also to be sold to defray the expenses of the Drainage Works and of dividing and allotting the Commons.

New Works

As soon as the Welland Commissioners had completed the new Cut for the Welland to Fossdyke, the Adventurers were at their own cost to enlarge and deepen the Vernatt's Drain, from Shotbolt's Bridge to Pode Hole, so as to give it a 30ft. bottom, and to erect carriage bridges over the drain, having a clear water-way of 30ft. and other bridges in place of those then existing, with clear water-ways of 30ft.; also to widen and deepen Blue Gowt Drain, from its outfall in the Glen to its termination near the Turnpike Road, and continue it by a new drain to the Dozens Bank, having a 10ft. bottom at the lower end and 6ft. at the upper; also to erect a sluice of 14ft. water-way at its junction with the Glen; they were also to make a new drain, branching from the Blue Gowt Drain to the Vernatt's Drain, and so much further on the south side as might be found expedient, with a culvert under the Vernatt's, 3ft. in diameter, for the purpose of draining the lands in Spalding and Pinchbeck, lying between the Westlode Drain and the Glen, so as to discharge their waters into the Glen.

Culvert under the Vernatt's Drain to drain Spalding

The Proprietors of this part of the District were also empowered by the Act to erect a drainage engine for lifting the water off the land lying west of Two Plank Bridge for discharging the water into the Vernatt's, subject to certain restrictions.

Vernatt's and Pode Hole Sluices

The Adventurers were also to deepen the Welland from Spalding Lock upwards and to strengthen the north bank of the river. After the Adventurers had completed these works, they were to be maintained by the Dykereeves of Spalding and Pinchbeck, except Vernatt's Drain; and the right of shutting down the doors at Pode Hole for twenty-eight days was to cease. Vernatt's Drain and Pode Hole Sluice were to vest in the Adventurers. In the event of a breach in the banks of the Glen or Welland, the Commissioners of Sewers were to have the power to shut the sluice doors at Pode Hole and keep them shut 'until the breach or gool shall be stopped and made secure.' If, at the end of two years, it appeared to the Commissioners that the mills and engines erected by the Adventurers would be found useful for drainage, they were to pay the Adventurers for them; but if it was found that they were not wanted, the Adventurers were to be allowed to take them down and sell the materials.

Drainage Engines

New Drains (North & South Drove Drains)

The following works were to be carried out by the Commissioners. A main drain, commencing at Pode Hole and extending to the Rampart Drain, and proceeding along that drain to the east end of the Commons at South Drove, and along this drove to its west end, and continuing thence to the Cross Drain, with a branch communicating with Crowland Common at its north end. This main drain was to be 24ft. at the bottom at the lower end. A main drain commencing at Pode Hole and continuing along the 18ft. Drain to the west end of the North Drove, and joining the Cross Drain. The width of the bottom at the lower end to be 24ft. A new drain across the Commons, having an 18ft. bottom, commencing at the north bank of the Welland, and extending to the south bank of the Counter Drain. The Counter Drain to be enlarged from Pode Hole to the Tunnel under the Glen from Thurlby Pastures; as also Hill's Drain for the use of the land in Deeping Fen. Bridges were to be erected over these drains as might be found necessary. King Street Drain was to be deepened. A Catchwater Drain was to be made near the Western boundary of the Commons, and the Glen was to be deepened and enlarged from the Reservoir to Kate's Bridge. These Works were to be done at the expense of the Owners of the Commons, lying between the Welland and the Glen. The money was to be raised by an equal acre rate.

Flood Gauges

The Commissioners were also to have a gauge stone erected near Pode Hole Sluice, with marks on it 7ft. 8ins. above the level of the floor of that sluice, and similar stones erected by the side of the main drains, at intervals of a mile, up to the Cross Drain, and having a second mark, denoting the height of 1in.

per mile, for every mile up the drains. The engines draining the fen were to have their wheels 'with the wallowers' thereof so constructed as to prevent their discharging water into the drains when the water rose above the higher of the two marks.

The right to drain Bourne South Fen and Thurlby Fen Pastures, by the culvert under the Glen, was confirmed.

Glen Banks

For the preservation of the banks of the River Glen the General Commissioners in their Award were to nominate Trustees or Officers to have charge of such banks, with power to levy rates for the purpose. By the Act of 1823 the Trustees of the interior Districts were directed to pay the Glen Trustees such sums as should be rated on them for the repair of these banks.

Deeping Fen Trust created.

After the works were completed and the Award made, a permanent Trust was created, consisting of 11 trustees, 4 elected by the Owners of 100 acres of the taxable lands in Deeping Fen; 2 by the Owners of 100 acres of the free lands; and 5 by the Owners of 100 acres of the allotted lands lying between the Welland and the Glen. An additional vote was given to every Owner for every 300 acres owned above the 100 acres. These Commissioners were to be elected every three years, and all the general works of drainage etc. were to vest in and be maintained by them. They were to have the usual powers of appointing Officers and levying taxes not exceeding one shilling an acre, unless the approval of the Owners of the land were obtained for a larger sum. The taxest were to be laid at a meeting held at Spalding or Market Deeping, on the day after the last Thursday in April every year. This was altered, by the Act of 1823, to the second Wednesday in April. The Trustees were to be allowed their reasonable expenses for attending such meetings.

Drainage Districts

The Commissioners were to set out the lands divided into parochial allotments, into Districts. Trustees were to be elected by each separate District for the management of the internal drainage, and for this purpose were authorised to lay rates, not exceeding two shillings an acre in one year. Six Districts were thus set out and the maximum tax was increased by the subsequent Act of 1823 to five shillings. By the Act of 1856 the power relating to these Districts, except the Fourth, were repealed and their powers transferred to the General Trustees.

Sheep only on Banks

The Trustees were empowered to let the herbage of the banks and forelands of the main drains, to be grazed with sheep only. The Award of the General Commissioners was to be enrolled and copies deposited in the parish churches of Spalding and Market Deeping, copies to be supplied to persons requiring the same at the rate of twopence for every 72 words. The right to inspect was to be obtained on payment of one shilling.

Condition of the Fen in 1815

Pear's Report 1815

The works executed under the direction of these Commissioners did not effect a permanent improvement. The recommendation of Mr. Rennie, in his report of 1800, as to the erection of steam engines at Pode Hole was not carried out, and in a report made by Mr. Thomas Pear in 1815, it was stated that the drainage was in a very unsatisfactory condition, the water often standing 6ft. on the sill of the old Vernatt's Sluice, which was the outlet for the drainage of Deeping Fen, including an area of 30,000 acres which were then drained by means of 50 wind engines. The distance of the outfall at Pode Hole from low water in the estuary was about 17 miles, and the distance from the lowest land in the fen, 20 miles. The fall from the surface of the lowest lands to low water was about 15ft. The outlet of the Vernatt's Drain, which conveyed the water from Pode Hole to the Welland was over-ridden by the water coming down that river, owing to the defective condition of the channel below Fosdyke Bridge. To remedy this he advised a new Cut two miles in length across the embanked

lands and salt marshes to a point near Holbeach Middle Sluice; also that a lock or sluice should be erected in the Welland, a little above the Reservoir, for the purpose of keeping up a navigable head of water in dry seasons, to be so contrived as to admit the free influx of the tides, and at the same time to be clear for the outflowing of the land water. He estimated the cost of the proposed works at £50,000. The recommendations contained in this report were not entertained.

J. Rennie. 1818

In the year 1818, Mr. John Rennie made a further report to the Proprietors of lands in Deeping Fen, on the improvement of the Outfall of the Vernatt's Drain. The result of his survey of the district was that he found the whole of Deeping Fen 'almost in a lost state.' At that time the sluice at Pode Hole, where the Vernatt's Drain commences, had three openings of 10ft. each, giving a water way of 30ft. The Vernatt's Sluice, the Outlet of the drain, had two openings with the same width of water way.

Proposed Cut to
Hobhole

Mr. Rennie approved the scheme already proposed for making a new Cut from Fosdyke to the Witham, but as a modification of that plan, he proposed that a new Cut should be made from the Vernatt's Sluice, to take the Deeping Fen waters only, passing under the Glen by an aqueduct, and running along the north bank of the Welland to Fosdyke; then along the inclosed lands for half a mile, across the sea bank, and along the open marshes to the Witham at Hobhole, with a sluice at the end. The length of this channel would be $8\frac{1}{4}$ miles, the total distance from the Cross Drove Drain in Deeping Fen, to the Outfall, being $23\frac{1}{2}$ miles, and ordinary low water mark at that time, standing at 3ft. 3ins. on Hobhole sill; which was 17ft. below the surface of the land in the fen, allowing the water to stand 2ft. under the surface of the land, and giving a fall throughout the whole length of the new channel of 6in. per mile. This Cut would also take the waters discharging from the lands draining by the Gosberton, Five Towns and Kirton Outfalls, amounting together to 18,000 acres. The estimated cost of this work was £123,650.

Steam Drainage
T. Pear

Bevan 1823

Mr. Rennie's plan not being adopted, a report was obtained from Mr. Thomas Pear, who, failing other plans, recommended the application of steam power for the drainage of the fen. This recommendation was endorsed by Mr. Bevan, who, in a report dated March 1st, 1823, advised the erection of two engines at Pode Hole, and the deepening of the drains.

4 Geo. iv. c. 76 1823

Pode Hole Steam
Engines

Being thus advised, the Deeping Fen Trustees obtained an Act giving them further powers of carrying out works, and levying additional taxes. The Preamble of this Act recites that the Works of Drainage carried out under the Act of 1801, had been found insufficient, and that for the purpose of facilitating the discharge of the waters, it was necessary that engines worked by steam should be erected. The Trustees were therefore authorised to erect at Pode Hole one or more good and substantial engines to be worked by steam, and to deepen and improve the drains. A Civil Engineer was to be appointed to superintend the works, and he was authorised by the Act, with the consent and approbation of the Trustees, to contract with any persons for the execution of the works, and was to be paid at the rate of five guineas a day for his services and expenses.

Civil Engineer
(Five Guineas per day)

To meet the cost of the works the Trustees were authorised to levy a rate of fifteen shillings an acre, and, with the consent of Owners of three-fifths of the land, a further tax of five shillings.

Under the powers of this Act, two steam engines of 80 and 60 horse-power, driving scoop wheels, were erected at Pode Hole in 1824. The average immersion of the scoops of these wheels was 2ft. 6in. The total quantity of land drained by these engines was 32,000 acres.

AUTOBIOGRAPHY.

To the Editor of the Mercury.

Sir,

Poor old Crowson, of Market Deeping, an eccentric character, who died on the 3rd of June last, in his 87th year, penned the enclosed piece of Biography a few days before his death, respecting which he gave especial injunction to his Executors. Possibly you may feel disposed to favour the last wish expressed at the foot of it.

I am, yours &c., M.

7th July, 1849.

John Crowson, born at Maxey, October 19, 1762. He lived at the Bertie Arms, Market Deeping, nearly 20 years, and in all that time not a game at ninepins or other unlawful game was allowed: in the same house there was only one birth in the course of 100 years, and that was Thomas Butler, late Postmaster. Crowson was bailiff of the Manor of East and West Deeping for 40 years, under Messrs. Pierrepont, Cheales, Forbes, and Moore, the Stewards. He was the only Publican ever known in Deeping who gave up business to live independent, which he did till his death, though he kept the sign of the Battering Ram, at Deeping St. James, for nearly 30 years, and there it is to be seen now. He remembered Deeping Bank breaking on Martinmas Eve, 1770, which drowned Deeping Fen 7 feet deep in many places, but 6 feet on the average, seven miles from Deeping Bank to Baston Bank, and 9 miles between Deeping and Spalding, 63 square miles six feet deep. The greatest sufferer was W. Bailey, called Wikeham Bailey, who had 130 acres of cropping all lost, besides a pound an acre Drainage Tax. His own land ruined him entirely, and many others. It then set in such a severe and long frost as had not been known for years, and it went or broke up with such a strong W. wind that it destroyed the greater part of the houses, barns, and mills all over the fen. By great industry and expense they got it drained and began to thrive, but in two years and a half at May fair, 1773, it rained for two days and nights, so that it drowned it again by the downfall only. It was called the May flood. These were sad times for the poor fen farmers, and now you farmers look at it and smile. All this poor old Crowson remembered well. He remembered several farms in the fen being sold for less than £5 an acre, but M. J. Mawby bought his under £3 an acre. And this I should like to be put in the Stamford Mercury. Farewell.

NOTE: — The Steam Engines at Pote Hole first commenced work on the 27th October, 1827.

**Deeping St. Nicholas
Parish 1846**

In 1846 the lands in Deeping Fen were made into an ecclesiastical parish, under the name of Deeping St. Nicholas, and a church built and endowed at the sole cost of Messrs. Stevenson of Stamford. In 1856 this was made, except as to the part in Crowland, also a civil parish under the powers of an Act, with provision for the maintenance of the poor, who hitherto had been provided for by the Adventurers of the free and taxable lands. For the purposes of the maintenance of the highways the parish was divided into the north, middle, east and south townships, each maintaining separately its own highways.

**Consolidating Act
19 and 20 Vict. c. 65.
1856**

Difficulties frequently occurring in the efficient management of the drainage of Deeping Fen, owing to the powers possessed by the Adventurers and the Trustees of the interior Districts, in addition to those of the General Trustees, an Act was obtained in 1856 for the purpose of consolidating these different Trusts and for other purposes. This Act recites that the area of land lying between the Welland and the Glen, subject to taxation, was 27,469 acres, of which 10,030 acres belong to the Adventurers who were exclusively charged with the maintenance of certain works described in the Acts of 1665, 1774 and 1801, for the purposes of which they had power to levy taxes. It was therefore enacted that these Adventurers of taxable lands should be charged in perpetuity with an annual rate of eighteenpence per acre, payable to the General Works Trustees, and their liability to maintain works and levy taxes was to cease, and all works and lands belonging thereto were for the future to vest in the General Works Trustees. Power was given to the General Works Trustees to rebuild the sluice at the end of the Vernatt's Drain, which had been destroyed a few years previously and to erect temporary sluices; to enlarge the Vernatt's Drain; to maintain and improve the Glen, and to contribute out of their funds to any works deemed necessary, jointly by themselves and the Glen Trustees. A tax of one shilling an acre was to be levied for enlarging the Vernatt's Drain. The Adventurers had to pay £3,648/13/4d towards the expenses of constructing the new outfall sluice, and the Trustees were to tax the Adventurers' lands two shillings an acre annually and the other lands a rate of one shilling an acre. These taxes were not to continue for a longer period than five years, unless by the consent of the majority of the Owners. The lands in the first, second, third, fifth and sixth Districts were to be liable to an annual tax of one shilling an acre for maintaining the interior drainage works; and the District Trustees' powers were to cease and vest in the General Trustees. The power to levy taxes imposed by previous Acts was confirmed. The Adventurers having been exonerated from the maintenance of the north bank of the Glen, from Gutherham Cote to Dovehirne, in consideration of an annual payment of £18, this was to be continued by the General Commissioners; who were also to pay, to the Officers having direction of the Glen Banks, such sums as the Adventurers' lands were rated at. Persons were forbidden to keep rabbits or geese on the banks of the forelands.

Adventurers' Tax

**Adventurers Exonerated
from Maintenance of
North Bank of Glen**

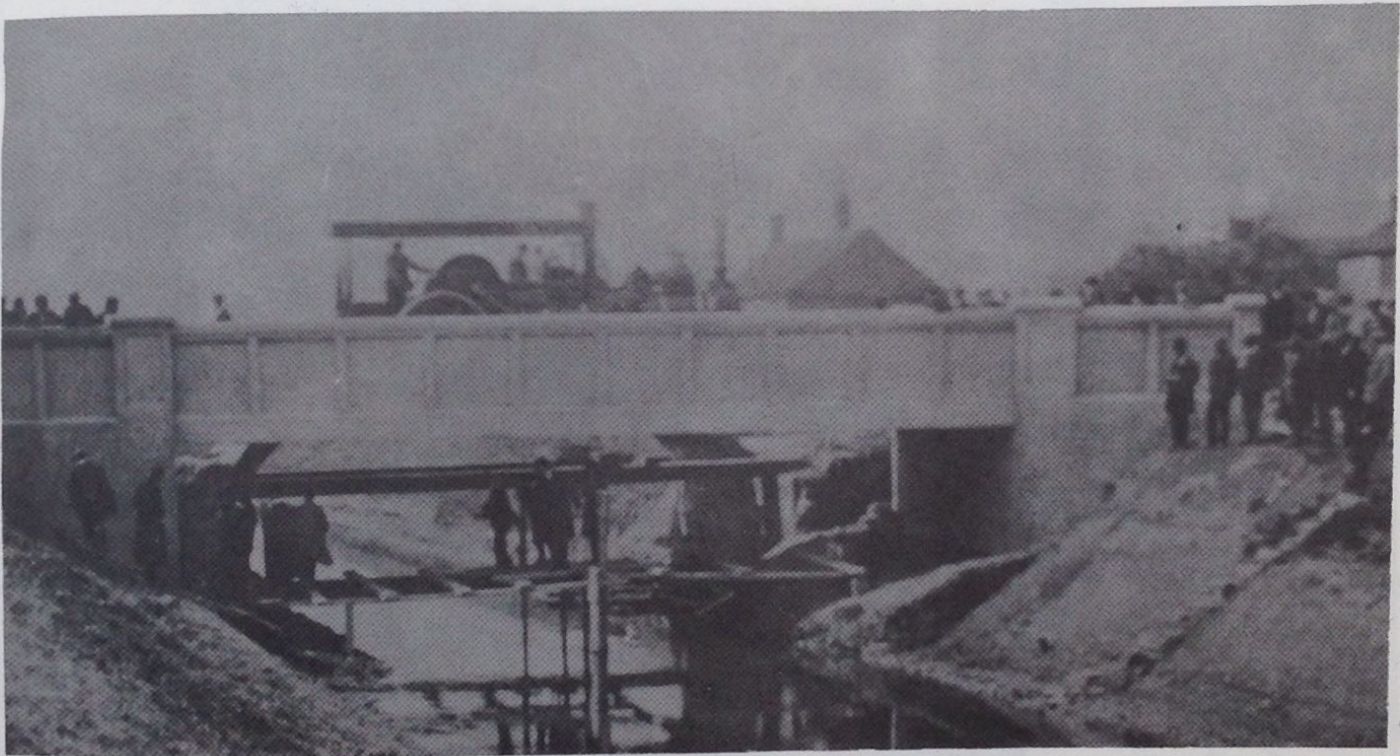
Vernatt's Sluice 1857

The Vernatt's Sluice was destroyed in 1842, the water having forced its way under the foundations. It was replaced in 1857, at a cost of £11,000 by a new structure, under the direction of Mr. William Lewin. This Sluice has three openings of 11ft. each, its sill being placed lower than the old one and level with the bed of the Welland (0.80ft. below Ordnance datum Liv.). The foundation stone was laid by Sir John Trollope.

Bridges

The Adventurers and Trustees were not only responsible for the drainage of Deeping Fen, but were also responsible for all the bridges over the River Welland and River Glen leading into the area and also the bridges over the main drains within the area. Even the Spalding High Bridge was built and maintained by them and was under the jurisdiction of the Board until 1953. Agreement was reached with the Holland County Council in 1953 for the handing over of the following bridges:—

River Welland	—	Spalding High Bridge
River Glen	—	Crossgate Bridge
		Herring Bridge
		Benner's Bridge (foot)
		Boarden Bridge
		Money Bridge
South Drove Drain	—	Horseshoe Bridge
North Drove Drain	—	Cuckoo Bridge
Pode Hole	—	Pode Hole Bridges (three arches)



Money Bridge over River Glen.

Testing new Ferro Concrete Structure 1911.

Public Houses.

The Trustees owned two Public Houses, one at each end of the Vernatt's Drain, "The Ship" at Surfleet Reservoir, which is still owned by the Board and the Fisherman's Arms at Pode Hole, which was sold in 1949. (A great mistake!).

DEEPING FEN 1965

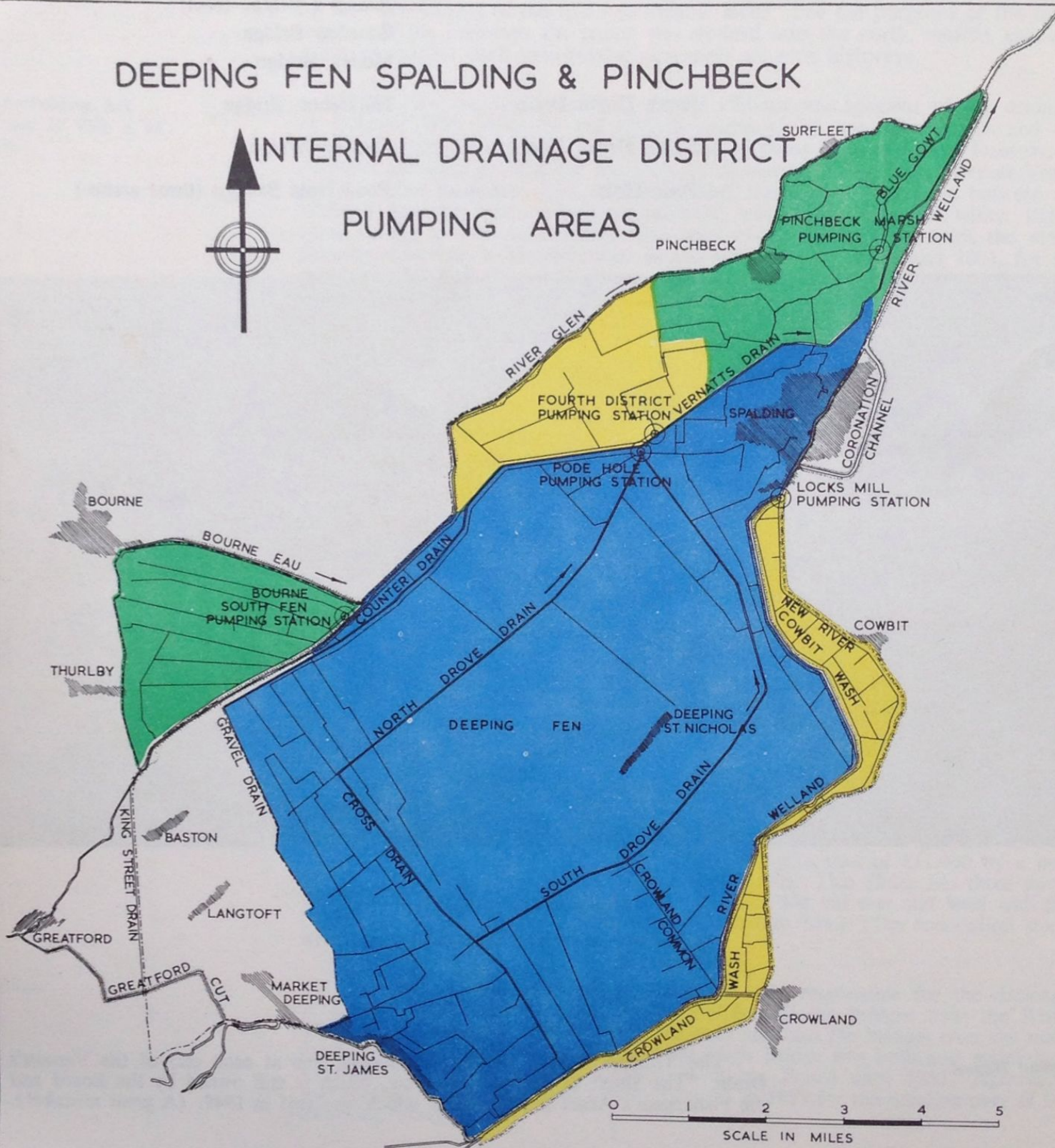
Before embarking on the history of Pode Hole Pumping Station it would be appropriate to first give a description of the Deeping Fen area as it is today (1965).

DEEPING FEN SPALDING & PINCHBECK



INTERNAL DRAINAGE DISTRICT

PUMPING AREAS



Area

The total area of the Deeping Fen, Spalding and Pinchbeck Internal Drainage District is 43,500 acres approximately.

Baston & Langtoft

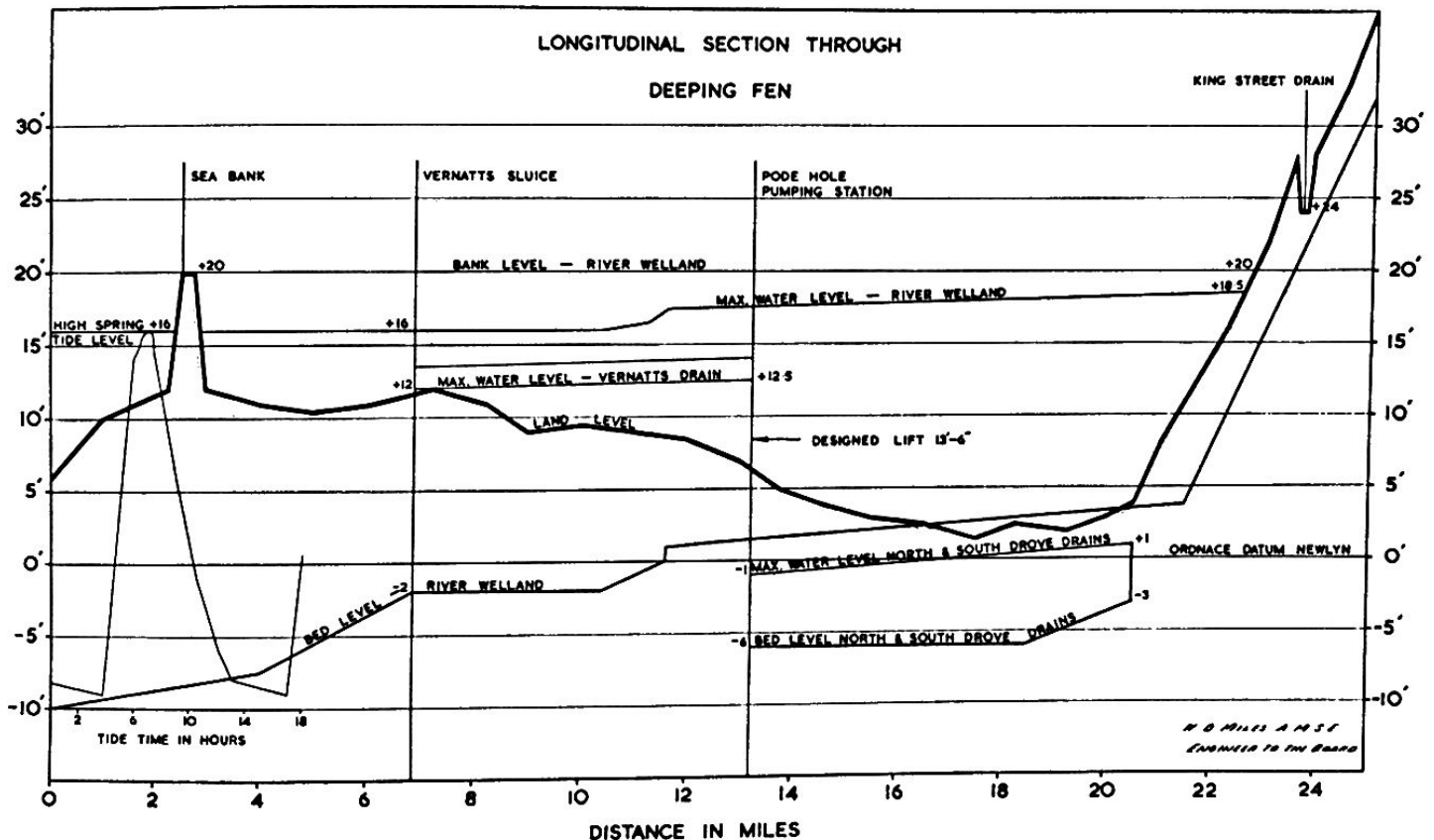
Also draining through the District is 5,170 acres of the Baston, Langtoft and The Deepings Internal Drainage District. This area drains by gravity via the Gravel Drain, the Counter Drain and the Vernatt's Drain and is not pumped at Pote Hole except in severe flood conditions.

Catchwater Drains

The Deeping Fen Board provides its own protection against highland waters from the immediate west by the maintenance of two catchwater drains, the Gravel Drain and the King Street Drain, the latter being situated some distance outside the Board's boundary.

Water Levels

In normal conditions the water level in the Rivers Welland and Glen is approximately 10 feet above the water level in Deeping Fen. In times of flood the difference could be as much as 20 feet. The following graphical longitudinal section illustrates the above mentioned points.



It will be observed from the above illustration that

(i) the bed of the River Welland near Crowland is above the low land level in Deeping Fen.

(ii) the maximum anticipated flood level in the River Welland is 18.5 O.D.N. and the anticipated maximum water level at Pode Hole is -1.00 O.D.N., a difference of 19ft. 6in.

(iii) the High Spring Tide Level is 16.00 O.D.N. and the low land level in Deeping Fen is 2.00 to 2.50 O.D.N., a difference of approximately 14 feet.

(iv) The low land in Deeping Fen is situated approximately 7 miles from the pumps at Pode Hole.

Soil

Almost every type of fen soil exists in the area, relatively high silt land in the Pinchbeck Marsh area, a mixture of silt and clay loam around Pode Hole, rich clay loam around Deeping St. Nicholas, peat on clay with a gravel subsoil immediately north-east of the Cross Drain and relatively heavy skirtland with a gravel subsoil between the Cross Drain and the Gravel Drain.

The whole of the Deeping Fen District has to be pumped. There is no natural gravity discharge. There are five pumping stations maintained by the Board as follows:—

Note: All levels related to O.D. Newlyn

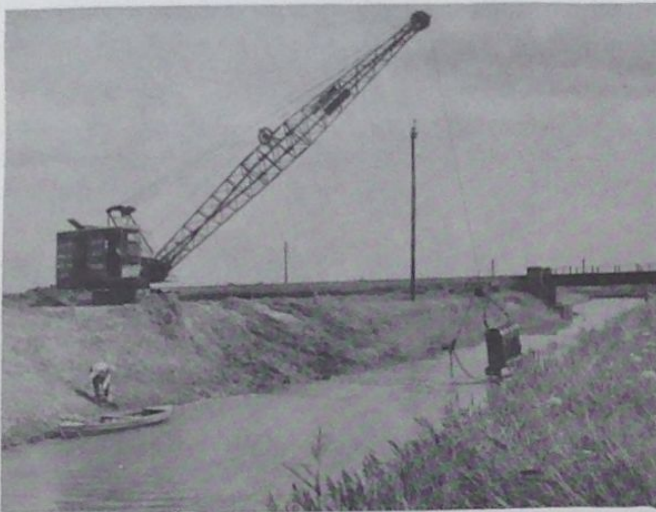
Pumping Station	District Drained	Acres Drained approx.	Low Land Level	Average Summer Land Level	Summer Water Level	Winter Water Level	Lowest Pumping Level	Designed Max. Lift	Pumps	Motive Power	Q Casesecs	Q per 1000 acres	Date Installed
Pode Hole	Deeping Fen	31,000	2.50	6.00	-1.00	-3.00	-7.00	13 ft.	Axial Flow 30"—100 H.P. Electric	45			1957
								13 ft.	Axial Flow 39"—185 H.P. Electric	84			1957
								13 ft.	Axial Flow 39"—185 H.P. Electric	84	20.4		1957
								15 ft.	Axial Flow 60"—650 H.P. Diesel	206			1964
								15 ft.	Axial Flow 60"—650 H.P. Diesel	206			1964
	Boston & Langtoft	5,170	10.00	15.00	4.34	6.00	-2.00	7 ft.	Axial Flow 50"—410 H.P. Diesel	145	28		1964
Bourne South Fen	Bourne South Fen & Thurbly Fen	3,250	4.00	7.00	2.00	1.00	0.00	13 ft.	Mixed Flow 20"—624 H.P. Electric	20			1949
								13 ft.	Mixed Flow 24"—100 H.P. Electric	32	16		1949
Pinchbeck Marsh	Spalding & Pinchbeck	4,000	7.50	9.50	4.50	3.00	+1.00	10 ft.	Axial Flow 20"—45 H.P. Electric	20			1953
								10 ft.	Axial Flow 24"—75 H.P. Electric	33	15.5		1953
4th District	4th District	2,750	4.50	6.50	1.75	0.50	-1.00	10 ft.	Axial Flow 20"—45 H.P. Electric	20			1953
								10 ft.	Axial Flow 24"—75 H.P. Electric	33	19.4		1953
Locks Mill	Crowland & Cowbit Washes	2,500	6.50	8.50	4.00	3.00	+2.00	9 ft.	Impeller 45"—100 H.P. Electric	38	15.5		1939

The Pode Hole and 4th District Pumping Stations discharge into the Vernatt's Drain, which in turn discharges into the tidal section of the River Welland through a sluice at Surfleet Reservoir. The Pinchbeck Marsh Pumping Station discharges into the Board's Blue Gowt Drain, which discharges into the River Glen at its outfall into the tidal section of the River Welland also at Surfleet Reservoir.

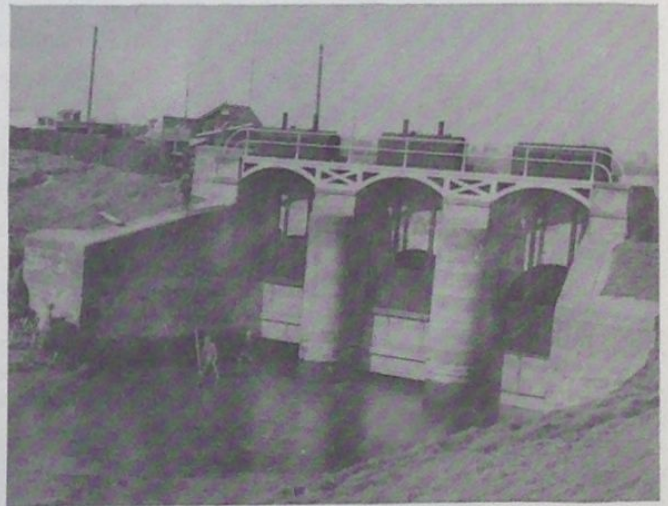
The Bourne South Fen Pumping Station discharges into the River Glen at Tongue End and the Lock's Mill Station into the River Welland immediately upstream of the town of Spalding.

Vernatt's Drain

The main outfall drain of the Deeping Fen system is the Vernatt's Drain, which receives the waters pumped at the Pode Hole and 4th District Stations and from the Counter Drain.



Improvement of the Vernatt's Drain 1942.



View of the Freshwater Retention Doors of the Vernatt's Sluice at Surfleet Reservoir, 1964.

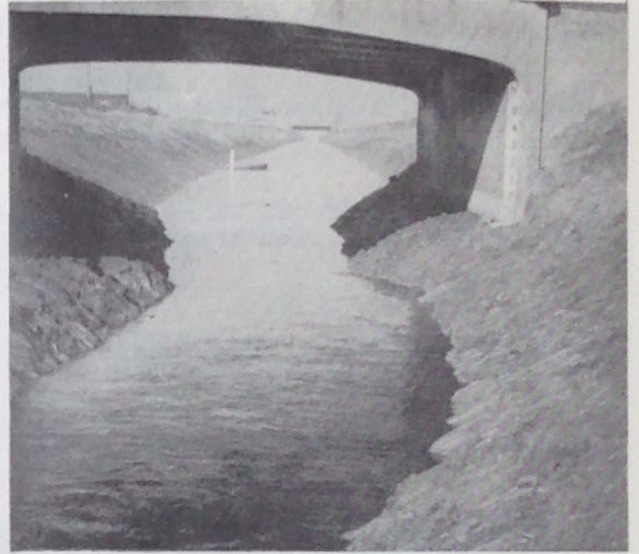
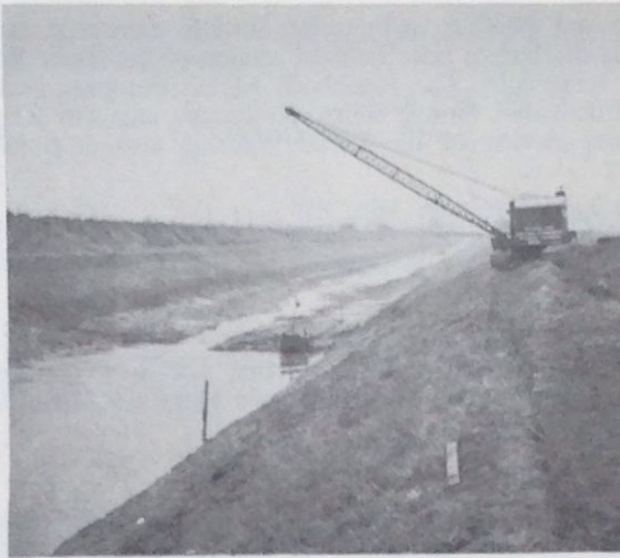
It discharges into the tidal section of the River Welland through a sluice at Surfleet Reservoir.

Vernatt's Sluice

The doors on the tidal side of the sluice are "pointing doors" and close automatically with each rising tide and open as the tide falls. Although the tidal doors at the sluice are closed for a period on each tide, the Vernatt's Drain has sufficient reservoir capacity to enable pumping to be continuous at the Pode Hole and 4th District Pumping Stations.

North & South Drove Drains

The main drainage arteries for Deeping Fen which convey the surplus water from approximately 31,000 acres to the pumps at Pode Hole, are the North and South Drove Drains.



Improvement of the South Drove Drain, 1958.

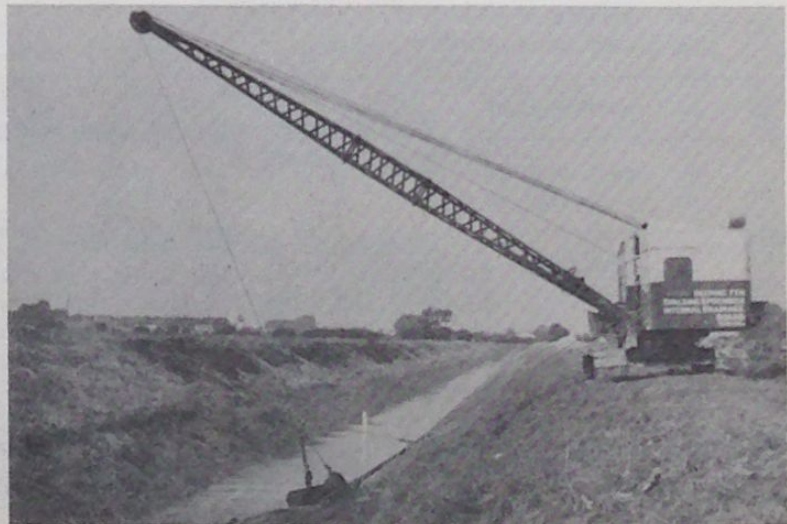
Originally these two drains were embanked and the water from the surrounding lands was lifted into them by numerous Wind Engines. The original banks were removed between 1940 and 1945 by spreading the soil onto the adjoining lands.

Maintenance

Preserving and maintaining a fen drainage system is a continuous operation demanding the constant attention of those responsible from the elected Members of the Board to the men who actually carry out the works. The many improvement schemes carried out in recent years were most essential, but the benefit of these works would quickly be lost if the river, drains and watercourses were not properly maintained.

Cleansing

The Deeping Fen Board is responsible for the maintenance of 200 miles of watercourses varying in size from the Vernatt's Drain, with a normal water width of 70 feet, to dykes approximately 5 feet in depth with a bed width of 3 feet. These watercourses need to be cleansed regularly and this work is carried out by the Board's employees by handlabour and dragline excavator methods.



Improvement of the New River, Cowbit Wash, 1959, with a Board's 10 R.B. Dragline.

The Board is also responsible for the maintenance of numerous sluices, tunnels, bridges, culverts and piling work.



Lowering of "Branton's Bridge" Road Tunnel, 1959.

Weed Control

But the most important work of maintenance of a fen internal drainage district, demanding constant attention and expenditure, is weedcutting and weed control. In consequence of the flat character of the fens, there is an extremely slight fall in the beds of the drains—in many cases, none whatever, and the flow of the water therein is brought about by creating a fall in the surface level of the streams. In the main drains of Deeping Fen, the designed fall per mile of the water is approximately 3in.—any large increase could result in the flooding of land situated at the upper end of the system. The fall per mile is greatly increased by the growth of weeds, which is so prolific that it is necessary to cut and remove them in most cases at least twice and sometimes four times in each growing season.

Roding

In Deeping Fen, roding or weedcutting of the smaller drains is carried out by handlabour methods. A machine to carry out this work efficiently and satisfactorily has not so far been devised. One difficulty is that crops are grown to the edge of most fen drains and a wheeled machine cannot be used from the side of a drain without damage to the crops.



Roding of Counter Drain, 1965.

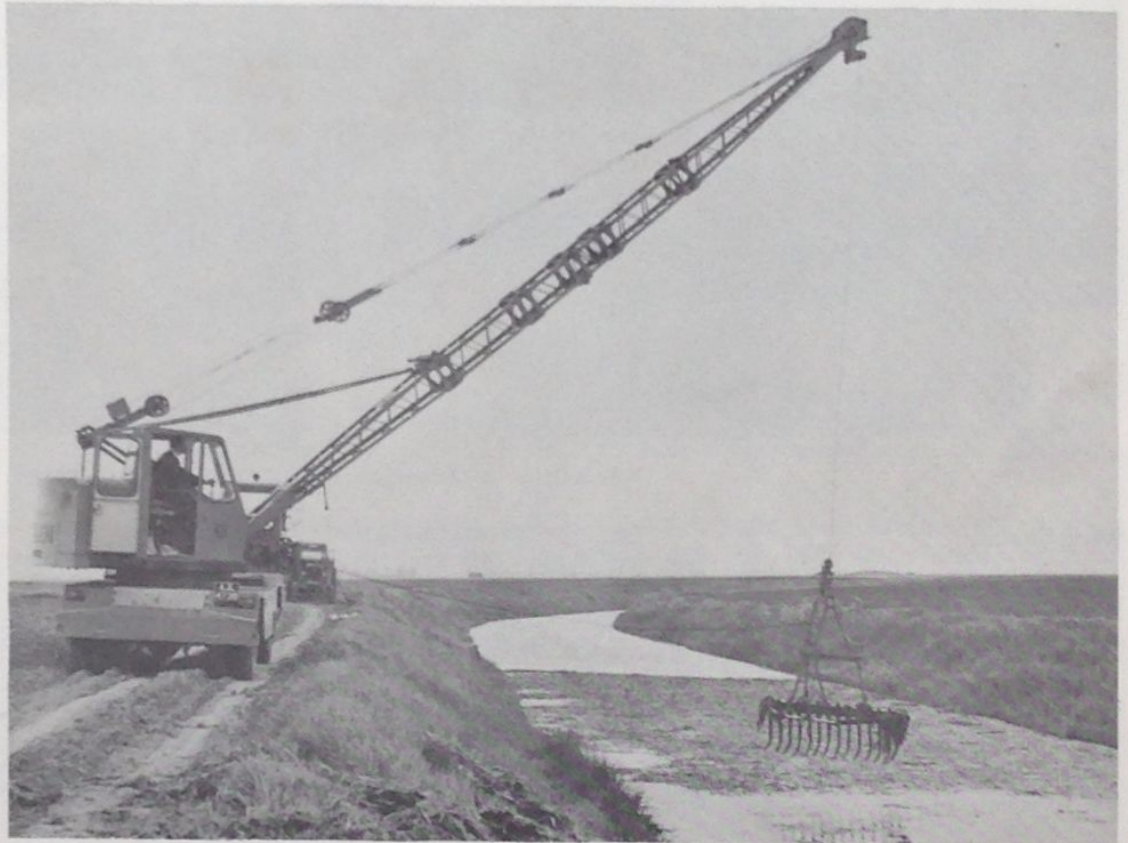


Howard and Dennis type Weed-cutter working in the North Drove Drain, 1965.

Floating Weedcutters

Weedcutting in the main drains is undertaken by weedcutter launch. The boat is propelled by paddles and will operate through very thick weeds. The actual cutting is by a V shaped knife, with serrated edges, which can be raised and lowered according to the depth required.

The cut weeds are collected at "booms" by the action of the wind or the current. Until this year the weeds were removed by hand raking but a mobile truck mounted crane is now used.



Allen truck mounted crane removing weeds, South Drove Drain, 1965.

Motor Scythes

In recent years the Board has made arrangements to enable some of the banks and slopes of the main drains to be grazed with sheep. Where this is not practicable, the slopes of the drains are mown twice yearly by means of motor scythe.



Allen Motor Scythe, Cross Drain, 1965.



"Cott" being removed from the New River, Cowbit Wash, by Dragline Excavator.

Algae locally called
"Cott"

One of the most troublesome and prolific weeds in fenland watercourses, where the current is normally very slow, is an Algae commonly called "Cott" or "blanket-weed". This weed forms on the bottom of the watercourses and in a few years can grow to a thickness of two or three feet. It is very heavy to remove by hand raking and mechanical removal by dragline excavator is often necessary.

Copper Sulphate

In 1960 the Deeping Fen Board commenced to control "cott" growth in the main drains by chemical means. At least twice and sometimes three times per year, the main drains are treated with copper sulphate at a concentration of 1 part per 1,000,000 for a period of approximately 7 days. At this concentration the chemical is not harmful to fish or animal life.

The result has been very satisfactory and the main drains have been kept almost completely clear of this troublesome weed at fraction of the cost of mechanical removal.



River Welland and
River Glen

Copper Sulphate being applied to the South Drove Drain by
trailing bags containing the Chemical through the water, 1965.

Prior to 1954 the area as a whole was very much under the command of the waters of the River Welland and River Glen. Records show that breaches in the banks of these Rivers frequently occurred in times of flood and Deeping Fen suffered inundation from highland waters. Although since the time the Fen was first drained, works of improvement to the banks and channels of these rivers were often undertaken the problem was not tackled in a major way until 1947 when the River Welland Catchment Board embarked on a major scheme of improvement to the River Welland and relief of the River Glen by the Greatford Cut. This work was under the direction of the late Mr. E. G. Taverner, M.S.E., Chief Engineer to the Board.

This major improvement scheme included the by-pass of the Town of Spalding by constructing the Coronation Channel, and followed the scheme of improvement to the Welland Outfall below Fosdyke undertaken between 1933 and 1940 and originally designed and supervised by the late Mr. Henry and Mr. Edgar Bain, Engineers of the Board.

The great Flood of 1947 emphasised the inadequacy of the Rivers Welland and Glen to convey flood water from the highlands to the sea and the following photographs clearly show the serious conditions along Deeping High Bank immediately upstream of Crowland Bridge.



NOTE:— Crowland Abbey is in the background.



London Road, Spalding, 1947.

Expenditure 1922-1923

The cost of maintaining the Deeping Fen system for the year 1922-23 amounted to £9,663 15s. 1½d. and was raised by an Acre Tax of 4/6d. upon the area drained, and the Income derived from the letting of banks etc. for grazing purposes.

The Works included:—

Sixty miles of Earthwork Embankments.

Sixty two miles of Main Drains and Rivers (partly tidal).

Seventy miles of Secondary Drains, together with the Pumping Plant, Bridges, Sea and other Sluices, Dredgers and all general plant.

In 1922-23 the area did not include the Districts of Spalding and Pinchbeck, 4th District, Bourne South Fen, Crowland and Cowbit Washes and Deeping St. James.

Expenditure 1963-1964

The expenditure of the Deeping Fen Board in maintaining the whole of the Deeping Fen area in the year 1963/64 amounted to approximately £103,000.

The expenditure is briefly summarised as follows:—

	£
Pumping Stations	7,542
Roding & Weedcutting etc. (200 miles of drains)	12,321
Maintenance Cleansing of drains ...	4,577
Administration, including rate collection, and stationery etc.	14,770
Maintenance of Office	1,445
Improvement Schemes	19,166—(Nett 9,583 after 50% Grant Aid)
Loan Charges and Interest	8,444
Precept to River Board	24,332
Culverts, tunnels, general work, men's holidays, fascine works, repairs to buildings, sluice keeper, lorry drivers, fencing etc.	10,393
	£102,990

RATES LAID FOR YEAR 1963/64

	Owners	Occupiers	Total	Cost per Acre
General District ...	5/6	5/-	10/6	£2
Bourne & Thurlby ...	5/-	13/-	18/-	£1.8.0
Crowland & Cowbit Washes	10/-	20/-	30/-	£1.13.6

HISTORY OF PODE HOLE PUMPING STATION

Steam Power

Without doubt the application of steam power under the Act of 1823 was the turning point in the drainage of Deeping Fen. Prior to this history shows that it had been one long and often futile struggle to drain the fen by means of gravity discharge and later numerous wind engines. The "ancients" knew that there was a "fall" of approximately 14 feet between the land level in Deeping Fen and the low tide level of the sea, but the insurmountable problem was the siltation of the outfall of the River Welland.

Thomas Pear 1820

The first recommendation for the application of steam power was made by Mr. Thomas Pear in his report to the Trustees dated the 30th September, 1820. He estimated the cost of two steam engines, one of fifty and the other of forty horse power, with two boilers to each engine, and Yorkshire stone wheel races and waterways, as £16,500. The following is an extract from his report:—

"Estimating the quantity of land to be drained at 43 square miles, or 27,520 acres, it will be necessary to ascertain the probable quantity of water to which it is subjected by downfall and soakage.

I will assume, therefore, that the quantity of downfall water that will require to be drained from the land in the course of the year, will average 4 inches in depth upon the plain surface which I have estimated at 43 square miles, or 27,520 acres, and this would give 399,590,400 cubic feet of water; and to this we must add the probable quantity of water arising from the soakage of the higher lands, which I will assume as equal to half the quantity arising from actual downfall. Two engines, therefore, one of 50 and the other of 40 horse power, would discharge the whole of the water in 69 days, being after the rate of 6,000 cubic feet per minute, and the main drains would be completely emptied in course of every 24 hours".

(Note: 6,000 cubic feet per minute equals 100 cusecs. The capacity at Pode Hole for the Deeping Fen area in 1965 is 612 cusecs against maximum head conditions).

Benjamin Bevan 1823

The recommendation of steam power by Thomas Pear was endorsed by Mr. Benjamin Bevan in his report dated the 1st March 1823. Being thus advised, the Deeping Fen Trustees obtained the 1823 Act giving them further powers of carrying out works, and levying additional taxes.

Ben. Bevan recommended two steam engines of 50 horse power each capable of raising 7,200 cubic feet per minute (120 cusecs) to a height of six feet. His estimate of the cost was as follows:—

ESTIMATE OF THE PROBABLE EXPENSE

Two steam engines of the best construction of fifty horse power each, with wheel and wheel race, waterways, building and every requisite	8,500	0	0
Deepening and improving North and South Drove Drains, and securing the north bank of the Vernatt's Drain ...	3,000	0	0
Contingencies on the above	1,000	0	0
	£12,500	0	0

Holland and Kesteven Engines

Even in those days, as to-day, the Deeping Fen Trustees adopted the principle of "making a good job whilst we are at it" and the steam engines eventually installed under the direction of Mr. Bevan were 80 H.P. and 60 H.P. respectively. The larger of the two was named the Holland and the smaller the Kesteven.

General details were as follows:—

HOLLAND	—	Installed 1824-7, taken out of commission 1928, demolished 1952. 80 H.P. output. Stroke 8'-0" Bore 3'-8"
Beam:		26'-2" long. 24'-9" between centres 3'-8" deep at centre bearing
Flywheel:		24'-0" diameter Rim Section 12" square, made of 3 sections, laminated round periphery. Approximate weight of flywheel, 21½ tons.
Connecting Rod:		24'-8" between centres
Speed of Engine:		16½ R.P.M.
Scoop Wheel,		28'-0" diameter: 5 R.P.M.
Originally:		40 Scoops each 6'-6" long radially x 5'-0" wide
1891:		31'-0" diameter: 5 R.P.M. 40 Scoops each 8'-0" long radially x 5'-0" wide
KESTEVEN	—	Installed 1824-27, taken out of commission 1928, demolished 1952. 60 H.P. output Other details similar but slightly smaller than the Holland.

Demolition of Steam Engines

During the demolition, the enormous wealth of constructional detail that was uncovered, brought to light the ingenuity and skill of the engineers of the early 19th century.

The cylinder, beam support columns, and crank assembly foundations were all separate masses of stone-work, not interconnected and approximately 16 feet deep. All three assemblies were anchored by 16ft. long 3in. diameter wrought iron bolts, carried down through the masonry to brick arched alcoves, which gave access to the cotters taking the engine upthrust.

Below the floor of the engine house were situated the jet condenser, the extraction pump which removed the condensed steam and air from the condenser into the open hot well; the boiler feed pump which picked up the water from the hot well and fed it back to the boilers, and also the jack pump which circulated the cooling water to the condenser system. The condenser cistern was always kept full to overflowing of cold river water, so that the condenser and the extraction pump were totally submerged, giving adequate cooling. This was James Watt's invention that later led to the surface condenser as we know it today.

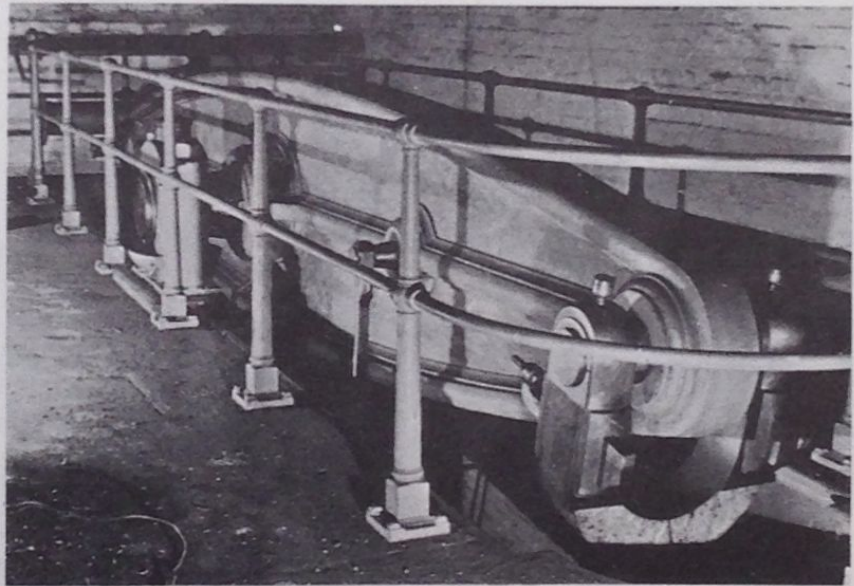
James Watt

All the castings, notably Kesteven's beam, the fluted connecting rod, the finely moulded cast iron beam spanning the beam support columns, and the cylinders are extremely fine examples of the pattern maker's and iron-moulder's craftsmanship, necessitated by the inadequacy of their machine tools. These castings emerged from the foundries so smooth and finished that no machining other than boring holes for various bearing pins was required.

In the case of both engines, the huge cylinders were steam jacketed; live steam from the boilers was passed through an annular space round the cylinders before entering the valve chambers, thus pre-heating the cylinders and raising the efficiency by reducing condensation in the actual cylinders.

The Holland was at first fitted with Watt's original type of "D" valve, to govern steam admission to the working cylinder, when, in 1873, it became necessary to lower the paddle wheel the second time, due to fen shrinkage, itself due to the improved drainage carried out by the engine, and to the lower retention levels decided upon, the additional power required was obtained by installing the then modern piston valve, with expansion gear, giving additional economy. This work was carried out by James Watt & Co., of Soho, Birmingham, late Boulton & Watt.

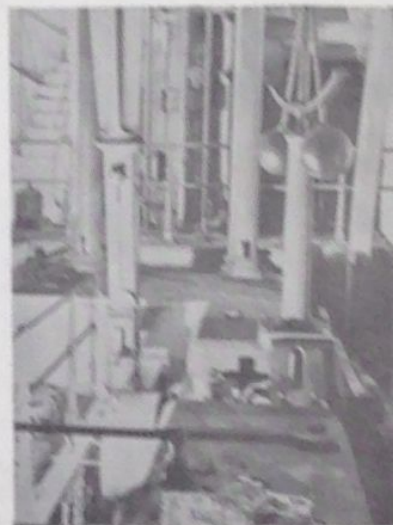
When the two engines ceased work in 1928, after a century's service, the steam was supplied by five 30ft. by 8ft. Lancashire Boilers. These were not the original boilers, but are believed to be the third replacement.



General view of Kesteven's beam, taken from connecting rod end, showing the single beam, the fine example of 19th century iron moulding mentioned in the general note. Also note the very fine forging of the yoke at the top end of the connecting road, showing the skill of the metal turners of the time.



General view of Kesteven engine showing governor, part of fly-wheel, part of the connecting rod and a portion of the crank and bottom end bearing, taken through the archway connecting with adjacent engine house.



General view of Kesteven engine taken from crank shaft end of engine, looking towards the cylinder. The mahogany lagging has already been removed from the piston valve and cylinder. Note the fluted Grecian style column supporting the governor, the fly-weights being 12 stone each. Notice the huge cotters anchoring the cast iron columns supporting the beam. These cotters carry the upward thrust of the beam.

Scoop Wheel

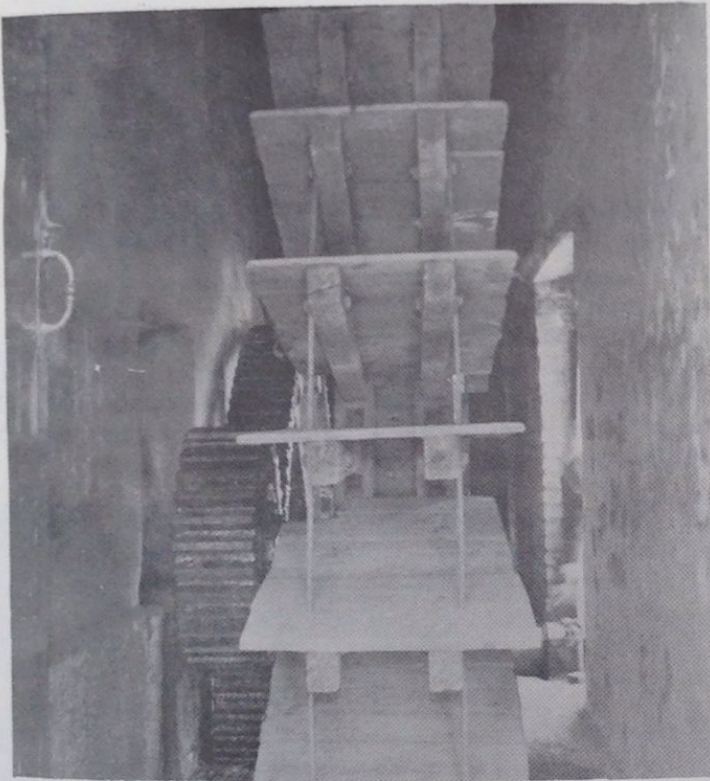
Unfortunately the only photograph that can be found of the old scoop wheels at Pote Hole is the following:—



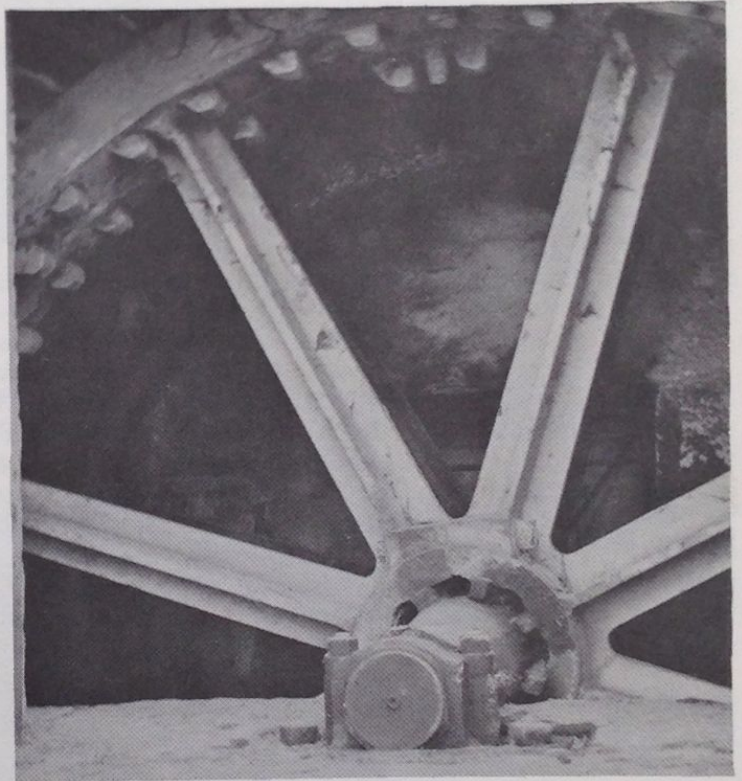
It was taken about 1938 when the old wheel was being demolished for the installation of the Henry Bain Pump. The timber scoops and radial arms have already been removed and only the cast-iron rim and frame of the wheel is shown.

However, the Deeping Fen Board own an old scoop wheel steam engine at the Pinchbeck Marsh Pumping Station. The engine was erected in 1833 and is being retained as a museum piece.

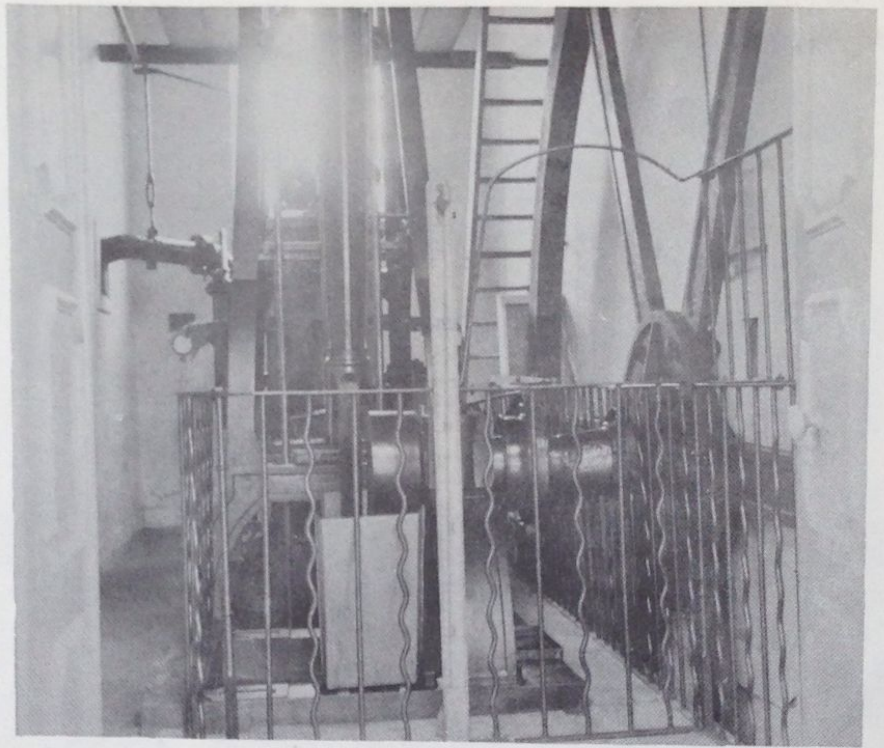
The following are photographs of this engine: —



The Scoop Wheel, last worked in 1953.



Side View of the Scoop Wheel showing the fixing of the timber staves of the scoops to the cast iron rim of the wheel.



Interior View of the Engine at Pinchbeck Marsh.

The following is a copy of photograph, kindly loaned by Mr. George Freir of Pode Hole, showing the construction of a scoop wheel for Bourne South Fen by his father, Mr. A. H. Freir, (Carpenter and Wheelwright of Pode Hole), in the Year 1904. The completed wheel with its supporting structure was transported in one piece to the site, no doubt pulled by horses.

Scoop Wheel,
Bourne Fen



In a report to the Commissioners of Deeping Fen dated the 16th July, 1830, Mr. William Shadwell Mylne made the following observations on the steam engines at Pode Hole: —

“Gentlemen,”

“According to your desire, I proceeded, on the 31st May, to Spalding, and surveyed Deeping Fen and the two steam-engines erected under the directions of Mr. Bevan for the drainage thereof. I find that the same error has taken place in this instance as is generally committed where the several mill powers have been concentrated, which, previously, had been distributed over various parts of the fen.”

“In all these cases I should never recommend two steam engines of such great power being erected at the same spot; for it must be evident to every fen-man that the drains required to feed those wheels must be much larger in proportion than what would be required to feed the wheels were they placed in different situations; and the result must necessarily be, that the water in the drains near the engines would be kept at a level far below what is beneficial for the cultivation of such land, without which a sufficient current cannot be maintained in the drain to clear the water from the further portion of the fen; and in doing so, the lift of the engines are so materially increased as to cause an additional expenditure in coals, which must be found very prejudicial to the interests of the landed proprietors.”

“The wheels of both these engines, during the greater portion of the year, are laid much too high to work beneficially; and yet the occasional head, in flood time, against which they have to lift, is such that it would not be advisable to lower them, unless a moveable threshold be introduced, which I conceive might always be done beneficially; and when the engines are but lightly loaded, much coal might be saved by working them with a greater speed, if the line of the side walls of the race which lead to the wheel be sufficiently splayed to admit of the water passing to the wheel without obstruction.”

“On the subject of the drains much may be said; but from the circumstance of all the original sections being lost, it is now impossible to judge what might have been the motive of the engineer in laying out the drains as they now are; but I think it very probable that since the fen has been so well drained, the moor land, in particular, is very likely to have settled, and that portion which is now the lowest and at some distance from the engine, might have been at that time the highest part of the fen.”

“From what I saw of the state of the South Drove drain (where there are some impediments under the Road Bridge which should be removed), I am not surprised at its not conveying the water to the engine, as it is much silted up and full of weeds.”

“The alterations I should propose in the drains would be to form them as near as possible to the accompanying sections, and to keep them, after they are so formed, as free from weeds as possible by the machine called the bear,

much used in the rivers under the Bedford Level Corporation, which I have observed has a very good effect in taking them up by the roots, or otherwise killing them, so that the drains are free for a long time after it has been employed."

Shrinkage of the Peat

At the time the Holland and Kesteven engines were installed the majority of the surface of Deeping Fen consisted of peat and shrinkage thereof immediately commenced due to the improved drainage conditions. This resulted in the scoop wheels of the Engines having to be lowered as follows:—

	1847	1862	1873	1881	1891	1904
Holland	—	14"	18"	—	4"	—
Kesteven	14"	—	—	18"	—	4"

When they first commenced work on the 27th October, 1827, the lowest part of both scoop wheels were at a level of 1.00 O.D. Newlyn. The normal water level maintained in the North and South Drove Drains was 4.5 O.D. Newlyn (present low land level 1965, 2.50 O.D.N.) and the lowest pumping level was about 2.00 O.D.N. In February of both 1830 and 1831 the River Glen bank broke and the water level in the fen reached a height of 8.33 O.D.N., when it appears from the Log Book that pumping had to cease for a time. (Not surprising). The Vernatt's Drain reached a height of 11.70 O.D.N.!

Breaches in Glen Banks

The Log Books of the old engines gives the following records of breaches in the River Glen banks:—

1830	Deeping Fen side
1831	Deeping Fen side
1837	North side (Black Sluice)
1872	North side (Black Sluice)
1876	North side (Black Sluice)
1877	North side (Black Sluice)
1880	Great Flood. Glen and Welland overflowed. Glen bank breached in Bourne South Fen. Rainfall for September and October 11 $\frac{7}{8}$ ". Record total for year 37 $\frac{1}{8}$ "
1882	Deeping Fen side near Wooley's Mill. Engines stopped to save Counter Drain Bank. Bank broke. Water level in Fen 5.17 O.D.N.
1910	North side—Bourne South Fen.

After the Holland Scoop wheel had been lowered for the second time in 1873 (a total since starting of 2-8") the normal water level maintained in the North and South Drove Drains was 2.33 O.D.N. and the lowest pumping level was approximately -0.42 O.D.N. In 1897, when the water level was 1.83 O.D.N., complaints were made regarding insufficient water in the drains.

In the Great Flood of 1880, the water in the Fen reached a level of 4.76 O.D.N.

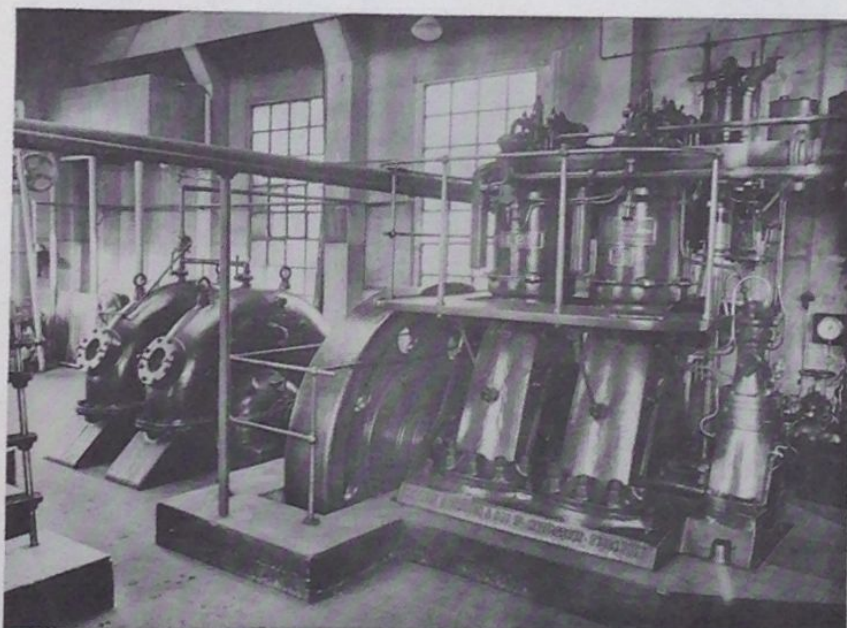
The normal summer level in 1905 was 2.00 O.D.N.

Elloe Engine 1914
Welby Engine 1920

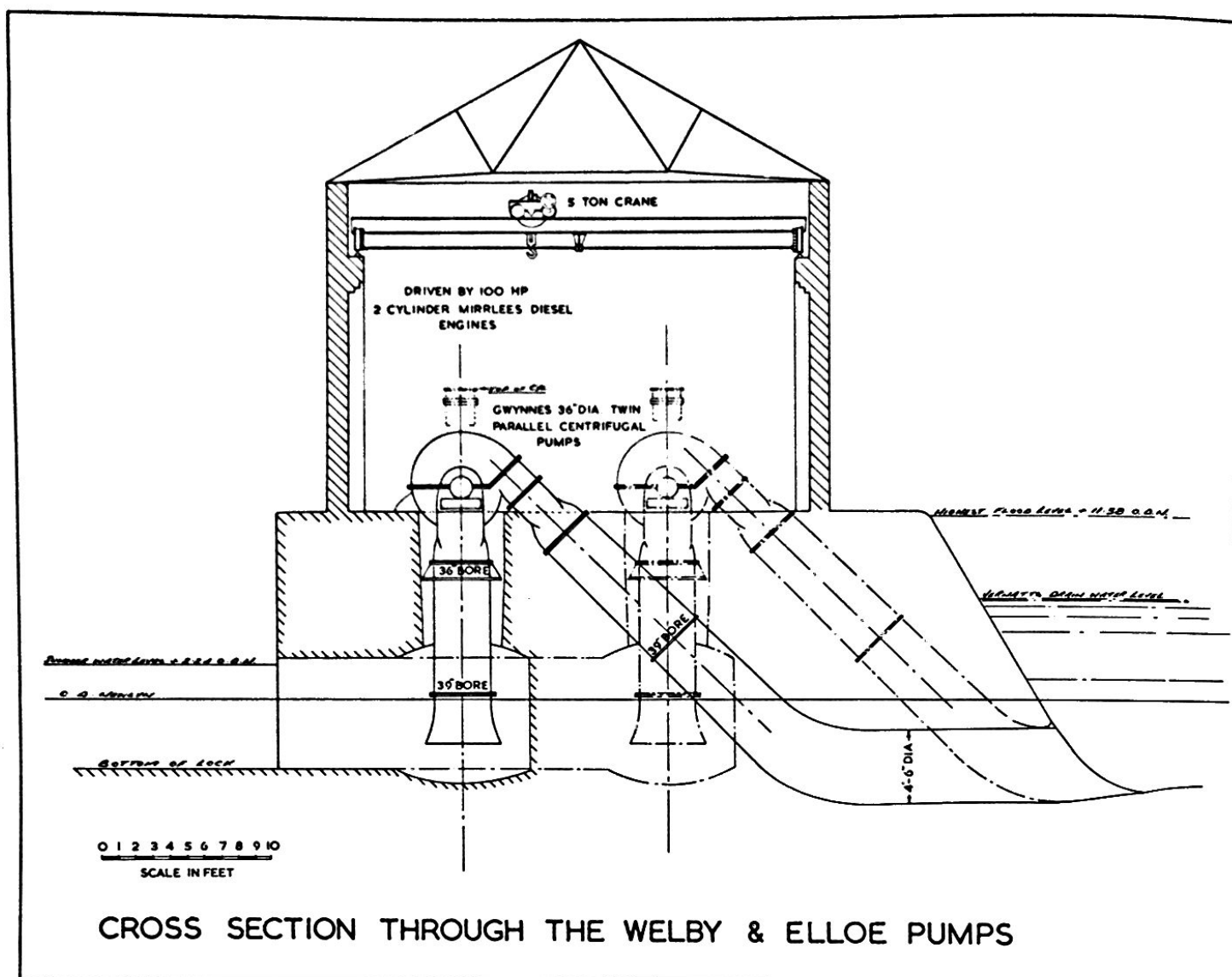
The steam engines were supplemented in 1914 by the "Elloe", a 100 H.P. 2 cylinder Mirrlees air-blast injection diesel engine driving a Gwynnes 36" dia. twin parallel Francis Vane centrifugal pump, and again in 1920 by the "Welby" of similar capacity and make. The combined capacity of these two diesel engine driven pumps was 120 cusecs against a total gauge head of 8.5 feet when running at 240 R.P.M. The actual static lift would be about 7 feet.

The installation of these two pumps therefore increased the pumping capacity at Pode Hole by exactly 100% on the original estimate of Benjamin Bevan in 1823.

In the original design for these pumps the summer water level in the Fen was taken as 2.24 O.D.N. and the lowest pumping level as -0.5 O.D.N. Therefore the levels adopted were similar to those of the existing steam engines, and no lowering was undertaken, which now seems rather strange.



The "Welby" Engine and Pump.



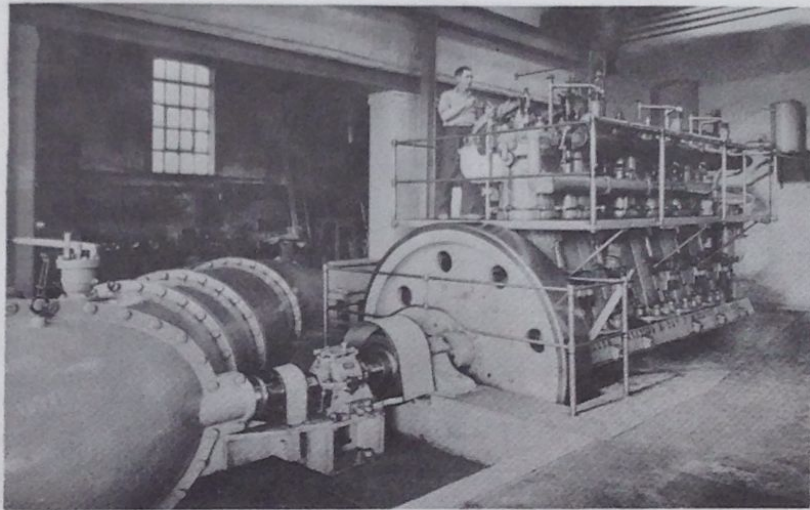
At that time the quantity of water lifted and discharged through the Pode Hole Station was greater than at any other station in the English Fens.

William Dennis Pump
1928

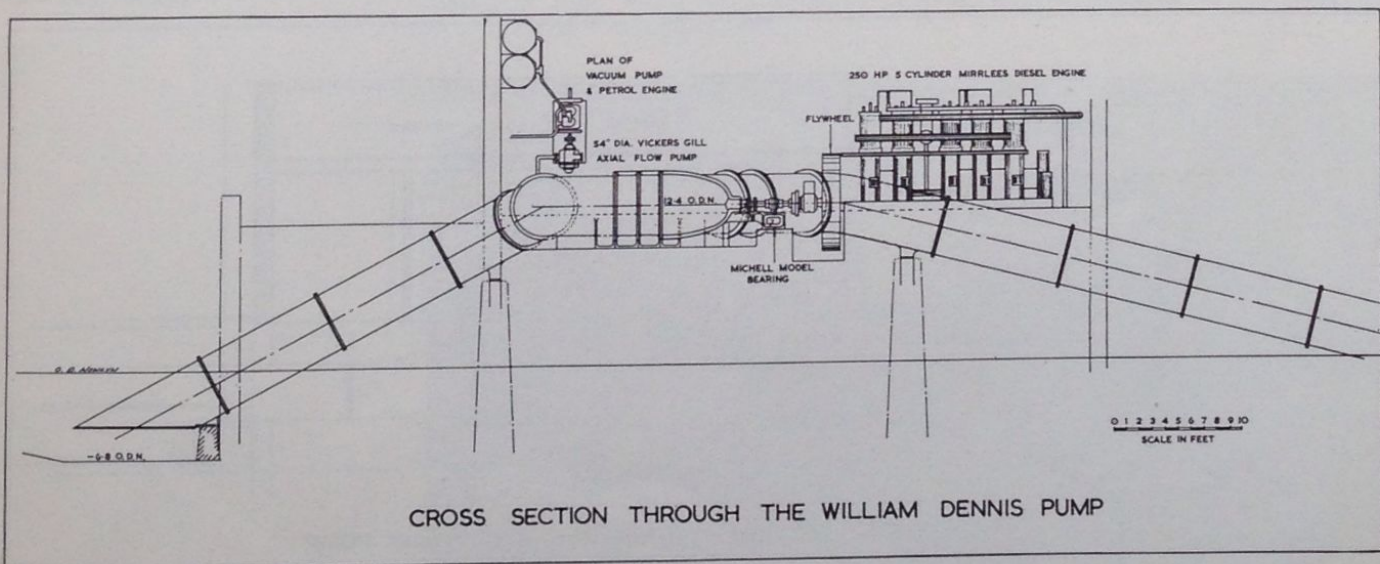
The Holland and the Kesteven beam engines were last run on the 24th and 26th January, 1928, respectively and were replaced by the "William Dennis", a 250 H.P. 5 cylinder Mirrlees air-blast injection diesel engine driving a 54 dia. Vickers Gill axial flow impeller pump. The pump was first run on the 1st October, 1928 and designed to discharge 260 tons per minute (156 cusecs) against a static head of 7 feet at 250 R.P.M.

By 1925 the normal summer water level maintained in the North and South Drove Drains was 1.75 O.D.N. The William Dennis Pump was designed to pump down to a minimum level of -2.80 O.D.N. a level approximately 2' 3" lower than was possible with the Elloe and Welby pumps or the old steam engines.

As previously stated the William Dennis pump is an axial flow impeller pump. The centre of the impeller is at a level of 12.40 O.D.N. and therefore before starting the pump has to be primed, i.e. air evacuated from the suction piping, so that by atmospheric pressure the water from the suction side is brought to the impeller. It is interesting to note that the maximum suction lift is 15.20 feet, a height very much in excess of that recommended today for this type of pump.



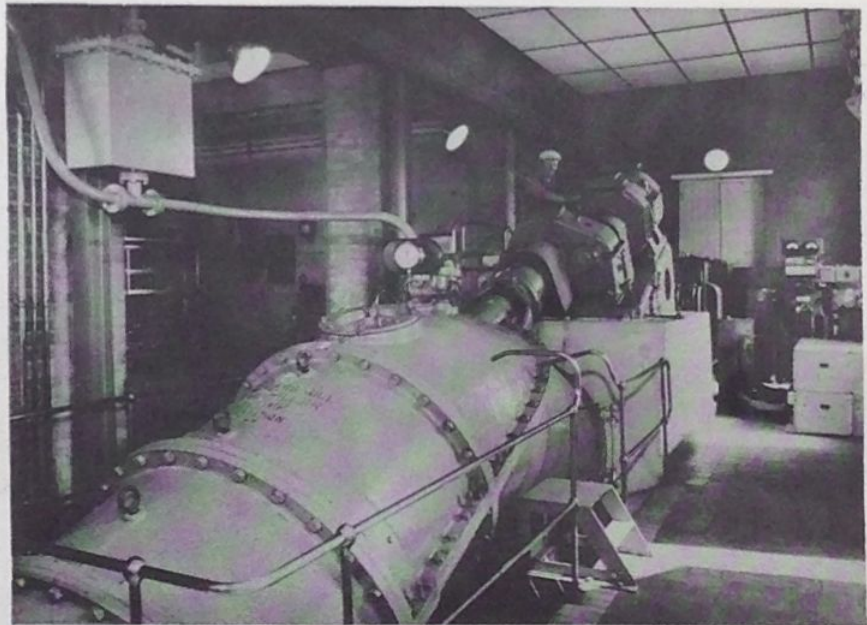
The William Dennis Pump.



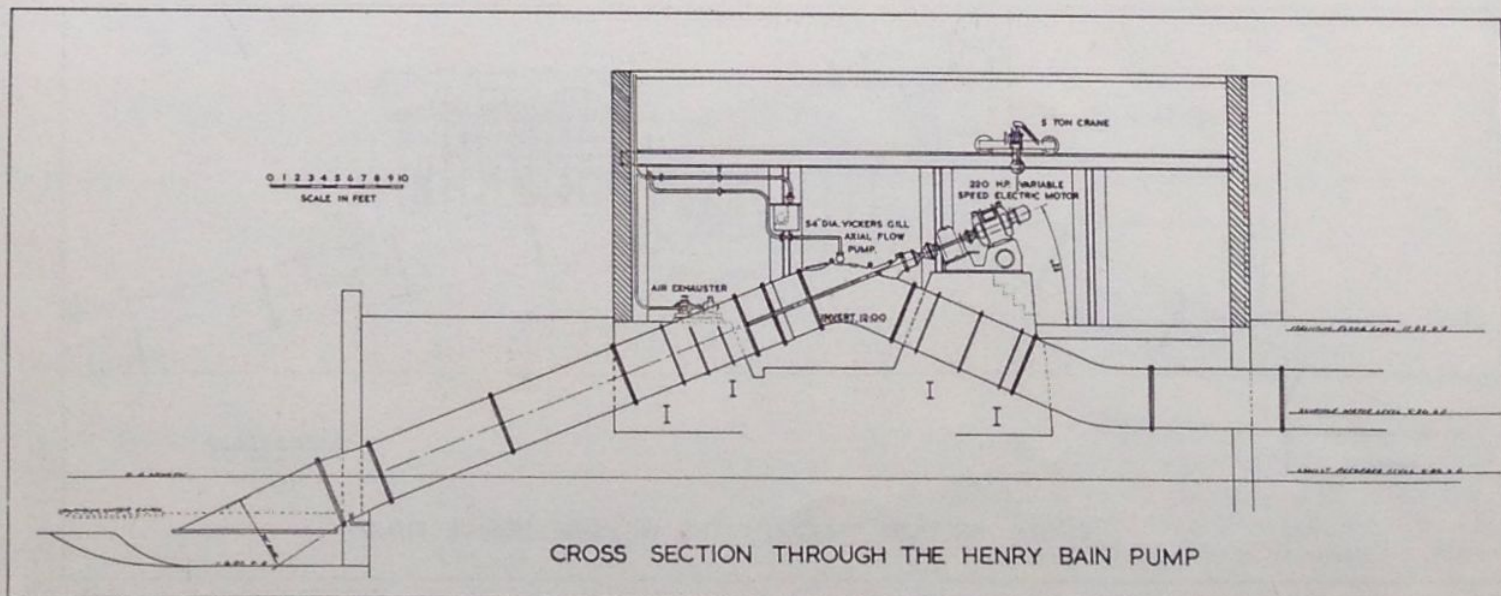
**Henry Bain Pump
1940**

Further pumping capacity was added when the Henry Bain pump was installed in 1939. Electricity was now available and the plant consists of a variable speed 220 H.P. induction motor by Metropolitan Vickers Ltd. driving a 54" dia. Vickers Gill axial flow impeller pump at a speed of 250 R.P.M. The pump is designed to discharge 220 tons per min. (132 cusecs) against a static head of 9 feet.

Similar to the William Dennis Pump, the lowest pumping level is -2.80 O.D.N. The suction lift is also similar to the William Dennis, i.e. 15.2 feet.



The Henry Bain Pump



1947 Flood

In the great Flood of 1947 both the River Welland and the River Glen overflowed their banks into the Deeping Fen area. A breach occurred in the south bank of the River Glen approximately $\frac{1}{2}$ mile south of Counter Drain Railway Station and the Counter Drain Washes were inundated to a depth of approximately 5 feet.



Sealing of the breach in the River Glen bank, 1947.

The water from the breach was however mainly contained in the Washes and was eventually evacuated by gravity via the Vernatt's Drain. The Vernatt's Drain reached a maximum height of 9.50 O.D.N. and with all pumps in operation at Pode Hole the water level in the Fen reached a height of 3.33 O.D.N. In this flood a breach occurred in the east bank of the River Welland, approximately 1 mile north of Crowland, causing serious flooding in the area of the North Level Commissioners.

Crowland Breach



Breach in the North Level Barrier Bank, 1947.

If the breach had occurred in the west bank of the Welland the result would have been disastrous to Deeping Fen and Spalding. The whole flow in the River Welland would have discharged into the Fen and also the flood waters being retained in the Crowland and Cowbit Washes.

1939—1955

During the War of 1939-1945 almost the whole of Deeping Fen was under the plough. Great advancements were being made in arable farming and the industry as a whole became more progressive and scientific. Drainage had to keep pace with this more modern approach. Many fen farmers believed that it was *not* beneficial to arable crops to retain high water levels in the drainage systems. Since 1940 a considerable number of schemes of improvements have been undertaken to the main drains in Deeping Fen. It is interesting to note the gradual lowering of the normal summer water level at Pode Hole as follows:—

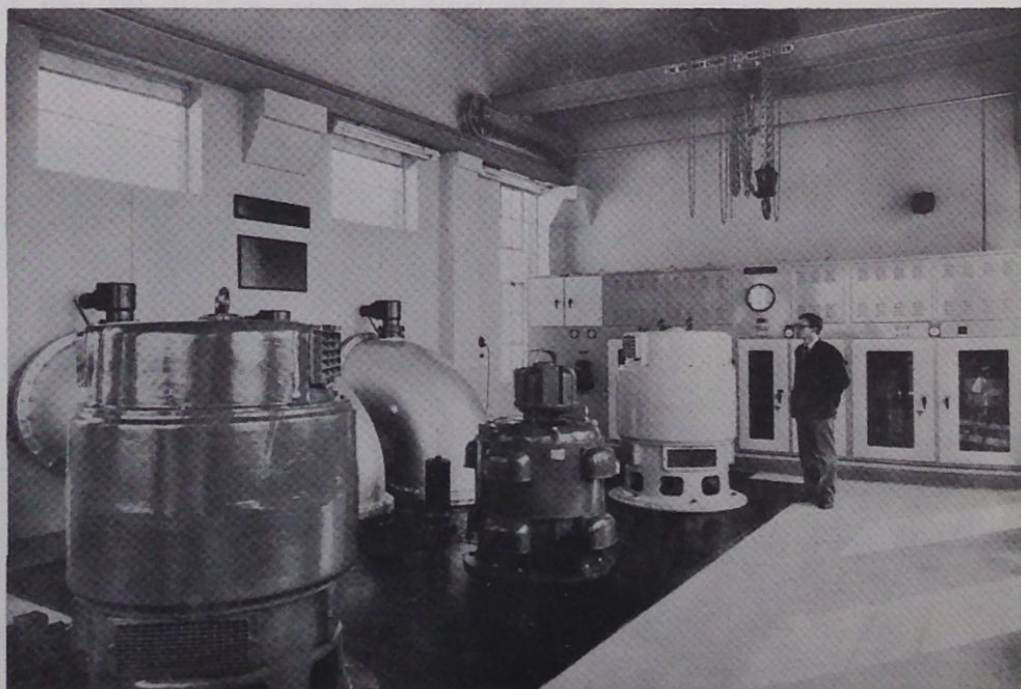
Summer Water Level at Pode Hole	1930	+1.50 O.D.N.
	1940	+1.45 O.D.N.
	1950	+0.75 O.D.N.
	1955	0.00 O.D.N.
	1965	-1.00 O.D.N.

Demolition of Elloe
and Welby

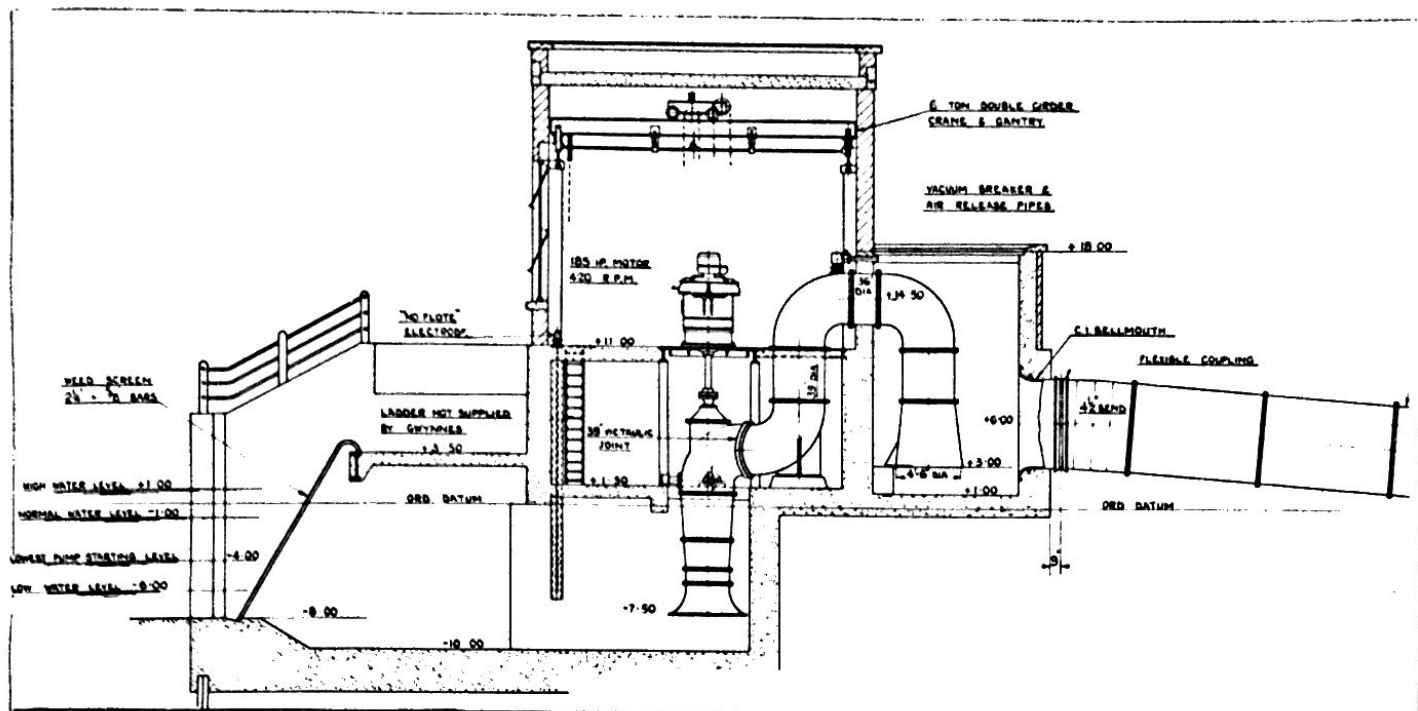
This lowering of the water levels generally resulted in the Elloe and Welby Pumps becoming obsolete. In fact they could not operate effectively below a water level of 0.00 O.D.N. They were demolished in 1956 and replaced by The Adventurers Pumps.

The Adventurer's
Pumps 1957

The Adventurers Pumps were installed in 1956-1957 and officially opened by the Chairman of the Board, T. R. Pick, Esq., O.B.E., on the 12th December, 1957. The plant consists of two 39" dia. and one 30" dia. axial flow pumps by Gywnnes operated by two 185 H.P. and one 100 H.P. electric motors by Crompton-Parkinson. The pumps are designed to discharge 356 tons per minute (213 cusecs) against a static head of 13 feet and pump down to a minimum level of -6.00 O.D.N. (i.e. Three feet lower than possible with the William Dennis and Henry Bain pumps). The pumps are vertical shaft axial flow, the impeller is always drowned and therefore no priming is required.



Interior view of the Adventurers Station.



Section of one of the Adventurers Pumps.

During the 1947 Flood the River Welland and the River Glen were incapable of containing the flood waters within their banks and considerable overflowing occurred, eventually resulting in breaches in the banks of both rivers. The river channels were incapable of discharging the volume of water down to the outfall below Surfleet Reservoir. In fact, during the period of the flood, reasonable water levels were experienced at Surfleet Reservoir at low tide, i.e. between 4.75 and 7.25 O.D.N.

River Welland Major
Improvement Scheme
1947-1954

Improvement to River
Glen 1962-1965

The River Welland Major Improvement Scheme 1947-1954 and improvement to the River Glen 1962-1965 has, without doubt, given added protection against flooding by upland waters to the Deeping Fen area and all the lowlands under the command of these two rivers.

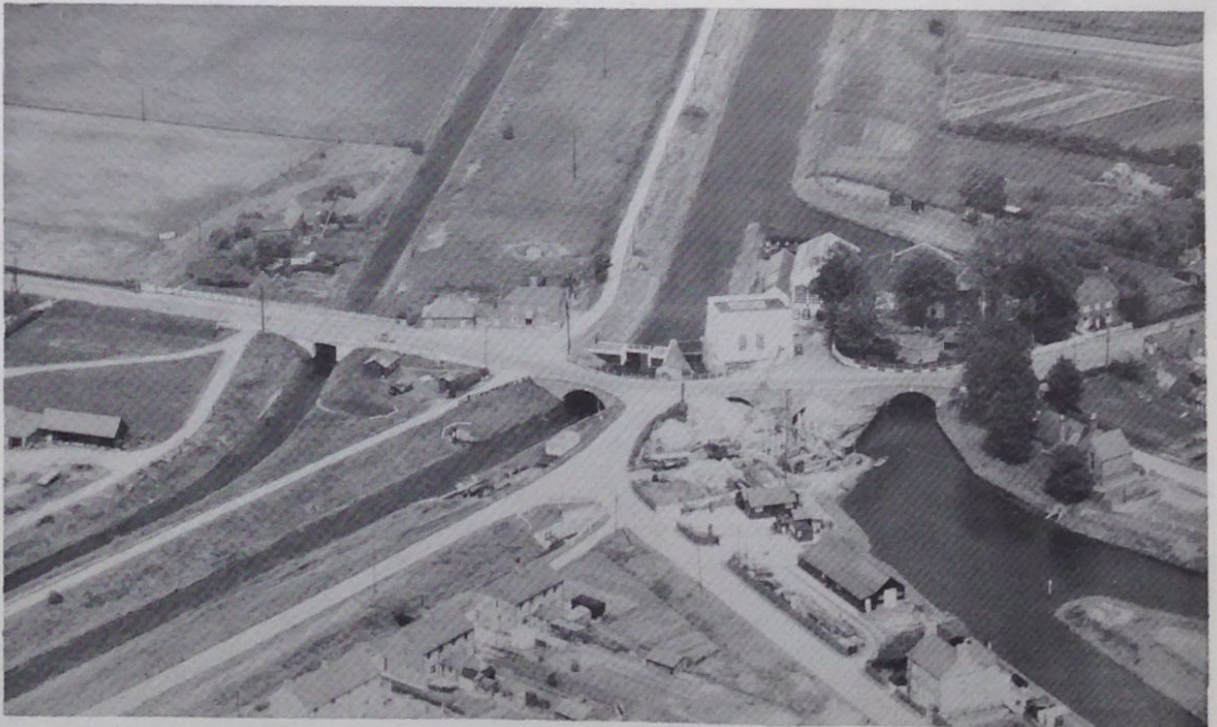
However, as a result of the above improvement schemes, a much higher water level at ebb tide than previously would be experienced in the Welland at the Vernatt's Outfall Sluice if 1947 Flood conditions again occurred. It is calculated that with these conditions, the minimum water level in the Welland at Surfleet would be approximately 10.00 O.D.N. and the maximum water level in the Vernatt's at Pode Hole during the tide locked period, approximately 13.00 O.D.N.

It is not practicable to reduce the above water levels by improvement to the River Welland below Surfleet Reservoir because of siltation of the tidal channel.

With a water level in the pumping basin at Pode Hole of -2.00 O.D.N. and a water level of 13.00 O.D.N. in the Vernatt's Drain, the static lift of the pumps at Pode Hole would need to be 15 feet. Although this is within the capabilities of The Adventurers Pumps installed in 1957, it is well outside the capabilities of the William Dennis and Henry Bain pumps, which were originally designed for a static head of 7 feet and 9 feet respectively. New pumping plant capable of operating against a static head of 15 feet was therefore required to replace these two existing pumps under the new conditions.

**The Deeping St.
Nicholas Pumps**

Accordingly the Welland River Board submitted a scheme to the Ministry of Agriculture, Fisheries & Food to provide new pumps at Pode Hole to replace the William Dennis and Henry Bain pumps and also to pump the Counter Drain when necessary. At the same time the Deeping Fen Board decided to increase the pumping capacity at Pode Hole from 15 cusecs per 1,000 acres run-off to 20 cusecs per 1,000 acres run-off and agreed to bear 17.36% of the total cost of the scheme. The River Board obtained an 80% Ministry grant on its proportion of the scheme.

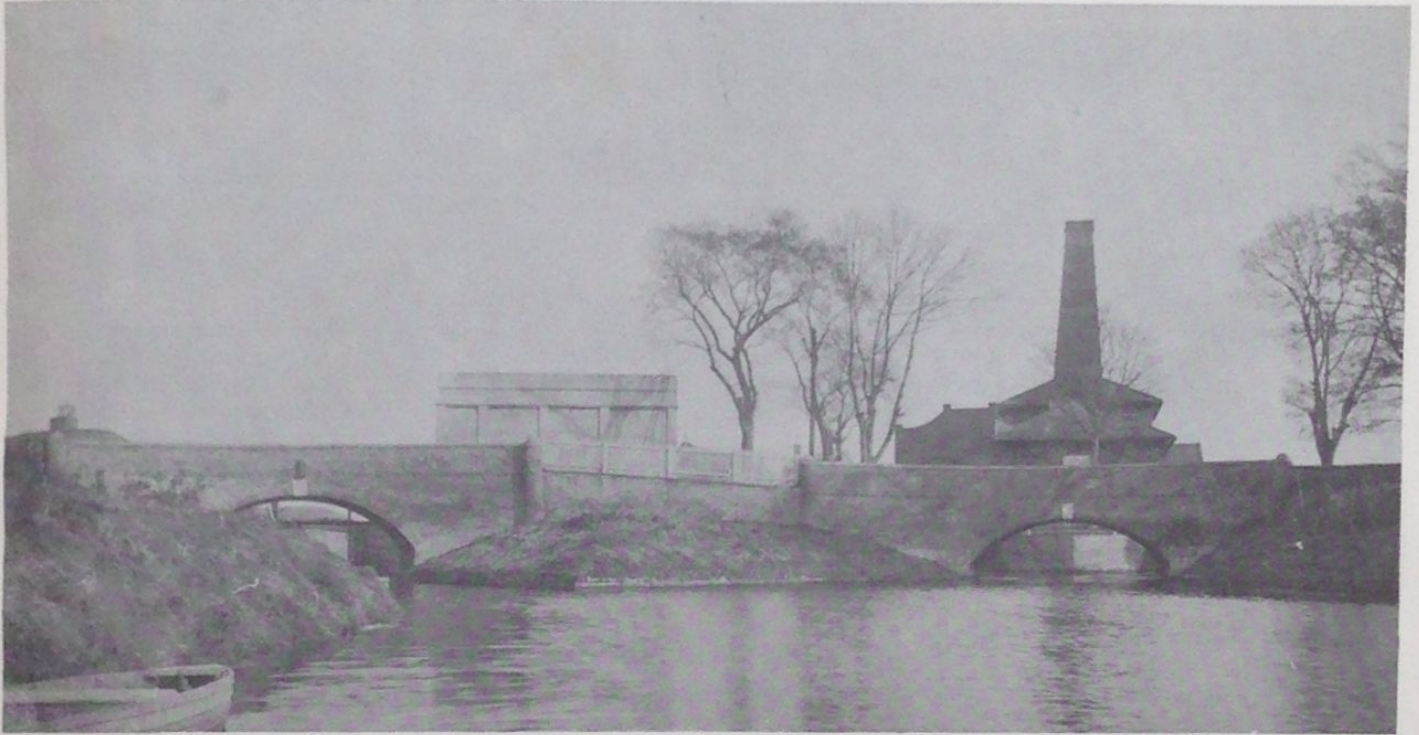


AERIAL VIEW OF PODE HOLE 1955

Piling in progress for the Adventurers Pumps.

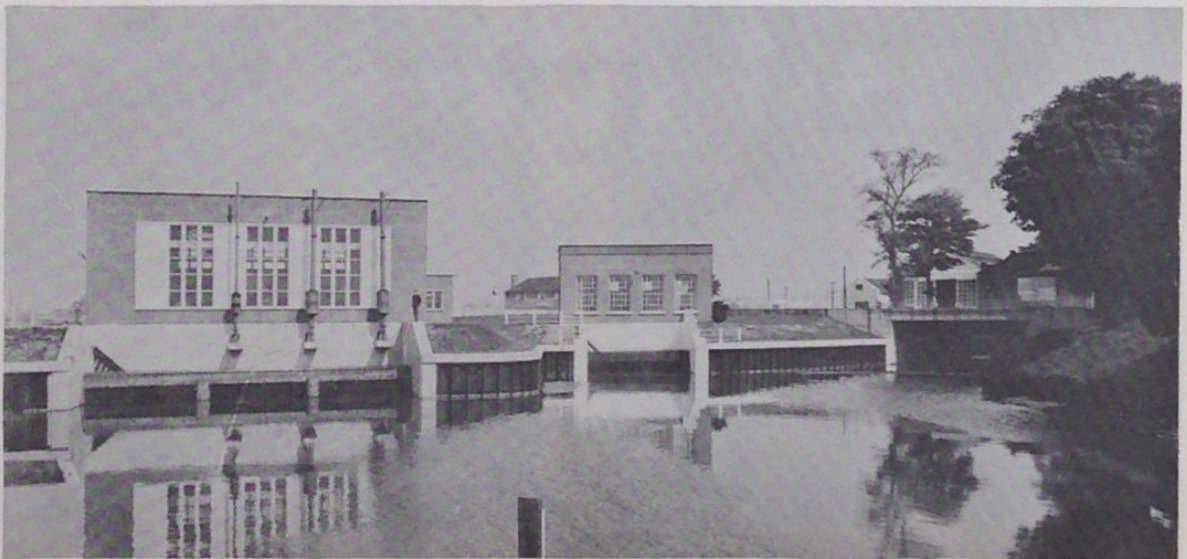
1710 Horse Power

The new "Deeping St. Nicholas Pumps" to be officially opened on the 16th July, 1965, consist of one 50" dia. and two 60" dia. vertical axial flow pumps, by Messrs. Gwynnes Pumps Ltd. of Lincoln, operated by one 410 H.P. VEB and two 650 H.P. VEBX (pressure charged) Ruston vertical diesel engines. The power is transmitted to the pumps through David Brown reduction gearing.



VIEW OF PODE HOLE 1920

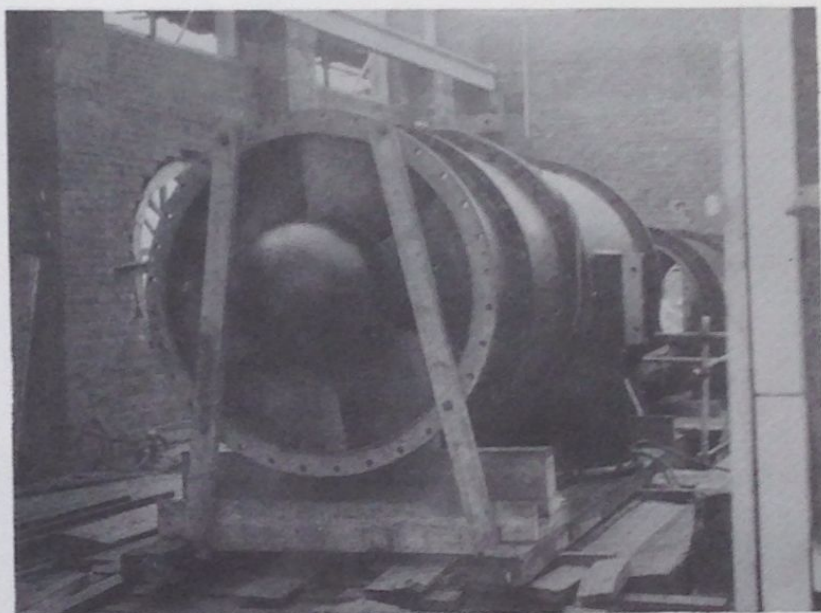
Steam Power House on the right. Diesel Power House on the left.



VIEW OF PODE HOLE 1965

Pumping of Counter Drain

Provision has been made to pump the Counter Drain when necessary by the installation of a piped intake to the sump of the 50" dia. pump. This pump can be used to pump either the Counter Drain or the Fen.



INSTALLATION OF THE PUMPS ON SITE
View of the Impeller or Rotor without Bellmouth.

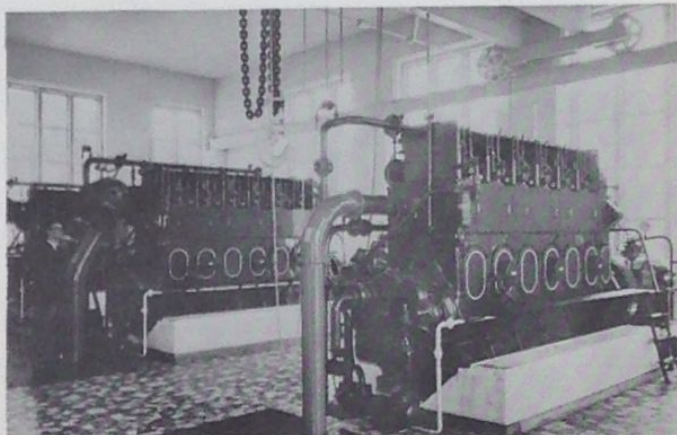
Particulars of the pumps are as follows:—

Particulars of Pumps	50" DIA. PUMP		Two 60" DIA. PUMPS
	7 feet (Counter Drain)	15 feet (Fen)	15 feet (Fen)
Designed maximum static head			
Discharge (cusecs)	145	120	206
Size of rotor	48" dia.	48" dia.	58" dia.
R.P.M.	280	280	236
Peripheral speed of rotor ft. per sec.	58.7	58.7	59.8
Speed of water through rotor ft. per sec.	15.25	12.62	14.95
Angle of blades of rotor	$20\frac{1}{2}^{\circ}$	$20\frac{1}{2}^{\circ}$	21°
Duty B.H.P.	300	330	540
Engine H.P.	410	410	650
H.P. to prime	380	380	600

The writer would like to acknowledge the sound technical advice and guidance given by Mr. William Rigby, M.I.Mech.E., who in 1963 retired as Deputy Chairman of Allen Gwynnes Pumps Ltd. Over a period of nearly 40 years many land drainage pumps in the Fens have been installed under his direction and he and his Company have been closely associated with Pode Hole, particularly with The Adventurers Pumps and the new Deeping St. Nicholas Pumps.



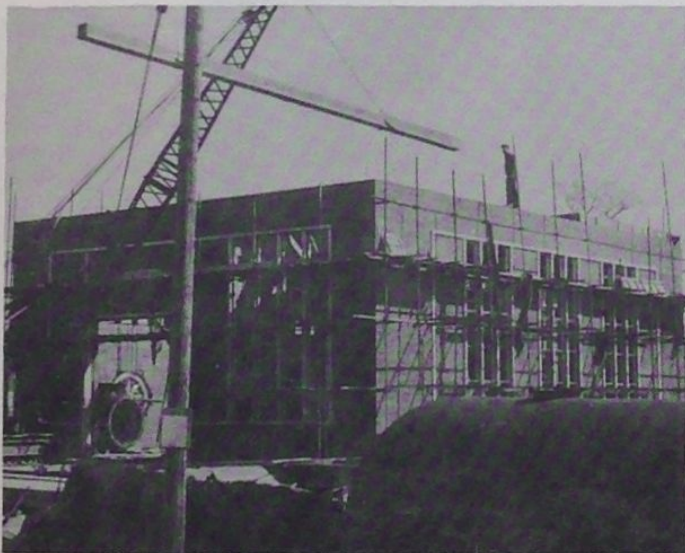
Witnessing the Works Test of the engines at the Lincoln works of Messrs. Ruston and Hornsby Ltd., 29th November, 1962.



Interior view of the Station of the Deeping St. Nicholas Pumps.

Station

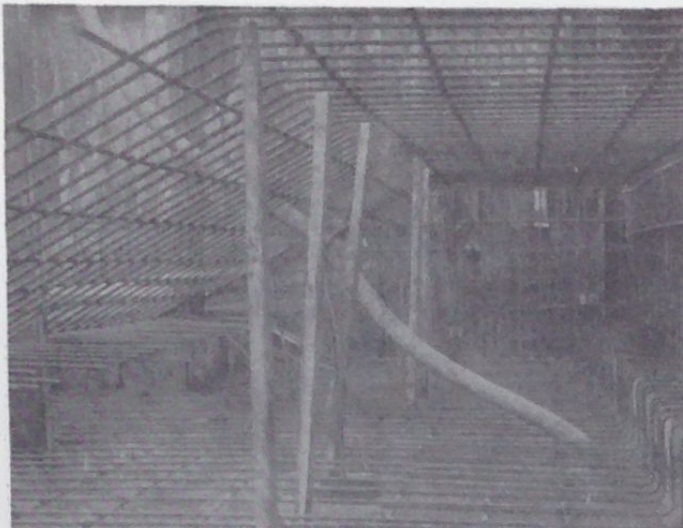
The civil engineering work, including the new pumping house, the inlet main from the Counter Drain, the outfall mains from the three pumps and the construction of a new sluice in the Counter Drain was undertaken by Contract by Messrs. J. L. Kier & Co. Ltd.



The precast concrete roof beams being placed in position.



The discharge pipes of the pumps being installed.



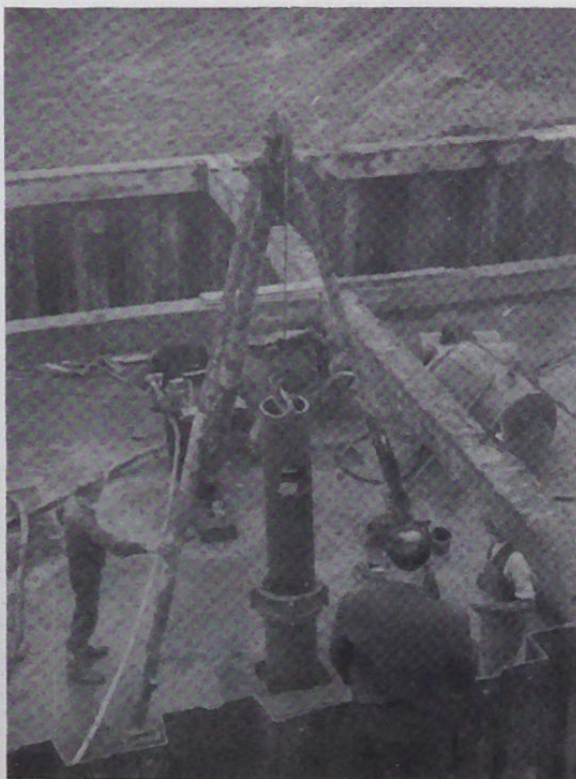
Some of the steel reinforcements for the concrete foundations of the building.



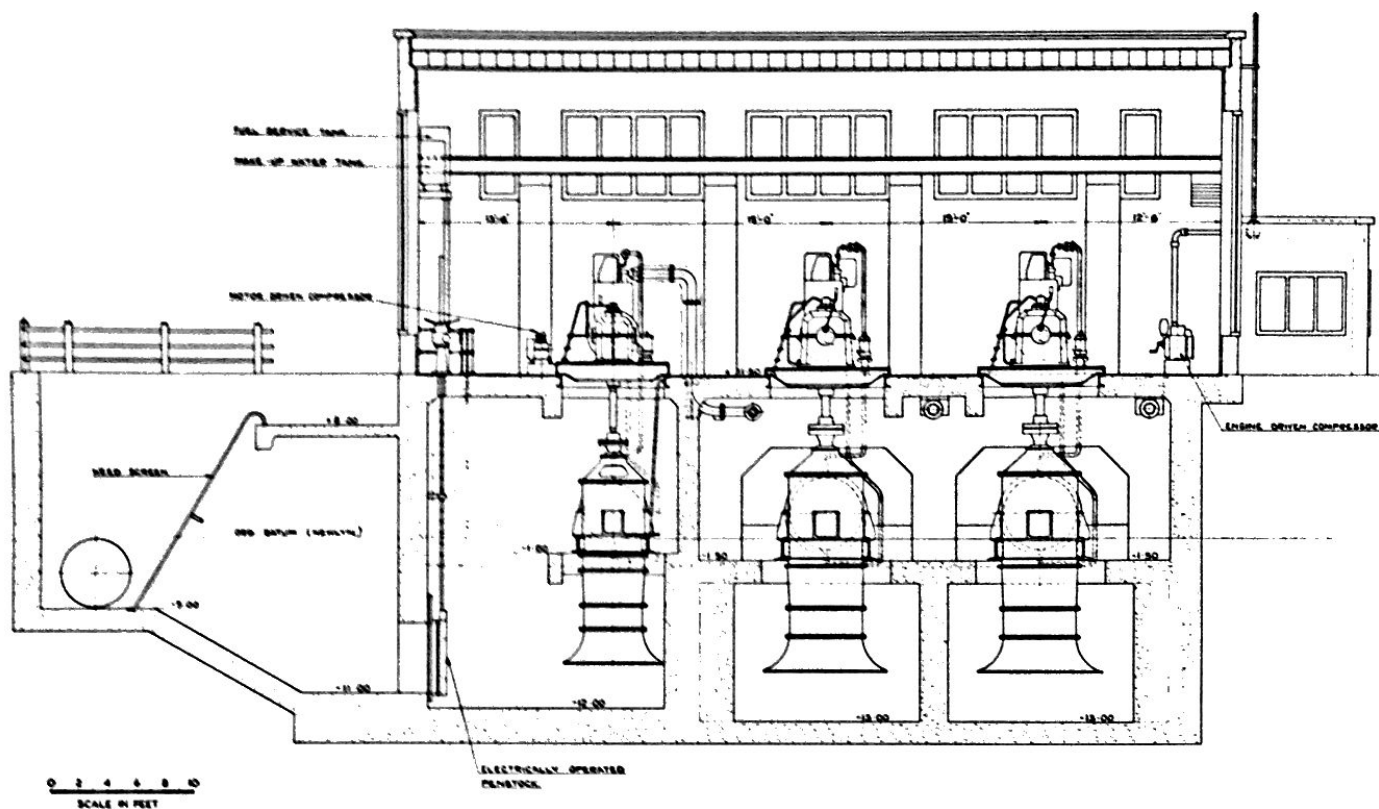
Stone pitching and concrete grouting of the outfall of the new pumps.

Piles

The total weight of the new building including the water in the pumps and suction bays is approximately 4,250 tons. It is supported on 85 18" dia. precast concrete bored piles (Prestcore), each pile designed to stand a safe load of 50 tons. The calculated ultimate load per pile is about 100 tons before failure. The piles were installed by Messrs. John Gill Contractors Ltd. The average toe level of the piles is -36.00 O.D.N. and penetrate approximately 16 feet of very hard clay, which exists below a level of -20.00 O.D.N.



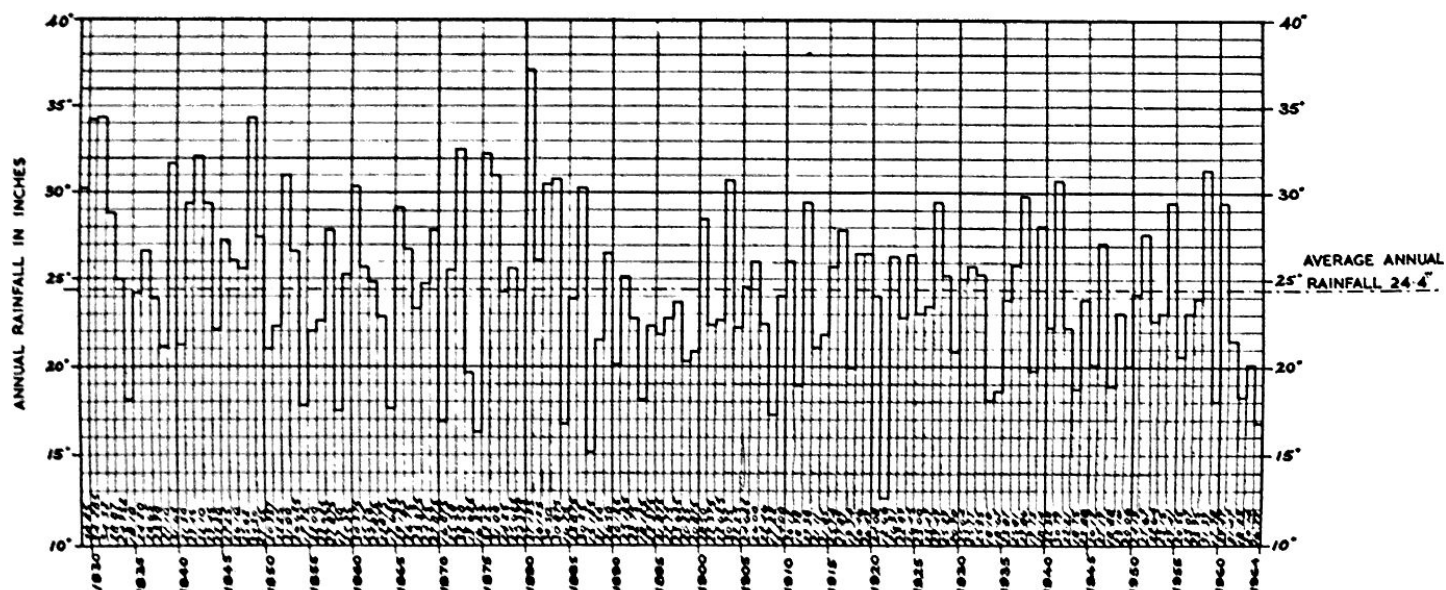
Boring for installation of one of the piles.



CROSS SECTION THROUGH THE DEEPING ST. NICHOLAS PUMPS

Rainfall

RAINFALL RECORDED AT PODE HOLE 1829 TO 1964



The daily rainfall has been recorded at Pode Hole since 1828 and the above graph shows the yearly rainfall for a period of 136 years. The average rainfall per year over this long period is 24.40 inches.

Fortunately it is not a question of having to pump all the rain which falls or we should arrive at the astronomical figure of 106,140,000 tons of water per year on average from the pumped area of Deeping Fen. The majority of the rainfall, particularly during the summer months, is dispersed by evaporation and evapo-transpiration of the crops and vegetation. In fact during a normal summer very little pumping is required at Pode Hole.

By October the majority of the crops in the Fen have been harvested, evaporation is considerably less and each rainfall gradually increases the water table or soak level until eventually all rainfall has to be pumped. The amount of pumping required per year of course varies considerably, at Pode Hole in 1958 the quantity pumped was 10.7 inches (33,130,000 tons) and in 1964 the amount was 3.17 inches (9,830,000 tons).

Rainfall Run-off

There is a "lag" from the time rain falls to the time the water flows to a certain point. Run-off is dependent upon:— area, slope, shape of catchment, intensity of rainfall and permeability of the land.

In the 1920's a figure of $\frac{1}{4}$ " rainfall run-off in 24 hours was used as the maximum in the design of fen drainage schemes and pumping plant installation. This was later increased to $\frac{3}{8}$ " in the light of experience and more information on the subject. Today, in view of the improvements carried out in recent years to the main drains, tributary drains and numerous private dykes and also the installation of more efficient tile drainage systems, a figure of $\frac{1}{2}$ " rainfall run-off in 24 hours maximum (i.e. 20 cusecs per 1,000 acres) is more generally adopted.

The pumping capacity at Pode Hole is based on this figure of 20 cusecs run-off per 1,000 acres for the Fen area and a figure of 25 cusecs per 1,000 acres for the Baston and Langtoft area (via the Counter Drain) plus a discharge of 20 cusecs through Heathcote Tunnel from Bourne South Fen (also via the Counter Drain).

Flow to Pode Hole

A summary of the calculated maximum flow to the pumps at Pode Hole is therefore as follows:—

1.	Deeping Fen area:—			
	30,600 acres at 20 cusecs per 1,000 acres	...	612	cusecs
2.	Baston and Langtoft area:—			
	5,000 acres at 25 cusecs per 1,000 acres		125	„
3.	Through Heathcote Tunnel from Bourne South Fen		20	„
			—	
	Total	...	757	„
			—	

**Capacity of Pode Hole
1965**

The capacity of the pumps at Pode Hole against maximum head conditions i.e. 15 feet (Fen) (W.L. Vernatts + 13.00 O.D.N., W.L. Fen — 2.00 O.D.N.; W.L. Counter Drain + 6.00 O.D.N.) is as follows: —

The Adventurers (Fen) 200 cusecs

The Deeping St. Nicholas Pumps: —

(i) 50" dia. pump (Counter Drain)	...	...	...	145	„
(ii) 60" dia. pump (Fen)	...	...	...	206	„
(iii) 60" dia. pump (Fen)	...	...	...	206	„

Total	...	...	...	<u>757</u>	„
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1,265 Tons Per Minute

The discharge of the pumps would of course be greater against less severe head conditions. The figure of 757 cusecs equals 1,265 tons of water per minute or 283,360 gals. per minute.

**Lovell's Work
Completed**

In conclusion it may be shortly stated that the Drainage Works previously detailed have entirely revolutionised the areas known as Deeping Fen. From being mere swampy wastes they have by the ingenuity of successive generations of Engineers, been converted into fertile tracts of land which in the quality and richness of soil it is difficult, if not impossible, to equal in our Islands and the present generation of men who are responsible for the well being and maintenance of the District are living in the hope and expectation that the labours of their predecessors have now been perfected.

Men of the Fens

But spite all the works of improvement in recent years the real fenmen, men, who like their forefathers live and gain their livelihood under the shadow of the mighty banks of the fenland rivers men, who have seen the great floods of 1947, 1937, 1928 and even 1912 these men, will probably never lose their instinctive fear of the great waters, and in their dreams may sometimes hear again the great bell of Croyland calling fenmen from their beds to "man" the banks and the cry echoing through street and fen—the Wash is "up".

