

WILLINGHAM (WEST FEN) PUMPING STATION



A GUIDE BY
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WILLINGHAM (WEST FEN) PUMPING STATION

Registered Charity No. 269824

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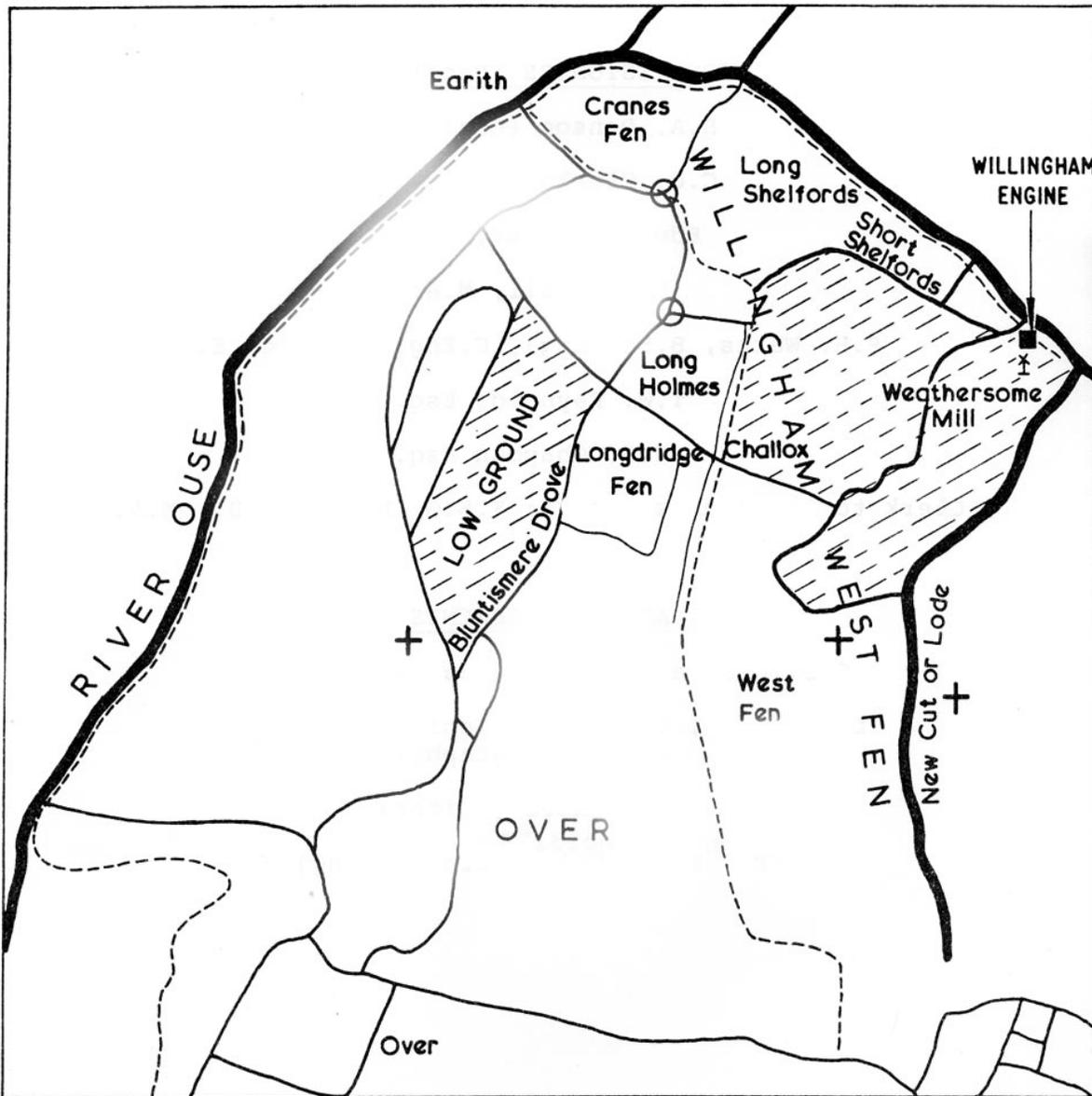
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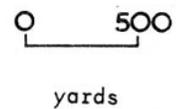
Mrs. Susan Cripps (for typing)

WILLINGHAM WEST FEN

An Historical Sketch Map



-  Mere
-  Roman remains found
-  Suggested sites of 17th century mills
-  Parish boundaries
-  Mill
-  Waterways
-  Roads & Tracks



FOREWORD

Eastern England contains an area of about 1,300 square miles which, but for the ingenuity and labour of man over many centuries, would still be marshy swampland, covered by water in winter, as indeed it was in the Middle Ages. For the purpose of drainage the area has been divided into numerous separate districts, varying in size from 500 to 30,000 acres. Each district has installed one or more pumping stations to lift its water into the river system.

The early pumping stations, built in the last century, were driven by steam engines. Over seventy of these were erected throughout the Fenland between 1817 and 1880. Of these, only three (non-working) examples have been preserved. These steam engines were later replaced by oil engines, but with the introduction of electrically driven pumps the old oil engines, in their turn, are also rapidly vanishing from the Fenland scene.

At Willingham we intend to preserve a working station so that those interested in the study of fen drainage will always be able to see a station of the old type as it was kept operated, together with the ancillary equipment necessary for local fen drainage. As this booklet will explain, the building (1847) was originally designed for a small beam engine, but at the beginning of this century this was superseded by an internal combustion engine, just as the scoop wheel gave way to the centrifugal pump.

With the acquisition in 1977 of the old Guinness steam engine it is hoped to demonstrate two generations of Fenland pumping – the Guinness engine in steam and eventually we hope coupled to a scoop wheel; as well as the existing pump equipment, an oil engine driving a centrifugal pump, which is in working condition.

Funds will be necessary to achieve this. This booklet describes a project made possible by the initiative and resources of Mr. K.S.G. Hinde, which must surely appeal to all lovers of the Fens. The Pumping Station can be maintained in its present condition at low cost, but restoration and the renovation required to create a centre for the study of Fen history (which is the ultimate aim of the Commissioners) is beyond our present means. It is to those people who are interested in preserving this part of our national heritage that we particularly appeal.

All contributions, large and small, will be welcome to help achieve our plans.

EDWARD FOWLER

CHAIRMAN 1975 – 1984

Willingham (West Fen) Pumping Station

INTRODUCTION

Willingham Pumping Station lies on the edge of the Fens one mile east of Earith and two miles west of Willingham Village in the county of Cambridge. The parish of Willingham contains some 4,600 acres which branch out from the village along the Old West River on either side as far as Earith to the west and Aldreth to the east, being bisected by Willingham Lode, which flows from the Old West River just east of the Pumping Station to the village. Thus a narrowing neck of Willingham land stretches along the side of the river to separate Over parish from the Old West. This area contained one of the fen meres - shallow lakes believed to have been caused by ponding up of water in pre-Roman times.

In the Middle Ages, local drainage was carried out by each parish, or by individual landowners. In the seventeenth century the general drainage of the southern Fenland was carried out by Vermuyden, but it soon brought new problems to the Fens. Within a hundred years local farmers banded together to form local districts for the drainage of a particular area. The first of these was Haddenham level, on the other side of the Old West from Willingham, formed in 1727.

Willingham was slow to follow the trend, and the landowners were far from united. Those with land to the east of the Lode joined with Cottenham and Rampton to form a district in 1843. In 1846 the land to the west of the Lode (including the bed of the old mere) was formed into a separate district called "Willingham (West Fen) Drainage Commission". It was to have charge of less than 1,000 acres, and was thus one of the smallest districts in the Fens.

The new Commissioners forthwith constructed the Pumping Station of which the building remains.

THE MERE

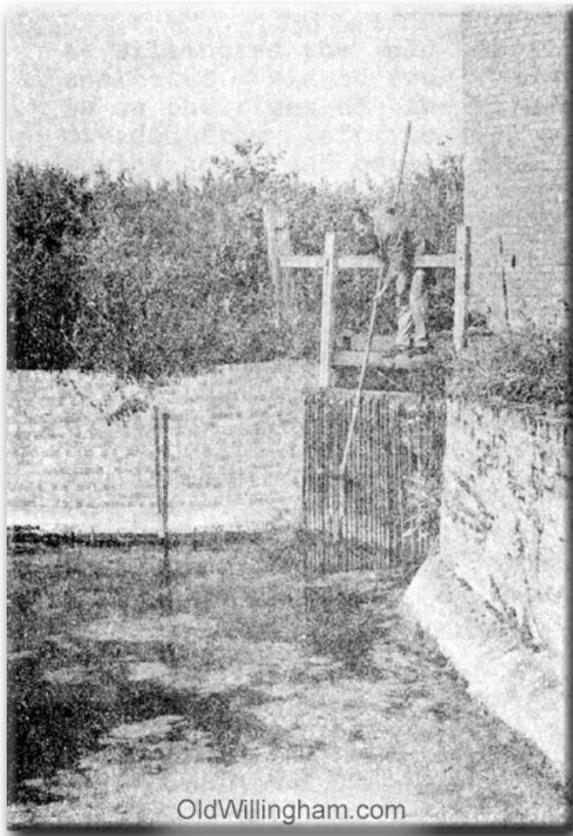
Willingham Mere was very large, being recorded in the sixteenth century as comprising some 80 acres with a depth of 16 1/2 feet. Its contents made fishing rights over it very valuable. After Vermuyden's time all of the meres wasted, and Willingham mere seems to have disappeared altogether by 1800.

MILLS

General drainage caused continuous shrinkage of the peat soil as it was drained and farmed, which continues to this day. This is the reason for the river banks being so much higher than the surrounding land. Thus farmers found it necessary to pump water from the land into the rivers which were and are at a higher level than the field drains.

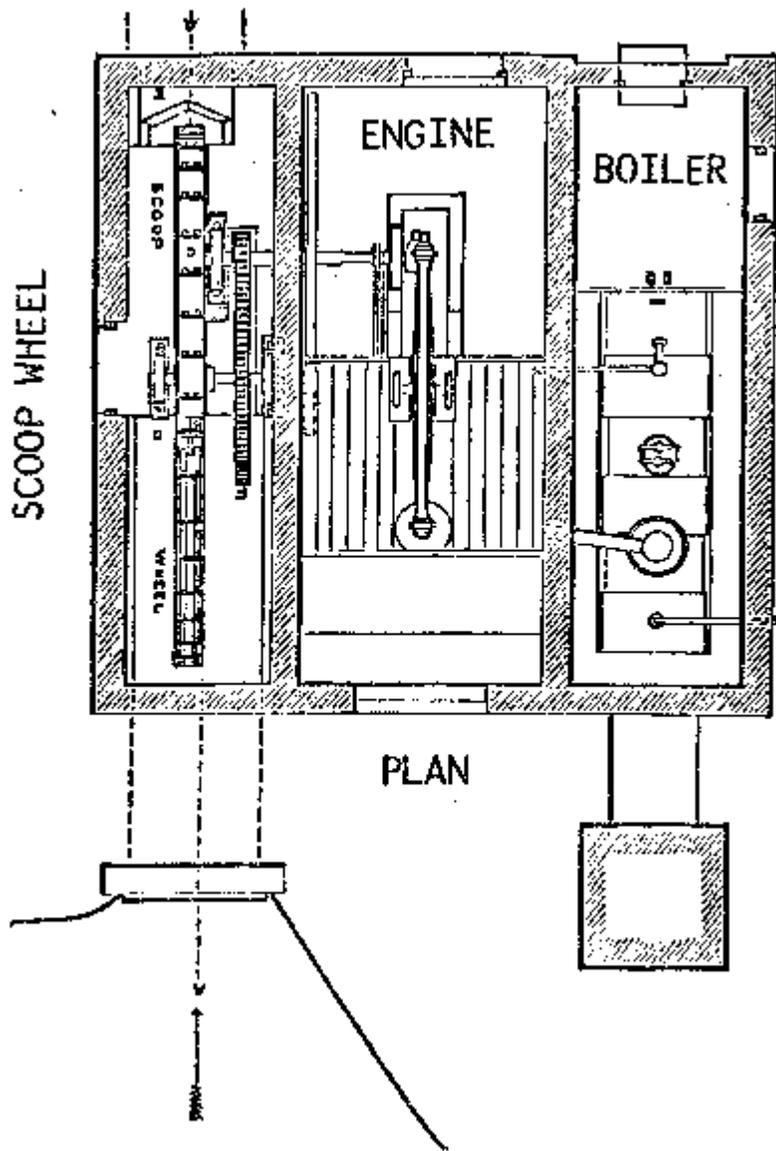


The Engine Drain with the bed of the mere in the background.



The essential Long Rake, which keeps clear the weed in front of the pump intake

This is similar to Willingham, where the coalyard is attached to the side of the Boiler House.



Ground Plan of a typical small Fen Pumping Station.
From A. Beazeley "The Reclamation of Land" 1900

Crosby Lockwood & Son

At first, horse mills and windmills were used for the purpose. Willingham can boast one of the earliest recorded pumping mills, noted in 1604. It stood behind Earith and appears to have drained a field called "Hinde's field" (later Crane Fen) into the Mere. There is no later record of it, but by 1697 Over villagers were allowed to place another mill also draining into the mere.

By 1800, a windpump had been erected on the site of the present pumping station to pump the mere water into the river, and this may directly have caused the end of the mere. It was called White's or Weathersome or Molly Mill, and was replaced by the engine in 1847.

WILLINGHAM (WEST FEN) PUMPING STATION

THE BUILDING

The building erected in 1847 is in the standard form of house for a small beam engine driving a scoop wheel such as had been evolved in the Fens since the first such plant had been installed some thirty years before. The larger engines, such as that at Stretham, were housed in an obviously tripartite building, whereas the small houses were composite.

At Willingham the old building is externally virtually unaltered. Viewed from the road, the lean-to coalyard is on the right of the main structure. The latter was divided from left to right, into scoop wheel house, engine house and boiler room.

The coalyard now has double doors facing the road. Originally it would have had doors on the river side to give access for coal delivered by barge, and was probably uncovered. Brick buttresses were erected against the side wall to support it against the weight of coal, but have since been dismantled to relieve the wall of their weight. These walls, as well as others throughout the building, contain bricks marked "Drain", which designated them as exempt from the brick tax, abolished in 1850.

A severe gale in 1947 lifted the original slate roof of the Engine House, and this has been replaced with corrugated asbestos. A door was formed into the scoop wheel side of the House, to give access to the new pump, and the scoop wheel door at ground level on the river side was bricked up. Otherwise the building is structurally original except for the chimney which was felled to roof level during the Second World War.

THE BEAM ENGINE

The original engine installed in this building was made by J. & E. Headley of Cambridge. It was a low pressure beam engine rated at 10 h.p. with one boiler and drove a cast iron scoop wheel 20 feet in diameter. It cost £455, whilst the building cost £460.

The boiler was replaced in 1875 by one made by Smithdale of St. Ann's Iron Works, Norwich. This was 5 ft. in diameter., 19ft. long and had one flue 2 ft. 9 ins, in diameter. It was fitted with Galloway tubes and cost £205.

In 1901 this plant was removed and a Hornsby 32 h.p. horizontal hot-bulb oil engine was installed to drive a Clayton and Shuttleworth pump. The bulb on this engine was heated with a double blow-lamp; this can still be seen in the Engine House.

This engine failed in the middle of the flood of January 1936. As an emergency measure, a traction engine was brought to the front of the building to drive a portable centrifugal pump. In March, 1936, the present engine was installed, at a cost of £340.

THE RUSTON ENGINE

The existing engine is a Ruston and Hornsby model 6HXR 34 horse power single-cylinder diesel engine. Due to the parlous state of agriculture in the years before the Second World War, as much of the existing plant as possible was retained. It was apparently felt that the new engine could not be coupled directly to the pump, so a shaft was constructed to a pulley wheel which was driven by a belt from the flywheel of the engine. The original belt was previously used to drive a threshing tackle, and remained in use on the engine for over forty years, although it has now been replaced.

A new compressor, belt-driven from the main engine, was fitted to fill an air-bottle for starting the engine. This meant that, if the engine failed to start at the first attempt, it was necessary to find two or three men to start it by hand. Bitter experience of this led to the installation of a 1.5 h.p. Petter engine to drive the compressor in 1942.

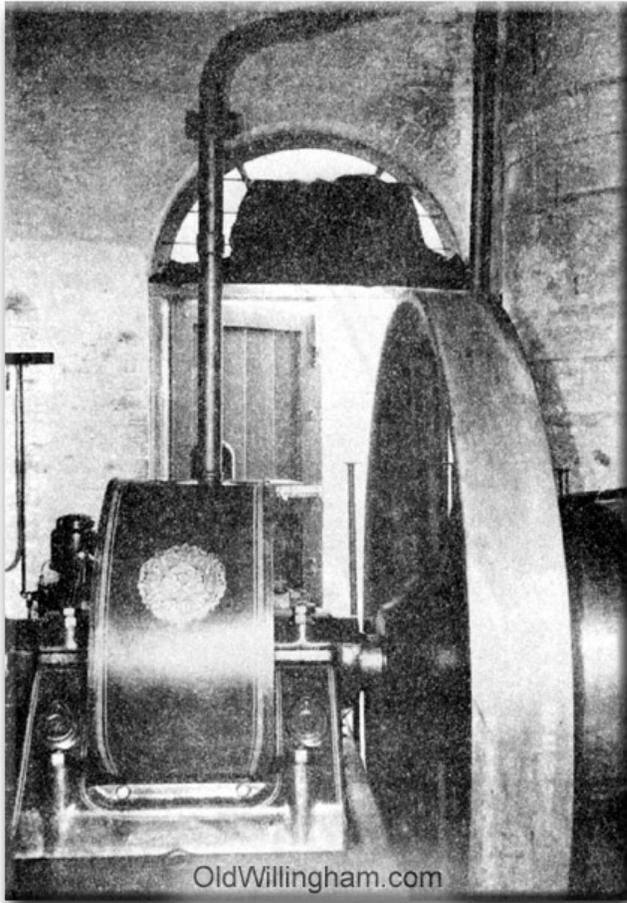
The only surviving piece of machinery from the original steam engine is the ram pump used to pump water from a well under the river bank into the cooling tank. This is belt—driven from the main pump extension shaft. It was recently renovated by Mr. P.H. Watts.

THE PUMP

The pump discharges about 35 tons of water a minute, and runs at 310 r.p.m. Viewed casually, the snail-shaped casting of the main pump appears to be a standard form of horizontal fan-driven centrifugal pump. In fact it is a vacuum-assisted turbine pump, having a vertical shaft about 15 feet long with a fishtail at the bottom, and driven by brass cog-wheels at the top. The vacuum is created by counter-opposed rollers in the top of the casting.

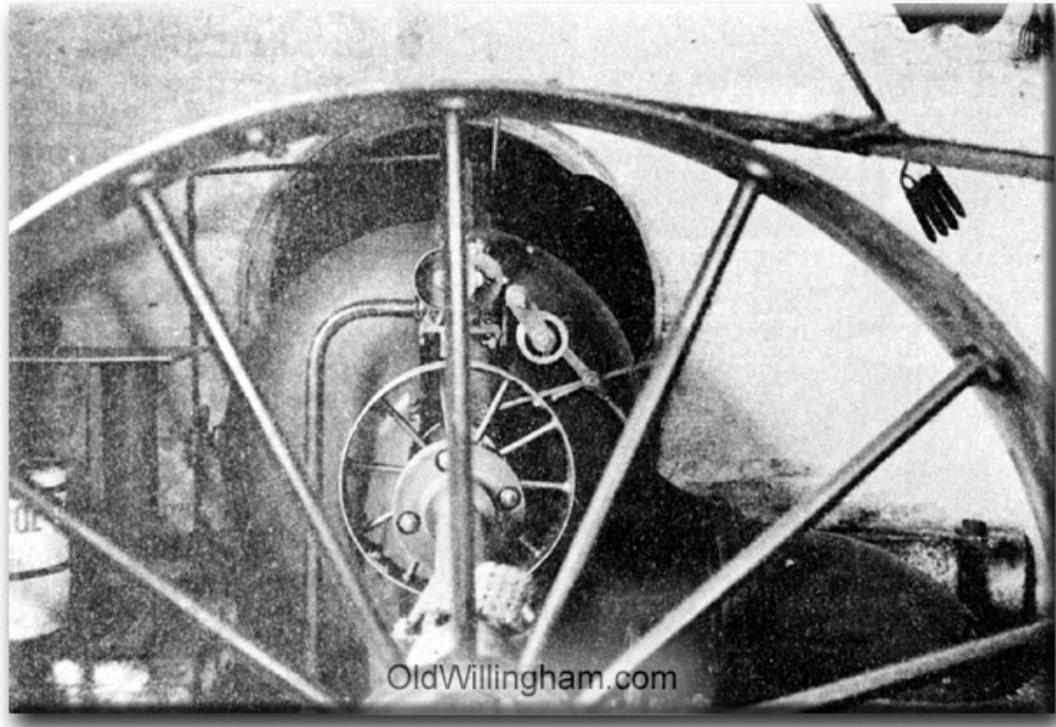
This is a very old form of pump and is believed to be the oldest pump still working in the Fens, as well as the only one of its type.

This pump was fitted into the old scoop wheel race. Before starting, it needs to be primed on the river side. Until about 1970, this was achieved by pouring some hundred bucketfuls of water (fetched from the river) to fill the race up to the concrete sill. Since then, a portable 2-inch Alcan pump has been used for the purpose, but has recently been stolen. In flood time the river is high enough to avoid this chore, and a slow alternative is to run the ram pump so as to cause the cooling tank to overflow into the race.

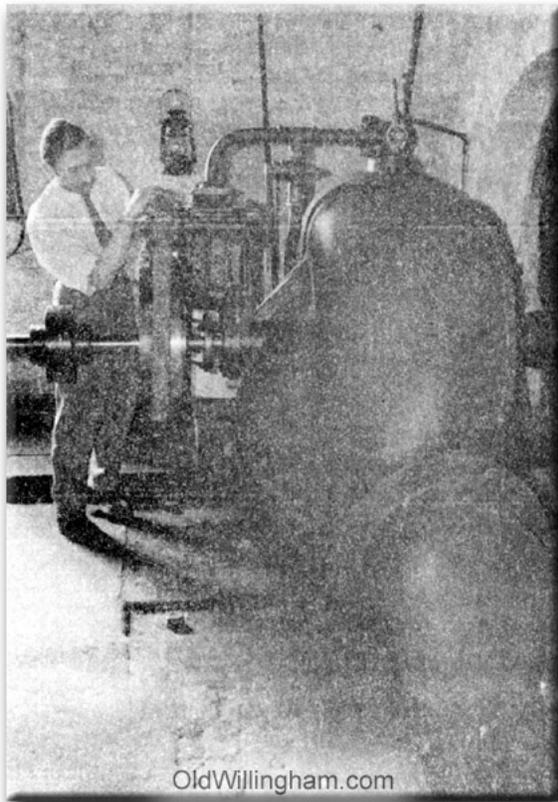


The Ruston Engine





The Clayton and Shuttleworth Pump with extension shaft and pulley wheel, and the old main belt



Fitting the belt to the Vacuumiser on the Main Pump

First it is necessary to start the Petter engine and charge up the air bottle to 200 lbs/sq.in. Having positioned the engine correctly by hand and set it to half compression, air is then admitted to turn the engine for four or five strokes. Then the fuel lever is set to open, and the engine turned to full compression.

Having started the main engine and filled the pump race, the vacuumiser is connected by belt from the pump extension shaft, and heavy gear oil is inserted into it to create the vacuum,

This pump is not easy to start, and if it fails to discharge at the first attempt it is usually necessary to allow it to cool down before trying again.

From cold, it can take up to an hour to start engine and pump.

INTERIOR

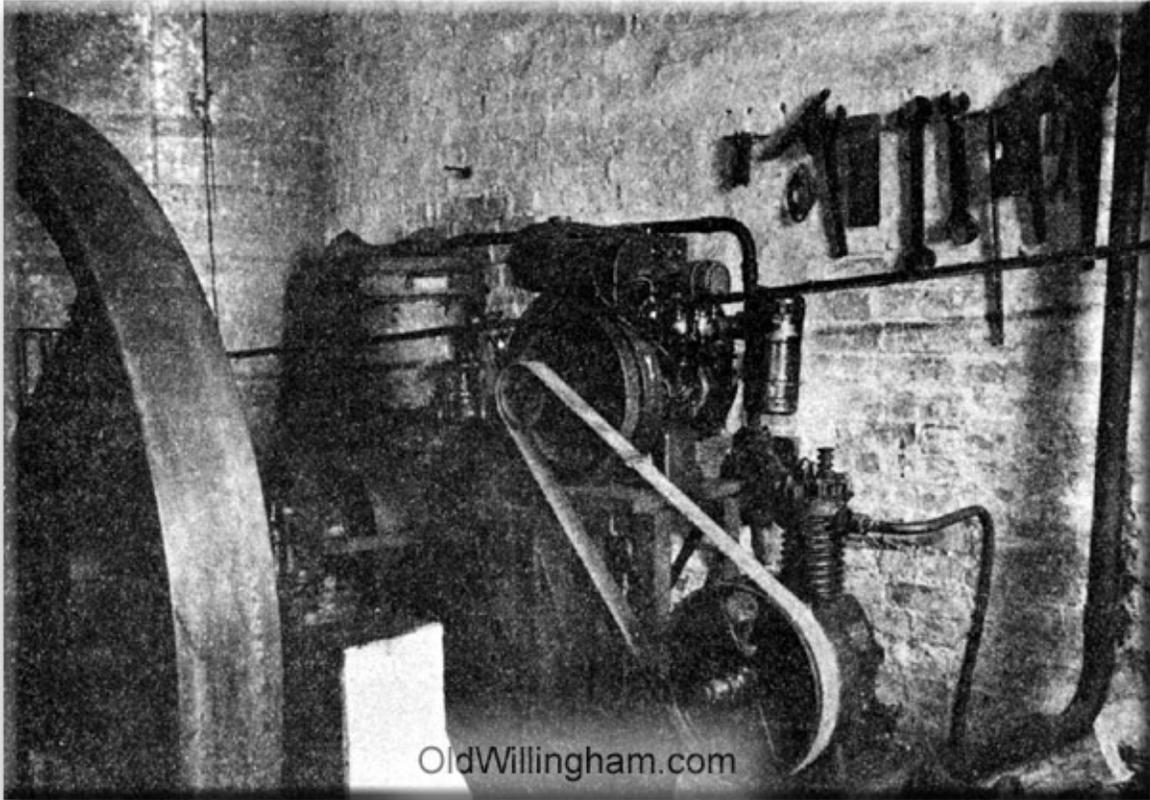
Entering the coalyard from the driveway, the Guinness Engine can be seen on the right. This is described below. At the back is the main fuel tank, having a capacity of 600 gallons, installed in 1936. Previously, fuel had been delivered in 40 gallon drums. Fuel is pumped from this tank by a semi-rotary pump in the Engine House to fill a 20 gallon direct feed tank. On full load, the engine consumes about 2 gallons of gas oil per hour.

Behind the Guinness Engine can be seen the slacker controlling a channel which runs from the river, under the coalyard, and into the main drain. This is used in the summer to let water back into the Fen for irrigation purposes.

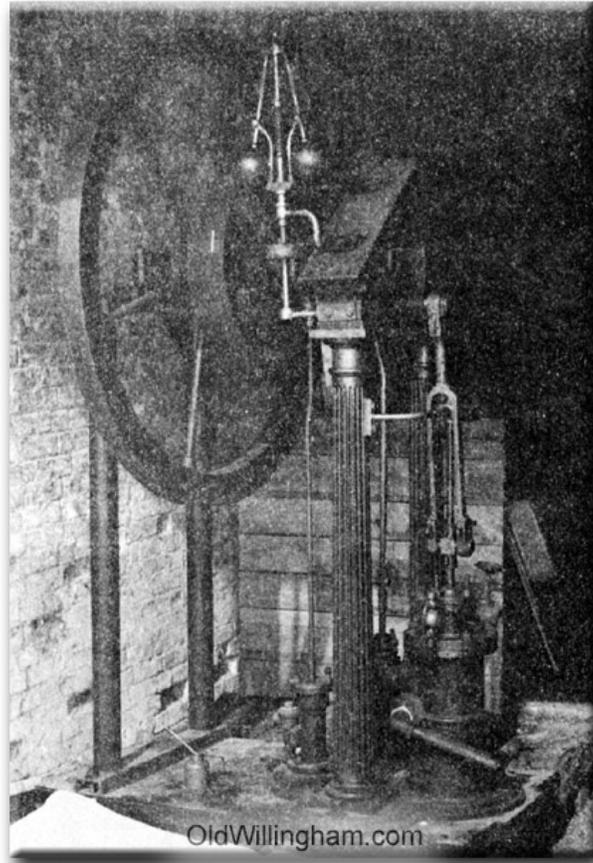
The original gravel floor of the coalyard led to much trouble through seepage, and this yard was usually filled with one or two feet of water in flood time. Some twenty years ago, a concrete retaining wall was built in the middle of the yard to contain this seepage, and in 1982 the entire floor was concreted at a higher level.

A step leads through a doorway from the yard into the boiler house. The original floor of this room was about four feet below the present floor. The floor was raised by two feet because of flooding and in 1984 a concrete floor at a higher level was made. At the back of this room a cabin was constructed in about 1940 to provide a shelter for the engine driver. This was removed in 1984. The old flue has been adapted to provide a fireplace. The door from the boiler room into the Engine House is relatively new. The original door on the river end of this wall has been bricked up.

In the Engine House, the marks of the old partition wall between the beam engine and the scoop wheel can be seen on the rafters, and one of the brick bases for the bearings of the scoop wheel can be seen in the wall.



The Petter Donkey Engine in the centre, belt—driving the Compressor. In the background is the small fuel tank, with the engine flywheel in the left foreground.



The Guinness Steam Engine, made in 1829



The Archimedean screw—pump with the main fuel tank in the background.

RECENT HISTORY

The district adjacent to Willingham West Fen is Over, itself containing only about 1,500 acres. In 1967, Over district decided to replace its existing diesel plant with an electric pump having a delivery of 80 tons per minute, which was double that of the old plant. This provided the opportunity to propose amalgamation of the two districts. It must always have been a relatively expensive luxury to maintain a separate organisation to drain as small an area as 800 acres, and the Willingham plant was by then old and run-down. The districts accordingly amalgamated, and the Pumping Station was placed on the market, complete with all equipment, in 1974.

This was purchased for preservation by the author, whose interest in fen drainage had been inspired by a long record of family involvement, and who was then Chairman of the Cambridge Society for Industrial Archaeology. He has formed a charitable trust, to which he has transferred a major interest in the property.

Since then, agreement has been reached with Over and Willingham Internal Drainage Board for the Station to be operated in case of emergency.

The trust intends to preserve the Station as a working entity as well as a centre for the study of the history and practice of local fen drainage. To this end, it will continue to supplement the existing range of drainage artefacts kept at the Station.

ACQUISITIONS

Besides the working tools at the Engine House upon acquisition, or since donated, it contained three new major items:-

The Guinness Engine

Arthur Guinness & Co. Ltd. has recently placed on permanent loan a 10 nominal horse-power vertical steam engine. This was built by H. & W. Davis of Landport in 1829, and worked in Fareham Brewery from then until 1952. Although not a Fen engine by origin, it is similar to that used at Middleton Towers Station to drive a scoop wheel. It is a particularly fine engine, and is believed to be the oldest stationary steam engine now in the Fens. Before delivering the engine to Willingham, Guinness completely overhauled it.

Archimedean Screw Pump

Anglian Water Authority (Great Ouse River Division) has placed on permanent loan a fine wooden Archimedean screw pump 15 feet in length, used for many years to drain parts of Roswell Pits, near Ely. This is a very rare example of a type of pump used in the Fens a hundred or more years ago. Such pumps are still quite common in Egypt. It can be surprisingly effective, discharging one ton of water per minute at 4 r.p.m., but this would be hard work for the hand operator.



The Main Pump in action: 35 tons of water a minute.



The Two—Man Water—Scoop with the Engine Cut in the background.

DRAINAGE TOOLS

Scythe

Cutting weeds from a drain was known as “roding” or “rooking”. It required two types of scythe. The first had a stick about five feet long with a three foot blade and two handles or “kegs”. With this the top “swathe” was moved, the man standing at the top of the drain.

He then took a second scythe with a handle about eight feet long and a shorter blade which was also thicker along the back. This was used, standing half-way down the drainside, which meant that the man could now reach the bottom swathe and some two feet into the drain bottom. The longer one was specifically known as a “roding” scythe.

There was also another type of scythe called a “dilly-spade”, probably having a twelve foot stick with no kegs attached. The blade on this was set at an obtuse angle and the tool was, so to speak, thrown towards the drain centre and pulled back in a series of snatches. This was used in drains not wide enough for shears or “snickels”, these being a series of blades bolted together.

Shears

To cut weeds growing in the bottom of drains, several scythe blades were joined together with a rope on each end, A pair of men used these, one man standing on each bank.

Rakes

When the main pump is working, it is essential to keep the drain clear of weeds which can choke and stop the pump. Long—handled rakes were used for this heavy work, which has always occupied a great part of the time of the driver or stoker when pumping.

Hodding Spade

A “hodding” spade is not to confused with a “more” spade. The “more” spade was used for clearing the top growth from the turf pits. The old English name for a hodding spade was a “didal”. The hodding spade has sharp edges for cutting the side of the drain. A cord would be stretched along to show the line of the new edge and the toolman would then work along the line of this card, using both hands to push down the spade.

The resulting “spoil” was pushed forward and allowed to fall into the drain, from where it would either be thrown out by hand labour, or taken out by a mechanical excavator.

At Willingham, there is also an old hay knife adapted for this purpose, with a long metal handle.

Mole Traps

Moles wreak sudden havoc in damaging the river banks throughout the Fens. Large districts used to employ full-time mole-catchers, and traps are an invariable feature of all Fen Pumping Stations.



A Wooden Mud Scoop stands on the top of the race, and behind to the right, the Two—Man Scoop. On the rear wall on the left is a Fly—Tool, and the One—Man Scoop is on the right.



Horse Mill and Scoop: an early mode of Fen drainage. From a paper by Baldwin Latham, on the Drainage of the Fens, Trans,Soc.Civil Engineers (1863), pp.154 et seq.

Gault Barrow

A shallow wooden barrow used primarily for moving gault or clay for the repair of the banks.

Branding Iron

Each district branded its initials on its tools. WWDC stood for Willingham (West Fen) Drainage Commissioners.

Coaling Shoe

The coal for steam-powered pumping stations was delivered by barge, and had then to be barrowed over the river bank, on planks, to the coal yard. The porters who wheeled the barrows were known as “flippers” and wore special irons on their boots to grip the planks. Very large barrows were used, and a good man could push 2 cwt. of coal in a barrow. Normally the bargemen acted as flippers. It was hard work, because the barrows had to be run up the planks, due to the gradient up the bank to the coalyard.

At the Hundred Foot Engine in 1861, James Stevens was paying 6d. per ton to the gang of porters. The gang was sometimes composed of three of his own men, but more often came from one of several outside firms. By 1873 the price had risen to 7 1/2d. per ton. The loads were usually around 75 tons, so the men each made 10/- or more for the task; high pay at the time.

Mud Scoop

These tools, made wholly of wood, were used for removing mud from the bottom of rivers and drains.

Box Water Scoops

This was a good idea in its day, when drains were deepened by hand-labour, for two men to use to lift water over a dam.

In those days, the area of work had to be kept as dry as possible, because the man had to stand in the bottom of the drain. So a part of the drain would be dammed off with a head dam, and a tail section could be dealt with by this scoop; it was actually very efficient, and could dispose of a surprising amount of water.

At Willingham there are two scoops. The two-men scoop was common in the South Level, where one man on his own would normally use a mud scoop for the purpose. The one-man box scoop comes from the Middle Level.



A Long Rake; the most essential tool in every Fen Pumping Station.



The old Gault Barrow in honourable retirement

Adze

This is a common carpenter's tool throughout the world. In fen drainage, it was used mainly to trim dam boards. When wooden dam boards were used in a drain, they were trimmed down to the thinner edge at the bottom, so that they could be driven into the drain bottom more easily. A "beetle" was used to knock them in, and it was large enough to cover a nine-inch board,

The blade, as can be seen, has an upward curve at the cutting edge. This was kept very keen. Unless extreme caution was used in each stroke the blade, if it happened to hit a knot in the wood, could glance off and bite deeply into the user's leg. Many bad injuries have been received like this.

This adze is believed to have belonged to James Stevens, driver of the Hundred Foot Engine between 1829-1873.

Donkey Hames

These are curved bars to which the traces were attached in the harness. Donkeys were used for towing barges of "clunch" or clay used for the repair of river banks. They had one special advantage in that, when the towpath changed to the other side of the river (as it frequently did), the donkey could be put into a barge and ferried over much more easily than a horse.

Fly Tool

This was a type of wooden scoop, tipped with steel. The wooden part was usually of willow, making it quite light. Its prime use was for working in a clay hole or a trench. Space in these situations being very restricted, it can well be understood that the less one moved about, the less one got "baumed" up with clay.

All that was necessary with this tool was to push it into the clay without using foot pressure at all. The sharpness of the steel edge would go through the clay like a knife through butter.

Willow wood was usually chosen because clay does not stick to it easily, and a swishing movement from the bottom of the hole would send a lump of clay probably as much as ten yards from the hole's edge. Before beginning this job a man would remove all his upper garments except his shirt and then pull on a "slop", which was usually an old shirt worn outside the trousers. Men working in a drain also usually wore "slops"

Sail Maker's Machine

This was used to repair the canvas sails of windmills, Made circa 1870.



Tools on the Engine House Wall

Right to left: eel glave, turf becket, two hodding spades flanking a fish dart, and another glave

OTHER TOOLS, ETC.

These include such diverse items as a thatcher's needle, rake and shears, horse-keeper's balling gun, mouth rasp, bull tamer, tooth extractor, mouth gag and hoof trimmer, gathering hook, flails, digging shoe, swede digger, dibbling iron and asses' shoes, bog oak, rat trap, bottles, pork pot, wash board, flat irons, plate warmer, and acetylene and oil bicycle lamps.

The working equipment preserved in the Station, together with additional artefacts and the other tools and articles described, already forms a substantial basis for a museum collection for the study of Fenland drainage. It is unfortunate that, due to recurrent break-ins and vandalism in recent years, it has now been thought prudent to remove many of the portable exhibits and these are transported to the Station on open days.

I hope many people will enjoy their visit, and this in turn will inspire some financial support or gifts of articles to add to the collection.



The Engine Cut with the Old West River in the Background