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 for such works, he having acquired a considerable knowledge of draining in foreign parts.

In compliance with the prayer of the memorialists, a Commission of Sewers was issued, which sat at Bourn, and also at Market Deeping. After inquiry, they granted to 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*l.*, but owing to the opposition of the fenmen, who broke down his banks and otherwise destroyed his works, the attempt was unsuccessful. A few years later the Commissioners for the drainage of the great Bedford Level, sitting at Wisbech, laid a tax of thirty shillings an acre on Deeping Fen for the purposes of reclamation, which not being paid, the Commissioners of Sewers made certain proposals to King James the First, who directed Sir Clement Edmonds to visit the fens, and report to him as to their condition, and also as to the state of the Welland. The Commissioners found the river so bad that they were forced to carry their boats three or four miles between Spalding and Fosdyke for want of a current to carry them down the channel, the water then being only six inches deep at a distance of two miles below Spalding. The King, having heard Sir Clement's report, in answer to the petition, signified his pleasure by the Lord Bishop of London to let them know that they might proceed to make a decree for the further and more perfect draining of the fen, and thereby to award as well from his Majesty, being lord of the soil, as from the former adventurers and others interested therein such proportion of land as might sufficiently bear the charge of the work; and, because his Majesty intended to see the whole of the Great Bedford Level prosecuted accordingly to his first princely design (it being for the country's good and his own service) in a manner that would most conduce to the public and general advantage of the whole fens, he was further pleased to declare himself the sole adventurer for the drainage of Deeping Fen. The King was unable to carry out his royal intentions, and matters remained in abeyance until the 17th year of Charles the First, when a fresh Commission being appointed they found that the Earl of Exeter was the owner of one-third of the Fens, by contract made with Thomas Lovell, the former adventurer, but that he had not carried out the terms of the original contract, the fens still remaining drowned; and they therefore granted one half of the land to Sir William Ayloff and Sir Anthony Thomas, the great contractors of those days, in consideration of their undertaking the drainage. They, in partnership with other adventurers, at once set about the "exsiccation" of the fen; and for this purpose widened and deepened the Welland from Spalding to the sea, and made it navigable: they also cleaned out and enlarged the drain which had been cut by Lovell, which passed under the Welland by a sunken tunnel near Cowbit. Another drain, called the Staker, 20 feet in width, was cut parallel with the Glen to relieve that river. Another drain, called Hill's drain, was also cut, which discharged into the Welland at Spalding, where was erected a great sluice. The Vernatt's drain, running from Pode Hole past surfleet to the sea, was also made at this time. The banks on both sides of the Welland, made by the former adventurers, were also strengthened and completed. These banks are placed at a great distance apart, in some places as much as a mile, leaving a large area of land, which forms a reservoir for the waters in times of heavy floods, and relieves the pressure on the banks of the river. These spaces or washes grow a coarse grass in summer, but in winter are under water; and if the temperature falls sufficiently low become frozen, and form a splendid skating ground. Cowbit wash has long been celebrated for its skaters, and people have come from all parts of the country to join in the matches that are held there. By the works above numerated 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, and so remained nearly 100 years; for the next attempt appears to have been made in 1729 by Captain Perry, an engineer, who had been engaged on works in the Thames, who erected windmills for working wheels for lifting the water out of Deeping Fen into the Vernatt's drain. These mills do not appear to have been very successful, the fen being reported subsequently to be almost in a lost state. The sluice at the end of the Glen appears to have been erected some few years after this, for an inscription on it bears date 1739, and states that it "was erected and built by order of the honourable adventurers of Deeping Fen, according to the model and direction of Messrs. Smith and Grundy."

[To be continued.]

PAPERS *on the* FENS *of* LINCOLNSHIRE,

by W. H. Wheeler, M. Instit. C.E.;

Being a description of the Rivers Witham and Welland, and their Estuary; and an account of the reclamation and drainage of the Fens adjacent thereto.

[Continued from the *Mercury* of Dec. 27.]

In the year 1794 an Act was obtained (34 Geo. III., c. 102) for improving the outfall of the river Welland, for the better drainage of the fen lands, and for improving the navigation of the river, by means of a new cut to be made from a place called the Reservoir, in the parish of Surfleet, near where the Vernatt's drain and the Glen river discharge into the Welland; to be carried thence through the enclosed and open salt marshes into Wyberton Roads. For the purpose of carrying out the Act, a body was constituted called the Welland Commissioners, and the money was raised by a tax on the lands of 1*s.* 6*d.* per acre; a part of the fen, near the river Glen, being charged only 6*d.* The design was partially carried out, the contemplated new cut extending only as far as Fosdyke bridge. Seven years afterwards, in 1801, an Act was obtained for draining, dividing, allotting, and enclosing Deeping, Langtoft, Baston, Spalding, Pinchbeck, and Cowbit commons, and also for draining Croyland common, otherwise called Goggushland. Under the powers of this Act (41 Geo. III., c. 128) several large arterial drains were either newly cut, or the old ones (made by Lovell and others) altered and enlarged, which brought the whole of the waters off the fen and discharged them into the Vernatt's drain at Podehole. The principal drains constructed at this time were the South Drove drain, 8¾ miles in length; the North Drove drain, 5¾ miles; the Cross drain and the Counter drain 6¾ miles. The total distance of the outfall, at the confluence of the Witham and the Welland, from Podehole, being about 15 miles, or 18 miles from the lowest lands in the fen, and the fall from the surface of the lowest lands at low water-mark being about 15 feet.

Fosdyke Bridge was built in the year 1812 by a private company, an Act having been obtained for the purpose. In 1824 an amended Act (51 Geo. III. cap 71) having been obtained, the Welland Commission was reconstituted, and was made to consist of thirteen trustees, one of whom was to be elected by the Corporation of Stamford, and one by the owners of the old enclosed lands in Spalding & Pinchbeck. The trustees were to be elected every three years, and their special duty was "the maintenance, support, and improvement of the new cut from the Reservoir to Fosdyke, and the drainage and navigation thereby." They were relieved from the liability entailed on them by the former Act from extending the new channel lower down than Fosdyke Bridge, and were authorised to carry out works for the removal of shoals in the Welland from and below the staunch fixed across the river above Spalding, and through the town of Fosdyke, and for training the waters through Fosdyke Marsh. They were also authorised, for navigation purposes, to place draw doors across the mouth of the river Glen at the request of the Deeping Fen Adventurers and the Dykereeves of Gosberton, Surfleet, and Pinchbeck. To assist in paying for these improvements the old tax of sixpence per acre on lands lying near the Glen and one shilling and sixpence on the rest of the low lands was continued, and they were further empowered to demand tonnage on all vessels using the new channel of the Welland, the tolls being fixed at a maximum of 2*d* per ton on coals, 4*d.* per last on oats, 4*d.* for the half last of wheat, and 4*d.* per ton on general goods, and other rates in proportion. This Act was again amended (in 1837) by the 1 Vict, cap 113, which, after reciting that the river had become deteriorated, and the taxes sanctioned by former Acts were not sufficient, gives power to raise them according to a fixed schedule. The principal dues were by this Act 3*d.* per ton on all ships and boats, 3*d.* per quarter on wheat, other corn 1½*d*, coals 6*d.* per ton. The money raised was to be applied to the improvement of the river from Spalding to Clayhole, by training and embanking it. Power was also given to erect quays and wharves, to levy wharfage rates, to employ pilots, and hire and maintain a pilot sloop, and appoint a harbour master.

Spalding is part of the Port of Boston, and up to the year 1842 all vessels navigating the Welland had had paid tonnage and lastage dues to the trustees of that port; but by the Act 5 Vict, cap. iv., in consideration of the Welland Trustees paying to the Boston Harbour Trustees the sum of 5000*l.*, being part of a debt then due to the Exchequer Loan Commissioners on the security of the tolls and dues, and also paying one-third of the annual expenses incurred by the Boston Harbour Commissioners in maintaining the buoys, beacons, and sea marks of the port; and the said trust was to give up all claim to dues on vessels navigating the Welland, and the Welland Trustees were authorised to collect a tonnage rate of sixpence, and lastage rate of one penny on wheat, and one halfpenny on other corn. Under the same Act, and also another passed in the same year, the Boston Harbour Trust and the Welland Trust were empowered severally to execute any works for the improvement of the navigation of their rivers up to the point of confluence; and below that jointly to execute any works for the improvement of the outfall of the said waters into Clayhole.

The taxes and tolls authorised to be levied by these Acts not proving sufficient to maintain these works, in the Session of 1867 another Act was obtained giving powers to the Commissioners to bring into taxation a large area of land, which had hitherto used the river as the outfall for its waters without contributing to the expense of its maintenance. From the preamble of this Act, it appears that out of 85,000 acres of land draining by the Welland, only 24,000 paid taxes, producing 535*l.* per annum; and that the dues from vessels, which in 1846 had exceeded 6000*l.*, had gradually diminished to 998*l* in 1865. At this time there were charges on the trust to the amount of 6000*l.* due on mortgage, and the sum of 1060*l.* in addition had been borrowed of the treasurer on the personal security of the Commissioners, to carry out works of emergency. From this it would appear that the revenues at the disposal of the Commissioners had become most seriously diminished owing to the decline of the navigation, arising no doubt from the alteration in the method of transit for all articles of produce and consumption, and chiefly of corn and coal, by the formation of railways. The only communication the interior of the fens had with other parts of the country, previous to railways, was by means of boats navigating the arterial drains, and the great fen rivers; but the greater certainty and convenience of the railway system has to a great extent superseded the canals; and Spalding, with all towns similarly situated, has suffered accordingly. The land has benefitted to a very considerable degree and increased in value, owing to the railways, and can therefore easily afford a small additional burden for the maintenance of the outfall drainage, on the preservation of which its whole prosperity depends.

Having thus named the various legislative enactments that have been made with respect to this district, there remains now only briefly to notice the engineering operations that have been carried out under the powers of the various Acts, and the present state and prospects of the river. Commencing with this century, the first engineers who were engaged in this district are Messrs. Rennie, Maxwell, Hare, and Jessop, whose reports chiefly relate to the interior drainage of Deeping Fen and the improvement of the Vernatt's Drain. In the year 1812 a report was made by Mr. R. Bevan on the improvement of the navigation and drainage of the river Welland. He describes the river as being greatly improved by the new cut made from the Reservoir to Fosdyke, but that below that point the river had a very winding channel, obstructed by sands and shoals. To remedy this he proposed a new cut should be excavated from Fosdyke Fen through the marshes to the Witham oppposite Hobhole, and that a sluice should be erected at the end of this cut. The expense of this and other improvements was estimated at 150,000*l.*

In 1815 Mr. Thomas Pear made a report to the effect that the drainage was in a very unsatisfactory condition, the water often standing six feet on the cill 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 drained by means of fifty wind engines. This outlet was overridden by the waters of the Welland and the Glen. The cause of this was the defective state of the outfall below Fosdyke bridge; neap tides, which rose 15 feet at the junction of the rivers, never reaching Spalding, a distance of 15 miles. He proposed as a remedy a new cut two miles in length, commencing at a point near the Holbeach and Whaplode sluice, and about two miles below Fosdyke inn, to be made through the embanked lands and open salt marshes, and ending with an outfall near Holbeach middle sluice: the channel to be fifty feet wide and five feet above the low-water mark in the south channel, with a rise of one foot per mile. He also proposes the erection of a lock or new sluice a little above the Reservoir, for the purpose of keeping up a navigable head of water in dry seasons, and 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 land water; and a similar pen sluice for the river Glen: the estimated cost of the improvements he put at 50,000*l.*

In the year 1818 Mr. John Rennie made a 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 10 feet each, giving a water way of 30 feet. The Vernatt's sluice, the outlet of the drain, had two openings with the same width of water way. This sluice, some years later, was blown up, the water having forced its way under the foundations, and was replaced in 1857 with a new structure built from the designs of the late Mr. Lewin, the foundation-stone being laid by Sir John Trollope. 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 enclosed lands for half a mile, across the sea bank, and along the open marshes to the Witham at Hob-hole, with a sluice at the end. The length of this channel would be 8¼ miles, the total distance from the Cross Drove drain in Deeping Fen to the outfall being 23¾ miles and ordinary low water mark, which at that time stood at three feet three inches on Hob-hole bill, which was 17 feet below the surface of the land in the fen, thus allowing the water to stand two feet under the surface of the land, giving a fall throughout the whole length of the new channel of six inches 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*l.* In recommending this plan, Mr. Rennie was no doubt influenced by the principle which he always so strongly advocated, of concentrating all the waters possible into one tidal outfall; and, regarded as a matter of principle, and as part of a whole scheme, which the Witham was the outfall, there is no doubt he was correct; but for the plan to have been successful it would have been necessary that the outfall of this river should have been dealt with in a very different manner from that which subsequent experience has shown to be the case. Mr. Rennie based his calculations on the fact that low water mark at Hob-hole would be maintained at the same level as he then found it; but the utter neglect of this part of the river Witham, combined with improvements in the upper reaches, has resulted in a gradual raising of the low water mark of from three to four feet; low water at Hob hole cill now constantly standing at six and seven feet.

Mr. Rennie's plan not being adopted, a report was obtained from Mr. Thos. Pear, who recommended the application of steam power for the drainage of this fen, which at this time was very imperfectly accomplished by wind engines, being sometimes wholly under water. This recommendation was endorsed by Mr. Bevan, who in a report, dated March 1st, 1823, advises the erection of two engines at Pode-hole, and the deepening of the drains. Being thus advised, the Deeping Fen Commissioners obtained the necessary powers, and in the year 1824 the engines were erected. These are two condensing beam engines of 80 and 60 horse power, working two wheels, the larger of which is 28 feet wide, with five feet float boards. The average immersion is about two feet ten inches, and the head of water against which the engines have to work being sometimes as much as six feet [6·0 ft.] The wheels had to be lowered after their erection, owing to the subsidence of the land; the improved cultivation and working of which had the effect of depressing the surface of the fen

...uring the winter season. The turnpike road from Boston

...that the Welland is celebrated for its fish, for that "once in seven or eight years immense shoals of stickiebacks appear in the Welland below Spalding, and attempts coming up the river in a vast column. They are supposed to be the collected multitudes washed out of the fens by the floods of several years, and carried into some deep hole. When overcharged with numbers they are obliged to attempt a change of place: they move up the river in such quantities as to enable a man, who was employed in taking them to earn for a considerable time 4s per day by selling them at a halfpenny per bushel. They were used to manure land, and attempts have been made to get oil from them."

The Welland bears conspicuous mention in the annals of the ecclesiastical history of this country, Crowland Abbey, one of the earliest religious establishments founded in this country, being situated on its banks. Monks became possessed of a great portion of the adjacent fens and marshes, which they endeavoured to reclaim by embanking and draining. The appearance of the country at the beginning of the 8th century is thus described:—"There is in the middle part of Britain a hideous fen of a huge bigness, which, beginning at the banks of the river Graute, extends itself from the south to the north in a very long tract, even to the sea: ofttimes 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 therewith they were affrighted: whereupon S. Gutnlac earnestly entreated 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 Crowland, and situate in the midst of the lake, but in respect of its desertness formerly known to very few, for no countryman, before that devout servant of Christ, S. Guthlac, could endure to dwell in it by reason that such apparitions of devils were so frequently seen there."

Not long after, St. Guthlac being awoke in the night time, betwixt his hours of prayer, as he was accustomed, of a sudden he discerned his cell to be full of black troops of unclean spirits, which crept in under the door, as also at chinks and holes, and coming in both out of the sky and from the earth, filled the air as it were with dark clouds. In their looks they were cruel, and of form terrible, having great heads, long necks, lean faces, pale countenances, ill-favoured beards, rough ears, wrinkled foreheads, fierce eyes, stinking mouths, teeth like horses, spitting fire out of their throats, crooked jaws, broad lips, loud voices, burnt hair, great cheeks, high breasts, rugged thighs, bunched knees, bended legs, swollen ancles, preposterous feet open mouths and hoarse cries; who with such mighty shrieks were heard to roar that they filled almost the whole distance from heaven with their bellowing noises; and by and by rushing into the house, first bound the holy man; then drew him out of his cell, and cast him over head & ears into the dirty fen; and having so done carried him through the most rough and troublesome parts thereof, drawing him amongst bramoles and briers for the tearing of his limbs."—(*Ingulph*)

The reputation for piety acquired by St. Guthlac soon made Crowland famous, and after his death Ethelbald, King of Mercia, whose confessor he had been, determined to erect a monastery to his memory, and endowed it with the whole isle of Crowland, together with the adjacent fens lying on both sides of the river Welland. The ground on which the monastery was built being so moist & fenny as not of itself to bear a building of stone, a great number of piles were driven deep into the ground, and a quantity of firm hard earth, brought from a distance of nine miles, was thrown amongst them, and upon this foundation the building was erected. The bounty of the King was thus celebrated in poetry by an ancient monk:—

"The Royal bounty here itself displays,
And bids with mighty pains a temple raise.
The soft, the slippery, the unsettled soil
Had long disdained the busy workman's toil.
No stone foundations suit this marshy land,
But piles of oak in goodly order stand;
And boats for nine long leagues, fetch filling land:
The fickle soil cements to solid ground.
The sacred pile on the firm base they found,
And art and labour grace the work around.

It will be unnecessary further to pursue the History of the Abbey of Crowland: suffice it to say, though the Monks "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." The fens, however, served other purposes than that of profit, for in the many incursions of the Danes, they became the chiefest refuge of the Monks, their lives being secured by means of these spacious fens, in the reeds and thickets whereof they hid themselves to avoid the cruelties of those barbarous people, whilst the rest of their convent was murdered and their abbey burnt. The Monks had other enemies besides the Danes, continual efforts being made by the adjoining proprietors to wrest from them the lands given by the King, and again and again in successive reigns the Abbot had to appear before the King to get the charters confirmed. Thus Dugdale tells us "notwithstanding that the lands and possessions of this abbey were, through the great bounty of several Kings and others, given thereto with divers ample privileges and immunities, and not only so, but with fearful curses pronounced by those pious persons against such as should violate any of their grants; nevertheless it appears that the inhabitants of Holand (bordering on the north side of Crowland), having drained their own marshes and converted them to good and fertile arable land, whereof each town had its proper proportion, wanting pasturage for their cattle took advantage of a false rumour of the King's (Henry II) death, and, bearing themselves not a little on their strength and wealth, thought that they might oppress the poor monks at Crowland without control." Accordingly they came down in a large body, pastured their cattle on the marshes of the abbot, cut and carried away his hay, and committed other depredations. He appealed to the King's justices, and for five years the contention was carried on, but at length the abbot prevailed and recovered possession of the marshes. In the reign of Henry III. the Abbot of Crowland being called upon by the King to make a road from his abbey towards Spalding, as far as a place called Brotherhouse, he pleaded that it would be a very difficult and expensive work, "because it was a fenny soil, and by reason of the lowness of the ground, in a moorish earth, it would be a difficult matter to make a causey fit and durable for passengers; because it could not be made otherwise than upon the brink of the river Welland, where there was so much water in winter time that it covered the ground an ell and a half in depth, and in a tempestuous wind two ells, at which time the ground on the side of that river was often broken by bargemen and mariners and by the force of the wind so torn away; so that in case a causey should be made there, it would in a short time be consumed and wasted away by the power of those winds, except it were raised very high and broad, and defended by some means against such dangers." The plea of the Abbot was admitted, but the men of Kesteven and Holland again urging on the King the necessity there was for a road, the Abbot at last undertook the construction, on condition that he might levy for seven years tolls sufficient to reimburse the cost and afterwards to maintain the road in good order.

In the same reign the town of Spalding was presented by the jurors before the justices, because they had neglected to scour out and repair the river Welland, where it passed through their jurisdiction, by reason of which neglect great damage had accrued to the King's liege people. The inhabitants of Spalding, being summoned by the Shirereeve to answer the charge, pleaded that the river then was and long had been an arm of the sea, wherein the tides did ebb and flow twice in 24 hours, and therefore that there was no obligation on them to repair it.

The river Welland was much injured by the loss of the back scour of the tidal waters, which at one time used to flow up and fill Bicker Haven. There is little known concerning the history of this arm of the sea, but that it occupied a considerable area may be gathered from the traces of its banks, which may be seen at the present time as far up as Bicker and near the turnpike-road, by which they are crossed between Sutterton and Gosberton. In the time of William the Conqueror it was still a receptacle for the tides, for the Abbot of Peterboro' is said to have had 16 salt pans at Donington, but the silting up must have taken place between this and Edward the Third's time, for in this reign the great dispute occurred between the Abbots of Swineshead and Peterborough as to whom the accreted land should belong, the area of Marsh more particularly involved in the law suit being 340 acres; the decision being given in favour of the ancient custom, "That all and singular Lords possessing any manors or lands upon the sea coast had usually silt and sand cast up to their lands by the tides." The Haven was also an outlet for a great quantity of fen and upland waters. By the old Skerth-drain it was connected with Kyme Eau, and by the Gilsyke with the lands bordering on the Upper Witham, and thus a great quantity of the land in the direction of Sleaford and Langrick would have the outlet for its waters by Bicker Haven.

In the same reign also a commission was appointed to inspect the river Glen, which runs through Deeping Fen, and they decreed that it was not sufficiently wide "to admit of the proper discharge of the waters which it brought down from the higher part of the country, so that the fens on either side were drowned, and that it ought to be widened from Gutheram's Cote to the sea, so that at Surfleet it should be 20 feet wide;" and that the work ought to be done by the persons who owned the land abutting on the river. The same commission also presented that the great bridge, called Spalding Brigge, was then broken, and ought to be repaired at the charges of the whole town; and also that the Marsh banks, being then broken in divers places, should be repaired. The commission further ordained that all persons, as well rich as poor, should be liable to all mene works, as well for the repairs of the sewers as the banks; and that every man, having a messuage and 10 acres of land, should find one tumbril or cart, and those who had less, one able man of not less than 18 years of age; or instead of the cart and horse a money payment of fourpence, and instead of the man, of twopence per day. Numerous presentments of a similar kind were made from time to time against the Abbot of Crowland and others for not repairing the banks or properly scouring out the drains, and orders made thereupon. These banks and drains had originally been made by the Abbots of Crowland in their endeavours to reclaim the fens. Thus Abbot Egelvic so improved a portion of the marshes as to be able to plough and sow them with corn. Ingulphus' account is that "in dry years he tilled the fens in four places, and for three or four years had the increase of an hundred fold of what seed soever he sowed." The monastery being so enriched by these plentiful crops that the whole country thereabouts was supplied therewith, and a multitude of poor people resorting thither for that respect made Crowland a large town. This state of prosperity did not continue, for in William the Conqueror's time they had no such tenants residing at Crowland, the only occupants of the adjacent fens being those of the tenants and their families, to whom the Abbot had let a great portion of the marshes and meadows, "no man delighting to inhabit here any longer than he was necessitated so to do; insomuch as those who in time of war betook themselves hither for security (as great numbers of rich and poor from the neighbouring countries did) afterwards returned back to their particular houses, for without boats there was not then any access thereto, there being no path except up to the gate of the monastery." Abbot Egelvic was an enterprising man; in addition to his banks and drains, and the ploughing up of the marshes, he also constructed a road from Deeping to Spalding, the foundation of which was made of woad covered with gravel, a most costly work, but of extraordinary necessity.

In William the Conquerer's reign, one Richard De Rulos, Chamberlain to the King, being much given to good husbandry, such as tillage and the breeding of cattle, took in a great part of the common of Deeping Fen, and converted it into meadows and pasture. He also prevented the Welland from flooding his lands by a great bank, and on it he erected divers tenements and cottages, and made there a large town, whereunto he assigned gardens and arable fields, which town was called Deeping, the name originating from the constant floodings of these lands from the Welland, the meaning of the word being a deep meadow. By similar means he also made a village dedicated to St. James, now called St James Deeping, and so by banking and draining he converted those low grounds, which before were only deep lakes and impassable fens, into fruitful fields and pastures, and the humid and moorish soil became a garden of pleasure.

Deeping Fen formed part of the great forest of Holland and Kesteven, the fen lands of which had been afforested by William Rufus, the bounds being afterwards extended by Henry the First as far as Market Deeping, and so it continued until the reign of Henry III, who disafforested all this fen "so that the lands, marshes, and turbaries were thenceforth quit of waste and regard."

The following particulars relating to Deeping Fen in the reign of Richard II. are given in Dugdale's history. The marsh called Deeping Fen did extend itself from East Deeping to the middle of the bridge of Crowland, and the middle of the river of Welland, and thence to the messuage of Wm Atte Townsend, of Spalding, and thence to a certain place called Dowe Hirne, thence to Goderham's Kote, thence to Estcote, and thence to Baston barre, thence to Langtoft outgouge, and thence to East Deeping in length and breadth, and that the agistments of all cattle in the said marsh did then belong to the lord, and were worth annually XX*l.*; and moreover that there was a certain profit of turfs, yearly digged therein, worth XX*l.*; and likewise a profit of poundage, to be yearly twice taken of all cattle within the said marsh, viz., one time of horses and afterwards of cattle; whereupon all cattle which have right of common there are delivered with payment of Greshyre, but of other cattle the lord hath Greshyre, which was worth XX*l.* per annum. "Also that there was within the said marsh a certain profit of fishing, newly taken by reason of the overflowing of the waters on the north part toward Spalding, which was yearly worth VIII*l.*, and that the other profits of fishing and fowling throughout the whole fen was worth C*s.*, and lastly that the fishing to the midst of the river of Welland to Crowland and thence to Spalding was yearly worth L*s.*"

In this same (Richard II) reign 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 divison. 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, and command given for erecting new crosses of stone at the charge of these men of Kesteven. In several succeeding reigns Commissions were issued by the Crown to view the banks, ditches, and water courses, and also the floodgates and sluices, and to see that all necessary repairs were executed for maintaining the same in proper order.

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 (Crowland) lies 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. 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 30 feet, 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 3000 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."

In Queen Elizabeth's reign 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 Crowland, 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 water courses, 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 for such works, he having acquired a considerable knowledge of draining in foreign parts.

In compliance with the prayer of the memorialists, a Commission of Sewers was issued, which sat at Bourn, and also at Market Deeping. After inquiry, they granted to 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*l.*, but owing to the opposition of the fenmen, who broke down his banks and otherwise destroyed his works, the attempt was unsuccessful. A few years later the Commissioners for the drainage of the great Bedford Level, sitting at Wisbech, laid a tax of thirty shillings an acre on Deeping Fen for the purposes of reclamation, which not being paid, the Commissioners of Sewers made certain proposals to King James the First, who directed Sir Clement Edmonds to visit the fens, and report to him as to their condition, and also as to the state of the Welland. The Commissioners found the river so bad that they were forced to carry their boats three or four miles between Spalding and Fosdyke for want of a current to carry them down the channel, the water then being only six inches deep at a distance of two miles below Spalding. The King, having heard Sir Clement's report, in answer to the petition, signified his pleasure by the Lord Bishop of London to let them know that they might proceed to make a decree for the further and more perfect draining of the fen, and thereby to award as well from his Majesty, being lord of the soil, as from the former adventurers and others interested therein such proportion of land as might sufficiently bear the charge of the work; and, because his Majesty intended to see the whole of the Great Bedford Level prosecuted accordingly to his first princely design (it being for the country's good and his own service) in a manner that would most conduce to the public and general advantage of the whole fens, he was further pleased to declare himself the sole adventurer for the drainage of Deeping Fen. The King was unable to carry out his royal intentions, and matters remained in abeyance until the 17th year of Charles the First, when a fresh Commission being appointed they found that the Earl of Exeter was the owner of one-third of the Fens, by contract made with Thomas Lovell, the former adventurer, but that he had not carried out the terms of the original contract, the fens still remaining drowned; and they therefore granted one half of the land to Sir William Ayloff and Sir Anthony Thomas, the great contractors of those days, in consideration of their undertaking the drainage. They, in partnership with other adventurers, at once set about the "exsiccation" of the fen; and for this purpose widened and deepened the Welland from Spalding to the sea, and made it navigable: they also cleaned out and enlarged the drain which had been cut by Lovell, which passed under the Welland by a sunken tunnel near Cowbit. Another drain, called the Staker, 20 feet in width, was cut parallel with the Glen to relieve that river. Another drain, called Hill's drain, was also cut, which discharged into the Welland at Spalding, where was erected a great sluice. The Vernatt's drain, running from Pode Hole past surfleet to the sea, was also made at this time. The banks on both sides of the Welland, made by the former adventurers, were also strengthened and completed. These banks are placed at a great distance apart, in some places as much as a mile, leaving a large area of land, which forms a reservoir for the waters in times of heavy floods, and relieves the pressure on the banks of the river. These spaces or washes grow a coarse grass in summer, but in winter are under water; and if the temperature falls sufficiently low become frozen, and form a splendid skating ground. Cowbit wash has long been celebrated for its skaters, and people have come from all parts of the country to join in the matches that are held there. By the works above numerated 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, and so remained nearly 100 years; for the next attempt appears to have been made in 1729 by Captain Perry, an engineer, who had been engaged on works in the Thames, who erected windmills for working wheels for lifting the water out of Deeping Fen into the Vernatt's drain. These mills do not appear to have been very successful, the fen being reported subsequently to be almost in a lost state. The sluice at the end of the Glen appears to have been erected some few years after this, for an inscription on it bears date 1739, and states that it "was erected and built by order of the honourable adventurers of Deeping Fen, according to the model and direction of Messrs. Smith and Grundy."

[To be continued.]

PAPERS *on the* FENS *of* LINCOLNSHIRE,

by W. H. Wheeler, M. Instit. C.E.;

Being a description of the Rivers Witham and Welland, and their Estuary; and an account of the reclamation and drainage of the Fens adjacent thereto.

[Continued from the *Mercury* of Dec. 27.]

1794 In the year 1794 an Act was obtained (34 Geo. III., c. 102) for improving the outfall of the river Welland, for the better drainage of the fen lands, and for improving the navigation of the river, by means of a new cut to be made from a place called the Reservoir, in the parish of Surfleet, near where the Vernatt's drain and the Glen river discharge into the Welland; to be carried thence through the enclosed and open salt marshes into Wyberton Roads. For the purpose of carrying out the Act, a body was constituted called the Welland Commissioners, and the money was raised by a tax on the lands of 1*s.* 6*d.* per acre; a part of the fen, near the river Glen, being charged only 6*d.* The design was partially carried out, the contemplated new cut extending only as far as Fosdyke bridge. Seven years afterwards, in 1801, an Act was obtained for draining, dividing, allotting, and enclosing Deeping, Langtoft, Baston, Spalding, Pinchbeck, and Cowbit commons, and also for draining Croyland common, otherwise called Goggushland. Under the powers of this Act (41 Geo. III., c. 128) several large arterial drains were either newly cut, or the old ones (made by Lovell and others) altered and enlarged, which brought the whole of the waters off the fen and discharged them into the Vernatt's drain at Podehole. The principal drains constructed at this time were the South Drove drain, 8¾ miles in length; the North Drove drain, 5¾ miles; the Cross drain and the Counter drain 6¾ miles. The total distance of the outfall, at the confluence of the Witham and the Welland, from Podehole, being about 15 miles, or 18 miles from the lowest lands in the fen, and the fall from the surface of the lowest lands at low water-mark being about 15 feet.

1824 Fosdyke Bridge was built in the year 1812 by a private company, an Act having been obtained for the purpose. In 1824 an amended Act (51 Geo. III. cap 71) having been obtained, the Welland Commission was reconstituted, and was made to consist of thirteen trustees, one of whom was to be elected by the Corporation of Stamford, and one by the owners of the old enclosed lands in Spalding & Pinchbeck. The trustees were to be elected every three years, and their special duty was "the maintenance, support, and improvement of the new cut from the Reservoir to Fosdyke, and the drainage and navigation thereby." They were relieved from the liability entailed on them by the former Act from extending the new channel lower down than Fosdyke Bridge, and were authorised to carry out works for the removal of shoals in the Welland from and below the staunch fixed across the river above Spalding, and through the town of Fosdyke, and for training the waters through Fosdyke Marsh. They were also authorised, for navigation purposes, to place draw doors across the mouth of the river Glen at the request of the Deeping Fen Adventurers and the Dykereeves of Gosberton, Surfleet, and Pinchbeck. To assist in paying for these improvements the old tax of sixpence per acre on lands lying near the Glen and one shilling and sixpence on the rest of the low lands was continued, and they were further empowered to demand tonnage on all vessels using the new channel of the Welland, the tolls being fixed at a maximum of 2*d* per ton on coals, 4*d.* per last on oats, 4*d.* for the half last of wheat, and 4*d.* per ton on general goods, and other rates in proportion. This Act was again amended (in 1837) by the 1 Vict., cap 113, which, after reciting that the river had become deteriorated, and the taxes sanctioned by former Acts were not sufficient, gives power to raise them according to a fixed schedule. The principal dues were by this Act 3*d.* per ton on all ships and boats, 3*d.* per quarter on wheat, other corn 1½*d*, coals 6*d.* per ton. The money raised was to be applied to the improvement of the river from Spalding to Clayhole, by training and embanking it. Power was also given to erect quays and wharves, to levy wharfage rates, to employ pilots, and hire and maintain a pilot sloop, and appoint a harbour master.

1837 Spalding is part of the Port of Boston, and up to the year 1842 all vessels navigating the Welland had had paid tonnage and lastage dues to the trustees of that port; but by the Act 5 Vict., cap. iv., in consideration of the Welland Trustees paying to the Boston Harbour Trustees the sum of 5000*l.*, being part of a debt then due to the Exchequer Loan Commissioners on the security of the tolls and dues, and also paying one-third of the annual expenses incurred by the Boston Harbour Commissioners in maintaining the buoys, beacons, and sea marks of the port; and the said trust was to give up all claim to dues on vessels navigating the Welland, and the Welland Trustees were authorised to collect a tonnage rate of sixpence, and lastage rate of one penny on wheat, and one halfpenny on other corn. Under the same Act, and also another passed in the same year, the Boston Harbour Trust and the Welland Trust were empowered severally to execute any works for the improvement of the navigation of their rivers up to the point of confluence; and below that jointly to execute any works for the improvement of the outfall of the said waters into Clayhole.

1842. The taxes and tolls authorised to be levied by these Acts not proving sufficient to maintain these works, in the Session of 1867 another Act was obtained giving powers to the Commissioners to bring into taxation a large area of land, which had hitherto used the river as the outfall for its waters without contributing to the expense of its maintenance. From the preamble of this Act, it appears that out of 85,000 acres of land draining by the Welland, only 24,000 paid taxes, producing 535*l.* per annum; and that the dues from vessels, which in 1846 had exceeded 6000*l.*, had gradually diminished to 998*l* in 1865. At this time there were charges on the trust to the amount of 6000*l.* due on mortgage, and the sum of 1000*l.* in addition had been borrowed of the treasurer on the personal security of the Commissioners, to carry out works of emergency. From this it would appear that the revenues at the disposal of the Commissioners had become most seriously diminished owing to the decline of the navigation, arising no doubt from the alteration in the method of transit for all articles of produce and consumption, and chiefly of corn and coal, by the formation of railways. The only communication the interior of the fens had with other parts of the country, previous to railways, was by means of boats navigating the arterial drains, and the great fen rivers; but the greater certainty and convenience of the railway system has to a great extent superseded the canals; and Spalding, with all towns similarly situated, has suffered accordingly. The land has benefitted to a very considerable degree and increased in value, owing to the railways, and can therefore easily afford a small additional burden for the maintenance of the outfall drainage, on the preservation of which its whole prosperity depends.

Having thus named the various legislative enactments that have been made with respect to this district, there remains now only briefly to notice the engineering operations that have been carried out under the powers of the various Acts, and the present state and prospects of the river. Commencing with this century, the first engineers who were engaged in this district are Messrs. Rennie, Maxwell, Hare, and Jessop, whose reports chiefly relate to the interior drainage of Deeping Fen and the improvement of the Vernatt's Drain. In the year 1812 a report was made by Mr. R. Bevan on the improvement of the navigation and drainage of the river Welland. He describes the river as being greatly improved by the new cut made from the Reservoir to Fosdyke, but that below that point the river had a very winding channel, obstructed by sands and shoals. To remedy this he proposed a new cut should be excavated from Fosdyke Fen through the marshes to the Witham oppposite Hobhole, and that a sluice should be erected at the end of this cut. The expense of this and other improvements was estimated at 150,000*l.*

In 1815 Mr Thomas Pear made a report to the effect that the drainage was in a very unsatisfactory condition, the water often standing six feet on the cill 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 drained by means of fifty wind engines. This outlet was overridden by the waters of the Welland and the Glen. The cause of this was the defective state of the outfall below Fosdyke bridge; neap tides, which rose 15 feet at the junction of the rivers, never reaching Spalding, a distance of 15 miles. He proposed as a remedy a new cut two miles in length, commencing at a point near the Holbeach and Whaplode sluice, and about two miles below Fosdyke inn, to be made through the embanked lands and open salt marshes, and ending with an outfall near Holbeach middle sluice: the channel to be fifty feet wide and five feet above the low-water mark in the south channel, with a rise of one foot per mile. He also proposes the erection of a lock or new sluice a little above the Reservoir, for the purpose of keeping up a navigable head of water in dry seasons, and 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 land water; and a similar pen sluice for the river Glen: the estimated cost of the improvements he put at 50,000*l.*

In the year 1818 Mr. John Rennie made a 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 10 feet each, giving a water way of 30 feet. The Vernatt's sluice, the outlet of the drain, had two openings with the same width of water way. This sluice, some years later, was blown up, the water having forced its way under the foundations, and was replaced in 1857 with a new structure built from the designs of the late Mr. Lewin, the foundation-stone being laid by Sir John Trollope. Mr. Rennie approved the scheme already proposed for making a new cut from Fosdyke to the

1857 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 enclosed lands for half a mile, across the sea bank, and along the open marshes to the Witham at Hob-hole, with a sluice at the end. The length of this channel would be 8½ miles, the total distance from the Cross Drove drain in Deeping Fen to the outfall being 23¾ miles and ordinary low water mark, which at that time stood at three feet three inches on Hob-hole bill, which was 17 feet below the surface of the land in the fen, thus allowing the water to stand two feet under the surface of the land, giving a fall throughout the whole length of the new channel of six inches 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*l.* In recommending this plan, Mr. Rennie was no doubt influenced by the principle which he always so strongly advocated, of concentrating all the waters possible into one tidal outfall; and, regarded as a matter of principle, and as part of a whole scheme, which the Witham was the outfall, there is no doubt he was correct; but for the plan to have been successful it would have been necessary that the outfall of this river should have been dealt with in a very different manner from that which subsequent experience has shown to be the case. Mr. Rennie based his calculations on the fact that low water mark at Hob-hole would be maintained at the same level as he then found it; but the utter neglect of this part of the river Witham, combined with improvements in the upper reaches, has resulted in a gradual raising of the low water mark of from three to four feet; low water at Hob hole cill now constantly standing at six and seven feet.

Mr. Rennie's plan not being adopted, a report was obtained from Mr. Thos. Pear, who recommended the application of steam power for the drainage of this fen, which at this time was very imperfectly accomplished by wind engines, being sometimes wholly under water. This recommendation was endorsed by Mr. Bevan, who in a report, dated March 1st, 1823, advises the erection of two engines at Pode-hole, and the deepening of the drains. Being thus advised, the Deeping Fen Commissioners obtained the necessary powers, and in the year 1824 the engines were erected. These are two condensing beam engines of 80 and 60 horse power, working two wheels, the larger of which is 28 feet wide, with five feet float boards. The average immersion is about two feet ten inches, and the head of water against which the engines have to work being sometimes as much as six feet [6·0 ft.] The wheels had to be lowered after their erection, owing to the subsidence of the land; the improved cultivation and working of which had the effect of depressing the surface of the fen

as much as two feet. The large wheel revolves at the rate of four miles an hour, and the two wheels, when at full work, can discharge 300 tons of water per minute. The total quantity of land drained by the engines is 25,000 acres, and the number of days the engines run varies from 50 to 100, according to the season. The working of these engines at first was not so satisfactory as was anticipated, and Mr. W. S. Mylne, C.E., a very eminent authority on the subject, was called in to report on them. In his report, dated July 16th, 1830, he condemns the erection of two engines in one place, the drains not being able to supply them without lowering the level of the water near the engines too low for advantage to the land. He further advised the lowering of the wheels and the deepening and improving of the interior drains. Whatever the first effect may have been there is no doubt that the ultimate effect has been the reclamation of this fen which, before their erection, had been in a half cultivated condition, and subsequently has grown excellent crops of wheat and other produce, and the value of the land nearly doubled.

No steps having been taken to carry out the recommendations for the improvement of the outfall, it gradually became worse and worse, till in the year 1835 it was reported that at low water, in dry seasons, there were only a few inches of water at Fosdyke. Vessels drawing three feet of water could not float except at the top of spring tides, and vessels drawing six feet could not depend on floating at springs, and no vessel. except barges, could reach Spalding at all. In fact, the state of the river had become so bad that the Commissioners were compelled to take active measures, or see the whole drainage of the district ruined. Mr. Jas. Walker, C.E., was therefore consulted, and in an able and detailed report, bearing date November 7. 1835, he sets out the work he considers desirable for the improvement of the outfall. These consisted in training the river by fascine work, in the first instance, as far as Holbeach middle sluice, a distance of 274 miles, and ultimately to Clayhole. The area of the uninclosed space, or estuary, below Fosdyke bridge he found to be 5000 acres, 4000 of which were available for reclamation. The estimated cost of the fascine training for the 274 miles was 13,000*l.*, and the advantage to be gained a very considerable lowering of the bed of the river, and the more rapid discharge of the water. Mr. Walker's report having been adopted, powers were obtained, as already mentioned, to increase the tolls, and the money having been borrowed of the Exchequer Loan Commissioners, the work was commenced by Mr. Beasley. From a subsequent report of Mr. Walker's. it appears that in October, 1838, the new channel had been successfully formed with fascine work for one and a half mile below Fosdyke bridge, the cost of this portion being 7026*l* The good result was immediate and most satisfactory. for vessels drawing eight feet of water could get along the new channel to Fosdyke with greater certainty than those of three feet could before. The water consequently being lowered nine feet. Mr. Walker concludes this report by saying that his original design extended to carrying the channel four miles below the bridge, but that this ought not to be the limit of the work, and adds, "where nature is at hand to do so much, the direction should be extended quite to the Witham."

The fascine work was extended about another mile after this with still further advantage, for in 1845 it is reported that the effect of the fascine work had been to lower the river about seven feet from Fosdyke Bridge downwards. The recommendation of Mr. Walker for its continuance has not been attended to; but on the contrary, owing to a scarcity of money, arising from causes already alluded to, the work which was then perfected was neglected, in consequence of which the tides gradually worked behind the fascine work, and the whole was in danger of being swept away. But after a considerable loss had been incurred, the Commissioners, having raised sufficient money on their own personal liability, the work has during the last spring been again put in a state of efficiency. The funds placed at their disposal by the additional lands brought into taxation by the Act of this Session will enable the Commissioners to maintain the present works; but it must be a matter of regret that a more comprehensive scheme for extending the training to the junction of the Witham was not brought forward It has been stated by no less authority than the late Mr. Pear, who was most intimately acquainted with the district, that in his opinion "there is no part of these fens but what is susceptible of the most complete natural drainage without the aid of engines or other appliances;" and if this be the case there is no doubt that a natural drainage is far preferable to an artificial one. A comprehensive scheme, which would embrace the training, by facine work, of the two rivers Witham and Welland to one common outfall, while rendering available the reclamation of several thousand acres of now pernicious saads, would at the same time improve most materially the navigation and the drainage. and add to the prosperity of the country; and even if it be found that, owing to the subsidence of the soil, Mr. Pear's theory is no longer correct, yet the head of water could be so lowered as to render unnecessary the use of the engines except in extreme floods, affecting a large annual saving in coals and working expenses. It is no new experiment: the plan has been tried, and found to be successful at a moderate cost. Wherever draining has been carried out, an immediate and palpable benefit has ensued; and no money which has been laid out on drainage has ever brought a better return than that which was expended on the main outfalls. Unless these are preserved all interior drainage must prove defective.

[To be continued.]

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[Continued from the *Mercury* of Jan. 10.]

CHAPTER VI.

Boston Harbour and Haven.

The port and harbour of Boston consist of all that portion of the river Witham and its estuary from the town to the sea over which the Corporation holds control under the charter granted them by Queen Elizabeth. By this charter they are enabled to exercise Admiralty jurisdiction "within the borough and port and also the roads and the deeps, commonly called the Norman Deeps, and over all streams and washes extending to Wainfleet Haven and to a place called Pullye Heads, and to another place called Dog's Head in the Pot, and to the uttermost limits of the flowing and ebbing of the waters aforesaid and every of them, and adjoining to the sea and floods and streams of the borders and confines of the county of Norfolk;" and also to take tolls and dues of all vessels entering the port, the proceeds of which were to be applied towards keeping the channel properly buoyed out.

The positions of the buoys and beacons as first placed under this charter were as follows.—The first, nearest to Boston, at Westward Hurn; the second at South Beacon; the third at Scalp Hurn; the fourth between Scalp Hurn and Elbow Beacon; the fifth, the Elbow Beacon, at Stone Hawe; the sixth, South Clay Beacon; the seventh the North Clay; the eighth, midway between the North and High Hurn; the ninth at High Hurn; the tenth on the Main between Boston and Benington; the eleventh and last, on the Long Sand. These beacons were fixed, for the first time in the year 1580, and a survey of them was made in the month of August by the Mayor, Aldermen, and sundry master mariners—a practice which has been continued annually up to the present time.

In the year 1795 an Act was obtained for the management of the pilotage, and the regulation of the rates; the conduct of the same being committed to a trust consisting of the Corporation and certain qualified master mariners and merchants of the town. The dues which the Corporation was entitled to receive under their old charter proved insufficient to maintain the port in a proper state of repair, and in consequence the quays went to decay and the river became much neglected; their powers also being ill-defined, encroachments were made on the river, to the detriment both of the drainage and navigation. To remedy this state of things the Corporation obtained an Act of Parliament in the year 1812. This Act repealed the old tolls, and in their place granted certain wharfage dues (according to a schedule) on all goods landed or shipped from any wharf or quay between the Grand Sluice and Maud Foster, the tonnage dues being fixed at sixpence for British and ninepence for foreign vessels. A lastage duty of one penny per quarter on wheat and one half-penny on other grain was also imposed on all corn whatsoever put on board or landed out of any ship within the limits of the port On the security of these dues the Corporation were authorised to raise a sum of 20,000*l.* to build new quays and wharfs, and to improve the river by widening and deepening and contracting the same. The new wall built along the eastern side of the river, from the south end of the Pack House quay to the bridge, and thence to the Fish market and the large warehouse on Packhouse quay, called the "London warehouse," were part of the improvements effected. About this time, also, a considerable improvement was made by straightening the upper part of the river by a new channel cut from the Grand Sluice to the iron bridge, the cost of the same being 3550*l.*, the work being contracted for by Messrs. Williamson & Woodward.

Notwithstanding the works carried out under this Act the navigation continued to be very much impeded by the state of the river below Maud Foster sluice. Several efforts had been made to induce the Drainage Commissioners to join with the Corporation in straightening and improving this portion of the river. Mr. Rennie had advised them to contribute liberally towards the cost of the work, and reported that a considerable saving could be effected in the drainage of the east and west fens by bringing the whole of the waters to Maud Foster instead of making a new cut where the Hobhole drain now is, but that to enable this to be done the river must first be improved.

The Harbour Commissioners were prepared to contribute one-half the cost of the work; and at a meeting held at Boston Dec. 9th, 1800, at which were present several merchants, shipowners, and traders, it was "resolved that to promote the improvement of Boston Haven there shall be levied on all vessels entering inward and clearing outward at the port of Boston a duty of *fourpence* per ton; which duty there is reason to believe will be equal to the interest of about one half the capital sum which the said improvement will require according to the estimate of Mr. Rennie." The Drainage Commissioners declining to join with the Corporation on the ground that their scheme did not go far enough, inasmuch as it did *not include the improvement* of the *outfall below Hobhole*, the river was allowed to remain in its imperfect condition until 1825, when Sir John Rennie having been called in to advise, an Act was obtained in 1827 by which the Corporation were empowered to borrow a further sum of 20,000*l.*, and to carry out the works recommended by their engineer. These consisted of the straightening of the river by means of a new cut 800 yards in length through Burton's Marsh, thus cutting off the great bend at Wyberton roads, and shortening the distance to deep water one mile and a half. The contract for this work was undertaken by Messrs. Joliffe and Banks for the sum of 24,000*l.*, and finally completed in the year 1833, at a total cost for land and works of 27,262*l.*

The remainder of Sir John Rennie's plan, embracing the straightening of the river from Skirbeck church to join this new cut, was not commenced till the year 1841, when Capt. Beasley undertook to train the channel, which was continually shifting between these two points, by fascine work, and to excavate where necessary, so as to make the river as nearly straight as possible. This work he successfully accomplished at a cost (including land) of 11 627*l.* In the following year Mr. Beasley completed a fascine barrier on the west side of the river, from nearly opposite Maud Foster Sluice to the end of Slippery Gowt Marsh, the length of the same being about one mile, at a cost of 2775*l.*; and the water being thus confined in one channel, the land on either side gradually accreted, till it became level with the top of the fascine work, and rose to such a height as only to be covered with water at the top of the spring tides. The land so formed has been embanked within the last three years by Mr. Black and the Corporation, and where once the waters meandered about through shifting sands, the plough now is driven, and crops of corn and other produce are raised.

Another considerable piece of training was the diversion of the waters from their circular course round Blue Anchor Eight Marsh to a straight line, by the fascine work carried out by the late Mr. Robt Reynolds, and the same result has followed on the inside of this work, as already mentioned, as taking place higher up the river. The sands and Marsh are now good agricultural land, having been embanked two years since. The amount expended by the Corporation in improving the channel of the river is as follows:—

	£. s. d
1825.—Cutting new channel for the river from the Grand Sluice to the Iron Bridge	3550 0 0
1828 to 1833.—Cutting a new channel through Burton's Marsh, diverting the old channel	27,262 0 0
1841.—Cutting a channel through Corporation Marsh, and making a fascine barrier on the eastern side of the river from Maud Foster to Corporation Point	11,627 0 0
1842.—Fascine barrier on the west side of the river from Rush Point to the south end of Slippery Gowt Marsh	2,775 0 0
1823 to 1859.—Sundry small contracts for extension of fascine work	7,555 0 0
Fifteen years' expenditure in repairing and heightening the fascine work, and general maintenance of the river	5 250 0 0
	£58 019 0 0

The shortening and straightening the river to deep water has been greatly serviceable to both navigation and drainage: the river is now maintained in as great a state of efficiency as practicable by the Corporation. The whole of the navigable channels are buoyed out, lights are placed when the tides serve in the dark, during the six winter months, at certain fixed points, from Elbow buoy to the town, by which vessels can steer their course. A pilot boat is always afloat in the lower part of the harbour, and an efficient staff of pilots maintained.

It has been stated that the Corporation under their ancient charter were entitled to collect dues from all vessels entering the port, which right was confirmed to them by the Act of 1812; but in the year 1842 an Act was obtained by which the dues on vessels navigating the Welland were transferred to the trustees of that river, and in consideration they were to pay to the Harbour Commissioners one-third of the cost of maintaining the buoys, beacons, and sea marks. By the same Act it was enacted that the Harbour trustees should have the power to execute any works for the improvement of the river as far as the point of confluence of the Witham and Welland, but beyond this al works are to be done jointly and only with the consent of both trusts.

The number of vessels frequenting the port of Boston has of late years very considerably diminished. The following statistics of the tonnage and lastage and the dues will show the state of trade at the port at different periods:

Year.	Tonnage of Goods.	Quarters of Grain.	Dues. £. s. d	
1800	52,693	——		
1805	62 980	201 898	——	
1810	86,256	256.040	——	The greatest number of qrs. ever recorded.
1811	——	360 699	——	
1815	66,736	246,160	——	
1820	——	247,535	2216 10 10	1818 to 1833 books
1830	——	149,709	2406 7 9	[burnt.
1835	69 383	——	——	
1840	61,854	141,759	3300 1 2	
1845	73,413	——	——	
1848	91 063	——	——	G. N. Ry. opened.
1849	56 8 0	——	——	
1850	55,910	114 399	1866 5 0	
1855	38 031	57,910	1160 6 0	
1860	40,147	65,547	1297 7 7	
1861	46 962	93 485	1522 2 6	[duced to 3*d.*
1862	43 220	72 066	805 3 2	Tonnage dues re-
1863	41,687	132,725	981 16 7	Last on wheat re-
1864	42 439	113 491	768 15 11	[duced to ½*d.*
1865	38 860	102,004	739 9 9	
1866	38 014	103,251	691 4 3	
1867	40 124	147,329	766 18 0	

The above returns are for the twelve months ending the 11th of October in each year. The dues at present levied are threepence per ton on all goods, and one half-penny per quarter on *all* grain shipped at the port. The Commissioners have power to raise these dues to sixpence per ton on goods and one penny per quarter on wheat.

The decrease is in a great measure owing to the construction of the Great Northern railway, the loop line of which through Boston was opened in the year 1848. Before this time a very considerable trade was carried on by means of the Witham and other navigable canals with the interior of the country. Previous to 1848 the river was the only means of conveyance for the export of the corn brought to Boston from the large agricultural district by which it is surrounded, and for the import of the coals and other produce for consumption by the inhabitants of the fens, which were brought by sea to Boston and carried thence by boat and barge up the canals and drains to the fens. On the opening of the railway a fresh means of communication was provided, and a considerable amount of traffic diverted to it from the river. A very large trade in inland coals was also carried on by the Witham, the quantity which passed down through the Grand Sluice gradually increasing from the beginning of this century from about 12 000 chaldrons to upwards of 30 000 in 1830 The duty being taken off sea coals in this year caused the quantity to diminish to about 13,000 chaldrons. From the opening of the railway in 1848 a steady decrease again took place, and the quantity now passing down the Witham is merely nominal compared to what it used to be.

Several schemes have been promulgated from time to time for providing the port of Boston with better accommodation for its shipping The most noticeable was a plan brought out by Mr. Staniland in the year 1845, at the time the Great Northern railway was in progress The company was organised under the name of the Boston Dock Company, with a capital of 200,000*l* Its professed object being the "further improvement of the Haven and Outfall and the construction of Wet Docks," the scheme was very strongly supported, the Mayor of Boston and two thirds of the Corporation being on the Provisional Committee, also seven magistrates of the borough, and several commissioners of the river Witham and Black Sluice, and a long array of landowners and merchants. The prospectus