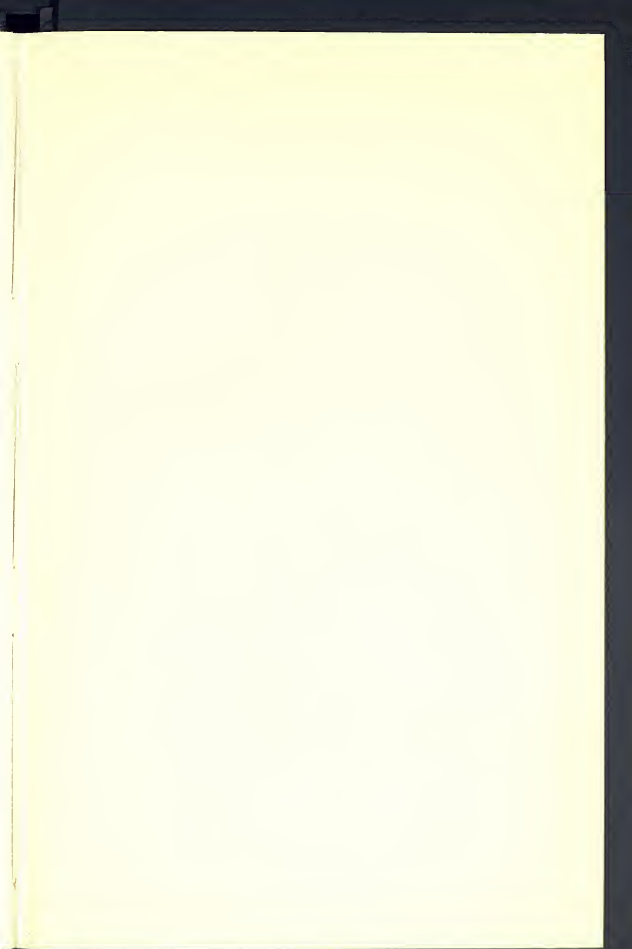


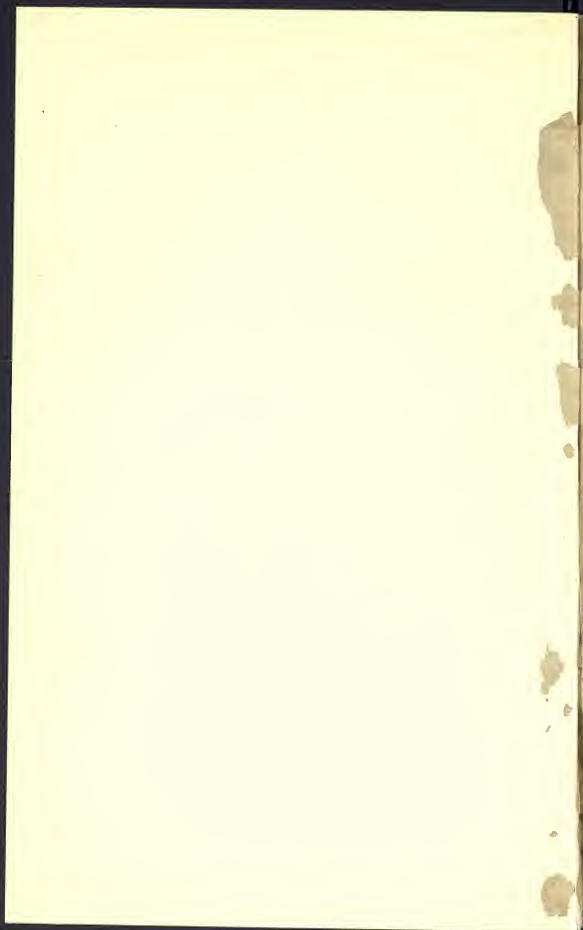
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THE  
Arterial Drainage of Norfolk.

BY  
SIR WILLOUGHBY JONES, BART.

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WITH A MAP.

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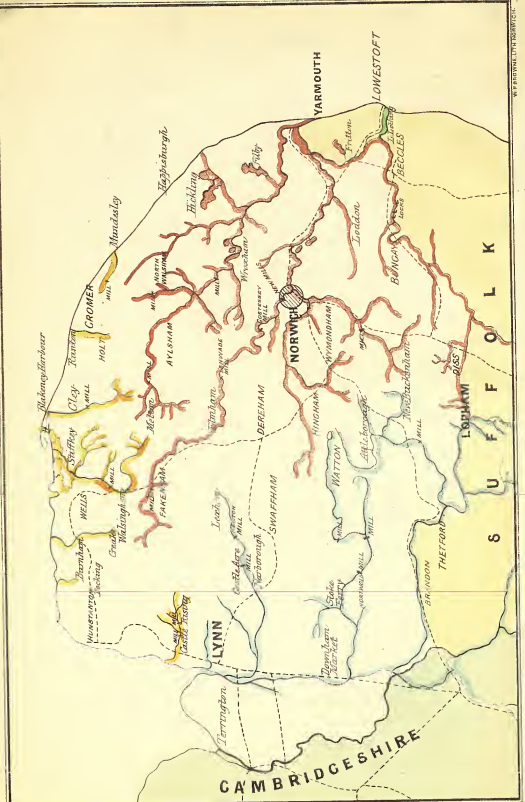
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THE  
ARTERIAL DRAINAGE  
OF  
*NORFOLK:*

A PAPER READ BEFORE SECTION F OF THE BRITISH ASSOCIATION FOR THE  
ADVANCEMENT OF SCIENCE, ON AUGUST 21ST, 1868,

BY

SIR WILLOUGHBY JONES, BART., M.A.

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*WITH ADDITIONS AND A MAP.*

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THE  
ARTERIAL DRAINAGE OF NORFOLK.

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A CAREFUL and elaborate paper by Mr. Harding will explain to the Section how human ingenuity and skill, extended over a series of years amounting to centuries, but receiving its principal development since the discovery of steam, has solved the problem of draining completely large tracts of almost perfectly flat land, situated in great part somewhat below high-water mark of the ocean boundary. The fen drainage of Norfolk has no doubt been facilitated by the circumstance that the rain-fall of the Eastern Counties is very small ; had it been as great as that of Ireland or of the West of England, the problem would have presented itself under other, and very much more formidable, conditions.

I.—THE RAIN-FALL.

It may not be out of place here to remark how very little pains have hitherto been taken to arrive at anything like an accurate estimate of the rain-fall. The experiments made at York in 1833, at the request of the British Association, prove how very greatly the results obtained depend upon the elevation

above the soil\* and general situation of the pluviometer, or rain-gauge; yet there is no invariable rule as to the construction of the gauges, or as to their position, nor is there any public officer whose duty it is to register regularly the results obtained. This important matter is left entirely to volunteers, and the records are therefore necessarily irregular—volunteers requiring holidays, and being from time to time absent from home. When it is considered how impossible it is to avoid the effects of evaporation even in the best-made gauges, it will at once be seen that the register ought to be kept regularly and at short intervals. It has been suggested to me by a gentleman who takes great interest in meteorological pursuits, that the two County Prisons at Norwich and at Swaffham, the Lunatic Asylum at Thorpe, and the Union Houses generally, would be excellent sites for permanent rain-gauges,† and that the officers who are always present at those institutions would be able to keep a daily register of the rain-fall, which would be of great value.

\* The distance above the surface of the soil at which a rain-gauge is situated is of great importance. The rain-fall at different heights above the soil has been reduced to a formula by Professor Phillips, and a law discovered which it seems to obey: it will be sufficient, however, to mention here that the gauges at Greenwich gave in 1846 the following results:

50 feet above the ground	-	-	-	13.46
24    "       "	-	-	-	22.63
2     "       "	-	-	-	25.86

These results may be roughly illustrated for the benefit of those who do not like figures, by the simple statement, that the quantity of rain that fell at an elevation equivalent to the roof of an average London house, was only half the quantity that fell on the surface of the soil.

† The importance of eliminating the local element by a great number of observations received a strong illustration this July. The total average rain-fall of the month was only about  $\frac{1}{3}$  of an inch; but during a thunder-storm in the south of England, in a very small district, the rain-fall on one day, and in a few hours, was  $2\frac{1}{4}$  inches.

The fact that the gauges kept at all these public stations, which in Norfolk would be 23 in number uniformly distributed over the face of the county, would be of the *same* description, that their height above the surface of the soil would be uniform, and lastly, that the elevation of the sites above the mean sea level (the Ordnance zero) could in most cases be easily obtained, and in all such public buildings ought to be not only known but notorious as data from which the surrounding districts could be levelled; all these facts would render these observations of exceptional value, and lighten considerably Mr. Symons's labours, and that of the Committee of the Association, in their arduous work of determining with anything like accuracy the rain-fall of each district and of the country generally.\* For my own part, I have little doubt, though I cannot speak from observation, that the average of  $26\frac{3}{4}$  inches given by Professor Ansted for Norfolk would be found too high at present, whatever it might have been some years ago.

The Rev. W. Blyth, in his History of Fincham, page 63, gives the rain-fall at Fincham, at 23.8 inches on an average of 11 years—from 1851 to 1861 inclusive. This is much below Professor Ansted's 26.75. On the other hand, H. E. Blyth, Esq., sends me the results of his register at Sussex Farm, Burnham, for 28 years. These averages are higher than the Fincham averages, but seem to show a steady and gradual diminution. They give—

\* The register of the public stations would be kept in duplicate, filled up once a day, and the duplicate sheet torn out, and forwarded once a month or once in three months in a printed, directed, and stamped envelope, either to Mr. Glaisher or to Mr. Symons, as might be thought advisable. A small subscription would suffice to provide the gauges, registers, &c.; and I do not doubt that the Governors of the Prisons and the Masters of the Unions would willingly undertake the interesting, and not very onerous, duty of filling up the daily register and forwarding the monthly or quarterly sheets.

† Physical Geography, p. 261.

From 1840 to 1849 inclusive, average of 10 years, 30.72 in.

From 1850 to 1859 inclusive, average of 10 years, 26.85 in.

From 1860 to 1867 inclusive, average of 8 years, 26.37 in.

The height of the gauge being  $4\frac{1}{2}$  feet from the surface, and standing at 102 feet above the sea level.

Mr. Grantham, in his paper on the Broads of East Norfolk, read before Section G of the Association, gives a tabular statement of the rain-fall of Norfolk for seven years, as follows :

1860	-	-	-	33.2 inches.
1861	-	-	-	22.2 „
1862	-	-	-	24.9 „
1863	-	-	-	18.6 „
1864	-	-	-	16.1 „
1865	-	-	-	29.6 „
1866	-	-	-	26.3 „

Mean rain-fall, 24.41 inches. This is rather higher than the Fincham average, 23.8 inches, and much lower than 26.3, the average of the same seven years at Burnham. The difference in quantity between one year and another, as shown by Mr. Grantham's table, is most remarkable: 1860, the wettest year, giving a rain-fall more than double that of the driest year, 1864.

These varying estimates show that the average rain-fall for the whole county must still be considered as undetermined for want of sufficient data, and the difference between East and West Norfolk in system of culture, size of fields, hedgerow timber, and other incidents, would make observations taken at stations evenly distributed over the county of peculiar value, as bearing upon the question as to the extent to which such differences influence the rain-fall.

The effect of trees, whether in masses or scattered, on the rain-fall is well known and almost universally acknowledged; but for the sake of those who entertain the opinion that the phenomena of the rain-fall and of rain-clouds are too vast and general to be modified by any incidents of the kind, two examples may not be out of place. Mons. Pouchet, an eminently competent observer, informs us that whereas in the Delta of Egypt rain used only to fall on *five* days in the year, since Mahomet Ali made his great plantations of twenty millions of trees (probably some five thousand acres of plantation), the number of days on which rain falls has increased to *forty*.\* On the other hand, the present barrenness of the Holy Land, in the presence of manifest indications of great productiveness and a teeming population in ancient times, may be fairly attributed to the destruction of the olive groves and vineyards for which the country was formerly celebrated, and to the drought which has in consequence prevailed there for a long period. Some remarks made by Dr. Tristram in the Geographical Section of the Association will be well worthy of perusal and consideration by those who entertain any doubts upon this subject. There can, at all events, be no question that in meteorology, as in every branch of science, great results are often produced from apparently small causes; and it is an unscientific method of reasoning to argue that *because* the whole rain-fall is mainly produced by the evaporation from the vast ocean, *therefore* the quantity that falls in a particular locality may not be modified by the presence of a few trees more or less, or even that the rain-fall of a whole country may not be greatly influenced by the presence or absence of herbage and timber.

Considering, therefore, that the question whether the general rain-fall in England has or has not diminished, is at present

\* Les Mondes, Moigno, vol. xvii., p. 679.

undecided, and taking it for granted that under-draining cannot have any prejudicial effect on the rain-fall, inasmuch as by warming the soil and admitting the air it rather increases its power of evaporating moisture, the fact still remains, that in the Eastern Counties, at all events, we should in the average of years, be glad of more rain than we get. The fertilizing power of water on well-drained land is enormous; its value to the population in a sanatory point of view is only now beginning to be understood in this country; is it not then more than doubtful whether any discouragement to woodlands, such as making them liable to rating when there is no underwood, is desirable in a national point of view? Woods are fast disappearing, being in themselves unprofitable; is it wise or patriotic to hasten the destruction now going on? The exemptions were granted in the reign of Elizabeth for the sake of our shipping; it may be found necessary to continue them in the reign of Victoria for the supply of our rivers and ponds.

## II.—THE OBSTRUCTIONS.

To return to the question of Drainage, we may consider that in the Fens it has been completely solved, and the level at which the water should stand in the ditches that separate the fields is under the absolute control of the experienced Engineers who superintend the different drainage systems. Perhaps it is in consequence of the great care that has been taken to help off the water that cannot help itself, that in the other districts of the county where a slight and continuous fall makes the arterial drainage a simple matter, and where the wisest practice would have been to leave well alone, a perverse ingenuity seems to have been displayed in obstructing



and damming up the rivers that ought to be the natural arterial drains of the country.

Norfolk has at all times on its good land, especially in the neighbourhood of its river valleys, grown a considerable quantity of corn, and no doubt to our forefathers the problem how to grind the corn they grew was one of first-rate importance. Windmills are all very well, but they labour under great disadvantages; their action can only be intermittent, depending upon enough wind and not too much, while the repairs which they always require make them at best but a costly and uncertain source of power, and therefore recourse was had to the power to be obtained from our small and sluggish streams. When land was abundant, and the population of the country small, there seemed to be no objection to this use of power, the sanitary evils arising from swamps and stagnant water not being understood or appreciated. The result has been that almost the whole fall of the upper and non-navigable portion of our Norfolk rivers has been utilized in this way, the river itself being converted into a long flight of watery stairs, with still-water between each little fall of three or four feet. The result of this as evidenced in the Wensum, Nar, and other rivers, is most curious; the river, for a long portion of its course, runs at intervals along raised water ways some two or three feet above the adjoining land at the bottom of the valley. Alongside of the river there often runs a little subsidiary river, called a soke drain, intended to catch the flood water, and having its outlet in the next mill-pool, a narrow ditch, perfectly ineffectual for any drainage purposes, and the land on both sides is occasionally inundated, and always swampy and greatly injured by water. Those who have noticed the portions of our valley bottoms visible from the railway, either near Thetford, or before entering Norwich, or on the Wells branch about Ryburgh, and elsewhere, will be

able to form some idea of the discreditable state of the valley bottoms throughout Norfolk. In a county whose agriculture is pre-eminent, and whose fen drainage is unequalled in Europe, it is a standing disgrace that the rivers, the arteries of the county, should be considered, not as water-courses, or drains, but simply as means of obtaining power to grind corn. The poor little mills that do all this mischief are generally obliged to use auxiliary steam power, and it would be a matter of easy calculation to estimate how little *more* power would suffice to enable the rivers to be freed from all their obstructions.

An old writer, Captain Walter Blyth, belonging to a highly respected Norfolk family, in his book, "The English Improver and New Surveyor of Husbandry," published in 1652, describes the effect of these mills in a strain of indignant eloquence and with a power and truth which must be my excuse for quoting him in this place. "The eighth prejudice," he says, "may be the many water-mills, which destroy abundance of gallant land, by pounding up the water to that height, even to the very top of the ground, and above the natural height, that it lyeth swelling and soaking and spewing, that it turneth very much land to a bogg or to mire, or else to flagg or rush or mareblatt, which otherwise was as gallant land naturally as could be. I am confident that many thousand a year are thus destroyed. Many mills, worth about 10 or 12 pounds per annum, destroy lands worth 20, 30, or 40 per annum. I know it of my own knowledge. I had some few years since a mill-dam in my land which destroyed one-half of a gallant meadow; means were used that it was removed, and that very land is returned to his perfect purenesse again."

The evil is now, however, far greater than it was in centuries gone by. The sediment brought down by every flood settles in the river bed in consequence of the stagnation

caused by the mills, raising thereby the level of the bottom of the river; then the banks have to be raised proportionably to keep the water in, and ultimately the phenomenon so frequent in Norfolk is produced—a non-navigable stream flowing sluggishly along a raised causeway (if I may use such a term as being more intelligible than water-way), with the valley in a state of swamp lying on both sides of it.

It is indeed lamentable, that in a country so fully populated as England, producing neither corn nor meat in quantities nearly sufficient for its inhabitants, a waste of land such as I have described should take place, and on so large a scale; but this is only a slight evil compared with the sanitary aspect of the question about which I must now say a few words.

Residing myself in the immediate neighbourhood of the Wensum valley, I am able from my own experience to testify as to the great prevalence of low fevers and Typhus in the villages on its banks. It was not without reason that as long ago as the 43rd Henry III., as we learn from Blomefield, an assize was held on account of the mill-pool at Fakenham being raised too high. It would be curious to calculate, as we might have done had the census existed, how many lives have been sacrificed since A.D. 1259, to the damming up of the Wensum above Fakenham. I find, on comparing the mortality of a large village\* situated in the valley affected by these mill dams, with the mortality of the whole Registration district, that the deaths on an average of 7 years last past, have been 22.2 per 1,000, while those of the whole district have been 21.7 per 1000; a death-rate itself for many reasons (of which the river and overcrowded dwellings are the principal), higher far than it ought to be.†

\* Sculthorpe.

† The figures here given are those of the last seven years compared with the census of 1861. The rate of mortality for Walsingham district is *the same*

Let us hear upon this important subject the opinion of Mr. C. S. Read, M.P., as set forth in his essay on the Arterial Drainage of Norfolk, prefixed to the 1864 edition of White's "Norfolk." He says, respecting the valley of the Waveney, "The parishes which border the river are always very unhealthy in the latter part of the winter and all through the spring. The marshes that have been long flooded stink fearfully as the heat increases, and even to villages 100 feet above the river the nuisance ascends and fevers are most fatal. The mortality of these parishes is  $1\frac{1}{2}$  per cent. in excess of other well-drained rural districts; and taking the parishes along the Waveney at 400 each, one human being in each parish is each year killed by that stagnant river. It is unnecessary to state that the same calculation, with the like fatal results, would apply to all the badly drained and flooded districts of Norfolk."

The Rev. E. Gillett, in the same work, tabulates the mortality of the county, and traces its excess to the neglect of arterial drainage; he mentions that "the valleys of the Waveney and the Bure are frequently flooded, and that the districts through which they wind their sluggish courses are subject to miasma; that the upper parts of the courses of these rivers, together with the Wensum, are made very pestilential by the water-mills, which hold up the water to obtain power to turn their wheels, and thus destroy the drainage which the small but gradual fall of the rivers would give."

Having said thus much on the subject of the water-mills and their effect on the agriculture and health of the valleys, I

as that given in White's "Norfolk," in the table of mortality, from 1841 to 1851, viz. 21 in the 1000, a rate identical with the average of the whole county. It is discouraging to find, that notwithstanding the Nuisances Removal Act, and the many new cottages built, and old cottages improved in the district, the death-rate remains unaltered. Great is the force of Miasma, and it will prevail.

must now call attention to what may at first sight seem to be a small matter, but which in fact, is producing a very great effect upon the upper waters of our rivers; I allude to the invasion of the *Anacharis Alsinastrum*, or American Water-weed, which now fills, in places, half or two-thirds of the water-way.

This weed is too well known to need description; fortunately, it requires moving water to obtain its full development; if it did not, our broads would soon be converted into spongy and saturated bogs of decaying water-weed. It exists indeed, I am told, in the broads in small patches, but does not attain the rank luxuriance with which it flourishes in our slowly moving streams; in them it is a formidable obstruction which it is nobody's duty to remove, and which cannot be got out of the way without considerable expense.

Should Parliament in its wisdom decide that the arterial drainage of England is a subject worthy of legislation, and looking at the matter broadly and nationally, pass a measure *that will work*, and not a measure, like the Land Drainage Act of 1861,\* which gives the oyster of profit to parties who are neither mill-owners nor land-owners, there is no

\* The cardinal defect of the Land Drainage Act, 1861, is the rating clause, sec. 38. Rates for improvement purposes (except special rates) are to be paid on the rateable value of the property benefitted: that is to say, the best land pays most and the worst land pays least; or in other words, the land most benefitted pays the smallest rate, and the land least benefitted pays the greatest rate. This has been found in practice an extreme hardship. Even the "special rate" has no definite scale or system of levying enacted in the statute, though Mr. Grantham, in his able pamphlet on the working of the Act, mentions that it has been decided judicially that it should be according to, or in proportion to, the benefit conferred. There is, however, an element of doubt on this matter that ought not to exist, or litigation is sure to be added to the great expense already inevitable from the cumbrous formalities and machinery of the Act. Why not make every expense from first to last be defrayed in proportion to the benefit received, such benefit to be determined by a competent valuer, with an arbitrator in last resort?

part of the country that would be more benefitted than the County of Norfolk. In any measure of the kind, not only should provision be made for the removal of mills by rating the land and tenements whose drainage would be thereby improved, but the same rate ought to cover the expense of keeping the water-way of the river clear of obstructions of any kind; and foremost among such obstructions for many years to come will be the *Anacharis Alsinastrum*.\*

Having given precedence to the defects of our arterial drainage, it remains for me to say a few words on the drainage system itself.

### III.—THE DRAINAGE SYSTEM.

Norfolk, surrounded on three sides by the sea and the fens, and separated from the conterminous counties by two rivers, the Waveney and Little Ouse, rising together at Lopham,† and flowing into the sea, the one at Yarmouth and the other at Lynn, may be considered for all drainage purposes as an island. No water pours from it into any other part of

\* Horses will eat the *Anacharis* weed when floating on ponds, and a correspondent of the *Standard* says they will eat it when dried; at present, however, they have not been educated into liking it, and I fear that for many generations they will be of the opinion of Bottom the weaver: "Good hay, sweet hay, hath no fellow."

† Lopham-ford-gate is the most important point in the arterial drainage of Norfolk. The name Lopham would seem to be derived from its being the water-shed. The Rev. John Gunn, in a paper read before Section C of the Association, makes the following remarks upon the unusual features presented by the Lopham water-shed: "At Lopham Ford, Norfolk, there occurs the singular phenomenon of a water-shed in the lower part of a river-valley, from which the Waveney and the Little Ouse, or Brandon river, take their rise. A road traverses the valley descending from the high land of South Lopham, and leading to the high land on the opposite side in Suffolk. From either

England, nor does any river or stream cross its boundary.\* Looked at with reference to the drainage of upland-Norfolk, the fens might be the sea, our streams flow into them as they would into the sea, and to the fen drainage engineers it pertains to do what they like with the water we give them. Hence the arterial drainage of Norfolk is a small insular system complete in itself; and Norfolk may be considered to be an island of about 1,200,000 acres in area, and having its central table-land from 200 to 250 feet above the mean sea level; the drainage will be conveniently classed in three heads.

1st.—The belt of high ground, some few miles in width, adjoining the sea, and extending from Happisburgh to Lynn. The main drains of this district are small streams and brooks, which enter the sea either by creeks in the belt of salt marshes, or else directly into the sandy beach. They are coloured

side of this road the water rises, which forms, or rather is the commencement of, these two important rivers. It is evident that, had the water-shed been originally on this spot, the part of the valley above it could not have been excavated; for there is an obvious tendency in the present arrangement to raise and consolidate, rather than wear down the Lopham Fen. It appears to me that the only way in which this phenomenon can be accounted for is by supposing the land to have been elevated on this spot, so as to cause the waters, which had previously flowed in one direction, to flow to the east and to the west. The river valley gravel, which remains on the Suffolk side, is on a grand scale, indicative of the power of the original stream. It resembles that of St. Acheul, near Amiens."

\* In this general view of the drainage, Marshland and the half-hundred of Clackclose west of the Ouse, must be omitted altogether, and the Great Ouse from Brandon Creek Bridge treated as being the boundary of the county. In fact, this extreme westerly portion of Norfolk belongs to another drainage system, that of the fens, and cannot be considered apart from the adjoining portions of Cambridgeshire and Lincolnshire. These remarks are therefore intended to apply to Norfolk *minus* Marshland and the half-hundred of Clackclose west of the Ouse. This portion of the county would have an area of about 1,224,000 acres, deducting about 70,000 acres for the portion west of the Ouse.

orange in the map. The stream that flows past Walsingham and Barsham, and which enters the sea at Stiffkey, and the river Glan, at Cley, are examples of the former, while the little streams at Runton, Mundsley, and Bacton, may be taken as examples of the latter class. These streams are for the most part very small; when they are sufficient to turn a mill, advantage has been taken of them, and in these cases the mischief done both agriculturally and sanatorily is out of all proportion to the value of the power obtained. It is to be regretted also that these very small streams should be polluted by sewage from the villages on their banks, the more so as they afford the water supply for drinking purposes to other villages lower down their course. A very severe outbreak of fever a few years ago at Stiffkey was distinctly traced to this cause.

2nd.—The district of West Norfolk, commonly known as the light-land district, or the brecks, the drainage of which empties itself into the fens. Of the streams that drain this district, coloured blue in the map, the principal are the Nar and Wissey; they are mostly very small, and are fed by springs, there being no surface drainage worth mentioning in the district. The soil being mainly gravel and sand, overlying the chalk at variable depths, the water percolates freely until it reaches the chalk, where it collects, forming springs in places, and generally giving the well supply of abundant clear hard water out of the chalk which is found throughout the county. The Nar, with its navigation and its mills, has a great deal of swampy ground to answer for.

*Lastly*, we come to what is the principal and main arterial drainage of the county, and this all flows to the one common outlet, Yarmouth, and is coloured carmine on the map. If, therefore, *we peel a thick rind* off the county, minus the fens, we shall find all the arterial drainage of the remaining portion



passing into the sea under Yarmouth bridge. The Wensum, the state of whose upper valley has been described in an earlier part of this paper, is the first in order and the longest in course. Flowing along a very winding channel of about 50 miles from its source near Houghton, it reaches Norwich from the north; just below and to the south of the city it is joined by the Yare, flowing from the west; the two flow on together under the name of the Yare, until at the mouth of Breydon Water they are joined by the Waveney, that river having been deflected some 15 miles from its proper outlet by Mutford into Lake Lothing, for the purpose of adding its waters to the Yare, and increasing the scour of Yarmouth Harbour. Had Lowestoft achieved in former times its present prosperity, we may well believe that the Waveney would have had a shorter channel, and the steam dredges in Lowestoft Harbour an easier time of it.\*

The Bure, and its tributary the Ant, complete the list of the rivers flowing to Yarmouth, and anyone looking at the map will see that they spread like the ribs of a fan, and convey to the sea all the spare surface and spring water of the inside of the county. The main outfall, the Yare and Breydon Water, is well cared for; the fall is trifling—not more than four inches to the mile for some twenty miles or more between Norwich and Yarmouth; but a joint Commission,

\* The deflection of the Waveney is a simple geographical fact which could not pass unnoticed in a paper on the Norfolk water-courses, however short or incomplete. It would seem, therefore, that the unusual notice that was taken at Yarmouth of the expression in the context, which I have retained unaltered, was hardly called for, and it might fairly have been assumed that I mentioned the matter without any intention of undertaking the onerous task of altering the present state of things. Whatever others may do, I have no intention of assuming to myself the part of a modern Hamlet:—

“The time is out of joint—O cursed spite  
That ever I was born to set it right.”

taken from Yarmouth and the County of Norfolk, and endowed with powers and a revenue by Act of Parliament, keeps the channel navigable, and in a creditable state. The rivers, however, that feed the main stream, though navigable, do not deserve this meed of praise. Of the Waveney and its valley we have spoken before, and with reference to the Bure and Ant, which drain East Norfolk between the Norwich and Cromer road and the sea, I must quote Mr. Clare Read again. "Certainly," he says in the Essay before quoted,\* "the river Bure is in a lamentable state. The shoals and mud almost stop the navigation, as well as choke the drainage. Few rivers drain a more valuable district, and very few that could be so easily improved are so shamefully neglected. The chain of Broads or small lakes, Filby, Rollesby, and Ormesby, which discharge by the Muck-fleet into the Bure just below Acle bridge, contain about 700 acres of water. This Muck-fleet (appropriately named, for it is both fleet (Norfolk dialect for shallow), and dirty) is about two miles long in its windings, and is stuffed up with mud, and the sluices are much too small, and the sills not low enough. Almost a thousand acres of skirtland, bordering on the Broads drained by the Muck-fleet, would be greatly improved, perhaps to the extent of 10s. an acre in annual value, by the permanent lowering of the water in the Broads. The total basin of the Broads (i.e., the high land from which the water runs off to them) is about 8000 or 9000 acres. It is easy to comprehend how much good might here be accomplished at a very trifling expense; and it may be as well to mention that a scheme for rendering the Muck-fleet navigable, and at the same time to improve and develop the resources, as well as to drain the whole district, was upset by one large

\* Essay on Arterial Drainage. White's Norfolk Directory, ed. 1864.

proprietor, because he thought his game and wild-fowl might be disturbed by the noise of the watermen and traffic of the barges."\*

There is a pleasant flavour of English country life about this anecdote, and with it I shall conclude this very slight outline of the arterial drainage of the county, its insular completeness, its peculiarities, and, alas! its defects.

#### IV.—FUTURE PROSPECTS.

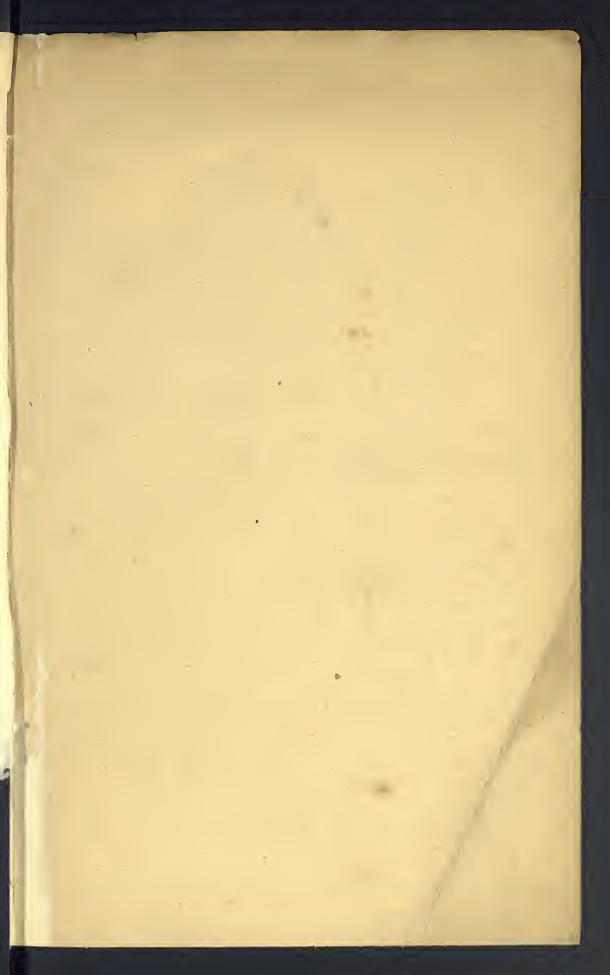
There only remains to mention that in 1866 an Act was obtained for the better drainage of the Valley of the River Waveney, the preamble to which mentions that "Whereas there now exist great obstructions to the free discharge of the waters of the River Waveney, in consequence whereof the lands in the valley of that river are subjected to great damage, and the value of those lands for the production of crops and the feeding of sheep and cattle, and in other respects is much diminished, and communication between the counties of Norfolk and Suffolk is frequently interrupted or made inconvenient by floods, and the health of the inhabitants of the valley and its neighbourhood is injuriously affected,"

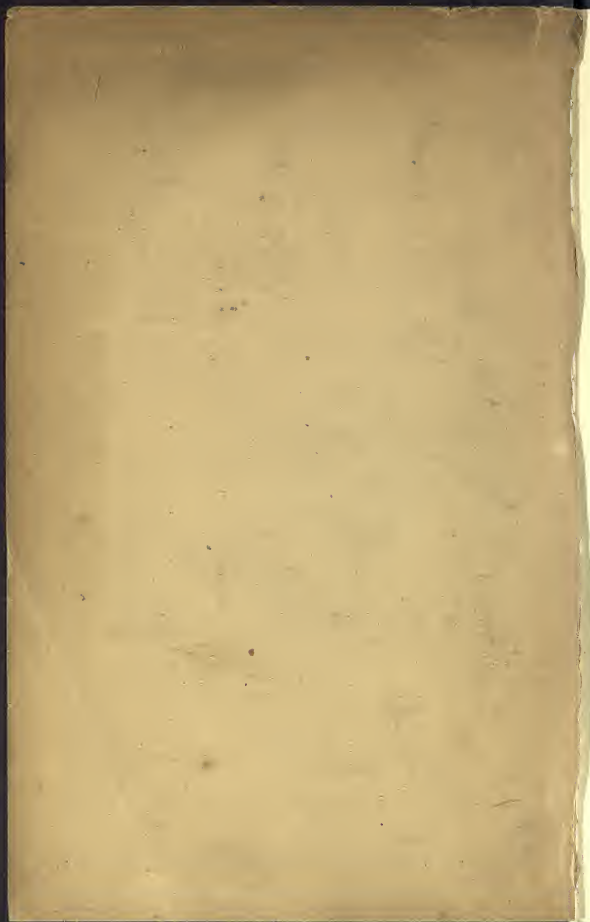
\* The Muck-fleet, on Sept. 2nd, 1868, was quite dry just above the sluices at Stokesby. The general state of the drain was as bad as possible. It seems to be a waste of natural advantages that the "navigation privileges" of the chain of Broads should be rendered absolutely useless by the construction of the sluices into the Bure, independently of the narrow and shallow channel of the "Muck-fleet River," as it is called in the old maps. No boat or barge can pass through the Stokesby sluices; there is therefore no navigation, properly so called, into the Broads. A very moderate expenditure would give a large portion of the wealthy and fertile Flegg Hundreds all the advantages of Yarmouth Harbour.

&c., &c. This preamble entirely bears out the facts as mentioned in the former part of this paper. If I may be allowed to give an opinion on the Act itself, I should, while applauding its object and the machinery provided for carrying it out, venture to utter a regret that the powers conferred by it had not been more ample; for instance, that in Section 39 the power had not been "to deepen, widen, alter, remove, or rebuild all locks, bridges, and sluices, *mill-dams, &c., &c.,*" instead of the power to deepen, widen and alter *or remove and rebuild* all locks, &c., thus omitting to confer the power of pulling down without rebuilding, and thus abating the more injurious mill-dams altogether. The bill is, however, a great step in advance, and I have purposely postponed all notice of it till the end of my paper, as giving us a gleam of hope for the future of our Norfolk valleys. The Waveney proprietors have set us an example, and we may hope that their success will encourage others to do likewise, the main impediment being at present the great expense of a private Bill. We must remember, however, that a private bill was necessary a few years ago to enable the commoners to enclose a waste, an operation now simple and comparatively cheap, so it may be found hereafter that similar facilities are possible when the object is to rid a river of obstructions and make a valley healthy and fertile.

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NOTE.—*The Map prefixed to this paper is merely intended to exhibit pictorially the general drainage system. Certain of the water-mills are shown, but only a small proportion of those arch-offenders. On the Wensum alone, between Norwich and its source, there are thirteen water-mills.*







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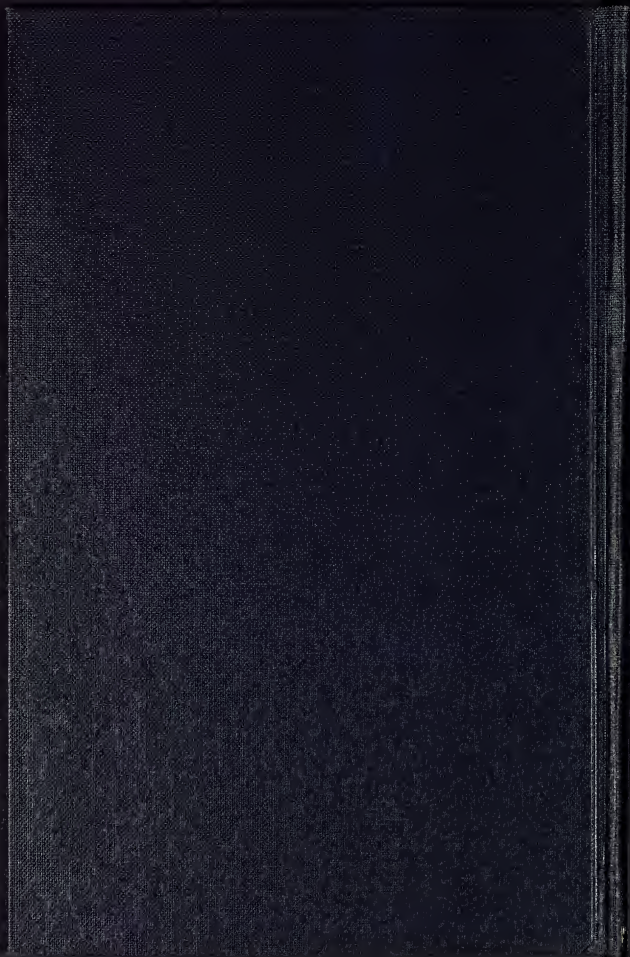
*Date of Issue*

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