

# R E P O R T S, &c.

---

QUESTIONS proposed by the Magistrates and Town-Council of *Dumfries* to the consideration of MR. SMEATON. October, 1760.

1st. **W**HAT is the easiest and most effectual method for preserving the town's grounds of *Kingholme* from the future encroachments of the river?

2d. How can the navigation of the river *Nith* be most easily improved from *Kingholme* to *Kelton*, and the channel rendered less precarious than it is at present?

3d. It is desired that MR. SMEATON may visit the works carried on in the under part of the river, opposite to the Merse grounds of *Netherwood*, *Cargin*, and *Lagball*; and, upon considering the course of the river, and the situation and extent of these works, to give his opinion how far the navigation of the river will be bettered or injured by such works; and what amendments or alteration of them are necessary for preserving the navigation entire? And in case such works are attempted to be made by other heretors, what orders ought the Magistrates and Town-Council to give thereanent, as being guardians of the public navigation of this river; and how many feet or fathom broad ought the channel to be kept free at those places?

In case it shall be thought proper or necessary that any of the works already erected ought to be destroyed, whether should the stakes be pulled up or knocked down, equal to or below the surface of the ground where they now are; and what ought to be done with such parts of the works as are of stone?

EBEN. HEPBURN.

JOHN DICKSON.

WM. CLARK.

## [ 2 ]

ANSWERS to the questions proposed by the Magistrates and Town-Council of *Dumfries*, for the consideration of J. SMEATON.

HAVING carefully examined the course of the river *Nith* and the banks thereof, from *Dumfries* to *Kirkconnel* on the West side, and from *Kelton* to *Dumfries* on the East, both upon the flood and ebb of a spring tide, I am of opinion as follows :

Answer to question 1.—Where the banks, by the undermining of the water, tumble down, I would advise them to be sloped as low down as where the water begins to act, and to defend the foot of the slope by rows of stakes, single or double, according to the violence of the water's action, placed in a direction parallel to the bank, with binders to confine down a lay of fascines pointing towards the water. The slope of the bank must not be greater than to incline five feet backward for every yard of perpendicular height; the surface of this slope to be soddied, sown with hay seeds, or otherwise grassed over as far as the grass will grow, and the remainder covered with gravel, laid partly upon the fascines. The directions of the rows of stakes ought to be suited to the direction of the water, attempting as much as possible a right line or fair curve, avoiding as much as possible all sudden turns and irregularities.

Answer to question 2.—The channel of the river *Nith* has so many sudden turns and irregularities, that the tide spends itself among the sinuosities of the river, and in filling up wide spaces above, after having passed through narrower below, and is thereby prevented from mounting to so great a perpendicular height as it would otherwise attain, in the upper parts of the river near *Dumfries* in case the course was more straight, and had a more regular contraction; and this disadvantage is still the greater, as the space of time occupied by the tide of flood is so short, that it begins to ebb below, before the loops of the river, in the superior part, have time to fill to the level that the surface had been at in the lower, at high water. The navigation, therefore, seems incapable of any great improvements at any moderate expence, otherwise than by cutting a navigable canal, with proper locks and other works upon it, which can be done for much less than it would cost to make the river itself tolerably regular. But the way to prevent it from growing worse than it now is, must be by hindering it from becoming still more crooked, and growing still more wide above than below, giving as free a passage as possible to the tide of flood, especially in the most contracted places. Whatever contributes to this end tends to preserve it; whatever has a contrary effect must be a detriment to it.

Answer to question 3.—In visiting those grounds and works, I observed as follows. That *Cargin Merse* being situated on the concave side, or in the very bottom of a considerable

## [ 3 ]

considerable loop of the river, the direction which the current receives from the superior grounds, on tide of ebb, and from the inferior, on tide of flood, both strongly tend to carry away the land of *Cargin Merse*, and thereby to render the loop still deeper: I am therefore of opinion, that the jettys and works there constructed, in as much as they contribute to prevent this loop from growing deeper, that is, the river from growing more crooked, they thereby contribute to the benefit of the navigation. But I am of opinion, that those jettys have been advanced too far into the river, whereby the course of the water has, in that part, been too much contracted; and also that, by being placed across the direction of the stream, they have contributed to hinder the free passage of the tide of flood, which would of consequence not fill the upper part of the river to so great a perpendicular height, as has been already mentioned. However, as those jettys have in some measure answered one good purpose, viz. that of preventing the river from falling into a deeper loop in that place, and as it might be of dangerous consequence to disturb the body of sleet there gathered, by totally rooting up those jettys, I am of opinion, that such of the jettys as run across, or intercept the current, should be levelled with the present surface of the sleet, which may be done either by driving down or sawing off the stakes. As to the jettys that have been formed on the *Netherwood* side, as they don't seem to have contributed to save the land, or to have answered any one purpose whatsoever, nor do they seem to produce any other effect than that of contracting the river in this, the otherwise narrowest part, and that of intercepting the current on tide of flood, both which, considering the large wide bay just above, and the various meandrings still higher, together with the smallness of the time that the tide of flood acts at this place, I am of opinion, that those jettys are very prejudicial to the navigation, and therefore think, that all of them, whether of wood or stone, should be pulled up, or otherwise levelled with the present bed of the river on which they stand. As to the jettys and works which have been raised upon the *Merse* grounds of *Lagball*, such as are contiguous to those of *Cargin* should be served in the same manner as has been mentioned concerning those of *Cargin*; but as to the rest, they are either so inconsiderable, or so placed, as to produce no sensible effect on the navigation. With respect to future works for preserving or gaining of land, provided they are so contrived as to shorten the course of the current, leaving the channel of the river of such a width, as to be wider than the medium width of half a mile above, and narrower than the medium width for half a mile below; at the same time carrying the weir fence, or advanced work, parallel to the natural direction of the current, reducing it, as near as may be, to a right line or fair curve, without sudden elbows and irregularities; laying also the banks or interior works smooth, and sloping, so as not to catch hold of and entangle the current of the tide of flood: I am of opinion, that all such works ought to be encouraged, as being advantageous to the navigation of the river.

*Austhorpe*, 28th Nov. 1760.

J. SMEATON.

## [ 4 ]

QUESTIONS offered by ROBERT MAXWELL of *Cargin* to the consideration of Mr. SMEATON.

THE Merse grounds of *Cargin* belonging to MR. MAXWELL, are situated on the west side of the river *Nith*, opposite to the Merse belonging to Mr. JOHNSTON, of *Netherwood*, on the east side of the river.

The Merse of *Cargin* for many years had been greatly injured by the river, until MR. MAXWELL raised weirs, or small creals, for defending his property from future encroachment. MR. JOHNSTON, late of *Netherwood*, made works of the same nature on his side, which extend a considerable way higher up the river than MR. MAXWELL's, and opposite to works of the like construction erected on the other side by MR. CORRIE, an heretor adjoining to *Cargin*, on the north or upper side.

While these works were carrying on, the Town Council (as guardians of the navigation of the river) interposed their authority, and, on a visitation thereof, appointed certain parts of the works, on both sides, to be removed, as being prejudicial to the public navigation. This order having been intimated to the whole heritors concerned, they agreed to comply therewith, and became bound in writing to remove the works pointed out as being so injurious. Accordingly MESSRS. MAXWELL and CORRIE did remove such parts of their works as were ordered, and fixed posts or pearches on what remained, for the direction of mariners. The other heretor, MR. JOHNSTON, did not remove a stick or stone of his; on the contrary, his heir and successor is now insisting to have the whole of MR. MAXWELL's works removed, as being hurtful to his, MR. JOHNSTON's, property, and to the public navigation.

It is therefore desired that MR. SMEATON will view the works on both sides, and, upon considering the situation and extent of them, to give his answer to the following questions.

1st. How far were these works necessary for preserving the Merse of *Cargin*; and how can they be further secured, without injuring the navigation of the river, or the private property of others?—In considering this question it is to be observed, that by the situation of the opposite grounds of *Netherwood*, and the higher works thereon, which extend far into the channel, the force of the land flood and ebb tide, as well as the current of the flowing tide, is thrown with much violence on the bosom of *Cargin* Merse, which has nothing but these

## [ 5 ]

these works to repel the force of it; so that MR. SMEATON will please to consider what would have been the natural consequence had such work not been made.

Question 2.—How far are the works on *Cargin* side prejudicial to public navigation? And please also consider whether works of this kind, raised in defence of private property, are illegal and unprecedented; and whether they tend to hurt public navigation, and injure the private property of an opposite heretor.

---

QUESTIONS offered by ROBERT MAXWELL, of *Cargin*, anent his work on the side of the river *Nith*, to the consideration of MR. J. SMEATON.

IT is desired that MR. SMEATON, in visiting the river, will view and consider the course of the river, the floods and tide, and the situation of the grounds and works constructed thereon, upon the *Merse* of *Cargin* and *Netherwood*, and give his answers to the following questions.

1st. Whether from the course of the river, and the situation of the opposite ground, the *Merse* of *Cargin* is exposed to the force of the land flood and ebb tide, and also to the current of the flowing tide; and if works were not therefore necessary, for defending *Cargin Merse* from the future encroachments of the river?

2d. Whether the work already erected on *Cargin Merse* can hurt or prejudice the opposite *Merse* of *Netherwood*; and whether these works can be deemed illegal and unprecedented, as being injurious to the opposite grounds?

3d. How can these works be secured or improved, in the easiest and most effectual manner, for preserving *Cargin Merse*, without injuring public navigation, or the private property of neighbouring heretors?

ROBERT MAXWELL.

---

ANSWER.

## [ 6 ]

ANSWERS to the Questions offered by ROBERT MAXWELL of *Cargin*, anent his Works on the side of the River *Nith*, by JOHN SMEATON.

## Answer to Question 1st.

CARGIN Merse laying in the bottom, or most concave part, of a considerable loop of the River *Nith*, is by its situation exposed to the principal action of the flood and ebb tides, and also to that of the land floods; and the natural soil being of a very loose nature, artificial works were absolutely necessary, for the defence thereof from future encroachments of the river, as without this, the natural effect of the currents would be, to make this loop of the river still deeper, by carrying away the soil of *Cargin Merse*.

Answer to the 2d question.—As *Cargin Merse*, notwithstanding what has been done, is still on the concave side of a deep loop of the river, the principal force of the current is still exerted on that side; and as the opposite grounds lay upon the convex side, they cannot be sensibly affected thereby; and those above, or below this concavity, are at too great a distance to be thereby affected. Works for this purpose are frequently made, and if not advanced further than what has been known to have been firm ground in the memory of man, I apprehend cannot be deemed illegal; but this part of the question more properly belongs to the laws.

Answer to the 3d. question.—By making the weirs parallel to the direction of the current, so as to make, as much as possible, a right line or fair curve, and sloping the banks, covering the same with fascines and gravel, except on such places as they can be grafted over.

*Austhorpe*, 28th November, 1760.

J. SMEATON.

---

To

Cambridge University Press

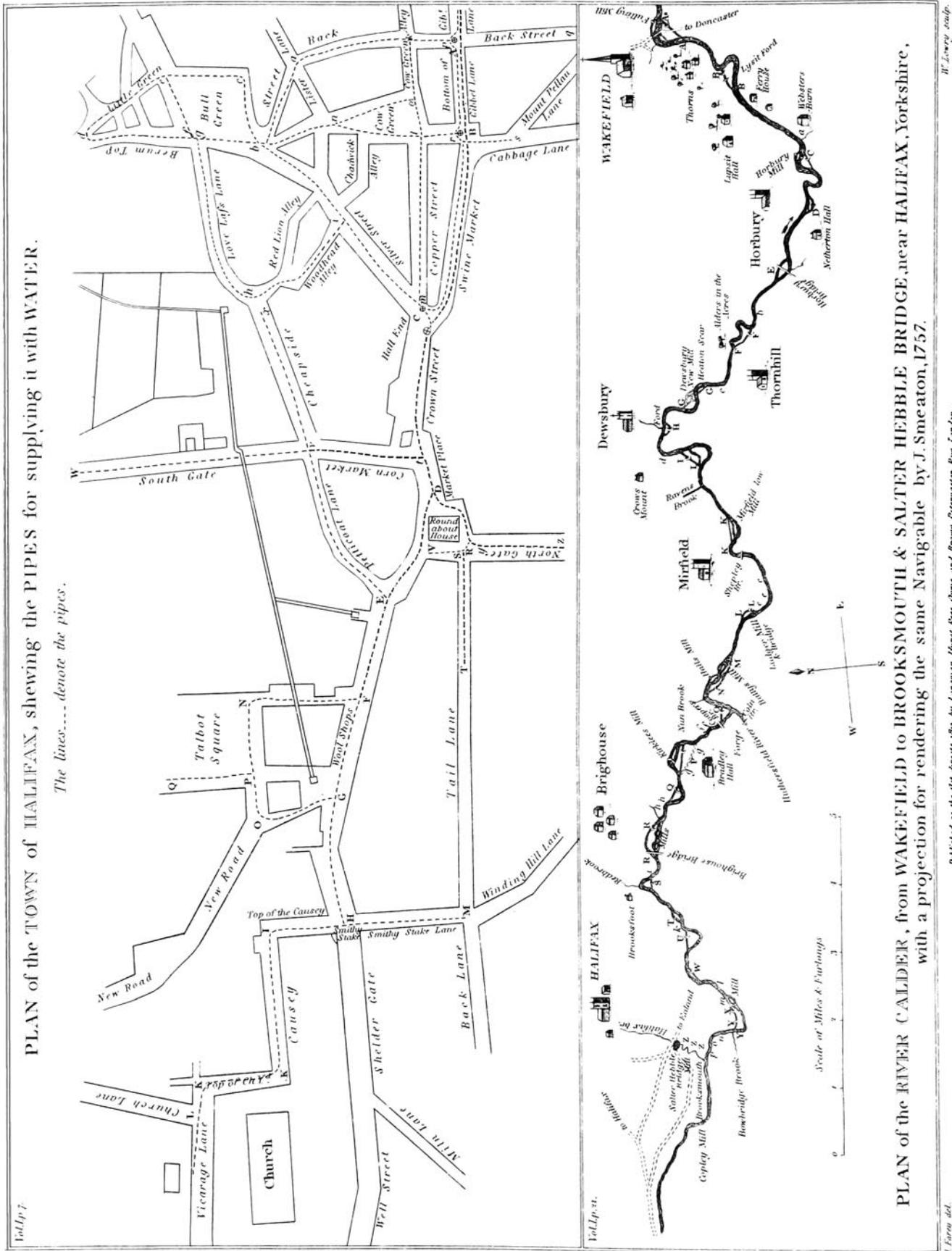
978-1-108-06977-9 - Reports of the Late: John Smeaton: Made on Various Occasions, in the Course of his Employment as a Civil Engineer: Volume 1

John Smeaton

Excerpt

[More information](#)

---



PLAN of the TOWN of HALIFAX, shewing the PIPES for supplying it with WATER.

The lines.... denote the pipes.

PLAN of the RIVER CALDER, from WAKEFIELD to BROOKSMOUTH & SALTER HEBBLE BRIDGE, near HALIFAX, Yorkshire, with a projection for rendering the same Navigable by J. Smeaton, 1757.

Published as the Act directs, this by J. Smeaton, Architect, Surveyor, Engineer, and Surveyor, Peterborough Row London. J. Every del. W. Every sculp.



[ 7 ]

On the water-works at *Halifax*.

To Mr. SIMPSON.

S I R,

INCLOSED you have a sketch of the method which I would propose for laying of the pipes of the intended Water-works at *Halifax*, and an estimate referring thereto, which I hope will be near the matter, having spent some time in the consideration and forming thereof; however, I would not wholly rely upon my own judgment, but desire that those papers may be overlooked and considered by my ingenious friend JOSEPH KNIGHT, whose natural sagacity and acquirements in these kinds of affairs will, I am persuaded, lead him to discover and point out such oversights and mistakes as I may have been guilty of, notwithstanding the care I have taken; and I must take this opportunity of desiring, that, though the Gentlemen have thought proper to consult me on this occasion, I may not be considered as any bar to his merit, but rather as jointly concerned.

It may not be amiss, however, to point out the general principle upon which I have conducted myself; and, in the first place, as the town lays very unequal in point of level, and, of consequence, a very great perpendicular pressure will lay upon the pipes, especially towards the lower parts, I have endeavoured to avoid the additional expence, that naturally would arise from proportional increase of thickness, by taking advantage of such circumstances in the situation, as have a tendency to relieve the disadvantages thereof; and, with this view, I have assigned the bores of the pipes in general considerably less than I should have done, in case the town had been more upon a level, because the declivity has a tendency to force the water through the pipes with greater velocity, and make them give as much water through a given orifice, as would be done by a larger pipe more upon a level, and with a lesser pressure upon it.

2dly. Considering that the supply will come from above the head of the town, and that the pipe of conduct, at its first entrance into the town, must carry all the water necessary for the supply of the whole, but that in going lower down it has only the water to convey for such parts as lay still lower; of consequence, the necessary bore of the pipe of conduct will grow less and less the further and lower it goes; but as it is a certain principle in hydraulics, that pipes become stronger in proportion as their diameters are less, when the thickness of the shell of the metal is the same, it follows, that if their bores are diminished in proportion as their perpendicular pressure is increased, the smaller pipe will be as able to sustain its weight of water as the larger will be to sustain the pressure peculiar thereto;

## [ 8 ]

thereto : for these reasons, instead of adding to the weight of metal as we go lower down, I have proposed the same thickness for the main all the way, and by diminishing the diameter, and consequently the weight, have added the necessary strength ; by which advantage a great weight of metal will be saved, without injury to the main design. As to the branches, I have proportioned their thickness to the thickness of that part of the main which is upon the same level, regard being had to the difference of their bores ; by these means every part of the system of pipes will be equally strong, with respect to the stress that will come upon it. I don't mean, however, that every part is adjusted with a mathematical exactness ; for as I have allowed every part to be considerably stronger than what may be barely called sufficient, that would be not only unnecessary, but by making every yard of pipe of different bore and thickness, would be more unreasonably troublesome in the execution. That that part of the main which lays between the reservoir at the *Gibbet*, and the back street, I have supposed of the same bore and thickness all the way, for the ease of calculation ; but, in reality, I propose it to be considerably wider towards the reservoir, yet, as the pressure diminishes that way, it can be done with the same metal as the calculation supposes.

3dly. Considering, likewise, the inequality of the ground in another view, in case there should be, at any time, any defect in point of quantity furnished to the reservoir for the supply of the whole town, it is evident that the lower parts of the town would be first supplied, because the water will naturally run down hill, and accumulate in the lowest parts first, by which means the lower parts would be well supplied, when the upper parts were partially, or scarce at all supplied : and even when the reservoir would furnish as much water as the pipes could take, as the water would issue with much greater velocity from the lower cocks than from the higher ; should many of the lower cocks be open together, this would still abate the issuing of the water from the higher, and especially those at a distance from the main, so that while the lower cocks were kept running in this manner, the upper ones would be but faintly supplied ; for remedying of which defects, as well as others that would accrue from the sensible effects of the leakage and waste of all the cocks in the town at once, I propose to part the town into two divisions, the upper and the lower, to receive the water alternately : the upper division to consist of all the streets above the Hall end, and the lower division of all below, which will be done by placing a stop-cock upon the main at \* ⊕, and three others at the three principal branches at ⊕ A, ⊕ B, and ⊕ C ; by which means, the \* cock being shut, and A, B, and C open, the upper division will be served alone : on the contrary, the cocks A B C being shut, and the \* cock open, the lower division will be served, and no part of the upper. And here it must be remarked, that I propose the two streets,  
called