# TREATISE ON THE IMPROVEMENT OF THE NAVIGATION OF RIVERS: WITH A NEW THEORY ON THE CAUSE OF THE EXISTENCE OF BARS

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Treatise on the Improvement of the Navigation of Rivers: With a New Theory on the Cause of the Existence of Bars by William Alexander Brooks



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WILLIAM ALEXANDER BROOKS

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Trieste

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OF BARS.

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BY

WILLIAM ALEXANDER BROOKS,

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" Nos erreurs sont, en cette matière, d'une toute autre conséquence que dans les objets de goût, de luxe, ou d'agrément; parceque toujours il en résulte, ou un dommage réel, ou la perte de quelque avantage précieux."—Du Buat.

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# TREATISE,

*&c.*

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## CHAPTER I.

### ON THE BARS OF RIVERS.

THE subject of this chapter is one of the very highest importance, whether it be considered in relation to national objects, or to science.

This has been so much felt in past ages, as well as in our own times, that many works of great magnitude have been undertaken for the purpose of obviating or removing the impediments to navigation, arising from the presence of bars. Many theories have been advanced to account for the formation of bars, amongst which I shall first notice that propounded by Major Rennel, in a note to his translation of Herodotus, which, moreover, describes in clear and general terms, the appearance usually presented by them.

" All rivers," says Major Rennel, " preserve to a certain extent of space, which is proportioned to the

velocity of their streams, a current of water into the sea, beyond the points of land that form their embouchures; when by the continued resistance of the sea they at last lose their motion. The mud and sand suspended in these waters during their motion, are deposited when that motion ceases, or rather, they are gradually deposited as the current slackens, according to the gravity of the substances that are suspended. This deposition then will form a bank or shallow in the sea, and which will be of a fan-like shape, consistently with the form in which the water of the river disperses itself. This bank is of very considerable breadth, and is, of course, constantly on the increase in height as well as extension, and the additions constantly made to the breadth will be on the side towards the sea, until the bank rises up nearly to the surface of the river water, which is constantly poured into the sea, and escapes freely over it; but when the bank has risen so high, as to inclose the water in a kind of lake, it is then compelled to force its way through the bank, although the passage will be both narrow and shallow while the bank remains under water. This passage is technically termed a BAR; for such it is in respect of the channel of the river, although it be the deepest part of the entrance to it."

The Vice President of the Geological Society, Mr. De la Beche, in his Geological Manual, advances another theory to account for the formation of bars,

in these words: "The action of waves on coasts is not only exhibited in piling up detritus in the direction of their greatest force on the shore, by which embouchures of rivers are turned on one side, but also by heaping up bars, as they are termed, even at their mouths, rendering their navigation dangerous, and in many instances preventing it altogether, though behind these barriers the rivers may have considerable depth and breadth.

"In some situations these bars are partially dry at low water, at others they are never uncovered, though rendered visible by the breaking of a furious surf."

A third theory attributes the existence of bars to the casual circumstance of the strength of the current of the flood tide not running in the same channel with that of the ebb; or to the embouchure of the river not being directly in the line of, or freely open to the course of the tidal current.

A fourth, assigns their formation to the occasional circumstance of the lower reach, or embouchure of the river, discharging its waters at right angles, or nearly so, into the sea, in lieu of entering it obliquely; or, in the words of one who has devoted much time in promulgating this theory:—

"The cause of the existence of bars is the conflicting action of effluent currents, or tides, passing into the ocean at right angles to the shore.

"This is the sole cause of bars at the mouths of

harbours; and wherever there is a backwater, or what is termed a scouring power, in operation, there a bar exists; and it is an invariable fact, that whenever attempts have been made to remove bars by increasing the velocity of the natural currents into the ocean, there the bars have also increased in proportion. To these consequences no exception is to be found in the whole globe, and in many cases, harbours have, from the causes alluded to, been blocked up and lost! But if the current or tide be by artificial means conducted into the ocean so as to join the sea tide at an acute angle, no conflicting action can arise, and then no bar will accumulate, but whatever silt or other matter be in that case held in suspension by the tides or currents will be carried away from the harbour's mouth in the direction of the tidal water of the ocean[1]."

A fifth assigned cause is an imagined insufficiency of backwater.

Commencing with the theory given by the talented translator of Herodotus, I venture to submit that it is insufficient to account for the formation of bars, because the operations described as producing the latter, take place in all rivers in a greater or less degree, and in those which, although their waters are most abundantly loaded with sand or mud, are nevertheless free from the presence of bars; and here it

[1] Nautical Magazine, p. 487.