(No Model.)

L. COISEAU.

METHOD OF AND APPARATUS FOR FACILITATING THE REMOVAL OF SAND, GRAVEL, AND THE LIKE FROM RIVERS, HARBORS, &c.

No. 301,682. Patented July 8, 1884.

Fig 1

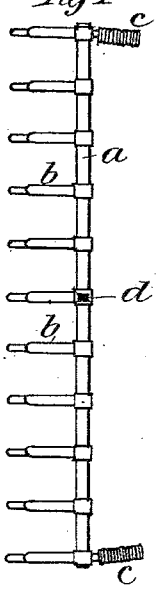


Fig 2.

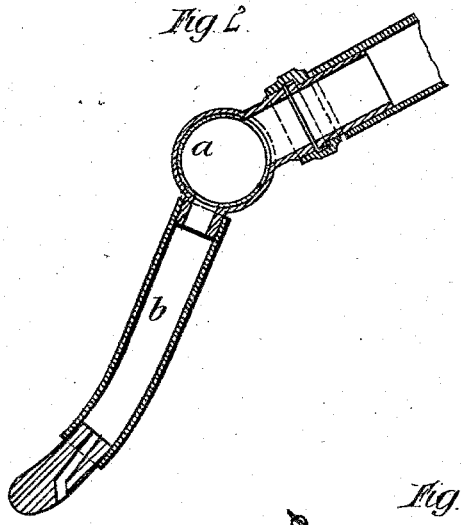


Fig 3.

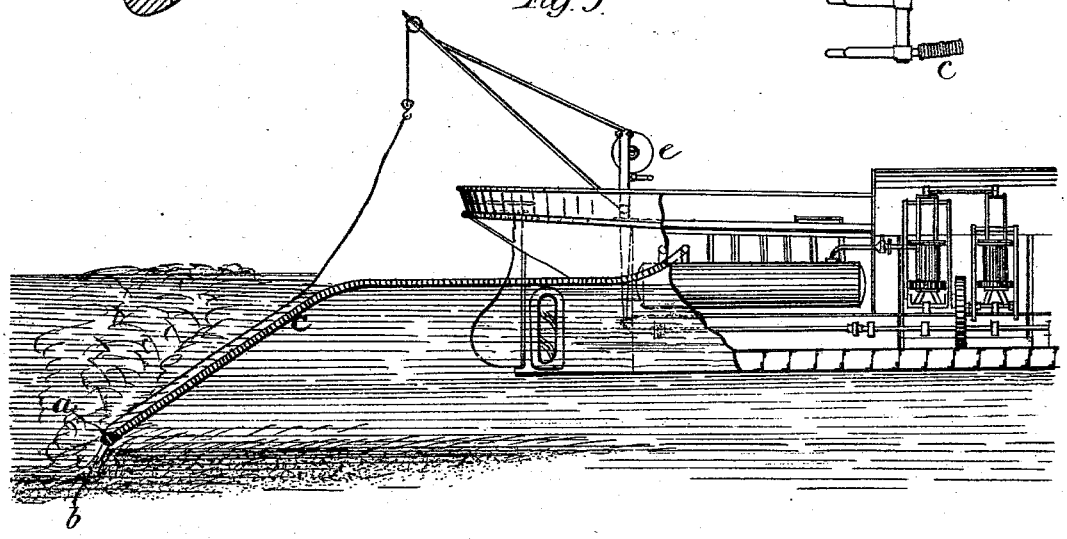
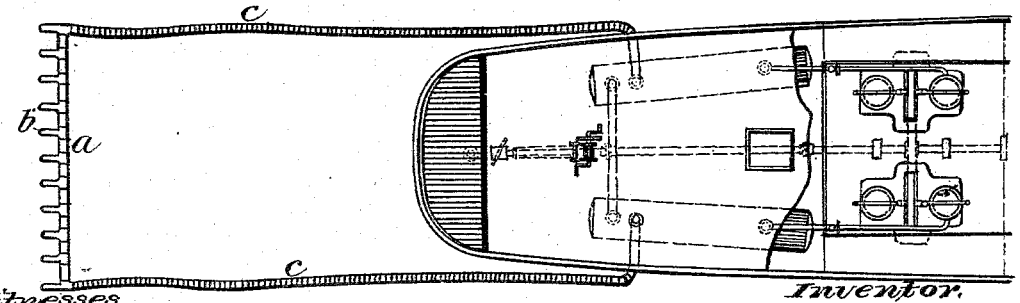


Fig 4.



Witnesses.
J. A. Rutherford
Robert Everett.

Inventor.
Louis Coiseau.
By James L. Norris.
Atty.

UNITED STATES PATENT OFFICE.

LOUIS COISEAU, OF ANTWERP, BELGIUM.

METHOD OF AND APPARATUS FOR FACILITATING THE REMOVAL OF SAND, GRAVEL, AND THE LIKE FROM RIVERS, HARBORS, &c.

SPECIFICATION forming part of Letters Patent No. 301,682, dated July 8, 1884.

Application filed June 14, 1883. Renewed April 23, 1884. (No model.) Patented in England April 5, 1883, No. 1,724, and April 6, 1883, No. 1,750.

To all whom it may concern:

Be it known that I, LOUIS COISEAU, of Antwerp, in the Kingdom of Belgium, civil engineer, have invented new and useful Apparatus for Removing Sand, &c., from Harbors, (for which I have applied for provisional protection in Great Britain on the 5th day of April, 1883, No. 1,724, and on the 6th day of April, 1883, No. 1,750,) of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to improved methods of and apparatus for disaggregating or separating sand, gravel, mud, and like substances in rivers or other water-courses or harbors, the said methods being based upon the employment of compressed air.

In carrying the said invention into practice I provide an air-compressor which, in some cases, is placed upon a boat, at one end of which is fixed a pipe either rigid or flexible, this pipe being united to the compressor. A windlass is provided for raising or lowering the pipe, which is supported by the chain of the said windlass. The end of the pipe designed to enter the water is furnished with one or more nozzles, each having a small orifice through which the compressed air escapes. These nozzles rest upon, and are dragged along, the bottom of the water-way in such a manner that should any obstacles be encountered—such as piles, débris of old boats or vessels, rocks, or the like—the said nozzles will glide over the same without being caught thereby. If this were not provided for the apparatus would be liable to destruction. Consequently this arrangement is of considerable practical importance. Each orifice through which the compressed air escapes occupies such a position that it discharges toward the boat. When the pipe is a flexible one, I can render it rigid by covering it with suitable material, or in any other suitable manner. The method of setting the nozzle is shown in Figs. 2 and 3 of the drawings, in which it is represented as inclining rearwardly and downwardly at an oblique angle to the supply-pipe *c*. In addition to inclining, as shown and described, it also, by preference, curves rearwardly, as shown in Fig. 2. The opening for the escape of the air from the nozzle runs so as to discharge the air in the direction that the nozzle is moved against or toward the obstruction to be removed, and preferably in an oblique direction to the length of the nozzle, as shown in Fig. 2; and it may be formed in a tip made separate from the nozzle proper, but connected therewith. It is obvious, however, that the nozzle may be made in one piece without departing from my invention, although I make no claim to making it in one piece.

This apparatus is of considerable use in maritime or other works. The following remarks will indicate some of the most important uses—that is to say, when it is required to clean or clear a joint or junction between two caissons, I introduce a rigid pipe (which, for this purpose, has a single nozzle) into the mud or sand which stops up the said joint. The air-pump is then operated and the sand or mud is immediately raised by the compressed air and carried off by the current. If it is desired to remove a sand-bar to prepare space for a caisson, or to remove the sand accummulated against walls by pile-driving or otherwise, I arrange at the ends of the pipes, and perpendicularly to the axis thereof, another pipe upon which there are small branch nozzles or tubes, the number of which must be proportionate to the breadth of the material to be removed and to the hardness of the substance to be disaggregated and distributed or placed in suspension in the water.

My apparatus may also be applied for regulating streams, maintaining the proper depth in channels, and removing sand or mud banks at the entrance of harbors. In this case I employ two pipes of india-rubber leading from the air-compressor placed upon the boat. These pipes are of such a length as to allow the boat to yield to the motion of the waves without injuring the apparatus.

In the accompanying drawings, Figure 1 is a plan of a pipe provided with nozzles and arranged perpendicularly to the keel of the boat. Fig. 2 is a vertical section of the said pipe and one of the nozzles. Fig. 3 is a sectional elevation, and Fig. 4, a plan, of a boat provided with my improved apparatus.

In the drawings, *a* is the pipe. *b b* are the

nozzles. *c c* are flexible pipes for the supply of compressed air. *d* is a lug for suspending the pipe *a* or attaching the same to a crane or winch, *e*. The thickness of the layer of material to be removed at each operation depends upon the hardness of the ground, the speed at which the boat is to travel, and other circumstances. If the current is strong, the boat may travel slowly. In this case a layer of from thirty to fifty centimeters in thickness may be moved and distributed. If the current is weak the speed of the boat may be increased and less material displaced.

My invention, when applied for maintaining the depth of channels leading to harbors, gives good results and may at the same time serve to insure a depth which it would be difficult to obtain by means of bucket-dredges or others, even at considerable expense. It may also be applied to the cleansing of collectors, drains, and the like.

The cost of dredging by means of the ordinary bucket or other dredges as compared with the cost of the same work effected by the system to which this invention relates is estimated at five to one.

What I claim is—

1. In mechanism for removing obstructions from bodies of water, the combination, with the pipe for supplying the actuating-fluid, of a nozzle inclined rearwardly from said supply-pipe, and provided with a discharge-orifice opening on its under face, substantially as described.

2. In mechanism for removing obstructions from bodies of water, the combination, with the pipe for supplying the actuating-fluid, of a nozzle curved and inclined rearwardly from said supply-pipe, and provided with a discharge-orifice opening on its under face, substantially as described.

3. The combination, with an air-compressor, of flexible supply-pipes *c*, transverse pipe *a*, and nozzles *b*, connected with pipe *a*, and inclining rearwardly therefrom, substantially as described.

In testimony whereof I have hereunto signed my name in the presence of two subscribing witnesses.

L. COISEAU.

Witnesses:
V. HEUERT,
W. WESTLAKE, Jr.