2 Sheets—Sheet 1.

W. B. HYDE.

DREDGING.

No. 188,369. Patented March 13, 1877.

Fig. 1.

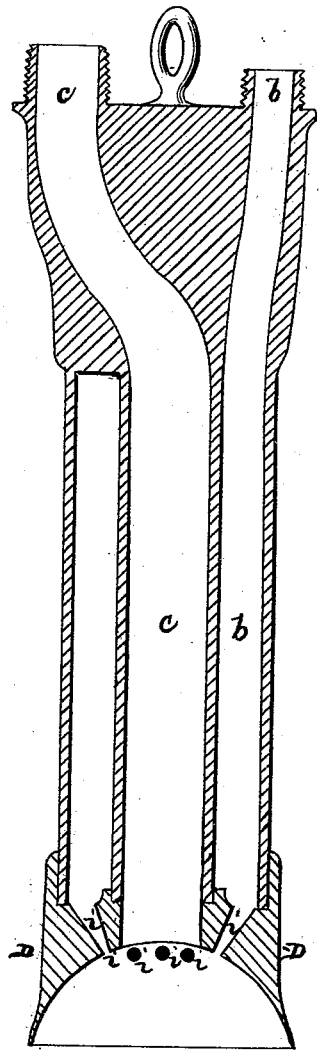
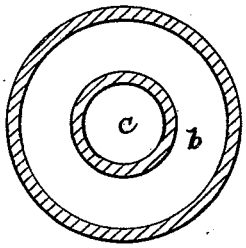


Fig. 2



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2 Sheets—Sheet 2.

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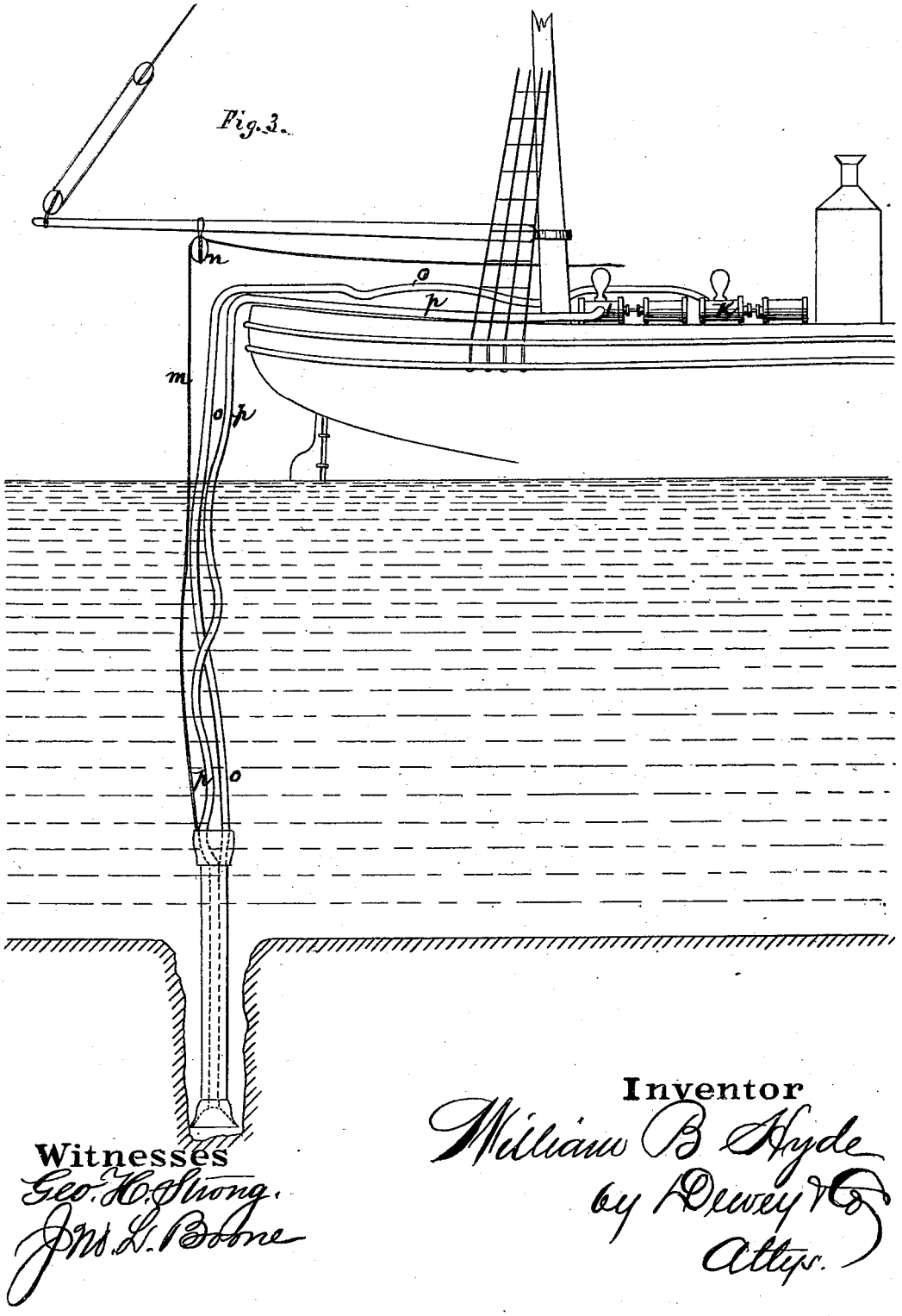
Fig. 3.



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UNITED STATES PATENT OFFICE.

WILLIAM B. HYDE, OF OAKLAND, CALIFORNIA.

IMPROVEMENT IN DREDGING.

Specification forming part of Letters Patent No. **188,369**, dated March 13, 1877; application filed January 27, 1877.

To all whom it may concern:

Be it known that I, WILLIAM B. HYDE, of Oakland, county of Alameda, and State of California, have invented Improvements in Submarine Boring and Dredging; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawing.

My invention relates to a novel mode or method of making submarine excavations; also, to an improved boring-dredger, by means of which I can sink holes in the bottoms or beds of rivers, lakes, and bays or seas, and remove the dredgings therefrom with great facility.

My method of excavating consists in sinking or boring a series of vertical holes or wells into and below the bottom or bed of the river, lake, or bay at the place where it is desired to excavate, or to deepen the water, so that after the drill or boring implement has been removed the action of the water upon the bottom of the river, lake, or bay will fill the holes with the loose material which forms the surface of the bottom, and thus reduce the general level of the bottom in a corresponding degree.

My boring apparatus consists of a barrel or cylinder of the required length, through which I make two distinct and independent passages or conduits. The lower end of this tube or pipe is made flaring or bell-shaped, so that it will press upon the bottom of the bore and exclude the surrounding or outside water. To the upper end of each passage or conduit I attach a pump, one of which acts as a force-pump to force a stream of water through one of the passages against the earth in the bottom of the bell-shaped chamber, for the purpose of cutting and loosening it up, while the other acts as a suction-pump to withdraw the water and loosened material, all as hereinafter described.

Referring to the accompanying drawings, Figure 1 represents a barrel or cylinder of any desired length, through which two independent passages or conduits, *b c*, pass. The lower end of this barrel or cylinder is provided with a flaring or inverted bell-shaped end piece, D, the interior of which forms a bell-shaped chamber, so that the edge of the bell-mouth or end piece will rest upon the mud or bottom of the river, lake, or bay, and thus form a chamber at the lower end of the barrel, into which but little outside water can pass. The lower ends of both of the passages or conduits *b c* terminate in this chamber, as hereinafter described. I then connect the upper end of each of the passages or conduits *b c* with a separate pump by means of a flexible hose, *e*, or other suitable tube or pipe, so that the barrel or cylinder can be lowered from a vessel or other floating structure until the rim of the bell-shaped end piece D rests upon the bottom of the river, lake, or bay. One of the pumps acts as a force-pump by taking water from the river, lake, bay, or other reservoir, and forcing it down through the conduit *b*. This I call the "forcing-stream." The lower end of this tube or passage terminates in a series of small perforations inside of the chamber at the lower end of the cylinder, so that each perforation will serve as a nozzle to direct a small stream of water directly downward against the material upon which the rim of the mouth or chamber rests, and thus loosen it. The other pump, which is connected with the conduit *c*, is a suction-pump, and serves to withdraw the water and loosened material through the conduit *c* from the chamber as fast as it accumulates.

It will thus be seen that I employ two separate independent pumps, each of which is connected, by a separate hose, with a separate conduit. One pump forces water into the inverted bell-shaped chamber, for the purpose of loosening the material, while the other withdraws from the chamber both the water and loosened material. As fast as the material is withdrawn from under the chamber the implement settles down, thus boring a hole with great facility.

Fig. 3, Sheet 2, represents the plan of a vessel upon which two pumps, K L, are located, and from the stern of which the implement above described is suspended by a rope, *m*, which passes over a pulley, *n*, and thence back over a drum or windlass, by means of which it can be raised or lowered. *o p* represent two flexible tubes, one of which, *o*, connects the pump K with the conduit *c*, thus carrying the forcing-stream into the conduit

b, while the other, *p*, connects the pump L with the conduit *c*, and forms the suction apparatus. This plan is a correct representation of an arrangement of the above-described apparatus, by which I have recently made a line of one hundred and twenty borings in the Bay of San Francisco, aggregating twenty-five hundred feet of borings, accomplished in seventeen hundred working minutes. These borings were made below water from sixteen to eighty-one feet in depth, each boring averaging twenty feet in depth.

My invention consists in connecting two pumps with a single chamber by means of two independent passages, so that each pump will have a distinct duty to perform, independent of any particular manner of arranging the conduits; yet I prefer to construct the boring-implement with the suction tube or passage passing down directly through its center, as represented at Fig. 1. In this case I make an annular chamber around this central tube, the upper end of which connects with the passage *b*, while a series of small perforations or nozzles, *i i i*, are arranged at intervals apart around the lower end of the central suction-tube, so as to connect the annular chamber with the interior of the inverted bell-shaped chamber. These perforations or nozzles I make at such an angle that all of the streams issuing from them will converge or focus at a suitable point below the nozzles, thus producing, in effect, a concentrated stream acting upon a large surface. The effect of this concentrated stream is to cut up and loosen the material which the bell-mouth rests upon, and cause it to boil upward into or toward the mouth of the suction-pipe, while the action of the suction-pump lifts the material through the conduit *b*.

This arrangement is the most effective of any that I have attempted; but the forcing-stream could be delivered at the center, and the suction-pipe arranged to take up the loosened material outside of it in a very effective manner.

This implement is very useful, not only for making a series of vertical holes for dredging purposes where it is desired to deepen a channel, but is of great value in prospecting in the bottoms of rivers, lakes, and bays, in order to discover the character of the underlying strata for engineering purposes, as the character of the material which is passing through can easily be determined by testing the material from the outflow-pipe. A chart of the substratum which underlies bodies of water can thus be easily produced, as has been actually done in the case above mentioned.

As a dredging-implement, this device has the advantage of allowing me to remove a large quantity of dredgings without moving the floating structure or dredging apparatus, because I can bore a number of holes at intervals apart, so that when they are filled up by the action of the water or otherwise the effect will be to reduce the general level of the bottom as much as if the dredgings were skimmed from the surface of the bottom; and if it be desired to hasten the work, and not wait for the holes to be filled by the action of the water, I can lower and explode a giant-powder cartridge in one or more of the holes, and thus destroy the walls between them, so as to fill the holes and reduce the level immediately.

I am aware that a single stream of water has heretofore been forced through a pipe into a submarine chamber by a pump, and then upward again by the pressure from the same pump for the purpose of raising dredgings and earthy material. I am also aware that earthy material and dredgings have been raised through a pipe by a suction in combination with a digging-wheel or other mechanical device for loosening and digging up the material. These, however, I do not claim.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The mode or method of making submarine excavations, consisting in boring a number of vertical holes in the bottom of rivers, lakes, and bays, and allowing them to fill, substantially as and for the purpose described.

2. A submarine boring or dredging implement, consisting of an open-bottom vessel or bell-shaped chamber, D, in combination with two separate passages, *b c*, each of which is connected by a flexible or extensible tube, *e*, with a separate and independent pump, one of which acts as a force, while the other acts as a suction pump, substantially as and for the purpose described.

3. The inverted bell-shaped end piece D, connected with the hose or conduit *b* by a central passage or opening, and having the conduit *c* connected with an annular chamber, from which small nozzles or perforations *i i* connect with the interior of the bell-shaped chamber, substantially as and for the purpose described.

In witness whereof I have hereunto set my hand.

WILLIAM B. HYDE.

Witnesses:
GEO. H. STRONG,
OLWYN T. STACY.