No. 691,123. Patented Jan. 14, 1902.

G. A. FARWELL.

PUMPING AND DREDGING APPARATUS.

(Application filed Mar. 5, 1901.)

(No Model.)

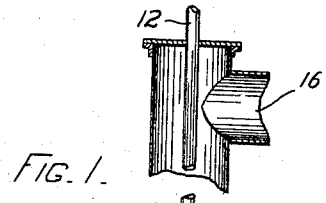


FIG. 1.

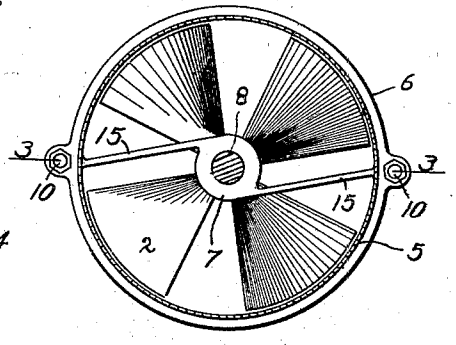


FIG. 2.

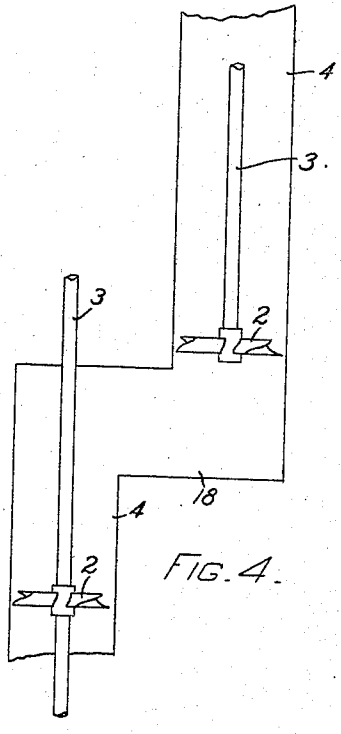


FIG. 4.

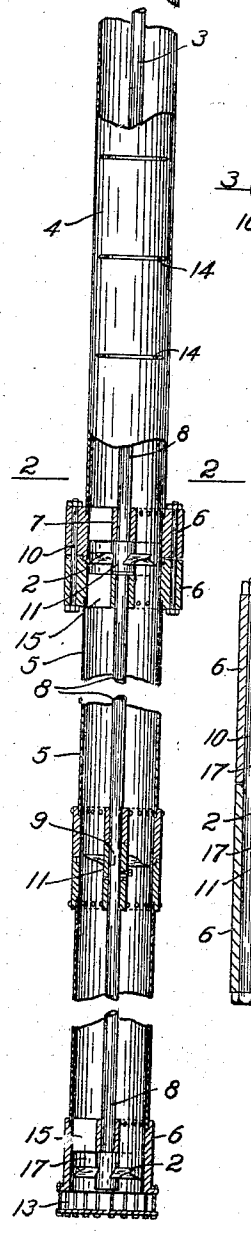
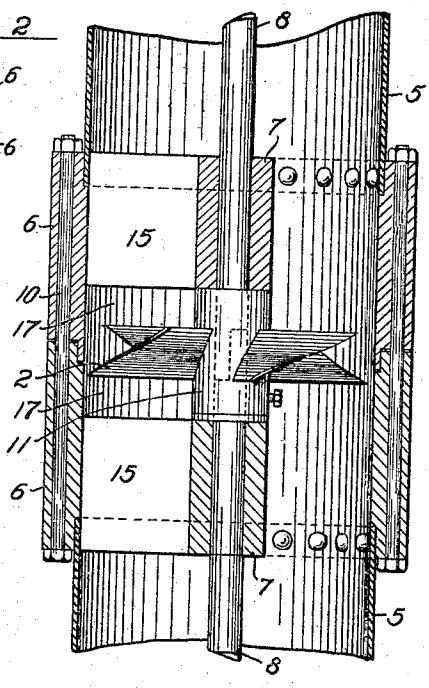


FIG. 3.



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PUMPING AND DREDGING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 691,123, dated January 14, 1902

Application filed March 5, 1901. Serial No. 49,787. (No model.)

To all whom it may concern:

Be it known that I, GEORGE A. FARWELL, a citizen of the United States, residing at Manchester, in the county of Hillsboro and State of New Hampshire, have invented certain new and useful Improvements in Pumping and Dredging Apparatus, of which the following is a specification.

My invention relates to apparatus such as is used for pumping out dry-docks, wrecks of vessels, and the like, and more particularly to apparatus of that type in which the water is forced upward by the action of one or more propeller-blades secured to a revolving shaft which is centrally journaled within a suitable pipe or passage-way, each propeller being arranged to act upon the water raised up to it and force it upward to the propeller next above it, thus effecting a step-by-step propulsion of the water through the apparatus.

My invention is intended to improve upon prior apparatus of the type above referred to as to certain features hereinafter set forth, and particularly to provide for the building up of an efficient apparatus out of any desired number of similar unit-sections, according to the height to which it is desired to raise the water operated upon, said unit-sections being superimposed and operated simultaneously.

In the accompanying drawings, Figure 1 is a side view, partly in elevation and partly in central vertical section, of a pumping apparatus constructed in accordance with my invention. Fig. 2 is a cross-section, enlarged, on the line 2 2 in Fig. 1. Fig. 3 is a vertical section of a portion of the apparatus, taken on the line 3 3 in Fig. 2. Fig. 4 is a diagrammatic view illustrating a modification of my apparatus.

The apparatus shown in the drawings is composed of a series of screw-propellers 2, secured to and operated by a common shaft or line of shafting 3, which is centrally journaled and supported within a vertical pipe 4. Said pipe and shafting are made up of superimposed similar sections, the number of which varies according to the height to which it is desired to force the water or other material operated upon and which can readily be separated or coupled together, as desired. The apparatus thus comprises a number of similar units, each of which consists, preferably, of a length of pipe 5, provided at each end with a flange 6, to which it is bolted, and with a central hub or bearing 7, in which is journaled a length of shafting 8, having a propeller 2 secured thereto. In order to enable said unit lengths to be secured together conveniently and expeditiously, I prefer to form the ends of each section of shaft 8 with interlocking half ends, as shown at 9, so that the shaft will rotate as a whole when the units are assembled and fastened together, as by bolts 10, passed through the flanges 6, as shown. Each propeller 2 is secured to its length of shaft 8 at any desired point, but preferably at its upper end, in such manner that the thrust of the propeller is received by the bearing 7, on which it is supported, while the hub 11 of the propeller itself acts as a coupling to receive the interlocking end of the shaft length 8 next above it, as shown in Fig. 3. In the apparatus shown the lower section of shafting 8 has two propellers secured to it, one at each end; but all the sections above it except the top one have only one propeller each, and said top section has none, serving simply to drive the sections below it. Each section of shafting 8 may, however, have any desired number of propellers secured to it, according to its length, the propellers being usually located about eight feet apart. Power is applied to the top of the shaft, as at 12, by any suitable means, but preferably by a direct-connected engine or motor, (not shown,) and the device will ordinarily have a strainer 13 secured to its lower end. In Fig. 1 I have shown the exterior of the pipe 4 as provided with a series of horizontal rods or other projections 14, forming a ladder upon which the apparatus may be ascended and descended.

In order to prevent the column of water contained within the pipe 4 from being rotated bodily by the action of the propellers 2 and thereby diminishing or destroying the propelling effect of the latter, I provide a series of longitudinal ribs or riffle-boards 15, preferably radially arranged and cast integral with the flanges 6 and bearings 7, and thus serving to connect the latter with said flanges. As thus constructed one riffle-board 15 is located above and one below each propeller 2, as shown, so that any tendency of the column of liquid to rotate will immediately be checked

by said riffle-boards, and its flow will be directed upwardly through the pipe 4 and out through the opening 16, provided at or near its top. I prefer to arrange the riffle-boards 15 tangentially to the hub 7 respectively, as best shown in Fig. 2, so that each riffle-board will extend from the circumference of the apparatus to a point forward of its center with respect to the direction in which the shaft 8 rotates, the object of this construction being to present to the ascending column of water a series of surfaces slightly inclined in such manner that all circumferentially-flowing currents will be deflected by said surfaces toward the center of the apparatus where the centrifugal action is the least, so that the tendency of the water-column to rotate as a whole with the propellers will be neutralized and all the power applied will be utilized in lifting said column. I also prefer to provide spaces 17 between each propeller 2 and the adjacent riffle-boards 15 sufficiently wide to afford clearance for the largest solid substances which can pass through the strainer 13 in order to avoid injury to the propellers.

In Fig. 4 I have indicated an arrangement whereby my apparatus may be adapted to be used for raising water to considerable heights, as is often desirable in carrying on mining operations and the like. According to this arrangement the pipe system 4 is offset at suitable intervals, as at 18, and is independently supported at each offset. Each portion of said pipe 4 between two offsets is provided with a separate shaft 3, carrying any desired number of propellers 2, said shafts being driven simultaneously by any suitable means. As thus constructed each shaft and the propeller or propellers carried by it serve to lift the water from one offset portion 18 to the next, the head of water in any section of pipe 4 being thus prevented from exerting pressure upon the pipe and propellers below such section, while the total weight of the column of water and of the apparatus itself is divided and independently supported at a suitable number of points.

By employing the unit construction described my apparatus may be made very portable and can readily be set up at any desired place and made of any desired height, according to the circumstances in which it is to be used. For example, when used in pumping out wrecks it can be suspended by its top from the boom or mast-head of the wreck or of a lighter and raised or lowered bodily at will. It may also be used effectively for lifting water charged with grain, coal, or the like, as in emptying wrecks, as it has no valves or similar parts which might be clogged or obstructed by any solid substance contained in the water which is drawn through it, and it is thus well adapted for dredging on muddy, sandy, or gravelly bottoms. In such cases the strainer 13 will have a mesh corresponding to the coarsest solid material which is to pass through it, and the powerful currents produced at and near said strainer by the suction due to the action of the propellers as they force the water up through the pipe will loosen the adjacent material by their erosive action and carry it in suspension into the apparatus and out through its open top.

It will be evident that my apparatus may be considerably modified in various details without departing from my invention and that it may be set up and operated at any desired angle instead of vertically.

I claim as my invention—

1. In an apparatus of the character described, the combination of a pipe, a shaft journaled therein, one or more propellers secured to said shaft, and one or more longitudinal riffle-boards secured within said pipe, each extending from the circumference thereof to a point forward of its center with respect to the direction of rotation of said shaft, for the purpose set forth.

2. In an apparatus of the character described, the combination of a series of pipe-sections secured together at their ends, a bearing located at each end of each pipe-section and united thereto by integral ribs forming riffle-boards, each riffle-board extending from the circumference of its pipe-section to a point forward of the center thereof, a sectional shaft journaled in said bearings, and a series of propellers secured to said shaft between the bearings located at the adjacent ends of each pair of pipe-sections and supported on said bearings, spaces being provided between said propellers and the adjacent riffle-boards, substantially as described.

3. In an apparatus of the character described, a pipe-section provided at each end with a flange, a bearing, and one or more radial riffle-boards, a shaft-section journaled in said bearings, and a propeller secured to the upper end of said shaft and supported on the adjacent bearing, the hub of said propeller forming a coupling adapted to receive the interlocking end of an adjacent section of shaft, substantially as described.

4. In an apparatus of the character described, the combination of a series of pipe-sections detachably secured together and provided respectively at each end with a flange and a central bearing secured thereto by radial ribs, forming riffle-boards, a corresponding series of shaft-sections journaled in said bearings and provided with detachably-interlocked ends, and a propeller secured to each shaft-section and supported on the upper bearing of the corresponding pipe-section, between the adjacent sets of riffle-boards, substantially as described.

In testimony whereof I have hereunto subscribed my name this 27th day of February, 1901.

GEORGE A. FARWELL.

Witnesses:
GEO. W. SHERMAN,
E. D. CHADWICK.