

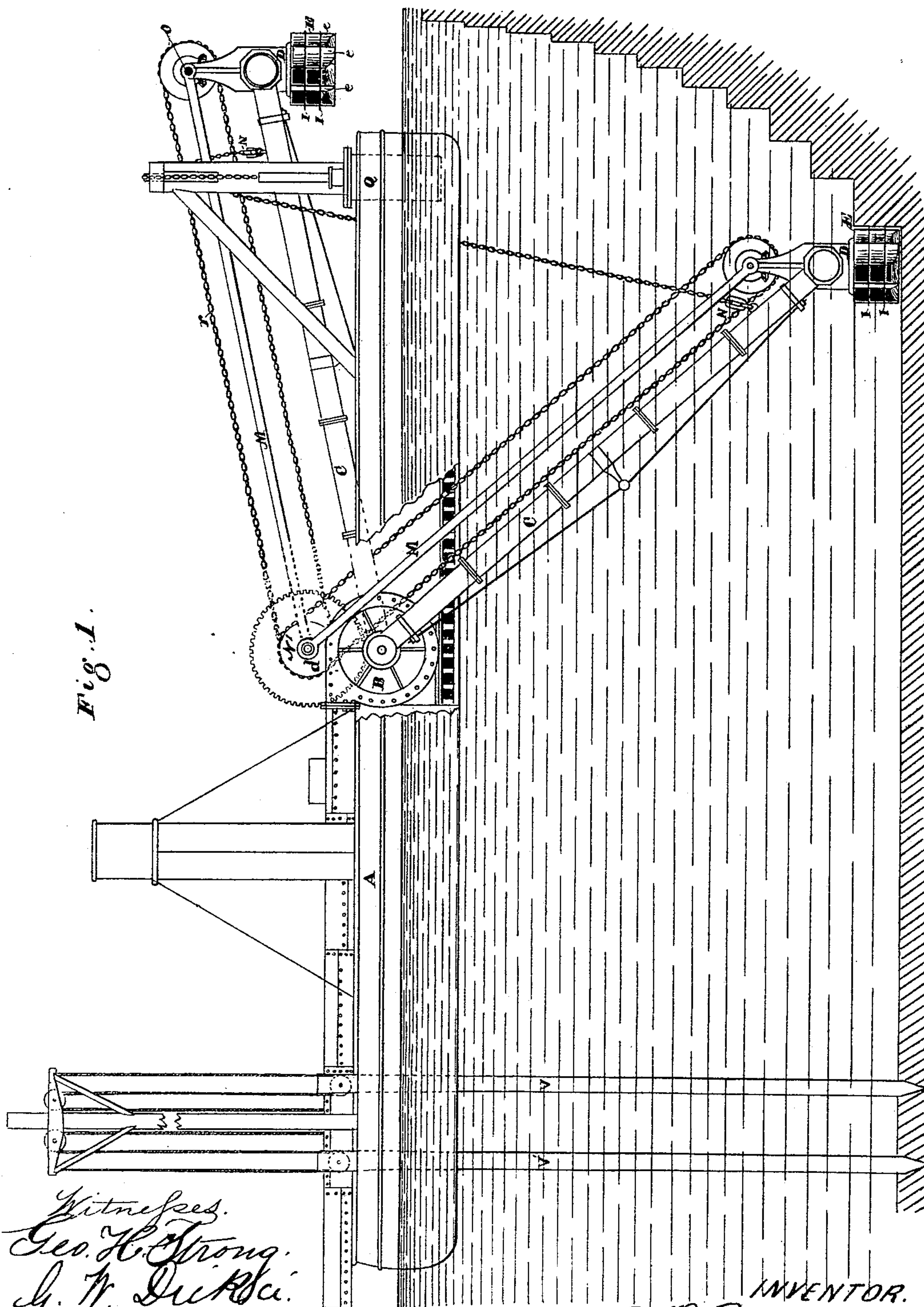
(No Model.)

2 Sheets—Sheet 1.

A. B. BOWERS.
DREDGING MACHINE.

No. 388,253.

Patented Aug. 21, 1888.



Witnesses.
Geo. H. Strong.
J. W. Dickson.

INVENTOR.
A. B. Bowers.

(No Model.)

2 Sheets—Sheet 2.

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Fig 2.

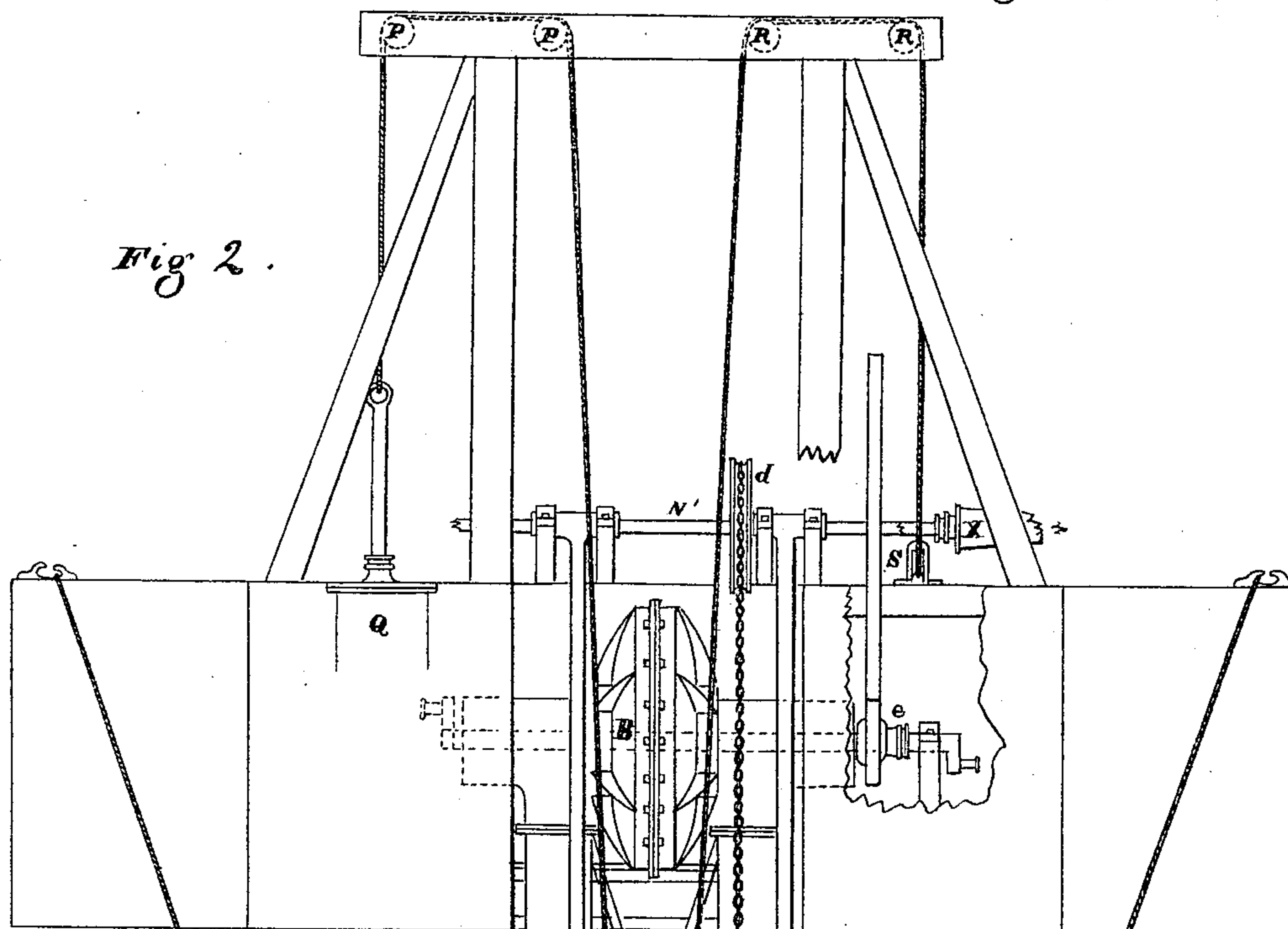


Fig. 3.

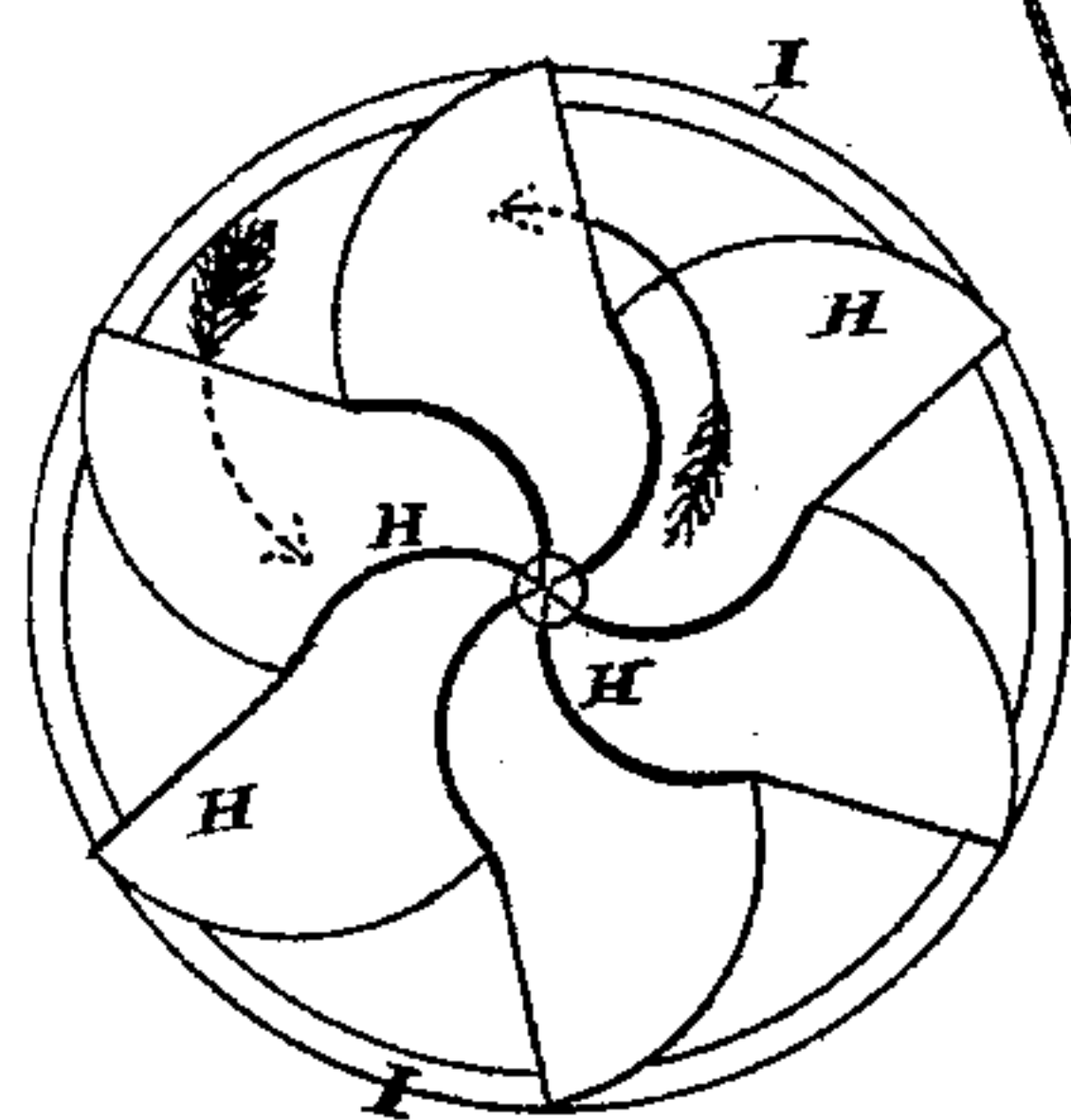
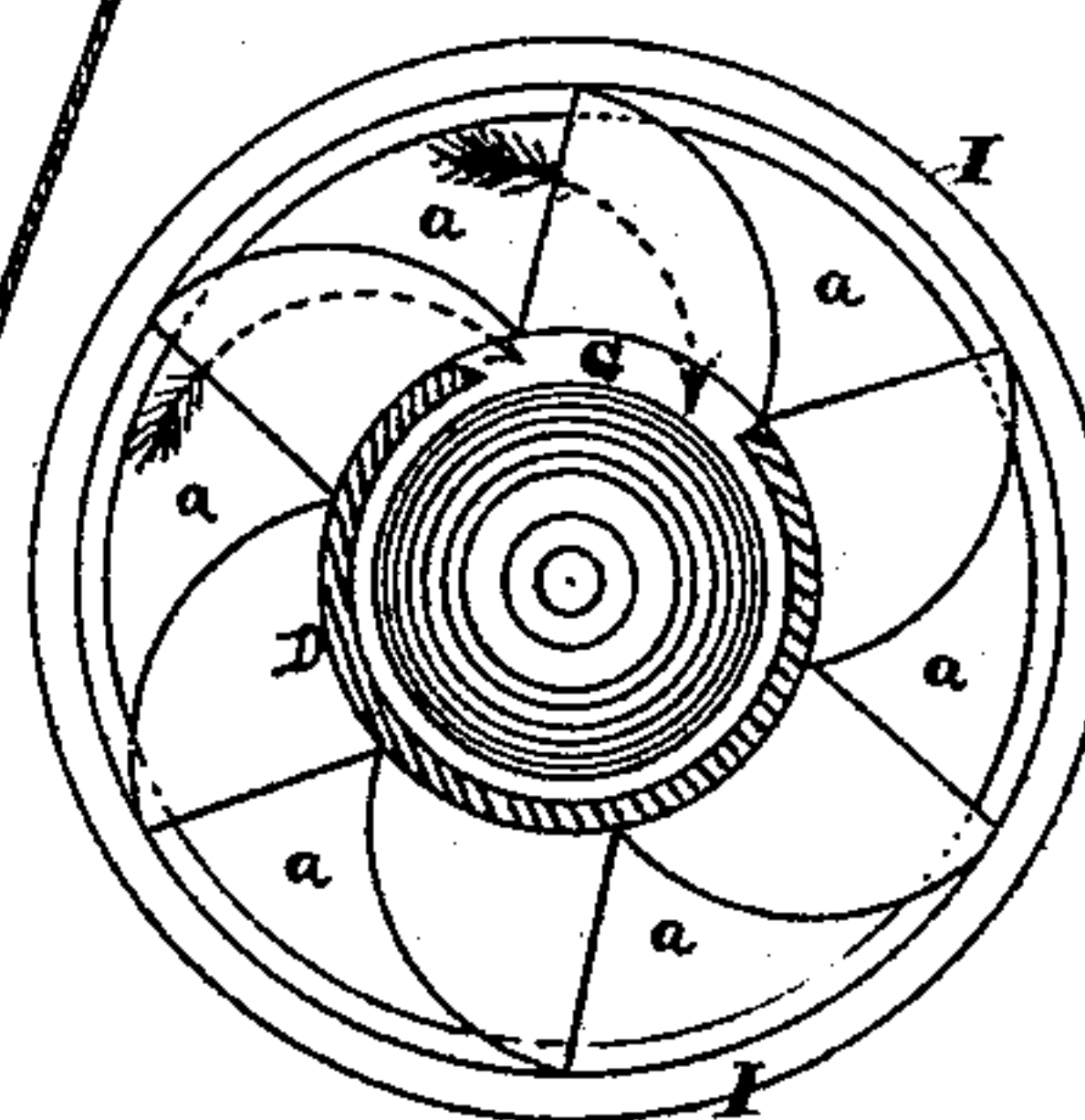
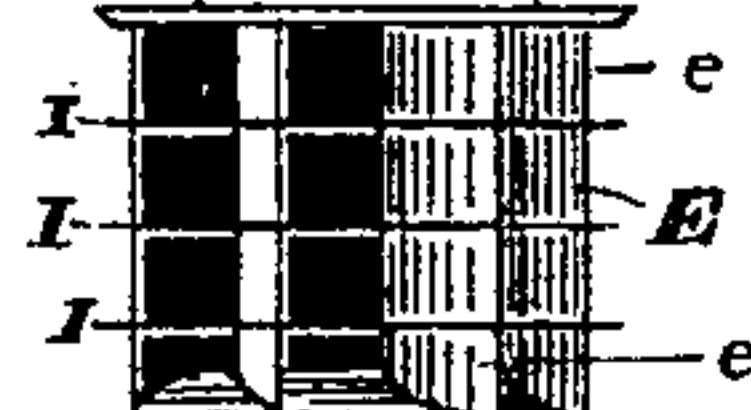


Fig. 4.



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UNITED STATES PATENT OFFICE.

ALPHONZO B. BOWERS, OF SAN FRANCISCO, CALIFORNIA.

DREDGING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 388,253, dated August 21, 1888.

Original application filed December 9, 1876. Renewed April 16, 1879. Divided and this application filed April 29, 1885. Serial No. 163,888. (No model.)

To all whom it may concern:

Be it known that I, ALPHONZO B. BOWERS, of San Francisco, California, civil engineer, have invented certain Improvements in Hydraulic Dredging-Apparatus, of which this is a specification.

It is a third division of an application filed by me December 9, 1876, and renewed April 16, 1879, being for portions of the original invention shown in the accompanying Sheets 1 and 3 of original drawings, now numbered 1 and 2; and this division of the invention consists, mainly, of an excavating implement constructed and arranged to work with a side feed or swing, mounted on a swinging suction-pipe or ladder in such manner as to preserve a horizontal position of its lower or bottom cutting-edges and make a level or nearly level cut the whole width of the excavator, at whatever angle the suction-pipe or ladder may be placed, or at whatever depth the work may be progressing; in a method of strengthening and stiffening the suction-pipes and combining them by trusses and braces into a rigid structure or ladder for the support of the excavator and to resist the various strains thereon; and in the use of a telescoping section of suction-pipe held in extended position by a strong spiral spring that, yielding to heavy pressure, allows this section to telescope, but extends the pipe as the pressure is removed, with details of construction, substantially as set forth.

Figure 1 is a side and part sectional view showing a rotary excavator, a method of actuating said excavator by means of an endless chain, a suction-pipe constructed to serve also as a ladder, and the excavator in working position, also indicating their position when raised out of water and the successive downward cuts made by the excavator as it swings from side to side in the process of dredging until the desired depth is attained. It also shows the vertical anchors of the turn-table and the method of counterbalancing the excavator described and claimed in Letters Patent No. 318,859, issued to me May 26, 1885. Fig. 2 is an end view of the hull, looking into the longitudinal well, in which swings the apparatus claimed in this division. It shows the same method of

actuating the excavator and of maintaining the horizontal position of its lower cutting-edges and the same method of utilizing the suction-pipes as a ladder, (shown in Fig. 1,) with the additional feature of short sections of pipe constructed and arranged to telescope in the pipes C C, these telescoping sections being provided with sliding guide-rods to keep them in line and prevent them from cramping or turning. They are also provided with spiral springs that, yielding to pressure, allow the short sections to telescope within the suction-pipe sides of the ladder, but extend these sections, as shown, when the pressure is removed, the object of this provision being to prevent breakage as the dredger heaves with the swell of the sea. Figs. 3 and 4 show certain details of one form of rotary excavator, for a full description of which and the claims therefor, as well as mode of operating the machine, see Letters Patent No. 318,859, hereinbefore specified.

A is a floating vessel for carrying the excavating and actuating apparatus.

B is any pump suitable for handling the spoil.

C C are suction-pipes firmly secured together by trussing and bracing to constitute them also a ladder for the proper support of the excavator. They are connected by cross-bars and braces, substantially as shown in Fig. 2, and stiffened by tie-rods and a vertical truss, as shown in Fig. 1. This ladder swings on strong hollow trunnions, forming elbows communicating through suitable joints and glands with the suction of pump B. Through these pipes the spoil is withdrawn by the pump from the excavator, with which these pipes communicate through the chamber D. One only or both of these pipes, as preferred, may be used for the conveyance of spoil.

D is a chamber or continuation of the suction opening into the interior of the excavator. It is constructed to swing on and communicate through suitable joint or joints with either or both of the pipes C C. It carries, in the present instance, in suitable bearings above and in the chamber, the shaft F of the excavator and mechanism for actuating said shaft. It is also jointed to the swinging arms M M, as

shown in Figs. 1 and 2, by means of which the vertical position of the excavator and horizontal position of its lower cutting-edges are maintained and a level bottom secured, whatever the depth of work or inclination of pipe or ladder.

E is usually a hollow, and here represented as a rotary excavator with side and bottom cutting-edges and with inward delivery through itself to, in this case, the chamber D, suction-pipe sides of the ladder C C, and pump B; but I confine myself to neither a hollow nor a rotary excavator. As here shown, it is substantially the hollow rotary excavator described and claimed in Letters Patent No. 318,859, issued to me May 26, 1885, being in this case mounted on a vertical axis. The side cutting-edges, *e*, Figs. 1 and 3, are the vanes or knives *s* of the patent, and the bottom cutting flared lips H, Fig. 3 of the accompanying drawings, the bottom cutting-lips *c* described in the aforesaid patent.

F, Fig. 2, is a shaft passing through suitable bearings to the hub of the excavator to which it is secured. It is actuated in this case by bevel-gearing, chain-wheels, and endless chain *r*; but this shaft and its actuating mechanism are used only when the excavator is of a rotary form.

M M are swinging arms pivoted at their inner ends to points directly over the upper joints of the suction-pipes and ladder. They are of the same length between joints as the ladder and pipe or pipes and lie in a plane parallel therewith, their outer joints being directly above the outer joints of the ladder in a plane intersecting the axes of shafts F and *o*, as shown, thus forming a swinging parallelogram with parallel movements and holding the excavator in proper position wherever placed. In some cases but one of these arms is used. The chain-wheels around which passes the endless chain *r* are mounted on shafts in line with the joints or pivots at each end of the arms M M, and are at all times equidistant, whatever the position of the excavator.

S' S'' are short sections of suction-pipe communicating through suitable swinging joints with chamber D, Fig. 2, and telescoping within the pipes C C, these pipes being represented as broken away to show the inner ends of the telescoping sections. Portions of these sections are seen within the spiral springs *u u*. These springs are sufficiently strong to fully extend the pipes and preserve the parallelism of the parallelogram hereinbefore described, except when subject to heavy pressure, such as the sinking of the hull between the waves of the sea or a lurch of the vessel against the bank where the excavator is working.

The sliding guide-rods *t t* and bearings sometimes used for the purpose specified are substantially the same as those described and claimed in Letters Patent No. 355,251, issued to me December 28, 1886, for the fifth division of the original application, the telescoping section S' being constructed substantially like the

lower telescoping section in said figure and patent. The rods *t t* are firmly secured to the lower ends of the telescoping sections S' S'', whence they pass outside of the springs *u u* through strong bearings in the lower ends, and similar bearings some distance from the ends of the hollow suction-pipes' sides of the ladder. They slide freely through these bearings and are provided with nuts or heads on their upper or inner ends to prevent the telescoping sections from dropping out of the hollow sides of the ladder.

I do not herein claim the following combinations, the same being claimed in another division of the original application pending concurrently with this, to wit: First, a ladder, suction-pipe, and hollow rotary excavator with inward delivery through itself to said pipe; second, a suction-pipe, ladder, and hollow rotary excavator with inward delivery through itself to said pipe, said excavator being provided with side cutting-edges and devices to effect a side feed; third, a suction pipe, ladder, and hollow excavator with cutting-edges and devices to effect a side feed.

In this third division I claim--

1. In combination, a swinging suction-pipe, an excavator with side cutting-edges constructed and arranged to work with a side feed, and a device to hold said excavator in position to make a horizontal cut and level bottom at the different angles in which the suction pipe is placed in the process of dredging.

2. In combination, a swinging suction-pipe, an excavator with bottom cutting-edges constructed and arranged to work with a side feed, and a device to hold said excavator in position to make a horizontal cut and level bottom at the different angles in which the suction-pipe is placed in the process of dredging.

3. In combination, a swinging suction-pipe, ladder, and excavator with side cutting-edges constructed and arranged to work with a side feed, and a device to hold said excavator in position to make a horizontal cut and level bottom at the different angles in which the suction-pipe is placed in the process of dredging.

4. In combination, a swinging suction-pipe, a hollow excavator with side cutting-edges constructed and arranged to work with a side feed, and a device to hold said excavator in position to make a horizontal cut and level bottom at the different angles in which the suction-pipe is placed in the process of dredging.

5. In combination, a swinging suction-pipe, ladder, and hollow excavator with side cutting-edges constructed and arranged to work with a side feed, and a device to hold said excavator in position to make a horizontal cut and level bottom at the different angles in which said pipe and ladder are placed in the process of dredging.

6. In combination, a swinging suction-pipe, a rotary excavator with side cutting-edges con-

5 constructed and arranged to work with a side feed, and a device to hold said excavator in position to make a horizontal cut and level bottom at the different angles in which the suction-pipe is placed in the process of dredging.

10 7. In combination, a swinging suction-pipe, ladder, and rotary excavator with side cutting-edges constructed and arranged to work with a side feed, and a device to hold said excavator in position to make a horizontal cut and level bottom at the different angles in which the pipe and ladder are placed in the process of dredging.

15 8. In combination, a swinging suction-pipe, a hollow rotary excavator with side cutting-edges constructed and arranged to work with a side feed, and with inward delivery through itself to said pipe, and a device to hold said excavator in position to make a horizontal cut and level bottom at the different angles at which the pipe is placed in the process of dredging.

20 9. In combination, a swinging suction-pipe, ladder, a hollow rotary excavator with side cutting-edges constructed and arranged to work with a side feed and with inward delivery through itself to said pipe, and a device to hold said excavator in position to make a horizontal cut and level bottom at the different angles in which said pipe and ladder are placed in the process of dredging.

25 10. In combination, a swinging section of suction-pipe provided with swinging or hinged joints at or near each end thereof, an excavating implement at the outer end of said pipe, and a swinging parallel bar constructed and arranged to form with said pipe and excavator a swinging parallelogram with parallel movements to hold said excavator in position to make a horizontal cut and level bottom at the different angles in which said pipe and bar are placed in the process of dredging.

30 11. In combination, a swinging ladder, an excavating implement hinged to its outer end, and a swinging parallel bar constructed and arranged to form with said ladder and excavator a swinging parallelogram with parallel movements to hold said excavator in position to make a horizontal cut and level bottom at the different angles in which said ladder and bar are placed in the process of dredging.

35 12. A ladder for dredging purposes constructed with hollow or tubular sides united by cross-bars and stiffened by vertical trussing and diagonal bracing.

40 13. Pipes C C, one or both being employed for suction, said pipes being also properly

trussed and braced to serve as a ladder, in combination with an excavating implement constructed and arranged to work with a side feed. 60

14. Pipes C C, one or both being employed for suction, said pipes being also braced to serve as a ladder, in combination with a hollow excavating implement constructed and arranged to work with a side feed. 65

15. Pipes C C, one or both being employed for suction, said pipes being also properly trussed and braced to serve as a ladder, in combination with a rotary excavator. 70

16. Pipes C C, one or both being employed for suction, said pipes being also braced and trussed to serve as a ladder, in combination with a hollow rotary excavating implement with inward delivery through itself to said conduit. 75

17. Pipes C C, one or both being employed for suction, said pipes being also properly trussed and braced to form a ladder, a rotary excavator at the outer end thereof, and a device for holding said implement in position to make a horizontal cut and level bottom at the different angles in which said ladder is placed in the process of dredging. 80

18. In combination, a swinging suction-pipe, a hollow rotary excavator with inward delivery through itself to said pipe at the outer end thereof, and an endless chain for actuating said excavator. 85

19. In combination, a suction-pipe having a telescoping section provided with a spiral spring passing around said section constructed and arranged to yield to heavy pressure and allow the pipes to telescope and to extend the telescoping section when the pressure is removed. 90

20. In combination, a suction-pipe having a telescoping section, a spiral spring to extend said section, and sliding guide-rods to keep the telescoping section in line. 100

21. The combination of a suction-pipe and excavator constructed to be raised and lowered by swinging in a vertical plane, said excavator being provided with devices to effect a side feed, and with an automatic device to hold the excavator in position to cut and make a level bottom, at whatever angle the suction-pipe may be placed in the process of dredging. 105

In testimony whereof I have affixed my signature in presence of two witnesses.

ALPHONZO B. BOWERS.

Witnesses:

W. A. BARTLETT,

J. W. HAMILTON JOHNSON.