W. LYTTON.

HYDRAULIC DREDGE.

APPLICATION FILED NOV. 27, 1908.

929,613.

Patented July 27, 1909.

2 SHEETS—SHEET 1.

Fig. 1.

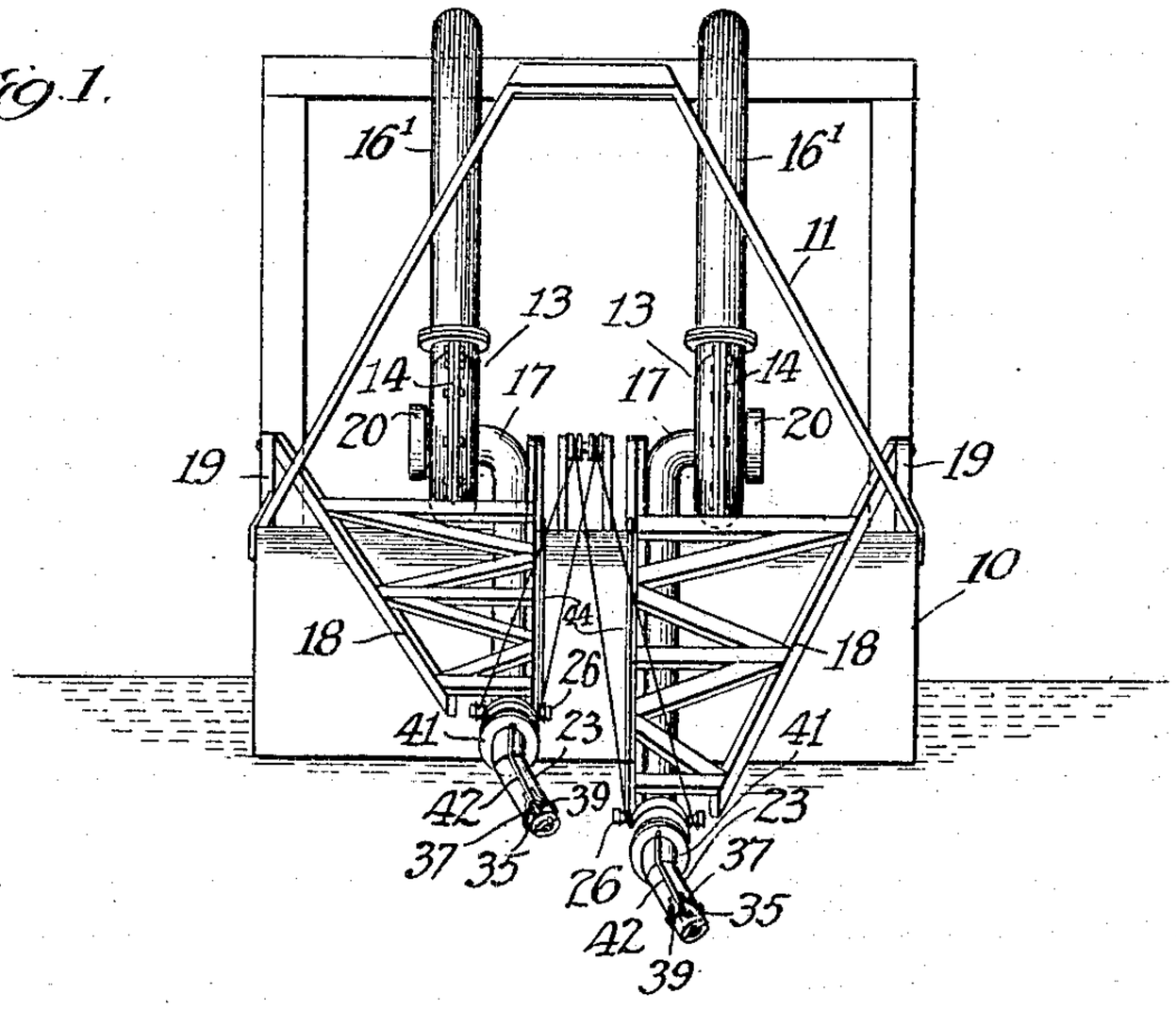
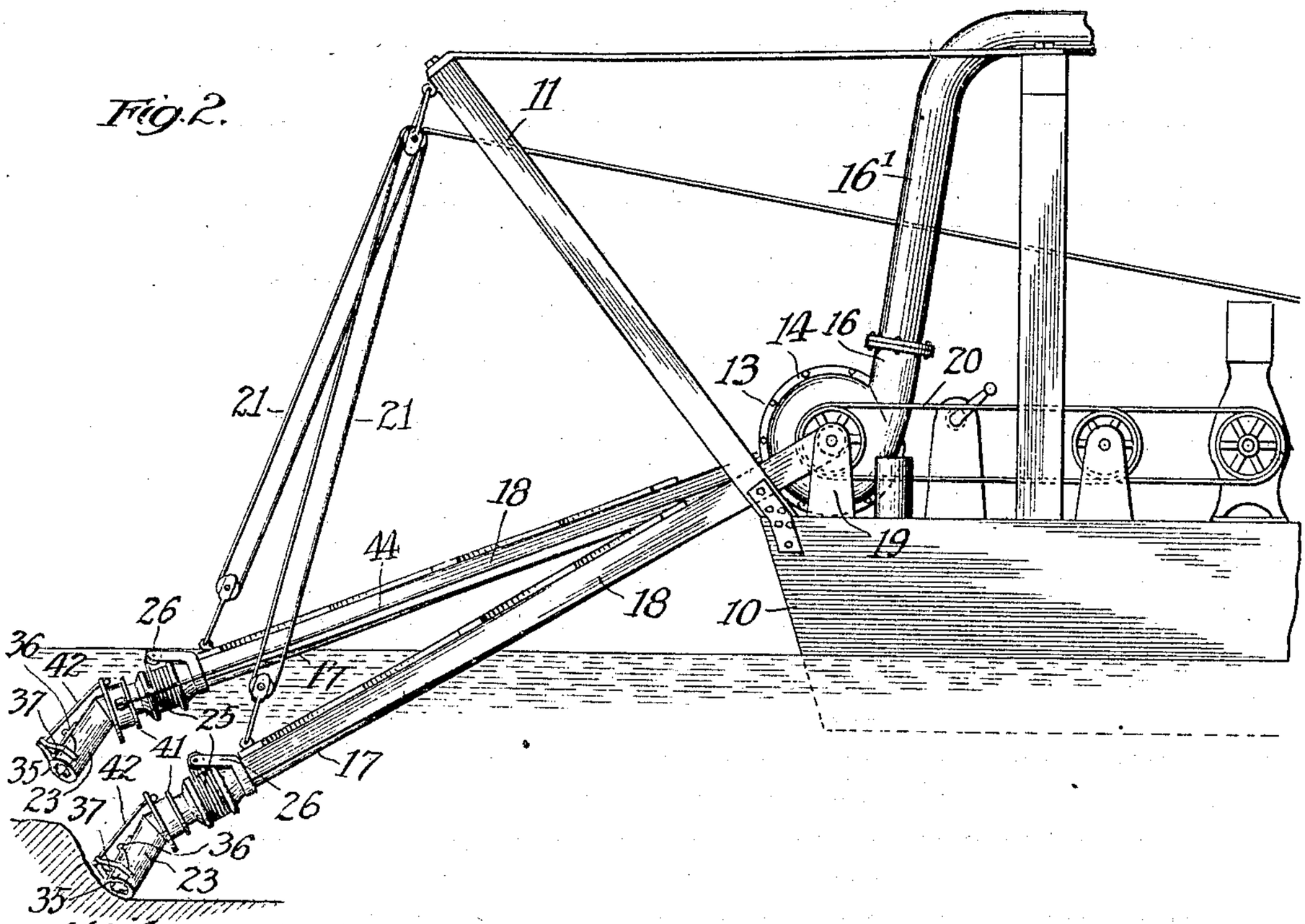


Fig. 2.



Witnesses

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2 SHEETS—SHEET 2.

Fig. 3.

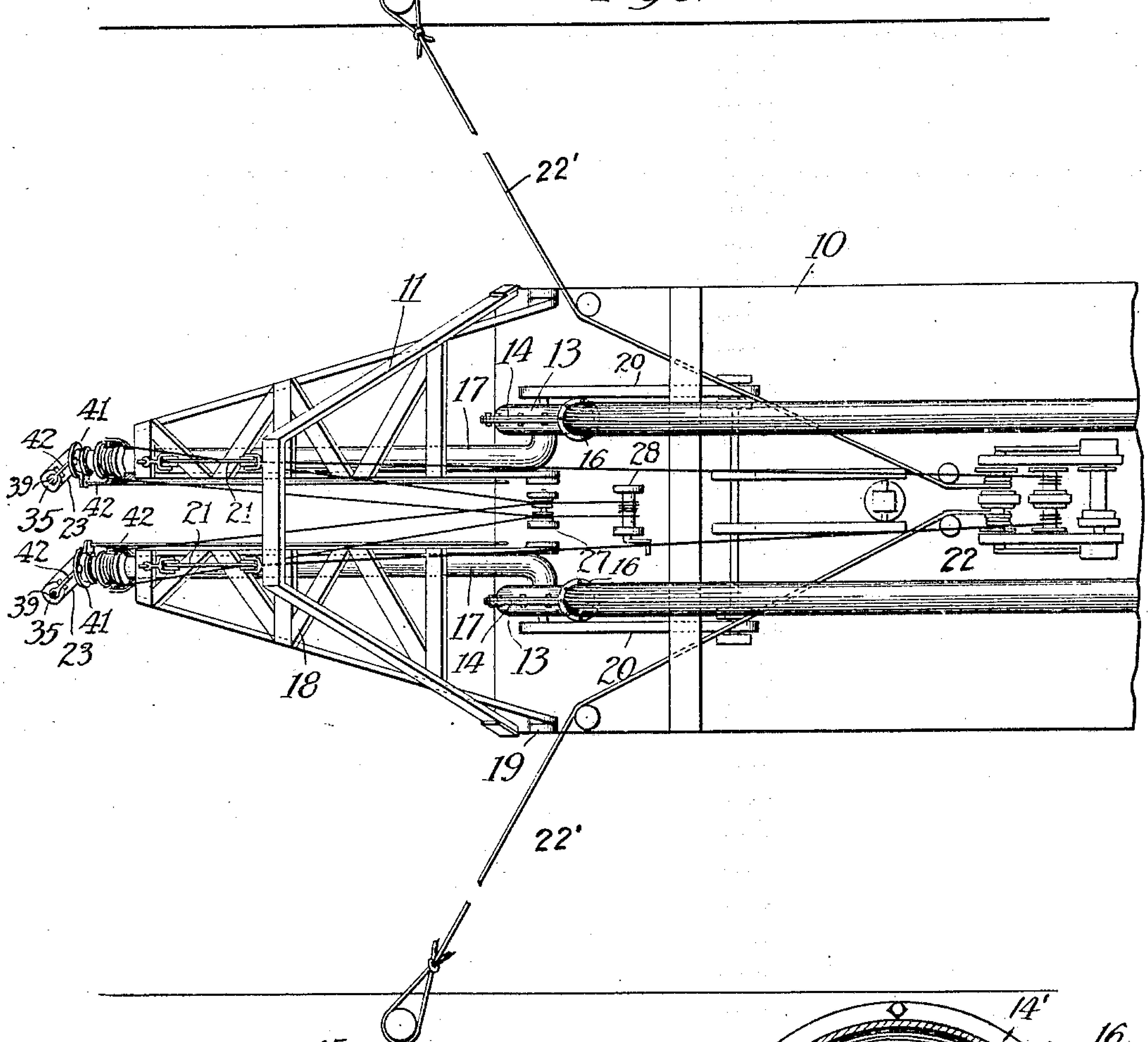


Fig. 4.

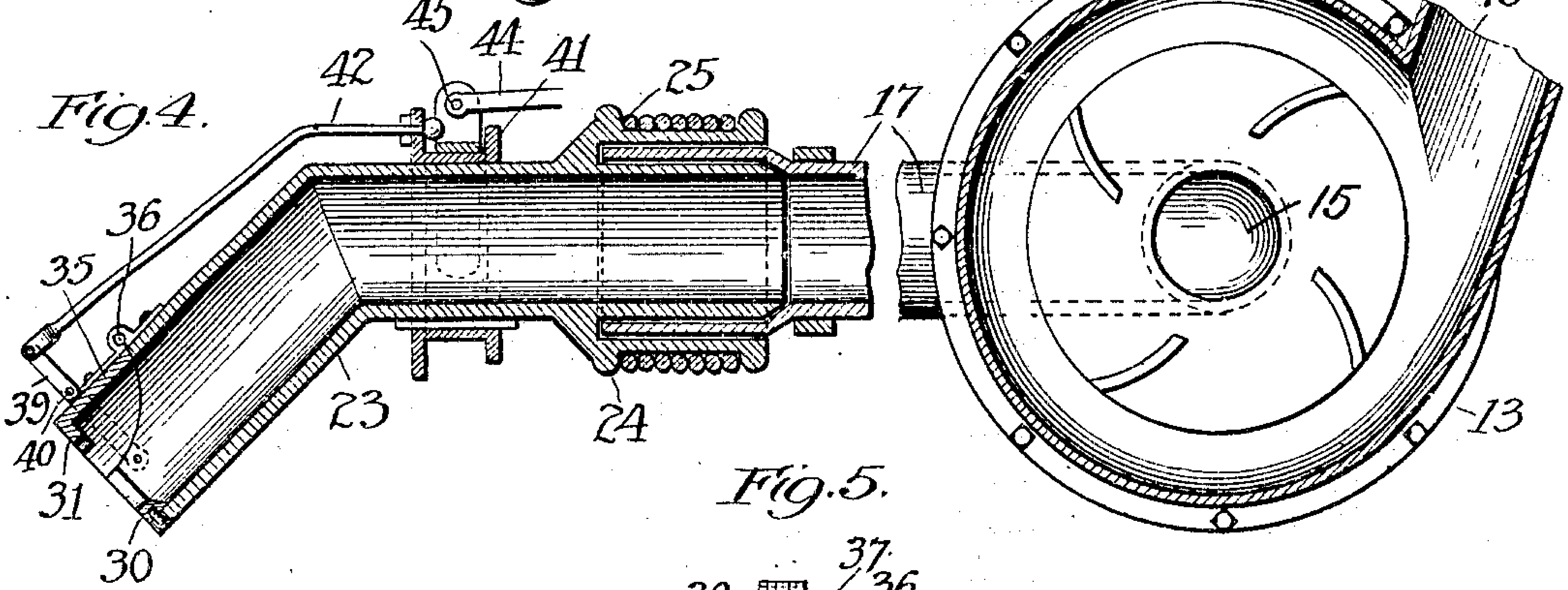
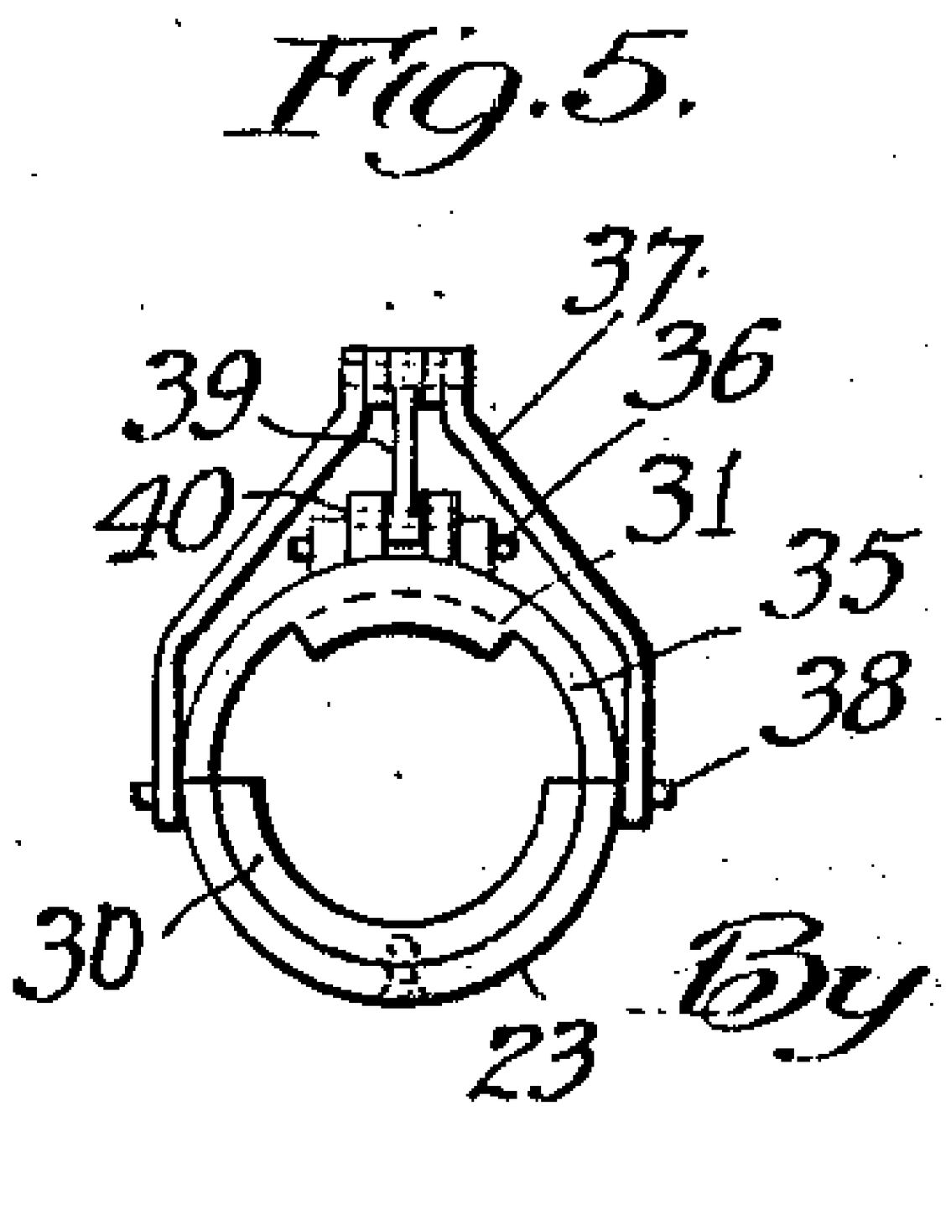


Fig. 5.



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UNITED STATES PATENT OFFICE.

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HYDRAULIC DREDGE.

No. 929,613. Specification of Letters Patent. Patented July 27, 1909.

Application filed November 27, 1908. Serial No. 464,535.

To all whom it may concern:

Be it known that I, WALTER LYTTON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Hydraulic Dredges, of which the following is a specification.

My invention relates to improvements in hydraulic dredges, and has for its general object to provide an hydraulic dredge of novel and improved construction, which in some of its features is particularly adapted for alluvial gold dredging.

In dredging auriferous gravels great difficulty is experienced in maintaining the dredging operations continuously for any length of time by reason of the constant clogging or stoppage of the suction nozzles and pipes by large gravel or peculiarly shaped rocks, frequently necessitating the lifting of the suction pipes above the water line for clearing the obstruction, and thereby necessitating the subsequent priming of the suction pump and consequent loss of time.

One of the salient features of my invention is the provision of suction dredging apparatus whereby the dredging operation may be less frequently interrupted than in the use of the ordinary suction dredge, and whereby the working dredging nozzle is constantly presented to the work in position most advantageously effecting the removal of the gold bearing deposit, without disturbance thereof such as to cause a settling of the gold to a level below the depth of effective operation of the suction apparatus.

More specific features of my invention will become apparent to those skilled in the art from the following description taken in conjunction with the accompanying drawings, wherein I have illustrated an embodiment of my invention in simple form.

In the drawings; Figure 1 is a front view of the bow of a dredge equipped in accordance with my invention; Fig. 2 is a side view thereof; Fig. 3 is a plan view; Fig. 4 is a sectional diagrammatic view of the suction pipe and its connected mechanisms, and; Fig. 5 is a detail end view of the suction nozzle.

In general I preferably provide my improved dredge with companion suction pipes and their appropriate centrifugal pumps or other exhausters, arranging each suction pipe for independent elevation and depression so that either may be worked to the exclusion of the other, and providing each suction pipe with an appropriate nozzle deflected at its extremity from the line of the pipe and arranged for rotation for most effective presentation to the work, the nozzles of the two pipes being arranged for synchronous rotation irrespective of the vertical elevation of the respective pipes, so that at all times each nozzle may stand in appropriate position to immediately resume work left by its fellow, and in the identical rotative position to make the cut precisely as started by its fellow.

Further my invention contemplates the provision of suction apparatus wherein the cross sectional area of the path of travel of the spoil or material may be greater in the suction pipe than at the mouth of the nozzle, greater between the runners of the pump than at the intake, and greater at the exhaust of the pump than at the intake, thereby to minimize the possibility of clogging or stopping of said passage by any body capable of passing the nozzle.

Further my invention generally contemplates the provision of an improved nozzle construction, wherein the inlet area is most effectively reduced, and wherein the inlet end is made in the form of a normally closed jaw capable of being opened to drop out any obstacle that may lodge therein. And further it provides a construction whereby a plunger action of the material in transit may be utilized to assist in the removal of such obstacles.

In the particular construction shown 10 indicates a suitable hull, which it will be understood may be conveniently provided at its rear end with the customary spuds, not shown, and provided with a suitable projecting frame 11, affording support to the hoisting pulleys. Two suitable pumps, 13, of any desired construction, herein illustrated as of ordinary centrifugal pump construction having a shell 14, revolving runners 14′, an axial inlet 15 and a tangential outlet 16, are mounted at the bow of the hull in connection with the vertically movable suction pipes 17, 17, connected with suitable pivoted skeleton booms 18, mounted on pivotal supports 19 coaxial with the pump inlet 15.

The companion pumps 13 are independently driven as by belt 20, and the companion booms 18 may be raised or lowered

by independent tackle 21, suitably connected, for power operation, with a steam hoist 22, and shore lines 22′ for opposite sides of the boat are arranged for control from the same source of power.

Each of the suction pipes 17 is preferably provided with a rotatable angular nozzle structure 23, the angular bend of which may conveniently be about 45°. The non-rotatable portion of the suction pipe and the rotatable nozzle are connected to leave the interior of the pipe smooth, and the nozzle is preferably provided with an integral drum 24, adjacent its point of connection with the non-rotatable pipe to receive a cable 25 by means of which the nozzle may be rotated. Both nozzles, similarly equipped, have their operating cables 25 passed over suitable pulleys 26, carried by the booms, or other suitable supports, and guiding pulleys 27, coaxial with the pivotal points of the boom, for connection in common with an operating drum 28, of suitable construction. It will be understood, therefore, that when the nozzles 23 are once adjusted to similar positions, rotation of the drum 28 will change the positions of both nozzles synchronously irrespective of different vertical elevations of their booms.

Each nozzle 23 is provided with a reduced mouth, the reduction being preferably effected by means of arcuate inserts 30 and 31, the lower insert 30 preferably covering about half the circumference of the nozzle, and the upper insert 31 covering preferably about one sixth of the circumference. I have found that this form of reduction is very effective in preventing the ingress of large boulders or the like into the suction pipe and that in general bodies which pass the nozzle, reduced as above described, will pass through the suction pipe without lodgment therein. The suction pipe is preferably of uniform diameter throughout its length, and at its extremity communicates with the inlet 15 of the pump of similar diameter. The effective or linear distances between the heels of the runners 14 of the pump, are preferably greater than the diameter of the inlet 15, so that any body which may pass through the inlet 15 may with certainty be discharged between the runners of the pump, and in the same fashion the outlet 16 is preferably of greater area than the inlet to work to the same end. The discharge 16′ is preferably disposed to form a stack ascending preferably nearly vertically to a considerable height above the level of the pump, whereby in the normal operation of the dredge, a considerable body of material will be maintained constantly in a process of elevation to the sluice. I have found this arrangement to be most effective for minimizing serious stoppage of the pipe, for while the nozzle may clog with a stone or the like, as soon as such clogging occurs power may be thrown off from the pump, permitting the heavy body of material in transit through the stack or discharge 16 to descend, to lend its weight and pressure to the material within the suction pipe proper, thereby to tend to eject the obstacle lodged in the nozzle without breaking the seal of the pump or requiring its repriming. This action is greatly facilitated by the construction hereinbefore described, in which the piping and free areas between the runners of the pump are of relatively great diameter, capable of freely passing material entrained through the nozzle. At times, however, the rock clogging the nozzle is so jammed therein as to resist the above described plunging action of the material within the discharge pipe 16, so that the suction pipe is temporarily out of commission. Under such condition the hitherto inactive suction nozzle, already primed, may be dropped into the place of the clogged suction nozzle and the power switched to the theretofore idle pump. It is desirable further that the nozzle of the idle pump shall be always kept under water in order that it may not need priming any oftener than is unavoidable, and I therefore, provide for the freeing of such clogging obstacles as resist the plunger action above described without the lifting of the pump nozzle above the water line. To this end I construct the pipe nozzle with a jaw portion 35 hinged as at 36 to the body of the nozzle, and capable of being opened to drop out of the nozzle anything that may have lodged in the orifice thereof.

The movable jaw 35 may be operated in various ways, the construction which I have herein shown being a simple arrangement to this end, and comprising a yoke 37 straddling the suction nozzle over the movable jaw, and pivoted to the solid body of the nozzle as at 38. The yoke has centrally connected thereto a link 39 pivoted as at 40 to the jaw 35, in such fashion that when the pivotal points 38, 40 and the top of the yoke are in alinement the jaw is tightly closed. For operating the lever closure above described a collar 41 is slidingly mounted on the straight part of the nozzle 23 and connected by links 42 with the center of the yoke 37, said collar arranged to be slid longitudinally of the nozzle by means of an operating bar 44 having its upper end accessible from the deck of the dredge, and its lower end provided with a yoke 45 straddling the collar. Obviously as the bar 44 is drawn upward the connection 42 pulls the yoke 37 back beyond the line of center 38 and 40, and the shorter line 49 pulls up the jaw 35 so as to open the jaw and release any body wedged therein. Restoration of the bar 44 reverses the movement and throws the yoke 37 forward until it is in the position shown in Fig. 4, wherein the several pivotal centers are in

alinement and the jaw is locked as by a set toggle. Now it will be seen in general that in the operation of a dredge, as above described, one nozzle may be maintained below the water line but above the level of the work while the other nozzle is engaged, the operating nozzle being presented to the work in practice preferably at about a 45° angle vertically, lengthwise and cross-wise of the dredge. If the nozzle clogs it is immediately lifted and the companion nozzle dropped to take its place on the work, and the primed, theretofore idle pump started in operation. The stoppage of the operating pump permits the plunger action of the material body in elevation through the discharge stack 16 tending to force out the obstacle from the nozzle, and should this operation fail the nozzle jaw may be opened without the lifting of the nozzle above the water line, thereby to release the clogging material. In this way it is insured that the dredge as an entirety is maintained in operating condition for a maximum proportion of its working time.

While I have herein described in some detail a specific embodiment of my invention which I believe to be new in many of its structural features, it will be understood that such description is for purposes of full disclosure and that my invention might be embodied in widely variant forms and with many structural changes within the spirit of my invention and within the scope of the appended claims.

Having described my invention, what I claim is.

1. In a dredge of the character described, the combination with a pump having an inlet, an outlet, and free passage from the inlet to the outlet of larger diameter than the inlet, of a suction pipe having a diameter not greater than that of the inlet and a nozzle having its extremity reduced to an area less than that of the suction pipe.

2. In a dredge of the character described, the combination with a pump having an inlet, a larger outlet, and free path of communication from the inlet to the outlet of greater dimension than the inlet, of a suction pipe of diameter not greater than the inlet, a nozzle at the extremity of the suction pipe reduced at its end, and a stack of diameter not less than the pump outlet, communicating with said outlet, and extending upward from the pump.

3. In a dredge of the character described, a centrifugal pump provided with an inlet, a larger outlet and runners separated at their innermost points to a greater extent than the diameter of the inlet, of a suction pipe of diameter not greater than the pump inlet, an opening-jawed nozzle for the suction pipe and means for opening said nozzle.

4. In a dredge of the character described, the combination of a pump, a suction pipe communicating therewith, an angular nozzle rotatable with respect to the suction pipe, and of normally smaller diameter at its extremity than said suction pipe, and means for rotating said nozzle.

5. In a dredge, the combination of a suction pipe, an angular nozzle rotatable upon the suction pipe, means for rotatably adjusting said nozzle, that it may be positioned for presentation with a downward and lateral incline, and means for advancing the nozzle and suction pipe to the work at an angle to the axis of the pipe.

6. In a dredge of the character described, a hull, a pump, a suction pipe communicating with said pump, an angular nozzle rotatable on the suction pipe, a drum connected with said nozzle to impart rotation thereto, a cable for rotating the drum, extending to and operable from the hull.

7. In a dredge of the character described, a suction pump, providing an inlet, and an outlet of larger diameter, and blades or runners separated at their innermost points by a distance greater than the diameter of the pump inlet, a suction pipe, communicating with the pump inlet, and reducing members in the extremity of said pipe, conforming with portions of its periphery.

8. In a dredge of the character described, a suction pump, providing an inlet and an outlet of larger diameter, and blades or runners separated at their innermost points by a distance greater than the diameter of the pump inlet, a suction pipe, communicating with the pump inlet, and removable reducing members in the extremity of said pipe conforming with portions of its periphery.

9. A suction pipe nozzle normally of substantially uniform diameter, and reducing parts conforming to portions of the periphery of said nozzle, detachably secured thereto.

10. A suction pipe nozzle provided with an opening jaw.

11. A suction pipe nozzle comprising two parts united for relative movement to open as a jaw, and means for normally locking said jaw parts in closed position.

12. In a dredge of the character described, a hull, a pump, a suction pipe communicating with said pump, a nozzle at the extremity of said suction pipe, comprising two connected parts relatively movable to open the end of the nozzle to an abnormal size, and means for operating said opening nozzle accessible from the hull.

13. In a dredge of the character described, a hull, a pump thereon, a suction pipe connected with said pump, an opening nozzle at the end of said suction pipe, comprising a relatively stationary part and a hinged part, levers for opening and closing said hinged part, and means for actuating said levers accessible from the hull.

14. In a dredge of the character described, a hull, a pump thereon provided with an inlet, and a larger outlet, and runners separated at their inner edges a distance greater than the diameter of the inlet, a stack or discharge pipe extending upward from the outlet, a suction pipe connected to the inlet, of a diameter not exceeding that of the inlet, and segmental reducers in the extremity of the suction pipe reducing its free area to less than the area of the suction pipe.

15. In a dredge of the character described, two companion pumps and suction pipes, means for independently raising and lowering said suction pipes, rotatable nozzles upon said suction pipes, and means for synchronously rotating the said nozzles.

16. In a dredge of the character described, a plurality of pumps, suction pipes connected therewith, means for independently raising and lowering said pipes, rotatable angular nozzles on said pipes, and means controlled by a single prime mover operable on the hull of the dredge for synchronously rotating said angular nozzles to maintain them constantly in like positions relative to their pipes irrespective of the elevation of their pipes.

In testimony whereof I hereunto set my hand in the presence of two witnesses.

WALTER LYTTON.

In the presence of—

FORÉE BAIN,

MARY F. ALLEN.