

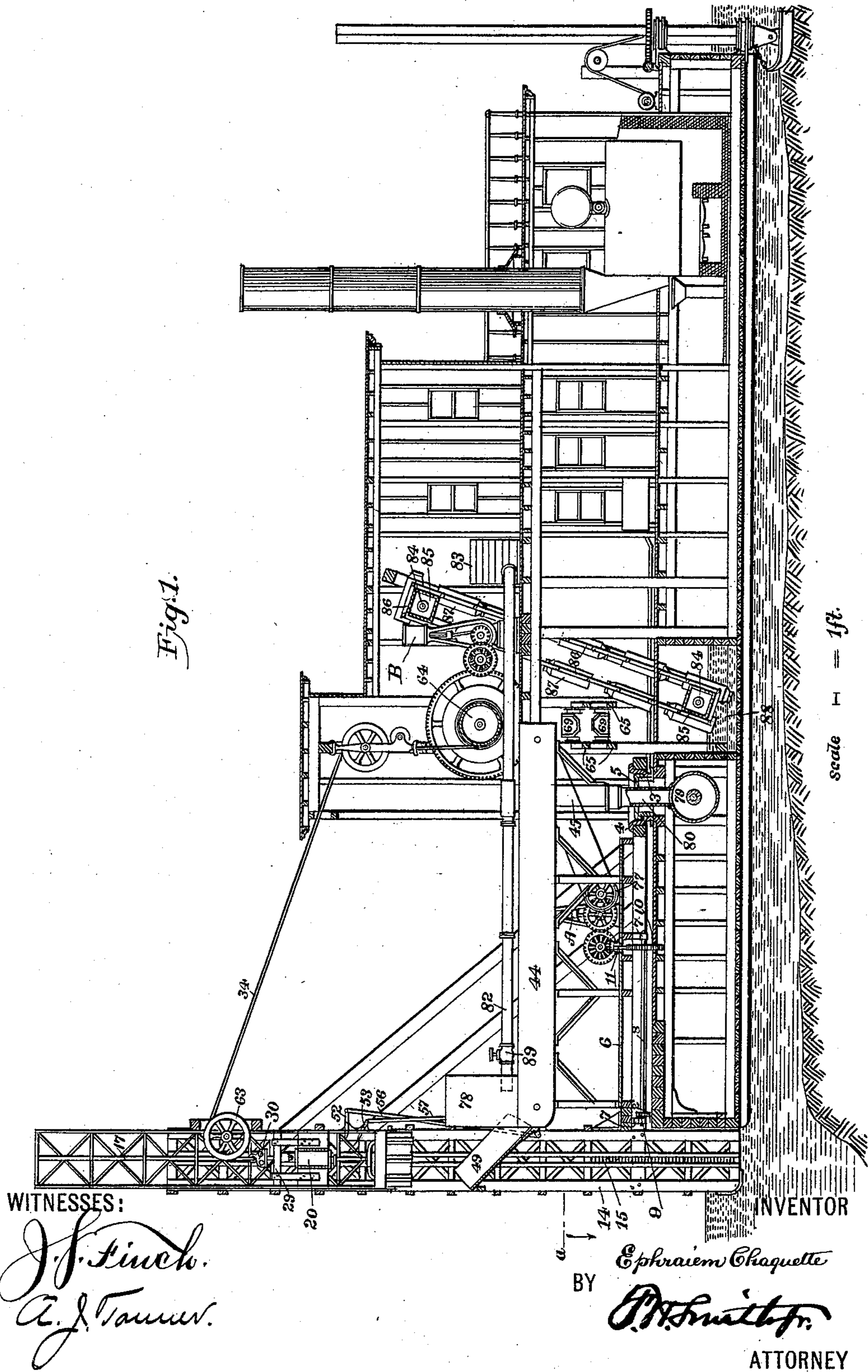
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7 Sheets—Sheet 1.

E. CHAQUETTE.  
DREDGING APPARATUS.

No. 523,959.

Patented July 31, 1894.



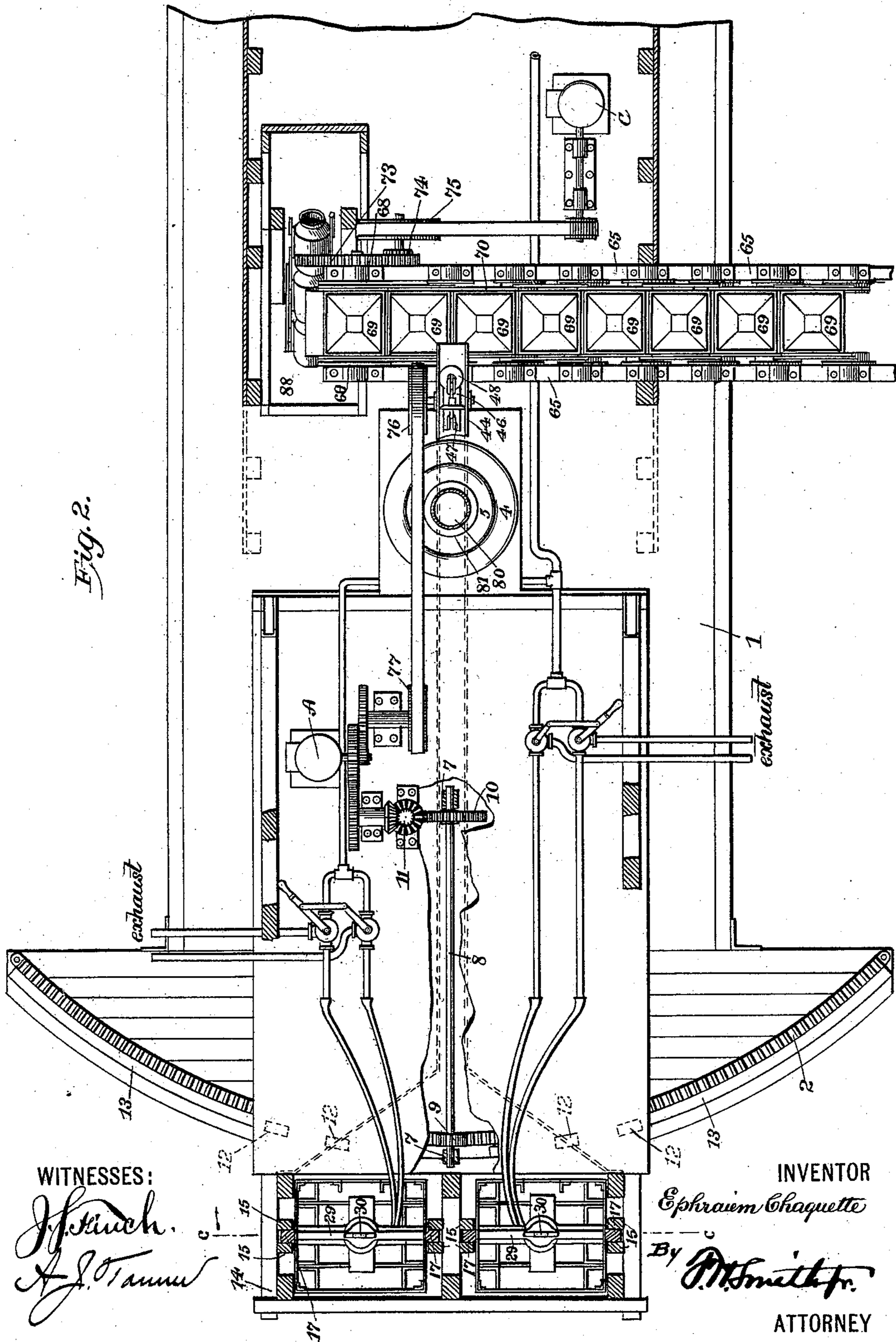
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7 Sheets—Sheet 2.

E. CHAQUETTE.  
DREDGING APPARATUS.

No. 523,959.

Patented July 31, 1894.



WITNESSES:

*J. Finch.*  
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INVENTOR

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By *P. M. Smith Jr.*

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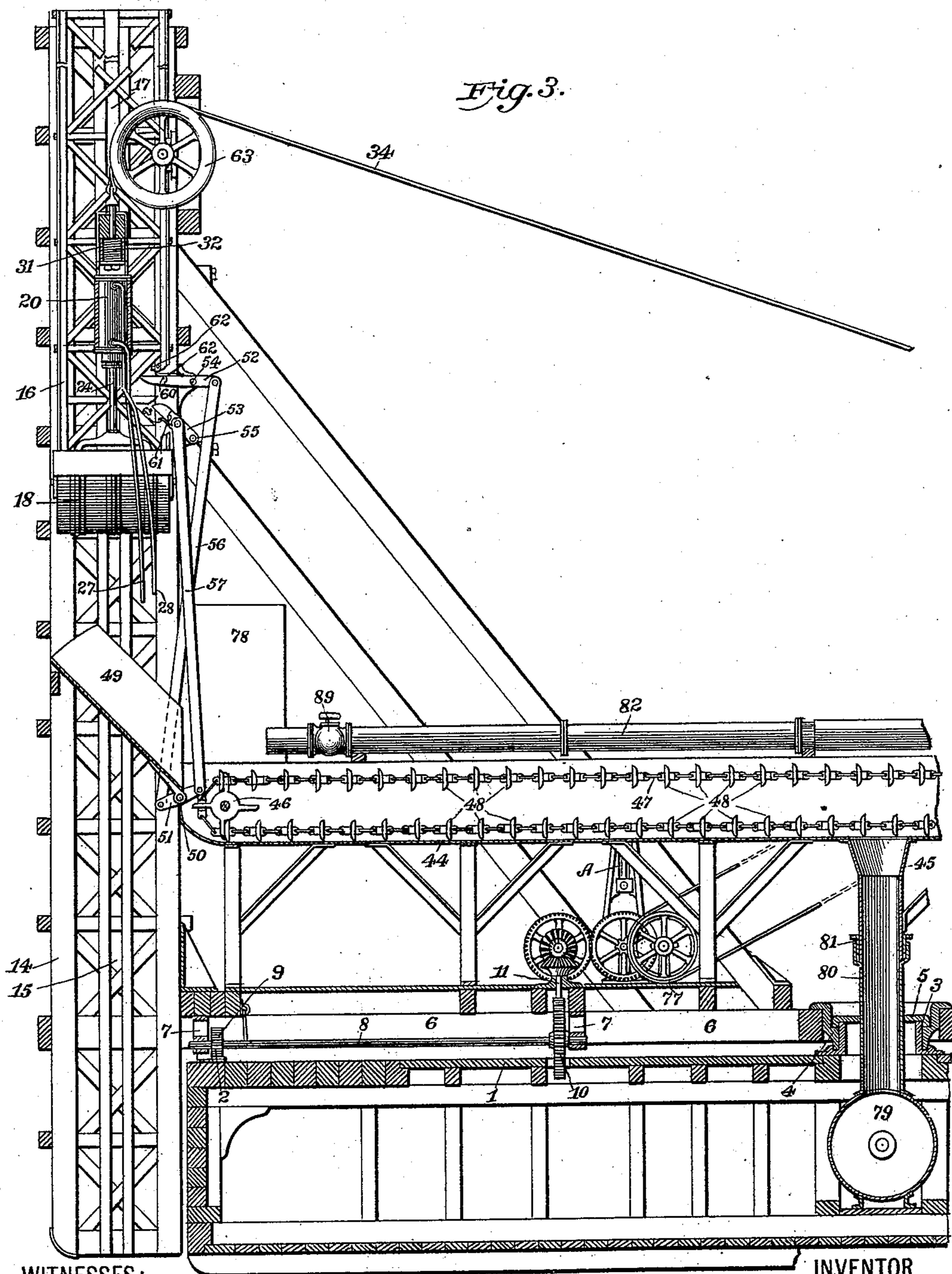
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7 Sheets—Sheet 3.

E. CHAQUETTE.  
DREDGING APPARATUS.

No. 523,959.

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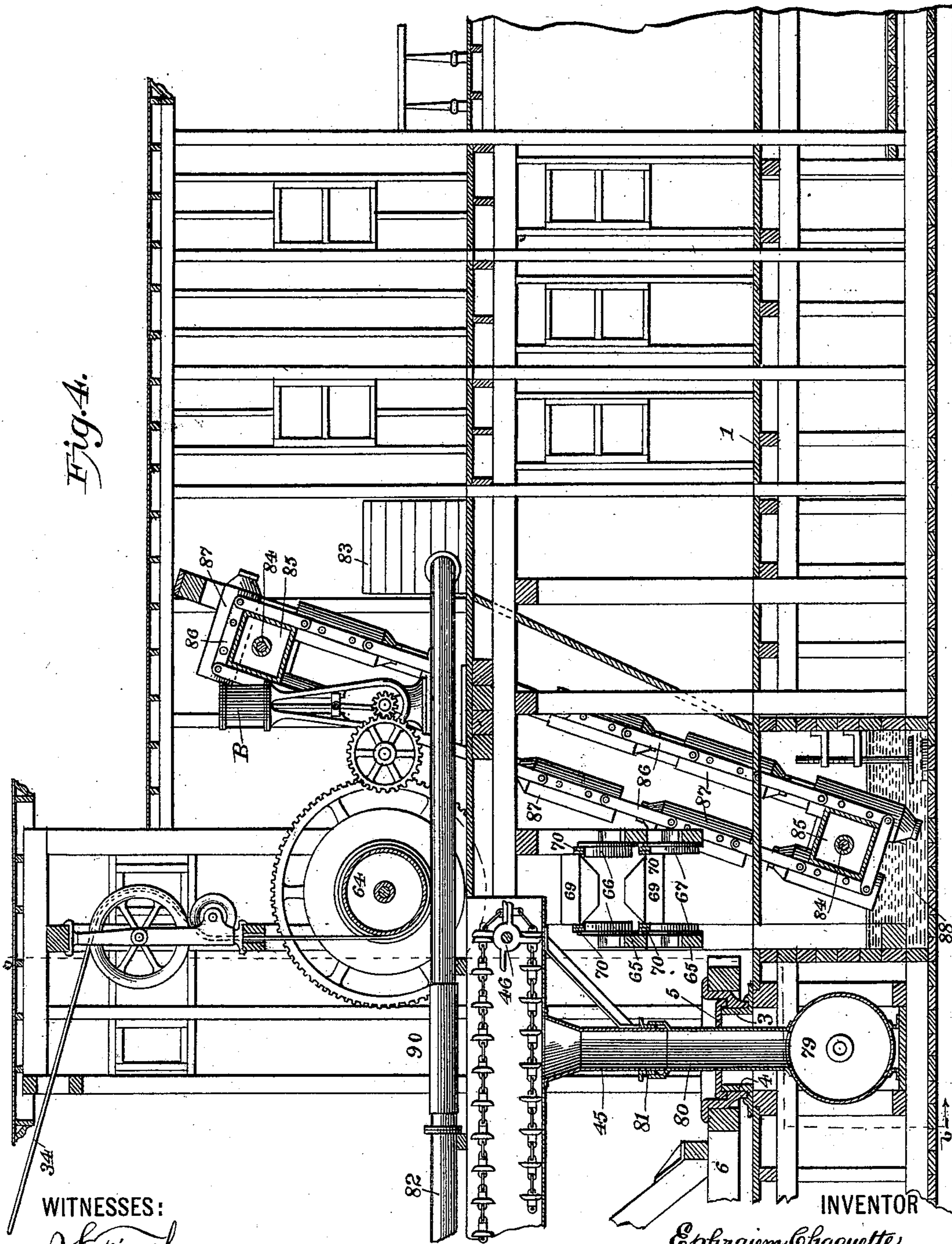
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7 Sheets—Sheet 4.

E. CHAQUETTE.  
DREDGING APPARATUS.

No. 523,959.

Patented July 31, 1894.



**WITNESSES:**

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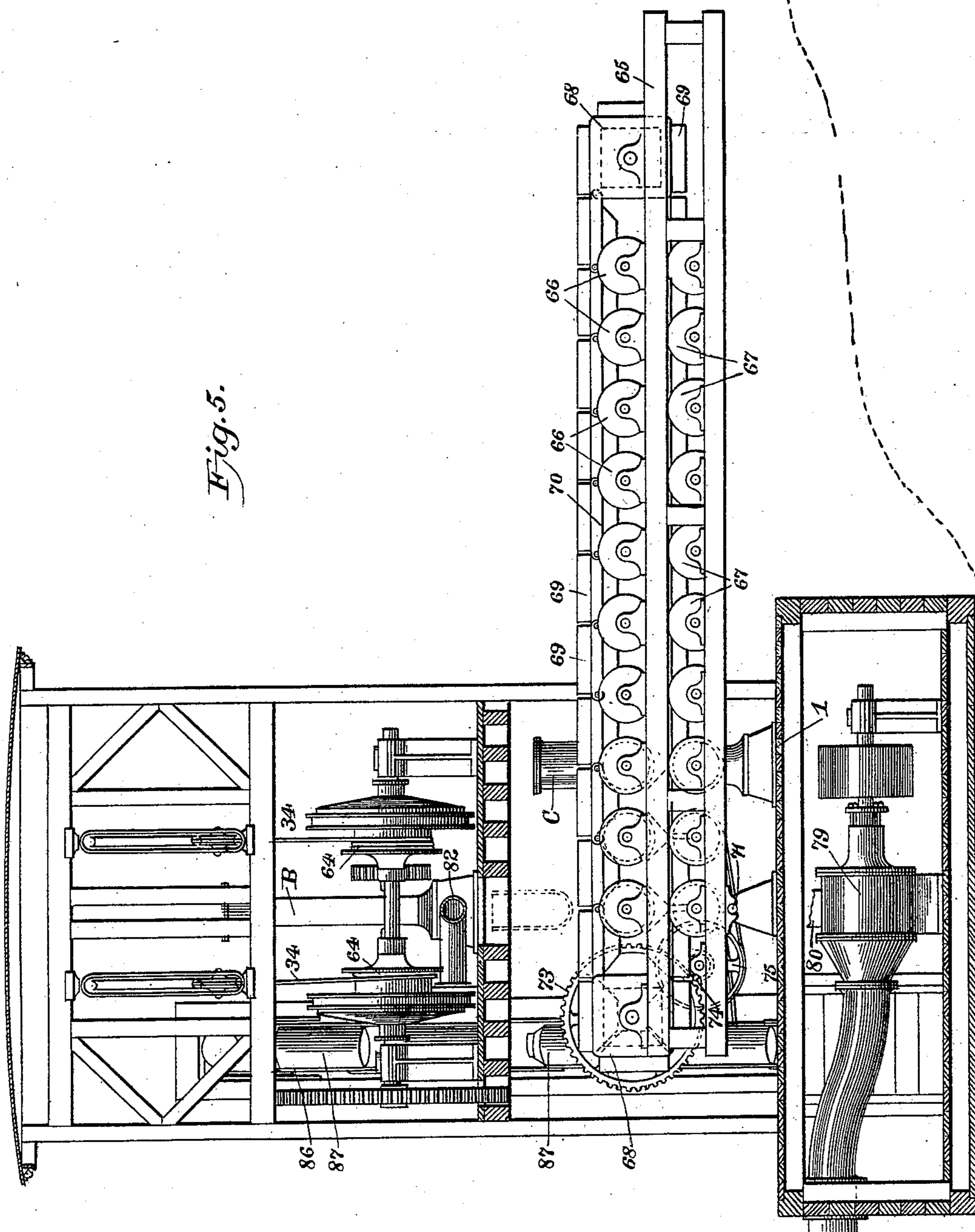
(No Model.)

7 Sheets—Sheet 5.

E. CHAQUETTE.  
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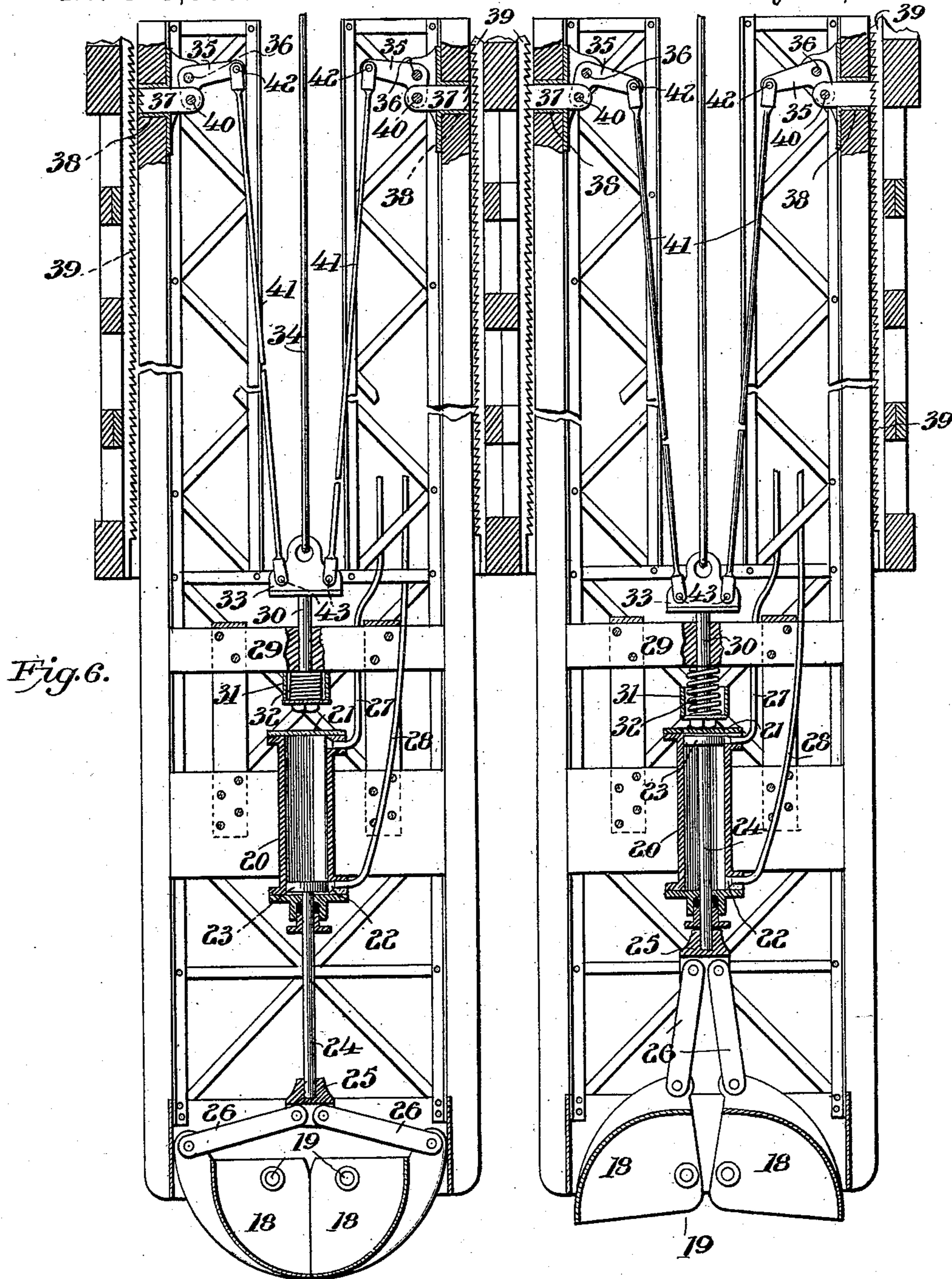
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(No Model.)

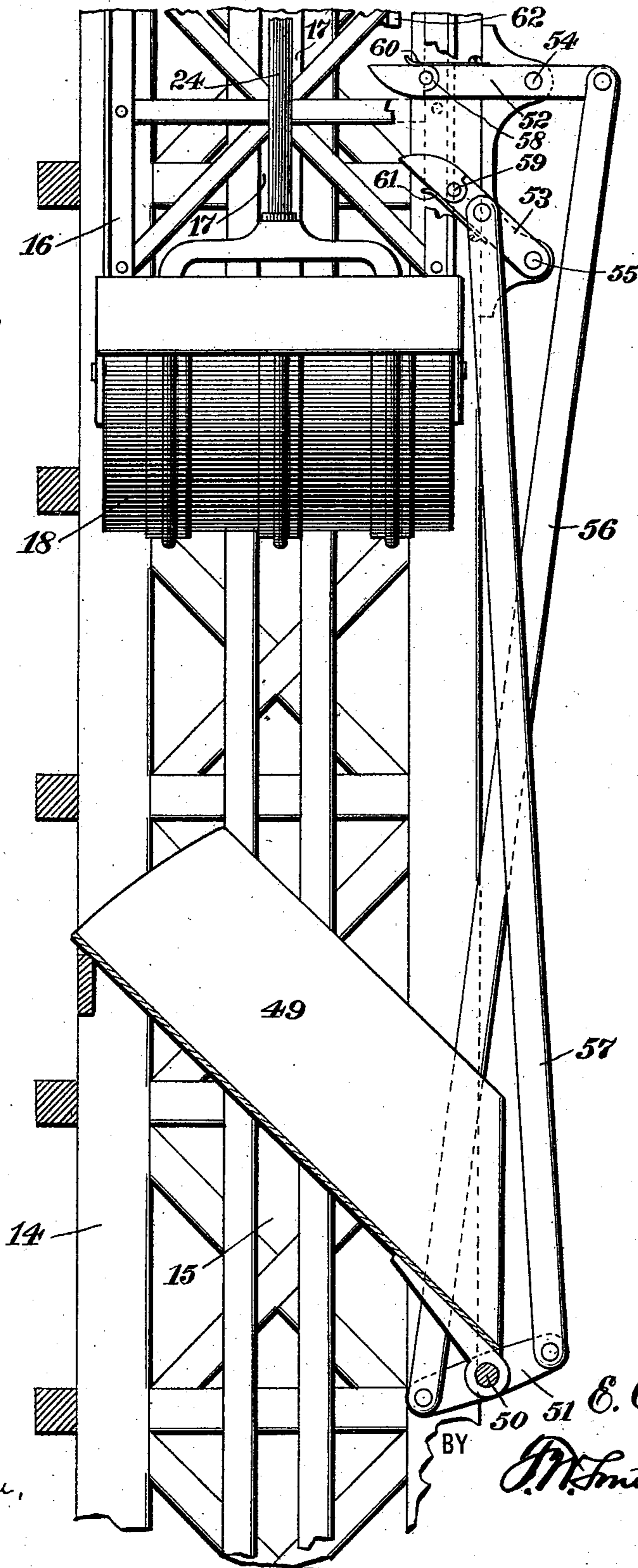
7 Sheets—Sheet 7.

E. CHAQUETTE.  
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*Fig. 7.*



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ATTORNEY

# UNITED STATES PATENT OFFICE.

EPHRAIEM CHAQUETTE, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO THE  
CHAQUETTE CANAL AND HARBOR DREDGING COMPANY, OF SAME PLACE.

## DREDGING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 523,959, dated July 31, 1894.

Application filed October 27, 1893. Serial No. 489,322. (No model.)

*To all whom it may concern:*

Be it known that I, EPHRAIEM CHAQUETTE, a citizen of the United States, residing at Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Dredging Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to dredging apparatus, and has in view the following objects:—first, to guide the digging clams positively and at all times within suitable ways; second, to greatly increase the capacity of an apparatus of this description and to economize in the power necessary to swing the digging elements throughout their field of operation; third, to do away with the unwieldy and top-heavy crane which displaces and often wrecks the dredging boat; fourth, to enable the digging element to travel and operate close to the boat, thereby lessening all strains and preserving the stability of the boat; fifth, to provide an automatically operated chute to receive the dumpings from the clams, which chute shall at all times occupy the same relative position with respect to the guide for the digging clams; sixth, to provide means for receiving the dumpings from the chute and for conveying them automatically to any suitable receptacle; seventh, to provide means for thinning the consistency of the dumpings by automatically introducing water into said dumpings, whereby they may be removed with greater facility or may be readily pumped and forced through a pipe line so as to be delivered at a remote point.

There are many parts of my improved apparatus which may be modified by changes such as are within the range of ordinary mechanical skill, and I do not therefore wish to be limited to the details of construction herein shown and described.

In order that those skilled in the art to which my invention appertains may fully understand its construction and operation, I will proceed to describe the same, reference being had to the accompanying drawings

which form a part of this specification, and in which—

Figure 1 is a vertical longitudinal sectional elevation of my improved apparatus; Fig. 2 a horizontal section at the line *a* of Fig. 1; Fig. 3 a broken sectional elevation of the forward half of my improved apparatus similar to Fig. 1 but on an enlarged scale; Fig. 4 a broken sectional elevation of the rear half of my apparatus similar to Fig. 1 but on an enlarged scale; Fig. 5 a section at the line *b—b* of Fig. 4; Fig. 6 a section on an enlarged scale at the line *c—c* of Fig. 2, and showing respectively the position of the operating parts when the digging element is depressed and the clams opened and closed, and Fig. 7 is a detailed broken elevation partly in section and enlarged scale showing particularly the construction and relative positions of the plunger frame and the devices for automatically operating the chute.

Similar numbers of reference denote like parts in the several figures of the drawings.

1 is the deck of any suitable boat and 2 an arcuate rack bar secured to said deck at the bow of the boat.

3 is a hollow king-bolt bolted to the deck and 4 is a thimble swiveled around said bolt so as to turn freely and held in position by means of a cap 5 over the top of the bolt and bolted or otherwise secured thereto.

6 is a table through the rear of which the thimble extends from top to bottom, said thimble and table being rigidly secured together in any ordinary manner. Depending from the bottom of the table are hangers 7 within which is journaled a shaft 8 having mounted thereon pinions 9, 10. The pinion 9 meshes with the rack 2 while the pinion 10 meshes with and receives motion from a worm (not shown) on the lower end of a vertical shaft 11 journaled in the frame work of the table, which shaft is revolved by means of any suitable and ordinary gearing operated primarily from any ordinary steam-engine A mounted on the table. 12 are rollers, shown in dotted lines at Fig. 2, journaled in the bottom of the table in the arc of a circle and normally resting upon an arcuate track 13 immediately in front of the rack bar 2.

The forward extremity of the table extends beyond the bow of the boat, and bolted or otherwise firmly secured to this extremity are the guide cages 14, which extend vertically upward. Each of these cages is provided with vertical guide ways 15 on opposite sides, and within said cages are plunger frames 16 provided with ribs 17 at their sides adapted to fit within the ways 15. 18 are the digging clams of any suitable shape and pivoted at 19 within the bottom part of the frames 16.

Since the cages and the parts contained and operated therein constitute duplicate sets of instrumentalities exactly alike I will hereinafter refer in my description to only one of these sets.

Mounted in the frame 16 is an ordinary tight cylinder 20 having ports 21, 22 at the upper and lower ends thereof, and within this cylinder is a piston 23 whose rod 24 depends through any suitable packing beyond the cylinder and carries at its lower end a block 25.

26 are toggle levers whose ends are pivoted respectively, to the clams 18 and to the block 25, so that it will be understood that when the rod is depressed the clams will be closed, while the elevation of said rod will open the clams.

27, 28, are ducts which lead from any suitable steam, compressed air or hydraulic source, into the ports 21, 22 above and below the piston, for the purpose of actuating the latter in the well known manner.

Extending loosely through a cross-bar 29 of the frame 16 is a vertical pin 30 to the bottom of which is secured a housing 31 within which latter and around the pin is a coil spring 32 confined between the bottom of the housing and the cross-bar. Secured to the top of the pin 30 is a block 33 to which is attached the cable 34 for elevating the frame.

35 are bell-cranks pivoted at 36 to the inside of the frame 16 and at opposite sides thereof, and 37 are pawls which extend through and are guided within sockets 38 in the sides of the frame and are capable of engaging and interlocking with ratchet bars 39 on the inside of the cage 14. The lower legs of the bell-cranks are loosely pivoted at 40 to the pawls, while connecting rods 41 are pivoted at 42, 43, to the upper legs of said cranks and to the block 33 respectively.

When the weight of the plunger frame is sustained by the cable 34, the block 33 will be pulled upward thereby compressing the spring 32 and bringing the housing 31 into abutment against the cross-bar 29, while at the same time the rods 41 will be elevated thereby keeping the pawls 37 out of engagement with the ratchet 39. As soon as the digging clams strike the bottom to be dredged, the cable 34 will be relieved and will slacken, and the spring 32 will distend thereby lowering the rods 41 and throwing the pawls 37 into engagement with the ratchets 39 to lock the plunger frame as against any upward

movement which would otherwise be caused by the closing of the clams 18, especially if the latter are operating in hard soil or other substance which offers considerable resistance.

In this present application I make no claim to any manner shown and described of opening and closing the digging clams, or to any device for locking the plunger frame as against any upward movement during the operation of said clams, since the same are shown, described and claimed in a separate application for Letters Patent of the United States filed on even date herewith.

In the present instance any suitable and ordinary means may be employed for the purpose of opening and closing the clams, and although I prefer to use the devices shown for locking the plunger frame, still they are not essential to the operation of my present invention and may be dispensed with.

I will not herein describe any particular means for controlling the supply and exhaust of steam, &c., through the ducts 27, 28, since this forms no part of my present invention and is moreover a part of the invention set forth and claimed in my above mentioned other application.

From the foregoing it will be readily understood that the digging element is at all times confined and guided in its movements by positive means; and this enables the digging to be effected and the dredgings to be delivered at places that are predetermined, and furthermore permits of the use of automatically operated appliances for the purpose of receiving the dumpings and conveying them to any convenient receptacle.

44 is an elongated mud-trough secured to the frame of the table 6 and extending at its front end close to the cage 14, while its rear end is open and overhangs any suitable mud depository hereinafter to be explained. The floor of this trough a little forward of the rear end thereof is provided with a chute which depends vertically and leads into any suitable pump hereinafter to be described. Journaled within this trough at each end thereof are sprocket wheels 46, and 47 is a chain carried by said wheels and having secured thereto at intervals hoes 48 which latter in their lowest position extend in close proximity to the bottom of the trough.

49 is the main mud chute having its lower extremity rigidly mounted on a rod 50 which latter is journaled between the sides of the cage. Rigidly secured around this rod 50 is a rocker bar 51, and pivoted to the cage above the chute 49 are dogs 52, 53. The pivotal point of the dog 52 is at or about its center as shown at 54 which makes this dog a lever of the first-class, while the pivotal point of the dog 53 is at its outer end as shown at 55 which makes said dog a lever of the second-class. Pivoted to the outer end of the dog 52 and to the inner end of the bar 51 is a connecting lever 56, and pivoted to the middle

portion of the dog 53 and to the outer extremity of said bar is a connecting lever 57.

From the foregoing it will be understood that the elevation of the inner end of the dog 53 will cause the chute 49 to be thrown inward within the cage, while the depression of the inner end of the dog 52 will cause said chute to be thrown outward without the cage. These dogs are peculiarly constructed, in that the dog 52 has its nose hinged to the body as shown at 58 in such manner that such nose resists any impact from above but yields readily to any force applied at its under side and folds backward out of the way, while the nose of the dog 53 is similarly hinged at 59 with the exception that it resists any impact from below and yields to a force applied from above.

60, 61, are flat springs secured to the bodies of these dogs and bearing against the noses to keep the latter normally closed.

Carried by the frame 16 is a shoulder 62, which, when said frame descends, strikes the dog 52, thereby throwing the chute 49 without the cage and bringing the dog 53 to a horizontal position. On the continued downward movement of the frame the hinged nose of the dog 53 will yield to the passage of the shoulder 62. When the frame ascends the shoulder will strike against the dog 53 and throw the chute within the cage, the hinged nose of the dog 52 yielding to the shoulder as the latter continues to move upward to its normally elevated position. The locations of these dogs and this shoulder with respect to the cage and frame are such that said dogs are always operated to swing the chute in its two positions when the digging clams occupy a horizontal plane above that of the chute, and it will therefore be readily understood that there can be no interference with the chute, and furthermore that the latter will always automatically assume the position necessary to receive the dumpings from the clams.

The cable 34 is passed over pulley 63 journaled in the top of the cage, and is wound around the usual drum 64, which latter is operated in any well known manner by an ordinary hoisting engine B. I will not describe this engine or any details of the mechanism used for winding up and releasing the cable, since they are all very ordinary and form no part of my invention.

After the dredgings have been delivered by the chute 49 within the trough 44, it becomes necessary to get rid of them in some manner. In open water dredging where the dumpings are to be carried away in a scow and deposited in any suitable place, said dumpings are emptied from the open rear end of said trough into a depository which latter carries them into the scow. It will accordingly first describe the devices which I employ in this last named instance.

65 is a frame between the sides of which are journaled two series of rollers 66, 67, the

former above the latter, and between the sides at each end of this frame are journaled square pulleys 68.

69 are buckets hinged together at their sides, as at 70, and extending after the manner of an endless belt around the series of rollers 66. The lower rollers 67 afford an anti-friction support for the inverted buckets. This bucket carrying frame is not fixed to any part of the boat, but is usually pivotally hung on a support 71 rising from the deck and supported at the outer end which overhangs the boat either by the scow or by any other suitable means. The object of the pivotal hanging of this frame is to allow for the rising and falling of the tide, and also to allow for the change in the elevation of the support for the frame away from the boat. For instance, in excavating for canals, the outer end of the frame would be supported on the bank, and as the latter may be irregular and may vary as to height, it would never do to fix this frame in a horizontal position. The location of this frame is such that the buckets are immediately below the open rear end of the trough 44, and these buckets are the depositories for the dumpings from the trough 44. On the shaft 72 of one of the square pulleys 68 is a spur gear 73 which meshes with a pinion 74 carried by the shaft of any suitable power pulley 75 operated in the usual manner from an ordinary engine C, whereby said square pulley is revolved and the series of buckets caused to travel after the manner of an endless belt around pulleys. This movement of the buckets will carry the dredgings and dump them into any suitable scow. To the shaft of the rear sprocket 46 is secured the pulley 76 which is belted up in any usual manner to a power pulley 77 operated in any ordinary manner from the engine A, whereby the chain 47 and hoes 48 are caused to travel continuously through the trough 44.

The operation of my improved apparatus as hereinbefore described is as follows:—It will be remembered that there are two sets of digging devices and delivery chutes, and, in order that the trough 44 may receive the dumpings from both chutes without making such trough throughout its length of a width equal to the combined widths of the chutes, I provide at the end of the trough at its sides flaring wings 78 (only one of which is shown) which extend beneath the chutes throughout their area and receive and guide the dumpings into the trough. During the operation of digging by one set of clams, the other set of clams is dumping its contents into the trough. The chute 45 is closed when the dumpings are to be disposed of by means of the buckets 69. The chain 47 and buckets 69 are always in operation, so that the dredgings are being continually forced throughout the trough 44 into said buckets and thence deposited in a scow or otherwise. It will be noticed that the chutes 49, trough 44 and the

digging elements, all swing in harmony with the table 6, so that their relative position in a vertical plane with respect to each other never changes. It will also be evident that the amount of time heretofore consumed, in swinging the clams around above the scow for the purpose of dumping and back again to digging position, is saved by the use of my apparatus, since the transfer of the dumpings to the scow is accomplished by means independent of the digging clams, which latter continue their function of digging during such transfer. This is a very important advantage, since, with a single set of my improved digging devices, I can do twice as much work as that heretofore accomplished by any other similar apparatus. The table which carries the digging devices is readily shifted at any time by means of power from the engine A in the manner heretofore described, and in this immediate connection I will say that my construction for accomplishing this result not only does away with the unwieldy crane heretofore used, but also enables the digging devices to travel close to the boat in their circuit of operation, thus greatly lessening the strain on the boat incident to the use of such crane, and economizing in the power necessary to swing the digging devices throughout their field of operation.

It will be seen that the capacity of my apparatus is still further increased by the provision of duplicate sets of digging clams, which work alternately and continuously, and this is a feature hitherto unknown in apparatus of this description which employs digging clams designed to be operated at the extreme end of the boat. There are, however, some dredging machines which employ several sets of digging clams which operate down through wells in various locations in the boat, but my apparatus is distinguished from these machines in that it employs the digging devices arranged to operate at the end of the boat. If desired, I can add more sets of these digging elements to still further increase the capacity of my apparatus, but I prefer to use the number shown for the reason that their capacity is sufficient for ordinary circumstances and they require a smaller force of operators than would be required in the instance of a larger system.

Heretofore it has been impracticable to operate a gang of digging clams at the extreme end of the boat for the reason that each set of digging clams must be swung from separate cranes operated independently, and this would cause the boat to be continually displaced and furthermore would so rack and strain the latter as to wreck it in a short time. In my improvement, a most important feature resides in the positive guiding of the digging devices within a stationary cage, and furthermore in dumping the contents of the digging clams and conveying said contents into any suitable receptacle without shifting such cage.

Instead of the trough and the devices oper-

ated therein and the traveling buckets, I can use any other suitable means for conveying the dumpings from the chute 49 to the place where said dumpings are finally deposited. For instance, I could employ an inclined trough leading directly from the chutes into a scow.

When not in use, the frame 65 is unshipped from the support 71 and placed in any suitable and convenient part of the boat.

In the construction of dikes or levees, a suitable stationary support for the outer end of the frame 65 is provided, which support may be shifted from time to time as the boat is advanced, or said support may be in the nature of an elongated track along which said frame may travel during the movement of the boat.

It frequently happens that an apparatus of this description is required for the purpose of filling in or reclaiming land that is unfit for cultivation in its primary state, owing to the fact that it is submerged, or of a swampy nature, or covered with tangled undergrowth or rocks, and in this connection my improvement has great utility owing to its extreme rapidity of operation. For accomplishing this purpose last referred to I dispense with the frame 65 and the buckets carried thereby and utilize instead thereof a pumping apparatus which receives the dredgings and forces them through a long pipe line which latter leads to the point at which they are to be deposited. This has hitherto been accomplished under serious disadvantages owing to the slowness in the operation of the digging devices and to the difficulty experienced in reducing hard and solid dredgings to the consistency necessary for forcing through the pump without such excess of water as will impair the actual capacity of the pump for delivering the dredgings. Heretofore water has been introduced into the dredgings and has been used to break the latter up and to reduce them to a state of fluidity, but it has been found well nigh impossible to regulate the proper supply of water to the dredgings and furthermore the mixing of these two elements has been very imperfectly performed, the result being that the deposit on the land to be reclaimed has invariably been covered with water at the depth of from six inches to a foot.

All these disadvantages above named are avoided by the use of my improvement, and I will now proceed to describe the means which I employ for the purpose of pumping and forcing these dredgings for delivery through a pipe line at a remote point.

79 is any suitable force pump preferably located below the deck of the boat and operated by any well known and ordinary means. I will not describe the construction of this pump or the manner of operating it, since they are very ordinary and form no part of my present invention, which latter has to do only with the proper delivery of the dredgings to the pump.

80 is a leader pipe to which the chute 45 is swiveled at 81, so that said chute and pipe form a direct vertical passage leading from the trough 44 directly into the pump. As before stated any suitable cover or plug (not shown) may be used to stop up the mouth of the chute in the bottom of the trough when the pump is not to be used, and such cover is of course removed when the pump is placed in operation. The chute is swiveled to the leader pipe 80 in order that the relative position of such chute and pipe may not be changed during the swinging movements of the table 6.

When the dredgings are of such a nature that they can readily flow through the pump and pipe line I do not bring into operation any means for introducing water into the trough to thin out the dredgings, and the latter as fast as they are dumped will be hauled along by the hoes 48 until they drop into the chute 45.

Whenever the digging devices strike hard or mucky soil which must be dug up in cakes or lumps, the latter as soon as they fall into the trough are soaked with water introduced through a pipe 82 into the forward end of the trough, and such lumps or cakes are chopped up by the hoes 48 and are thoroughly mixed by the latter with water during the passage throughout the trough to the chute 45. This pipe 82 is made in two sections, the rear section leading from a reservoir 83 which is automatically supplied with water in the manner presently to be described, while the forward section overhangs the forward end of the trough and is secured thereto. These sections are joined together by means of any suitable flexible coupling 90, so that when the trough is swung with the table the forward section of this pipe 82 will be free to swing likewise.

84 are shafts which are journaled in the frame of the boat in any suitable manner and which carry square pulleys 85.

86 is an endless chain carried by said pulleys, and 87 are cams which are secured one to every other link of the chain.

88 is a water tank in the bottom of the boat which is kept supplied from the surrounding water and into which the cans 87 dip as they are carried downward. The upper pulley 85 is so located that as the cans are carried over the same they will empty their contents into the reservoir 83.

The upper shaft 84 is revolved by means of any suitable and ordinary connections and appliances (not shown) operated from the engine B.

89 is a valve in the pipe 82 and by means of which the supply of water within the trough may be regulated according to the nature of the dredgings.

Thus it will be readily understood that only enough water will be delivered in the trough to reduce the dredgings to a condition suit-

able for the passage through the pump and pipe line.

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

1. In a dredging apparatus, the combination of a pivoted horizontally supported table capable of swinging in the arc of a circle, a vertically disposed cage secured to the front end of said table, the series of independently operating frames carrying the digging clams and contained within and positively guided by said cage, means for opening and closing said clams, and means for lowering and elevating said frames, substantially as set forth.

2. In a dredging apparatus, the combination of a horizontally swinging table carrying a series of independently operating and vertically guided frames, the digging clams depending from said frames, chutes automatically operated by the latter during their upward movement for receiving the dredgings, means for elevating and lowering said frames independently of each other, means for opening and closing the clams at predetermined times, and instrumentalities independent of the clams for conveying the dredgings to any suitable receptacle, substantially as set forth.

3. In a dredging apparatus, the combination of the vertically disposed cage, the plunger frame guided therein, and carrying digging clams, and means—as a chute—independent of the digging devices for receiving the dumpings from the latter in their elevated position and for conveying them to any suitable receptacle, substantially as set forth.

4. In a dredging apparatus, a horizontally supported and swinging table carrying the following elements, namely, digging devices positively guided in a vertical plane, an automatically operated chute for receiving the dumpings from said devices, and a conveyer for delivering said dumpings into any suitable receptacle, substantially as set forth.

5. In a dredging apparatus the combination of a pivoted horizontally swinging table, a vertically disposed guide cage secured to the outer end of said table, a plunger frame guided within said cage and capable of a free vertical movement therein, digging clams pivoted in the bottom of said frame, means for opening and closing said clams at predetermined times, means for elevating and lowering said frame, a chute automatically operated by said frame to swing in and out of said cage and to be in position for receiving the dumpings from said clams when they are opened, and means independent of the digging devices for conveying the dumpings to any suitable receptacle, substantially as set forth.

6. The combination of the cage, the plunger frame guided therein and carrying the digging devices, the pivoted chute, the rocker bar rigid with said chute, the dogs pivoted to the cage and having noses which project within said cage, the levers whose ends are pivotally

connected to said dogs and rocker bar, and the shoulder carried by the plunger frame and capable of acting against said dogs to swing the chute in and out of said cage, substantially as set forth.

7. The combination of the vertically guided and operated digging clams, the automatically operating chute independent of said clams and into which the dumpings from the latter are delivered, the trough into which said chute leads, and devices operating continually within said trough for conveying the dumpings to any suitable depository, substantially as set forth.

8. In a dredging apparatus, the combination of the vertical cage, the series of independent plunger frames operating and guided within said cage, the digging clams depending from said frames, means for elevating and lowering the latter, means for opening and closing said clams at the ends of the upward and downward movements respectively of said frames, and means for receiving the dumpings from the clams when the latter are opened at the end of the upward movements of the frames, substantially as set forth.

9. In a dredging apparatus, the combination of the digging devices carried by a table having a horizontally swinging movement, the automatically operated chute and the trough carried by said table, and devices automatically operated within said trough and independent of the digging devices for conveying the dumpings from the latter to any suitable receptacle, substantially as set forth.

10. In a dredging apparatus, the combination of the digging devices, the trough leading into a force pump, means for delivering the dredgings from the digging devices into said trough, means for introducing a regulated supply of water within said trough and upon the dredgings, and a series of continuously operating hoes within said trough whereby the dredgings and water are thoroughly mixed together and conveyed to the pump, substantially as set forth.

11. In a dredging apparatus, the combination of the trough leading into a force pump or other suitable receptacle for the dredgings, the chute leading into the forward end of

said trough, the digging devices and means carried thereby for automatically swinging said chute beneath and beyond the digging devices at predetermined times, instrumentalities continuously operated within said trough for conveying the dredgings throughout the same, and means for automatically introducing water within said trough thereby thinning the consistency of the dredgings, substantially as set forth.

12. The combination of the arcuate rack secured to the forward extremity of a dredging boat, the table pivoted to the deck of the boat and carrying a rotary pinion meshing with said rack, the vertically disposed cage rigid with the forward end of said table, the digging devices guided and operated within said cage, the trough carried by said table and leading into any suitable receptacle for the dredgings, the automatically adjustable chute for receiving the dredgings from the digging devices and leading into said trough, automatically operated instrumentalities within said trough for conveying the dredgings to said receptacle, and means for revolving said pinion whereby the table and the parts carried thereby are shifted bodily but without changing their relative positions, substantially as set forth.

13. The combination of the shafts journaled within the frame of the boat at points near the top and bottom thereof respectively, the square pulleys carried by said shafts, the endless chain carried by said pulleys, the cans secured to the links of said chain, the water tank at the bottom of the boat and through which said cans are passed, and the reservoir in the upper part of the boat and into which said cans successively empty their contents, substantially as set forth.

14. In a dredging apparatus, the frame supporting the devices for removing the dredgings pivotally hung to the deck of the boat.

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

EPHRAIEM CHAQUETTE.

Witnesses:

H. W. SMITH, Jr.,  
F. J. TANNER.