No. 668,629.

Patented Feb. 26, 1901.

L. A. DÉSY.

DREDGE.

(Application filed Aug. 6, 1900.)

(No Model.)

2 Sheets—Sheet 1.

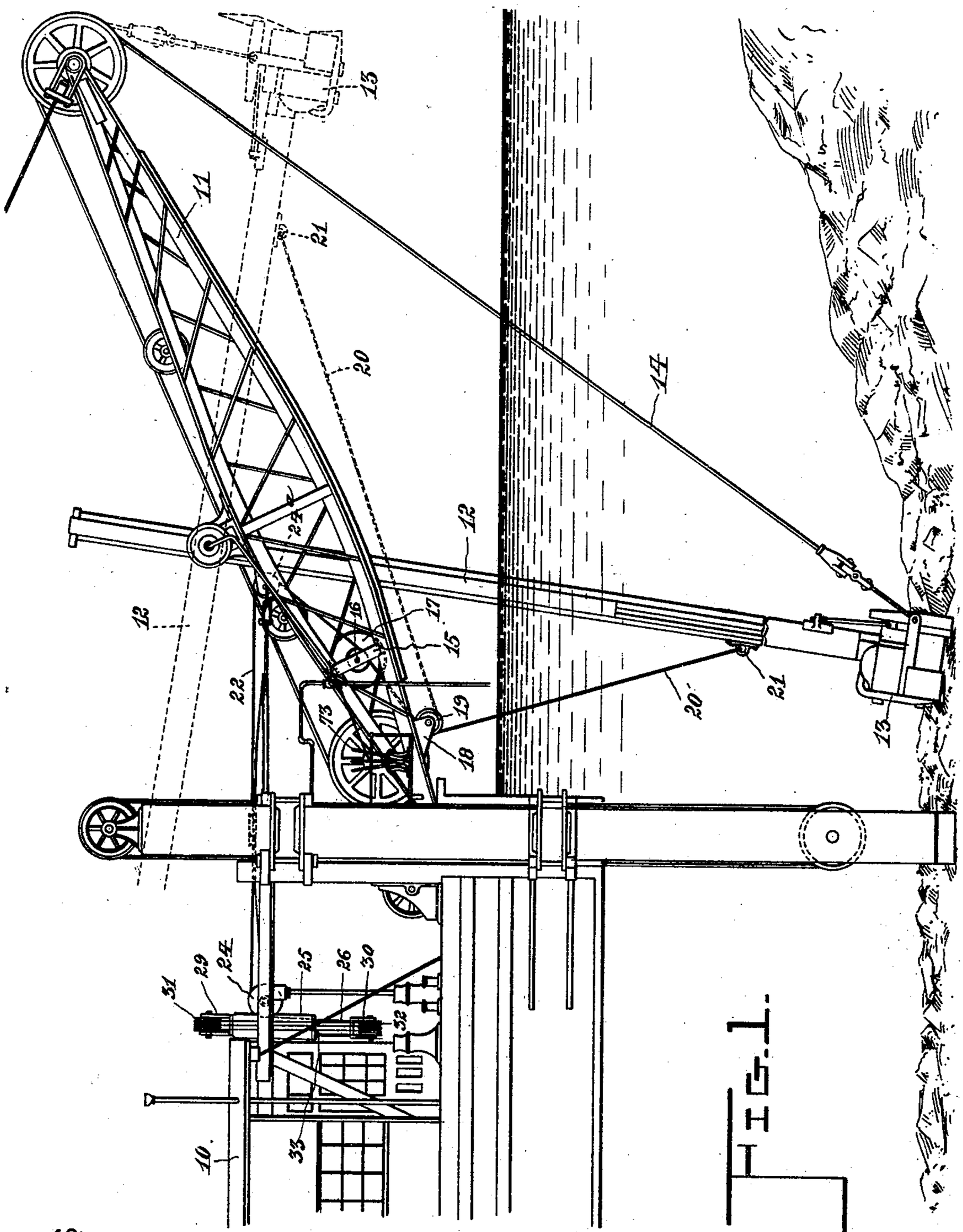

FIG. 1.

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(No Model.) 2 Sheets—Sheet 2.

FIG. 2.

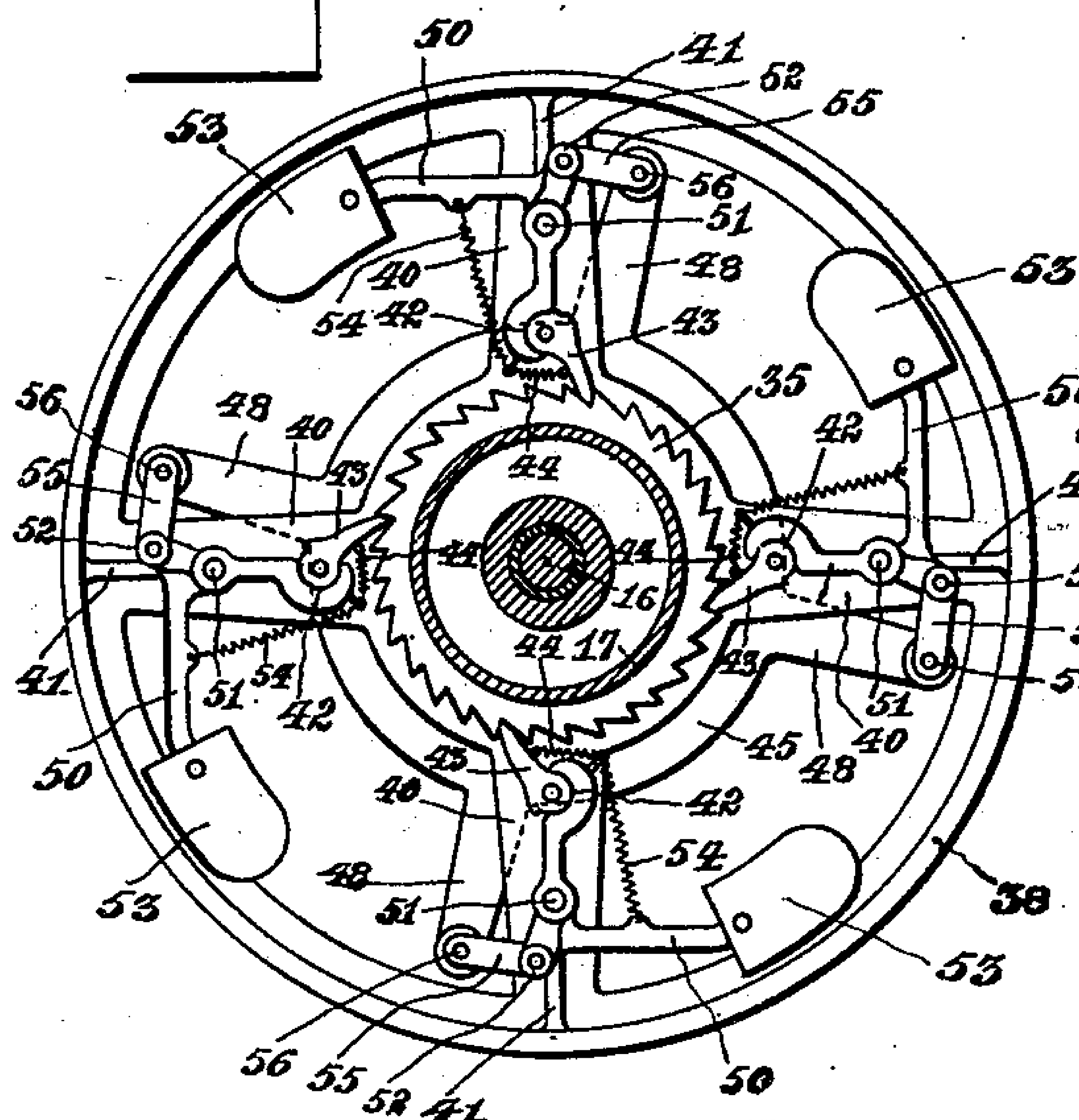


FIG. 3.

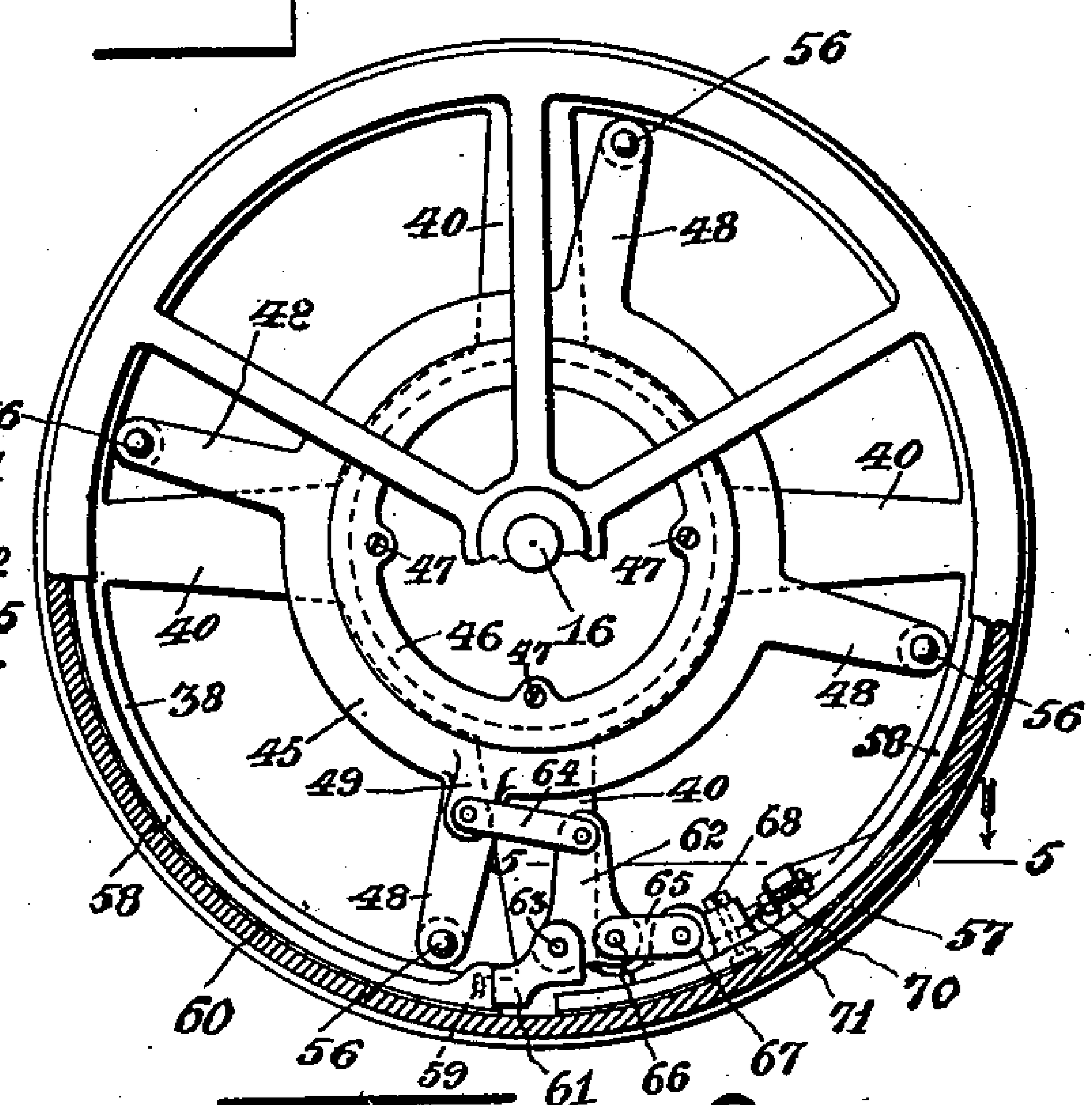


FIG. 4.

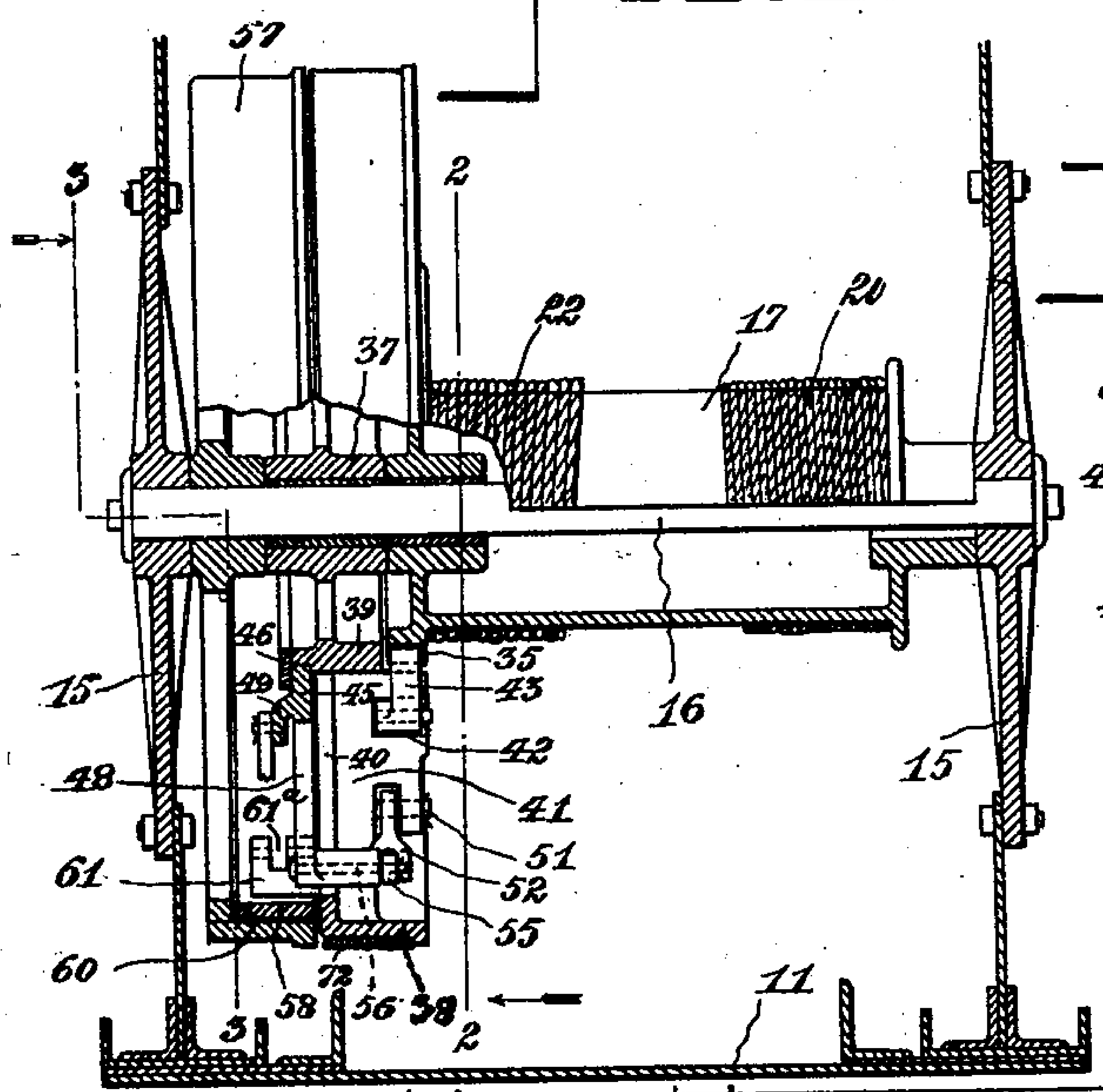


FIG. 6.

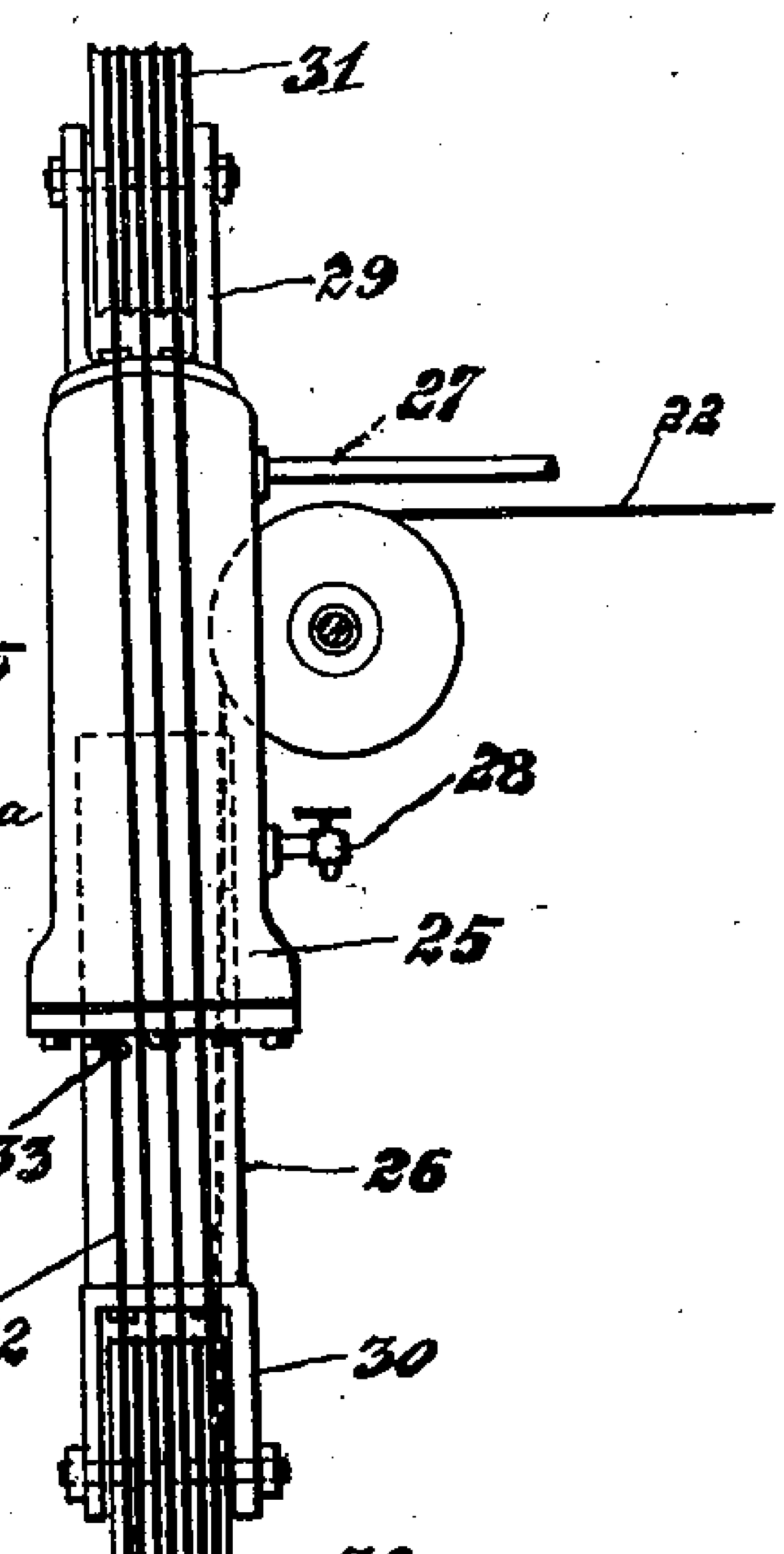
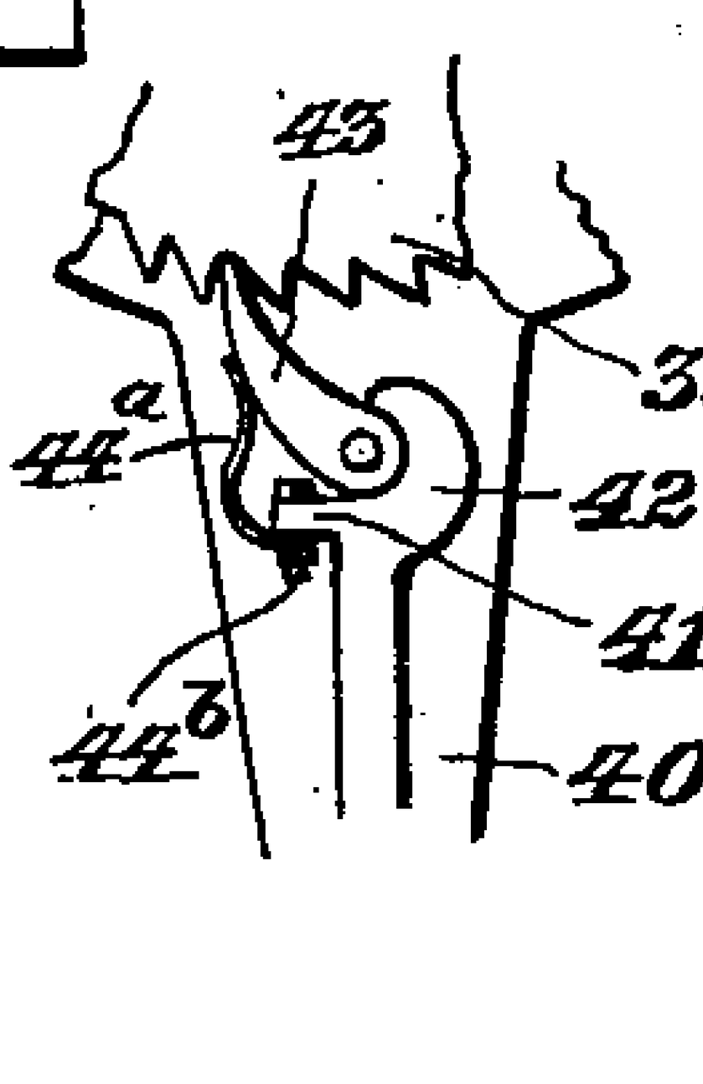


FIG. 7.



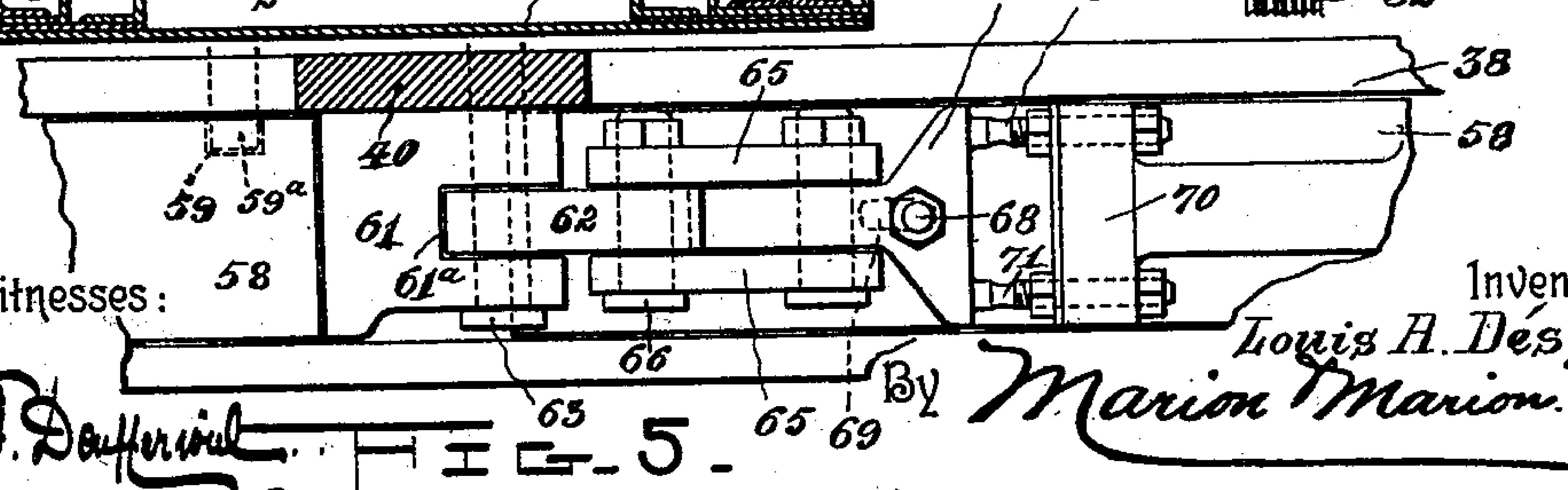


FIG. 5.

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UNITED STATES PATENT OFFICE.

LOUIS ARSÈNE DÉSY, OF MONTREAL, CANADA.

DREDGE.

SPECIFICATION forming part of Letters Patent No. 668,629, dated February 26, 1901.

Application filed August 6, 1900. Serial No. 26,100. (No model.)

To all whom it may concern:

Be it known that I, LOUIS ARSÈNE DÉSY, a subject of Her Majesty the Queen of Great Britain, residing in the city and district of Montreal, Province of Quebec, Canada, have invented certain new and useful Improvements in Dredges; and I do hereby declare that the following is 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.

In ordinary dredges it is customary to employ means for drawing the dipper-arm in an arcuate path and back to a position approximately vertical before allowing it to suddenly drop for the bucket to take up its load of material. A familiar type of backing mechanism for the dipper-arm is a backing-chain attached to said arm near the bucket and passing through a hawse-pipe secured in the front portion of the dredge-scow, said chain being connected to a drum of a backing-engine, which operates to take up the slack in the chain. It is found in the practical service of a mechanism of this type that the backing-engine cannot be run fast enough to pay out the backing-chain when the dipper-arm drops suddenly in an approximately perpendicular path, and, furthermore, the wear and tear on the backing-chain and the hawse-pipe is so great as to necessitate frequent renewals and repairs, thus involving stoppage in the operation of the dredge and the consequent loss of time, labor, and expense.

The primary object of this invention is to provide a mechanism wholly automatic in its operation for taking up the slack in the backing-cable and for drawing the dipper-arm back to its perpendicular position before it drops suddenly, such cable-take-up mechanism permitting the backing-cable to pay out as rapidly as required on the drop of the dipper-arm and such mechanism being, furthermore, under the control of fluid-pressure, so as to take up instantly any slack in the cable on the elevation and on the backward movement of the dipper-arm.

A further object is to provide an automatic brake mechanism which remains inactive during the elevation and the forward and backward swinging movements of the dipper-arm, such brake mechanism also being inoperative on the descent of the dipper-arm at a certain speed; but when this speed is exceeded and the dipper-arm has a tendency to move forward beyond a proper prescribed path owing to the rapid paying out of the backing-cable such brake mechanism is by centrifugal energy thrown into operation to retard the rotation of the cable-drum and to check the too-rapid uncoiling of the cable.

Further objects and advantages of the invention will appear in the course of the subjoined description, and the novelty in the combination of mechanisms and in the construction and arrangement of parts will be defined by the claims.

In the accompanying drawings, forming a part of this specification, Figure 1 is a side elevation of a portion of an ordinary dredge equipped with a backing mechanism for the dipper-arm constructed in accordance with my invention, the dipper-arm being shown in its lowered position by full lines and in its raised position by dotted lines. Fig. 2 is a vertical transverse section taken in the plane of the dotted line 2 2 on Fig. 4 looking in the direction of the arrow. Fig. 3 is a similar transverse section taken in the plane of the dotted line 3 3 on Fig. 4 and looking in the contrary direction as indicated by the arrow. Fig. 4 is a sectional elevation taken longitudinally through a portion of the revoluble drum and the automatic brake mechanism therefor. Fig. 5 is a fragmentary sectional plan view, on an enlarged scale, of a portion of the expansible brake-band and certain parts associated therewith, the plane of the section being indicated by the dotted line 5 5 on Fig. 3. Fig. 6 is a detail view in elevation of one form of fluid-pressure take-up mechanism which may be employed. Fig. 7 is a detail view of another form of spring adapted to actuate the pawl of the brake mechanism.

The same numerals of reference denote corresponding parts in each figure of the drawings.

In order that others skilled in the art may understand my invention, I have illustrated the same applied to a dredge by Fig. 1 of the drawings, in which the numeral 10 indicates a portion of said dredge, 11 is the dipper-crane, 12 the dipper-arm, and 13 the bucket carried by said arm, and 14 the haulage-cable

that elevates and gives the necessary movement to the dipper-arm in a manner well understood by those skilled in the art. No further description of these parts is considered necessary to be given by me, because said parts are constructed for operation in the well-known manner; but instead of connecting a backing-cable to the dipper-arm and of operating said backing-cable by a backing mechanism, as heretofore, I have provided certain means for automatic operation in connection with the dipper-arm, so as to take up any slack in the backing-cable.

In the improvements now about to be described I shall employ the terms "backing-cable" and "take-up cable," which are coiled on a revoluble drum, one of said cables being connected to the dipper-arm in lieu of the usual backing-chain and the other cable being under the control of the fluid-pressure take-up mechanism. Although I prefer to use cables in my invention, it is to be understood that chains or other equivalent means may be employed in lieu of such cables.

The upper and lower portions of the dipper-crane at a point adjacent to the crane-mast are connected by the standards 15, (see Figs. 1 and 4,) said standards being arranged parallel to each other and at opposite sides of the dipper-crane. These standards support a non-revoluble axle 16, which is held securely in place in and by the standards by any suitable means, it being essential that the axle shall remain stationary, while the drum 17 shall be free to rotate on said axle. This drum is sleeved or otherwise mounted loosely on a portion of the axle, between the bearings thereof, in the spaced standards 15, and the remainder of the space on the axle which is unoccupied by the drum is taken up by an annular brake-carrier and by an annular brake-surface, as will hereinafter appear, whereby the three elements referred to absorb all the space of the axle between the two standards 15.

I prefer to employ two backing-cables 20, only one of which is represented by Fig. 1 of the drawings, each backing-cable being attached to an eye 21, which is secured on the dipper-arm at a point to which the backing-chain is ordinarily attached. A bracket 18 is firmly secured on the dipper-crane at a point in rear of the upright position assumed by the dipper-arm before it drops in the operation thereof, and in this bracket are idly mounted the sheaves 19, which accommodate the backing-cables 20. By the location of the brackets and the sheaves at the point indicated the backing-cable is caused to pass in a rearward direction from the drum and the eye on the dipper-arm, whereby the cable in the operation of suddenly dropping the dipper-arm in an approximately vertical path is made to exert a rearward pull on the dipper arm, so as to give the proper "backing action" thereto. This cable 20 thus passes through the eye on the dipper-arm to and around the sheaves 19 and thence to the drum 17, so as to be coiled thereon in one direction. The take-up cable 22 is coiled on another portion of the drum and in an opposite direction to the cable 20, so that as the cable 20 is uncoiled from the drum 17 in the operation of lowering the dipper-arm the other cable 22 will be coiled on said drum in opposition to the pressure of the motive fluid in the take-up mechanism, and vice versa. This take-up cable 22 is preferably smaller in diameter than the backing-cable 20; but this is immaterial. The take-up cable 22 passes from the drum 17 in an upward and forward direction around a sheave 24^a, which is supported on the dipper-arm in advance of said drum 17. From thence said take-up cable passes in a substantially horizontal direction to and around another sheave 24, which is supported on a part of the dredge 10 at a point adjacent to the take-up mechanism.

As shown by Figs. 1 and 6, the fluid-pressure take-up mechanism has a vertical cylinder 25, adapted to be secured in a stationary position on a suitable part of the dredge 10, and in this cylinder operates the plunger 26. Motive fluid of any suitable character is supplied to the cylinder through the medium of a pipe 27, such motive fluid being either steam under boiler-pressure, compressed air, water, or any other suitable fluid. A drain-cock 28 is adapted to discharge the water of condensation from the cylinder when steam is used as the motive fluid. The cylinder 25 has a bracket 29 attached to the upper head thereof, while another bracket 30 is secured to the foot of the plunger 26. In these two brackets are mounted two series of sheaves 31 32, around which is reeved the major portion of the take-up cable 22, one end of the latter having a fixed point of attachment, as at 33, whereby the length of the cable is greatly multiplied.

It will be understood that the fluid-pressure take-up mechanism is carried wholly by the dredge-scow, and thus the weight of this take-up mechanism is removed from the dipper-crane and from the revoluble drum, which in a measure is under the control of the take-up mechanism, owing to the connection obtained by the employment of the take-up cable 22, whereby any slack in the backing-cable 20 will be instantaneously absorbed by the rotation of the drum 17 under the pull of the cable 22, which is controlled by the pressure of the motive fluid in the take-up mechanism.

The revoluble drum 17 is provided at one end with a ratchet 35, adjacent to which is disposed an annular brake-carrier, the latter serving as the means for supporting a series of pawls in operative relation to this ratchet and also supporting the centrifugal governor means by which an expansible brake-band is thrown into tight frictional engagement with an annular brake-surface at a proper period in the operation of uncoiling the backing-cable from the revoluble drum and during the

dropping of the dipper-arm. This annular brake-carrier consists of a hub 37, an outer ring 38, an intermediate ring 39, and a series of radial arms 40, all of which are cast in a single piece of metal. The hub 37 of this annular brake-carrier is sleeved loosely on the non-revoluble axle 16, contiguous to the hub of the drum 17, and each radial arm 40 of said annular brake-carrier is formed on one side with an offstanding rib 41. In the drawings I have shown this annular brake-carrier as formed with a series of four radial arms and a like number of offstanding ribs on said arms; but the number is immaterial. Each rib of the series on the arms of the carrier is formed with a pocket or recess 42, adapted to accommodate the heel of the pivoted pawl 43. The series of pawls 43 are thus mounted on the arms of the brake-carrier in order to travel therewith and to be presented in position for engagement with the ratchet of the revoluble drum 17, and to each pawl 43 is connected a spring 44, the tension of which is exerted normally to hold said pawl in engagement with the ratchet, whereby the series of pawls operate to clutch the annular brake-carrier to the drum in order that the brake-carrier and the drum may rotate together when said drum is moved in one direction by the uncoiling of the backing-cable therefrom, and, furthermore, the rotation of the drum in an opposite direction causes the ratchet to slip idly past the pawls, so that the drum and the ratchet will rotate freely and independently of the brake-carrier and also without restraint from the brake mechanism.

In Fig. 2 of the drawings the spring 44 is shown as a coiled spring attached at its respective ends to the pawl and the brake-carrier; but the style of spring is immaterial, because in Fig. 7 the pawl 43 is seated in the pocket 42, so as to be pivoted to the brake-carrier, a portion of the pocket forming a rib 41 being extended to form a lug 41^a, which is adapted for the attachment of the leaf-spring 44^a, the latter being secured in place by a screw or bolt 44^b and having its free end arranged to press against the pawl.

The annular brake mechanism supports a brake-expander, an expanding-lever, and a series of centrifugally-acting levers, which are connected with the shiftable brake-expander in a manner to move the same and through said expander to actuate the expanding-lever, which applies the brake-band against a stationary brake-surface. The shiftable brake-expander is in the form of a ring or annulus 45, that is fitted on the inner ring 39 of the brake-carrier and is held loosely in place by a confining-ring 46, the latter being secured in place by the screws 47. This expander is loosely mounted in place, so that it may be capable of a limited movement around an imaginary axis, and it is formed with a series of radial arms 48 and with a single short arm 49, said radial arms 48 being equidistant and on one side of the expander-annulus. The series of centrifugally-acting levers 50 are fulcrumed on the radial arms 40 of the brake-carrier, and said levers are connected operatively with the radial arms 48 of the shiftable brake-expander, as will now appear. Each lever 50 has an arm which is fulcrumed at 51 and is forked at its other end, as at 52, (see Figs. 2 and 4,) and said lever carries a weight 53 and is partly controlled by a coiled spring 54, the strength of said spring being such as to counteract the centrifugal force of the weight and the lever when the brake-carrier and the drum rotate within a certain speed limit. In the forked end of each lever 50 is pivoted one end of a link 55, in the free end of which link is secured a bolt 56, that extends across to one arm 48 on the shiftable brake-expander, whereby the series of weighted levers which are disposed on one side of the arms 40 of the annular brake-carrier are operatively connected with the series of arms on the shiftable brake-expander that is mounted on the opposite side of said arms 40, forming a part of said annular brake-carrier, as will be readily understood by a comparison of Figs. 2, 3, and 4 one with the other.

The style of brake which I employ is an expansible band 58, arranged within an annular brake-surface 57, the latter being firmly secured to the axle 16, so as to occupy a fixed stationary relation to said brake-band, the latter being arranged loosely within said brake-surface and also being self-contracting, so as to free itself from frictional engagement with said brake-surface. At one end this brake-band has a socket or opening 59, adapted to loosely receive a pin 59^a, as indicated by dotted lines in Figs. 3 and 4, which pin is make fast with the brake-carrier. The external working face of the expansible brake-band has a friction-covering 60, of some suitable material, such as leather, said covering arranged to have contact with the inner face of the annular brake-surface 57. The loosely-confined end of this brake-band rests against an abutment-lug 61, which is made fast with the annular brake-carrier, so as to extend laterally therefrom and to lie in the path of said loosely-held end of the brake-band, as shown by Figs. 3 and 4, said abutment-lug being forked, as at 61^a. In this forked lug is fulcrumed an expanding-lever 62 on the pin or bolt 63, and the upper portion of this lever 62 is connected by a link 64 to the short lug 49 of the shiftable brake-expander. A pair of parallel links 65 are arranged on opposite sides of this lever 62, so as to be connected pivotally thereto by the pin or bolt 66, (see Figs. 3 and 5,) and said links 65 are pivoted to an adjustable plate 67, the latter being seated upon the otherwise free portion of the brake-band and attached to the latter by a bolt 68, which plays in a slot 69, the latter being formed in the brake-band, as indicated by dotted lines in Fig. 5. A lug 70 is made fast or integral with the brake-band at a point

adjacent to the adjustable plate 67. In this lug 70 is threaded the adjusting-screw 71, by manipulating which the plate 67 may be shifted so as to adjust the expansible brake-band in a manner to compensate for wear due to the frictional engagement of said brake-band with the brake-surface.

It will be noted that the shiftable brake-expander 45 is connected with the series of levers 50 and with the expanding-lever 62, and said expanding-lever is linked to a free portion of the expansible brake-band, the other end of which brake-band abuts against a lug which is fast with the brake-carrier and to which lug is fulcrumed said expanding-lever 62. The elevation of the dipper-arm 12 by the haulage-cable 14 pulls on the backing-cable 20, so as to uncoil it from the drum 17, thereby turning the drum in a direction for the ratchet to slip idly over the pawls without disturbing the brake-carrier or the brake mechanism and also causing the take-up cable to be coiled on said drum 17 in opposition to the pressure of the motive fluid in the cylinder in the take-up mechanism. The operation of swinging the dipper-arm in an arcuate path from its horizontal position (shown by dotted lines in Fig. 1) to an approximately vertical position preliminary to permitting the arm to drop suddenly causes slack in the backing-cable 20, and this slack is instantly taken up by the pressure of the motive fluid in the take-up cylinder, which causes the cable 22 to be uncoiled from the drum 17, and thereby coils up a portion of the cable 20 on said drum 17 as rapidly as the dipper-arm moves in an upward direction. Now with the dipper-arm in its upright position ready to be dropped the strain comes on the backing-cable 20 during the dropping operation of the dipper-arm, and the speed with which this dipper-arm descends determines the action of the brake mechanism. As the arm descends and the strain comes on the cable 20 the latter is uncoiled from the drum 17, which is rotated in a direction to make the pawls engage with the ratchet, and thereby turn the brake-carrier, which operates in unison with the drum. If the dipper-arm descends at a speed within a prescribed limit, the weighted levers are held by the springs 54 in an inactive position and against the centrifugal energy of the weighted levers, whereby the brake mechanism is not applied against the stationary brake-surface, notwithstanding the rotation of the brake-carrier with the drum. If the dipper-arm, however, moves at a speed in excess of the predetermined limit, the rotation of the drum has a tendency to pay out the cable 20 at a rate which will permit the dipper to swing forward somewhat beyond its proper position, and at this period the rotation of the brake-carrier with the drum permits the levers 50 to be moved outwardly under centrifugal force and against the tension of the springs 54, so that one or the other of the levers 50 will turn the annular brake-expander 45 a limited distance. This movement of the brake-expander is communicated by the link 64 to the expander-lever 62, and this lever acts through the links 65 so as to expand the brake-band 58 into frictional engagement with the annular brake-surface 57, whereby the rotation of the drum will be retarded and the uncoiling of the cable 20 will be checked automatically. This operation, however, does not retard the drop of the dipper-arm; but the brake serves merely to prevent the cable from paying out so rapidly as to permit the dipper-arm to swing forwardly to an improper position.

In addition to equipping the apparatus with an automatic brake mechanism I have supplied it with an emergency-brake 72, the latter being in the form of a band arranged to circumferentially embrace the ring 38 of the brake-carrier externally. This emergency-brake is under the control of a hand-lever 73, which is disposed within convenient reach of the attendant who controls the movement of the dipper-crane and the dipper-arm; but this emergency-brake is not intended to be operated except in rare instances.

Changes within the scope of the appended claims may be made in the form and proportion of some of the parts, while their essential features are retained and the spirit of the invention is embodied. Hence I do not desire to be limited to the precise form of all the parts as shown, reserving the right to vary therefrom.

Having thus described my invention, what I claim as new is—

1. In a dredge, the combination with a dipper-arm, a drum, and a backing-cable, of an automatic brake mechanism, to check the paying out of the cable on the descent of the dipper-arm beyond a predetermined speed, as and for the purposes set forth.

2. In a dredge, the combination with a dipper-arm, a drum, and a backing-cable, of an automatic brake mechanism arranged to remain inactive when rotating with said drum at a certain speed on the descent of the dipper-arm, said brake mechanism being operable automatically by centrifugal energy developed by the rotation of the drum and the paying out of the backing-cable when the dipper-arm drops at a speed beyond a predetermined limit, as set forth.

3. In a dredge, the combination with a dipper-arm, a drum, and a backing-cable coiled in one direction around the drum, of a motive-fluid take-up mechanism carried by the dredge, and a cable coiled in an opposite direction on the drum and having an operative connection with said take-up mechanism, said last-named cable being operable by the take-up mechanism to rotate the drum in a direction to coil up the backing-cable when slack exists therein owing to the movement of the dipper-arm in certain directions, substantially as and for the purposes set forth.

4. In a dredge, the combination with a dip-

per-arm, a revoluble drum, and a backing-cable coiled on said drum, of a motive-fluid take-up mechanism, a single tension-cable coiled on the drum in an opposite direction to the backing-cable and connected operatively with the take-up mechanism to be controlled normally thereby in a manner to rotate said drum when slack exists in said backing-cable and automatically wind the latter on the drum, and an automatic centrifugal brake mechanism in active relation to the drum and adapted to rotate therewith in an inactive condition at certain speeds, as and for the purposes set forth.

5. In a dredge, the combination with a dipper-arm, and a drum, of a cable-guide disposed in rear of said drum and back of the path of said dipper-arm when it assumes a position preliminary to dropping, a backing-cable connected at one end to said dipper-arm, at its other end to the drum, and fitted on the cable-guide at a point intermediate of its connection to the dipper-arm and the drum, and a take-up mechanism tending to rotate the drum normally in a direction opposite to the movement communicated thereto by uncoiling the backing-cable from the same on the descent of the dipper-arm, substantially as and for the purposes set forth.

6. In a dredge, the combination with a dipper-arm, of a drum mounted on the dipper-crane, a backing-cable coiled in one direction on the drum and connected to the dipper-arm, a take-up mechanism, a take-up cable operatively related to said take-up mechanism and coiled reversely on the drum, a stationary brake-surface, a brake-carrier adapted to rotate with said drum, and a brake mounted on the carrier and having an element disposed in operative relation to the brake-surface, substantially as described.

7. In a dredge, the combination with a dipper-arm, of a drum mounted on the dipper-crane, a backing-cable coiled in one direction on the drum and connected to the dipper-arm, a take-up mechanism, a take-up cable operatively related to said take-up mechanism and coiled reversely on the drum, a brake-surface, a brake-carrier, means for clutching said brake-carrier to said drum when the latter rotates in one direction and arranged to permit the drum to rotate freely in an opposite direction, and a brake mechanism mounted on the carrier and arranged to coöperate with the brake-surface when said drum is rotated beyond a certain speed by the action of one cable thereon, substantially as described.

8. In a dredge, the combination with a dipper-arm, of a drum mounted on the dipper-crane, a backing-cable coiled in one direction on the drum and connected to the dipper-arm, a take-up mechanism, a take-up cable operatively related to said take-up mechanism and coiled reversely on the drum, a brake-surface, an expansible brake-band, a brake-carrier arranged to rotate with said drum, normally inactive levers mounted on the carrier, and expanding devices operable by one of said levers and arranged to expand said brake-band into contact with the brake-surface, substantially as described.

9. In a dredge, the combination with a dipper-arm, of a drum mounted on the dipper-crane, a backing-cable coiled in one direction on the drum and connected to the dipper-arm, a take-up mechanism, a take-up cable operatively related to said take-up mechanism and coiled reversely on the drum, a brake-surface, a brake-carrier arranged for rotation with said drum, centrifugal levers mounted on said brake-carrier and held normally inactive under the rotation of said drum within a prescribed limit, a movable brake element coöperating with the brake-surface, and connections between the centrifugal levers and said movable brake element, substantially as and for the purpose described.

10. In a dredge, the combination with a dipper-arm, of a drum mounted on the dipper-crane, a backing-cable coiled in one direction on the drum and connected to the dipper-arm, a take-up mechanism, a take-up cable operatively related to said take-up mechanism and coiled reversely on the drum, a brake-surface, a brake-carrier arranged to rotate with said drum, a shiftable brake-expander mounted on said brake-carrier, centrifugal levers fulcrumed on the carrier and connected with said brake-expander, means for restraining said centrifugal levers and the brake-expander from movement under the rotation of the drum within a prescribed limit, an expansible brake-band, and an expanding-lever connected with the shiftable lever and with said brake-band, substantially as described.

11. In a dredge, the combination with a dipper-arm, of a drum mounted on the dipper-crane, a backing-cable coiled in one direction and connected to the dipper-arm, a take-up mechanism, a take-up cable operatively related to said take-up mechanism and coiled reversely on the drum, a stationary brake-surface, a brake-carrier, a brake-band loosely confined at one end and having its other end free, an expanding-lever linked to the otherwise free end of said brake-band, and centrifugally-governed actuating means mounted on the brake-carrier and operatively related to the expanding-lever, substantially as described.

12. In a dredge, the combination with a dipper-arm, of a drum mounted on the dipper-crane, a backing-cable coiled in one direction and connected to the dipper-arm, a take-up mechanism, a take-up cable operatively related to said take-up mechanism and coiled reversely on the drum, a brake-surface, a brake-band, an adjustable plate on a free portion of said band, an expanding-lever linked to said adjustable plate, means for positively adjusting the plate to compensate for wear on the brake-band, and a centrifugal gov-

ernor actuated by the drum arranged to operate said expanding-lever, substantially as described.

13. In a backing mechanism for the dipper-arm of a dredge, the combination with a revoluble drum, of the backing and take-up cables coiled oppositely on said drum and arranged to rotate the latter in opposite directions, a motive-fluid take-up mechanism for placing one cable normally under tension, a friction brake mechanism, and a centrifugal governor mechanism remaining inactive with relation to the brake mechanism and the drum when the latter is under the control of the cable which is actuated by said take-up mechanism, said centrifugal governor mechanism remaining inactive when the drum rotates with a certain speed owing to the pull of the other cable, and being brought automatically into service when said drum exceeds the predetermined speed limit, as set forth.

14. In a dredge, the combination with a dipper-arm, a drum thereon, and a backing-cable coiled on said drum, of a fluid-pressure take-up mechanism carried by the dredge and having its cylinder and the plunger equipped with sheaves, and a single take-up cable having one length thereof coiled in an opposite direction on said drum and also having another length thereof fitted to form by a multiplying connection around the sheaves on the cylinder and piston of said take-up mechanism, substantially as described.

15. In a backing mechanism for the dipper-arm of a dredge, the combination of a drum, provided with a ratchet, the backing and take-up cables coiled oppositely on said drum, a take-up mechanism for controlling the take-up cable, a brake mechanism, a brake-carrier equipped with pawls which are presented for engagement with said ratchet of the drum, and a centrifugal governor mechanism mounted on the brake-carrier and having operative relation to a movable element of the brake mechanism, substantially as described.

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

LOUIS ARSÈNE DÉSY.

Witnesses:

FRS. J. O'NEILL,

J. ED. PAGE.