

(No Model.)

4 Sheets—Sheet 1.

P. S. ROSS.
SUBAQUEOUS ROCK BREAKER.

No. 517,556.

Patented Apr. 3, 1894.

Fig. 2,

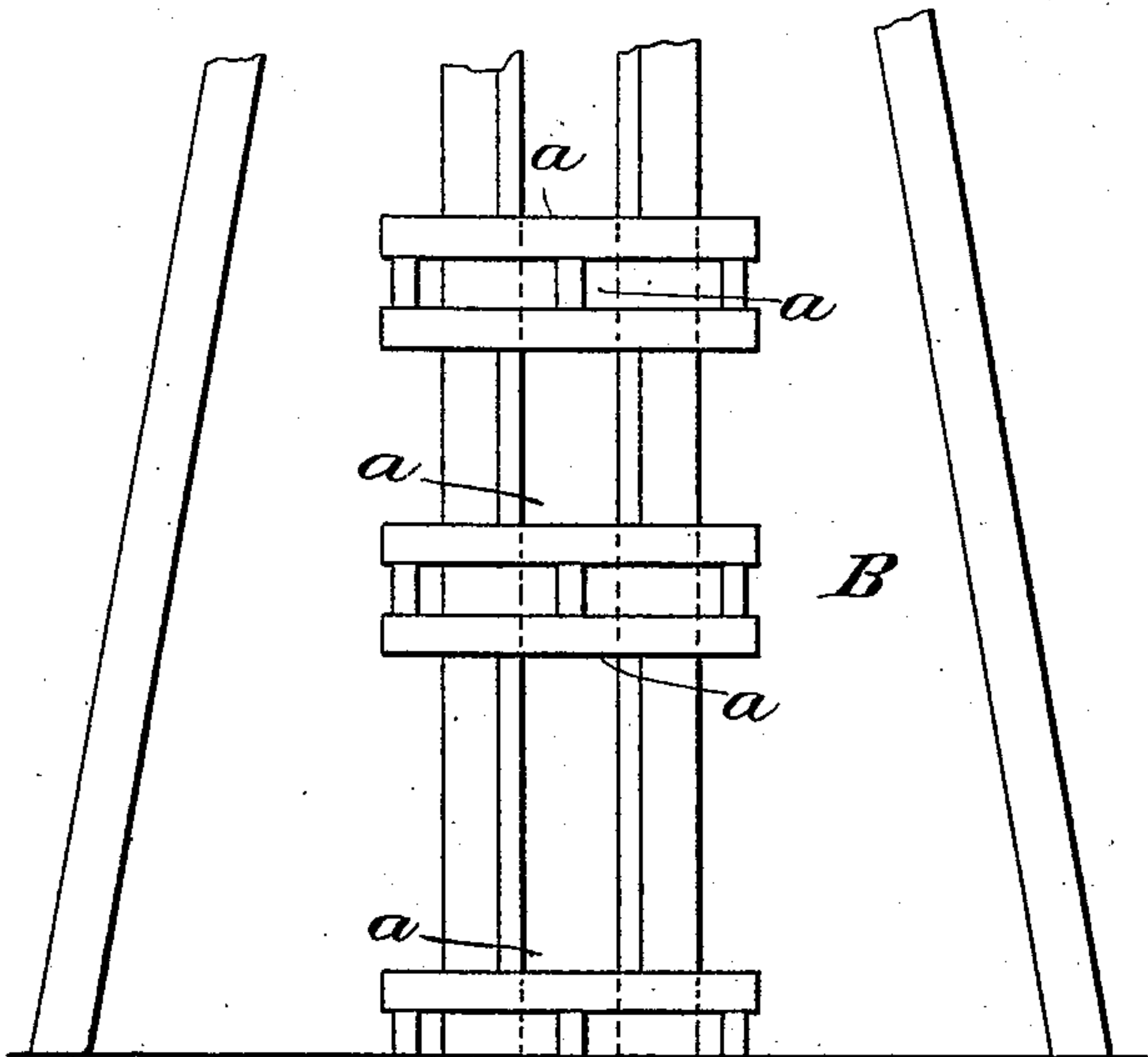
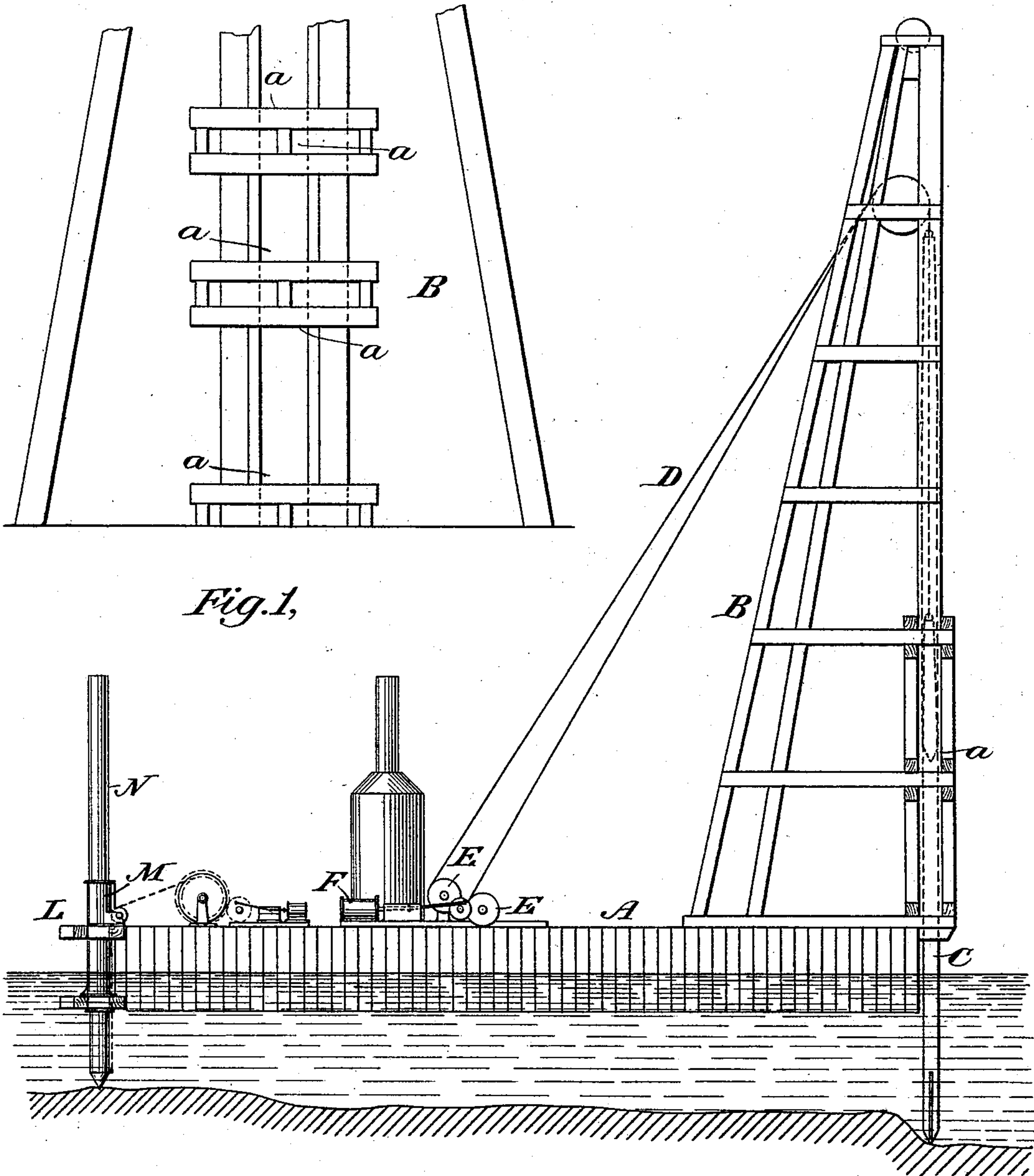


Fig. 1,



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Fig. 3,

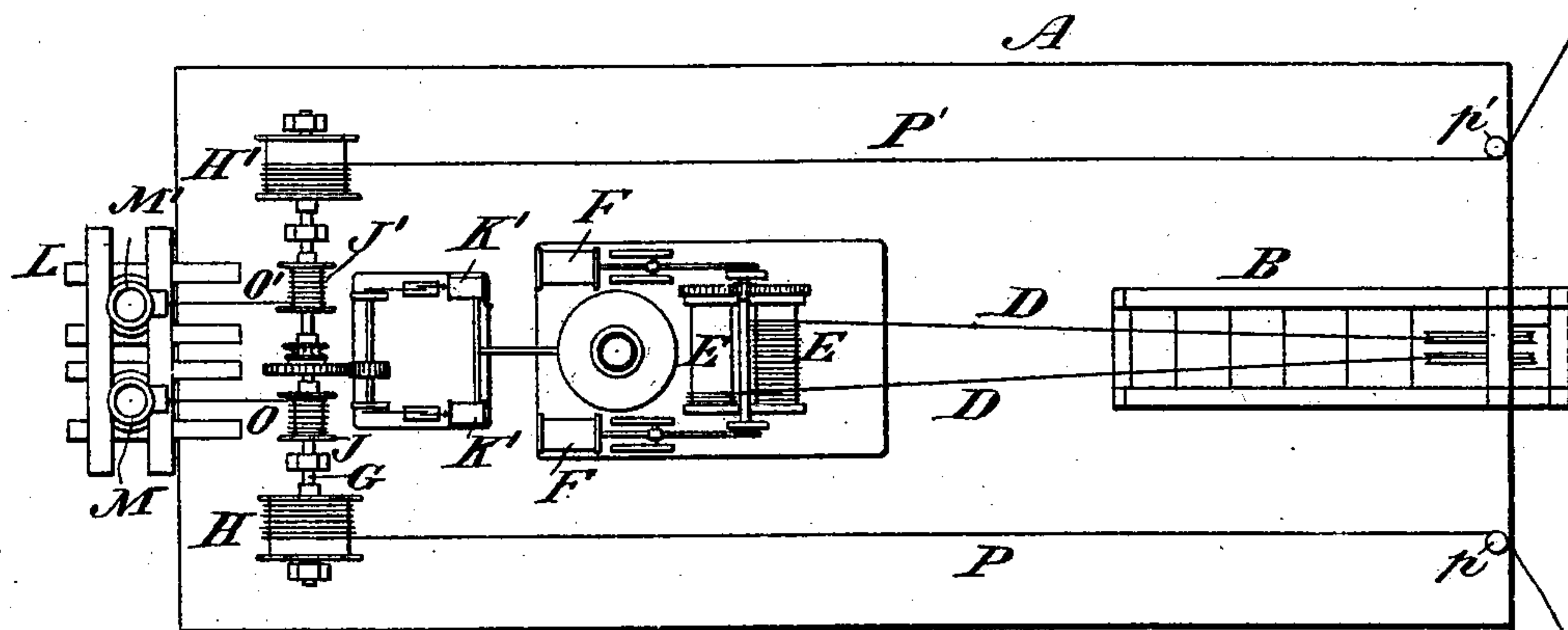
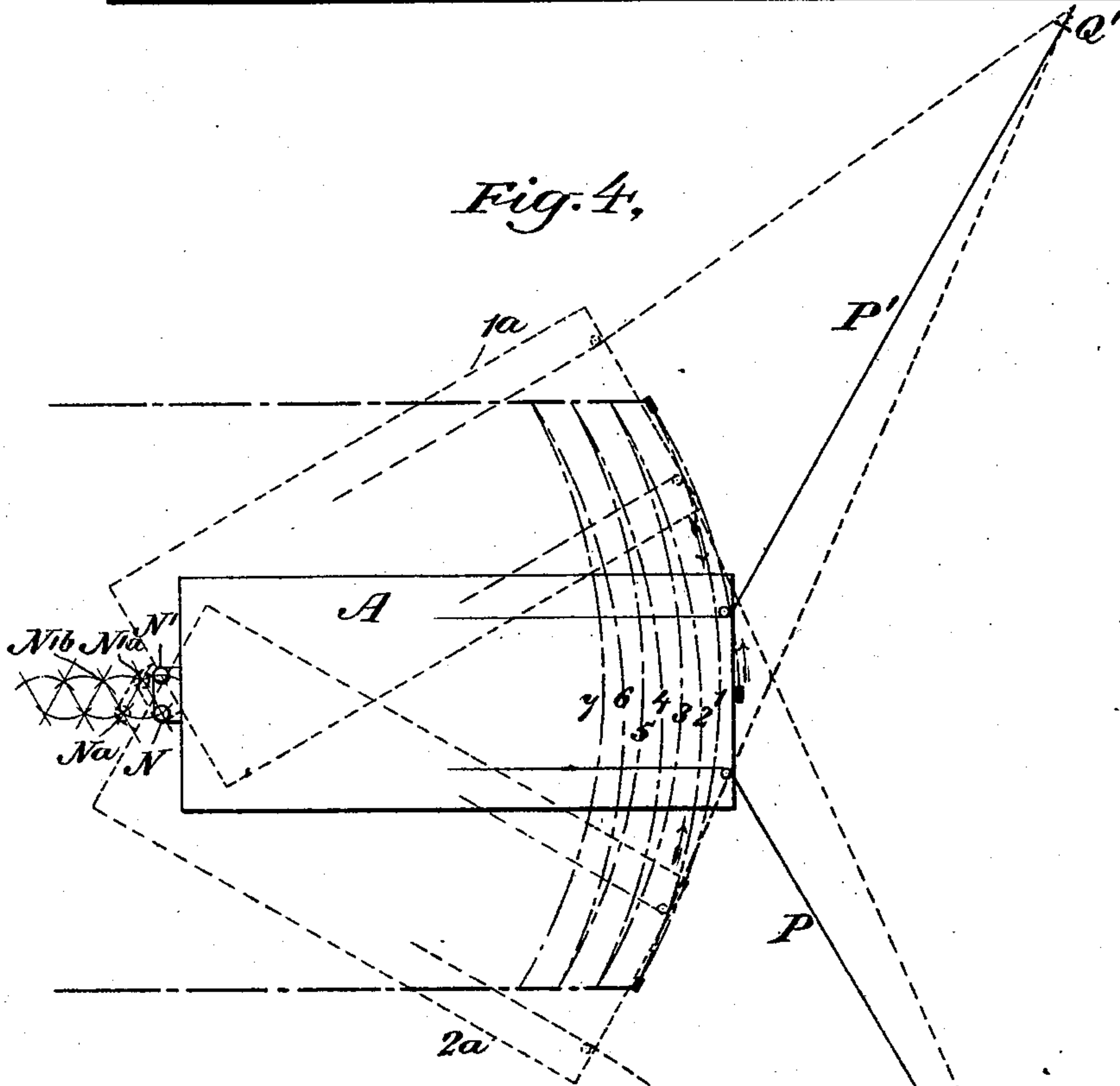


Fig. 4,



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4 Sheets—Sheet 3.

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Fig. 5,

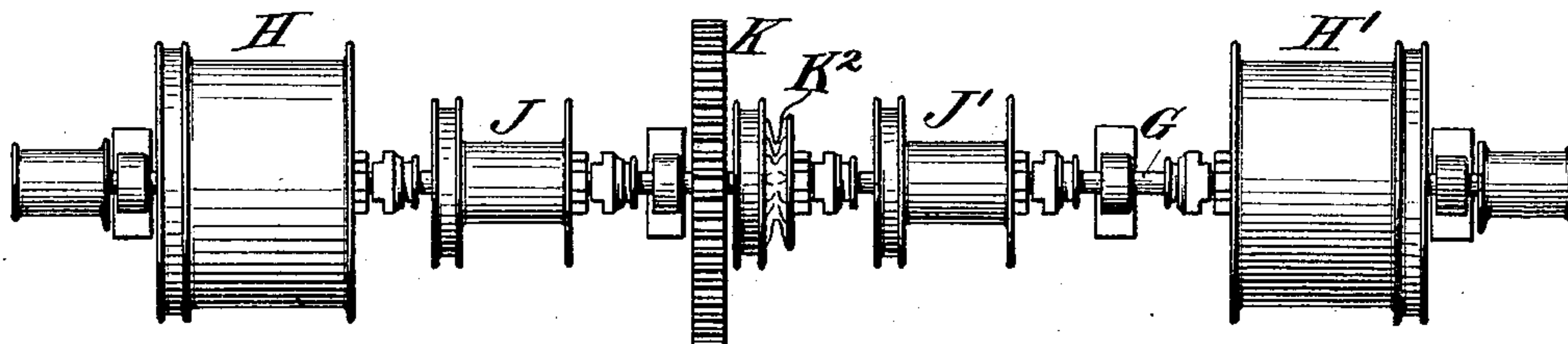
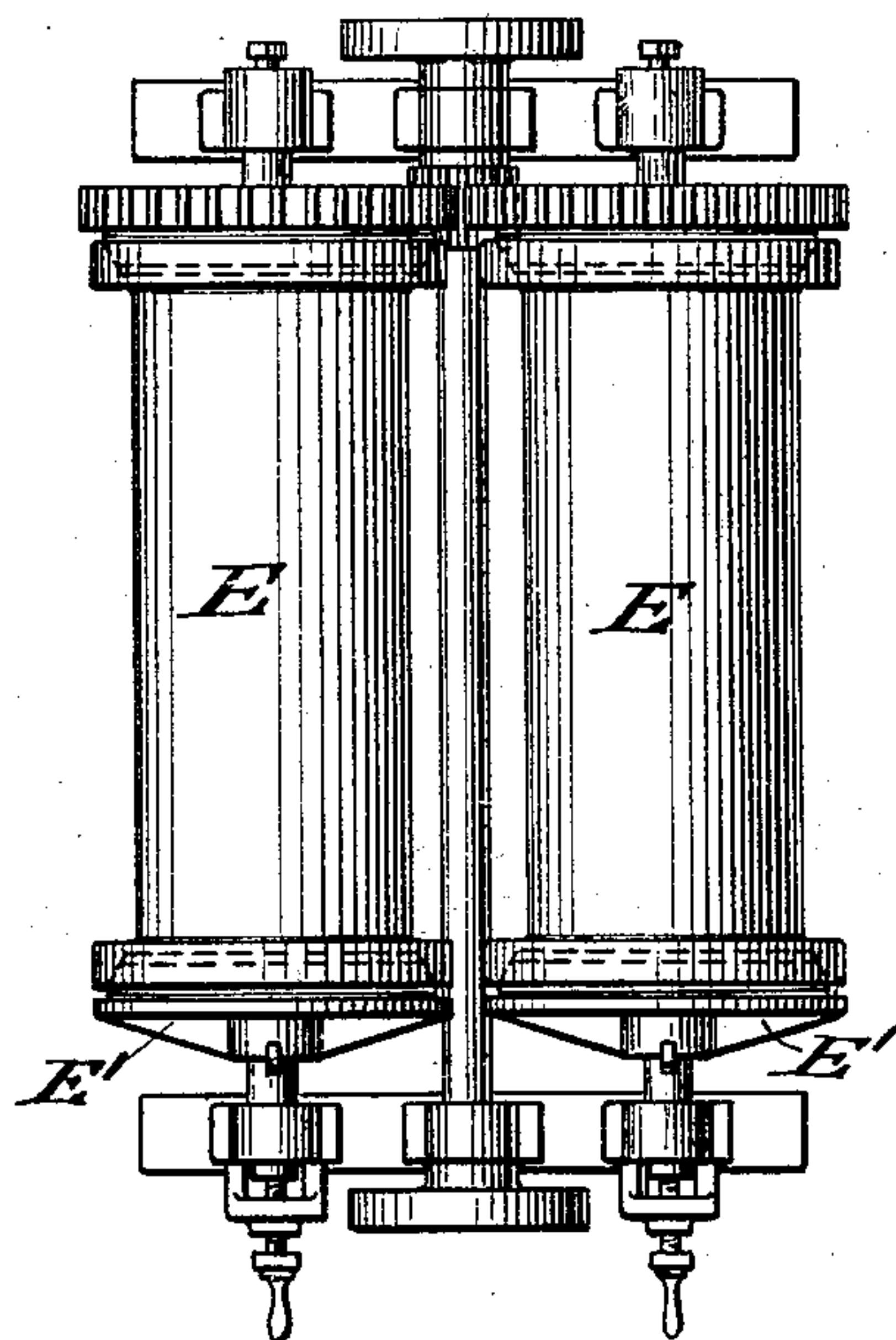


Fig. 6,



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Fig. 7,

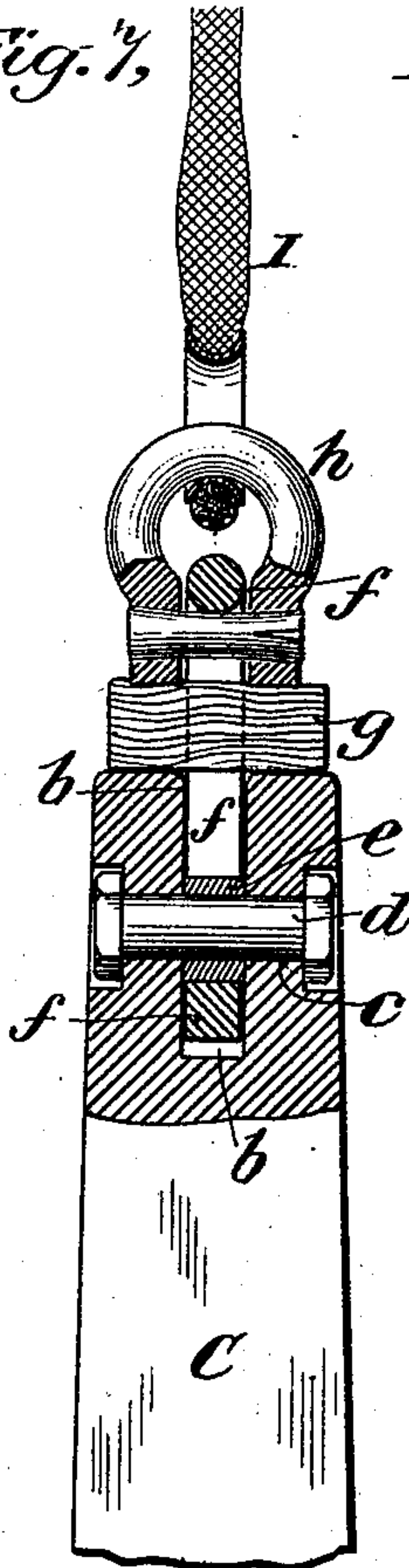


Fig. 8,

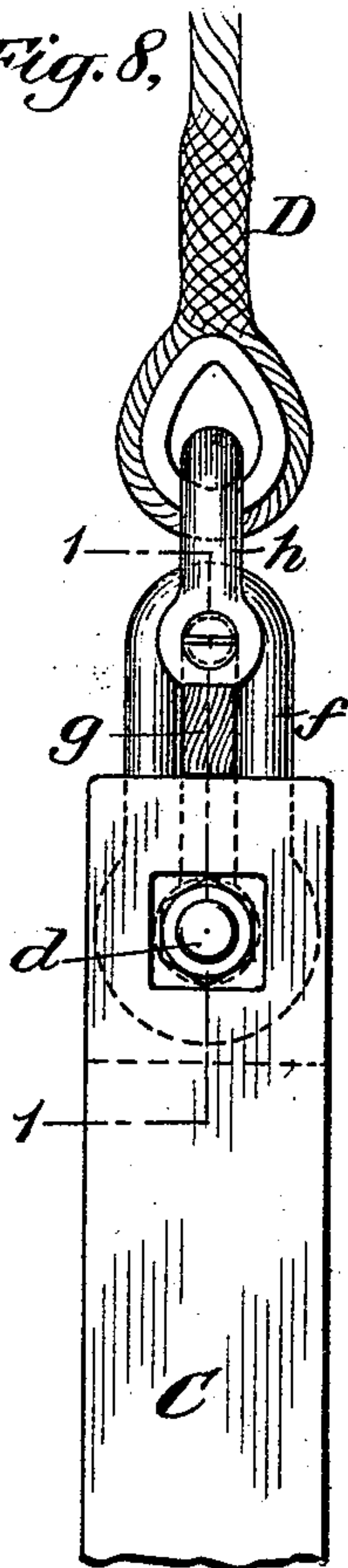


Fig. 11,

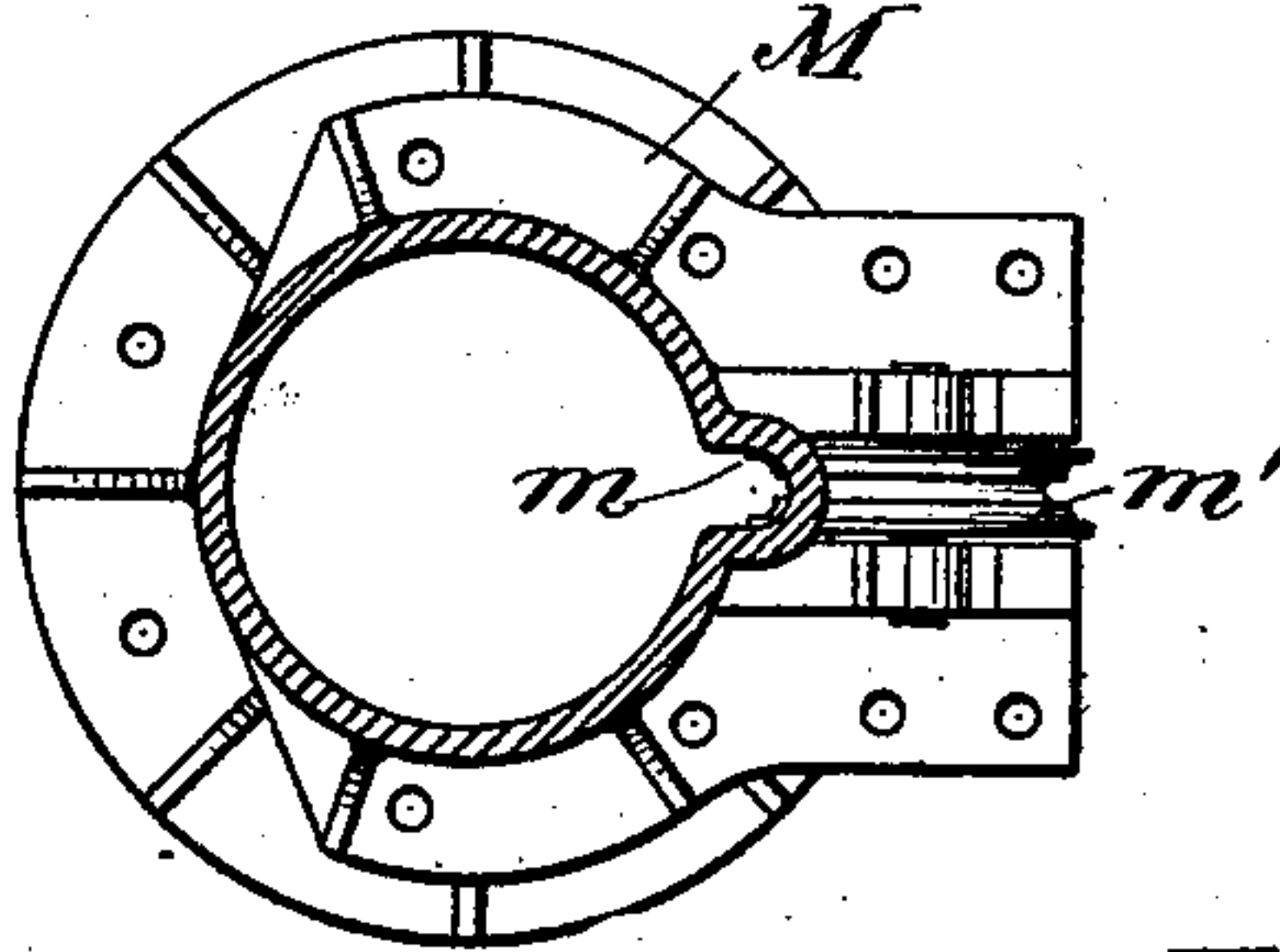


Fig. 10,

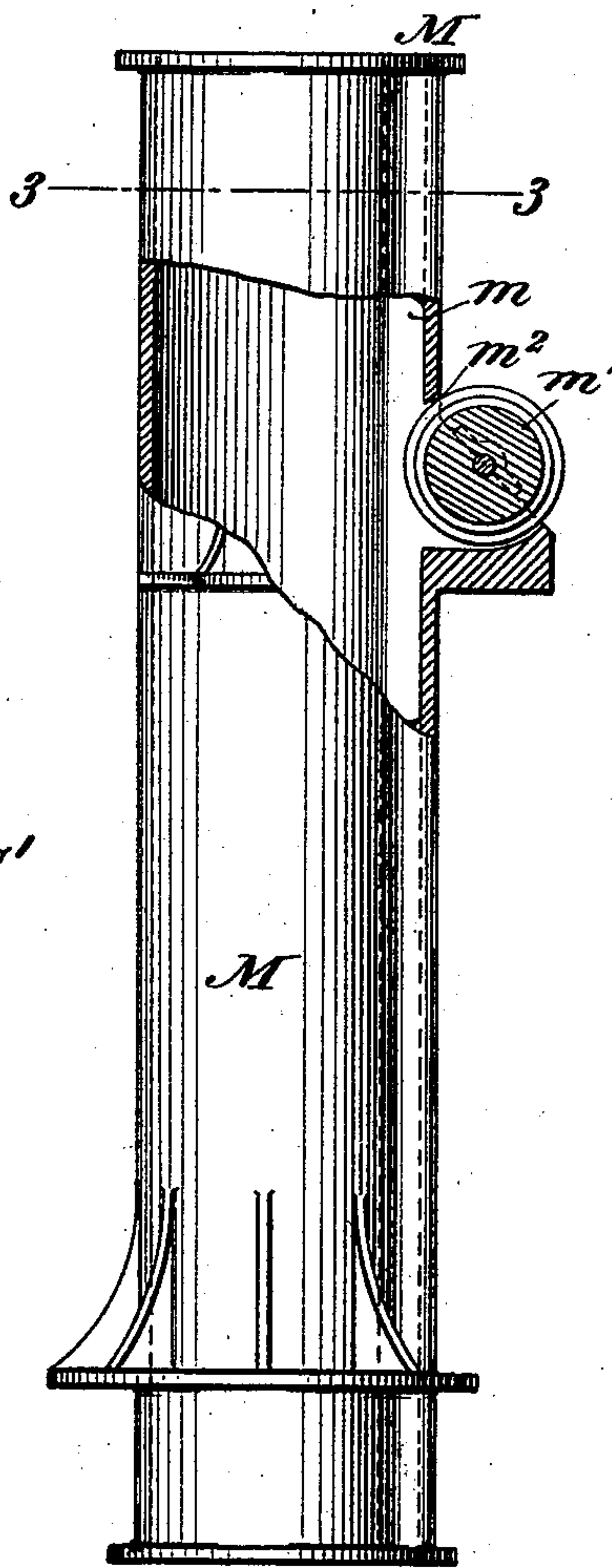


Fig. 12,

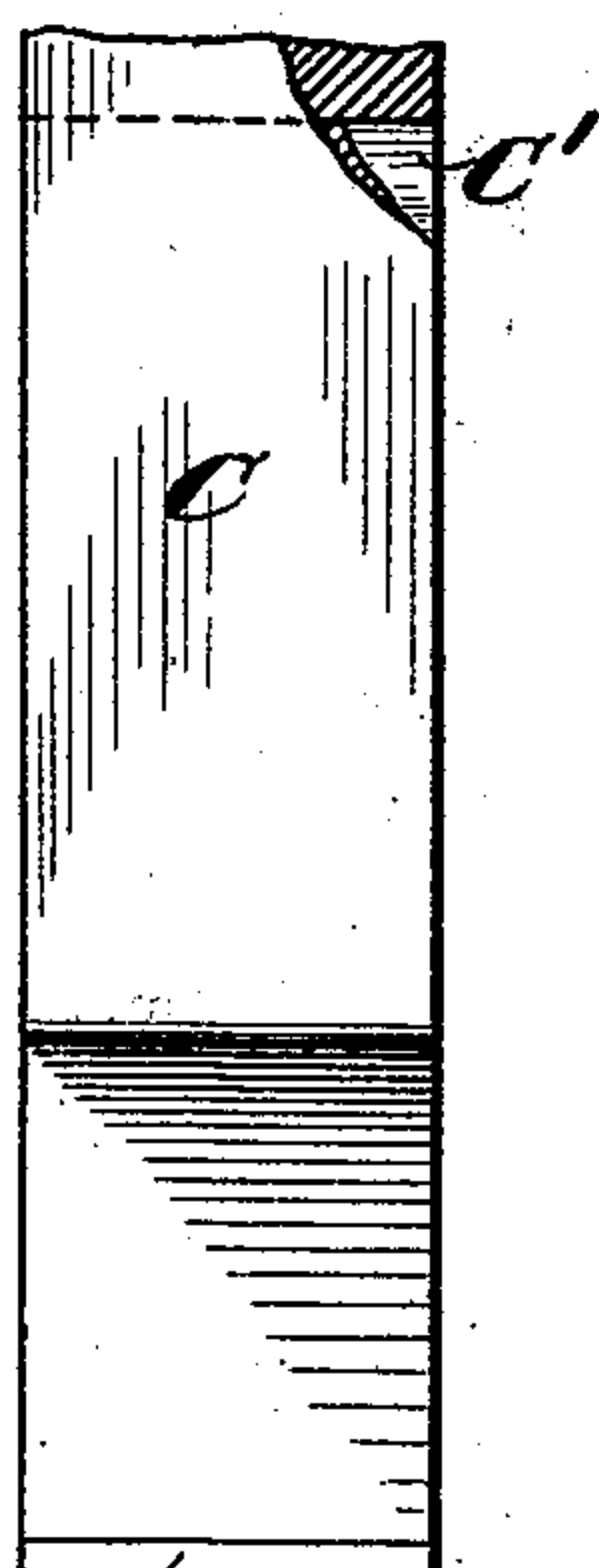
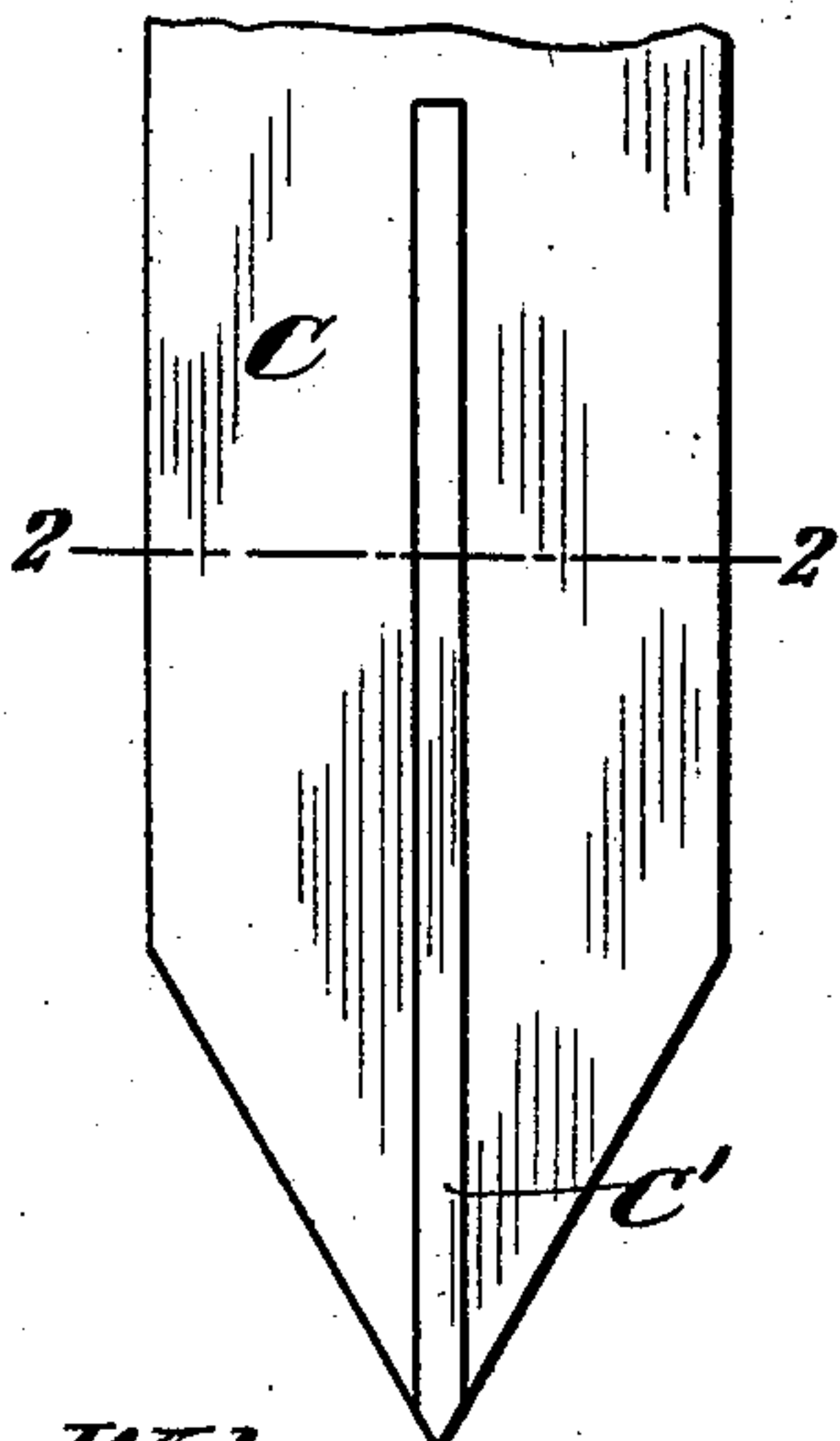
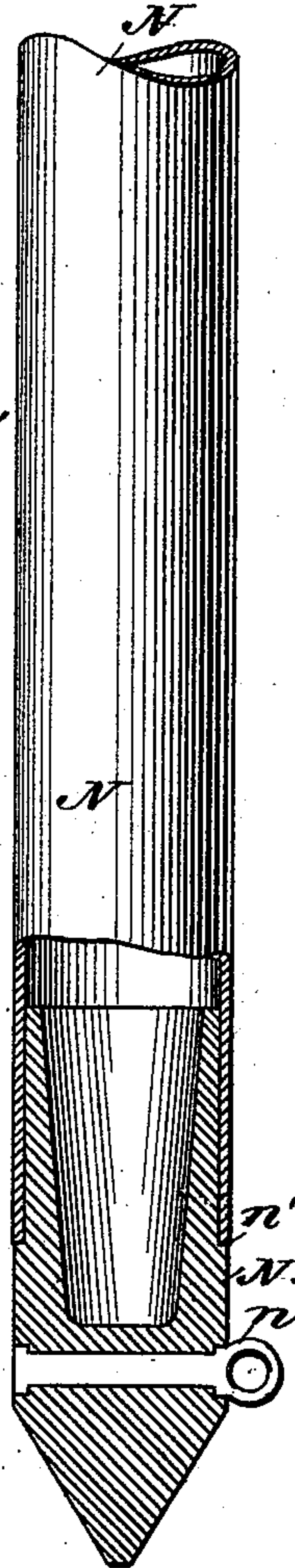
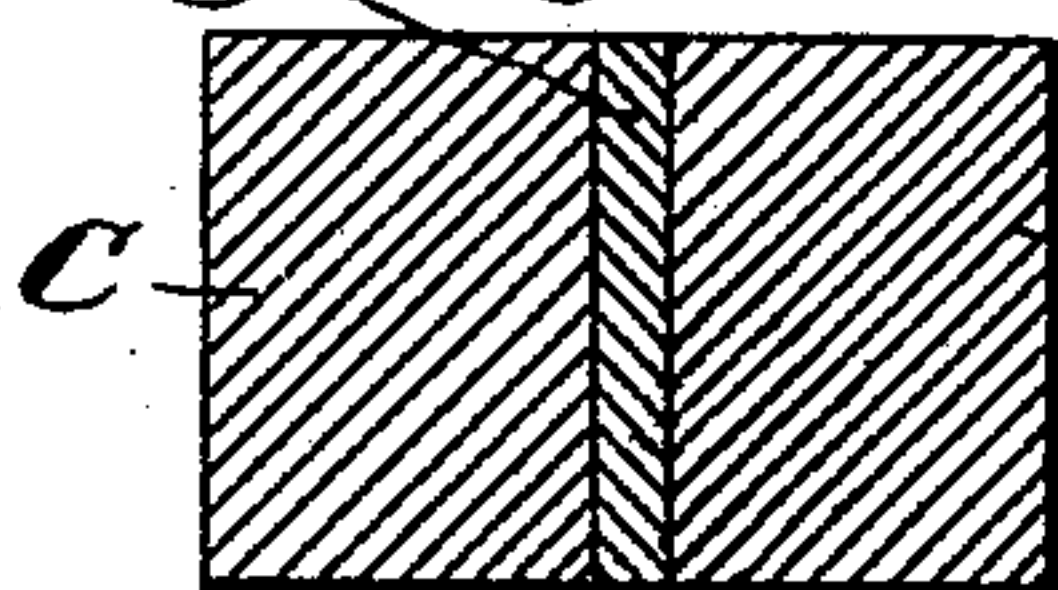


Fig. 9,



Witnesses:-

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UNITED STATES PATENT OFFICE.

PETER SANFORD ROSS, OF NEWARK, NEW JERSEY.

SUBAQUEOUS ROCK-BREAKER.

SPECIFICATION forming part of Letters Patent No. 517,556, dated April 3, 1894.

Application filed November 2, 1893. Serial No. 489,806. (No model.)

To all whom it may concern:

Be it known that I, PETER SANFORD ROSS, a citizen of the United States, and a resident of Newark, in the county of Essex and State of New Jersey, have invented a new and useful Improvement in Subaqueous Rock-Breakers, of which the following, taken in connection with the accompanying drawings, is a specification.

My invention relates to the construction and arrangement of mechanism designed to assist in the removal of rock lying beneath the surface of a body of water.

The object of the invention is to break or disintegrate the rock so that it may be easily removed by an ordinary dredger, and the invention consists of the various features of construction and arrangement hereinafter set forth.

Referring to the drawings, in which like letters denote corresponding parts in all the views, Figure 1 is a side elevation of a boat provided with the various features employed in carrying out the object of the invention.

Fig. 2 is a front elevation of a derrick, partly broken away, which is carried by the boat. Fig. 3 is a plan view of the boat and its mechanism. Fig. 4 is a plan view of the boat in diagram, showing the arcs of circles through which the boat moves when at work. Fig. 5 is a plan view of a drum shaft carried by the boat. Fig. 6 is a plan view of a pair of friction clutch winding drums carried by the boat. Fig. 7 is a side elevation of a rock breaking chisel partly broken away and in section on the line 1—1 Fig. 8. Fig. 8 is a side elevation of the chisel looking at right angles to the view shown in Fig. 7. Fig. 9 is a transverse section of the chisel on the line 2—2 of Fig. 7. Fig. 10 is an elevation partly in section of a spud-well carried by the boat. Fig. 11 is a transverse section of the spud-well on the line 3—3 of Fig. 10. Fig. 12 is an elevation of a spud having a part broken off and partly in section.

Upon a suitable boat A, such as a barge or scow, I mount at the bow a derrick B having one or more perpendicular ways *a* overhanging the bow. In these ways are heavy pounding weights or iron chisels or rams C weighing several tons and arranged to be hoisted to the top of the ways by a suitable motor and

then dropped. The force of the blow from the chisels upon the rock disintegrates it so that it can afterward be removed by a dredger.

My arrangement for operating a chisel and connecting it to the motor, is peculiar, and enables me to work it with a considerable economy of time, besides reducing the wear on the parts to a minimum.

Referring to Figs. 7 and 8, it will be seen that the upper end of the chisel C is provided with a slot *b* extending longitudinally a short distance into the head of the chisel, and that a bore *c* runs transversely through the slot. A bolt *d* passes through this bore threading a thimble *e* in the slot and engaging a link *f*, the lower end of which also extends into the slot. The head and nut of the bolt rest in counter-sunk polygonal recesses and are sealed therein by solder or other suitable means. Across the top of the chisel and extending through the link *f* near its upper end, is a cushion or bolster *g*, preferably of wood, and resting upon the bolster and engaging the upper end of the link *f* so as to fit snugly in place, is a link-ring *h*. A cable D, preferably of wire, is permanently fastened to the link-ring, and, extending over a pulley mounted in the top of the derrick, is fastened at its other end to a winding drum E driven by the motor F. The cutting end of the chisel is sharpened, and extending from this end up some little distance is a strip of steel C' embedded and welded into the mass of the chisel. If the chisel is given a wedge-shaped end as shown, the strip of steel will be flat and extend laterally through the chisel and be centrally located. This feature provides the chisel with a hard durable cutting edge, as iron, being softer than steel, will wear away faster, and thus the sharp wedge-shape of the cutting end is preserved. If it is desired to give the cutting end a conical point, a cylindrical steel strip can be welded in the chisel along its axial line.

I have shown and sometimes prefer to employ two chisels at the same time, each having its own operating cable D and drum E. These drums are preferably of the friction clutch type and are so arranged that while the cable on one is being wound to hoist its chisel, the other drum is free to turn to let its cable run freely out while the other chisel

is dropping. The friction clutches for the drums are shown at E, Fig. 6, and each can be operated independently of the other, by hand or otherwise. The friction clutch which enables me to instantly engage and disengage the drum, and the permanent connection of the cable and its chisel, which makes it possible to hoist the chisel the moment after it has struck the rock, enable me to save considerable time in operating the chisel, and the cushion form of connection between the cable and the head of the chisel being snug and free from play, prevents a great amount of wear which would be otherwise occasioned by the impact of the various elements of the connection at the head of the chisel when the chisel strikes the rock. Moreover, there being no projecting ends or corners in the connection, the slack of the cable due to the sudden stopping of the chisel is prevented from being cut or ruptured. Nearly all of the wear at the connection is upon the wooden bolster, and when it is worn out a new bolster can be easily driven in.

Across the boat near the stern a shaft G is mounted in suitable bearings. Upon the shaft are mounted the independently rotatable drums H H', and J J', and the anchor chain-wheel K² each of which is provided with an independent clutch adapted to lock it to the shaft. Suitably mounted on the shaft and rigidly connected therewith is a gear wheel K suitably geared with motor K'. Upon the stern of the boat and projecting therefrom is a crib-like frame L adapted to firmly support two spud-wells M M'. These spud-wells are tubular and preferably cylindrical, and made of iron as shown in Fig. 10. They are arranged in a line running transverse the boat, and preferably in a line running at right angles to a longitudinal line running through the center of the boat, each well being located at an equal distance from this longitudinal line. Each is provided with a longitudinal gutter m on the side nearest the boat, and a pulley m' located near the upper end of the well, the periphery of which projects into the gutter through an aperture m² in the side of the well. These spud-wells carry the spuds N, N', each of which comprises a long iron body portion tubular throughout its length as shown in the drawings, which is provided with an iron shoe N² carrying an eye-bolt n. The body portion of the spud extends up through its spud-well preferably to some little distance above the deck of the boat. The upper end of the shoe, which conforms to the shape of the abutting end of the long tubular body portion of the spud, projects inside the spud so that the latter overlaps the shoe and rests securely upon a circumferential shoulder n' of the shoe. To the eye-bolts n are attached chains or cables O O' which pass up through the wells, along the gutters and over the pulleys m' to the drums J and J'. To the drums H and H' are at-

tached the cables P, P' which pass over the pulleys p, p' near the bow of the boat, and are secured to anchors Q, Q' thrown out to some distance on each side of the boat.

The operation is as follows: The boat is moved to the desired position, and the anchors Q, Q' are fixed in place as shown in full lines in Fig. 4. The spud N is then lowered into the bed of the water, the cable P is paid out and the cable P' is hauled in by operating the drums H, H'. This draws the boat into the position shown in dotted lines in Fig. 4 and marked 1^a. The spud N is then hauled up and the spud N' dropped into position N'^a, and the boat is now ready to begin the operation of breaking rock. One of the chisels C is then hoisted to the top of the derrick and the drum released, permitting the chisel to fall with great force upon the rock. While this chisel is falling, the other chisel is being hoisted to the top of the derrick, and when the first chisel is being again hoisted, the second one is dropping. Thus the two chisels, by a proper manipulation of their hoisting drums, can be alternately dropped and hoisted. While the chisels are at work, the cable P' is gradually paid out and the cable P is gradually hauled in, thereby swinging the boat in the arc 1 of a circle of which the spud N' is the center, so that the rock is cut or broken along this arc. When the boat has reached the position marked 2^a the chisels are stopped, the spud N' is drawn up and the spud N is let down, occupying the position marked N^a. The boat is then swung again to the left toward the position 1^a on the arc 2, and the spud N is drawn up and the spud N' let down. The chisels are now set to work a second time and the boat is gradually swung to the right along the arc 3, the spud N' being the center but occupying the position N'^b, and the chisels working all the while. When the boat has reached its limit of movement in this direction, it is again swung rapidly to the left upon the spud N along the arc 4. Thus it will be seen that the rock is cut along the arcs 1, 3, 5, &c., of concentric circles of which the spud N' is the center, and that the boat when returning to its cutting position swings along the parallel arcs 2, 4, 6, &c., of concentric circles, of which the spud N is the center. It will also be seen that when the boat moves back and forth, the free spud when let down occupies a position in the rear of the working spud. Thus the boat is gradually backed over the bed of the rock which it is desired to cut, the chisels cutting the rock in successive parallel strips equal in length and width, so that no patches of projecting rock are left.

It will be noted that by the arrangement of the independently rotatable spud drums and the independently rotatable anchor drums upon the same shaft any number of which may be operated at the same time, enables me to operate my boat with great economy of

labor and machinery. When the boat has reached the limit of its movement in one direction, the drum of the spud which has been the center of oscillation, and the drum of the anchor toward which the boat is to be next swung, may be geared to the shaft at the same time, the other drums being disengaged from the shaft. When the shaft is now rotated the spud which is to be lifted is drawn up, and the anchor drum geared to the shaft at the same time pulls in on the anchor. Thus the rotation of the shaft accomplishes at the same movement the withdrawal of a spud and the pulling in on an anchor. It will also be seen that the arrangement of the anchor drums on the same shaft enables me to easily adjust the boat to the required position by pulling in on both anchors at the same time, or either alone, and with drawing simultaneously either or both of the spuds.

Numerous changes, which will suggest themselves to one skilled in the art, may be made in the various features of my invention and their arrangement as herein set forth, without departing from the spirit of the invention. Moreover, various features of the invention are not necessarily restricted to their use on a sub-aqueous rock-breaker. For instance, the permanent connection between the chisel and its cable may be employed between any pounding weight, such as a pile driver, and its cable. Again, one or any convenient number of chisels may be worked simultaneously by suitably arranged mechanism.

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination of a boat, a winding drum and a derrick carried by the boat, and a pounding weight permanently connected to the drum by means of a cable, the cable and weight being connected together through the intermediation of a cushion connection, substantially as set forth.

2. The combination of a boat, a spud carried by the boat, a drum shaft mounted on the boat and carrying a rotatable hoisting drum connected to the spud, a second independently rotatable drum carried by said shaft, an anchor connected to said second drum, said drums being adapted to be independently connected to the drum shaft, and

mechanism for driving the shaft, substantially as set forth.

3. A rock-breaking chisel having a wedge-shaped end and made of iron, and provided with a flat core of steel welded into the iron and extending laterally through the chisel and upward from the edge of the wedge, substantially as set forth.

4. The combination of a pounding weight, and a cable permanently attached to the weight through the intermediation of a cushioned connection, substantially as set forth.

5. The combination of a pounding weight provided with a slot, a bolt passing through the slot and engaging therein a link, a link-ring engaging the upper end of the link, a bolster passing through the link and resting upon the weight and beneath the link-ring, and a cable permanently connected to the link-ring, substantially as set forth.

6. The combination of a pounding weight provided with a slot, a counter-sunk sealed bolt passing through the slot threading a thimble in the slot and engaging a link therein, a link-ring engaging the upper end of the link, a wooden bolster passing through the link and resting upon the weight and beneath the link-ring, and a cable permanently connected to the link-ring, substantially as set forth.

7. An iron tubular spud-well provided with a longitudinal gutter and with an aperture in the gutter, and carrying a pulley arranged in line with said aperture, substantially as set forth.

8. A spud comprising a long iron body portion tubular throughout its length and an iron shoe having a circumferential shoulder, the tubular body overlapping the shoe and resting upon the shoulder, substantially as set forth.

9. A spud comprising a long iron body portion tubular throughout its length and an iron shoe carrying an eyebolt and having a circumferential shoulder, the tubular body overlapping the shoe and resting upon the shoulder, and a chain attached to the eyebolt, substantially as set forth.

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