

No. 657,515.

Patented Sept. 11, 1900.

B. H. COFFEY.
SUBAQUEOUS ROCK BREAKER.

(Application filed May 20, 1899. Renewed Feb. 6, 1900.)

(No Model.)

3 Sheets—Sheet 1.

FIG. 1.

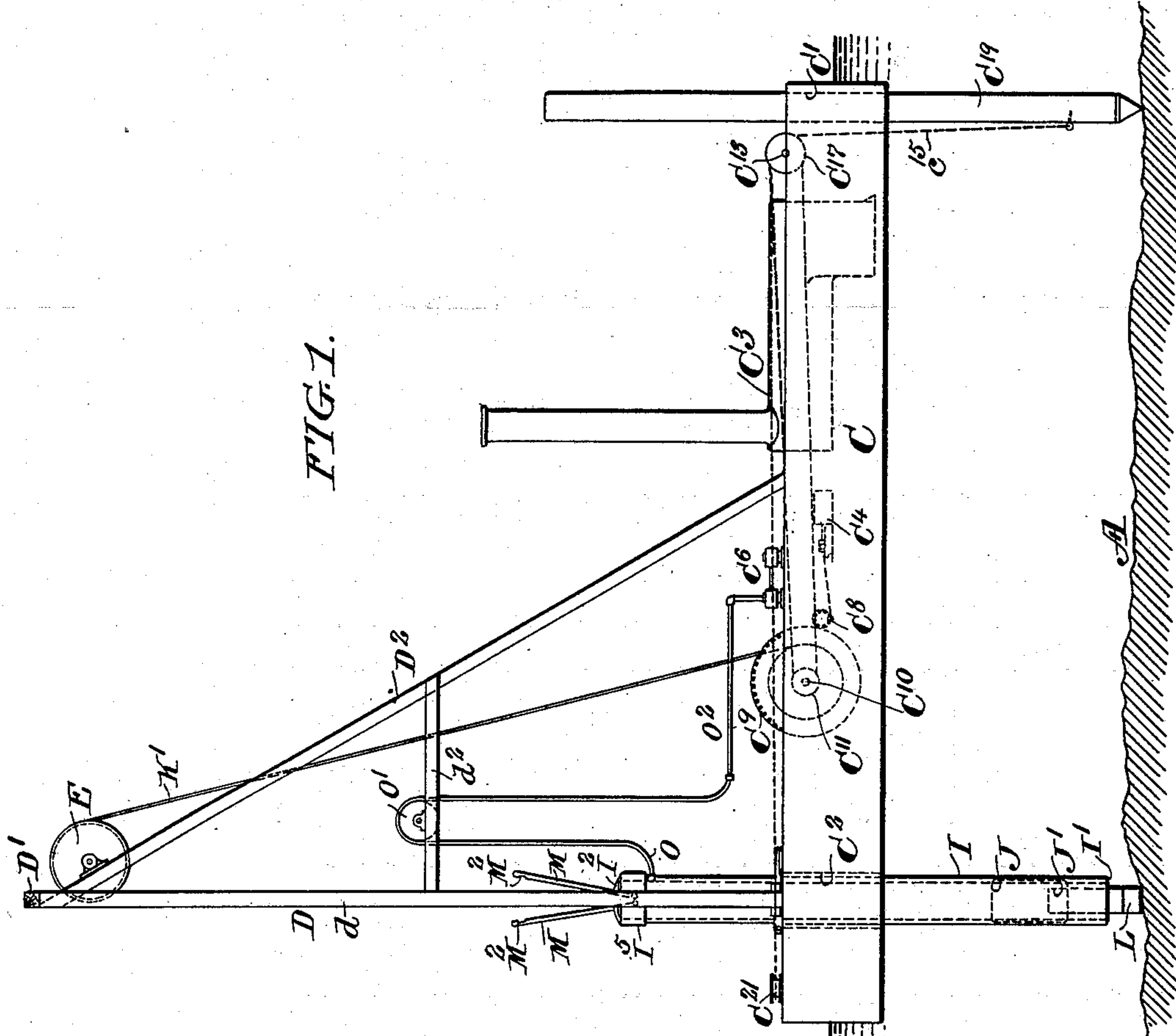
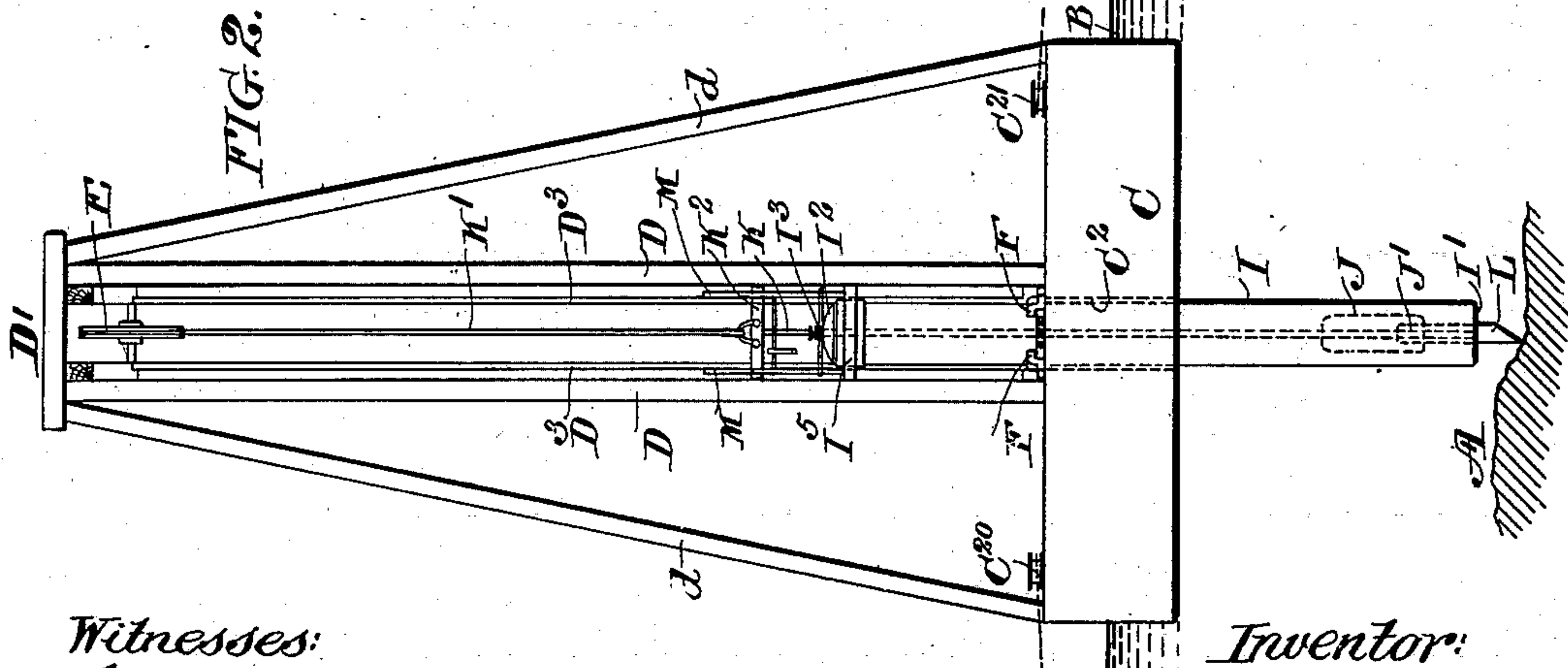


FIG. 2.



Witnesses:
Henry Denny
Sherman

Inventor:
Barton H. Coffey
by his atty.
Francis W. Chambers

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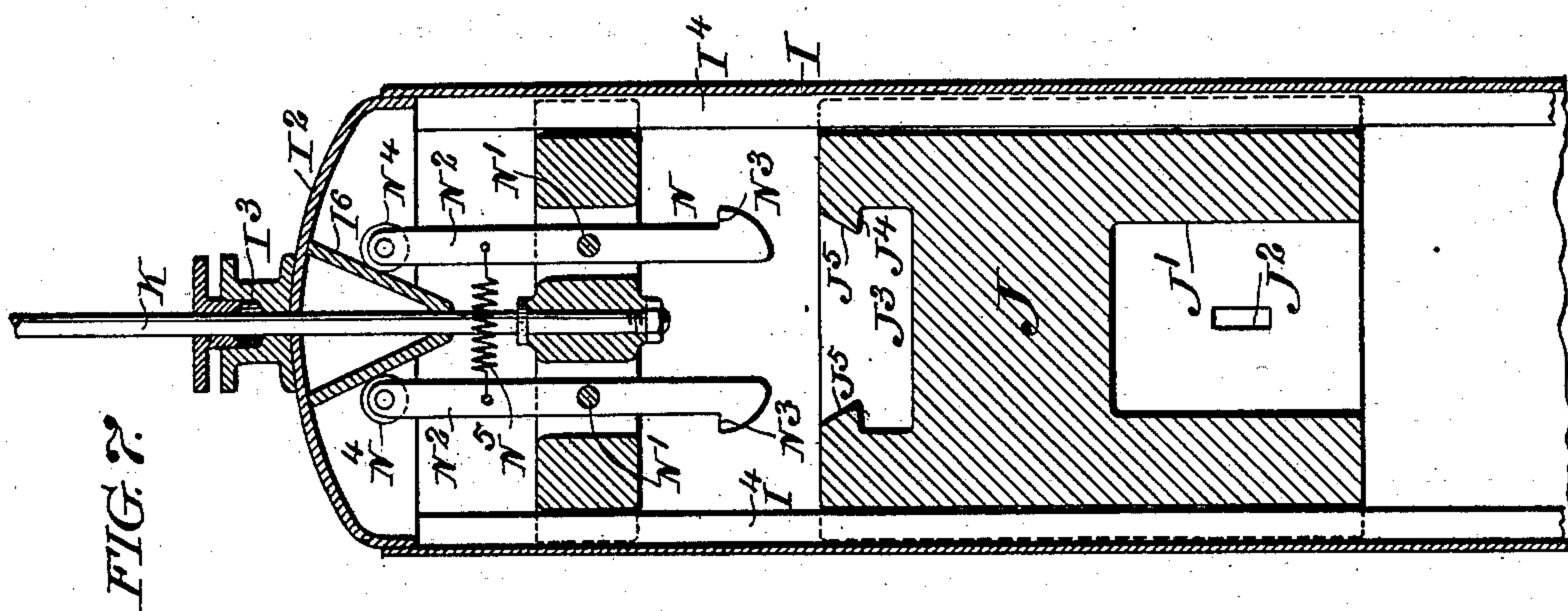
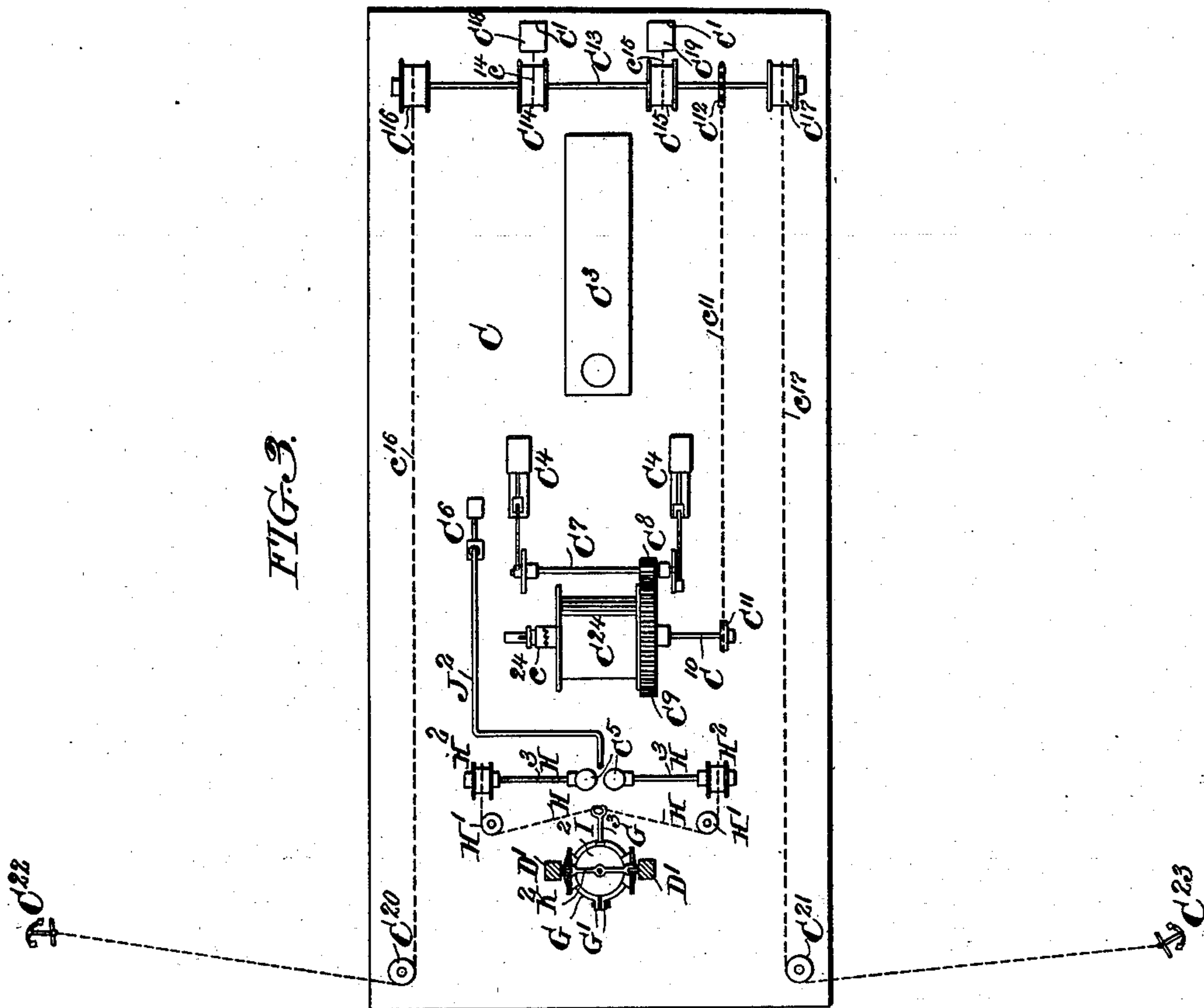
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3 Sheets—Sheet 2.



2577

Witnesses:

Harry Dwyer
Stewart

Inventor:

Barton H. Coffey
by his atty.
Francis T. Chamber.

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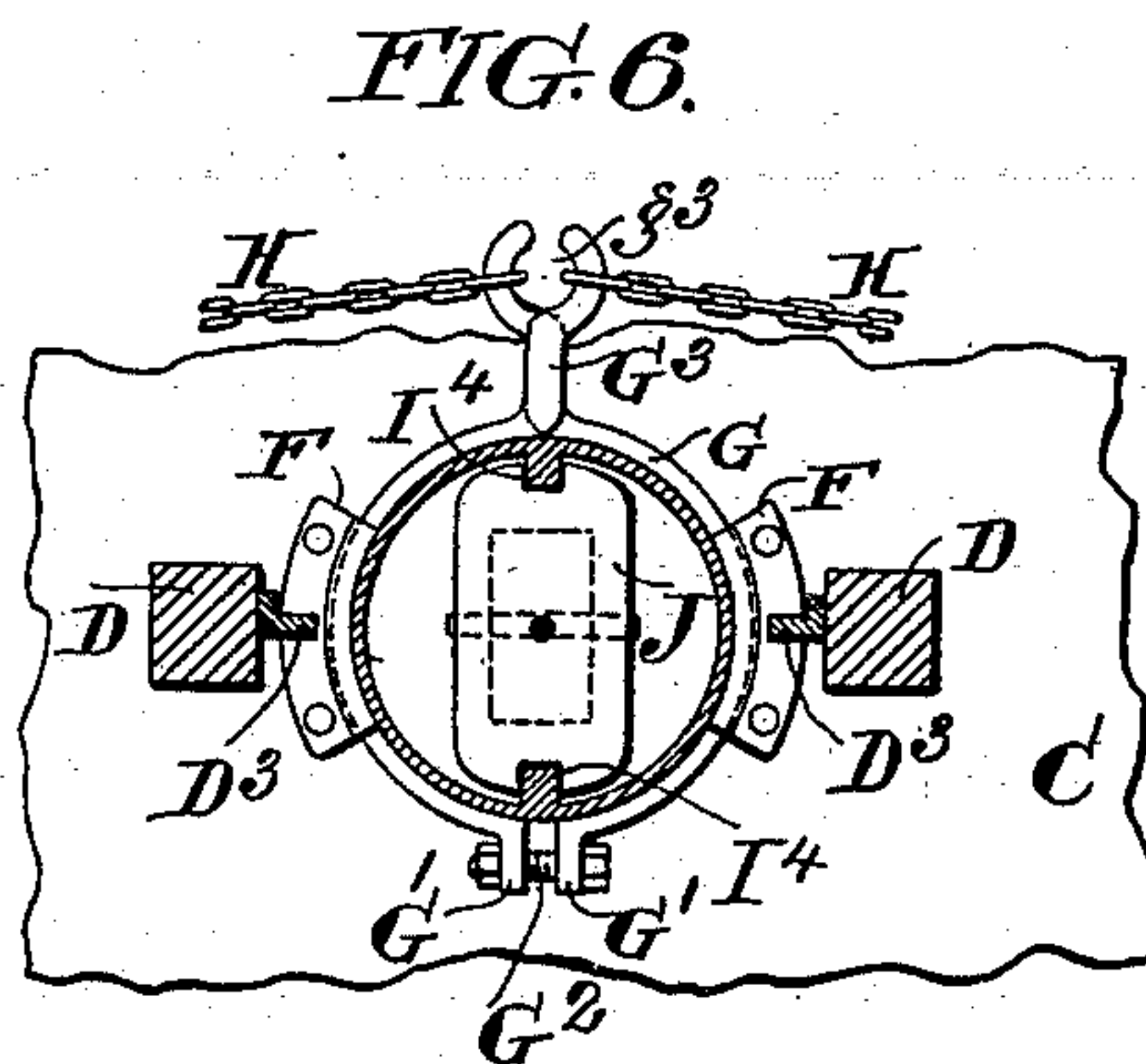
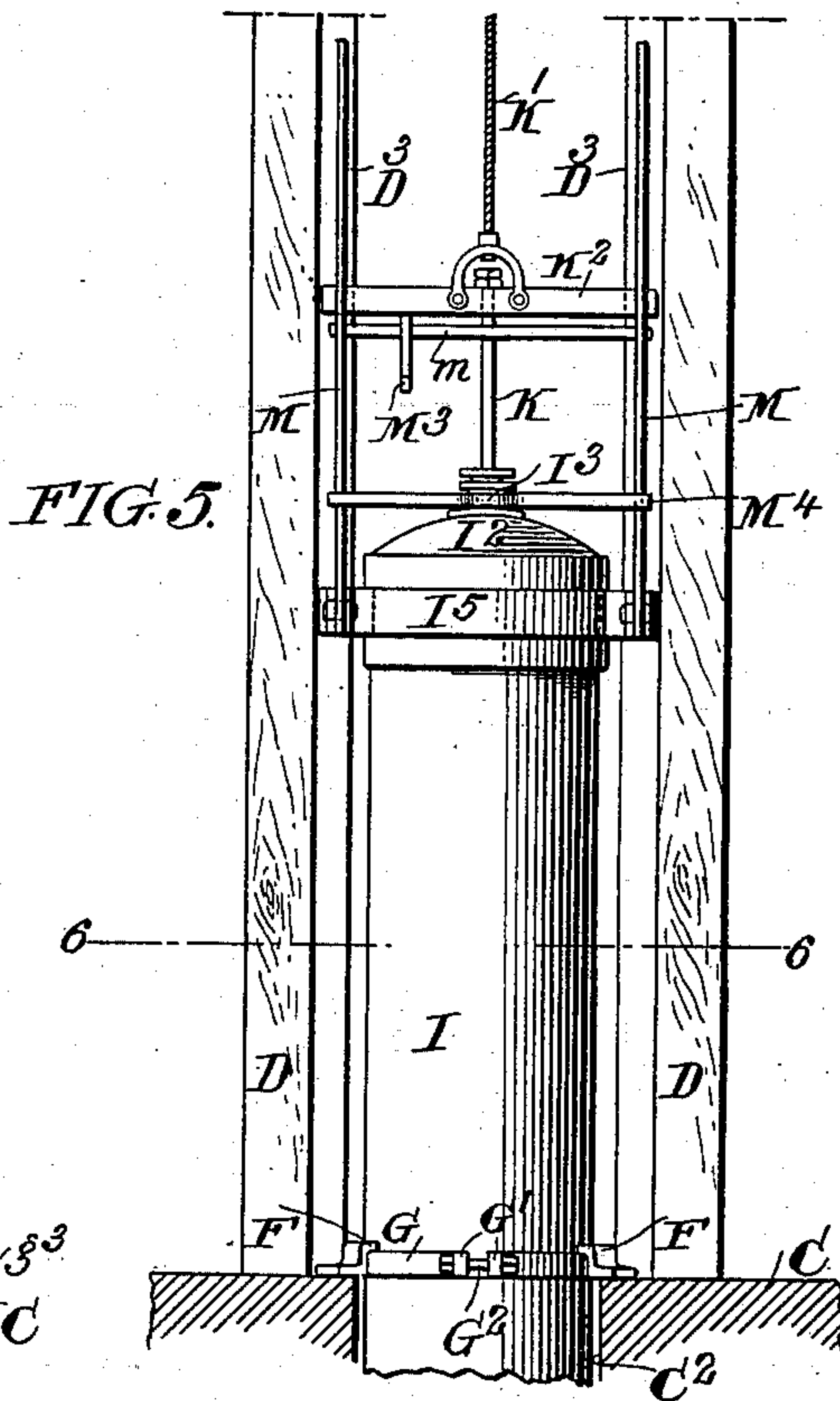
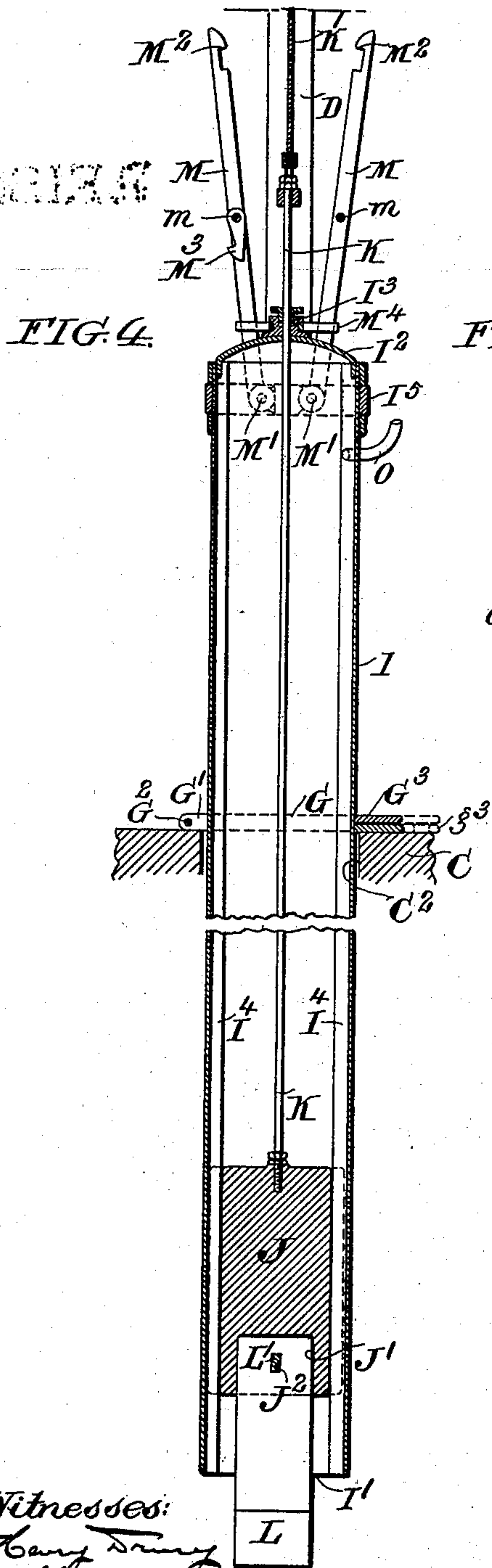
B. H. COFFEY.

SUBAQUEOUS ROCK BREAKER.

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(No Model.)

3 Sheets—Sheet 3.



Witnesses:

Harry Drury
H. H. Hume

Inventor:

Barton H. Coffey
by his atty.

James T. Chambers

UNITED STATES PATENT OFFICE.

BARTON H. COFFEY, OF PHILADELPHIA, PENNSYLVANIA.

SUBAQUEOUS ROCK-BREAKER.

SPECIFICATION forming part of Letters Patent No. 657,515, dated September 11, 1900.

Application filed May 20, 1899. Renewed February 6, 1900. Serial No. 4,283. (No model.)

To all whom it may concern:

Be it known that I, BARTON H. COFFEY, a citizen of the United States of America, residing in the city and county of Philadelphia, in the State of Pennsylvania, have invented a certain new and useful Improvement in Subaqueous Rock-Breakers, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

My invention relates to the class of subaqueous rock-breaking machinery in which a heavily-weighted chisel is impelled, generally by its own weight, against the rock for the purpose of splitting and chipping it away. Apparatus of this kind has been used with great success; but it has been found that a condition of successful use is the depth of water through which the chisel falls, the friction and resistance of the water rapidly impairing the efficiency of the apparatus as the depth increases.

The object of my invention is to provide a rock-breaker which can be used in deep, as well as shallow water, and the leading feature of my invention consists in the provision of a tubular caisson closed at top and open at the bottom, means for forcing compressed air into the caisson to keep it substantially free from water, and rock-breaking chisel together with mechanism for operating it working in the caisson. By this arrangement it will be readily understood I completely avoid all material resistance to the fall of the weighted chisel, and thus insure its striking the rock at the bottom of the caisson with maximum force and efficiency.

Other features of my invention will be best understood as described in connection with the drawings, in which they are illustrated, and in which—

Figure 1 is a side elevation of a float such as is commonly used in dredging, showing my approved apparatus in connection therewith. Fig. 2 is a front view of the float and attachments; Fig. 3, a plan view thereof; Fig. 4, a longitudinal sectional elevation of the caisson and parts connected therewith; Fig. 5, an elevation taken at right angles to that shown in Fig. 4, showing the upper part of the caisson, portions of the derrick, and the clamp

by which the caisson is attached to the float. Fig. 6 is a plan view taken on the horizontal section 6 6 of Fig. 5, and Fig. 7 is a sectional elevation of the top of a caisson, showing certain modifications in the construction of the chisel-carrying weight and mechanism for acting upon the weight.

A, Figs. 1 and 2, indicates the rock to be broken.

B is the water-level.

C is the float, which, as shown, is formed at its stern with two openings C' C', through which pass spuds C¹⁹, used for anchoring the float in place. C² indicates another vertical passage through the bow of the boat provided for the passage of my tubular caisson.

At C³ is indicated the fire-box, boiler, and stack.

C⁴ C⁴ indicate steam-engines which, as shown, are horizontal.

C⁵ indicates a vertical steam-engine, and C⁶ an air-compressor.

C⁷ is a shaft acted on by the engines C⁴ C⁴ and having attached to it a gear-wheel C⁸, engaged with a gear-wheel C⁹, attached in turn to a shaft C¹⁰. I have indicated at C¹¹ a pulley on the shaft C¹⁰, connected by means of a chain or belt (indicated at c¹¹) with a pulley C¹², attached to a shaft C¹³, to which shaft are attached drums C¹⁴ and C¹⁵, acting through chains c¹⁴ c¹⁵ on the spuds C¹⁸ C¹⁹, either of which can be drawn up at will. C¹⁶ and C¹⁷ are also drums attached to the shaft C¹³ and connected by ropes or chains c¹⁶ and c¹⁷, passing over pulleys C²⁰ and C²¹, with anchors C²² and C²³. It will be understood, of course, that the drums are all detachably connected with the shafts, so that any one or more of them can be thrown into gear at will with the purpose of raising either of the spuds or of swinging the boat from side to side.

C²⁴ is a hoisting-drum journaled on the shaft C¹⁰ and connected to be driven by said shaft at will, as by means of a clutch, (indicated at c²⁴.)

D D, d d D', and D² d² indicate parts of a derrick erected on the boat, the vertical members D D extending up on each side of the stay D² and being, as shown, provided with guides D³ D³.

E is a pulley secured at the top of the der-

rick, and F F segmental guide-clamps secured to the deck of the float on opposite sides of the opening C².

G is a split clamp-ring, the outer edge of which fits under the circular guide-clamps F F, while the inner face of the ring is adapted to clamp the caisson, to be hereinafter described. As shown, the split end of the ring is made with the expanding flanges G' G', which are drawn together, as by means of a bolt G².

G³ is a lever-arm extending from the clamp-ring and connected, as by the split eye g³, to chains H H, which, as shown in Fig. 3, run over pulleys H' H' to drums H² H², secured on shafts H³ H³, actuated by the steam-engine cylinders indicated at C⁵. By means of this device the clamp can be turned from side to side or held in any desired position.

I indicates the tubular caisson, the lower end I' of which is open, while the upper end I² is tightly closed, having, as shown, at its center a stuffing-box I³ for the actuating-rod to pass through. The caisson is formed with guides (indicated at I⁴ I⁴) on opposite sides and is preferably provided at its upper end with a ring I⁵, arranged to turn freely on the caisson, but to move longitudinally with it.

As shown in Fig. 7, the caisson is also provided with a wedge-like inwardly-projecting device, (indicated at I⁶;) but this is a particular detail of the modification illustrated in said figure and hereinafter described.

J is the weight, vertically movable in the caisson and constructed at its lower end so as to engage a heavy rock-breaking chisel. This may be conveniently done, as shown, by providing the weight J' and keyway J². The weight moves freely on the guides I⁴ and is so shaped as to leave abundant room on each side, as indicated in Fig. 6, so that the air in the caisson will offer no substantial resistance to its free movement. As shown in Figs. 2 and 4, the weight J is attached to the lower end of a rod K, passing upward through the stuffing-box I³ at the top of the caisson and connected at its upper end with the cross-head K², moving in the guideways D³ D³ of the derrick and to which in turn is connected a rope K', passing over the pulley-wheel E and winding on the drum C²⁴. As shown in Fig. 7, the rod K is connected to a cross-head N, situated in the caisson above the weight J and like it moving in the guideways I⁴. To this cross-head, which should be of considerable weight, is attached a catch or latching device, which when the cross-head moves down against the weight automatically engages the weight and which when the cross-head and weight are drawn up to the top of the caisson is automatically disengaged. A convenient construction is that shown in Fig. 7, in which two lever-arms N² N² are pivoted to the cross-head N, as indicated at N' N', and formed with hooked ends, as N³, and rollers N⁴ at their upper ends, a spring, as N⁵, normally drawing the hooked ends apart.

For this special construction of catch I form a recess J³ in the top of the weight J, with lugs J⁴ J⁴ projecting over its edge. The upper faces J⁵ J⁵ of the lugs being inclined, it will be obvious that when the cross-head N moves down the hooked ends N³ of the levers will engage the lugs J⁴, so that when the cross-head is moved up the weight will be drawn upward with it until the rollers N⁴ at the tops of the levers come in contact with the wedge I⁶, whereupon the upper ends of the levers will be forced apart and the hooked ends forced together, releasing the weight and permitting it to fall. This construction has certain advantages in that the fall of the weighted chisel is not opposed by the frictional resistance offered to the downward motion of the rod K.

L indicates the chisel, secured in the socket J' of the weight by the key L'.

For certain purposes it is desirable to at times connect the weight J with the caisson, so that, for instance, the weight will be drawn up with the caisson or the caisson forced down by means of the weight. A convenient device for doing this consists of the rods M M, pivoted at M' M' onto the ring I⁵ and formed with hooks at their free ends, as indicated at M². The rods or bars M are, as shown, connected together by rods m, and normally they lie in the position indicated in Fig. 4, being prevented from moving farther outward by a frame, such as m⁴. When it is desired to couple the weight and caisson together, the bars M are moved in, so that their hooked ends engage the cross-head K², and they are secured in this location by a latch M³, said latch being pivoted on one rod m and adapted to engage with the other rod m.

The operation of my device is readily followed. The caisson is lowered into the position at the point where the work is to be done, the weight J being coupled to the caisson to assist in lowering it, if desired, in the way above described. When brought to proper position, the clamp G is tightened, so as to hold the caisson against a tendency to rise, while giving it room to turn in the well or passage C². Compressed air is then forced in from the compressor C⁶ through the pipes O² and O, the latter pipe being flexible and passing over a pulley O', secured, as shown, on the cross-bars d² of the derrick. The hooked bars M M are released from the cross-head K² and the actuating mechanism then set to work to raise the weight J and the chisel attached to it and let it fall in the caisson. A simple and convenient device for doing this is the drum C²⁴, which is coupled to the shaft C¹⁰ when the weight is to be raised and uncoupled when it is desired to drop the weight, or when the modification shown in Fig. 7 is used uncoupled and after the weight is drawn up and automatically released, so that the cross-head N will follow the weight down and reengage it. The angle of the caisson and of the chisel L is adjusted from

time to time by the engine C⁵ acting through the connections described on the arm G⁶ of the clamps.

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

1. A subaqueous rock-breaker consisting of a tubular caisson closed at top and open at bottom, in combination with a heavily-weighted chisel vertically movable in the tubular caisson, means for elevating the chisel in and dropping it through the caisson and means for forcing compressed air into the caisson to maintain it substantially free from water.

2. A subaqueous rock-breaker consisting of a tubular caisson closed at top and open at bottom and provided with longitudinal guides, as I⁴, in combination with a weight as J, movable on the guides in the caisson and adapted to hold a rock-breaking chisel in its lower end, means for elevating the weight in and dropping it through the caisson and means for forcing compressed air into the caisson to maintain it substantially free from water.

3. A subaqueous rock-breaker having in combination a tubular caisson closed at top and open at bottom, a weight adapted to hold a chisel longitudinally movable in said caisson, means for raising and dropping said weight and means for connecting the weight and caisson together at will.

4. A subaqueous rock-breaker having in combination a staging having an opening therethrough, a tubular caisson closed at top and open at bottom passing through opening, a weight adapted to hold a chisel longitudinally movable in said caisson, means for raising and dropping said weight and a clamp adapted to secure the caisson to the staging arranged as described to have a capacity to rotate with the caisson.

5. A framing or derrick, as D D', having guides, as D³ in combination with a tubular caisson arranged to extend down into water beneath said derrick, a weight vertically movable in the caisson and adapted to hold a

rock-breaking chisel, a rod, as K, extending through a stuffing-box in the top of the caisson and adapted to connect with the weight aforesaid to raise it, a cross-head, as K², moving in the guides D³ and connected to the top of rod K, a cord connected to said cross-head and leading over a pulley on the derrick to a hoisting-drum and means, as hook-arms M M, for connecting the top of the caisson to the cross-head K².

6. A framing or derrick, as D D', having guides, as D³, in combination with a tubular caisson arranged to extend down into water beneath said derrick, a weight vertically movable in the caisson and adapted to hold a rock-breaking chisel, a rod, as K, extending through a stuffing-box in the top of the caisson and adapted to connect with the weight aforesaid to raise it, a cross-head, as K², moving in the guides D³ and connected to the top of rod K, a cord connected to said cross-head and leading over a pulley on the derrick to a hoisting-drum, means, as hook-arms M M, for connecting the top of the caisson to the cross-head K² and means, as clamp G, for holding the caisson in depressed position.

7. In a subaqueous rock-breaker, a tubular caisson closed at top and open at bottom in combination with a weight adapted to hold a chisel and longitudinally movable in said caisson, said weight having a catch-engaging device at its top, a catch situated in the caisson above the weight and also longitudinally movable therein, said catch being adapted to engage and hold the weight when forced against its top, means for moving the catch in the caisson and a catch-disengaging device situated at the top of the caisson and whereby the catch is made to disengage the weight when drawn upward to the disengaging device.

BARTON H. COFFEY.

Witnesses:

CHAS. F. MYERS,
D. STEWART.