

(No Model.)

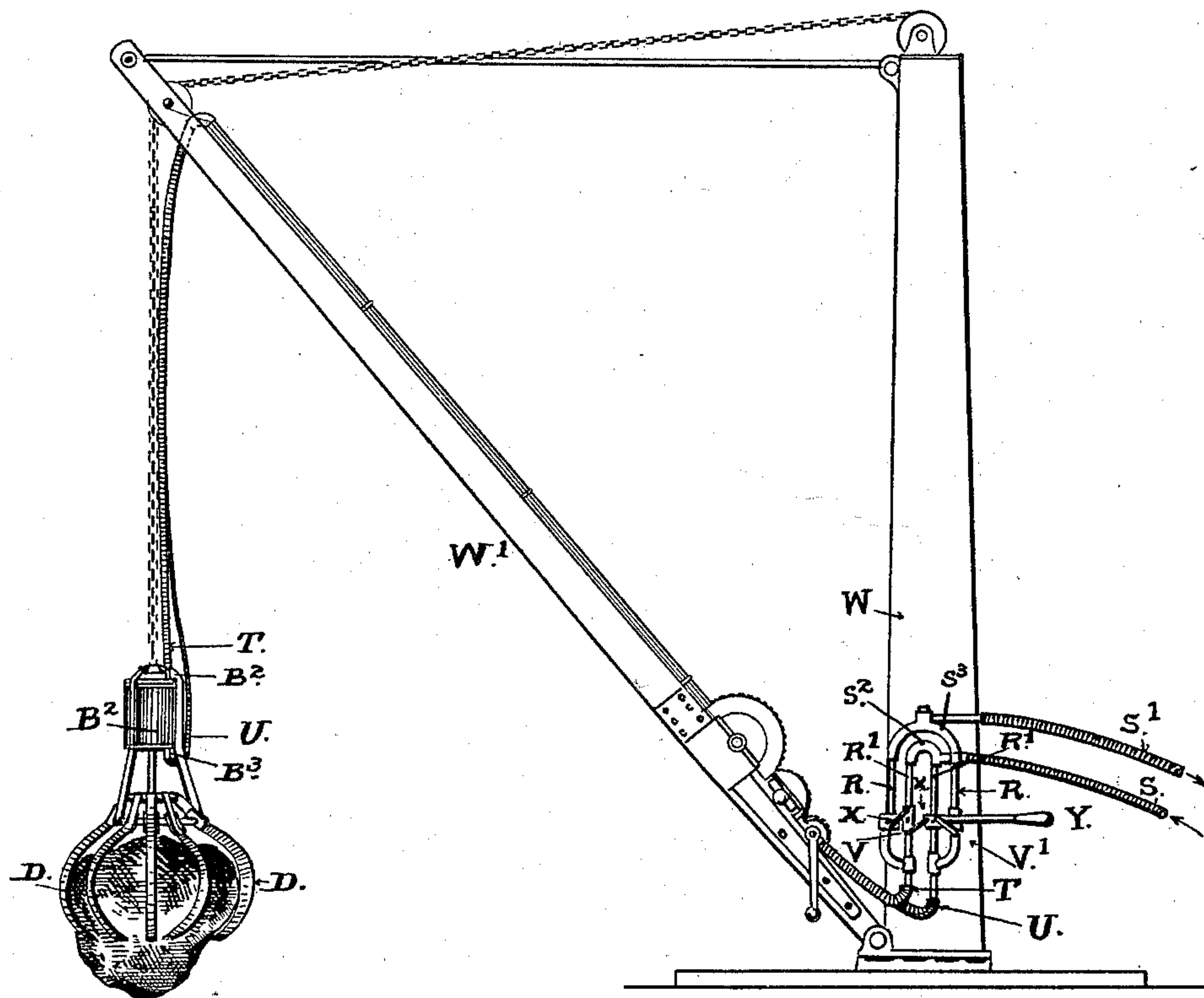
2 Sheets—Sheet 1.

W. KNOX.  
STONE GRAPPLE.

No. 584,880.

Patented June 22, 1897.

Fig. 7.



WITNESSES:

E. Salomon

M. Regier

INVENTOR:

William Knox

by Smith & Osborn.  
his atty

(No Model.)

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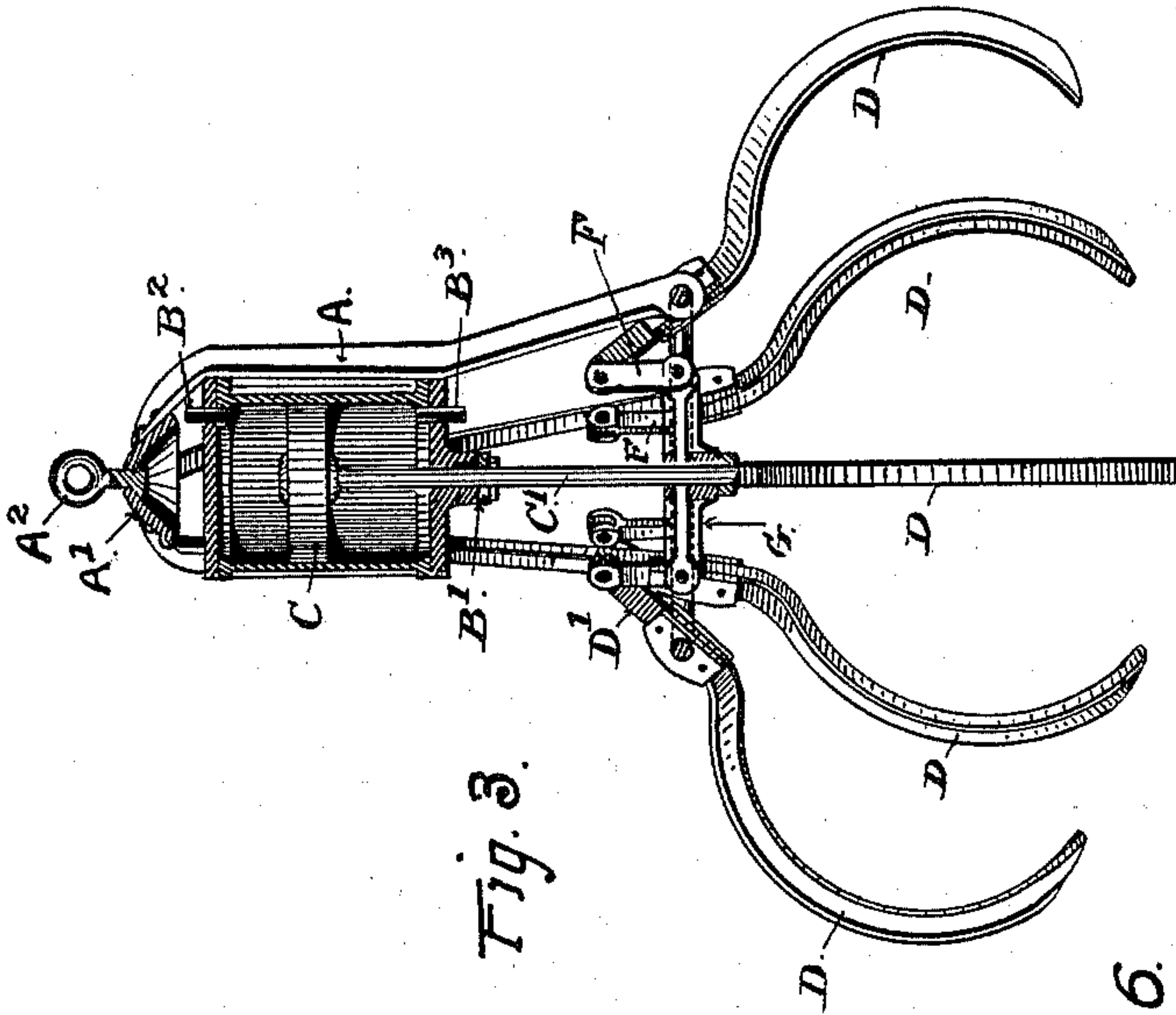


Fig. 3.

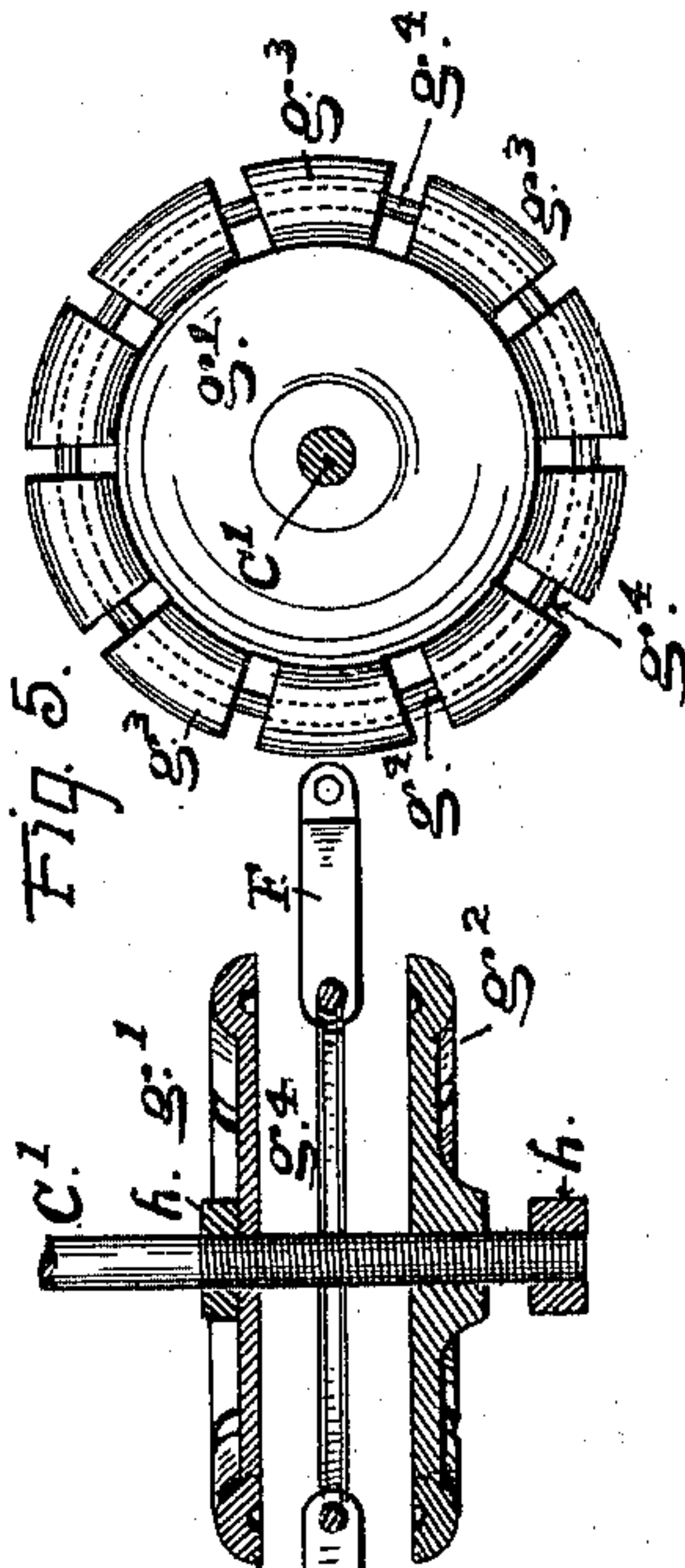


Fig. 5.

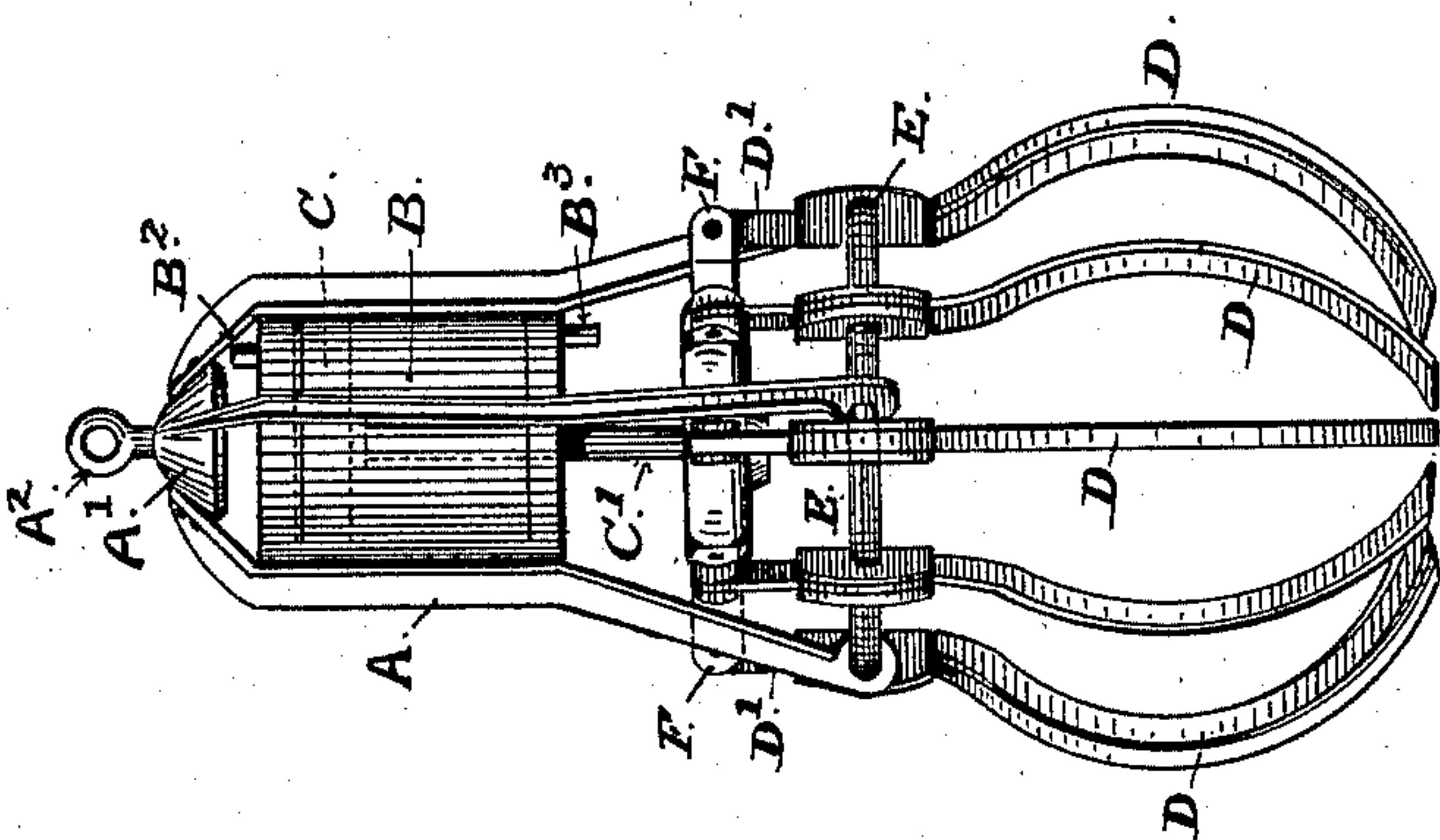


Fig. 2.

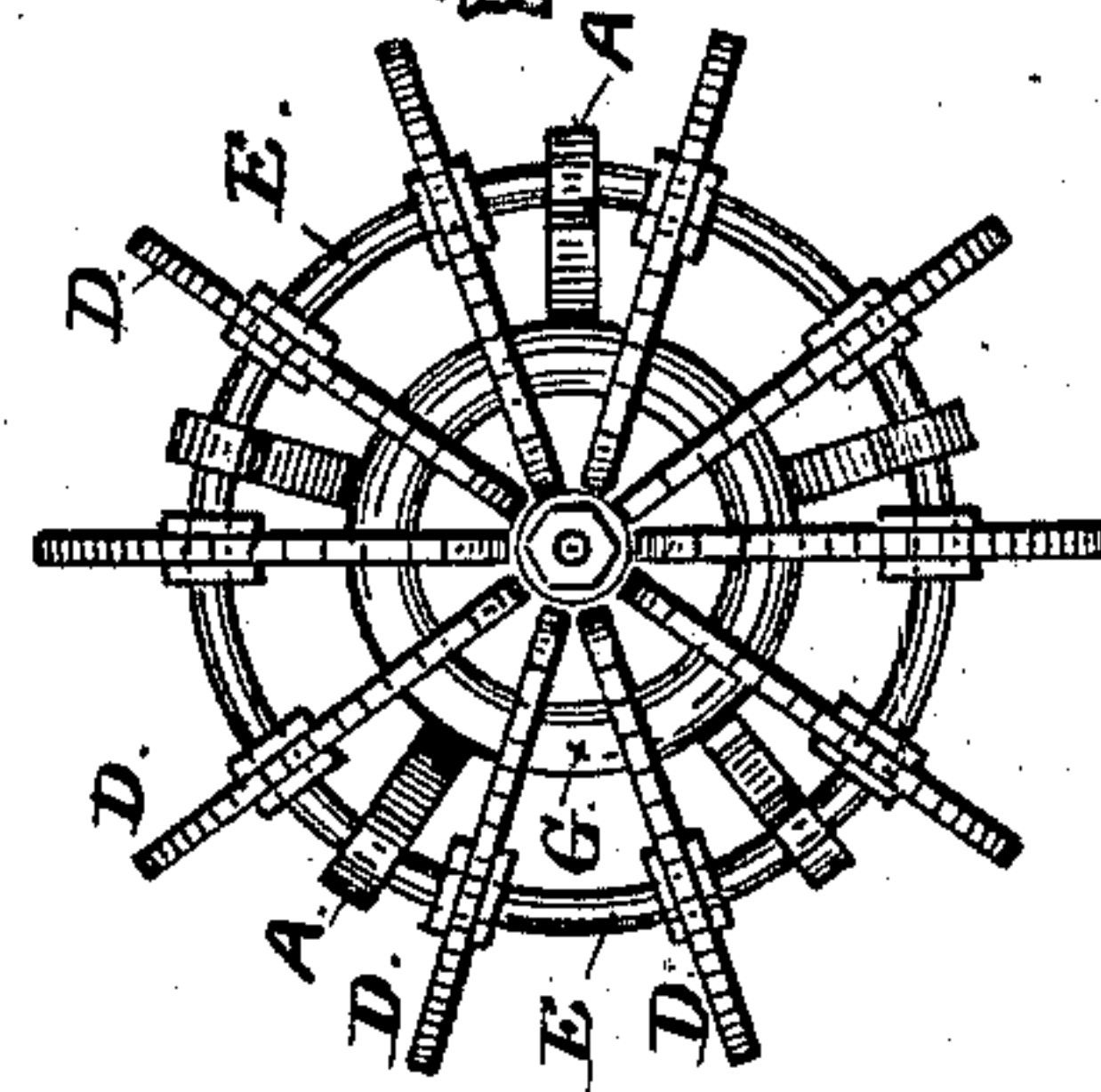


Fig. 4.

Witness:

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*W. Salomon*

Inventor:

*William Knox*

*B. Smith & Son, Attys*



# UNITED STATES PATENT OFFICE.

WILLIAM KNOX, OF HAYWARD, CALIFORNIA.

## STONE-GRAPPLE.

SPECIFICATION forming part of Letters Patent No. 584,880, dated June 22, 1897.

Application filed June 5, 1896. Serial No. 594,376. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM KNOX, a citizen of the United States, residing at Hayward, in the county of Alameda and State of California, have invented certain new and useful Improvements in Stone-Grapples, of which the following is a specification.

This invention relates to improvements made in grapples for handling boulders and large stones in mining, quarrying, and other similar work; and the invention consists in certain novel parts and combination of parts producing a grappling device in which the claws are operated and controlled by power applied through the medium of a piston in a cylinder mounted on the grapple, as hereinafter described, and pointed out in the claims, reference being had in the following description to the drawings that accompany and form part of this specification.

Figure 1 of the said drawings represents in elevation a grapple constructed according to my invention for use in mining operations, combined with a derrick and means for working the piston to open and close the claws. Fig. 2 is an elevation, on an enlarged scale, of the grapple with the claws closed. Fig. 3 is a sectional view of the same with the claws opened. Fig. 4 is an inverted plan or bottom view of Fig. 2. Fig. 5 is a top view of the connecting-head or coupling on the end of the piston-rod by which all the claws are connected to the rod. Fig. 6 is a vertical transverse section through the center of Fig. 5 with the parts separated.

The bars A A, of T-iron, form a light skeleton frame, in the upper part of which is fixed a cylinder B, closed at both ends and fitted with a piston C. The rod of this piston is carried downwardly through a stuffing-box B' on the bottom of the cylinder and is connected at the lower end to the straight upper members D' of the grapple D. The motive force is steam, air, or liquid, applied upon one side of the piston C to open the claws and on the opposite side to close the claws, and the same is applied by connecting the cylinder-spaces with the source of pressure by means of tubes or hose carried from the mast of the derrick or crane W along the boom or arm W' to the outer end and thence downward to the cylinder, one tube being

coupled to an inlet-tube B<sup>2</sup> in the top head of the cylinder and the other to a similar inlet-tube in the bottom head. These tubes connect the cylinder with a system of valves V, set in convenient position and so arranged for operation that one tube is connected with the source of power for a supply-tube to apply the power to one side of the piston, while the other tube, communicating with the cylinder-space on the opposite side of the piston, is thrown open or is converted into an exhaust-tube by the same movement of the lever that opens the valve in the inlet or supply tube.

The valves of both tubes are coupled together to work simultaneously, so that the outlet from the cylinder on one side of the piston is thrown open and the inlet from the opposite side is opened by the movement of a single lever Y. An arrangement of conducting-tubes and valves to operate in this manner is shown in general view in Fig. 1, where it will be seen that the two tubes coupled to opposite ends of the cylinder B and carried along the boom W' to the lower part of the mast W are connected with a supply or inlet tube S and with an exhaust or outlet tube S' by two sets of branch tubes R R', provided with two sets of valves V V', all connected together and to a common operating-lever Y. The upper ends of the branch tubes R' R' are connected with the inlet-tube S by an elbow S<sup>2</sup>, and to their lower ends are coupled the two conducting-tubes T U. In these branches R' R' are placed rotary valves V, one set at right angles to the other and the two connected by a link X, so that the movement of rotation to open one valve simultaneously closes the other valve.

The outlet or exhaust tube S' is connected to the tubes T U below the before-mentioned valves V by branch tubes and an elbow S<sup>3</sup>, and in these branches are placed rotary valves V', arranged in similar manner to the inlet-controlling valves V and connected by links X with those valves, so that when the valve in one inlet-tube is opened the valve in the opposite outlet branch is opened also and by a single movement of the hand-lever, while the other inlet and outlet valves are closed at the same time. Any suitable construction of quarter-turn rotary valve can be



used for this purpose, and no detailed description of the same is necessary, as such valves and connections can be applied and arranged for operation by the mechanic without further instruction to accomplish the desired end and object—namely, to connect the cylinder-space on one side of the piston with the force or power to move it and the space on the opposite side with the exhaust at the same time.

The uprights A of the frame are placed at equal distances apart around the body of the cylinder, and their upper ends are turned over the top cylinder-head and joined to a common saddle-block A', through which a swivel-hook or an eye A<sup>2</sup> is inserted for the hoisting-chain. In the lower ends of the uprights are eyes or bearings for a ring E of cylindrical shape in cross-section, which is supported by these bars A of the frame at proper distance below the cylinder to form a common carrying-ring for all the claws. Each claw is attached to and hung on this ring from a point below the end of the straight upper portion or member of the claw to swing loosely in and out, and the end of such straight member is connected by a link F to the end of the piston-rod C', so that by the vertical movement of the piston the claw is thrown outward or is drawn inward toward the center, according to the direction of the movement, and all the claws are moved at the same time and with equal throw.

The link F is forked at one end to take the end of the straight member of the claw and form a hinge-joint, while the inner end of the link is attached to the piston-rod by means of a circular head G, formed of two separate plates  $g'$   $g^2$ , with knuckles  $g^3$  to receive the ends of the links, and a round wire ring  $g^4$ , passing through the eyes of all the links and fitted in recesses in the opposing faces of the two plates, so that when brought together the two plates  $g'$   $g^2$  clamp the ring between them, while the links F, thus attached to the head, are free to play in the slots or openings between the knuckles.

The before-mentioned plates are drawn together and held by a screw-thread on the piston-rod and the clamp-nuts  $h$   $h$  above the top

plate  $g'$  and below the bottom plate  $g^2$ . This construction will be understood from Figs. 4 and 5 of the drawings.

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

1. A grapple comprising in its construction grappling-claws arranged in a circle, each claw having a curved lower member and a straight upper member, a cylindrical ring forming a common pivot for all the claws and upon which the claws are arranged in a circle at equal distances apart, a cylinder arranged for operation above said ring, rigid arms secured to the sides of the cylinder and depending therefrom to the lower ends of which said ring is connected, a piston in said cylinder, a piston-rod, a circular head on the lower end of said piston-rod, a link connecting the straight upper member of each claw with the circular head and an eye at the top of said cylinder for connecting a hoisting-rope, there being inlet and outlet apertures in said cylinder and tubes connecting the same with a source of pressure for operating the piston, as set forth.

2. In a grapple, the combination of claws having curved lower members and straight upper members, the ring forming a common pivot for the claws and upon which they are arranged to open and close in a circle, a cylinder containing a piston, supporting-arms secured to the said cylinder and having depending lower ends by which the said ring is supported below the cylinder, a piston-rod extending through the bottom head of the cylinder, a circular head composed of separable slotted plates on the lower end of said piston-rod and a ring clamped between them and means for setting up and holding the plates together and links pivotally connected to the upright members of the claws and connected to the said circular head by the ring thereof, as set forth.

In testimony that I claim the foregoing I have hereunto set my hand and seal.

WILLIAM KNOX. [L. S.]

Witnesses:

LEE D. CRAIG,

EDWARD E. OSBORN.