

No. 675,860.

A. LEVEDAHL.

MOTOR.

(Application filed May 3, 1900.)

Patented June 4, 1901.

3 Sheets—Sheet 1.

(No Model.)

Fig 1.

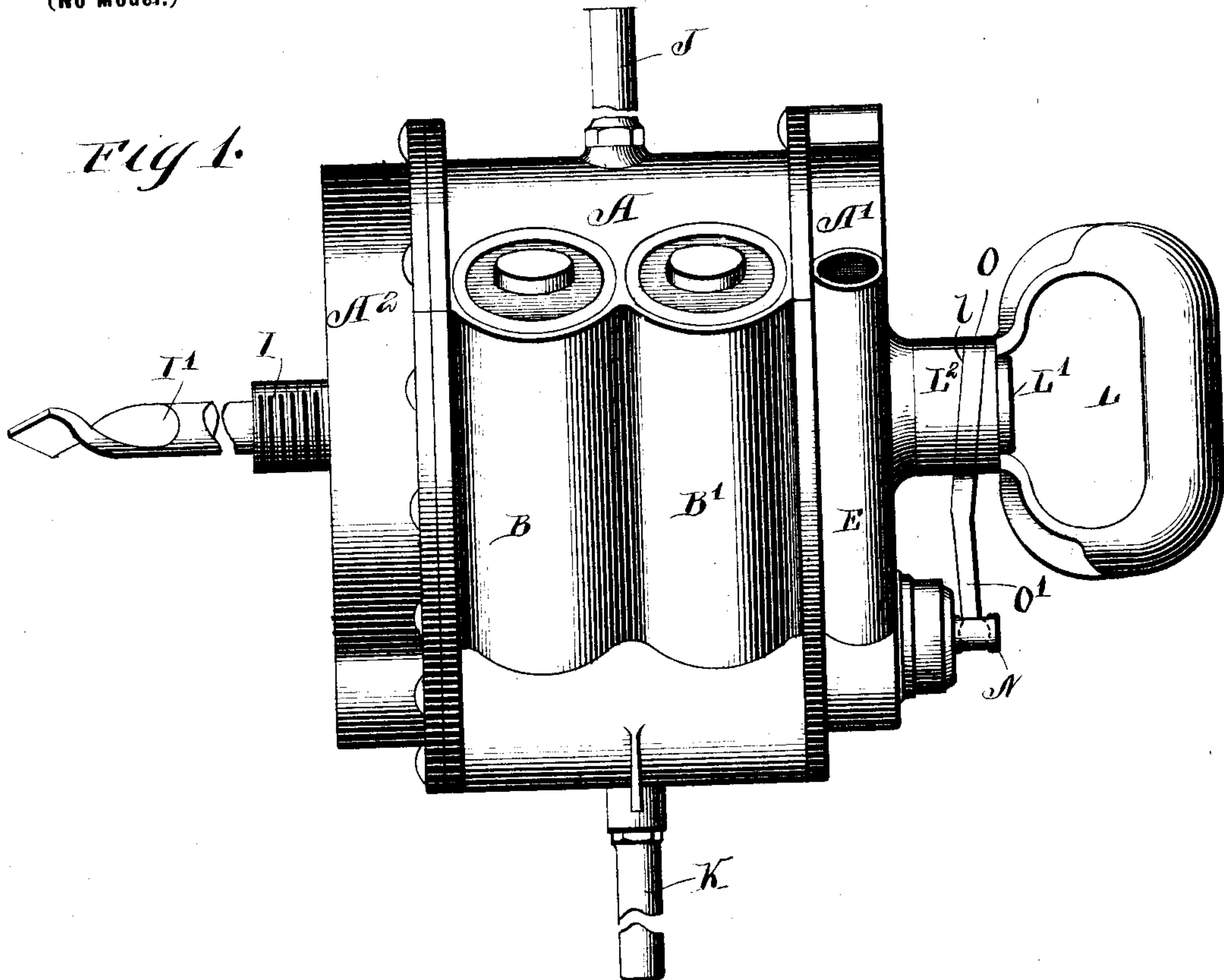
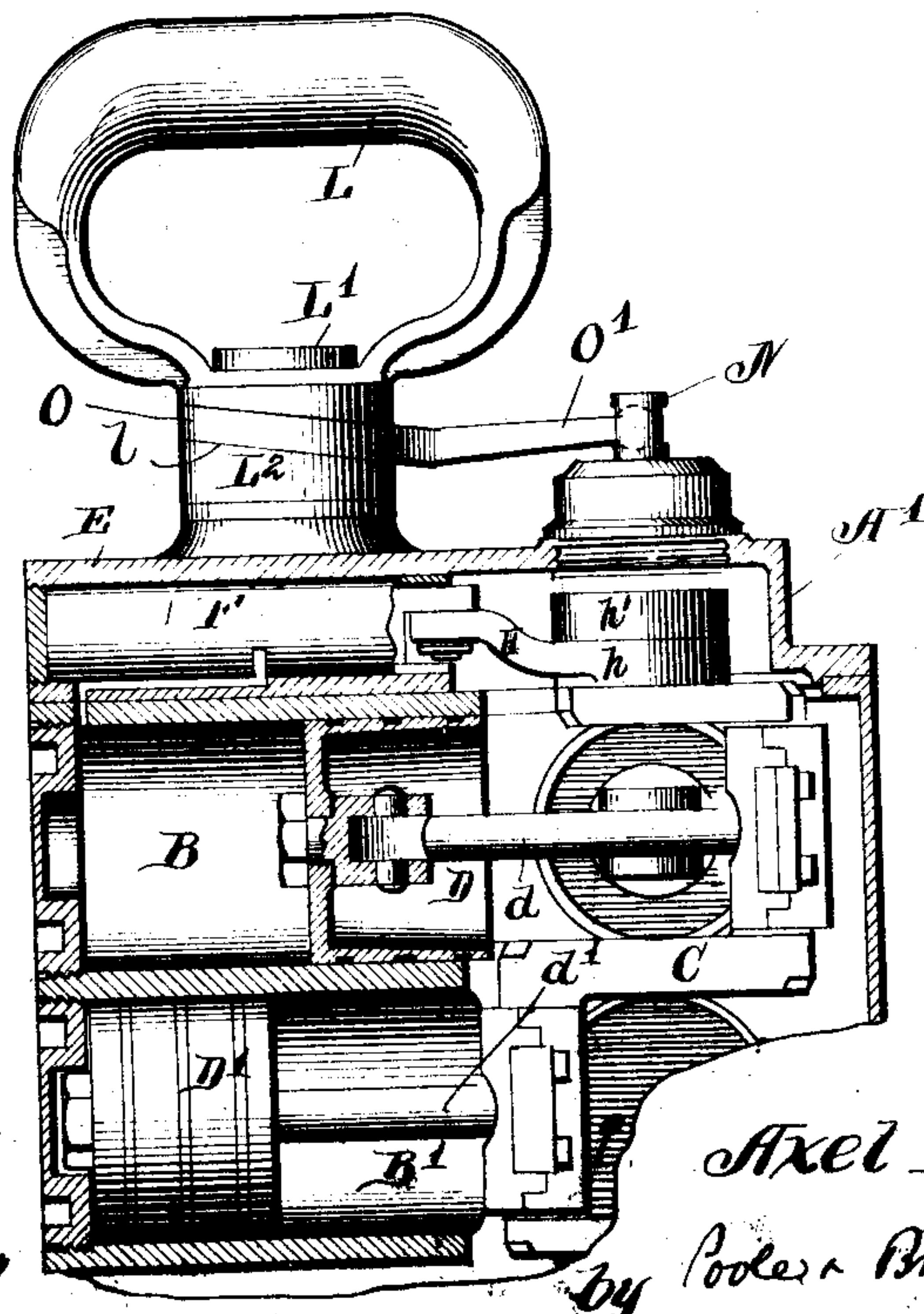


Fig 2



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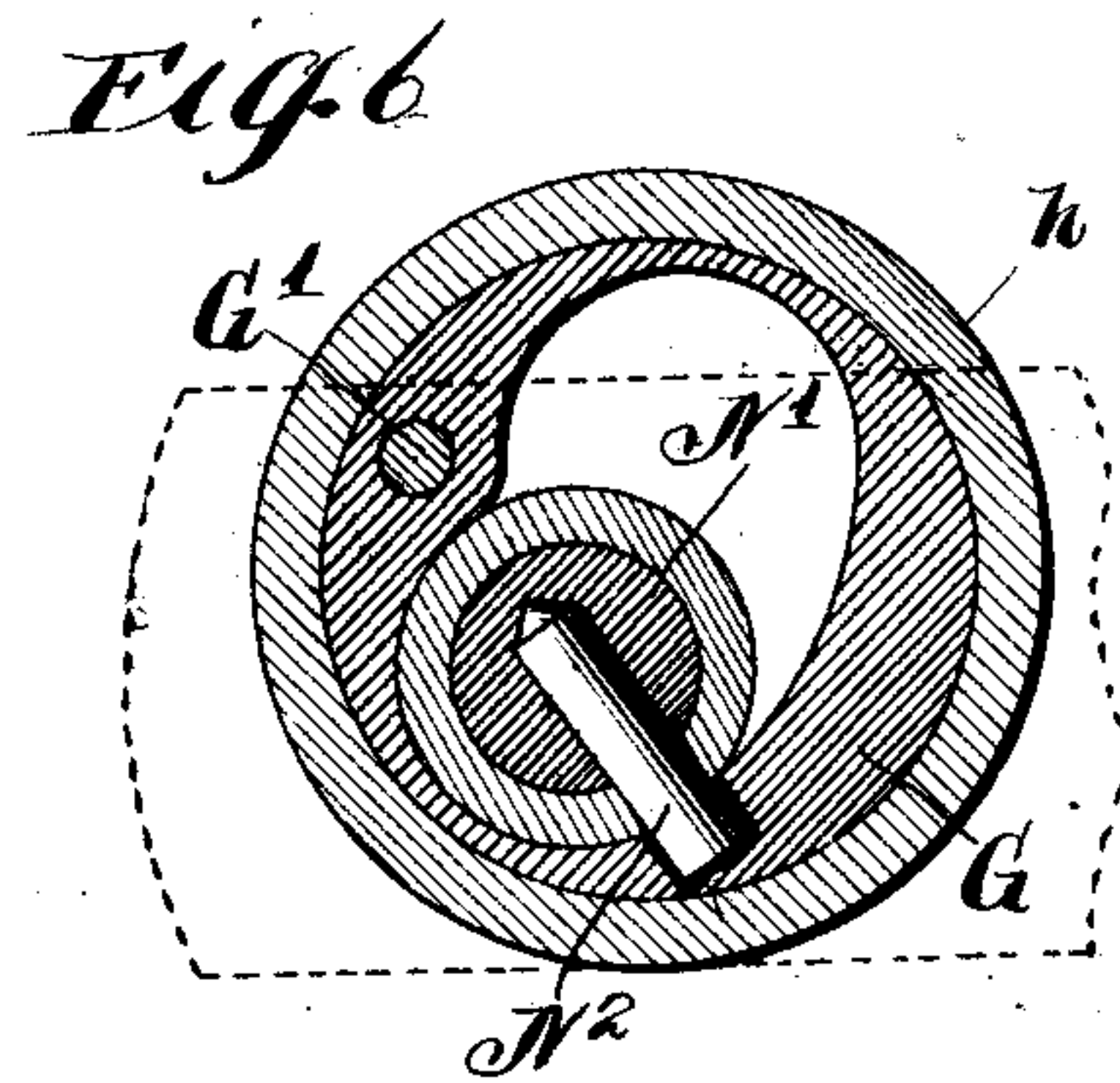
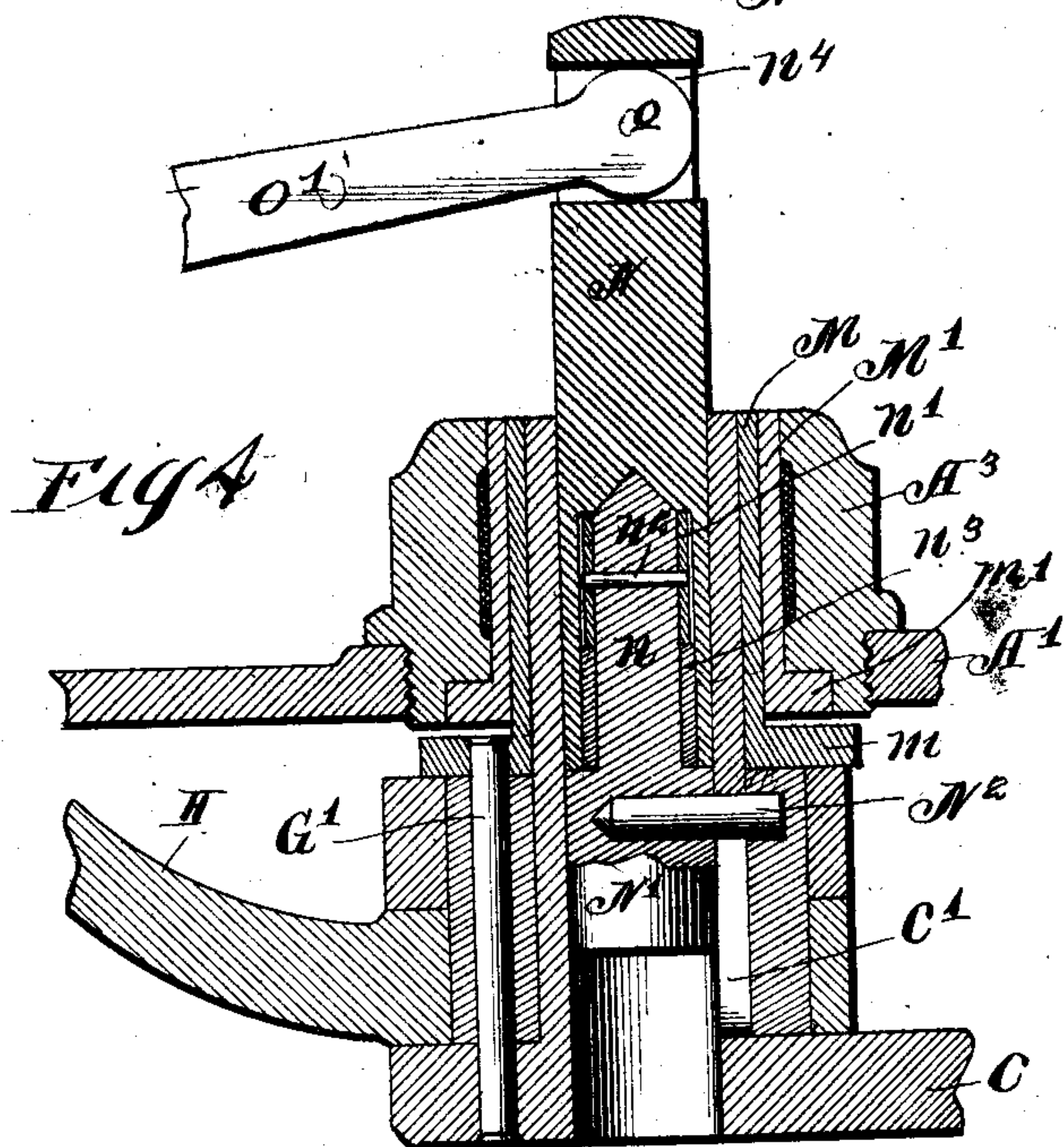
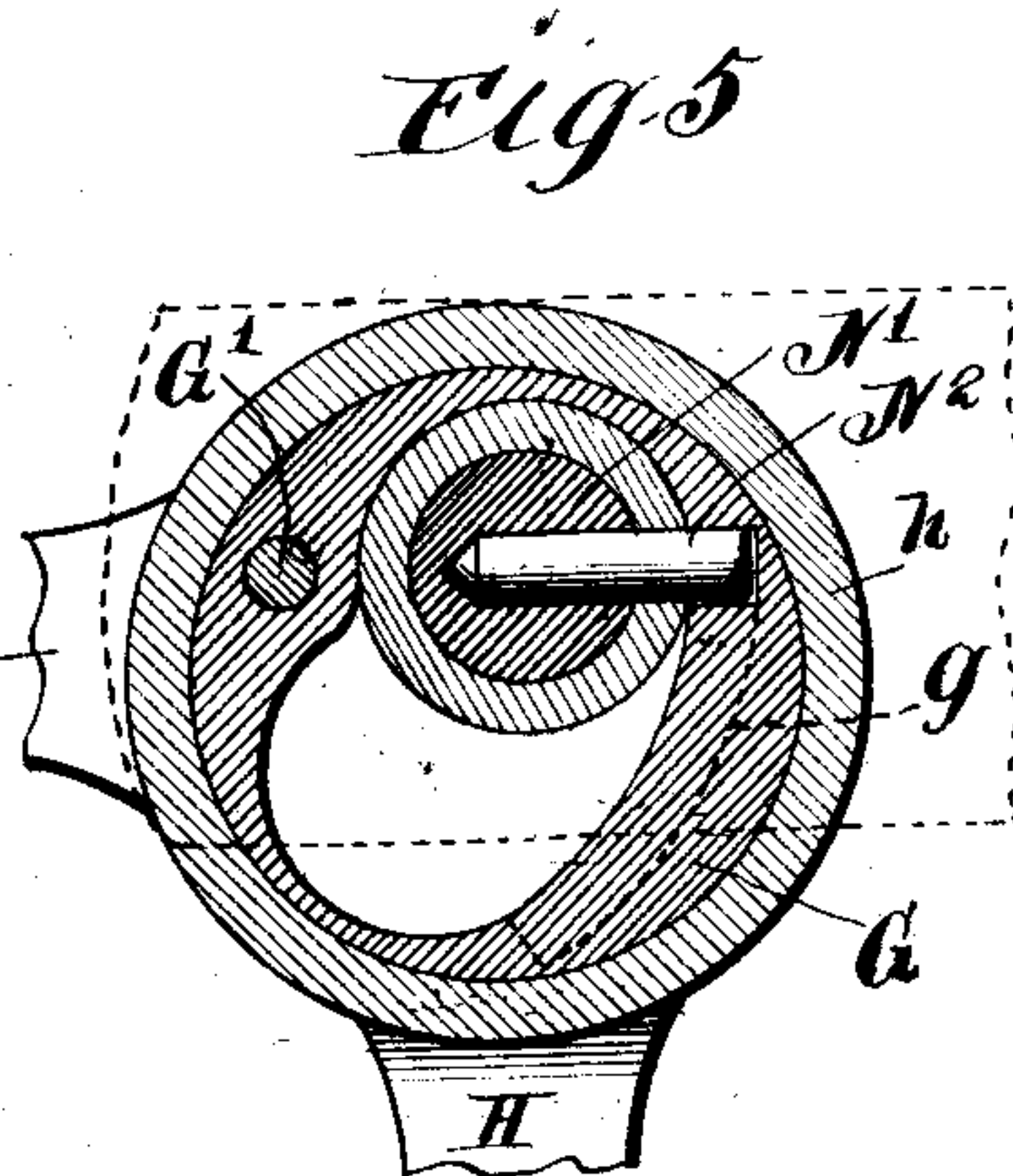
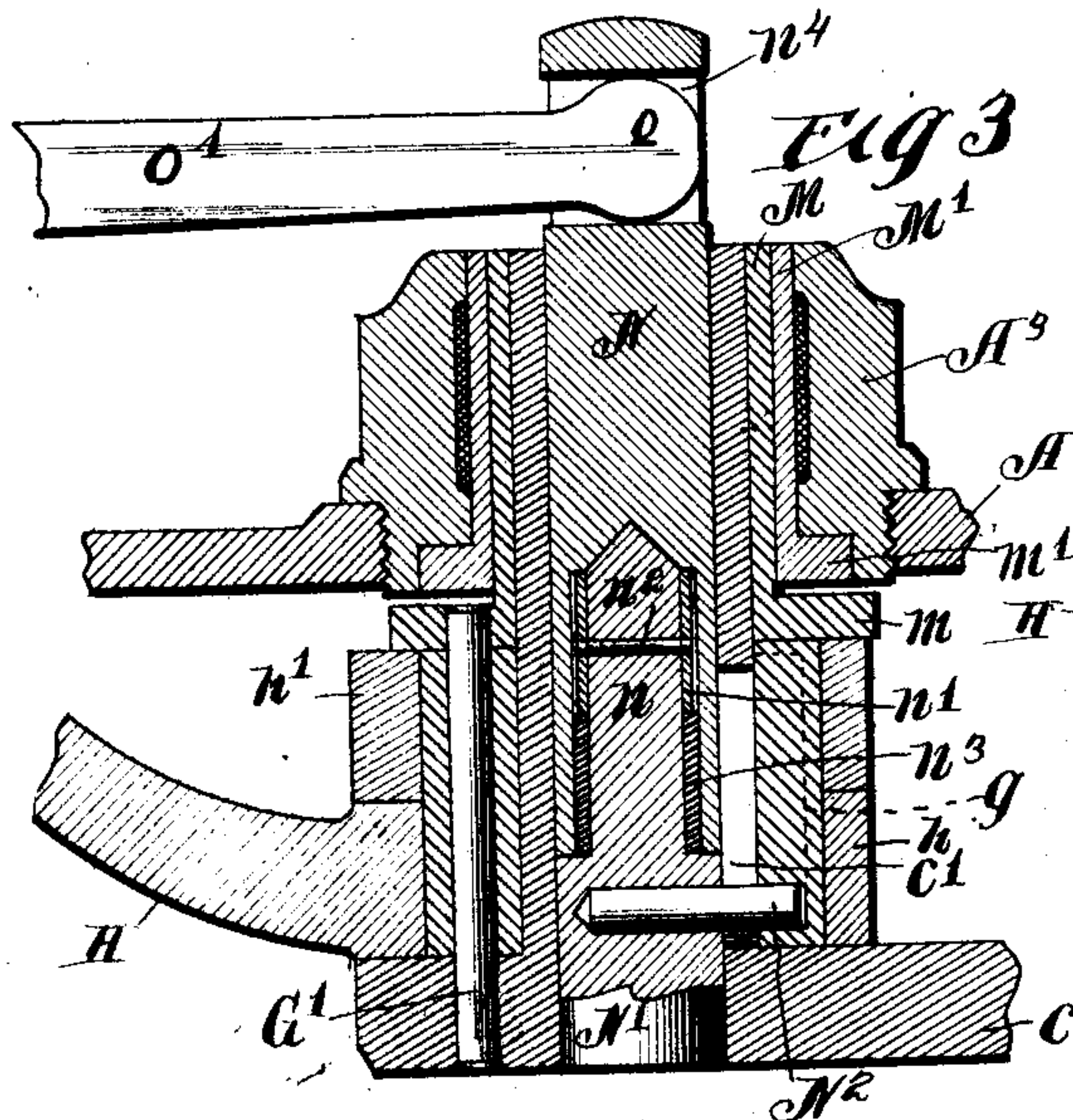


Fig 7

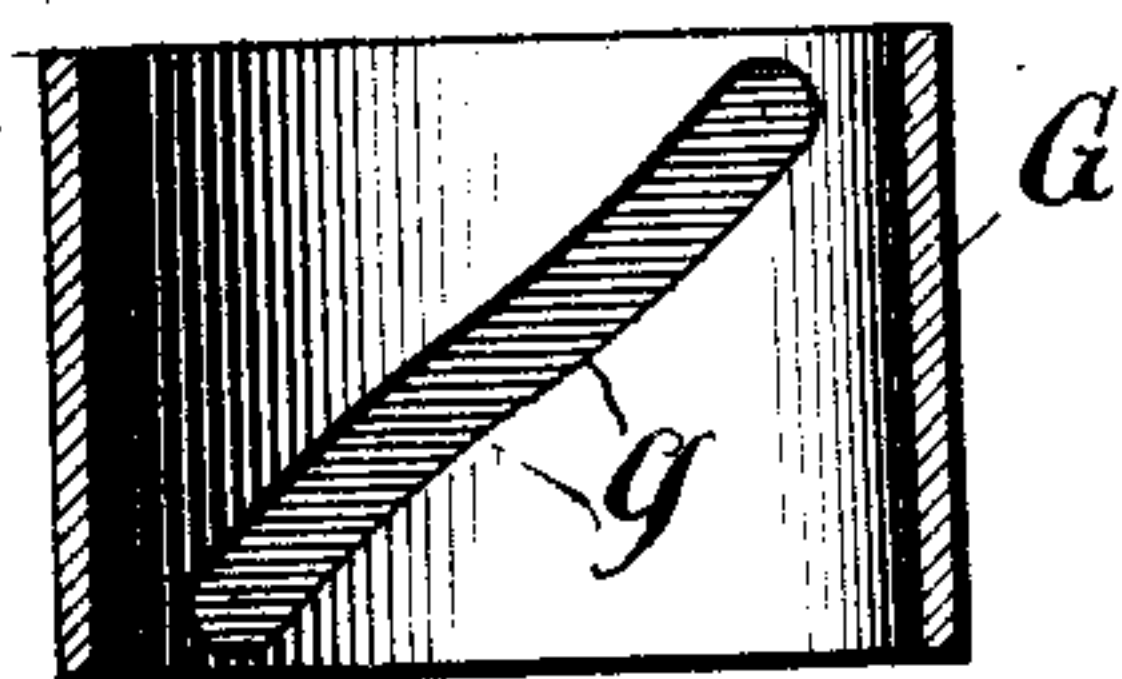
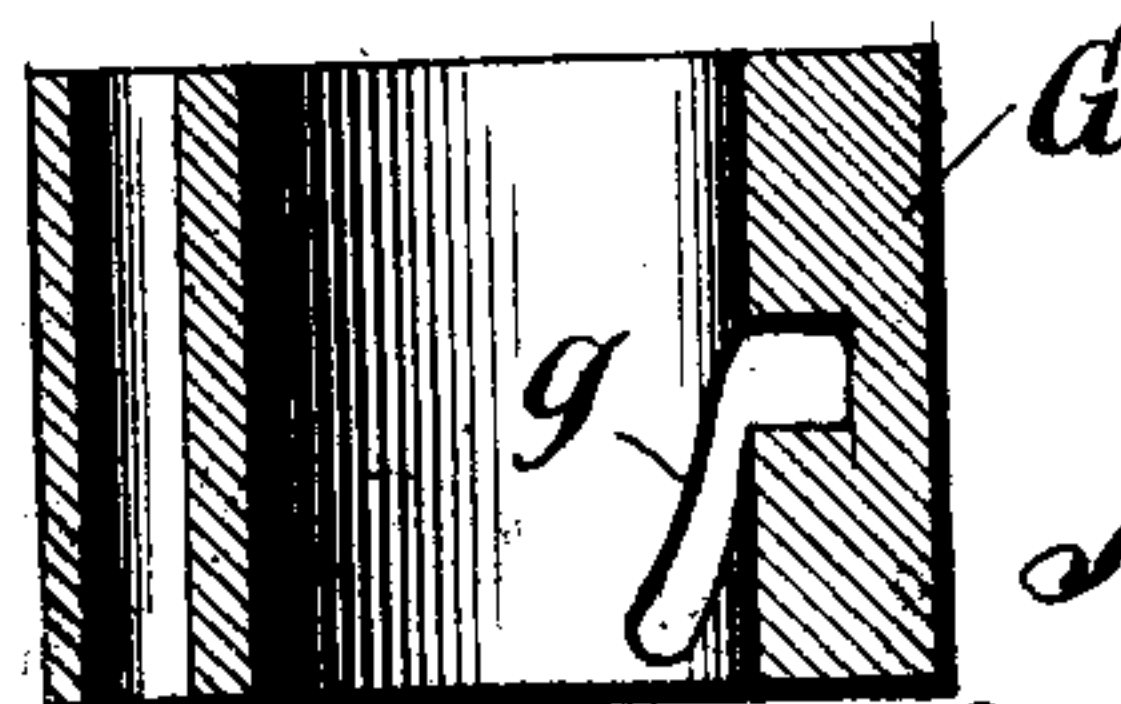


Fig 8



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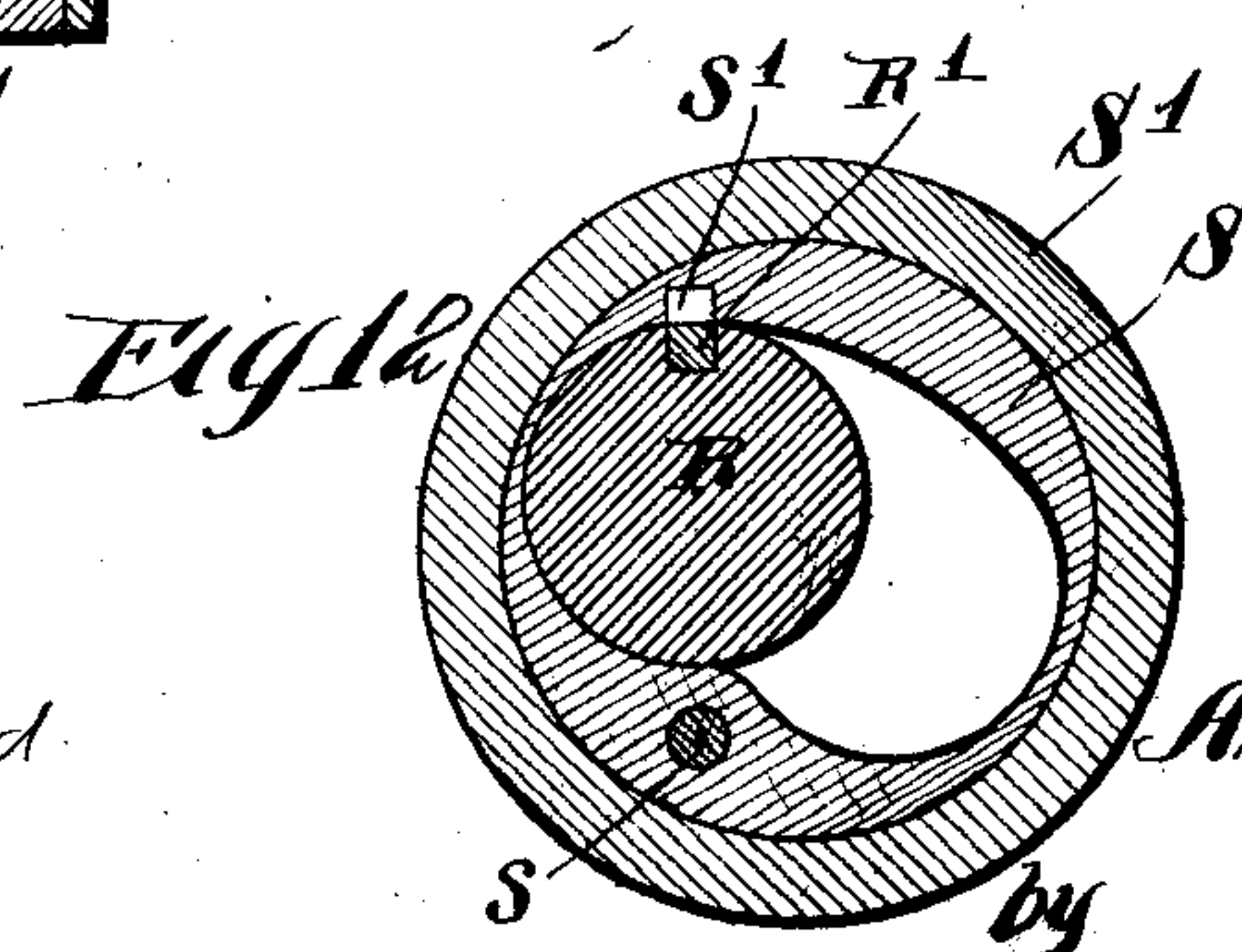
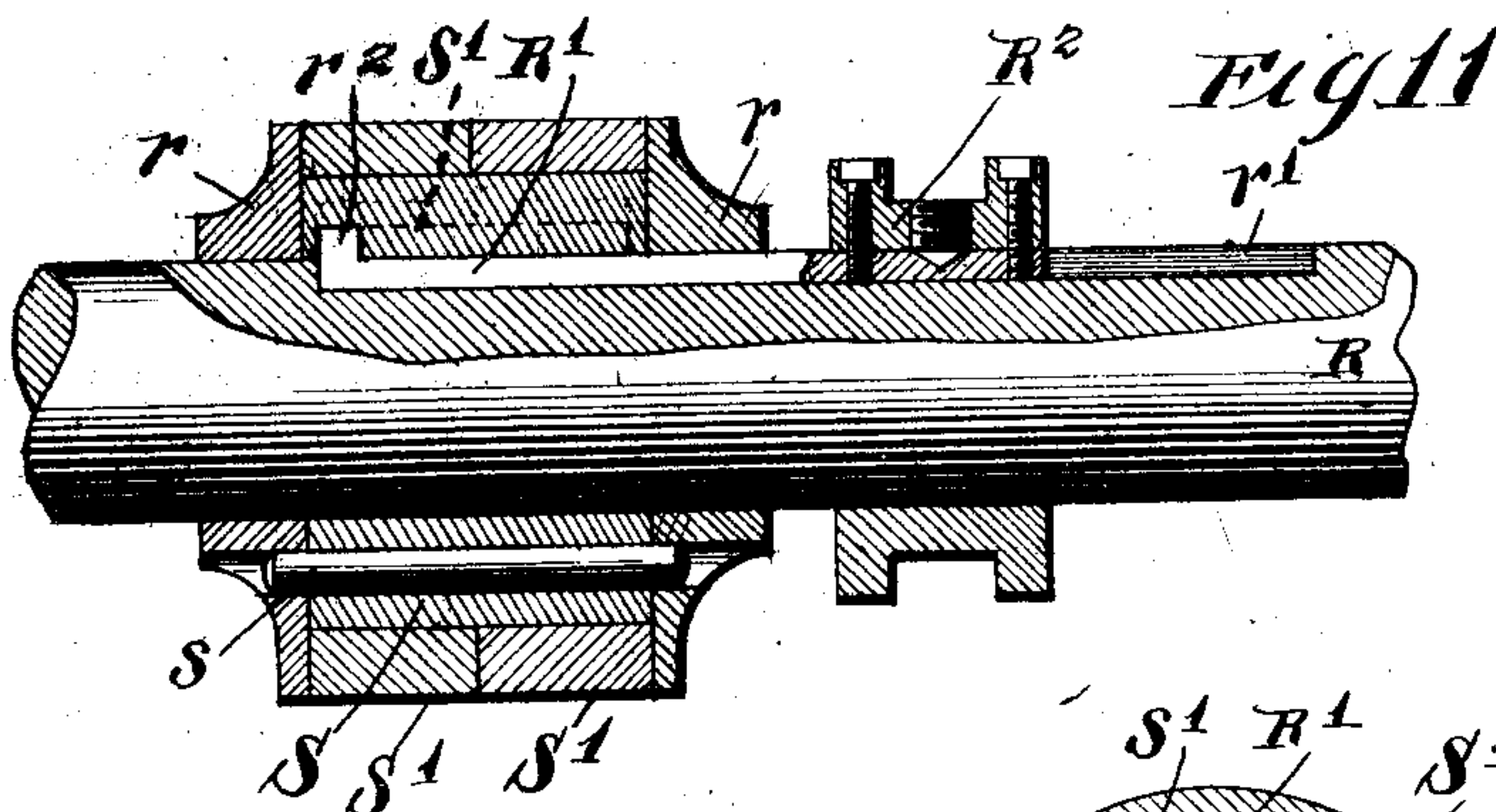
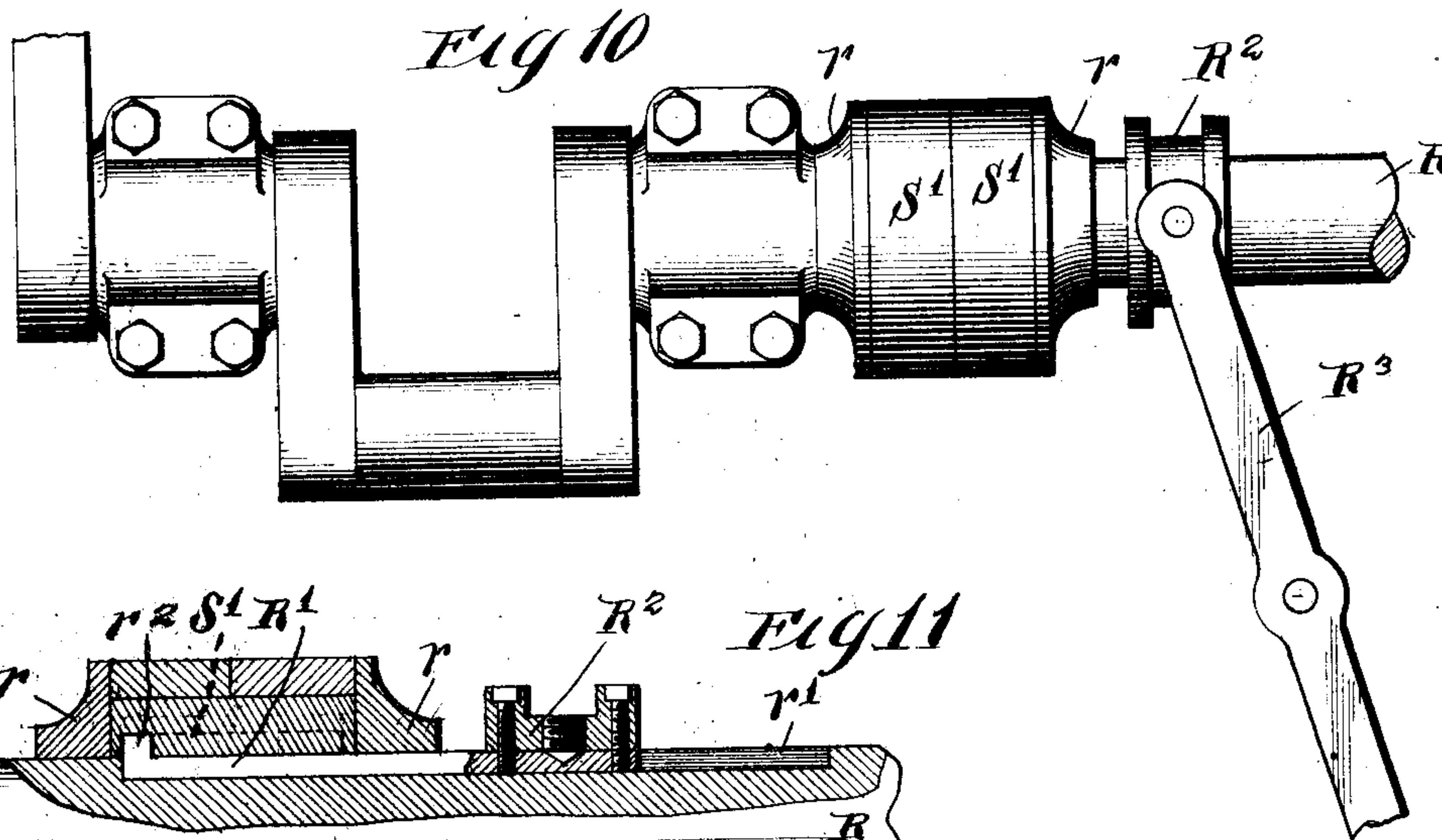
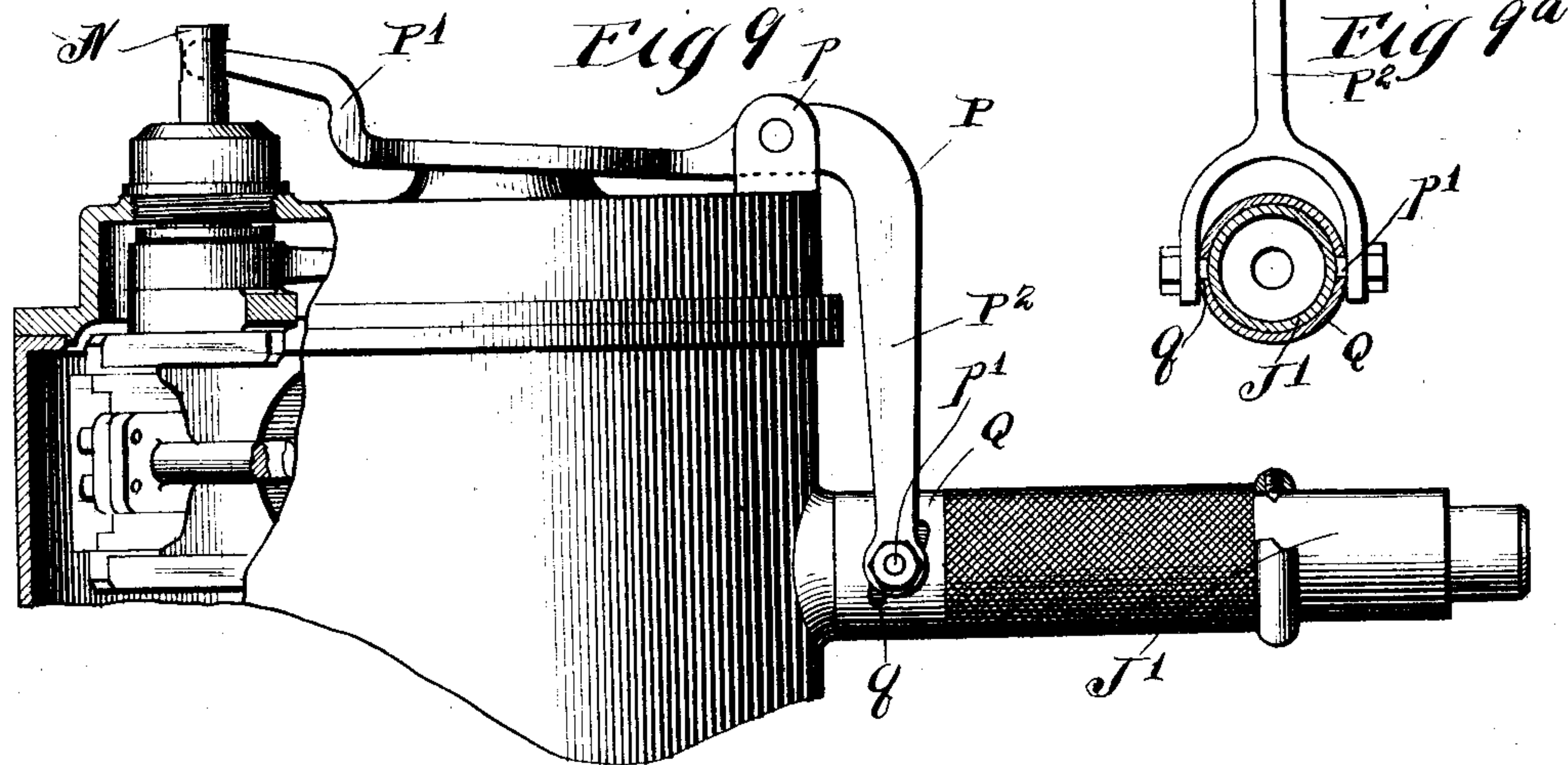
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3 Sheets—Sheet 3.



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UNITED STATES PATENT OFFICE.

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MOTOR.

SPECIFICATION forming part of Letters Patent No. 675,860, dated June 4, 1901.

Application filed May 3, 1900. Serial No. 15,326. (No model.)

To all whom it may concern:

Be it known that I, AXEL LEVEDAHL, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful
5 Improvements in Motors; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form
10 a part of this specification.

This invention relates to improvements in valve-actuating mechanism for motors or engines of that class operated by an elastic fluid under pressure. The invention consists in
15 the matters hereinafter described, and more fully pointed out in the appended claims.

My invention is herein shown with a portable pneumatic motor employed for actuating a drill or like purpose and in which motion
20 is given to a rotative shaft by means of a plurality of cylinders containing reciprocating pistons and in which slide-valves are employed to control the admission of the fluid to the cylinders.

25 The invention will be more readily understood by reference to the accompanying drawings, wherein—

Figure 1 is a view in side elevation of a portable motor embodying my invention. Fig. 2
30 is a detail sectional view thereof taken axially through two of the power-cylinders of the motor and through the slide-valve, by which the admission of steam to said cylinders is controlled. Fig. 3 is a detail section,
35 considerably enlarged, taken through the crank-shaft of the engine and illustrating the devices by which the slide-valve is actuated. Fig. 4 is a detail sectional view taken on line 4 4 of Fig. 3. Fig. 5 is a section similar to
40 Fig. 3, illustrating a changed position of the parts. Fig. 6 is a detail section taken on line 6 6 of Fig. 5. Figs. 7 and 8 are detail views of the eccentric shown in Figs. 3 to 6, taken on lines 7 7 and 8 8, respectively, of said Fig.
45 5. Fig. 9 is an exterior view of a part of the casing of the engine with parts broken away to show the interior construction, illustrating in modified form the devices by which the eccentric is operated. Fig. 9^a is a detail section taken on line 9^a 9^a of Fig. 9. Fig. 10 is
50 a view of the crank-shaft with eccentric there-

on, illustrating a modified construction in devices for actuating the said eccentric. Fig. 11 is a detail section of the crank-shaft shown in Fig. 10, taken through the eccentrics there-
55 on, showing devices for operating said eccentrics. Fig. 12 is a detail section taken on line 12 12 of Fig. 11.

The motor illustrated is generally similar in its main features to the motor illustrated
60 in Patent No. 630,357, granted to H. J. Kimman August 8, 1899.

As shown in the said drawings, A indicates the main casing of the motor, which is of sector shape and provided at one end with a head
65 A' and at its opposite end with a head A². The motor is provided with four cylinders, which are cast integral with the casing and two of which are shown in the drawings and marked B and B'. Said cylinders are ar-
70 ranged in two pairs, with the cylinders of each pair parallel with each other and at right angles to the cylinders of the other pair. C indicates a crank-shaft which is provided with
75 two cranks. The cylinders contain pistons D D', which are connected with the crank-shaft by means of pitmen d d'. The pitmen belonging to two of the cylinders are connected with the crank-pin of one of the cranks, and the pitmen of the other two cylinders are
80 connected with the crank-pin of the other crank. The head A' of the casing is provided with two integral valve-casings, which are interiorly of cylindric form and are arranged with their central axis parallel with those of
85 the pairs of cylinders with which they are associated. One of these valve-casings is shown in the drawings and is marked E. The valve-casing E contains a piston-valve F, adapted to slide endwise in the valve-casing and which,
90 through suitable ports or passages in the valve-casing and motor-casing, affords a proper supply of steam to and permits the exhaust of steam from the cylinders B B'. The details of construction with regard to these
95 parts are not illustrated, the same having no bearing on the present invention.

Mounted on the crank-shaft C, at its end adjacent to the piston-valve, is an eccentric G, through which the said valves are given
100 endwise reciprocatory motion. Eccentric-rods H H' are employed to transmit motion from

said eccentric G to the two piston-valves, said eccentric-rod being pivoted to the valves and provided with eccentric-straps $h h'$, which are arranged side by side upon the eccentric G.

5 I indicates a shaft which is driven from the crank-shaft C and which is adapted to receive a drill I' or other rotative tool.

J indicates a tube which is attached to one side of the casing A, and K indicates a rod 10 attached to the casing A opposite and in alignment with the tube J. The tube J and the rod K constitute handles by which the motor may be held and manipulated when in use. A flexible supply-pipe is connected with the 15 tube J, whereby the compressed fluid is supplied to the motor. L indicates a third handle, which is attached to the head A' and which may be used in connection with the tube J or rod K in manipulating the tool 20 which is driven by the motor.

So far as described the motor illustrated is like similar motors heretofore used.

Now referring to the novel features constituting my invention, these are constructed 25 generally as follows: The eccentric G instead of being rigidly secured to the crank-shaft is pivotally connected therewith, so that it may be shifted thereon in a plane perpendicular to the central axis of the crank-shaft and is 30 so arranged that when shifted from one limit to the other of its movement its greatest eccentricity will be thrown from one side to the other of the shaft with the effect of reversing the direction of the motion of the engine, and 35 if placed in its central position it will be concentric with the shaft, will give no motion to the slide-valve, and will entirely cut off the supply of compressed fluid to the cylinders. In connection with the shifting eccentric thus 40 arranged I provide an operative connection between said eccentrics and one of the handles of the motor, by which the said eccentric may be moved or shifted to reverse the motor or stop the same by movement of one 45 of the hands of the operator while still grasping the handle to which the operating device extends.

Now referring to the details of construction in the shifting eccentric and actuating 50 devices therefor illustrated in Figs. 1 to 8, these parts are constructed as follows: The eccentric G is mounted on a pivot-pin G', which is arranged parallel with the crank-shaft C and suitably supported at its ends on 55 said crank-shaft. In the particular construction illustrated, Figs. 3 and 4, the said pivot-pin G' is engaged at one end with an adjacent crank-arm c' of the crank-shaft and at its opposite end, or that adjacent to the head A', with a flange m on a sleeve M, which sleeve 60 surrounds and is attached at the outer part of the crank-shaft. As herein shown, this end of the crank-shaft is provided with a collar M', which surrounds the sleeve M and engages a bearing-ring A³, secured by screw-threads in an opening of the head A'. Said 65 collar M' is provided with a flange m' , which

bears against the ring A³ to hold the shaft from endwise movement. The eccentric G is provided with a segmental slot or opening, 70 through which the crank-shaft passes and which is arranged concentrically with the pivot-pin G', so as to admit free-movement of the eccentric on the said pivot-pin to an extent required for reversing the engine, the 75 motion of the eccentric being limited by contact with the shaft at either limit of its throw.

To provide means for actuating or moving the shifting eccentric from the exterior of the motor-casing, I provide, as shown in Figs. 1 80 to 8, devices as follows: The end of the crank-shaft on which the said eccentric is mounted is made hollow or tubular, and in the same is mounted an endwise-sliding actuating-rod N, which projects outwardly from the end of the said crank-shaft. The said actuating-rod is provided at its inner end with a swiveled head N', which is free to rotate while the actuating-rod N is held from 85 rotation, but which at the same time is engaged with said rod N, so as to be moved endwise therewith. The swivel connection between the head N' and the rod N, as herein shown, consists of a stem n on the head, which enters a socket in the rod and is provided 90 near its inner end with an attached sleeve n' , herein shown as secured thereto by means of a pin n^2 . In the outer part of the socket in the actuating-rod N is a ring n^3 , which is inserted in the socket and secured therein by 95 any suitable means and the inner end of which forms a shoulder adapted to bear against the adjacent end of the sleeve n' , and thereby hold the stem from outward movement, the stem being held from inward move- 100 ment by contact of its inner end with a bearing-surface at the inner end of the socket. In the said head N' is secured a radially-arranged stud M², which projects outwardly through a longitudinal slot c' , formed in the 105 tubular crank-shaft, and projects beyond the crank-shaft into position for engagement with an oblique or cam slot g , formed in the inner surface of the eccentric G, Figs. 4, 5, 6, and 7. By reason of the engagement of the stud 110 N² with the slot c' of the crank-shaft it is obvious that said stud, as well as the head N', will always turn or rotate with the crank-shaft. The stud N² is arranged radially with respect to the pivotal axis of the shifting eccentric, and the cam-slot g is located on the inner face of the segmental opening of the eccentric, so that the outer end of the pivot-stud will remain constantly in position for 115 engagement with said cam-slot g . It follows from the construction described that when the actuating-rod N is moved longitudinally the stud N² will be carried along or through the slot c' in a direction endwise of the shaft and by engagement with the oblique or cam slot 120 g will swing or oscillate the eccentric in one direction or the other, according to the direction in which the actuating-rod is moved. Figs. 3 and 4 show the actuating-rod at the in-

ward limit of its movement, the stud N^2 at the inner end of the slot q' , and the eccentric G at one limit of its throw. Similarly Figs. 5 and 6 show the actuating-rod N at the outer limit of its throw and the eccentric at the opposite limit of its throw from the position shown in Figs. 3 and 4.

It follows that the device described provides means by which the eccentric may be moved or shifted at any time to either limit of its throw, and thereby reverse the direction of the motion of the engine, or placed at the center of its throw and concentric with the shaft with the effect of stopping the motion of the valve, or placed at any intermediate position to vary the speed of the engine.

The actuating-rod N may itself constitute a handle that may be grasped by the operator and moved inwardly and outwardly to accomplish the shifting of the eccentric. A portable motor of the kind illustrated, however, which is grasped and held by both hands for properly operating the tool carried thereby, and I have provided means for operating the shifting eccentric without the removal of either hand of the operator from the handles of the machine. For this purpose I have shown in Figs. 1 to 8 devices as follows: The handle L , which is mounted on the head A' of the motor, is pivotally connected therewith by means of a pivot-stud L' , affording rotative movement of the handle and which passes through and engages a cylindric or tubular sleeve L^2 , forming part of the handle. In said sleeve L^2 is formed an oblique or inclined groove l , in which rests a ring O , having attached to it an arm O' , which is rigid to and engages the actuating-rod N . As herein shown, the outer end of said rod N is provided with a transverse slot n^1 , and the arm O' is provided at its end with a head o , which enters and engages the opposite walls of the slot. Obviously the arm O' is held from sidewise movement by engagement at its outer end with the actuating-rod N , so that when the handle L is rotated the ring O will be held from turning, so that by the shifting of the position of the inclined groove l the outer end of the arm O' will be moved toward or from the casing, and the actuating-rod N thereby operated.

In the use of the motor thus constructed the motor will be supported by the operator grasping with one hand either the tube J or handle K and with the other hand the handle L . By turning or rotating said handle L he may stop, start, or reverse the motion or change the speed of the engine as desired.

In Figs. 9 and 9^a I have shown a construction by which the actuating-rod N for the eccentric may be operated from one of the lateral handles J or K of the motor. As shown in said Figs. 9 and 9^a, a lever P is pivoted to the engine-casing by means of a lug p thereon or otherwise. One arm P' of said lever extends to and engages the actuating-rod N

in such manner as to give endwise movement to the rod when the lever is operated. The other arm P^2 of the lever P is at right angles to the arm P' and extends to the tube J' at a point near the motor-casing. On said tube J is mounted a rotative sleeve Q , which is provided at its opposite sides with cam-slots q, q' . The adjacent extremity of the lever-arm P^2 is forked, and the arms of the fork are provided with inwardly-extending studs p', p'' , adapted to engage the cam-slot q . The sleeve Q is made of such length that it may be grasped by the hand of the operator and is preferably provided with a rough surface, as shown. Obviously a partial rotation of the sleeve Q in either direction will, through the medium of the cam-slot q and lever P , give movement to the actuating-rod N either inwardly or outwardly with a result of shifting the eccentric in the manner before described.

In Figs. 10, 11, and 12 I have shown a device for shifting the eccentric which differs somewhat from that illustrated in the previous figures. In this instance a crank-shaft R is employed, which is provided with two fixed collars r, r' , by which is supported the end of the pivot-pins s of an eccentric S . S', S'' indicate two eccentric-straps which surround the said eccentric S . In one side of the crank-shaft R is located a longitudinal groove r'' , in which is placed an endwise-sliding rod R' , which extends within the shifting eccentric and is provided with a radial stud r^2 , adapted to engage a cam-groove s' , like the cam-groove g hereinbefore described. The outer end of the sliding rod R' is secured to a grooved collar R^2 , which is engaged by the forked end of a shifting lever R^3 . It will be obvious that by movement of the lever R^3 and of the collar R^2 the eccentric may be operated in the same manner and with the same results as hereinbefore stated.

I claim as my invention—

1. A compressed-fluid motor provided with a closed casing and comprising a cylinder, a piston, a slide-valve, a rotative shaft actuated by the piston, an eccentric mounted on the shaft operating said slide-valve, said eccentric being movably connected with the shaft in such manner that when at the central part of its movement it will be concentric with the shaft, and means for operating said eccentric contained within said shaft extending longitudinally through said shaft to within said casing.

2. A portable motor provided with a handle or handles, said motor comprising a cylinder, a piston, a slide-valve, a rotative shaft actuated by said piston and provided with a shifting eccentric for operating said slide-valve, and means for operating said shifting eccentric extending from the same to the handle on the motor, whereby the said eccentric may be operated by the same hand which grasps said handle.

3. A portable motor comprising a casing

having a movable handle, a cylinder, a piston, a slide-valve, a shifting eccentric for operating said valve, and means for operating said eccentric extending to and operated by said movable handle.

1. A portable motor comprising a closed casing, a cylinder, a piston, a slide-valve, a rotative shaft actuated by the piston and provided with an eccentric for actuating the valve, located in the casing a handle movably mounted on said casing, and means for operating said shifting eccentric, extending from said eccentric through the casing and connected with the said movable handle.

5. The combination with a rotative shaft, of an eccentric pivoted on the shaft by means of a pivot-pin arranged parallel with the shaft-axis, said eccentric being provided with an opening of segmental form concentric with the said pivot-pin through which the shaft passes, means for actuating said eccentric comprising a stud arranged radially with respect to said pivot-pin and secured at its inner end to a rod within said main shaft having longitudinal movement therein, and a cam-groove in the face of the segmental opening in the eccentric adapted for engagement with the outer end of said radial stud.

6. The combination with a rotative shaft, of an eccentric thereon, said eccentric being connected with the shaft by a pivot-pin arranged parallel with the shaft-axis, and being provided with an opening of segmental form for the passage of the shaft, of an endwise-sliding, actuating-rod mounted concentrically within said shaft, and provided with a stud projecting radially through an opening in said shaft, a cam-groove in the inner face of the eccentric opening adapted to be engaged by said stud, and a non-rotative part having endwise movement with respect to the shaft and connected with said actuating-rod, whereby longitudinal movement may be given to the latter.

7. The combination with a rotative, hollow, longitudinally-slotted shaft, of a piston, an eccentric pivoted to the shaft so as to be shifted thereon, and provided with an aperture through which the shaft passes, an endwise-movable actuating-rod contained within the shaft, said rod having a non-rotative head swiveled thereto, a stud in said head passing radially through the longitudinal slot in the shaft, the face of said eccentric opening being provided with a cam-groove to receive the said stud.

8. A portable motor comprising a closed casing, a handle pivotally mounted thereon, a cylinder, a piston, a rotative shaft actuated by said piston, a shifting eccentric on the shaft, an endwise-movable rod extending outside of the casing having operative connection with the eccentric, and a lever connecting said rod with the handle, said handle being provided with a groove arranged obliquely to its axis of rotation, and the lever having a rigidly-attached ring which engages said groove.

9. A portable motor comprising a closed casing, a cylinder, a piston, a slide-valve, a rotative shaft actuated by said piston, a shifting eccentric on the shaft provided with an oblique cam-groove, a stud movable endwise on the shaft, an actuating-rod adapted to slide in the shaft having operative connection with said stud, and extending outside of the casing, a handle mounted to rotate on the casing, and provided with an oblique groove, and a lever provided with a ring which engages the said groove, said lever having operative connection with said actuating-rod.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two witnesses, this 28th day of April, A. D. 1900.

AXEL LEVEDAHL.

Witnesses:

CHAS. E. ERIKSON,
JOHN J. BURKEL.