No. 639,738. Patented Dec. 26, 1899.

H. J. KIMMAN.

PORTABLE PNEUMATIC ROTARY DRILL.

(Application filed Nov. 14, 1898.)

(No Model.) 3 Sheets—Sheet 1.

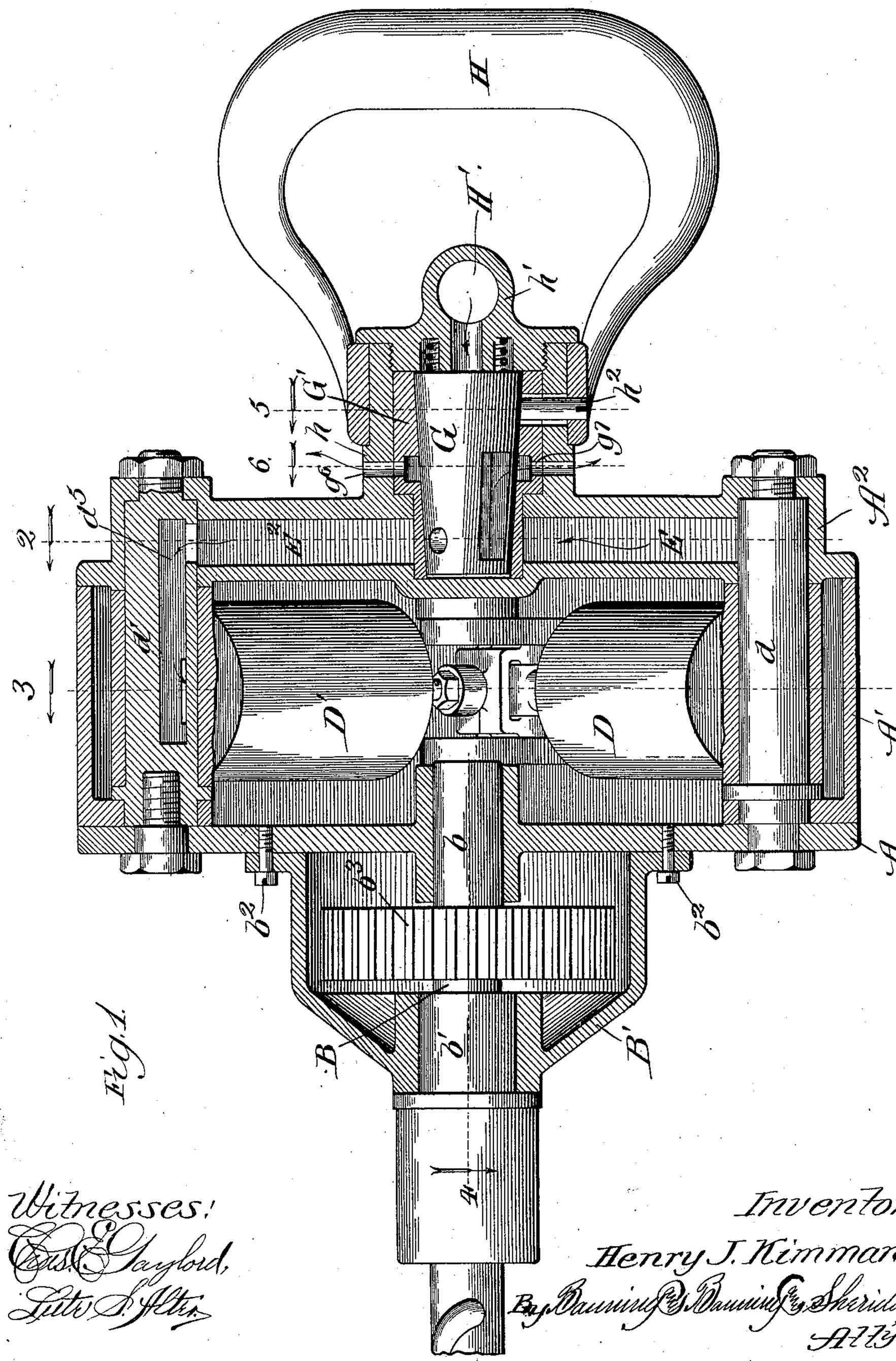

Fig. 1.

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Fig. 3.

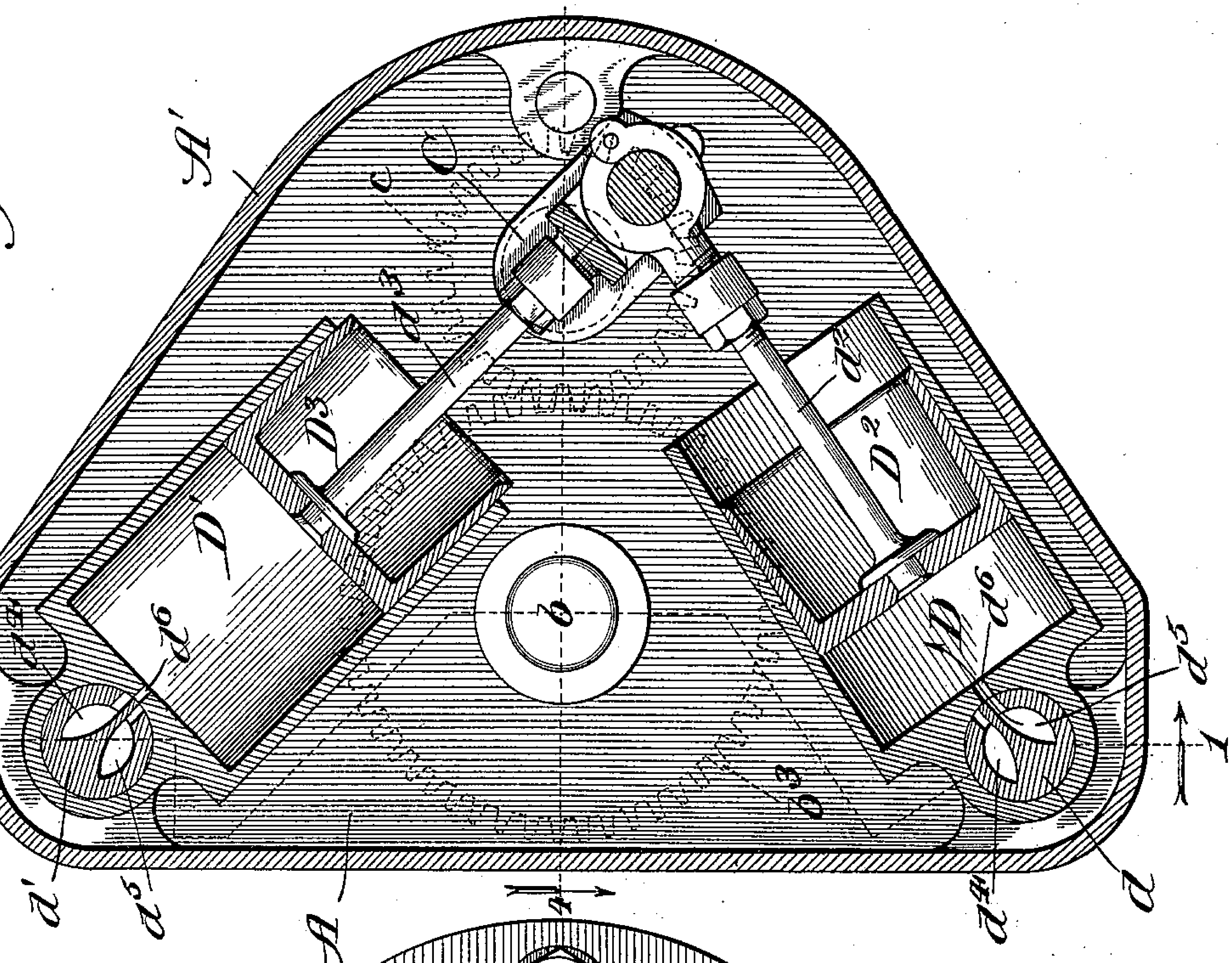

Fig. 2.

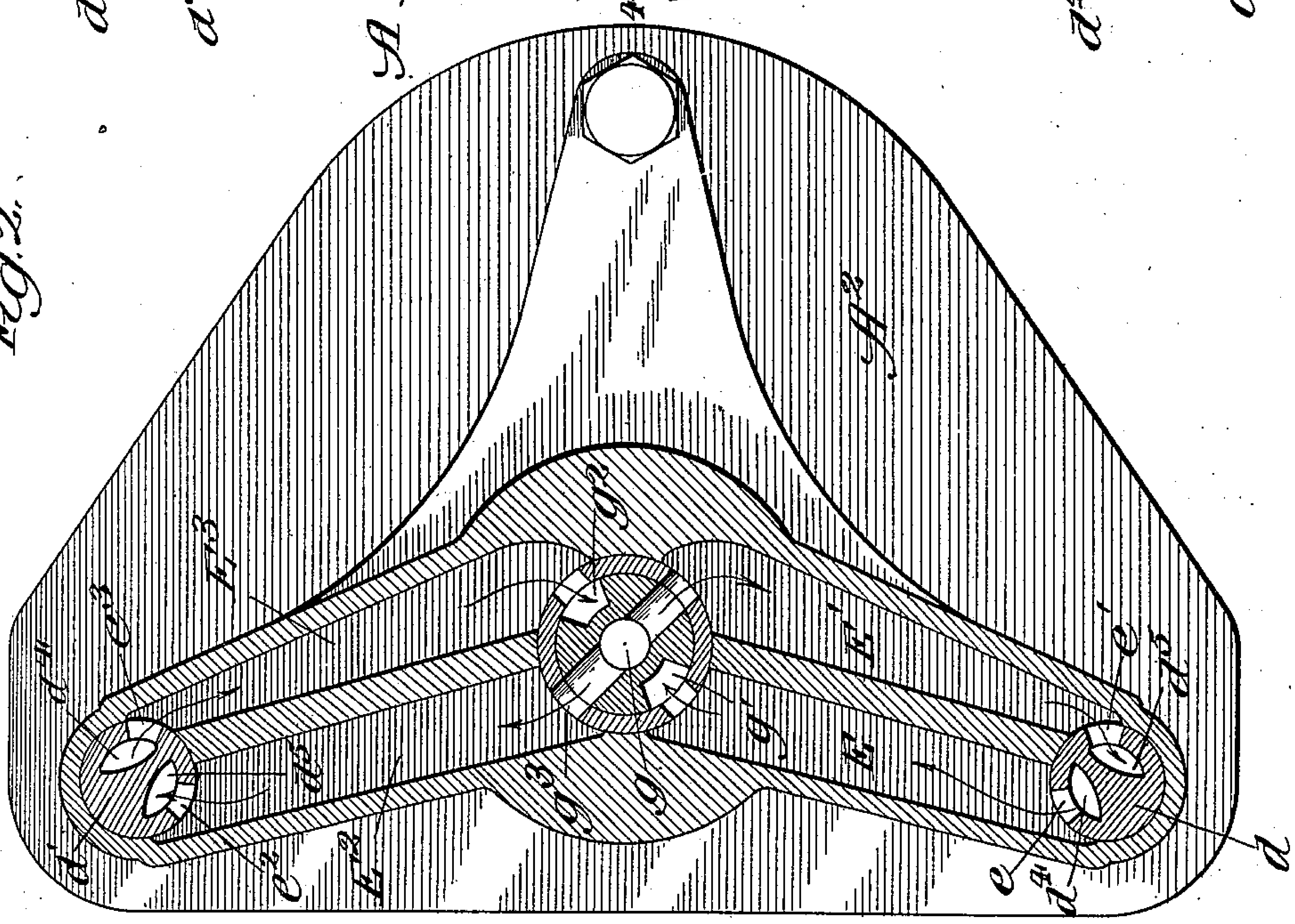

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Fig. 5.

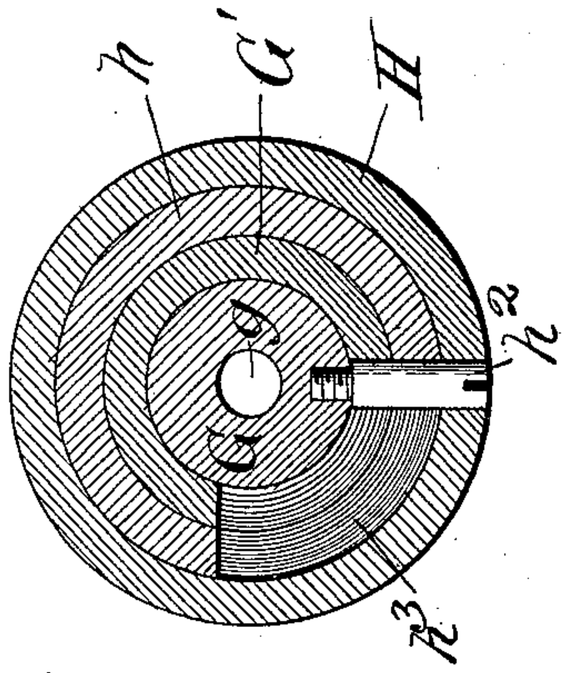


Fig. 6.

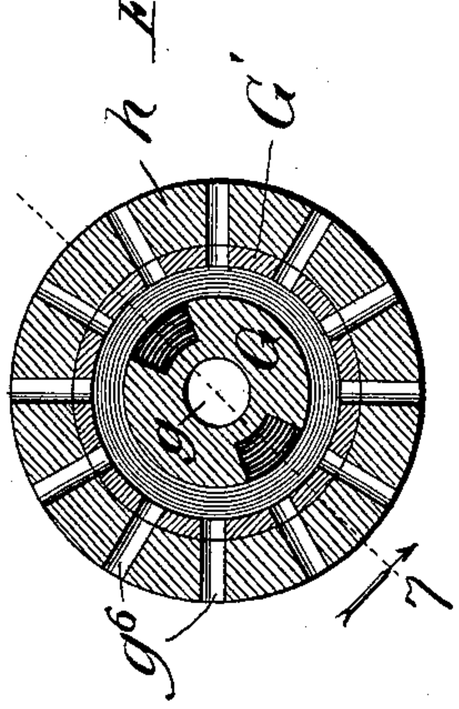


Fig. 7.

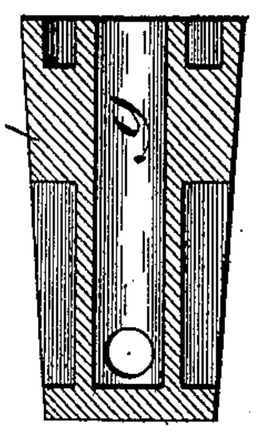
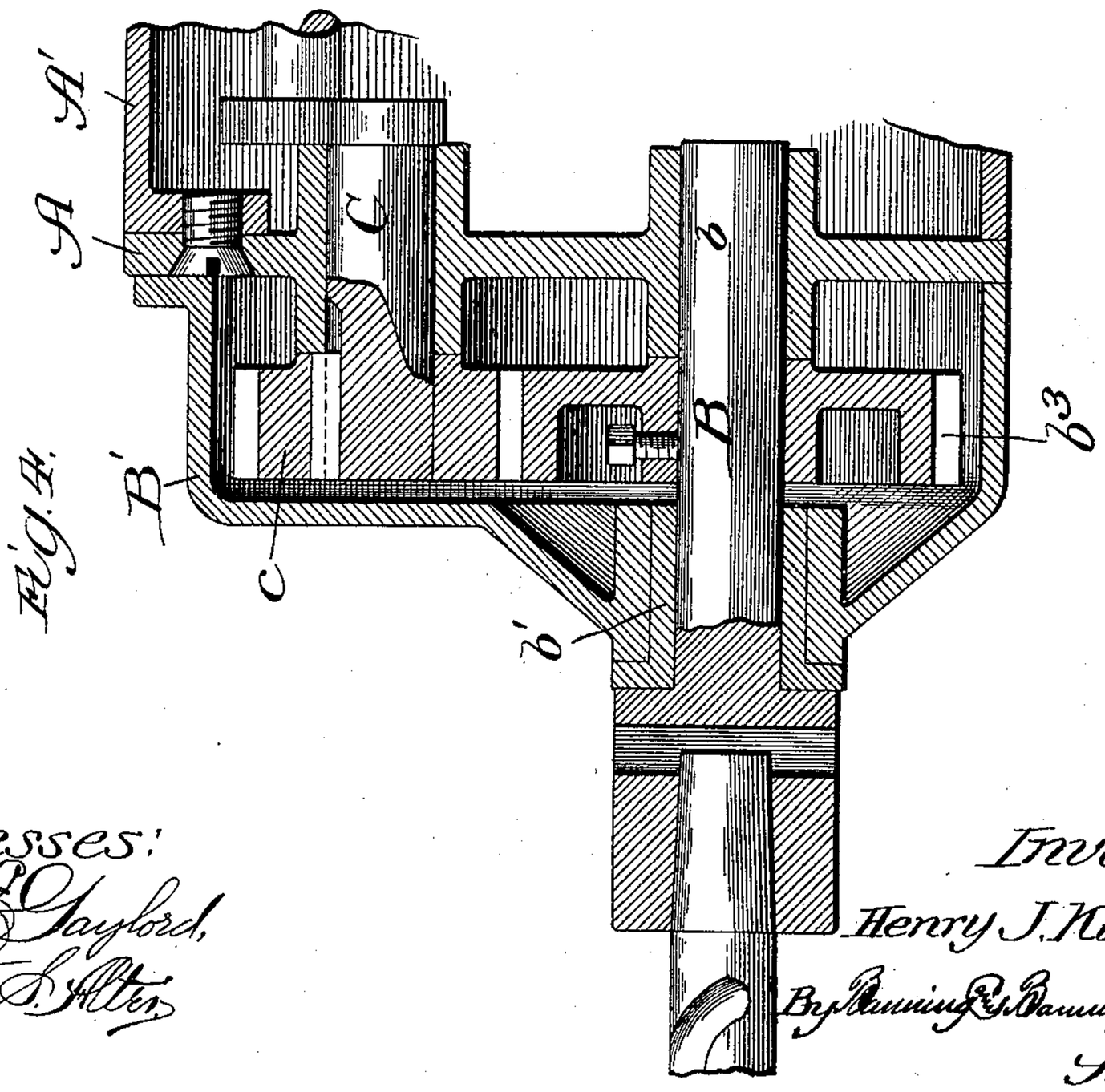


Fig. 4.



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UNITED STATES PATENT OFFICE.

HENRY J. KIMMAN, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO EDWARD N. HURLEY, OF SAME PLACE.

PORTABLE PNEUMATIC ROTARY DRILL.

SPECIFICATION forming part of Letters Patent No. 639,738, dated December 26, 1899.

Application filed November 14, 1898. Serial No. 696,418. (No model.)

To all whom it may concern:

Be it known that I, HENRY J. KIMMAN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Portable Pneumatic Rotary Drills, of which the following is a specification.

This invention relates to that class of drills which are portable in their arrangement and adapted to be operated by compressed air and for use in connection with car-building and large superstructures of all kinds.

The principal object of the invention is to provide a simple, economical, and efficient portable pneumatic drill.

A further object of the invention is to provide a portable pneumatic drill of such construction that its operating-shaft can be rotated either in a left or right hand manner.

The invention consists in the features, combinations, and details of construction hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a vertical longitudinal sectional elevation; Figs. 2 and 3, plan sectional views taken on the lines 2 and 3 of Fig. 1; Fig. 4, a longitudinal sectional view of a portion of the machine, taken on the line 4 of Fig. 3; Fig. 5, a transverse sectional view taken on the line 5 of Fig 1; Fig. 6, a transverse sectional view taken on the line 6 of Fig. 1, and Fig. 7 a longitudinal sectional view of a portion of the main controlling-valve.

In constructing a portable pneumatic drill in accordance with my improvements a main casing is provided and preferably made in three parts—a base-plate A, an intermediate casing A′, and a cap A^2. These parts in plan contour resemble an isosceles triangle and are made of the desired size and strength to hold and maintain the operative parts in their desired relations.

An operating-shaft B is provided and has one bearing b in the base-plate of the casing and its other bearing b' in a lower cap B′, which is secured to the base-plate by means of the screws b^2. To rotate this operating-shaft, a crank-shaft C is provided, which has its bearings arranged in the upper and lower parts of the main casing and is provided with a spur-pinion c, which is attached to the lower end thereof and which meshes or engages with a spur-gear b^3 on the operating-shaft, so that as the crank-shaft rotates the operating-shaft is also operated.

To rotate the crank-shaft in either direction, or, in other words, to provide a reversible pneumatic drill, two oscillating cylinders D and D′ are provided and pivotally mounted upon valve-pivots d and d'. Each of the oscillating cylinders is provided with reciprocating pistons D^2 and D^3 and have their piston-rods d^2 and d^3 projecting out therefrom and engaging with the crank on the crank-shaft. It will be observed from the above description and from the arrangement of mechanisms as shown in Fig. 3 that the impulse on the crank-shaft is intermittent—that is, the pistons act on the said shaft alternately.

In order to supply fluid under pressure to the oscillating cylinders at the desired time or times, the valve-plugs upon which they are mounted are made hollow, or, in other words, provided with a pair of passages d^4 and d^5. These passages are provided with two transverse outlets arranged to be brought into alinement with the passages d^6 in the oscillating cylinders, so that pressure may be admitted to or exhausted from such cylinders at the proper time or times. In order to admit fluid under pressure to the valve plugs or pins, the upper cap of the main casing is provided with two sets of passages E E′ and E^2 E^3, arranged in pairs and which connect with the longitudinal passages in the valve-plug by means of the transverse openings e, e', e^2, and e^3.

In order to control the admission and exhaust of the fluid under pressure so as to rotate the crank-shaft in either direction, a main controlling-valve is provided, which has a tapered plug G, having its seat in a bushing in the cap of the main casing and which is provided with a longitudinal and transverse inlet-passage g and exhaust-passages g' and g^2. The bushing G′ in which this tapered plug is seated is provided with four transverse openings g^3, adapted to register with the transverse openings or passages in the said plug.

To rotate the tapered plug of the main valve

so as to supply fluid under pressure to the oscillating cylinders and rotate the crank-shaft in either direction and to cut off the same, a handle H is provided and oscillatingly mounted on a hub h of the main-casing cap and on the outside thereof. A flanged plug or nut h' assists to maintain this handle in its desired position and is also provided with a main inlet h', through which the fluid under pressure is admitted to the longitudinal inlet-opening of the main-valve plug. A pin h^2 is inserted in the handle portion and passed through a segmental slot H^3 in the hub of the cap and valve-seat and engages with the tapered plug of the main valve, so as to partially rotate the same by means of the handle whenever desired, all of which will more fully hereinafter appear.

In operation assuming the controlling-valve to be in the position shown in Fig. 2 fluid under pressure passes through the main cap down through the inlet-opening g of the tapered plug of the main valve into the passages E′ and E^2 of the casing-cap. The pressure continuing, flows through the passage d^5 of the valve-pivot d and out through the passage d^6 into the pressure-cylinder D to force its piston forwardly and assist in rotating the crank-shaft. At the same time the oscillating cylinder D′ is in such position that the further admission of fluid under pressure has stopped. The further rotation of the crank-shaft carries the parts to such position that the fluid under pressure passes out through its passage d^6, through the exhaust-passage d^4 of the valve-pivot d', thence through the passage E^3 in the casing-cap or passage g^2 in the tapered plug of the main valve, and out through the opening g^6 in the valve-casing. The crank-shaft continuing its rotations, the oscillating cylinder D′ is oscillated so as to shut off the exhaust and bring its passage d^6 into alinement with the transverse passage of the inlet-passage d^5 in the valve-pivot d', so as to admit a supply of fluid under pressure from the supply-channel E^2. At the same time the oscillating cylinder D has been carried into such position that its passage d^6 is brought into alinement with the exhaust-passages d^4 e E g' g^7 to be exhausted into the open air. If it is desired to reverse the rotations of the crank-shaft and the operating-shaft, the handle H of the drill is rotated so that its pin h^2 is brought to the opposite position to that shown in Fig. 5. This brings the passages in the tapered plug of the main valve one-fourth of the way around, so that what were the exhaust passages in the cap and valve-plugs described during the previous operation now become the inlet-ports and what were described as the inlet-passages in the foregoing operation now become the exhaust-passages, thus permitting the parts to be rotated in a reverse direction.

The principal advantages due to a machine constructed in accordance with my improvements are, first, that one tool may be used for drilling or tapping holes in either direction—in other words, the operating-shaft can be rotated in a right and left hand manner—and, second, I have provided a tool which is simple to understand, economical to construct, and efficient in operation.

I claim—

1. In a portable pneumatic drill, the combination of a main casing, provided with two passages for each valve-pivot, an operating-shaft rotatably mounted therein, a crank-shaft engaging therewith so as to rotate the same, at least two oscillating cylinders provided with reciprocating pistons engaging with the crank-shaft, a valve-pivot in the casing for each cylinder upon which it is oscillated and provided with at least two passages adapted to be connected with two passages in the casing and become either inlet or exhaust passages, and a main valve arranged to be operated so as to admit or exhaust fluid-pressure from either of the passages in the valve-pivots and to the oscillating cylinders so as to rotate the operating-shaft in either direction, substantially as described.

2. In a portable pneumatic drill, the combination of a main casing, provided with two passages for each valve-pivot, an operating-shaft rotatably mounted therein a crank-shaft engaging with the operating-shaft so as to rotate the same, at least two oscillating cylinders pivotally mounted in the frame and provided with reciprocating pistons engaging with the crank-shaft, a valved pivot for each cylinder upon which it is pivoted and oscillated and provided with at least two passages adapted to be connected with two passages in the casing and become either inlet or exhaust passages, a tapered plug forming a part of the main valve provided with inlet and exhaust passages and means for operating the tapered valve-plug so as to bring its inlet and exhaust passages into connection with either of the passages in the casing and thereby with either of the passages in the valve-pivots, and admit or exhaust fluid-pressure to and from the oscillating cylinders so as to rotate the operating-shaft in either direction, substantially as described.

3. In a portable, pneumatic drill, the combination of a main casing provided with a base-plate and a cap, an operating-shaft rotatably mounted in the base-plate, a crank-shaft rotatably mounted in the base-plate and cap and engaging with the operating-shaft so as to rotate the same, at least two oscillating cylinders provided with reciprocating pistons engaging with the crank-shaft, a valved pivot for each cylinder upon which it is oscillated and provided with at least two passages adapted to be connected with two passages in the cap of the main casing, and become either inlet or exhaust passages, two passages in the cap of the main casing for each valve-pivot, a tapered valve-plug provided with two sets of passages—inlet and exhaust passages, and a handle portion engaging with the tapered

valve-plug and adapted to rotate the same so as to bring the plug with its inlet and outlet passages into engagement with either of the passages in the valve-plugs so as to admit or exhaust fluid under pressure to and from the oscillating cylinders and rotate the operating-shaft in either direction, substantially as described.

4. In a portable pneumatic drill, the combination of a main casing adapted to receive two oscillating cylinders located on opposite sides of a crank-shaft mounted in the casing, an end cap having channels extending from the center outward and each divided to form two passages in each channel, a plug-valve located at the juncture of the passages and having communication with both passages of each channel and with a fluid-pressure supply and with the atmosphere, and a pivot-valve for each cylinder on which the cylinder is mounted for oscillation, each pivot-valve communicating with both passages of the channel leading thereto and with its cylinder, whereby the plug-valve can be operated to both admit fluid-pressure to and exhaust it from the cylinders, substantially as described.

5. In a portable pneumatic drill, the combination of a main casing adapted to receive two oscillating cylinders located on opposite sides of a crank-shaft mounted in the casing, an end cap having channels extending from the center outward and each divided to form two passages in each channel, a plug-valve located at the juncture of the passages, a central longitudinal passage in the plug-valve closed at the inner end, ports through the wall of the valve communicating with the passages of the channel, recesses in the exterior face of the valve communicating with the passages of the channels, and an opening in the valve-casing communicating with the external air and with the recesses, substantially as described.

6. In a portable pneumatic drill, the combination of a main casing adapted to receive two oscillating cylinders located on opposite sides of a crank-shaft mounted in the casing, an end cap having channels extending from the center outward and each divided to form two passages in each channel, a plug-valve having a central longitudinal passage closed at the inner end, ports through the wall of the valve communicating with the passages of the channels, recesses in the exterior face of the valve communicating with the passages of the channels, an opening in the valve-casing communicating with the external air, a pivot-valve for each cylinder, each pivot-valve having a longitudinal recess in its face communicating with the passages of the channel, and a recess in its face communicating with a port leading to the cylinder, substantially as described.

7. In a portable pneumatic drill, the combination of a main casing, two oscillating cylinders located in the main casing on opposite sides of a crank-shaft, a crank-shaft mounted in the casing, a power-shaft driven from the crank-shaft, an end cap for the main casing having two channels each running from the center outward, a partition in each channel dividing the channel into two passages, a plug-valve located at the juncture of the two passages, passages and ports in the plug-valve communicating with the fluid-pressure supply and with the passages of the channels, a valve-casing for the plug-valve, a recess in the plug-valve communicating with the passages of the channel, an annular recess in the valve-casing communicating with the external air and with the recess in the plug-valve, a pivot-valve for each cylinder communicating with both passages of the channel and with the pressure-cylinder, and means for reversing the plug-valve to reverse the rotation of the crank-shaft, substantially as described.

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