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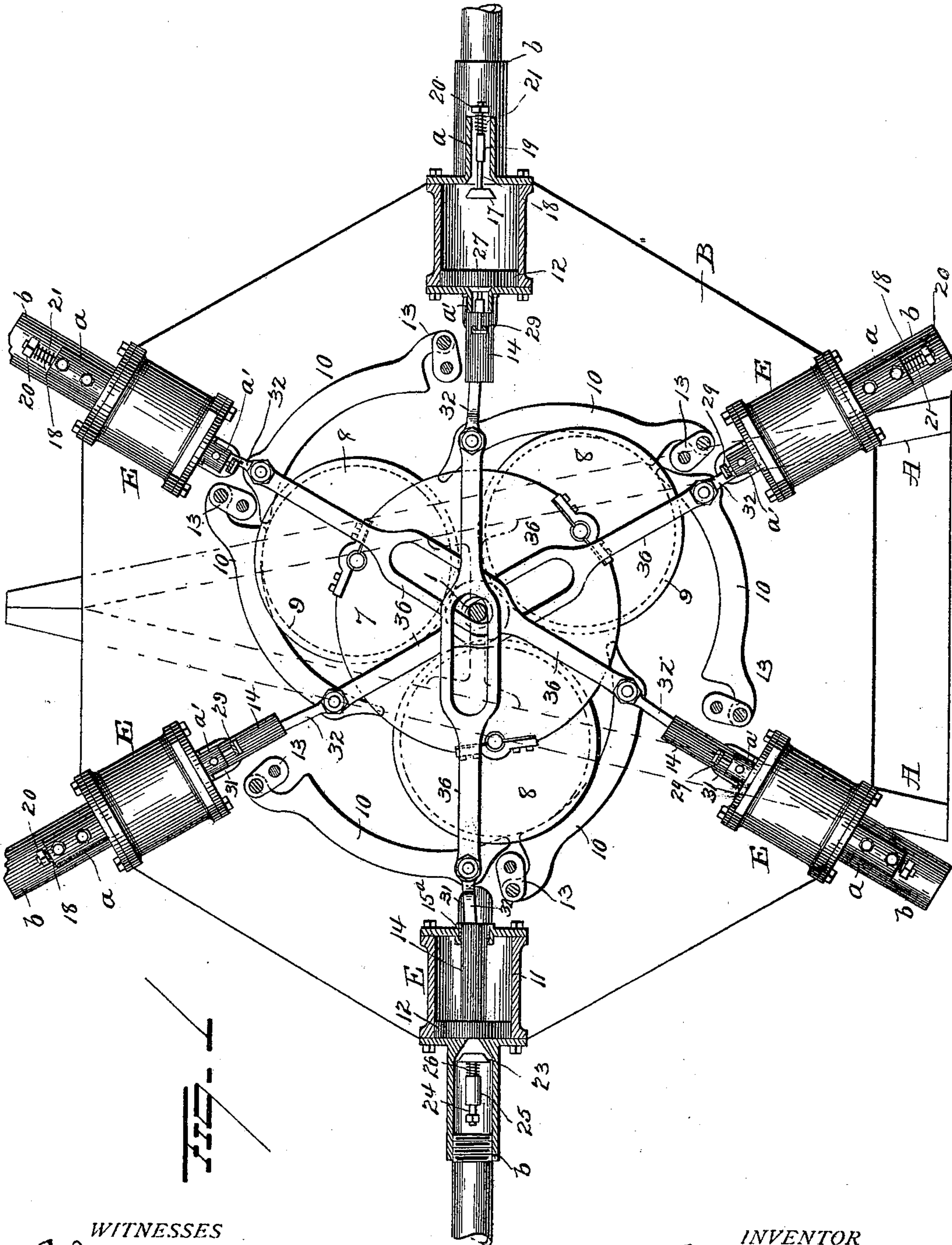
Patented Mar. 27, 1900.

J. D. McKINNON.
AIR COMPRESSOR.

(Application filed Mar. 17, 1899.)

(No Model.)

3 Sheets—Sheet 1.



WITNESSES

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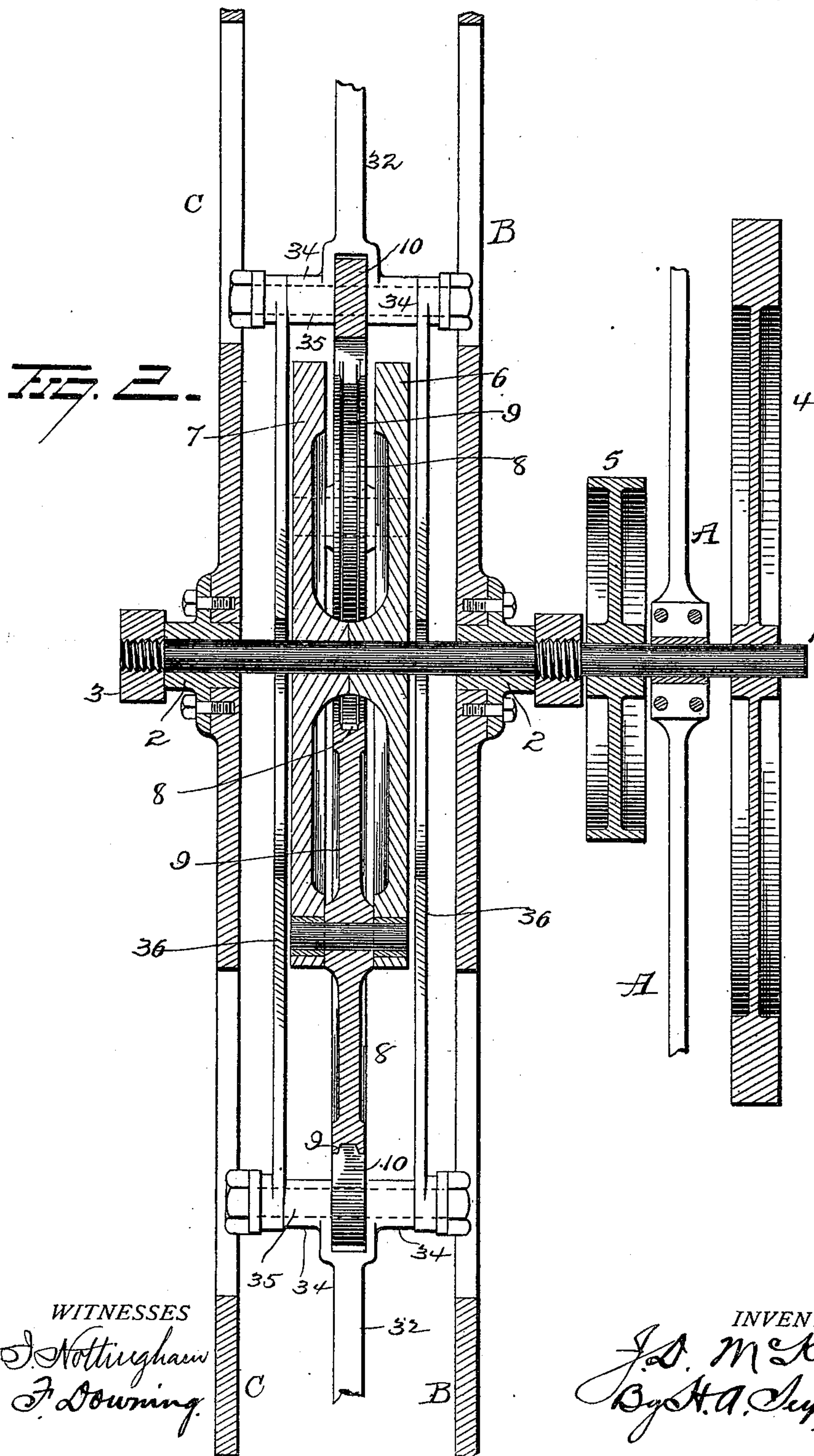
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FIG. 3.

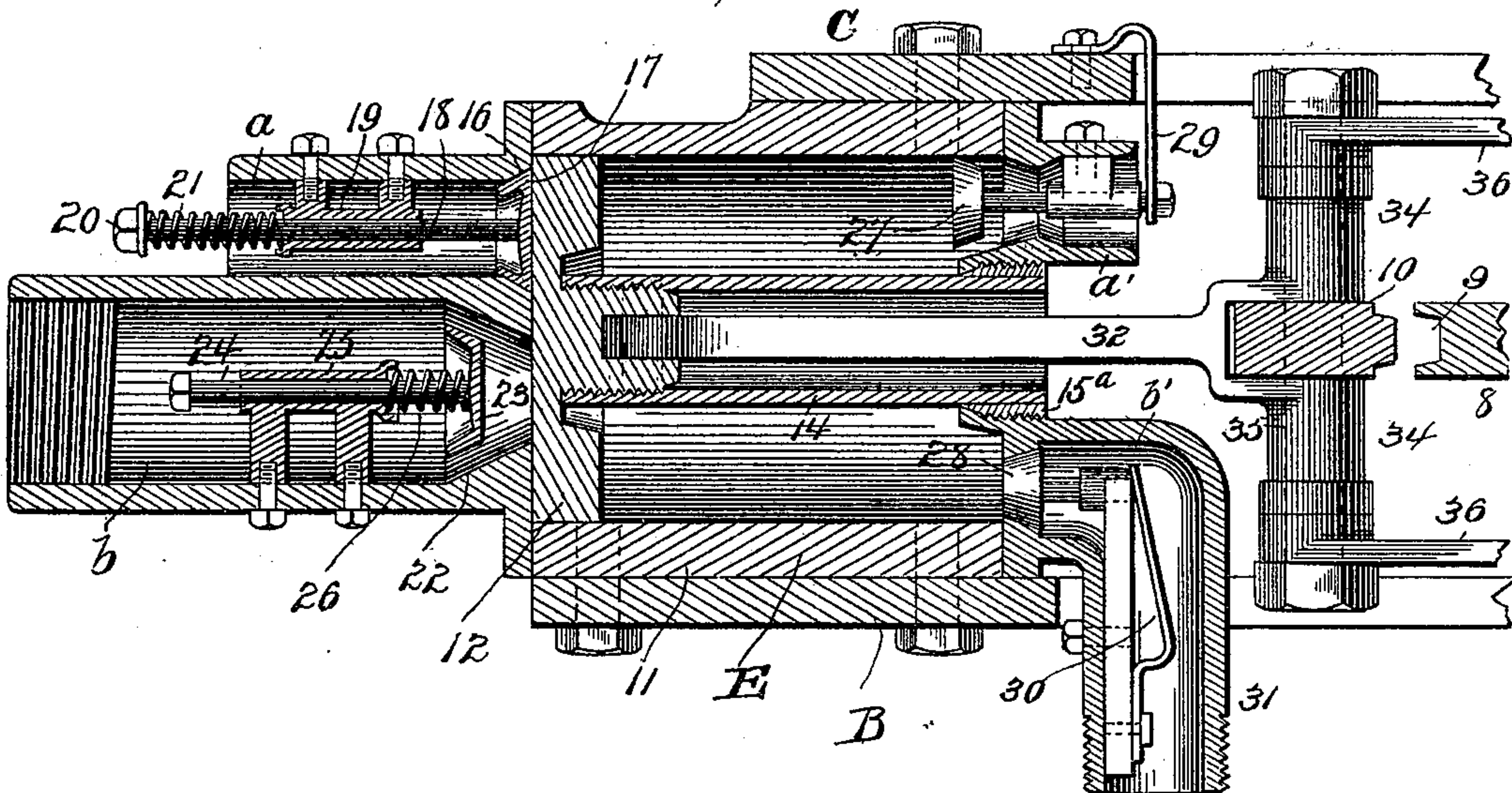


FIG. 4.

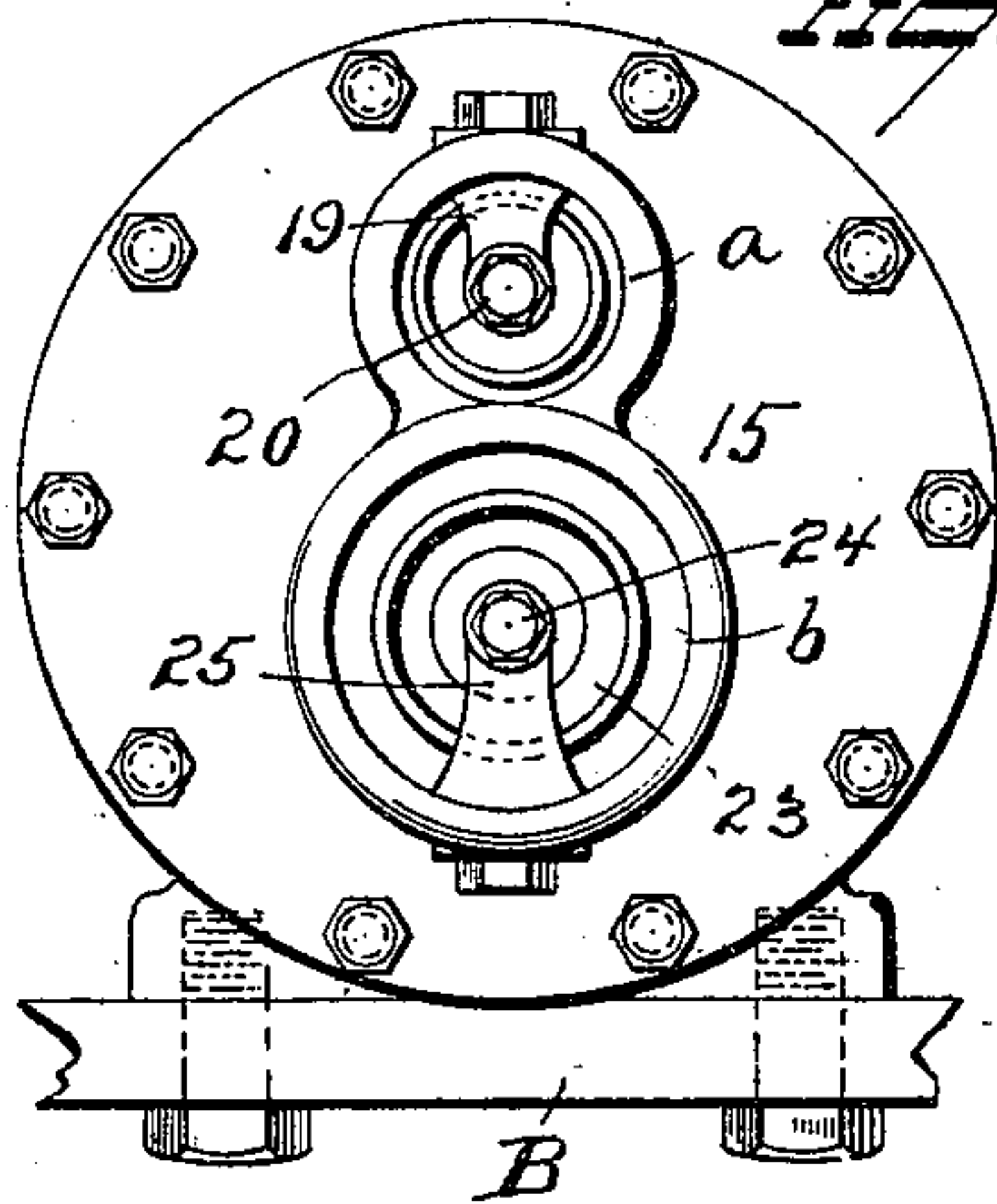


FIG. 5.

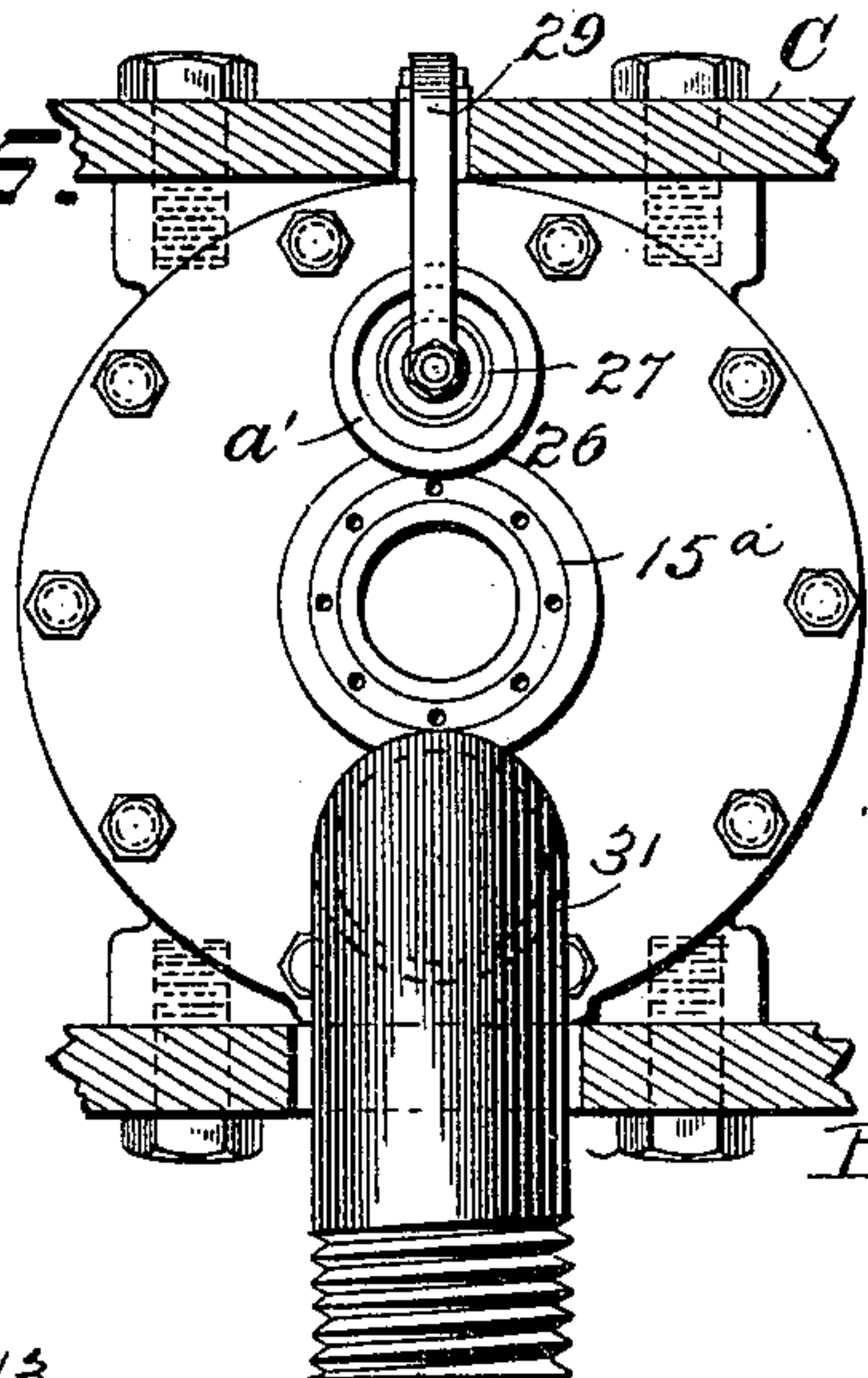
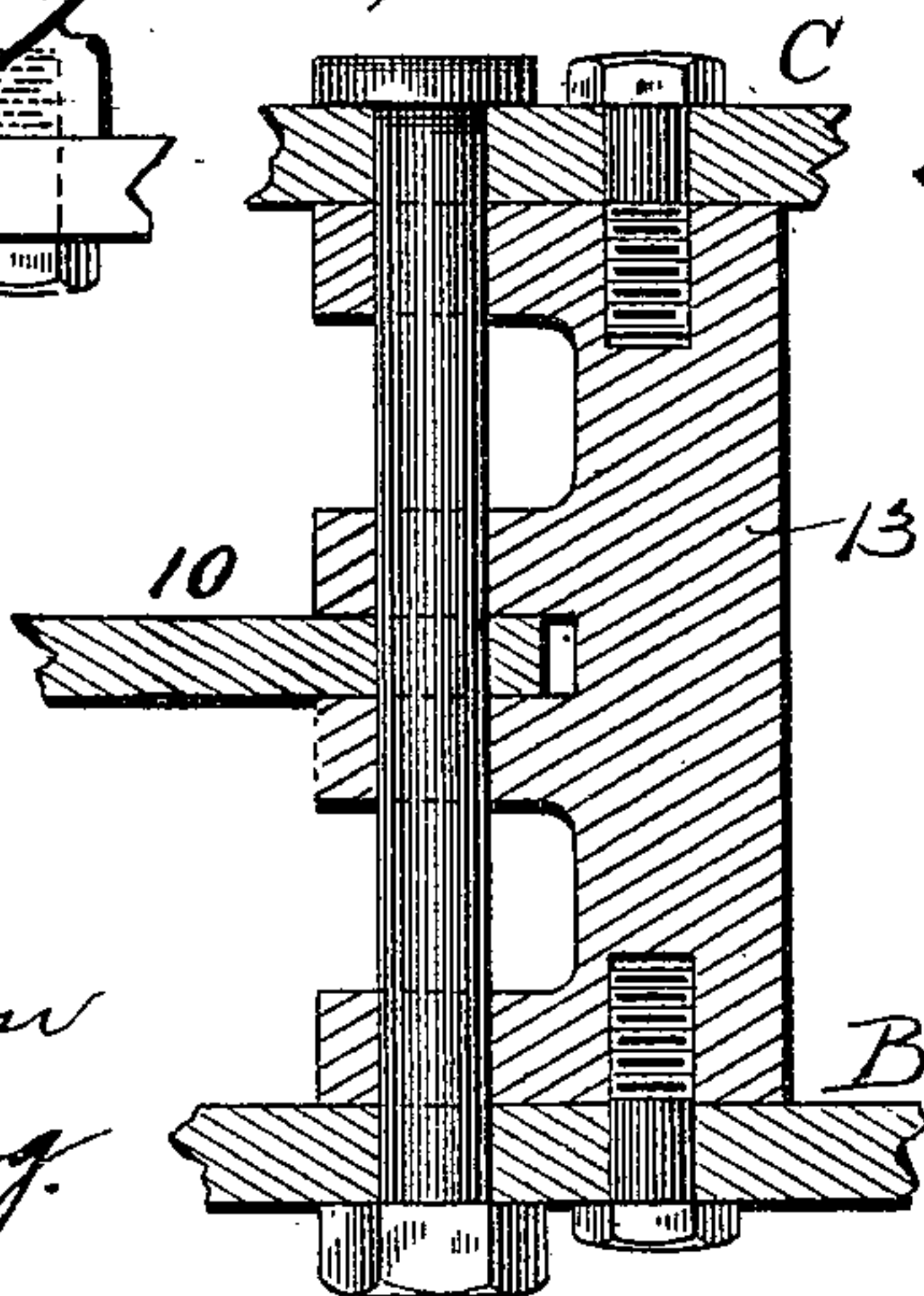


FIG. 6.



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UNITED STATES PATENT OFFICE.

JAMES D. McKINNON, OF PORTLAND, OREGON.

AIR-COMPRESSOR.

SPECIFICATION forming part of Letters Patent No. 646,031, dated March 27, 1900.

Application filed March 17, 1899. Serial No. 709,491. (No model.)

To all whom it may concern:

Be it known that I, JAMES D. McKINNON, of Portland, in the county of Multnomah and State of Oregon, have invented certain new and useful Improvements in Air-Compressors; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to an improvement in air-compressors, the object of the invention being to provide simple and efficient means for forcing air into a suitable tank and compressing it therein, which means shall be so constructed and arranged as to operate positively to move the piston in both directions and result in rapidly accumulating and compressing air with the expenditure of a minimum amount of power.

With this object in view the invention consists in certain novel features of construction and combinations and arrangements of parts, as hereinafter set forth, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a face view with parts of the framing removed. Fig. 2 is a transverse sectional view. Fig. 3 is an enlarged sectional view through one of the cylinders, showing also parts connected with the piston in the cylinder. Figs. 4 and 5 are views showing the respective ends of one of the cylinders. Fig. 6 is an enlarged detail view showing the connection of one of the arms 10 with the frame.

A represents an upright framework of any desired form of construction for supporting, preferably in an upright position, the operating parts of the apparatus and their supporting frame or casing. The latter comprises two plates B C, one somewhat larger than the other and securely bolted to framework A. Between these plates all the working parts of the apparatus are disposed in a manner which will now be specifically explained. A main driving-shaft 1 is mounted centrally in the plates B C and projects laterally therefrom at both ends, suitable journal-bearings 2 being secured to the plates for the accommodation of said shaft. A suitable nut 3 is screwed on one end of the shaft 1, and to the other end of said shaft a fly-wheel

4 is secured, while at a point intermediate of the ends of the shaft a driving-pulley 5 is fixed.

To the shaft 1, within the frame or casing formed by the plates B C, two wheels 6 7 are secured, and between said wheels a series of wheels 8 (three being shown in the drawings) are mounted, the journals of said wheels 8 being mounted in the wheels 6 7, at the peripheries of the latter. Each wheel 8 is made with a peripheral groove 9 to insure proper coöperation with a series of arms 10, by means of which a series of compressors E are operated, each compressor consisting of a cylinder 11 and a plunger 12. One end of each arm 10 is pivotally connected to a block 13, secured between the plates B C, and said blocks also constitute stops for the free ends of the arms 10.

The cylinders 11 are secured between the plates, at the peripheries thereof, and the plunger 12 of each cylinder is provided with a tubular extension 14, adapted to have free movement through a packing-ring 15^a, secured in the inner head of the cylinder, and thus serve to guide the plunger and prevent all possibility of lateral strain thereon within the cylinder. Any desired number of compressors may be employed, but for convenience of illustration I have shown six such cylinders and coöperating devices. The outer head of each cylinder is provided with a valve-casing 15, divided into two compartments *a b*, each of which communicates with the interior of the cylinder. A seat 16 is provided at the inner end of the chamber *a*, and on this seat an inwardly-opening inlet-valve 17 bears. The stem 18 of valve 17 passes loosely through a guide-sleeve 19, and on its outer end said stem is provided with a nut 20. A spring 21 encircles the stem 18 and bears at its respective ends against the guide-sleeve 19 and nut 20 to normally press the valve 17 on its seat. The compartment *b* of the valve-casing 15 also communicates with the cylinder and is provided at its inner end with a seat 22, on which an outwardly-opening outlet-valve 23 bears. The stem 24 of valve 23 passes loosely through a guide-sleeve 25 and is retained normally on its seat by means of a spring 26, encircling said stem and bearing respectively against the guiding-

sleeve and valve. The compartment *b* of the valve-casing 15 communicates, by means of a suitable pipe, with a storage-cylinder for compressed air. The inner head of each cylinder 5 is also provided with a valve-casing 26, having two compartments *a'* *b'*, each communicating with the cylinder.

An inwardly-opening valve 27 is disposed within the compartment *a'* of casing 26, and 10 an outwardly-opening valve 28 is mounted in the compartment *b'* of said casing. The stems of these valves are guided in a manner similar to that above described in connection with the valves 17 and 23, and the valves 27 and 15 28 are normally pressed against their seats by flat springs 29 30, bearing respectively on the stems of said valves. The compartment *b'* is made with a coupling 31, with which a 20 suitable pipe is connected for conveying air to the storage-tank. Thus it will be seen that each cylinder is provided at each end with two valves—one for contracting the admission of outside air into the cylinder and the other for controlling the exit of air from 25 the cylinder to the storage-tank. Each compressor is therefore double-acting, forcing air to the storage-tank and drawing fresh air into the cylinder at each stroke of the plunger. To successfully accomplish this each 30 plunger must be moved positively in both directions. I therefore employ the devices now to be explained.

Each plunger is connected by a plunger-rod 32 with one of the arms 10, at a point 35 near the free end of the latter. For the purpose of the connection of the plunger-rod with arm 10 the inner end of said rod is bifurcated for the reception of the arm and each fork of the bifurcated portion of the rod is 40 provided with a laterally-projecting sleeve 34. A short shaft 35 passes through these sleeves and loosely through the arm 10, disposed between them. The ends of the shafts 35 of two oppositely-disposed compressors are connected 45 together by means of two parallel pitmen 36, disposed at respective sides of operating mechanism, and each pitman is enlarged centrally between its ends and provided with an elongated slot for the accommodation of the main driving-shaft 1. Thus 50 it will be seen that the arms 10 and the plungers of the compressors are connected together in pairs by the pitmen 36, so that as the main driving-wheel revolves and one of 55 the wheels 8 engages and moves one of the arms 10 the plunger immediately connected with said arm will be forced outwardly and result in forcing air through the valve 23 to the tank, and that the plunger of the oppositely-disposed compressor will be positively 60 moved toward the inner end of its cylinder through the medium of the pitmen 36, and thus force air through the valve 28 to the tank. At the same time fresh air will be

drawn into the two cylinders, into the first 65 through the valve 17 and into the other through the valve 27. The pitmen 36 serve to return the plungers after they have been moved outwardly and also renders it possible to positively force air to the storage-tank 70 during such return movement of the plungers.

My improvements are simple in construction and effectual in all respects in the performance of their functions. 75

Various slight changes might be made in the details of construction of my invention without departing from the spirit thereof or limiting its scope, and hence I do not wish to limit myself to the precise details herein set 80 forth.

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

1. In an air-compressor, the combination 85 with a frame, an annular series of cylinders mounted therein, inlet and outlet valves for each cylinder and a plunger in each cylinder, of a shaft mounted centrally in said frame, pitmen connecting the plungers in pairs, each 90 pitman having a slot centrally between its ends for the accommodation of said shaft, an annular series of wheels carried by said shaft, a series of arms, one for each plunger, each arm pivotally connected at one end with the 95 frame and pivotally connected near the other end to one of said pitmen in position to be actuated by said wheels to reciprocate the pitmen and operate the plungers connected therewith. 100

2. The combination of two parallel plates, a circular series of cylinders secured between said plates, inlet and outlet valves at both ends of each cylinder, plungers in said cylinders, pitmen connecting the plungers in pairs, 105 a shaft mounted centrally in said plates, two wheels disposed between said plates and secured to the driving-shaft, a series of wheels having their bearings in the peripheries of said first-mentioned wheels, and pivoted 110 arms connected with the plungers in the cylinders and operated by said series of wheels.

3. The combination with two parallel plates, of cylinders secured between said plates, plungers in said cylinders, blocks secured between said plates, arms pivoted at 115 one end to said blocks and near the other end to the plungers in the cylinders, said blocks constituting stops for said arms and means for moving said arms to reciprocate the plungers. 120

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

JAMES D. MCKINNON.

Witnesses:

ALEX. BERNSTEIN,
F. CLARNO.