

(No Model.)

H. RICHMANN.  
ROTARY AIR COMPRESSOR AND PUMP.

No. 462,453.

Patented Nov. 3, 1891.

Fig. 2.

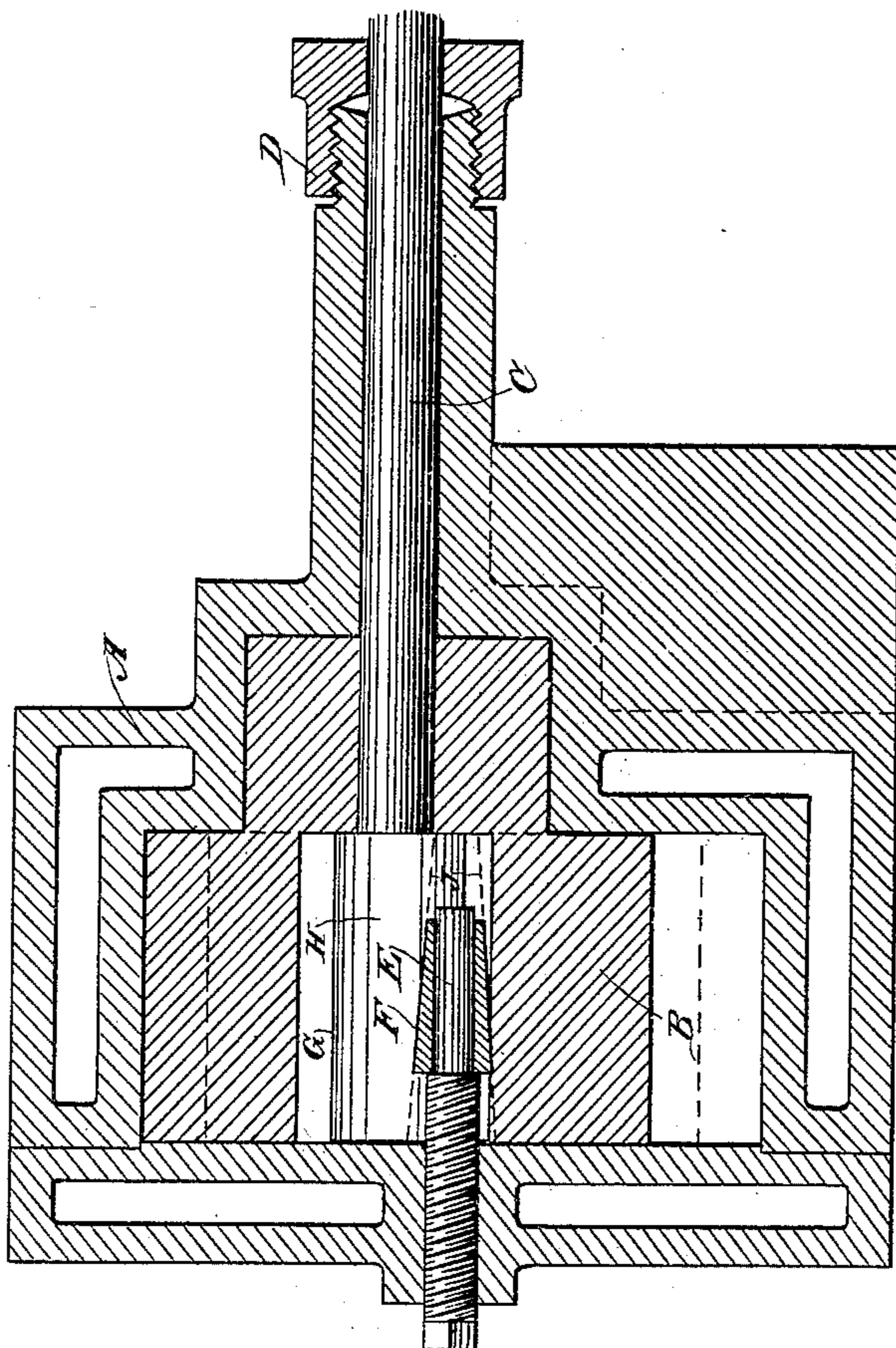
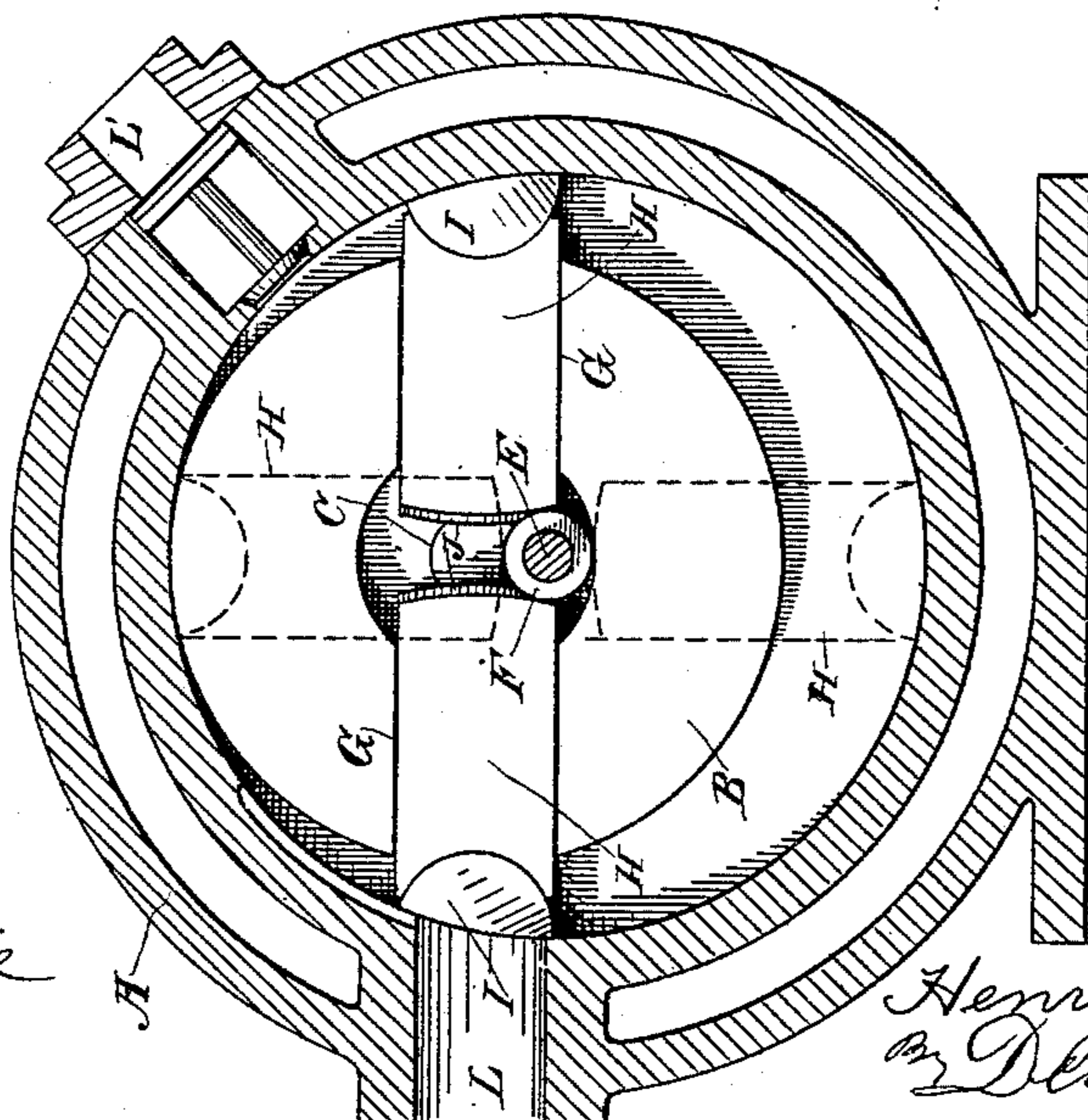


Fig. 1.



Witnesses,  
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# UNITED STATES PATENT OFFICE.

HENRY RICHMANN, OF SANTA CRUZ, CALIFORNIA.

## ROTARY AIR COMPRESSOR AND PUMP.

SPECIFICATION forming part of Letters Patent No. 462,453, dated November 3, 1891.

Application filed October 24, 1890. Serial No. 369,229. (No model.)

*To all whom it may concern:*

Be it known that I, HENRY RICHMANN, a citizen of the United States, residing at Santa Cruz, Santa Clara county, State of California, have invented an Improvement in Rotary Air Compressors and Pumps; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to certain improvements in rotary engines which may be used for compressing, air-pumping, or for similar purposes.

It consists in certain details of construction, which will be more fully explained in the following specification.

Referring to the accompanying drawings for a more complete explanation of my invention, Figure 1 is a vertical section taken in a plane transverse to the axis. Fig. 2 is a vertical section taken in a plane longitudinal through the axis.

My invention relates to that class of devices in which a circular disk or hub is fitted to revolve within an exterior case eccentric thereto, the hub having a sliding piston or pistons, which may be alternately forced out at one side and the other, so that either one end or the other of said piston or pistons projects beyond the periphery of the hub and fills the space between it and the inside of the outer case, where the eccentricity of the two form such a space.

The object of my invention is to provide certain improvements in the sliding pistons, a means by which they are alternately forced out and retracted, an automatically-moving self-adjusting packing fitted to the ends of the pistons, and a means for adjusting these pistons to or from the center of the hub, and in certain details of construction.

A is the outer case, which is made in the form of a short cylinder, having ends or heads by which it is closed. Within this cylinder is a hub B, which is of considerably smaller diameter than the interior of the cylinder, and it is mounted upon a shaft which passes through one end of the case and is journaled correspondingly to one side of the center of the cylinder itself, so that while one side of the hub rotates in contact with the inner pe-

riphery of the cylinder at one side it leaves a crescent-shaped space of considerable size upon the opposite side between it and the interior of the case, as shown. This hub is mounted upon a shaft C, which extends out through the side of the casing, having a journal or bearing of sufficient length to support it and the hub steadily, and a stuffing-box D serves to make a tight joint when it passes out of the case. From the opposite end of the case a short shaft or spindle E projects centrally into the casing and has a sleeve or roller F, journaled to turn loosely upon its inner end, as shown. This shaft is not in line with the main shaft of the hub, but is in the center of the exterior case. The hub has radial slots or channels G made from its center to the periphery, these channels being of sufficient width to allow the hub revolving on its axis eccentric to the axis of the case to turn around the sleeve, which latter is moved around in a circle within the channel by reason of this eccentricity of motion.

H H are the pistons, which are of the same width and depth as the channels G and fit therein, the sides of the channels acting as guides to cause the pistons to slide evenly within them. The outer ends of the pistons have a semicircular concavity made in them, and within these are fitted the semicircular packing-disks I, the semicircular inner sides of these packing-disks fitting exactly into the semicircular depressions in the ends of the pistons. The outer faces of these packing-pieces are curved with a radius of curvature equal to that of the interior periphery of the case, so that when these packing-pieces are set in place the outer faces will just fit against the interior of the case.

The inner ends of the pistons H are made convex, having a curvature formed with a radius from the centers of the packing-pieces, and these convex faces J, abut against the roller F on the end of the fixed shaft E, which projects through the side of the case, as before described.

It will be seen that as the hub is turned about its center it will travel around the sleeve, which is upon the shaft in the center of the case, and consequently this sleeve or roller will travel

within the channel in the hub, making a circular motion within the hub, which is traveling around it. This motion acts upon the inner ends of the sliding pistons, so that when one of the pistons is in line with the point where the hub is in contact with the inner face of the casing that piston will be withdrawn to its fullest extent, while the other will be equally forced outward, so that its outer end is also in contact with the inner side of the case opposite. Inlet and outlet passages are made in the case, as shown at L L'. As the hub continues to revolve, the first piston is gradually forced out by reason of the eccentricity of the hub to the case, and the inner convex end of the piston travels over the central sleeve or roller F in its movements in such a manner as to be gradually forced out to follow the interior curve of the casing, while the piston which was at the opposite side and forced out to its farthest extent is gradually relieved from the disk as the hub revolves, so that the pressure of the interior periphery of the case upon it forces it in until it arrives at the starting-point of the first one, when the same action takes place with that. It will be manifest that three or more pistons may be arranged to slide radially within this hub, the inner end of each piston acting upon this centrally-placed roller F and operating all the pistons in the same manner as has been described for the two which I have shown in this illustration.

The roller or sleeve F is preferably made tapering upon the outside, and the inner convex ends of the pistons are correspondingly inclined, so as to fit this taper. The shaft E, which supports this sleeve, is movable by a screw or otherwise, so that when forced inward the conically-shaped sleeve will act upon the inner ends of the pistons, so as to force them out and cause a more perfect fit of the outer ends of the packing-disks I, which are fitted into them. These packing pieces or disks, which fit loosely into the outer ends of the pistons and have their faces of the same curvature with the inner periphery of the case, will always move with these outer faces in contact with the inner periphery of the case, and by reason of the eccentricity of the hub, which carries them and the pistons, it will be manifest that they will rotate slightly within the ends of the pistons as the latter are carried around by the rotation of the hub. This oscillation of the packing-disks in the ends of the pistons enables me to make these disks with contact-faces of considerable extent, and this insures a correspondingly-closer packing and less liability to leakage at the ends of the pistons. The sides of these packing-disks and also the sides of the pistons may be grooved or channeled, and any suitable packing material may be fitted into these grooves or channels, so as to form a close joint against the ends of the case within which the pistons revolve; but I have found

that when made with reasonable accuracy the width of the pistons and the packings and the extent of the contact-faces of the packings, are such that a reasonably-tight joint can always be depended upon without making too tight a fit.

It will be manifest that the device which I have herein described may be used either as a vacuum or force pump for liquids or for air or vapor, or it may be used under pressure as an engine, the construction being the same in any case. When used to pump liquids, the well-known principle of packing with an extended film of the liquid itself is very effective in this device on account, as before described, of the extent of the contact-surfaces, and I have found when using the device as an air-compressor that the same rule holds good, and that a comparatively-small power needs to be applied to operate the device either slowly or rapidly, and that very little leakage takes place.

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

1. In an air-compressing apparatus or pump, the outer casing having the central shaft passing through one end, a sleeve or roller journaled upon the inner end of said shaft within the casing, a hub mounted upon a shaft passing through the opposite end of the casing and journaled eccentric to the sleeve or roller, radially-sliding pistons fitted into corresponding channels in the hub, having their inner ends made convex and abutting against the sleeve or roller and their outer ends formed with semicircular depressions, and correspondingly-shaped packing-disks fitting said depressions and having their outer surfaces curved, so as to fit the inner periphery of the casing, substantially as herein described.

2. An air-compressing apparatus or pump consisting of an exterior casing having a shaft or spindle passing through the center of one end and adjustable therein, a tapering or conically-shaped sleeve or roller journaled upon the inner end of said spindle and movable therewith, a hub of smaller diameter within the interior of the casing, mounted upon a shaft which extends through the opposite end of the casing and is journaled therein eccentric to the spindle and roller, radial channels formed in said hub, and correspondingly-shaped pistons fitting said channels, having their outer ends provided with movable packing-disks, which fit the interior periphery of the casing, the inner ends made convex and inclined to correspond with the taper of the adjusting-roller, whereby the pistons may be adjusted with relation to the interior of the casing, substantially as herein described.

3. In an air-compressor or pump, an exterior casing, a hub journaled within said casing upon a shaft which is eccentric to the

center of the casing, radial channels formed  
in said hub, and sliding pistons fitting said  
channels, having their inner ends abutting  
against a stationary pin or sleeve which pro-  
5 jects centrally into the case from the end op-  
posite the shaft of the hub, said pistons hav-  
ing their outer ends formed with semicircu-  
lar concavities, with correspondingly-shaped  
disks fitted therein, having their outer faces  
10 of the same curvature with the interior of the  
casing, said disks being free to rotate within

the ends of the sliding pistons, so as to accom-  
modate themselves to the varying relative po-  
sition of the sliding pistons and the inside of  
the casing, substantially as herein described. 15

In witness whereof I have hereunto set my  
hand.

HENRY RICHMANN.

Witnesses:

M. A. GRAHAM,  
S. H. NOURSE.