

AIR COMPRESSOR.

1,399,151.

2 SHEETS--SHEET 1.

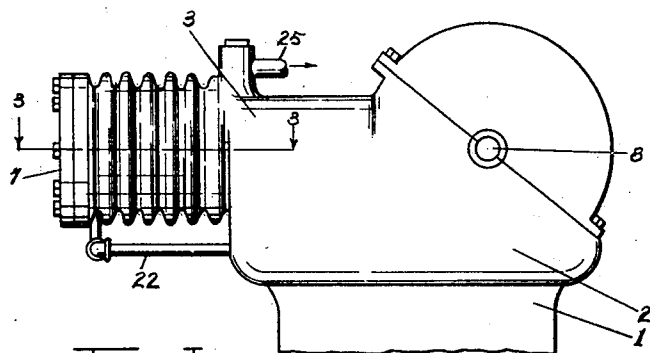


Fig. I.

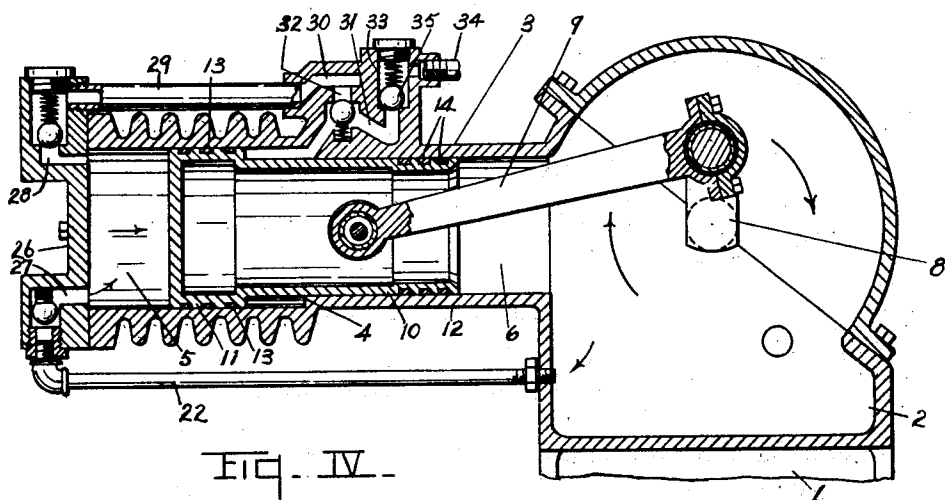


Fig. IV.

Witnesses

Henn Gilman
 M. Louise Thurston

Inventor
Delmer M. Putnam
Harley M. Dunlap

By Chappell Earl
Attorneys

D. M. PUTNAM AND H. M. DUNLAP.
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2 SHEETS—SHEET 2.

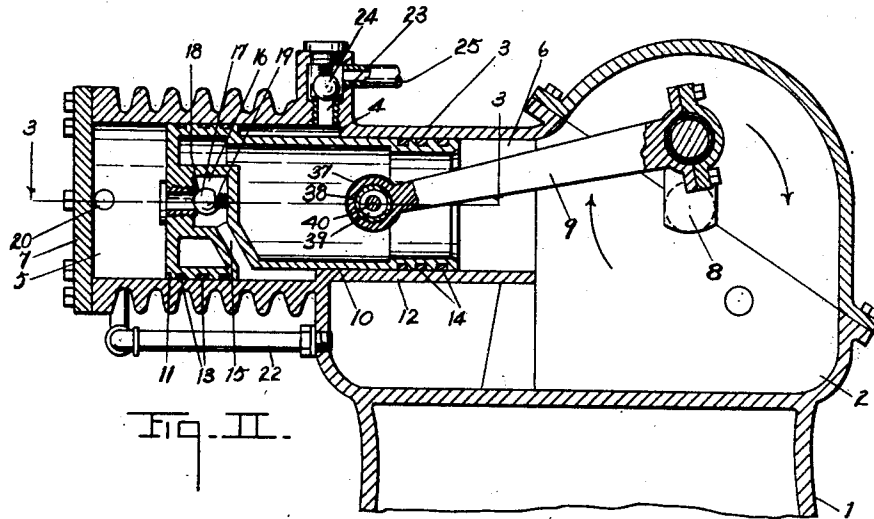


Fig. II.

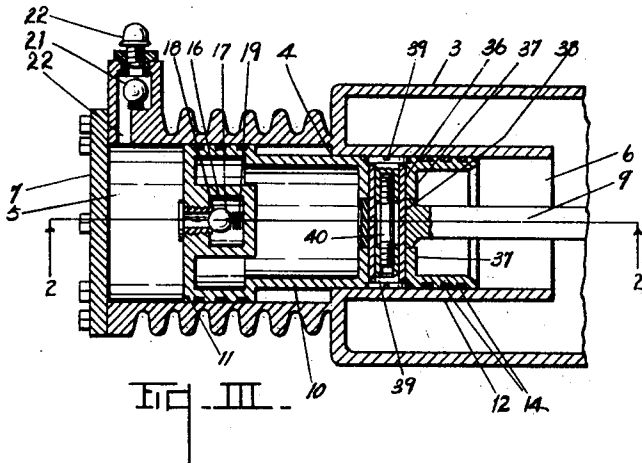


Fig. III.

Witnesses

René Gilman
M. Louise Thurston

Inventor
Delmer M. Putnam
Harley M. Dunlap

384 *Chappell & Carl*
Attorneys

UNITED STATES PATENT OFFICE.

DELMER M. PUTNAM AND HARLEY M. DUNLAP, OF BATTLE CREEK, MICHIGAN.

AIR-COMPRESSOR.

1,399,151.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that we, DELMER M. PUTNAM and HARLEY M. DUNLAP, citizens of the United States, residing at Battle Creek, Michigan, have invented certain new and useful Improvements in Air-Compressors, of which the following is a specification.

This invention relates to improvements in air compressors.

The main objects of this invention are:

First, to provide an improved multi-stage air compressor of the piston type which is of large capacity.

Second, to provide an improved multi-stage air compressor of the piston type in which rod packings are eliminated.

Third, to provide an improved multi-stage air compressor of the piston type which is simple in its parts and very durable.

Further objects, and objects relating to structural details, will definitely appear from the detailed description to follow.

We accomplish the objects of our invention by the devices and means described in the following specification. The invention is clearly defined and pointed out in the claims.

A structure which is a preferred embodiment of our invention is clearly illustrated in the accompanying drawing, forming a part of this specification, in which:

Figure I is a side elevation of an air compressor embodying features of our invention, a portion of the base being broken away.

Fig. II is a detail view mainly in vertical section, on a line corresponding to line 2—2 of Fig. III.

Fig. III is a detail view mainly in horizontal section on a line corresponding to line 3—3 of Figs. I and II.

Fig. IV is a detail view mainly in vertical section corresponding to section of Fig. II showing certain modifications in the compression chamber and discharge connections.

In the drawing, similar reference characters refer to similar parts throughout the several views, and the sectional views are taken looking in the direction of the little arrows at the ends of the section lines.

Referring to the drawing, 1 represents the base, 2 the crank case and 3 the cylinder of our improved pump. The cylinder 3 is stepped or shouldered at 4 to provide bores of different diameter, the larger bore 5 being at the outer end of the cylinder and the smaller bore 6 at its inner end. The cylin-

der head 7 is in the preferred embodiment a flat plate. The crank shaft 8 and piston rod 9 are shown conventionally. The piston, designated generally by the numeral 10, has a head portion 11 coacting with the larger bore of the cylinder and a barrel portion 12 coacting with the smaller bore thereof of the cylinder.

The head portion 11 of the piston is provided with piston rings 13 while the barrel portion 12 has piston rings 14 at its inner end. The outer end of the cylinder constitutes the primary compression chamber, while the portion of the larger bore at the rear of the head portion of the piston and surrounding its barrel portion constitutes the secondary compression chamber.

In the embodiment of our improvement shown in Figs. I, II and III, the primary compression chamber is provided with a discharge passage 15 opening centrally through the head of the piston to the secondary compression chamber and delivering to the secondary compression chamber at the rear of the head of the piston. See Fig. II.

The piston is provided with a valve chamber 16 for valve 17. This valve is held yieldingly to its seat 18 by the spring 19. These parts are also shown mainly in conventional form, as they form no part of our present invention. The inlet port 20 is provided with a check valve 21. To lessen the noise, the inlet pipe 22 is connected to the crank case 2. The discharge port 23 of the secondary compression chamber is located at the rear of the chamber adjacent the shoulder 4. A check valve 24 is provided for this discharge port, and the pipe 25 leads to the pressure tank or other delivery, as may be desired.

In the modification shown in Fig. IV, the head 26 is provided with an inlet port 27 provided with the valve 21. The discharge for the primary compression chamber is through port 28 in the cylinder head, pipe 29 and passages 30 and 31, the passage 31 serving both as an inlet and an outlet for the secondary compression chamber. The port 32 connecting the ports 30 and 31 is controlled by check valve 33. The passage 31 connects with the discharge pipe through the check valve 35.

With the parts thus arranged, the air is forced under pressure from the primary compression chamber into the secondary compression chamber as described, which is of much less capacity than the primary com-

pression chamber, owing to the space occupied by the barrel of the piston.

The packings are of the piston ring type, so they are simple in form and very durable and effective in use, the use of rod packings being entirely avoided by our improvements. The piston rings 12 are disposed at the rear of the piston pin so that the full stroke of the piston may be utilized.

To provide an air tight joint for the piston pin and also to effectively support and retain the pin, we provide the piston with opposed bores 36 having inwardly projecting flanges 37 about them providing supports for the tubular piston pin 38. Thus the piston pin is retained and tight joints provided by means of plug-like retaining members which fit into and close the bores 36. The retaining members are threaded upon a tie bolt 40, the pin being thus retained so that it cannot work longitudinally, and also the parts have the advantage of being very economical to produce and assemble.

We have illustrated and described our improvement in two embodiments which we consider very practical. We have not attempted to describe other adaptations which we contemplate as being desirable under certain conditions, as we believe the disclosure made will enable those skilled in the art to which our invention relates to embody or adapt same as may be desired.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. In a multi-stage air compressor, the combination of a cylinder stepped to provide bores of different diameters with the larger bore at the outer end of the cylinder, a piston having a head portion coacting with said larger bore and a barrel portion coacting with the smaller bore, the outer end of the cylinder constituting the primary compression chamber and the portion of the

larger bore at the rear of the head portion of the piston and surrounding its barrel portion constituting the secondary compression chamber, the head and barrel portions of the piston being provided with piston rings, the piston rings of the barrel portion being at its inner end, a discharge passage for the primary compression chamber through the head of the piston opening at the rear thereof, a check valve for said passage, an inlet valve for the primary compression chamber at the outer end of said cylinder, and a valved discharge connection for said secondary compression chamber at the rear end thereof.

2. In a multi-stage compressor, the combination of a cylinder stepped to provide bores of different diameters, with the larger bore at the outer end of the cylinder, a piston having a head portion coacting with the larger bore and a barrel portion coacting with the smaller bore, the outer end of the cylinder constituting one compression chamber, and the portion of the larger bore at the rear of the head portion of the piston and surrounding its barrel portion constituting a second compression chamber, said chambers being connected for delivery from one to the other, the head and barrel portions of the piston being provided with piston rings, the piston rings of the barrel portion being at its inner end, a piston rod, a piston pin therefor disposed between the piston rings of said piston and so that it passes from the reduced portion of the cylinder on the outstroke of the piston, and means for sealing the ends of the piston pin whereby leakage from the said second compression chamber through the piston is prevented.

In witness whereof we have hereunto set our hands and seals.

DELMER M. PUTNAM [L. S.]
HARLEY M. DUNLAP [L. S.]