H. HARFORD.

AIR COMPRESSOR.

APPLICATION FILED MAR. 7, 1914.

1,138,215.

Patented May 4, 1915.

3 SHEETS—SHEET 1.

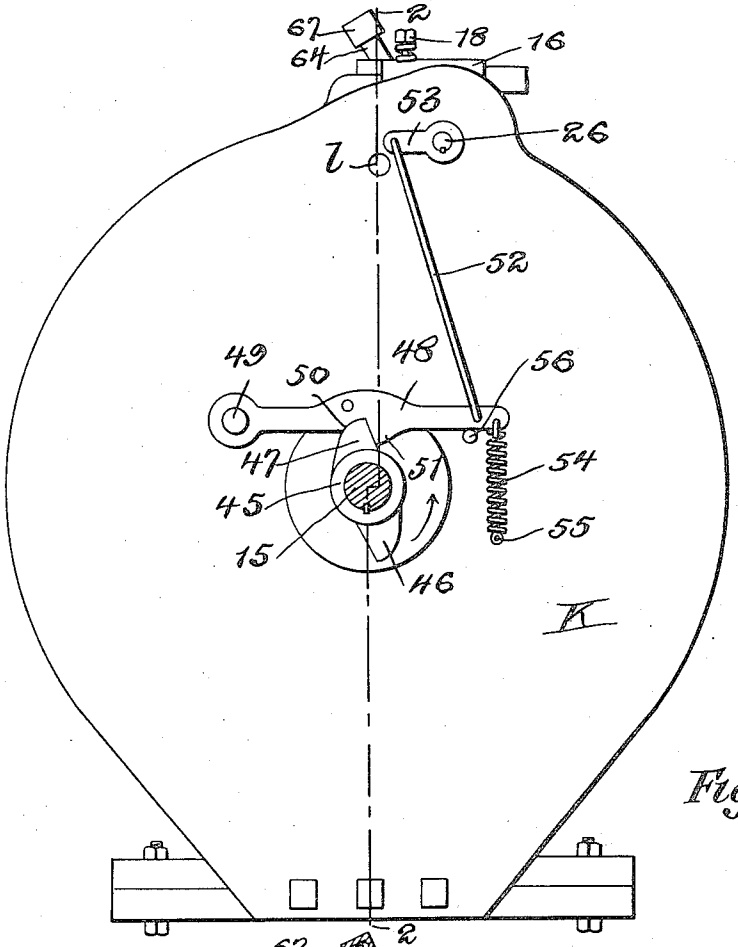


Fig. 1.

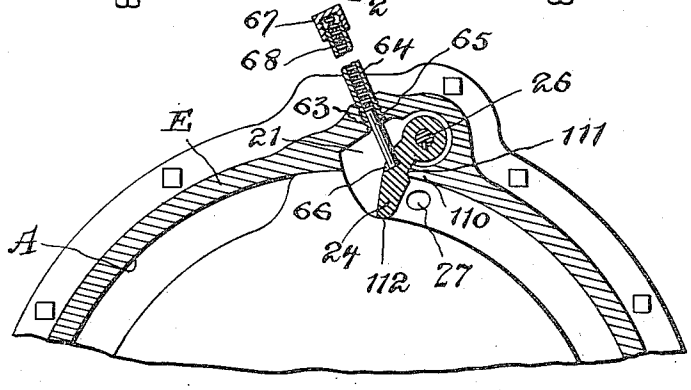


Fig. 4.

Witnesses.
Alice F. Kelley,
Irena Axford

Inventor:
H. Harford
by Egerton N. Case
Atty.

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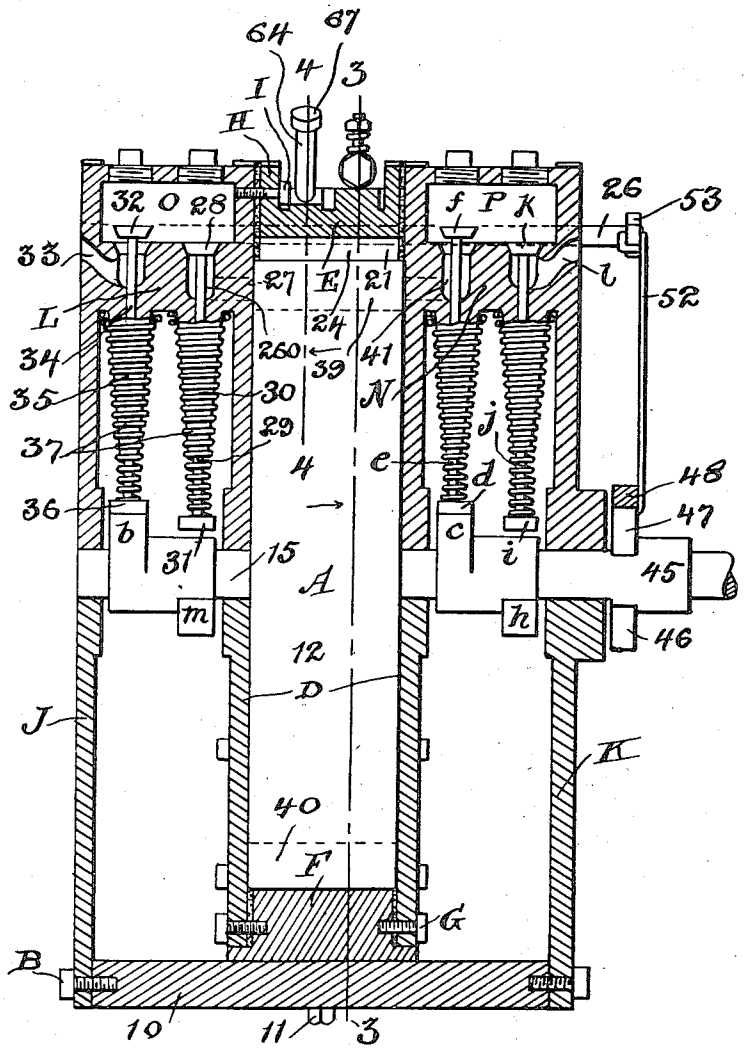


Fig. 2.

Witnesses.
Alice F. Kelley.
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3 SHEETS—SHEET 3.

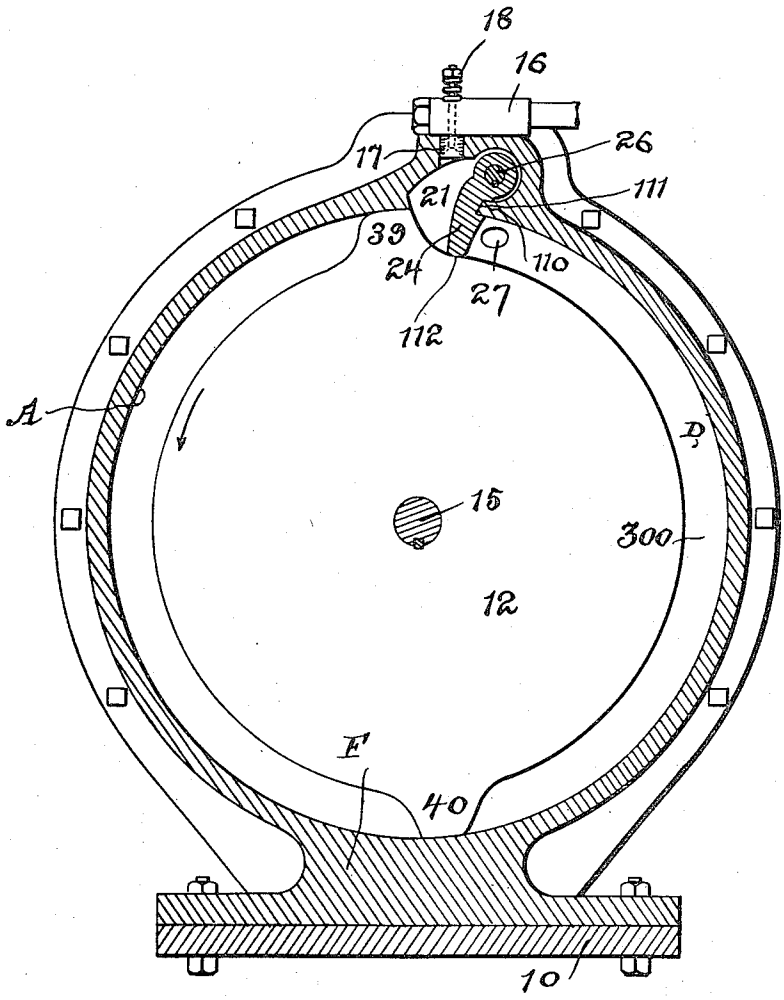


Fig. 3.

Witnesses.
Alice F. Kelley.
Irma Axford

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UNITED STATES PATENT OFFICE.

HAVELOCK HARFORD, OF PORT ALBERNI, BRITISH COLUMBIA, CANADA.

AIR-COMPRESSOR.

1,138,215. Specification of Letters Patent. Patented May 4, 1915.

Original application filed July 24, 1912, Serial No. 711,330. Divided and this application filed March 7, 1914. Serial No. 823,051.

To all whom it may concern:

Be it known that I, HAVELOCK HARFORD, of Port Alberni, Vancouver Island, in the Province of British Columbia, Canada, a subject of the King of Great Britain, have invented certain new and useful Improvements in Air-Compressors, of which the following is a specification.

My invention relates to improvements in air compressors, and relates more particularly to that type of air compressor in which a rotary piston is utilized to compress the air, the present application being divided from the parent application Serial Number 711330, filed July 24, 1912, for improvements in rotary engines.

The principal object of my invention is to design an air compressor, the piston whereof makes two compressions for each revolution, and another object of my invention is to design a particular type of governor to control the degree of compression of the air by the said air compressor.

The compressor comprises the compression cylinder in which operates a piston provided with two wings positioned substantially at an angle of 180 degrees to each other. A pair of compression chests is provided having valves to control the entry and escape of compressed air thereinto and therefrom. Means for operating said valves is provided, as well as an abutment mounted in a suitable recess or chamber formed in the upper portion of the said cylinder, as hereinafter more particularly set forth.

Figure 1 is an end elevation of my compressor, showing the cams and connecting levers for operating certain internal parts. Fig. 2 is a vertical longitudinal section on the line 2—2, Fig. 1. Fig. 3 is a vertical transverse section on the line 3—3, Fig. 2, and Fig. 4 is a vertical transverse section on the line 4—4, Fig. 2.

In the drawings, like characters of reference indicate corresponding parts in each figure.

A is the compression cylinder, and the same is composed of side walls D which are bolted or otherwise secured to the ring plate E, which is preferably integrally formed with the base F.

G are cap screws by means of which the side walls D are secured to the base F. The ring plate E is provided substantially for the whole of its periphery except where the base F is positioned, with side flanges H, and screwing through these flanges and into the said walls D are cap screws I which secure these parts together.

J and K are the end plates of the compressor, and the same are secured by suitable cap screws B to the base plate 10.

Integrally formed with the side walls D and the end plates J and K are castings L and N which are cored out to form the compression chests O and P.

The base F is secured to the base plate 10 by any suitable means such as the nuts and bolts designated by the common numeral of reference 11.

15 is a shaft journaled in the end plates J and K and the walls D, and keyed to this shaft is a rotary piston 12.

16 is an air-pipe secured by the extension 17 in the top of the compression cylinder A.

18 is a spring-controlled intake valve of any ordinary type, and the same controls the passage of air into the compressor through the pipe 16.

Formed in the upper portion of the ring plate E is a recess or chamber 21 which communicates with the cylinder A. Mounted to operate in the said chamber is an abutment 24 which is keyed to the rod 26 which has bearing in the end plates and side walls already mentioned. The normal position of the said abutment is illustrated clearly in Figs. 3 and 4.

Formed in the chest-casting L is a port 260 which opens into the compression chest O. The mouth 27 of said port opens from the compression cylinder A behind the abutment 24 therein. Controlling the port 260 is a valve head 28, the stem 29 of which has bearing in the extension 30 of the chest-casting L.

31 is a shoe carried by the stem 29.

32 is a valve head controlling the port 33 formed in the chest-casting L through which the compressed air from the chest O is fed to point of consumption. The said valve is provided with a valve-stem 34 which has bearing in the extension 35 of the said chest casting.

36 is a shoe carried by the valve stem 34.

Each valve stem 29 and 34 is of course provided with the usual spring 37.

39 and 40 are wings carried by the piston 12, and these wings (see Figs. 3 and 4) project beyond the perimeter of the said piston,

thus forming two annular spaces, one on each side of the said wings, and bounded by the perimeter of the said piston and the internal surfaces of the cylinder A.

By any suitable means, not necessary to illustrate, the shaft 15 is driven to operate the piston 12. When one of the wings of the piston 12 is operating to draw air into the compressor through the pipe 16, the other wing is compressing a charge of air into either of the compression chests O, and P. In the position of the parts illustrated in Figs. 2 and 3, the cam *b* keyed to the shaft 15 has, through the medium of the shoe 36, opened the valve 32, thus permitting the escape of compressed air from the chest O through the port 33 to point of consumption. As the said valve 32 is being opened, the wing 39 of the piston 12 is drawing in a fresh supply of air into the cylinder A through the pipe 16, and the wing 40 will be forcing the air from the annular chamber 300 through the port 41 (which is a duplicate of the port 260) leading from the compression chamber A into the compression chest P. Simultaneously with the operation just described, the port 260 is closed by the valve 28, and the port *l* is closed by the valve *k*, and the cam *c* keyed to the shaft 15 comes into contact with the shoe *d* of the valve stem *e* and moves the valve-head *f* to open the port 41. By means to be presently described, the abutment 24 is operated in due course to permit the wings 39 and 40 to pass thereby, after which the said abutment is closed. In due course, the cams *b* and *c* move out of contact with the shoes 36 and *d*, thus causing the valves 32 and *f* to be closed. In due course, the cam *h* keyed to the shaft 15 comes into contact with the shoe *i* of the valve stem *j* and moves the valve head *k* so as to open the port *l* leading from the compression chest P to point of consumption. Simultaneously with the movement described, the cam *m* carried by the shaft 15 is operating the valve head 28 through the medium of its stem 29 and shoe 31 and opens the port 260 thereby permitting the wing 39 of the piston 12 to compress a fresh charge of air into the compression chest O. From the foregoing part of this specification, it will be clear to one skilled in this art that there are two compressions for each revolution of the piston 12, and that the air compressed by one of the said wings passes into one of the said chests, whereas the air compressed by the other of said wings passes into the other chest.

Keyed to the shaft 15 adjacent the end plate K, is a sleeve 45 provided with a pair of cams 46 and 47 positioned substantially at an angle of 180 degrees to each other.

48 is a lever pivoted by the pin 49 to the end plate K. The cam 47 is resting in the notch 50 of the lever 48. Before the wing 40 of the piston 12 reaches the abutment 24, the cam 46 shall have come in contact with the lip 51 of the lever 48 and moved this lever upward upon its pin 49. The lever 48 is connected by a link rod 52 with an arm 53 which is keyed to the valve rod 26, and therefore the abutment 24 will be moved into its chamber or recess 21 to permit the free passage of the wing 40. Immediately the said wing has passed far enough to be out of the path of movement of the said abutment, the cam 46 has been moved into the position occupied by the cam 47, and as the lever 48 is partly controlled by the spring 54, connected thereto and to a pin 55, through the before-described parts, the said abutment is returned to normal position.

56 is a pin carried by the end plate K against which the lever 48 normally rests. The use of this pin prevents undue wear of the cams 46 and 47, and lever 48.

In order to regulate the degree of compression of the air within the chests O, and P, I provide the compression cylinder A with the governor I shall now describe.

Screwing into a hole 63 formed in the ring plate E and extending into the chamber 21, is a tubular casing 64 in which operates a pin 65, the lower end of which rests in a pocket 66 formed in the abutment 24.

67 is a cap screwing over the outer end of the tubular casing 64, and housed within this casing between the said cap and inner end of the pin 65, is a coiled spring 68 which exerts pressure against the said pin to keep it in place. By means of the cap 67, the head of which extends beyond the outer end of the tubular casing 64, the pressure exerted by the spring 68 against the pin 65 can be regulated for the purpose hereinafter set forth.

By means principally of the spring-held pin 65, the abutment 24 is normally held closed so that I am enabled to compress the full charge of air within the compression cylinder A and pass the whole of this charge into respectively the compression chests O and P, by means of one of the wings of the piston 12, when the said piston is operated at a given number of revolutions per minute. For instance, if the said piston be revolving at the rate of 100 revolutions per minute, the compression within the cylinder A will not be strong enough to open the abutment 24 against the pressure of the spring 68 exerted by the pin 65 thereagainst, but the complete charge of air will be freely passed through either of the ports 260 or 41 into one of the compression chests O or P. If the speed of the piston 12 reaches 105 revolutions per minute, the increased compression of the air will cause the abutment to open against the spring-held pin 25 to a greater or lesser extent by reason of the in-

ability of the air to pass through the open outlet 27 with sufficient rapidity, and so permit part of the charge of air to escape beyond this abutment and into the chamber 21 and the other part of the compression cylinder A in front of the wing compressing the air. It therefore follows that when the speed of the piston 12 is increased as mentioned, there will be less air forced into either of the compression chests, with the result that the pressure therein will fall.

The ring plate E is provided with a shoulder 110 which fits into a notch 111 formed in the under side of the abutment 24, thereby forming a stop therefor. The nose 112 of the abutment 24 rests in contact with the circular perimeter of the piston 12, and it will of course be understood that the said abutment is co-extensive with the width of the cylinder A, and chamber 21, and has close enough contact with the walls thereof to prevent binding, and to reduce to a minimum leakage thereby.

What I claim as my invention is:

In an air compressor, the combination of the casing; a compression cylinder formed therein; a rotary piston mounted in said cylinder and provided with two wings spaced the required distance apart and projecting beyond the perimeter of said piston; a shaft for said piston journaled in said casing; an abutment mounted to operate in a recess formed in said cylinder; a rod on which said abutment is secured; compression chests formed in the said casing and positioned one on each side of said compression cylinder, each of the said compression chests being provided with an exhaust port, and being further provided each with an intake port which opens into said compression cylinder behind the said abutment mounted therein; a valve mounted to control the passage of air through each of the said ports; valve gear operated by said shaft to control said valves; means carried by said shaft for operating said abutment, comprising a sleeve keyed to the outer end of said shaft and provided with two cams positioned 180° apart; a lever pivoted at one end to the outside of said casing and adjacent said sleeve, provided in its underside with a lip, and further provided with a notch; means to maintain said lever in normal position; an arm carried by the outer end of said rod; a link-rod connecting said lever with said arm; a spring-controlled pin operating in said recess and having its inner end held in a pocket formed in said abutment; means whereby the tension of said spring against said pin can be adjusted, and a spring-controlled intake valve mounted in said air compressor to communicate with the said recess formed therein and in front of said abutment.

In testimony whereof I have affixed my signature in presence of two witnesses.

HAVELOCK HARFORD.

Witnesses:

ARCHIE FLEMING,

H. E. ONEALE.