J. W. LAWHEAD.

AIR COMPRESSOR.

APPLICATION FILED MAR. 5, 1919.

1,295,529.

Patented Feb. 25, 1919.

3 SHEETS-SHEET 1.

Fig. 1.

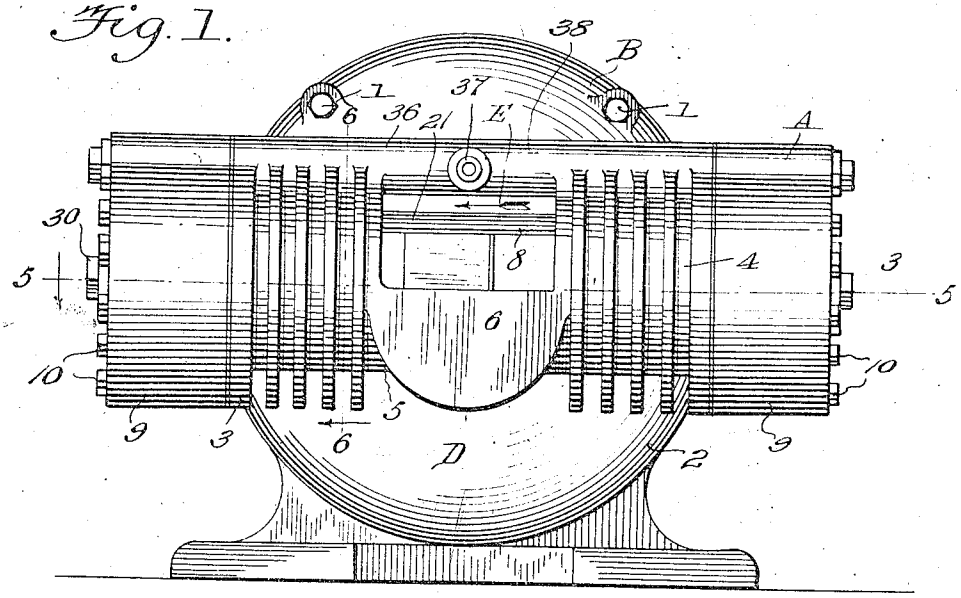
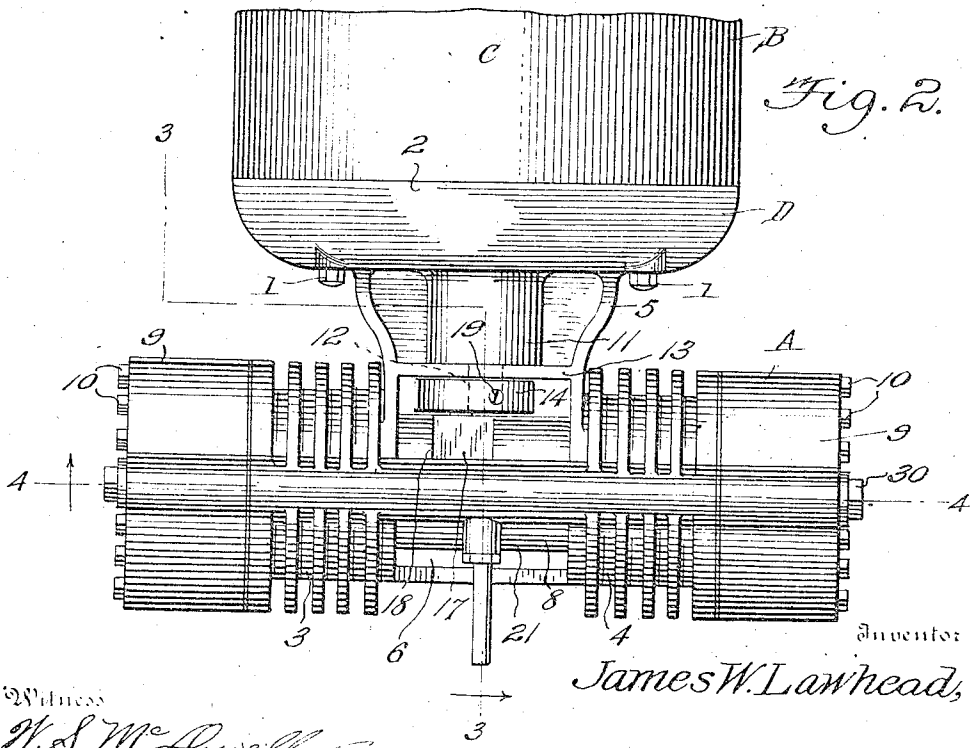



Fig. 2.




Witness

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3 SHEETS—SHEET 2.

Fig. 4.

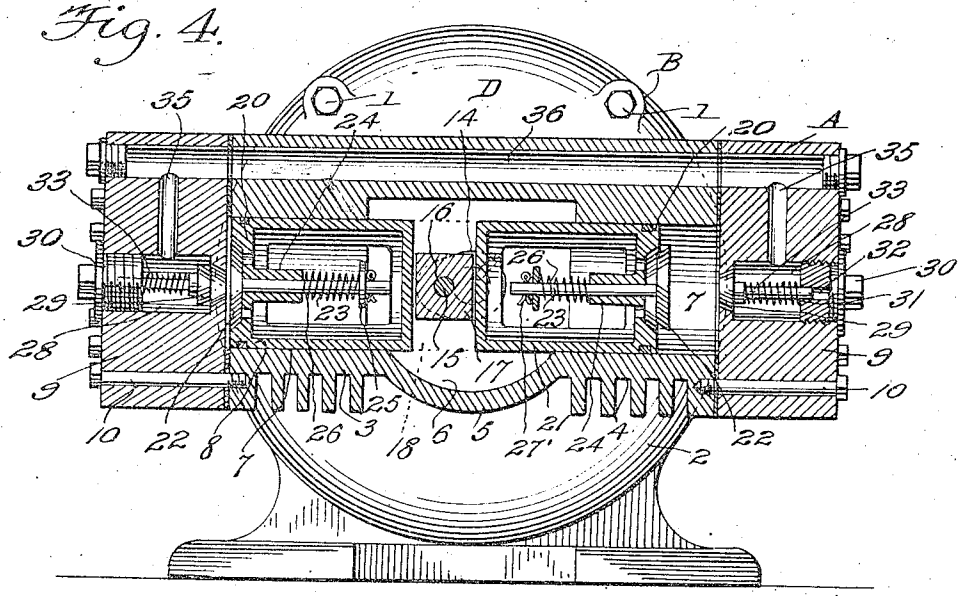
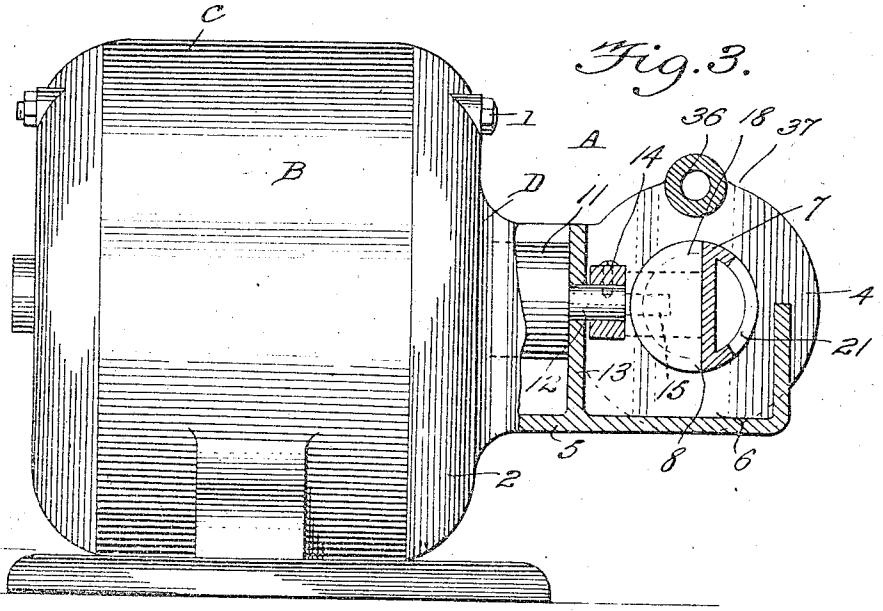



Fig. 3.




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3 SHEETS—SHEET 3.

Fig. 5.

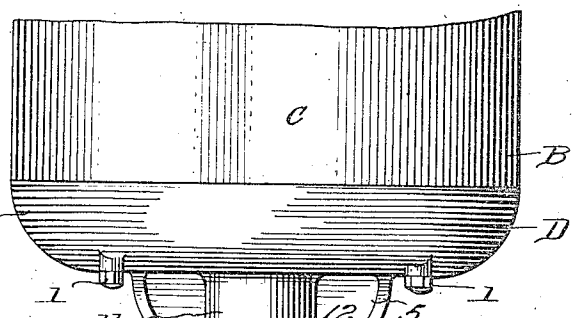
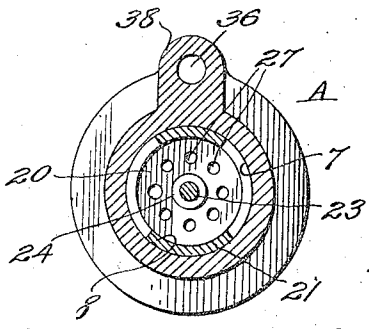
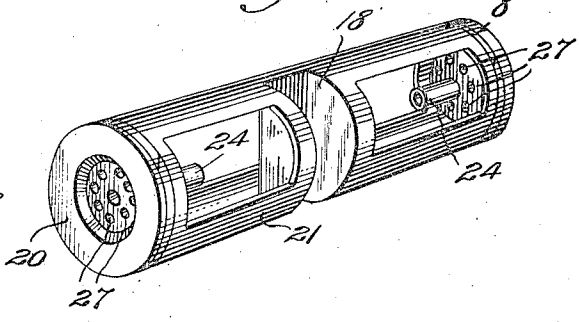



Fig. 6.

Fig. 7.



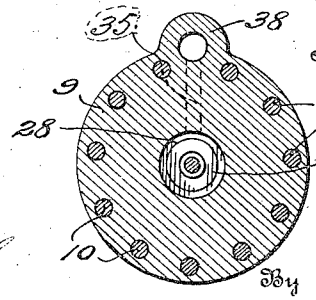




Fig. 8.

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# UNITED STATES PATENT OFFICE.

JAMES W. LAWHEAD, OF WILMINGTON, OHIO.

## AIR-COMPRESSOR.

1,295,529. Specification of Letters Patent. Patented Feb. 25, 1919.

Application filed March 5, 1918. Serial No. 220,416.

*To all whom it may concern:*

Be it known that I, JAMES W. LAWHEAD, a citizen of the United States, residing at Wilmington, in the county of Clinton and State of Ohio, have invented certain new and useful Improvements in Air-Compressors, of which the following is a specification.

This invention relates to fluid compressors, and has for a primary object to provide a compressor wherein is embodied improved features of construction which are designed to facilitate the manufacture and assemblage of the compressor parts, and to render the same capable of being economically and efficiently fabricated.

Another object of the invention resides in an air compressor wherein is included a pair of alined and opposed cylinders, which are adapted to receive a common piston, said latter being of uniform diameter throughout its length and of lesser diameter than the bores of said cylinders, whereby the piston is capable of being inserted into its operative position within said cylinders subsequent to the operation of alining and assembling the latter.

A further object is to provide an improved form of piston for use in connection with a fluid compressor embodying opposed cylinders, wherein is provided improved means for effecting the reciprocation of said piston without appreciably increasing its diametrical proportions, whereby ease and convenience are obtained in assembling the compressor parts.

A still further object is to provide an air compressor possessing novel features of construction which permit the same to be readily connected with a power imparting unit, and wherein the diametrical alinement of its opposed cylinders is insured.

With these and other objects in view as will appear as the description proceeds, the invention accordingly consists in the novel features of construction, combination of elements and arrangement of parts, hereinafter fully described in the following specification and having the scope thereof pointed out with particularity in the appended claims.

In the drawings, wherein has been shown one of the preferred embodiments of the invention, Figure 1 is a front view of the fluid compressor, constructed in accordance with the preferred principles of the invention.

Fig. 2 is a top plan view of the compressor, and disclosing more particularly its application to an electric motor.

Fig. 3 is a transverse vertical sectional view, taken along the line 3—3 of Fig. 2.

Fig. 4 is a vertical longitudinal sectional view taken along the line 4—4 of Fig. 2.

Fig. 5 is a horizontal sectional view, the plane of which being disclosed by the line 5—5 of Fig. 1.

Fig. 6 is a transverse sectional view taken along the line 6—6 of Fig. 1.

Fig. 7 is a perspective view of the compressor piston.

Fig. 8 is a transverse sectional view taken through one of the cylinder heads, and disclosing more particularly the valve mechanism thereof.

Similar characters of reference denote corresponding parts throughout the several views of the drawings.

Referring more particularly to the drawings, the fluid compressor A shown therein, and comprising the preferred form of the invention, is coupled for operation with a power imparting unit B, which latter in this instance consists of an electric motor, although any other equivalent driving means may be employed in lieu of said motor if conditions warrant such substitution. Connected with the casing C of the motor, preferably by means of bolts 1, is a cylinder casting D. This member is integrally formed to include an end wall 2, for incasing one end of the motor B, and with a plurality of horizontally alined and opposed compressor cylinders 3 and 4, said latter being connected with the wall 2 by means of integral webs 5, which are so constructed as to provide a lubricant containing well 6. Thus it will be manifest that in the preferred form of the invention, the casing D provides an efficient, easily assembled and economical method of forming the cylinders 3 and 4, so as to effect their convenient association with the motor B and to further insure the exact alinement of the piston bores 7 thereof. Hitherto, it has been common in the opposed type of compressor to form the cylinders separately, in order that the space usually found between the same could receive the so-called Scotch yoke piston driving connection, hence in assembling the compressor, it has been found necessary to assemble the piston and the operating mechanism therefor in operative relation before mounting the cylinders

in their final positions. This latter construction, it will be apparent, presented difficulties in properly alining and maintaining the alinement of the cylinder sections and, furthermore, rendered the compressor difficult to adjust and repair. Through the construction of the casting D, it is possible to readily and securely mount the compressor structure in connection with the motor B, and through its integral formation, the bores 7 of the cylinders thereof may be accurately machined so as to be in perfect or true alinement and to be capable of maintaining such alinement.

Mounted for reciprocation within the cylinder body 7 is a piston 8 of novel and improved construction. This piston is substantially of integral formation and is of the same diameter throughout its length, and hence of lesser diameter than the bore 7, this construction being employed to facilitate the insertion of the piston within said cylinders. The latter are provided with removable heads 9, whereby when the end of the same is removed, said piston may be longitudinally inserted into said bores, said heads 9 being secured in position through the medium of lag bolts 10, which are threaded into openings formed in the ends of the cylinders 3 and 4. The casting D is provided with a bushing 11 which is adapted to receive the armature shaft 12 of the motor B, which shaft being formed to project forwardly through a wall 13 into the well 6. The outer extremity of the shaft is provided with a fixed crank 14, from which protrudes a fixed stud 15, the latter being adapted to be positioned within an opening 16 formed in the sliding block element 17. This element is situated to vertically reciprocate within a socket 18 formed centrally of the piston 8 upon the rotation of the shaft 12 and its connected crank 14, whereby the reciprocation or stroke of said piston will be effected. In assembling this structure in association with the motor B, the piston 8 is positioned within the cylinders 3 and 4, and the members 14 and 17 are situated in coöperative relation with the socket 18 thereof, so that when the casting D is passed over the projecting extremity of the shaft 12 and made fast to the motor casing by means of the bolts 1, said shaft extremity will be positioned within the shaft opening of the crank 14. Then subsequent to the adjusting of said crank to conform with the stroke of said piston, the former is made fast to the shaft 12 by means of a set screw or other equivalent means 19. Thus it will be manifest that the present invention provides a structure which permits of the convenient association or assembling of its several parts and eliminates the use of a Scotch yoke or other similarly enlarged driving connection for effecting the operation of a compressor piston, and thus enables said piston 8 to be positioned within the compressor cylinders without necessitating the removal of the latter from their proper operative positions.

With regard to the valves of the compressor A, the piston 8 is provided with end walls 20 and a webbed body 21, which permits of a free circulation of air through the piston up to the walls 20. These end walls are formed with valve seats in which are positioned opposed valve heads 22, said latter being provided with inwardly projecting valve stems 23, mounted for reciprocation within guides 24 integrally formed with the walls 20. The ends of the stems 23 are preferably equipped with washers 25, and between the latter and the guides 24 there are situated coiled springs 26, which normally tend to maintain the valve heads 22 in seated relation with their respective seats, and thereby normally closing a plurality of circularly arranged openings 27, which are employed to establish communication between the normally closed cylinder bores 7 and the atmosphere. Cotter pins 27′ pass through the inner ends of the valve stems 23 and serve to maintain the washers 25 in their proper positions thereon. Thus it will be seen that upon the reciprocation of the piston 8, the valves 22 will be alternately opened and closed by the vacuums created through the piston's reciprocation within the bores 7 and by virtue of the action of the springs 26, thus automatically effecting the controlled admittance of air into said cylinder bores.

The heads 9 of the cylinders are formed with longitudinally extending bores 28, which terminate at their inner ends in oppositely disposed valve seats for the reception of valves 29, the outer extremities of the bores 28 being threaded for the reception of removable plug elements 30. Stems 31 project outwardly from the valves 29 and terminate within guide openings 32 formed in the elements 30, and springs 33 are situated to surround the stems 31 and are interposed between the valves 29 and the inner walls of the elements 30. By this construction, it will be manifest that by virtue of the action of the springs 31, the valves 29 will be normally maintained in engagement with their respective seats. Thus in operation, upon the reciprocation of the piston 8 in the direction of the arrow E, air will be admitted into one of the bores 7 by the opening of the controlling valve 22, said valve of course being opened against the normal tendency of its spring 26 by the suction of a vacuum created within the bore 7. Then upon the compressor movement of the piston, the air confined within the bore 7 and situated between the end wall 20 of said piston and the inner wall

of one of the heads 9, will be compressed so that when the piston reaches the end of its stroke, the fluid thus compressed will be forced out of said bore 7 by the opening of the valve 29 as the latter responds to fluid pressure, so that fluid compressed within the bore 7 will be discharged into one of the bores 28. It will of course be understood that this action takes place in identically the same manner in both of the cylinders 3 and 4.

Compressed fluid is discharged from the compressor A, by providing the bores 28 with right-angularly disposed and communicating passageways 35, which extend vertically and establish communication between the bores 28 and a horizontally extending passageway 36 extending longitudinally of the compressor and formed in the walls of the cylinders 3 and 4 and the heads 9. An outlet jet 37 is carried by the central portion of a pipe 38 through which the passageway 36 extends, and to which jet a suitable connection (not shown) may be attached to lead the compressed fluid to a suitable point of discharge.

From the foregoing it will be seen that there has been provided mechanism whereby the objects of the invention have been achieved, and that all of the advantageous features above mentioned are, among others, present. The compressor described is capable of being readily and conveniently associated with a driving motor, and is so constructed that the placing of the piston 8 therein may be readily accomplished with ease and facility and without causing the demounting of the cylinders 3 and 4. The above desirable features have been primarily accomplished by forming the piston 8 so that the same will be of uniform diameter throughout its length, thereby eliminating use of enlarged means for effecting its reciprocation, and further permits the cylinders 3 and 4 to be integrally cast. The motor is of simple construction, contains but few and accessible parts, may be economically manufactured and is not likely to become out of order or to occasion undue repairs.

Having described the invention, what is claimed as new and patentable is:

1. An air compressor, comprising a pair of horizontally alined integrally formed cylinders, a piston common to both of said cylinders and formed with a centrally disposed vertically extending socket, a block slidably mounted for vertical rotation within said socket and having its orbit of travel limited to approximately the vertical height of said socket, a motor shaft having its driving end removably journaled in a bearing formed with said cylinders, and means mounted upon the operative end of said shaft for effecting the rotation of said block and the consequent reciprocation of said piston.

2. An air compressor, comprising a pair of axially alined integrally formed cylinders having registering piston receiving bores extending completely therethrough, a single piston common to both of said bores and mounted for reciprocal movement therein, said piston being initially insertible into said bores by being moved lengthwise therein, removable head members carried by said cylinders and disposed to cover said bores, spring controlled valves carried by said piston and head members and responsive to suction and pressure created within said cylinders by the reciprocation of said piston, a motor shaft removably journaled in the bearing formed in the connecting portion of said cylinders, and means coöperative with the end of said shaft to effect the reciprocation of said piston, said means lying at all periods of its operation within the diameter of said piston.

3. An air compressor, comprising a pair of axially alined cylinders, an open web connecting said cylinders and providing a lubricant chamber, a piston common to both of said cylinders and insertible lengthwise therein, removable head members carried by the ends of said cylinders, valve mechanism mounted in said head members and piston, a web formed internally and centrally of said piston and providing an open vertically disposed socket, a block slidably mounted within said socket, and a motor shaft mounted to rotate said block and to effect a consequent reciprocation of said piston.

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

JAMES W. LAWHEAD.

Witnesses:
SIMEON KENTON GLASCOCK,
O. W. HALE.