No. 880,731. PATENTED MAR. 3, 1908.

G. F. HALL & B. ALBERTSON.

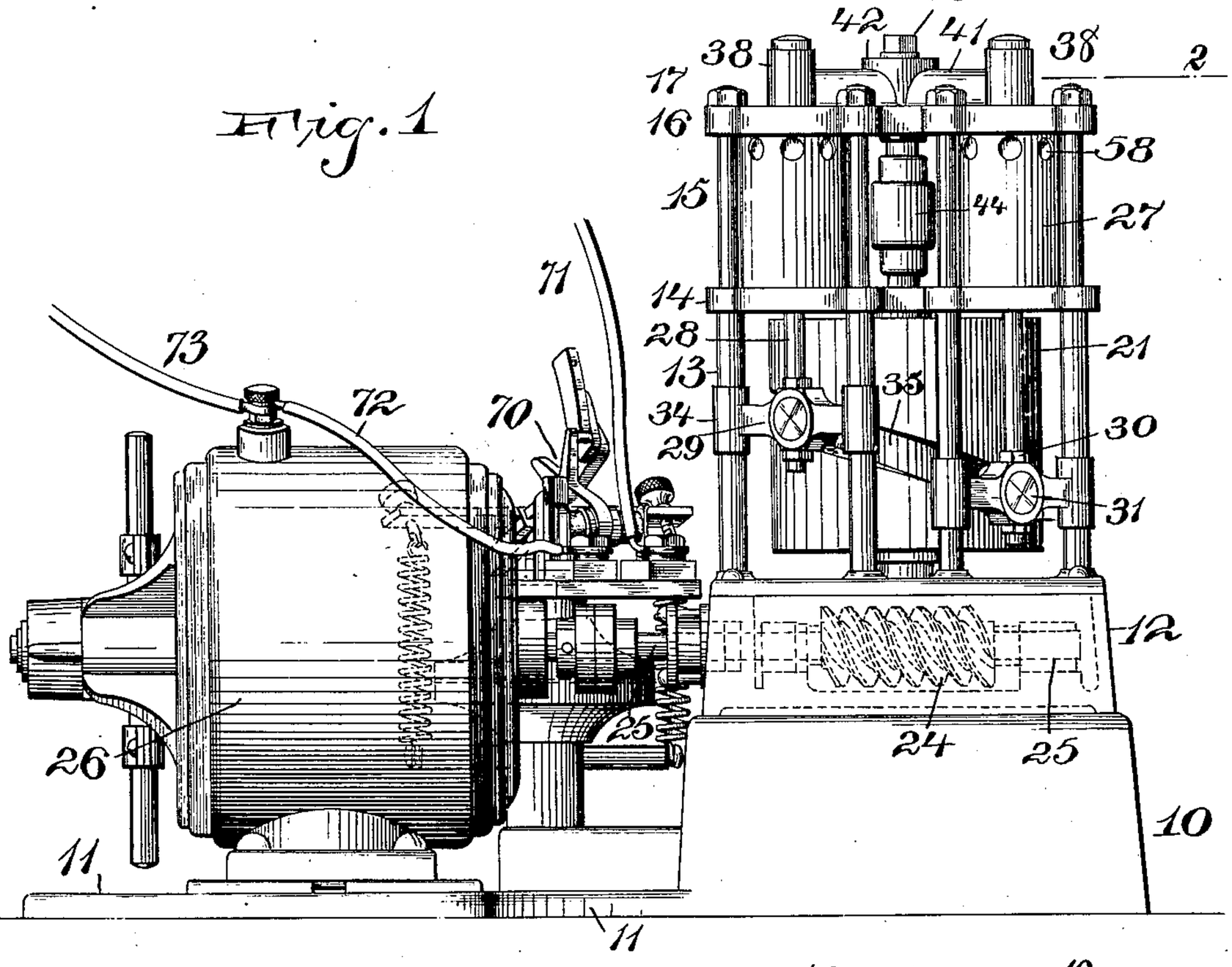
AIR COMPRESSOR.

APPLICATION FILED APR. 12, 1907.

3 SHEETS—SHEET 1.

43

Fig. 1



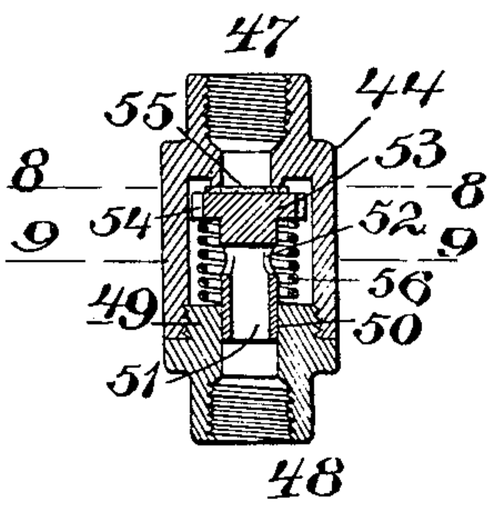


Fig. 7

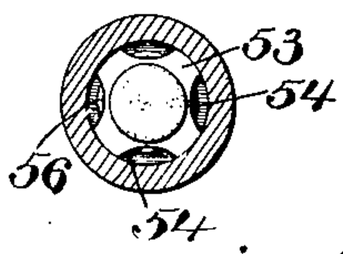


Fig. 8

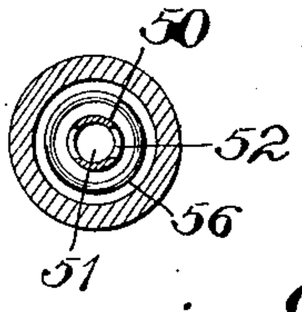


Fig. 9

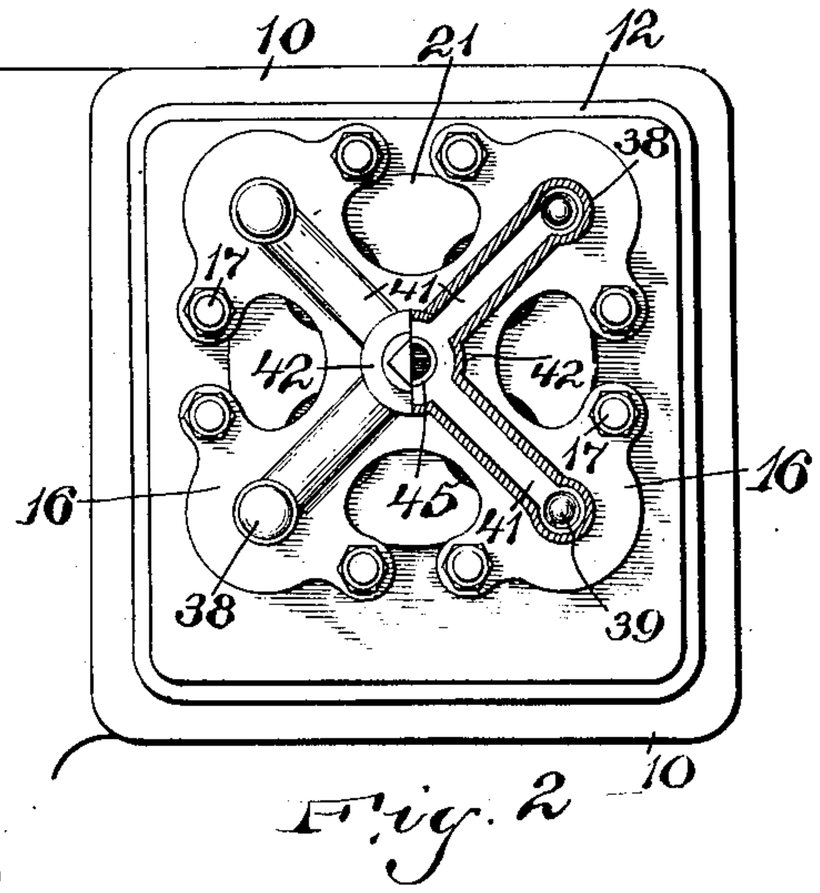


Fig. 2

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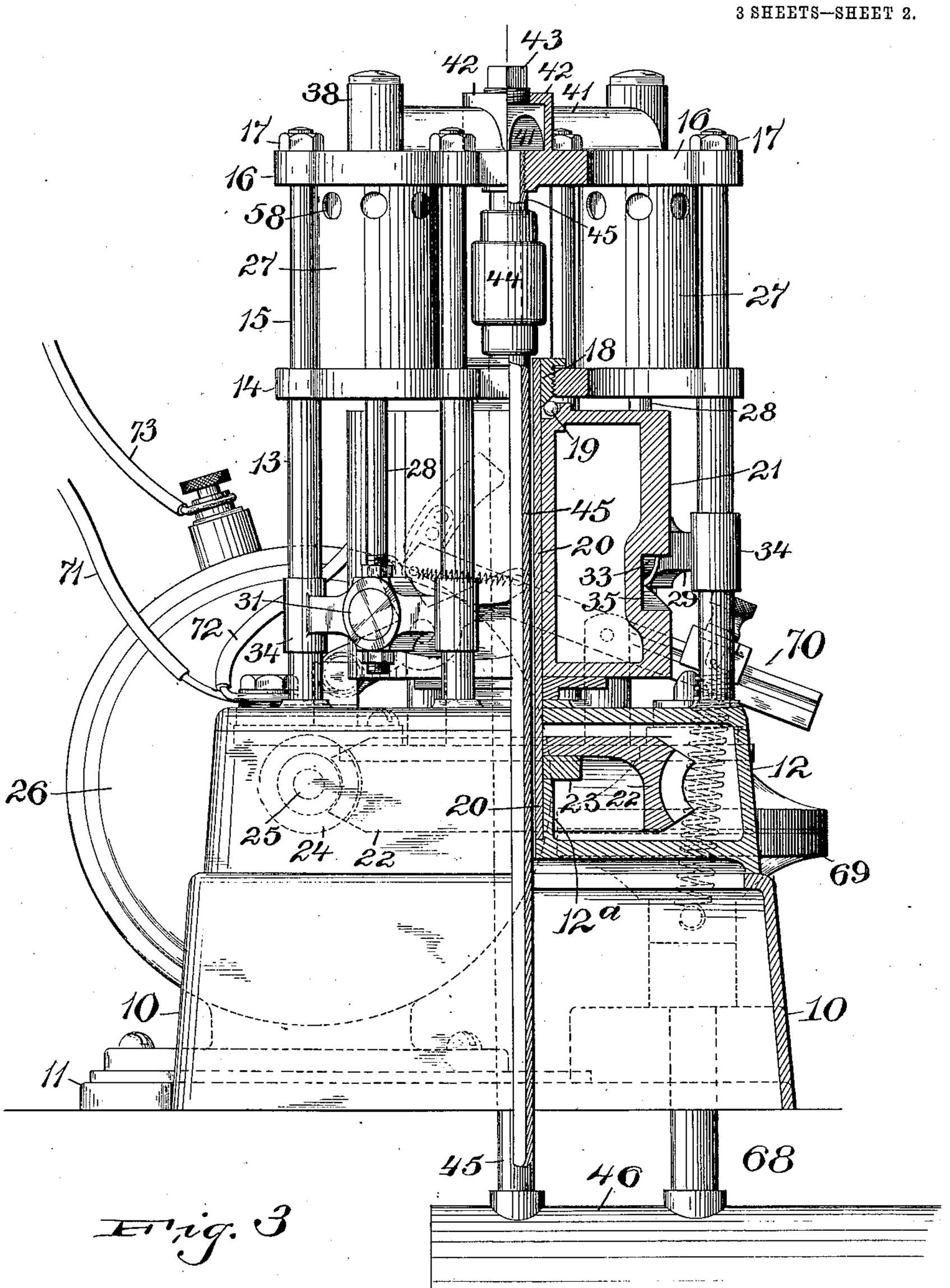

Fig. 3

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3 SHEETS—SHEET 3.

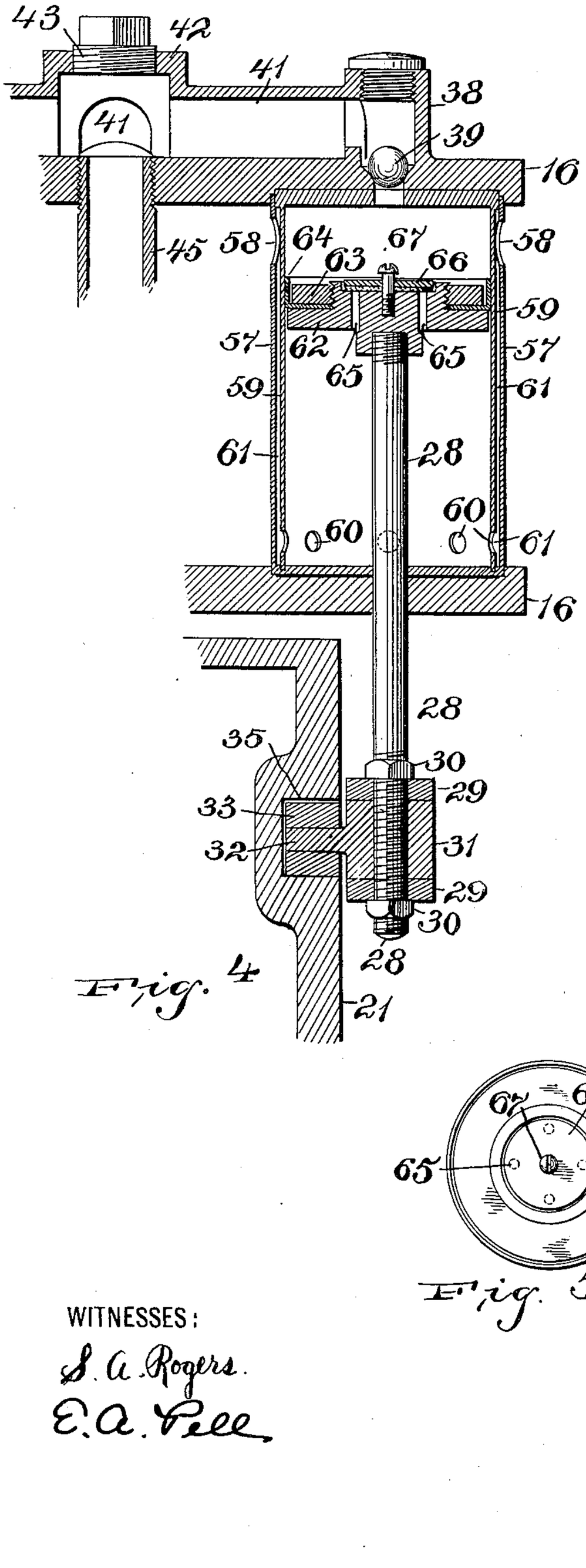

Fig. 4

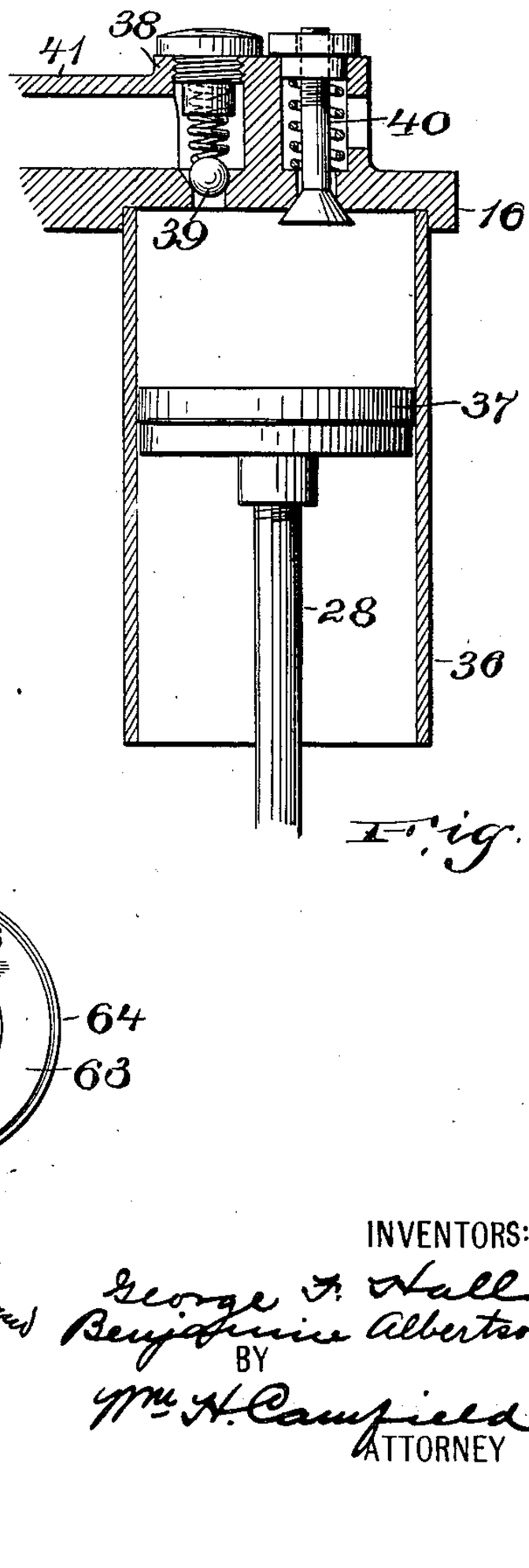

Fig. 6

Fig. 5

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UNITED STATES PATENT OFFICE.

GEORGE F. HALL, OF JERSEY CITY, AND BENJAMIN ALBERTSON, OF MANTOLOKING, NEW JERSEY; SAID HALL ASSIGNOR, BY MESNE ASSIGNMENTS, TO SAID ALBERTSON.

AIR-COMPRESSOR.

No. 880,731. Specification of Letters Patent. Patented March 3, 1908.

Application filed April 12, 1907. Serial No. 367,768.

To all whom it may concern:

Be it known that we, GEORGE F. HALL and BENJAMIN ALBERTSON, citizens of the United States, residing at Jersey City and Mantoloking, respectively, in the counties of Hudson and Ocean, respectively, and State of New Jersey, have invented certain new and useful Improvements in Air-Compressors; and we 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, reference being had to the accompanying drawings, and to figures of reference marked thereon, which form a part of this specification.

This invention is designed to provide an air compressor that can be made in any size for any purpose, but is particularly designed for small work, such as for barbers' use where massage vibrators and similar appliances are now run by compressed air, and also for compressing air for cleaning purposes where a jet of air is used to remove dust and dirt from recesses, and for automobile purposes where compressed air is used for assisting in charging the engine, for operating the alarms, inflating the tires and numerous applications. The compressor is designed particularly to economize space, and to also make an effective compressor, this being due to the utilization of the central part of the machine for the passage of the air pipe from the compressing cylinders to the tank.

The machine comprises a revolving drum which, by means of a mechanical connection, operates the pistons of a series of cylinders arranged around the drum, and the pipe for supplying the tank passes down through the drum in its center. An improved feature of this device is also the form of cylinder, preferably employed, which provides a cooling space between the inner and outer casing of the cylinder which tends to prevent heating and undue friction in the compressing cylinders.

The pipe for conveying air from the cylinders to the tank for storing, is provided with a check valve which is of new construction for machines of this character, and we have found that we could devise no valve for holding compressed air, which would not leak, that will compare with the valve shown herein for economy and efficiency.

The invention is illustrated in the accompanying drawings, in which

Figure 1 is a side view of the compressor showing it connected upon the same support with a motor, and also with a diaphragm snap switch to stop the compressor when a certain pressure has been attained. Fig. 2 is a top view of the compressor portion of the device, half of it being shown in section on line 2, in Fig. 1. Fig. 3 is an end view of the air compressor, this view also showing the storage tank, the compressor on the right hand half being shown in a central vertical section. Fig. 4 is a view in section of one of the cylinders showing the means for conveying the compressed air to the central pipe of the compressor, and showing the connection with the slotted drum for actuating the piston. Fig. 5 is a top view of the piston shown in Fig. 4. Fig. 6 is a view of another kind of cylinder, this form showing both the inlet and the outlet valves of the cylinder on the top thereof. Fig. 7 is a longitudinal central section of the check valve of the compressor. Fig. 8 is a section on line 8, 8, in Fig. 7, and Fig. 9 is a section on line 9, 9, in Fig. 7.

The compressor is mounted on a suitable base 10 for the reception of a suitable motor, preferably an electric motor. Mounted on the top of the support 10 is a casing 12 which has, projecting from the top thereof, the bars 13 which form a support for the horizontal plate 14, and projecting up therefrom are the posts 15 supporting, in their turn, the top plate 16, the whole being held together by the nuts 17 screwing on the top of the posts 15. This constitutes the supporting frame work of the machine or compressor.

Mounted centrally in the horizontal plate 14 is a bearing 18 which is designed to receive the anti-friction elements 19, which may be rollers or balls, and these serve to maintain, on the top, a drum 21 which is rotatable and is secured to the hollow shaft 20, which on one end is arranged in the bearing 18, and on the other end fits into a cup formed by the annular flange 12^a, this flange extending up from the bottom of the casing 12. The hollow shaft 20 is rotated by the worm-gear 22 which can be directly secured to the hollow shaft, or secured thereto by means of the disk 23. The worm-gear 22 is rotated by means of the worm 24 which is mounted on the shaft 25, the shaft 25 being coupled up

directly to the shaft of the motor 26, as shown in Fig. 1.

Secured between the top plate 16 and the supporting plate 14 is a series of cylinders 27. Each cylinder contains a piston for compressing air, and each piston is operated by a piston rod 28, the rod 28 fitting in the cross-head 29 and being adjustable therein by means of the nuts 30. A block 31 is secured in the cross-head, in each instance, and has a stud 32 projecting therefrom, the stud acting to rotatably hold a roller 33 which rolls into and is reciprocated by a cam slot 35 cut in the periphery of the drum 21. It will be seen that these rollers, and the respective cross-heads and piston rods are successively reciprocated by the rotation of the slotted drum. The cross-heads 29 are secured, on the two ends, by means of the sleeves 34 that are arranged to slide on the bars 13, the cross-heads thus having a positive and true path of travel.

We may employ, in the device, the cylinder shown in Fig. 6, the cylinder having the casing 36 which receives the piston 37. The valve casing 38 at the top of the cylinder includes an exhaust or outlet valve 39, and an inlet valve 40. The reciprocation of the piston will be seen to cause a flow of air in through the cylinder, out of the valve 39 and into the passage 41, there being one of these passages from each of the cylinders to a small chamber 42, preferably centrally located on the top plate 16. A plug 43 makes a closure for the chamber.

Extending down from the top plate and conveying the compressed air from the chamber, is a pipe 45 which can have installed, at a suitable point, the check valve 44. This pipe 45 extends down through the center of the compressor, passing through the hollow shaft 20, and connects, at any suitable point, with a storage tank 46 which is provided with a capacity sufficient for the needs of the establishment. The check valve in this pipe 45 is made as shown in Figs. 7, 8, and 9, the check valve having an inlet portion 47 forming a pipe connection, and having an outlet portion 48 forming a pipe connection. The valve is composed of two members screwed together, and one of the members has a projecting portion 49 which acts to receive the stem 50 of the valve, this stem having a longitudinal recess 51 and having the transverse openings 52 connecting with the recess. A flat head 53 is provided with cut away portions 54 to allow the passage of air around the head, and the gasket 55 can be installed on the top of the head and be forced against a valve seat to shut off the air. A spring 56 acts to hold the valve shut when no air is being compressed, and when there is no back pressure on the valve. This valve has been found to be the most satisfactory for compressed air purposes, the valve being positively guided, on the hollow stem, with the transverse openings 52 and the openings 53 around the head forming a passage for the air when the valve is opened.

When high speed is necessary, on a small machine for instance, we employ the construction of cylinder and piston shown in Figs. 4 and 5. The cylinder embraces an outer casing 57 provided, near the outlet end of the cylinder, with the perforations 58. An inner casing 59 is installed within the casing 57, and with perforations 60 on the end opposite to the perforations 58. This construction provides an annular space 61 between the inner cylinder 59 and the outer casing 57, and the air is taken in through the openings 58 and 60, so that when the piston comes down to draw the air in through the cylinder, the air rushes through the space 61 and tends to keep the cylinder cool, preventing overheating thereof. The piston 62 is screwed onto the end of the piston rod 28 in the illustration, but it can be secured thereto in any well known manner, and it has screwed to the top a plate 63 thereby clamping the cup or packing 64. Perforations 65 are drilled or suitably put in the piston, and the clapper 66 sets over the perforations 65 and closes them when the piston ascends, and opens them when the piston descends, the air thereby rushing through the perforations 65 and opening the clapper 66, the movement of the clapper being limited by the head of the screw 67. The outlet valve 39 is held closed when the piston descends, and the vacuum caused by the descent of the piston draws the air in. When the piston ascends to compress the air, the clapper 66 is forced tightly over the perforations 65, and there is no leak through the piston and there is a positive feeding of air into the passage 41 to be conveyed to the pipe 45.

This construction of air compressor is compact; the parts are simply arranged, and the feature of having the air pipe fitted down through the center saves considerable space, and allows the machine to be installed in the small portion of a building.

To regulate the air compressor and to stop it when the air has come to a predetermined point of compression, we put in a pipe 68 leading up from the tank 46 and connecting with the usual diaphragm 69 which operates a snap-switch operating mechanism 70. We are not explaining in detail the operation of the switch, as any well known form can be employed, and the particular form is fully illustrated and described in a co-pending application on the switch. The switch is designed to be operated by the diaphragm when a certain compression is reached, to break connection between the wires 71 and 72, thus cutting out the operation of the motor. The current is fed in through the feed wires 71 and 73, the wire 72 passing

from the motor to the switch. When the air pressure goes down, the diaphragm permits the snap-switch to again go shut, and makes the circuit between the wires 71 and 72, and the compressor again starts in motion. This permits the compressor being operated with constant manual regulation, and the device is very efficient.

The partition 12ª, inside the casing 12 that supports the hollow shaft 20, also acts to retain oil in the casing 12, the casing being filled with oil nearly to the top of the partition 12ª, and the gear and the worm thus running in oil are assured of lubrication.

The pipe for conducting air from the chamber 42 can be, if desired, led off in any direction from the top by simply displacing the plug 43 and inserting a pipe connection.

Having thus described our invention, what we claim is:—

1. An air-compressor comprising a base portion, a drum having a cam groove and rotatably arranged on the base portion, bars surrounding the drum, cylinders supported on the bars, pistons and their rods in the cylinders, cross-heads on the piston rods, a roller on each cross-head to enter the cam groove, and sleeves on the cross-heads to embrace the bars and slide thereon.

2. An air-compressor comprising a base portion, a drum rotatably mounted thereon, a series of bars around the drum, cylinders supported on the bars, pistons and their rods in the cylinders, means for operating the piston from the drum, cross-heads on the piston rods, and sleeves on the cross-heads to embrace the bars and slide thereon.

3. An air-compressor comprising a base portion, a drum rotatably mounted thereon, and having a central hollow portion and a peripheral cam groove, supporting bars around the drum, cylinders on the supporting bars, pistons and their rods in the cylinders, a cross-head on each piston rod, a roller on each cross-head to enter the cam groove, and a tubular sleeve on each end of the cross-head to embrace a supporting bar and slide thereon.

4. An air-compressor comprising a base portion, bars projecting therefrom, a horizontal plate, a top plate, cylinders between the plates, means within the bars to operate the cylinders, a chamber on the top plate, the top plate having passages from the cylinders to the chamber, and a check valve for each cylinder for controlling the flow of air through its passage.

5. An air-compressor comprising a base portion, bars projecting therefrom, a horizontal plate, a top plate, cylinders between the plates, means within the bars to operate the cylinders, a chamber on the top plate, the top plate having passages from the cylinders to the chamber, a check valve at the top of each cylinder leading into its passage, a pipe leading from the chamber, and a check valve in the pipe.

6. An air-compressor comprising a base portion, a rotating drum with a cam groove thereon, a series of bars around the drum, a horizontal plate, rods thereon, a top plate, cylinders between the plates, pistons and their rods in the cylinders, cross-heads on the piston rods and embracing and sliding on the bars, a chamber on the top plate, a passage from each cylinder to the chamber, a check valve in the top of each cylinder, a pipe passing from the chamber through the drum and the base portion, and a check valve in the pipe.

7. An air-compressor comprising a series of cylinders circularly arranged, a drum in the center of the cylinders for operating them the drum having a central perforation, a pipe passing from the cylinders through the perforation of the drum, a check valve in the pipe comprising a casing having pipe connections on its opposite ends, a valve seat in one end, a hollow valve stem fitting the casing, the hollow stem having transverse openings, a head with recessed side edges fitting against the valve seat, and a spring under the head to hold it shut.

8. An air compressor comprising a base portion, a centrally perforated drum mounted thereon, a series of cylinders arranged beyond the periphery of the drum, means for operating the cylinders from the drum, and an outlet pipe connected to each cylinder by a radial passage, the outlet pipe passing down through and beyond the perforation in the drum.

9. An air compressor comprising a base portion, a centrally perforated drum mounted thereon, a series of cylinders arranged beyond the periphery of the drum, means for operating the cylinders from the drum, a motor on the base portion operatively connected with the drum to rotate it, and an outlet pipe connected to each cylinder by a radial passage, the outlet pipe passing down through and beyond the perforation in the drum.

10. An air compressor comprising a base, a casing on the base, a horizontal plate supported above the casing, a hollow shaft supported by the casing and the plate, a drum on the hollow shaft, a driving mechanism in the casing for rotating the hollow shaft, a series of cylinders on the horizontal plate, means for operating the cylinders from the drum, and an outlet pipe leading from the cylinders through the hollow shaft.

11. An air compressor comprising a base, a casing on the base, a horizontal plate supported above the casing, a circular partition projecting from the bottom of the casing, a hollow shaft journaled in the partition of the casing and the horizontal plate, a drum on the shaft, a gear wheel on the shaft within

the casing, mechanism for rotating the gear wheel, cylinders on the plate, and mechanism for operating the cylinders from the drum.

12. In an air compressor, a cylinder, a piston in the cylinder having ports therein and having a valve for the ports, a cylindrical casing concentric to the cylinder and outside of the same, the cylinder and the casing having openings in opposite ends, the openings being disposed around the cylinder and casing to form a cooling chamber and passage between them.

In testimony that we claim the foregoing, we have hereunto set our hands this 11th day of April 1907.

GEORGE F. HALL.
BENJAMIN ALBERTSON.

Witnesses:
WM. H. CAMFIELD,
E. A. PELL.