No. 838,140. PATENTED DEC. 11, 1906.

L. H. ROGERS.

AIR COMPRESSOR.

APPLICATION FILED FEB. 2, 1905.

4 SHEETS—SHEET 1.

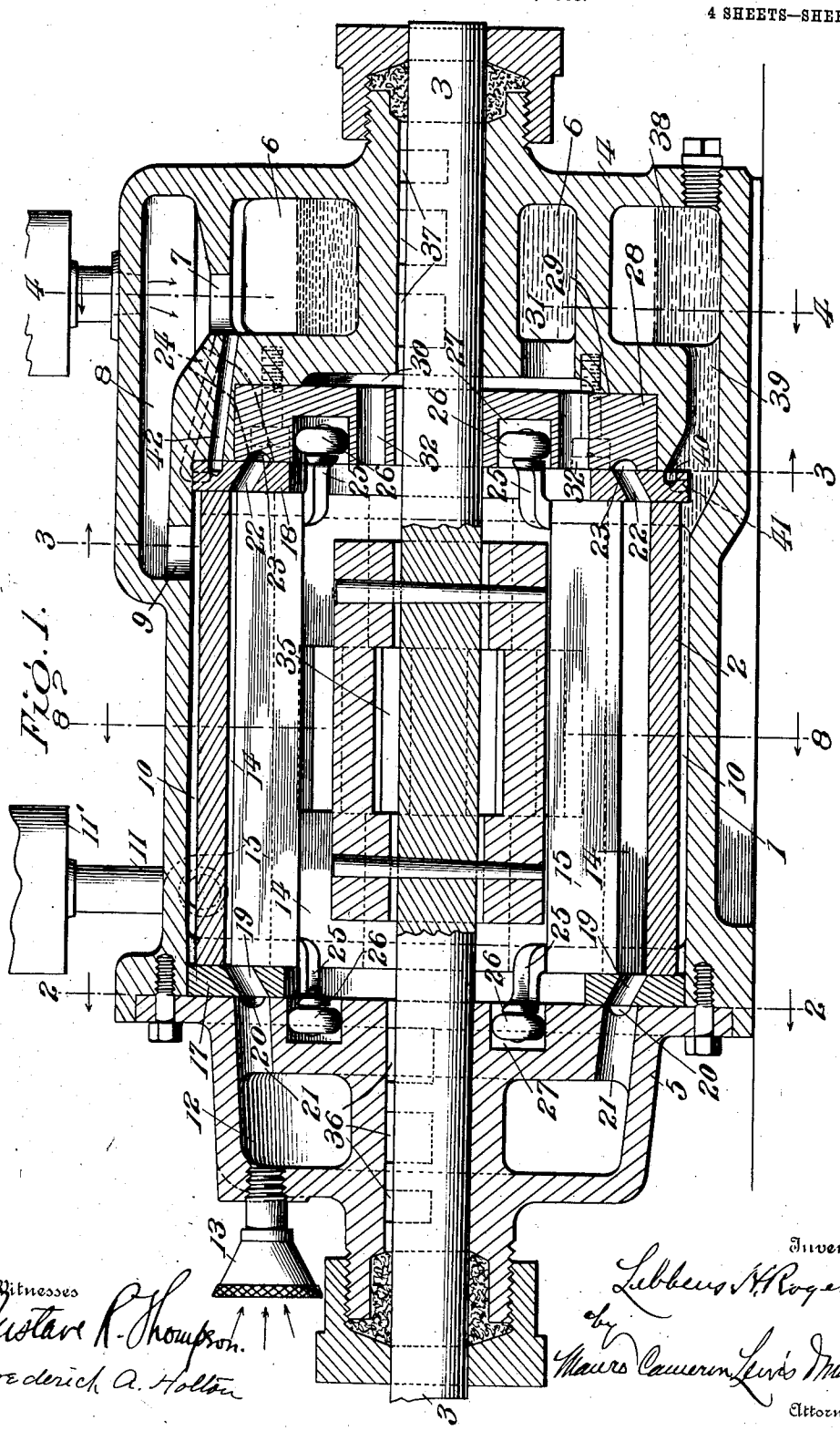


Fig. 1.

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4 SHEETS—SHEET 2.

Fig. 2.

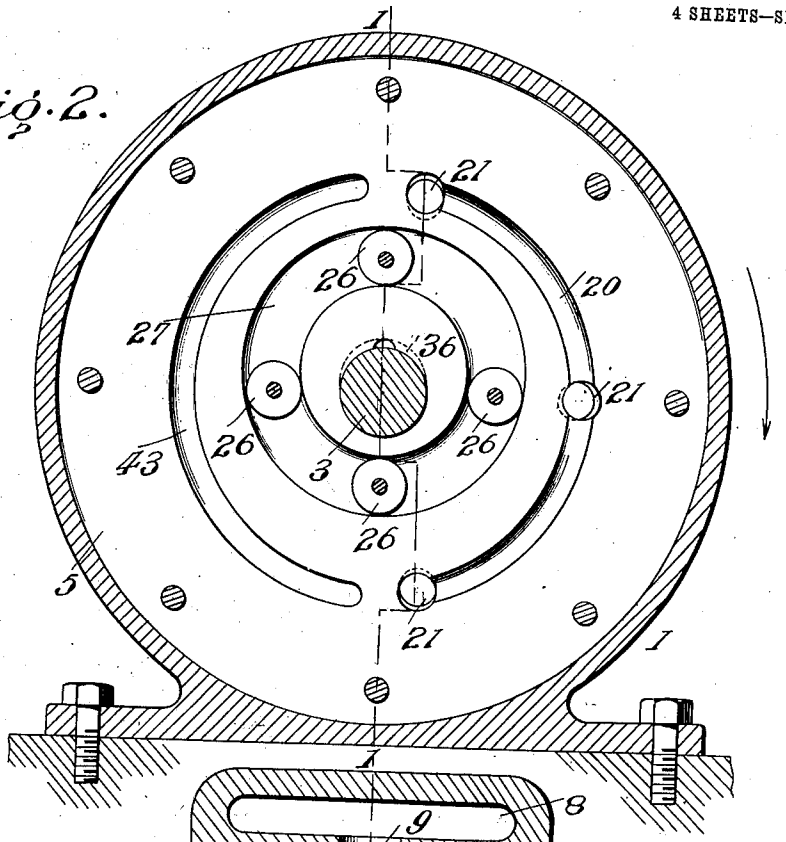
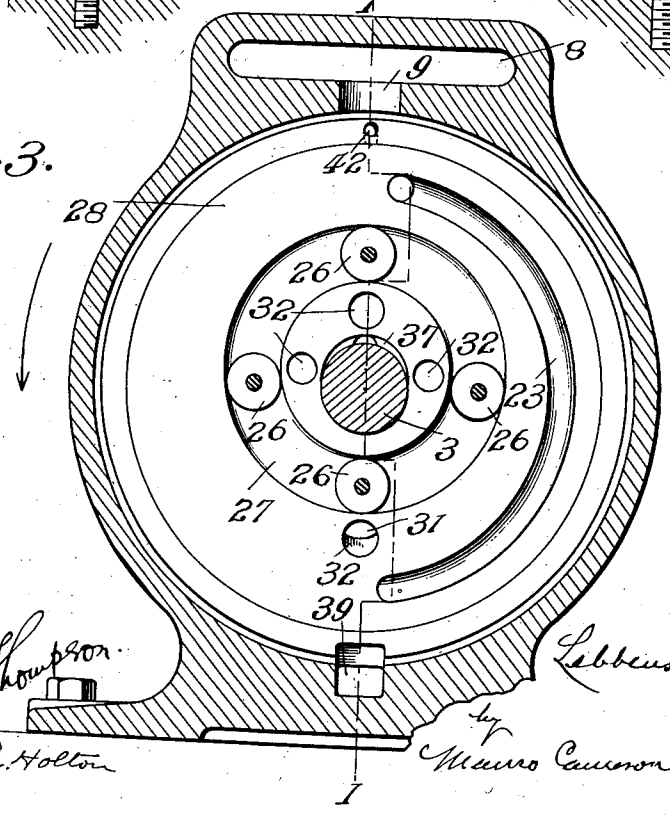


Fig. 3.



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4 SHEETS—SHEET 3.

Fig. 4.

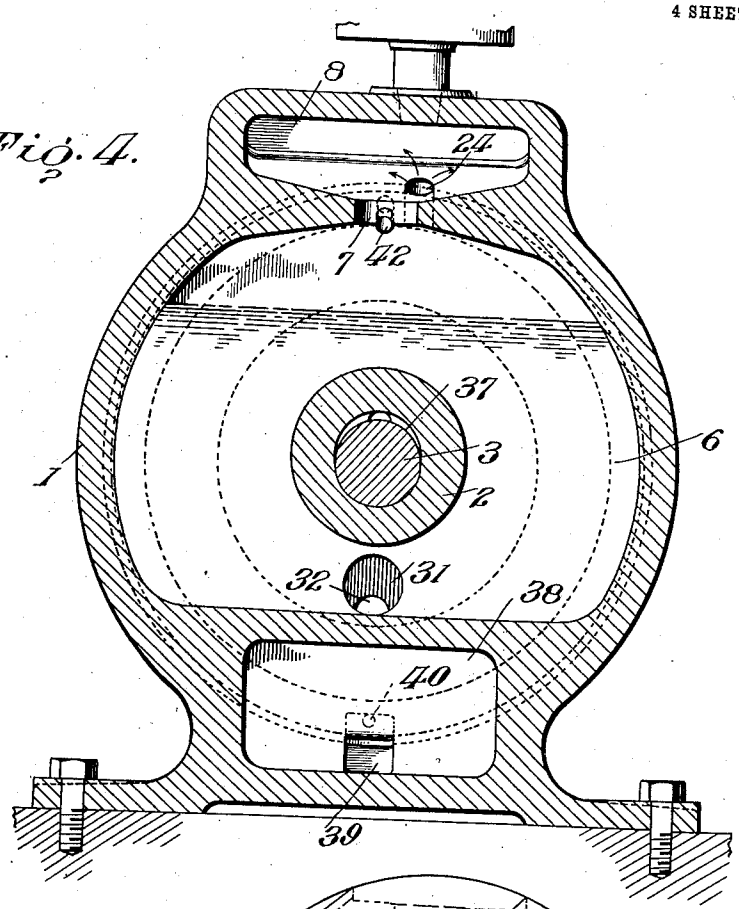
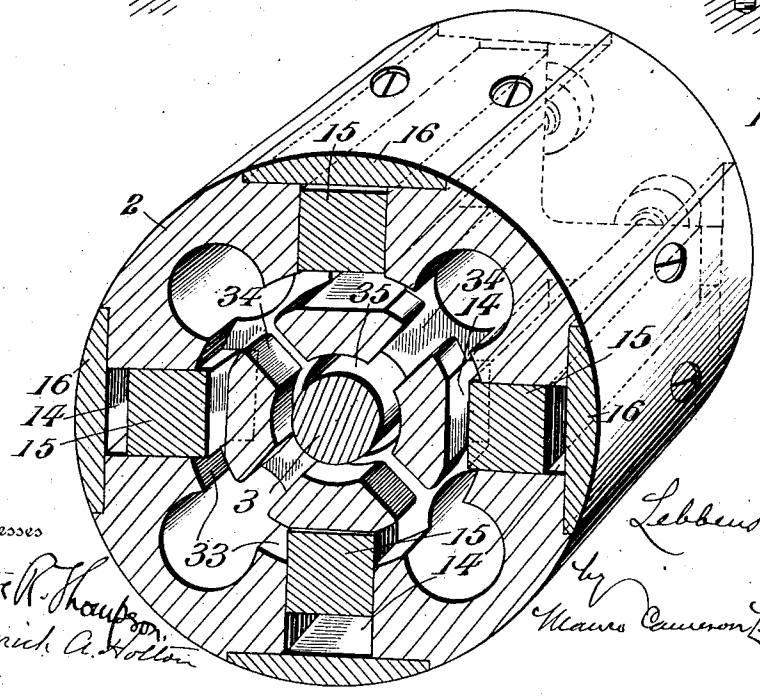


Fig. 5.



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4 SHEETS—SHEET 4.

Fig. 6.

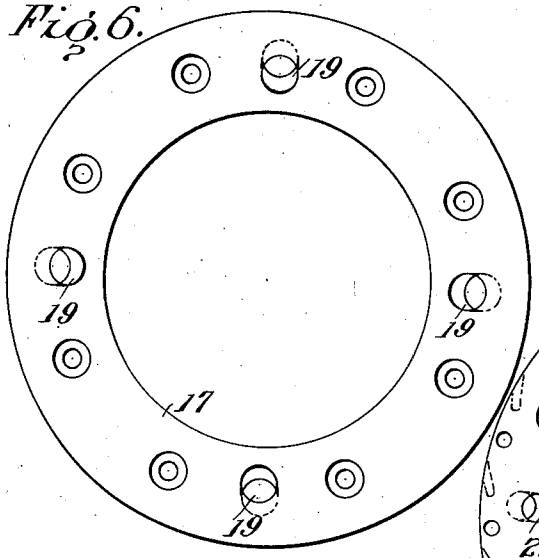


Fig. 7.

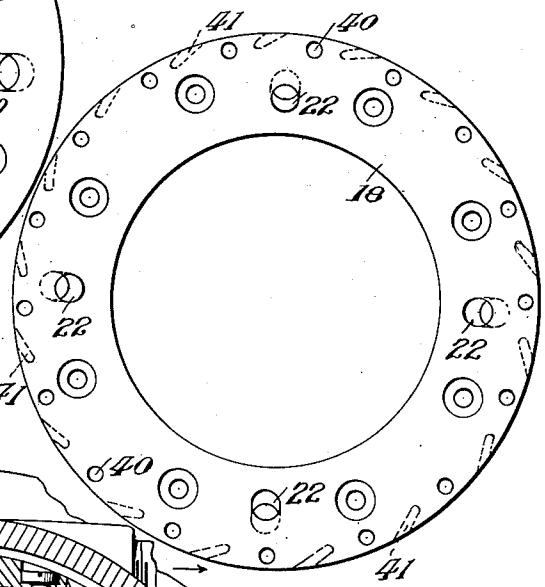
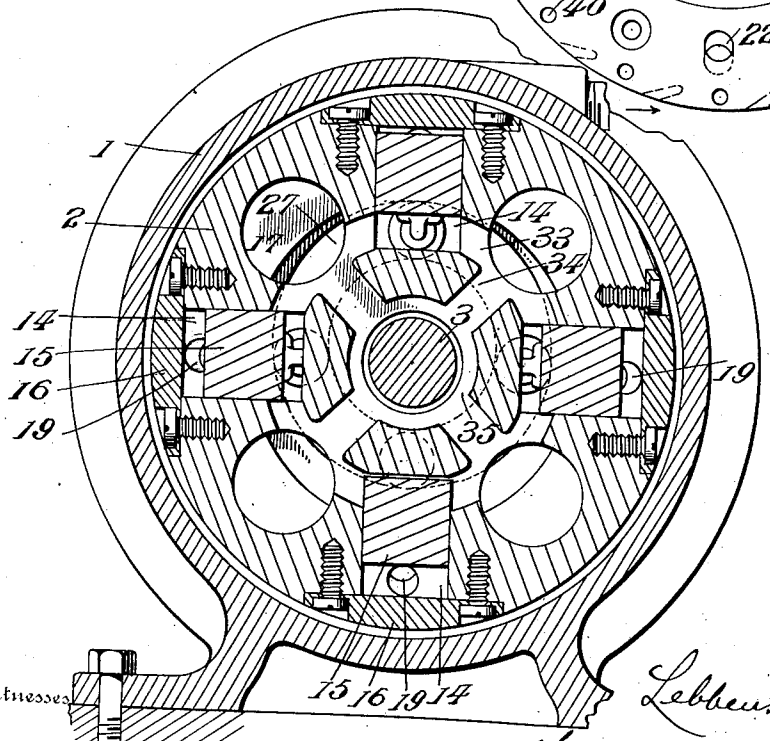


Fig. 8.



Witnesses

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UNITED STATES PATENT OFFICE.

LEBBEUS H. ROGERS, OF NEW YORK, N. Y.

AIR-COMPRESSOR.

No. 838,140. Specification of Letters Patent. Patented Dec. 11, 1906.

Application filed February 2, 1905. Serial No. 243,868.

To all whom it may concern:

Be it known that I, LEBBEUS H. ROGERS, a resident of New York, N. Y., have invented a new and useful Improvement in Air-Compressors, which invention is fully set forth in the following specification.

This invention relates to air-compressors, and more particularly those of the rotary type. In my United States applications, Serial No. 223,913, filed September 9, 1904, and Serial No. 231,800, filed November 7, 1904, I have shown compressors of this type in which oil or other suitable fluid under pressure is admitted to the rear of reciprocating pistons, which together with other features were designed to avoid clattering noises and friction in the operation of the compressor and to otherwise improve its construction and operation.

The present invention embodies improvements upon the structures of the said applications and is designed to permit a less obstructed flow of the oil or other fluid under pressure to the desired parts of the compressor to more effectively balance the pressure, to more compactly arrange the parts, to facilitate its installation in restricted spaces, and to generally improve the construction and operation of compressors of this type.

With these objects in view the invention consists of the improved features of construction hereinafter described and then pointed out in the claims.

While the invention is capable of receiving various mechanical expressions without departing from the principle thereof, the preferred embodiment is shown for the purpose of illustration in the accompanying drawings, in which—

Figure 1 is a vertical longitudinal section on the lines 1 1 of Figs. 2 and 3. Fig. 2 is a transverse section on line 2 2, Fig. 1. Fig. 3 is a like section on line 3 3, Fig. 1. Fig. 4 is a vertical transverse section on line 4 4, Fig. 1. Fig. 5 is a sectional perspective of the piston-drum and its pistons, showing the communicating channels at the rear of the pistons. Figs. 6 and 7 are end elevations of the end closure-rings on the piston-drum; and Fig. 8 is a vertical transverse section on the line 8 8, Fig. 1.

Referring to the drawings, in which like numerals indicate like parts, 1 is the cylinder or casing, within which is mounted the piston-drum 2 on shaft 3, having bearing in the cylinder-head 4, integral with the cylinder 1, and cylinder-head 5, detachably secured thereto. Within the head 4 is the oil-chamber 6, which communicates through port 7 with condenser-chamber 8, which in turn communicates with the interior of the cylinder 1 by port 9. The exterior diameter of drum 2 is somewhat less than the interior of cylinder 1, so that there is an annular air-space 10 between the two, from which space the conduit 11 leads to the air-reservoir 11′. Within the detachable head 5 is the air-chamber 12, having inlet-valve 13 opening from the atmosphere.

The piston-drum 2 has longitudinal channels 14, Figs. 5 and 8, within which pistons 15 reciprocate, the said channels being closed at the drum's periphery, preferably by detachable plates 16, while the ends of the channels are also partly closed by end rings 17 and 18, (see Figs. 1, 6, and 7,) the ring 17 being at the end adjacent to the air-chamber 12 and the ring 18 adjacent to oil-chamber 6. The ring 17 has ports 19, through which air passes to the channels 14 from the groove 20, which groove communicates with the air-chamber 12 through ports or ducts 21. The ring 18 has ports 22, leading to groove 23, Fig. 1, which in turn has a duct 24, (shown in dotted lines, Fig. 1,) leading to the condenser 8. The pistons 15 have trunnions 25, which engage through the medium of antifrictional bearings 26 in eccentric grooves 27 in the ends of the cylinder 1. These eccentric grooves 27 may be located directly in the cylinder-heads or in a cam-plate secured in said heads. As here shown, one of these grooves is formed in the detachable head 5 and the other is formed in a plate 28, secured in a recess in the integral head 4, (see Fig. 1,) the plate resting on an annular ledge 29, so as to leave a space 30, which is in communication with oil-chamber 6 via port 31. This space 30 is open to the interior of the drum 2 via ducts 32 in the cam-plate 28 and the interior of the end ring 18. By reference to Figs. 5 and 8 it will be seen that all the channels are connected at their bottoms by ducts 33 and 34 and a chamber 35, so that as the pistons reciprocate the oil freely passes from one

channel to the other without meeting any resistance, such as would result if it flowed through restricted ports. Moreover, the oil passes through the drum 2 and the interior of ring 17, filling the cam-groove 27 in cylinder-head 5, and also passing to the chambers 36 in the shaft-bearing in said head. The oil also reaches the chambers 37 in the shaft-bearing in cylinder-head 4.

Referring to Figs. 1 and 4, 38 is a chamber formed in the lower portion of cylinder-head 4 and communicating with the interior of the cylinder via port 39. This chamber 38 is for the reception of any oil that may be carried by the air past condenser-chamber 8 to the interior of the cylinder 1 or that may leak past the joints between the drum and cylinder. The following provision is made for returning the oil from chamber 38 to chamber 6: The end closure-ring 18 has pockets or depressions 40 on its face and 41 on its periphery, which pockets during the revolutions of the drum and ring pick up the oil at the port 39, Fig. 1, and carry it up to the conduit 42, leading from the ring 18 to the oil-chamber 6. After the pockets 40 41 rise out of the port 39 the oil is retained in them by the walls inclosing the ring, but escapes therefrom when the pockets reach the enlarged conduit 42 and flows by gravity into the oil-chamber 6.

By referring to Figs. 1, 2, and 3 it will be seen that the air in entrance-groove 20 is at atmospheric pressure, while that in exit-groove 23 is at a higher or reservoir pressure, and consequently the pressure in groove 23 is always forcing the drum from right to left in Fig. 1 and tending to create friction between the outer face of the ring 17 and the head 5. To avoid this friction, means are provided whereby an air-pressure is exerted on the ring 17 equaling and in opposition to that exerted on the ring 18 through the groove 23. As here shown, these means take the form of a groove 43 in the interior face of the removable cylinder-head 5, which groove 43 is in communication with the piston-channels 14 via ports 19 in ring 17 at the same time that said channels 14 are in communication with groove 23 via ports 22—that is, during the compression-stroke of each piston. It follows from this construction that the pressure per unit of surface in the two grooves 23 and 43 is the same, and since these grooves are exactly alike it follows that the pressure in one tending to force the drum in one direction is counterbalanced by the pressure in the other tending to force the drum in the opposite direction.

From the foregoing it will be understood that the pistons 15 reciprocate radially in their channels, making one complete reciprocation at each revolution of the shaft 3 by reason of their engagement in the eccentric grooves 27. During their inward stroke air is drawn into the piston-channels 14 by way of air-chamber 12, ports 21, groove 20, and ports 19, and during their outward stroke air is forced to the reservoir via ports 22, groove 23, duct 24, condenser 8, port 9, space 10 between the drum and cylinder, and conduit 11. Any oil that may have found its way into the piston-channels 15 or groove 23 will be forced out through duct 24, with the air, into the condenser 8, from whence the greater portion will fall by gravity through port 7 into oil-chamber 6. With the parts properly constructed and fitted together the amount of oil thus forced out through the duct 24 will be small.

The surface of the oil in chamber 6 being exposed to reservoir-pressure, the oil will be forced via ports 31 and 32 to the interior of the drum, and the rear of all the pistons 15 will thus be exposed to reservoir-pressure, and since all the piston-channels 14 are in free communication with each other and with the interior chamber 35 via passages 33 and 34 it will be seen that the oil displaced by the inward stroke of one piston is exactly and freely compensated for by the oil required to fill the space due to the outward stroke of the opposite piston. Moreover, since all the parts move freely in oil under pressure friction is reduced to a minimum and clattering or other noises eliminated. The drum is balanced, as it were, in the cylinder, since all pressure exerted upon it at any point is balanced by an exactly equal and oppositely-directed pressure at another point.

What is claimed is—

1. In a compressor, a cylinder, a drum revolving in said cylinder, a piston in said drum, an oil-chamber, a conduit leading therefrom to the rear of said piston, and means operated by the drum for delivering oil from said cylinder to said oil-chamber.

2. In a compressor, a cylinder, a drum revolving therein, an oil-chamber communicating with the interior of said drum, a compressor-piston in the drum, and a reservoir in open communication with the drum, the cylinder and the oil-chamber.

3. In a compressor, a cylinder, an air-chamber in one head and an oil-chamber in the other head thereof, and a compressor-drum carrying pistons in channels which communicate with the air-chamber in front of the pistons and the oil-chamber in the rear thereof.

4. In a compressor, a cylinder, an air-chamber in one head and an oil-chamber in the other head thereof, a compressor-drum closed on its periphery and revolving in said cylinder, piston-channels in said drum, pis-

tons therein, open passages for oil from the oil-chamber to the rear of said pistons and from one piston to another, an air-reservoir and conduits leading from the air-chamber to the piston-channels and from the piston-channels to the air-reservoir.

5. In a compressor, a cylinder, a revolving drum therein having pistons and piston-channels, an oil-reservoir communicating with said channels to the rear of the pistons, an oil-chamber receiving any leakage, and means operated by said drum transferring oil from said leakage-chamber to the oil-reservoir.

6. In a compressor, a reservoir, a cylinder, a drum therein closed on its periphery and having pistons and piston-channels, an outlet-groove in one of the cylinder-heads communicating with the reservoir and the piston-channels on the pressure side of the compressor, and a corresponding groove in the other cylinder-head and communicating only with the piston-channels on the pressure side of the compressor.

7. In a compressor, a cylinder, a drum within the same having piston-channels communicating freely at their bases, pistons reciprocating within said channels, and means introducing fluid under pressure to said channels at the rear of the pistons.

8. In a compressor, a cylinder, a drum revolving therein, radial piston-channels in said drum and freely communicating with each other through the interior of the drum, an oil-reservoir whose contained oil is under pressure, and a conduit connecting said reservoir and the interior of said drum.

9. In a compressor, a cylinder, a drum within said cylinder whose exterior diameter is less than the interior diameter of the cylinder, whereby an annular space is left between the drum and cylinder, pistons and piston-channels in said drum, a compressed-air reservoir communicating with said annular space, and an oil-chamber in the cylinder-head and communicating with said space and the piston-channels in rear of said pistons.

10. In a compressor, a cylinder, a drum within and of less diameter than the interior of the cylinder, whereby an annular space is left between the drum and cylinder, pistons and piston-channels in said drum, a compressed-air reservoir communicating with said annular space, an oil-supply reservoir also communicating with said space and with the interior of the drum, a leakage or secondary oil-chamber also in communication with said space, and means transferring oil from said leakage-chamber to said oil-supply reservoir.

11. In a compressor, a cylinder, a compressor-drum therein carrying compressing-pistons, a compressed-air reservoir, an oil-chamber open to the said reservoir and communicating with the interior of said drum behind said pistons, a leakage oil-chamber, and means transferring oil from said leakage-chamber to said first-mentioned oil-chamber.

12. In a compressor, a cylinder, a revolving compression-drum therein having a closed peripheral wall and having all inlet-ports on one end only and outlet-ports on the other end only.

13. In a compressor, a cylinder, a revolving compression-drum therein, compression-pistons reciprocating radially within said drum, inlet-ports in one cylinder-head only, outlet-ports in the other head only, and conduits for admitting fluid-pressure to the rear of said pistons through the latter head only.

14. In a compressor, a compressed-air reservoir, a cylinder, a revolving compression-drum therein, compression-pistons reciprocating radially within said drum, inlet-ports in one cylinder-head only, outlet-ports in the other head only and leading to the said reservoir, an oil-chamber open to pressure from said reservoir, and conduits from said chamber to the rear of said pistons in the drum.

15. In a compressor, a compressed-air reservoir, a cylinder, a revolving compression-drum therein having a closed peripheral wall, and means subjecting the periphery and ends of said drum to the same pressure.

16. In a compressor, a compressed-air reservoir, a cylinder, a revolving compression-drum therein having a closed periphery, and means subjecting the periphery and ends of said drum to reservoir-pressure.

17. In a compressor, a compressed-air reservoir, a cylinder, a revolving compression-drum therein having a closed periphery, radially-operating compression-pistons therein, and means subjecting the periphery and ends of said drum and the rear faces of said pistons to reservoir-pressure.

18. In a compressor, a compressed-air reservoir, a cylinder, a shaft passing longitudinally through said cylinder, a compression-drum on said shaft within the cylinder, an oil-chamber at one end of the cylinder and open to pressure from said reservoir, and a passage for the oil from said chamber through said drum and to one side of said shaft in its bearings.

19. In a compressor, a compressed-air reservoir, a cylinder, a shaft having bearings in the heads of the cylinder, a compression-drum within the cylinder, radially-operating pistons in said drum and means subjecting the periphery of said drum, the rear faces of the pistons and the shaft in its bearings to reservoir-pressure.

20. In a compressor, a cylinder, a revoluble piston-carrying drum in said cylinder, radially-disposed piston-channels in said

drum said channels being in open communication with the interior space of said drum, reciprocating pistons in said channels, the spaces back of said pistons being filled with a liquid under reservoir-pressure, and means for operating said pistons to maintain a constant volume of liquid within the drum back of said pistons.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

LEBBEUS H. ROGERS.

Witnesses:
L. HARDING ROGERS, Jr.,
ALBERT R. ROGERS.