

Oct. 9, 1923.

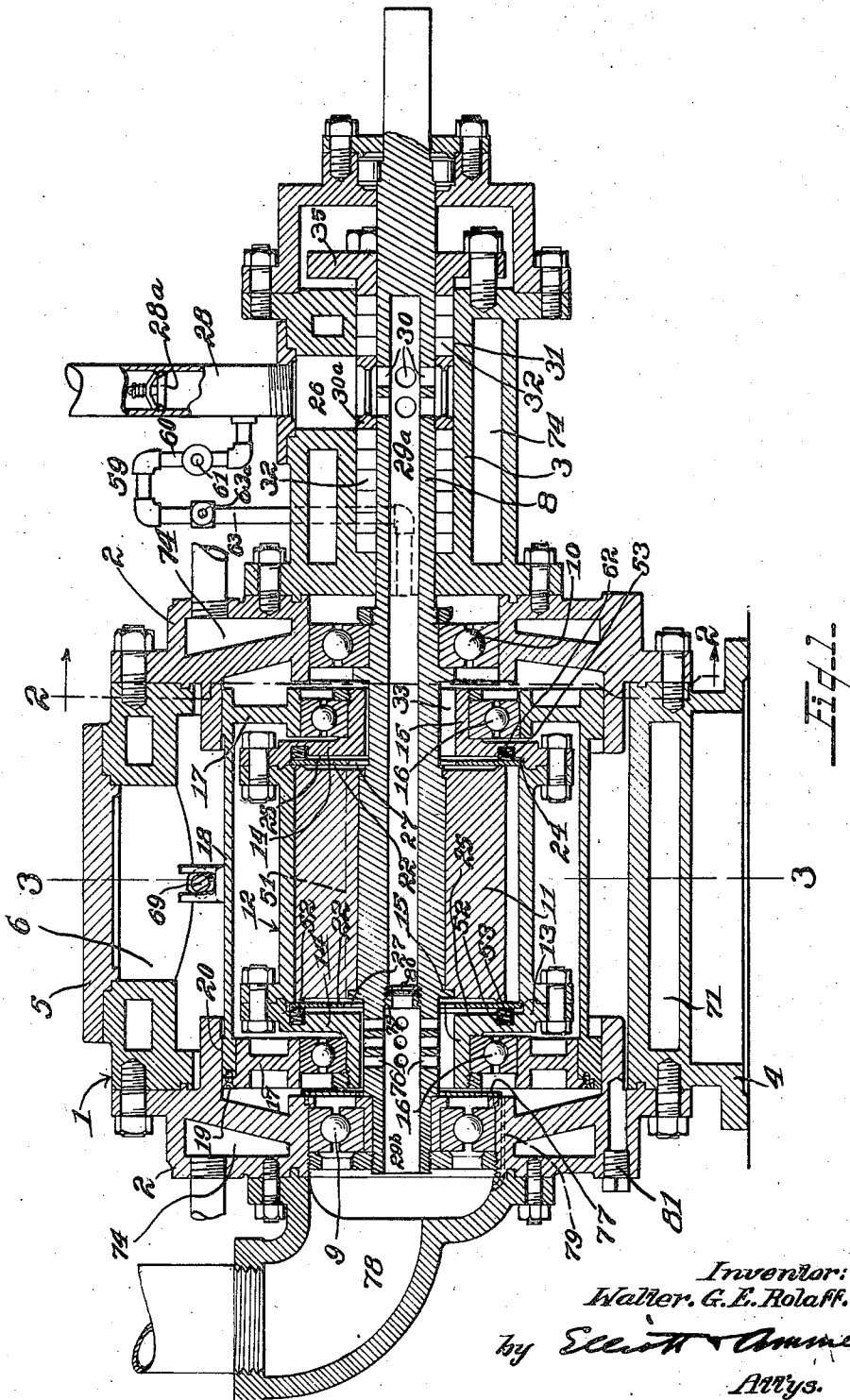
1,470,030

W. G. E. ROLAFF

ROTARY COMPRESSOR

Filed Dec. 19, 1919

3 Sheets-Sheet 1



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ROTARY COMPRESSOR

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Fig. 2.

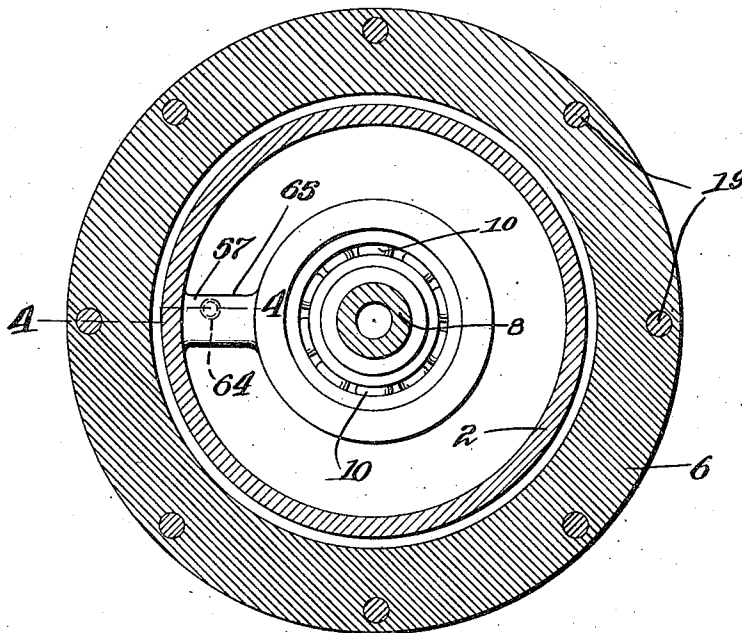
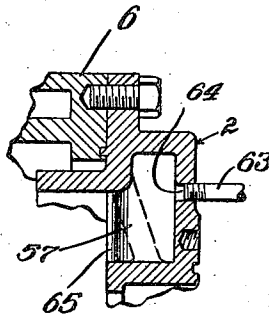


Fig. 4.



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Fig 5

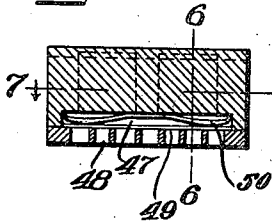


Fig 6

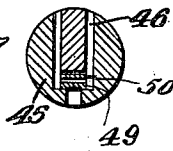


Fig 7

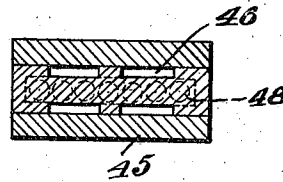
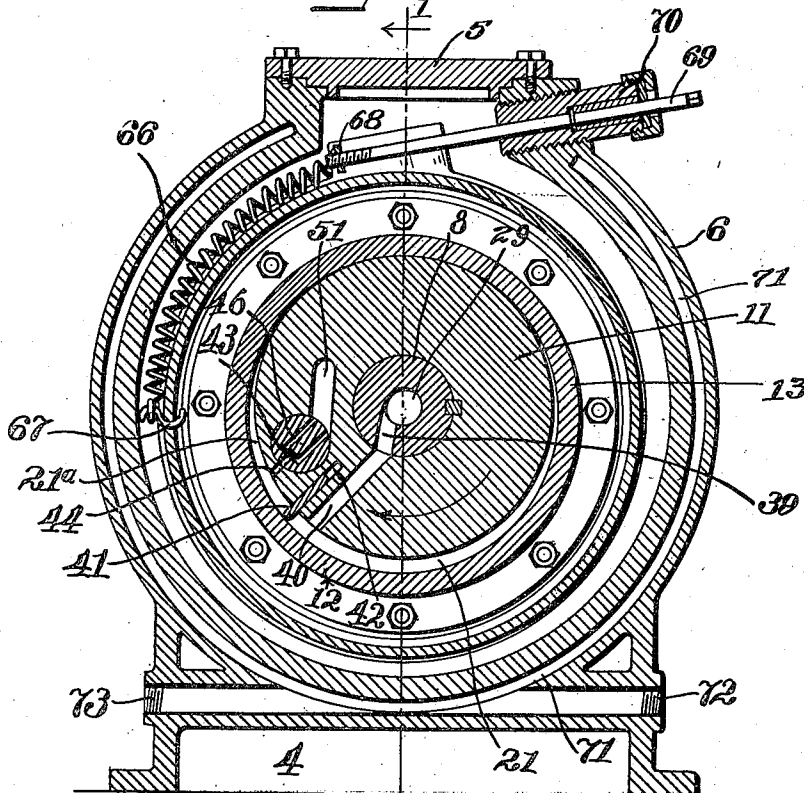


Fig 3



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UNITED STATES PATENT OFFICE.

WALTER G. E. ROLAFF, OF BELLEVILLE, ILLINOIS.

ROTARY COMPRESSOR.

Application filed December 19, 1919. Serial No. 345,935.

To all whom it may concern:

Be it known that I, WALTER G. E. ROLAFF, a citizen of the United States, residing in the county of St. Clair, city of Belleville, and State of Illinois, have invented new and useful Improvements in Rotary Compressors, of which the following is a specification.

This invention relates to rotary machines such as the rotary compressors employed for compressing ammonia gas, air or other fluids.

The general object of the invention is to produce a rotary compressor, the characteristics of which are lightness of weight and compactness combined with efficiency in operation; also to provide ample means for relieving any excessive or dangerous pressure developed in the compressing chamber, and to provide an improved system of lubrication for the bearings and other parts of the compressor. Such compressors are frequently operated with a regulating system functioning in such a way that if the pressure in the storage reservoir to which the compressor delivers, drops below a given point, the motor and compressor start up automatically, and when the pressure rises in the reservoir to a predetermined pressure, the motor and compressor are automatically stopped. It is desirable that a compressor used in such a system should respond quickly to the conditions of the regulating system, that is to say, it should promptly cease to deliver the compressed fluid after the motor is shut off. It is also desirable that in starting up the motor that drives the compressor, especially where the motor is of relatively low power for the compressor, the load should be placed on the compressor gradually. One of my objects has been to provide a compressor which will substantially meet such requirements, that is to say, to provide a compressor which will operate in practice so that the pressure load will gradually come onto the compressor when the motor is starting up, and which will also operate in such a way that when the compressor commences to stop, a very slight reduction in its speed will result in unloading the compressor in such a way as to stop or arrest the forcing of the compressed fluid into the reservoir; one of the objects has been to provide a construction tending to effect the separation of the lubricating oil from the compressed fluid.

Further objects of the invention will appear hereinafter.

The invention consists in the novel features, and in the general combination of parts to be particularly described hereinafter, all of which contribute to produce a simple and efficient rotary compressor. A preferred embodiment of my invention will be particularly described in the following specification, while the broad scope of my invention will be pointed out in the appended claims.

In the drawing,

Figure 1 is a longitudinal vertical section through a compressor embodying my invention; this section is taken on the line 1—1 of Figure 3;

Figure 2 is a vertical cross-section taken on the line 2—2 of Figure 1;

Figure 3 is a vertical cross-section taken on the line 3—3 of Figure 1;

Figure 4 is a horizontal section broken away, and taken about on the line 4—4 of Figure 2;

Figure 5 is a longitudinal section through the outlet valve of the compressor;

Figure 6 is a cross-section through this valve taken on the line 6—6 of Figure 5; and

Figure 7 is a horizontal section of the valve taken about on the line 7—7 of Figure 5.

The adaptation of my invention described below is applied to fluid compressing apparatus comprising a casing 1 including two heads 2, one of which carries a stuffing box 3; these heads are attached on the ends of the body 6 of the casing. The casing body 6 is formed below into a base 4 and is closed on its upper side by a cover plate 5.

The compressor which is carried within the casing is of rotary type and preferably constructed so that the cylinder of the compressor rotates with a drum lying within the cylinder, and I provide means for circulating a lubricating oil through the interior of the compressor and past the bearings of the compressor. I also provide a delivery-head which receives the compressed fluid from the compressor and this delivery-head is preferably located near the axis of the shaft so that the oil is separated from the compressed fluid. I provide means for catching the lubricating oil within the casing and for circulating it through the bearings and through the compressor, and the

operation of the circulating system is such as to effect the gradual loading of the motor in starting, and the quick unloading in stopping. In order to attain these effects, I provide a central shaft 8 which is preferably hollow and rotatably mounted on ball-bearings 9 and 10 mounted in the casing. The shaft carries a drum 11, which is eccentrically mounted within a compressor cylinder 12, which cylinder comprises an annulus or shell 13 to the ends of which, heads 14 are attached, these heads 14 being provided with tubular trunnions 15 which are rotatably mounted by means of ball-bearings 16 in the body section of the casing. I prefer to mount these ball-bearings 16 on two large eccentric heads 17, one of which is integral with a cylinder-shell 18, the other eccentric head being attached to the shell by means of suitable screws 19 (see Fig. 2); the eccentric heads 17 and shell 18 constitute a large adjusting eccentric for regulating the contact between the drum 11 and cylinder-shell 13. The eccentric heads are rotatably mounted in bores 20 of large diameter which are formed in annular flanges projecting in from the inner faces of the heads 2. These bores 20 are co-axial with each other and concentric to the axis of the shaft 8.

The surface of the drum 11 touches the inner surface of the shell 13 of the cylinder (see Fig. 3) and as the drum is of slightly smaller diameter than the shell 13, a crescent shaped compression chamber 21 is formed between the drum and the shell. The ends of this compression chamber are formed by means of relief heads or floating heads 22 that lie against the end faces 23 of the drum and against the end faces 24 of the shell 13, which faces are flush with each other. The relief heads 22 are free to rotate but are held in alignment by the real heads 14 which engage their edges. I provide means for admitting the fluid pressure to the outer sides of the floating heads to produce a force to hold them against the ends of the drum and shell 13. This may be accomplished by developing a differential effective pressure on the opposite faces of the floating heads. In this way, I provide for counterbalancing the force exerted by the fluid so that there is a slight excess of force on the outer side. For this purpose the middle portion of each end face of the drum is cut away or depressed so as to form a pocket or recess 25 in each end of the drum. The central portion of these discs or floating heads 22 are formed with large openings 27 through which the shaft 8 passes.

The air, ammonia, or other fluid which is to be compressed in the compressor is admitted by means of a down-pipe 28 (see Fig. 1) into a chamber 26 formed in stuffing box 3. In order to admit the fluid to be compressed from the chamber 26 into the

interior of the cylinder, I provide the shaft 8 with a longitudinal bore, a portion 29^a of which constitutes an intake port or duct, and with this duct, communicates a plurality of orifices 30 which are formed through the wall of the shaft and through a bushing 30^a. The bore 31 of stuffing box 3 is provided with packing rings 32 on each side of the bushing 30^a, the packing rings and the bushing 30^a being held in place by a gland 35. The fluid is drawn along the bore 29^a toward the drum, and passes through a port 39 (see Fig. 3) into a substantially radial inlet passage 40 which emerges on the cylindrical face of the drum. This inlet passage for the fluid is located just to the rear (with respect to the direction of rotation) of a piston which is preferably in the form of a radially disposed plate or blade 41 which slides in and out in a guide slot 42 in the drum, so that it traverses the compressing chamber 21 as the drum rotates. This piston blade may be of any improved form that will insure efficient packing of its lines of contact with the floating heads and the shell 13. The outer edge is held against the shell 13 by centrifugal force as the drum and cylinder 12 rotate.

As the rotation takes place in the direction of the arrow indicated in Figure 2, the fluid, such as air or ammonia, is compressed in the forward portion 21^a of the compression chamber 21 which is forward of the piston blade 41, and the compressed fluid finds outlet through an outlet valve 43 of multiple port type, the details of which are illustrated in Figures 5 to 7. This valve is located back of a longitudinal slot 44 which is an outlet in the wall of the drum, and consists of a substantially circular block 45, (see Fig. 6) having four ducts 46 which communicate with a valve-chamber 47. This valve-chamber is located directly back of a plurality of valve-openings 48 which are normally closed by an elongated valve in the form of a plate 49 lying in the valve-chamber 47 and held against the inner ends of the valve-openings 48 by means of a leaf spring 50. This device operates as a multiple port check-valve.

Now, when the pressure rises in the portion 21^a of the compression chamber 21, forward of this piston plate 41, this valve plate 49 opens and the fluid passes through the ducts or ports 46 back into a large passage 51 (see Fig. 3) which is formed longitudinally in the drum. Any suitable means may be provided for conducting this compressed fluid away from the compressor which is consistent with a construction operating in such a way as to admit the fluid to the outer sides of the floating heads. I provide escape passages 33 beyond the relief heads into which the compressed fluid may escape past the heads if the pressure

within the cylinder 12 should rise suddenly to a dangerous point, and these passages 33 may operate as ordinary receivers for the compressed fluid. These receivers or passages extend over the outer faces of the relief heads so as to subject them to pressure. In the present instance, the passage 51 emerges on the end faces delivering the compressed fluid through the aforesaid openings 27 into the relief passages or escape passages 33 and through the tubular trunnions 15. The chambers around the outer sides of the floating heads, therefore constitute receivers for the fluid under pressure. The outer sides of the floating heads 22 are exposed to this fluid pressure which is developed by the compressor. On account of the recesses 25, it will be evident that the fluid pressure is admitted to the inner faces as well as the outer faces of these heads and the force on the opposite faces is nearly balanced. There is, however, an excess of total pressure or force developed on the outer sides of the heads by reason of the fact that the areas opposite the faces 23 and 24 of the drum and shell 13 are not balanced. Hence, it will be seen that these heads 22 are held yieldingly against the ends of the drum by reason of the excess of effective area exposed to the fluid pressure on the outer sides of the floating heads. I also provide additional yielding means tending to hold the floating heads up against the drum, in the form of a plurality of small spiral springs 52 which are disposed in pockets 53 on the inner faces of the heads 14. (See Fig. 1.)

The rotary parts within the compressor throw off the lubricating oil by centrifugal force. I provide means substantially in the plane of rotation of these parts for catching the oil, and I also provide means for returning this oil to the compressor. This means is preferably so organized as to effect the gradual loading of the compressor by by-passing the compressed fluid with the lubricating oil when the compressor starts up. In this way I effect the gradual choking of the by-pass when the compressor starts up. For this purpose, the interior of the casing is provided with means for catching the oil which may consist of a basin 57 (see Figs. 2 and 4) formed on one of the heads 2, and in which the oil accumulates as it is thrown out from the shaft and adjacent bearings. When the machine is in operation, a bath of lubricating oil accumulates in the basin 57, filling the same. In order to return this lubricating oil to the intake ports 30, I provide a by-pass 59 comprising a short vertical pipe 60 in which is connected a sight-feed 61, through which the oil passes downwardly, the lower end of the pipe being connected to the intake pipe 28. A valve 63^a is provided for regulat-

ing the flow through the by-pass. A pipe 63 forming part of the by-pass connects to the basin 57 through an outlet 64 in the side of the basin and the relation of this outlet to the overflow edge 65 of the basin is important, as effecting the mode of operation of the compressor, as will appear hereinafter.

I shall now describe the purpose of the eccentric heads 17 and the eccentric shell 18. Referring especially to Figure 3, it is evident that by reason of this eccentric mounting for the cylinder, if the eccentric shell 18 is rotated in the proper direction, the shell 13 of the cylinder 12 can be forced against the face of the drum. I provide means yieldingly tending to rotate the eccentric shell, for this purpose. The construction employed includes a coiled-spring 66, one end of which is anchored at 67 at the side of the ring and the other end of which is attached to a nut 68 on the end of an adjusting stem 69, which is rotatably mounted in a stuffing box 70 mounted in an inclined position in the upper portion of the main section 6 of the casing. By rotating this stem 69 by means of a wrench applied to its squared end, the tension of the spring can be adjusted; in other words, the pressure of the shell 13 against the drum can be adjusted. In practice, the shell should be held against the drum with just sufficient pressure to insure that the cylinder 12 will rotate in unison with the drum. This avoids any friction, except rolling friction, between the drum and the shell 13. The intake pipe 28 may be provided with a small check-valve 28^a which opens inwardly and prevents a back flow of air from the machine when it stops.

In order to keep the compressor and its casing cool, I provide a suitable water-circulation system. For this purpose the main-section 6 of the casing is provided with a water-jacket 71 with which two openings 72 and 73 communicate. (See Figs. 1 and 3.) I also provide a water-jacket 74 around the bearing 3. The heads 2 are also provided with water-jackets 74.

I utilize the centrifugal action of the compressor to effect the separation of the oil from the compressed fluid. For this purpose I deliver the compressed fluid about on the axis of the shaft 8. To accomplish this, I use one end of the bore of the shaft as an outlet duct 29^b, and separate it from the inlet duct 29^a by suitable means such as a plug 75. The receiving chamber 33 in the adjacent head has outlet ports 76 which let the compressed fluid escape into the duct 29^b. In order to assist in directing the fluid through these ports I provide a baffle plate 77 that covers the adjacent ball bearing 9. The duct 29^b is quite free from oil because it is on the axis of revolution, the oil being

thrown away from this point by centrifugal force. Port or duct 29^b carries the fluid to the end of the shaft and delivers it into a delivery head or elbow 78 from which a pipe leads to a reservoir. A small drain duct 79 is provided in this elbow through which any oil accumulating in the elbow may drain back into the casing.

The plug 75 is preferably constructed to operate as a safety device. To accomplish this the plug carries a disc 80 of sheet lead or other suitable material that will blow out with reasonable accuracy at a predetermined pressure.

A suitable removal drain plug 81 may be provided in one of the heads 2 on a level with the bottom of the body section 6 of the casing.

I shall now describe the mode of operation of the entire compressing apparatus.

The shaft 8 is rotated by any suitable means, thereby rotating the drum 11 and the cylinder 12 of the compressor in unison. As the cylinder and drum rotate, substantially the same cycle, or relative movement occurs as though the drum were rolling around the interior of a fixed cylinder. The result of this is that the air or ammonia, which is in advance of the piston 41, is compressed and forced out through the multiple valve and through the passage 51. At each rotation, fluid to be compressed is drawn in from the chamber 26 through the ports or orifices 30 into the intake duct 29^a in the shaft, and thence through the port 39, and passage 40 into the compression chamber 21 behind the piston 41. As the compressed fluid passes out of the ends of the port 51, it passes over and carries oil to the ball bearings. The compressor should be very liberally supplied with oil. While the compressor is in operation, the lubricating oil flows continuously through the pipe 60 to the pipe 28 and thence through ports 30, and flows in with the inducted fluid which is to be compressed, so that it passes back into the compressor and into the compression chamber 21. This oil thoroughly lubricates the interior of the cylinder and the rubbing faces of the floating heads, the drum, and the shell 13, not only reducing friction, but assisting in making air-tight contact points between these parts. As the oil is carried into the bearings it also keeps them thoroughly lubricated. Furthermore, as the supply of oil is liberal, a quantity of the oil is constantly being thrown up by centrifugal force so as to be caught in the basin 57.

It will be noted that the upper edge of the outlet 64 is slightly below the level of the overflow edge 65 of the basin; and the lower edge of the outlet 64 is disposed above the bottom of the basin. When the machine is not in operation, the level of the oil is even with the lower edge of the outlet 64

because the remainder of the oil will have gravitated through the by-pass 59 down into the bore of the shaft 8, and possibly down into the compression chamber 21, if the drum has happened to stop in the position in which it is illustrated in Figure 3. With the level of the oil in the basin 57 at the lower edge of the outlet 64, it will be evident that when the compressor starts up, the fluid passing through the compressor will move out into the receiving chambers 33 without developing any pressure because it will find unrestricted outlet through bearings 16, shell 18 and the by-pass 59 if the valve 63^a is open; and hence, when the machine starts up, the fluid to be compressed is simply "churned" around through the compressor and through the by-pass, that is to say, it circulates without developing any pressure. As the speed of the compressor increases, however, the oil accumulates in the basin 57 and tends more and more to fill and choke the by-pass 59. When the level of the oil finally rises to about level with the upper edge of the outlet 64, the by-pass will be completely choked with oil, hence the air or ammonia being compressed will then be excluded from the by-pass. After this moment arrives, real compression of the fluid will begin and the pressure in the head 78 will rise rapidly until it arrives at the pressure existing in the reservoir to which it is connected; then the valve (not illustrated) to the reservoir will open and the air or ammonia gas will flow into the reservoir. After pressure has been developed in the delivery head, of course the circulation of the oil is accelerated through the by-pass on account of the pressure on the surface of the oil in the basin 57. The valve 63^a enables the operation of the compressor to be nicely regulated.

By reason of the fact that the by-pass chokes gradually in the manner described, the load will come very gradually upon the compressor. While this matter is of small importance in small machines, it is of more importance in the larger types because it allows time for the motor to attain substantially its normal speed before the actual compression begins.

When the motor is stopped in order to stop the operation of the compressor, the level of the oil almost immediately drops below the upper edge of the outlet 64, hence a very slight reduction in speed of rotation of the compressor will result in opening up the by-pass, which will take the load off of the compressor.

By reason of the fact that the cylinder 12 rotates, as well as the drum 11, it will be evident that the floating heads 22 will partake of the rotation of the drum and cylinder, and hence there will be a very small amount of relative movement between the

floating heads and these parts which would cause friction. There is, of course, a slight rubbing movement because the drum and the cylinder do not rotate at the same angular velocity.

Any sudden pressure developing in the cylinder and which is not taken care of by the valve 43 will be relieved at the floating heads. Such a sudden high pressure may arise by the sudden vaporizing of ammonia coming into the cylinder. It is obvious that the relief-feature of the floating heads could be secured by the use of a single floating head.

Certain features described and shown in the drawing in this application are also shown in applicant's co-pending application Ser. No. 222,126 for rotary compressor, filed November 19, 1919, and are covered by claims in that application.

It is understood that the embodiment of the invention described herein is only one of the many embodiments my invention may take, and I do not wish to be limited in the practice of my invention nor in my claims, to the particular embodiment set forth.

What I claim is:

1. In a fluid compressing apparatus, the combination of a cylinder-shell, a rotary drum eccentrically mounted in the shell, and co-operating therewith to form a compression chamber, relief heads disposed against the ends of the drum and shell, and constituting the end walls of the compression chamber, and means for admitting the fluid pressure to the outer sides of the relief heads to hold the same against the ends of the cylinder and drum.

2. In a fluid compressing apparatus, the combination of a cylinder-shell, a rotary drum eccentrically mounted within the shell and co-operating therewith to form a compression chamber, relief heads disposed respectively against the ends of the drum and shell, and constituting the end walls of the compression chamber, and means for admitting the fluid pressure to the inner sides and the outer sides of the relief heads, the area exposed to the fluid pressure on the outer sides of the heads being slightly greater than the exposed area on the inner sides of the heads whereby the heads are pressed by a relatively small force against the ends of the drum and shell.

3. In a fluid compressing apparatus, the combination of a cylinder-shell, a rotary drum eccentrically mounted in the shell and co-operating therewith to form a compression chamber, a relief head disposed against each end of the drum and shell, said relief heads constituting the end walls of the compression chamber, means for admitting the fluid under pressure to the outer sides of the relief heads, each end of said drum hav-

ing a recess formed therein to which the fluid pressure is admitted to partially counterbalance the fluid pressure on the outer sides of the heads, the area exposed to the fluid pressure on the outer sides of the heads being slightly in excess of the exposed area on the inner sides of the heads, thereby producing a slight excess of force on the outer sides of the heads to hold the same against the ends of the shell and drum which will permit the heads to move outwardly if a dangerous pressure occurs within the cylinder.

4. In a fluid compressing apparatus, the combination of a cylinder-shell, a rotary drum mounted in the shell and co-operating therewith to form a compression chamber, a relief head disposed against the end of the drum and shell, said relief head constituting the end wall of the compression chamber, means for yieldingly holding said relief head against the end of the shell and drum, and means for supplying a stream of lubricating oil to the compression chamber with the fluid being compressed to lubricate the contact points of the head with the shell and drum and assist in maintaining an air-tight connection therebetween, said relief head operating to move outwardly if a sudden increase in pressure should occur in the cylinder, and thereby relieve the pressure within the cylinder.

5. In a rotary compressor, the combination of a cylinder, a rotary drum eccentrically mounted therein, and co-operating with the cylinder to form a compression chamber, means for admitting a fluid to said compression chamber, floating heads disposed against the ends of the drum and constituting the end walls of the compression chamber, escape passages beyond said floating heads, and means for yieldingly holding the floating heads against the ends of the drum, whereby the floating heads may move outwardly and effect communication between the compression chamber and the escape passages to relieve an excessive pressure developed within the compression chamber.

6. In a rotary compressor, the combination of a cylinder, a rotary drum eccentrically mounted therein and co-operating with the cylinder to form a compression chamber, means for admitting a fluid to said compression chamber, floating heads disposed against the ends of the drum and constituting the end walls of the compression chamber, said compressor having escape passages constituting receiving chambers for receiving the fluid under pressure on the outer sides of said floating heads, the fluid pressure in said receiving chambers operating to hold the floating heads yieldingly against the ends of the drum, whereby the floating heads may move outwardly to re-

lieve the pressure within the cylinder when the pressure in the cylinder rises suddenly above the pressure existing in the receiving chambers, and means for holding the heads against the ends of the drum before the fluid pressure has been developed.

7. In a rotary compressor, the combination of a cylinder mounted to rotate, a drum eccentrically mounted therein, engaging the wall of the cylinder, said cylinder and drum co-operating to form a compression chamber, means for admitting a fluid to said compression chamber, floating heads rotating with the drum and cylinder, disposed against the ends of the drum and constituting the end walls of the compression chamber, said compressor having receiving chambers on the outer sides of said floating heads for receiving the fluid under pressure, the fluid pressure in said receiving chambers operating to hold the floating heads yielding against the ends of the drum, whereby the floating heads may move outwardly to relieve sudden excessive pressure within the cylinder.

8. In a fluid compressing apparatus, the combination of a casing, a rotary compressor mounted in said casing, including a rotary outer cylinder, means for delivering lubricating oil into said compressor cylinder, a basin within the casing located substantially in the plane of revolution of said compressor whereby the lubricating oil is thrown off by centrifugal force from the compressor and accumulates in the basin, and a by-pass for leading the oil back from the basin to the compressor.

9. In a fluid compressing apparatus, the combination of a casing having an intake port for the fluid to be compressed, a rotary compressor in said casing including a rotary cylinder, said casing having bearings for said compressor, means for supplying lubricating oil to the bearings and to the said rotary cylinder, a basin having an outlet and located in a position to catch the oil thrown off from the rotary parts, a by-pass leading from said outlet to said intake port, whereby, when the compressor is running at its normal speed, the oil fills the by-pass enabling fluid pressure to be developed in the compressor, said basin having an overflow edge substantially on a level with the upper edge of said outlet, whereby, in stopping the compressor as soon as the normal speed of the compressor is reduced, the by-pass opens to the passage of the compressed fluid and stops the delivery of the compressed fluid from the casing to the reservoir.

10. In a fluid compressing apparatus, a casing, a rotary compressor within said casing having a shaft with a longitudinal bore operating as an intake duct for the fluid to be compressed, and a diaphragm mounted in said bore separating the duct from the

delivery space of the compressor containing the compressed fluid and operating as a safety device to blow out if the pressure on the delivery side of the compressor rises above a predetermined point.

11. In a fluid compressing apparatus, the combination of a casing having an intake port for the fluid to be compressed, a rotary compressor mounted in said casing including a rotary cylinder, a rotary drum mounted in said cylinder, said casing having bearings for said drum and for said cylinder, means for supplying lubricating oil to the interior of said cylinder, said cylinder having outlet openings for the compressed fluid and lubricating oil located so as to pass the compressed fluid and lubricating oil over the bearings, means located substantially in the plane of rotation of the cylinder for catching the oil thrown from the same by centrifugal force, and means for returning the oil to the intake port.

12. In a rotary compressor, the combination of a casing, compressor parts mounted to rotate within said casing and adapted to throw the oil by centrifugal force against the wall of the casing, a cup projecting from the wall of the casing to catch the oil, moving by centrifugal force along the surface of the wall of the casing, and means for returning the oil to lubricate the rotating parts.

13. In a rotary compressor, the combination of a casing, a shaft within said casing, compressor parts driven at a high rotative speed by said shaft whereby the lubricating oil is thrown by centrifugal force away from the shaft, and means for delivering the compressed fluid substantially on the axis of the shaft whereby the centrifugal force operates to effect a separation of the lubricating oil from the compressed fluid.

14. In a rotary compressor, the combination of a casing, a hollow shaft within said casing, compressor parts driven at a high rotative speed by said shaft whereby the lubricating oil is thrown by centrifugal force away from the shaft, said shaft having air outlets for conducting the compressed fluid into the hollow shaft, and a delivery head on said casing to which the hollow shaft delivers the compressed fluid.

15. In a fluid compressing apparatus, a casing, a rotary compressor within said casing having a shaft with a longitudinal bore, a portion of said bore constituting an intake duct for the fluid to be compressed, the other portion of the said bore constituting an outlet duct for the compressed fluid, and a diaphragm mounted in said bore separating said ducts and operating as a safety device to blow out and relieve the compressor from a dangerous pressure.

16. In a fluid compressing apparatus, the combination of a casing having a stuffing

box, a rotary compressor within said casing, a shaft for said compressor rotatably mounted in said stuffing box, and having a longitudinal bore, a part whereof constitutes an intake duct for leading the fluid into the compressor, said shaft having intake openings through the wall thereof at said stuffing box for admitting the fluid into the intake duct, another part of said bore constituting an outlet duct for leading out the compressed fluid, means within said bore for separating said ducts from each other, and means for effecting a circulation of oil through said stuffing box and through the intake duct into the compressor.

17. In a fluid compressing apparatus, the combination of a casing comprising a body and a pair of heads attached to the ends of said body, a shaft rotatably mounted in said heads, a drum carried by said shaft, each of said heads having a bore eccentric to the axis of the shaft, an eccentric mounted in said bores and having bearings eccentric to

the axis of said shaft, a rotary cylinder comprising a cylinder-shell and heads rotatably mounted in said last named bearings, and means for adjusting the position of said eccentric to regulate the contact of the drum with the cylinder-shell.

18. In a fluid compressing apparatus the combination of a cylinder-shell, a rotary drum eccentrically mounted in the shell and co-operating therewith to form a compression chamber, relief heads disposed against the ends of the drum and shell and constituting the end walls of the compression chamber, and means for developing a differential effective pressure on the sides of the relief heads to hold the same against the ends of the cylinder and drum, and to prevent leakage past the heads, of the fluid being compressed.

In testimony whereof, I have hereunto set my hand.

WALTER G. E. ROLAFF.