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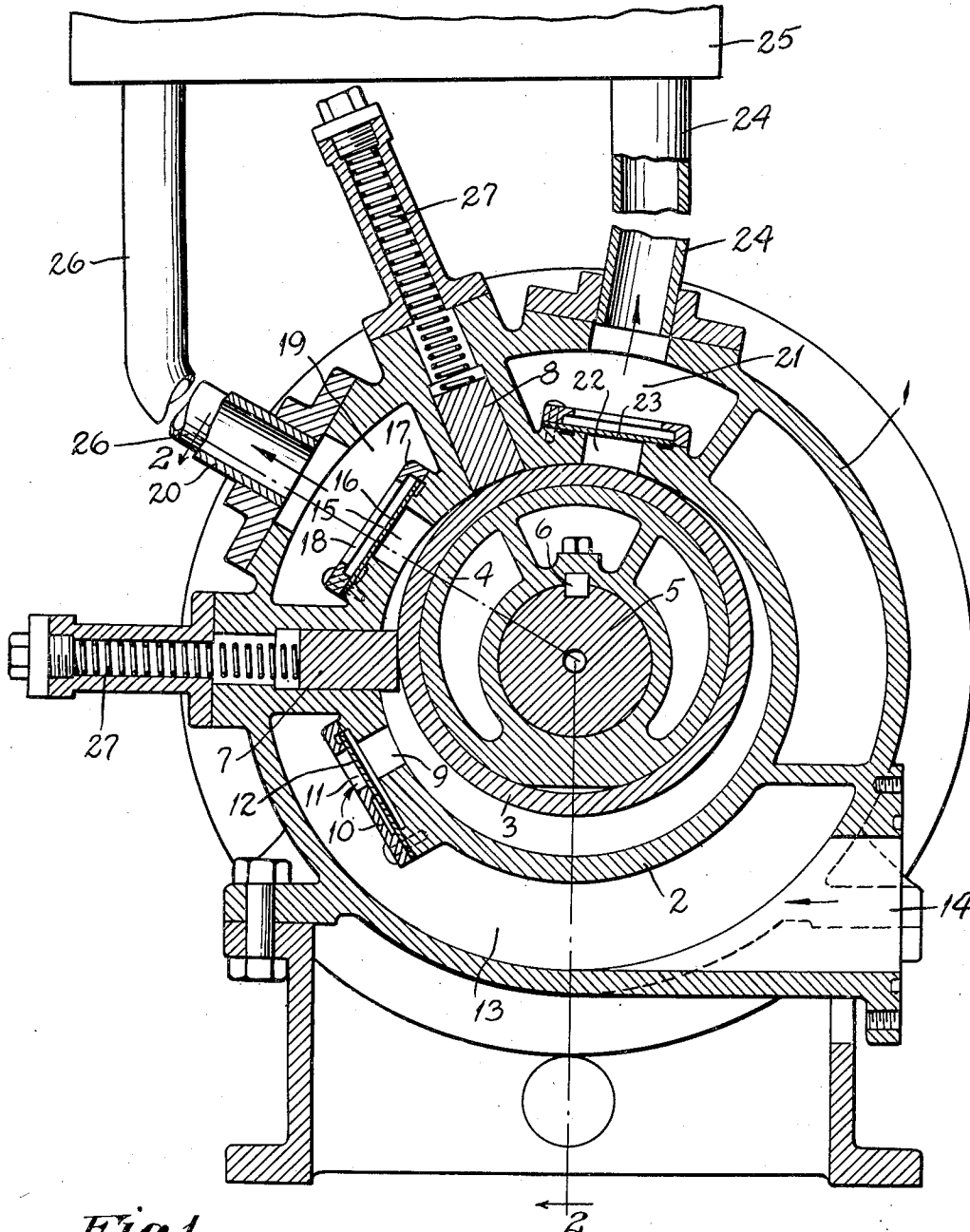
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1,983,997

MULTISTAGE ROTARY COMPRESSOR

Filed Nov. 17, 1930

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 2.

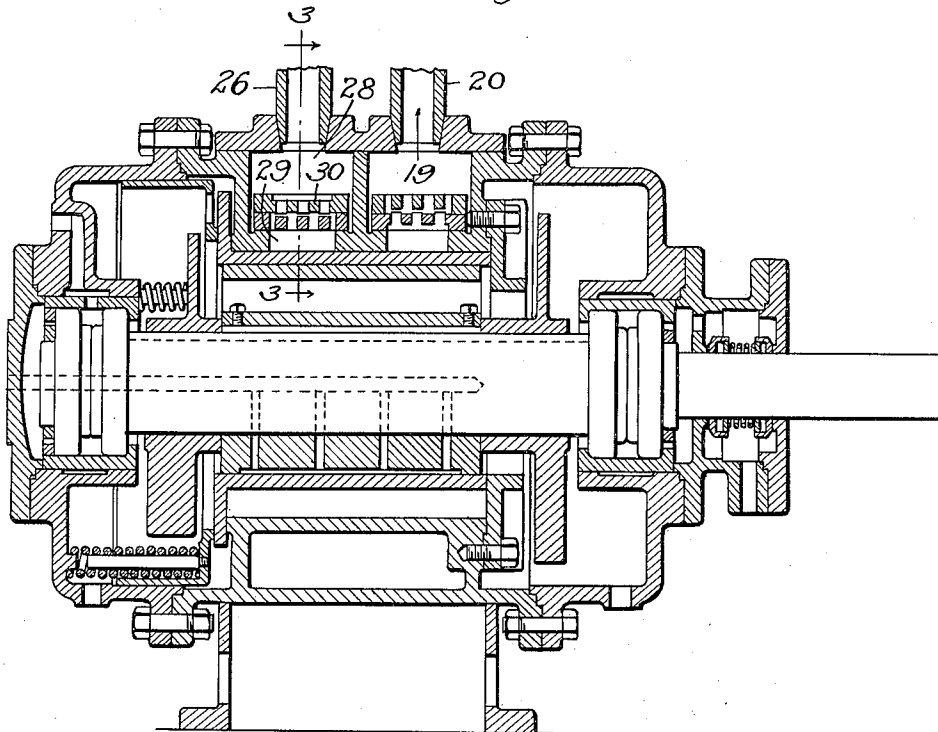
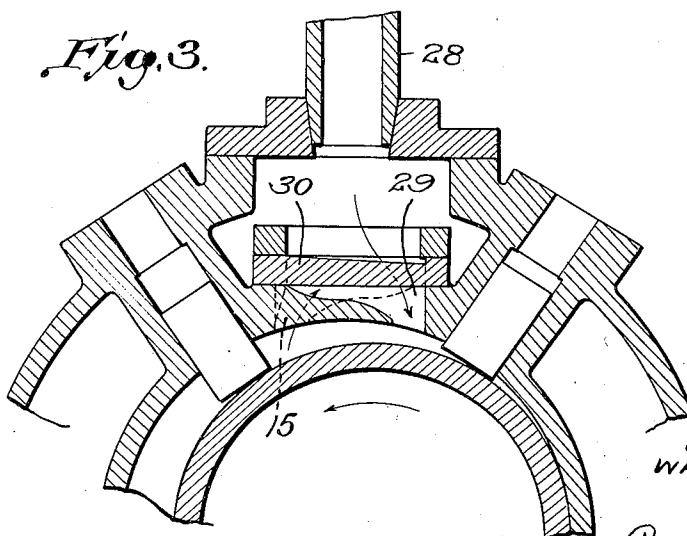


Fig. 3.



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MULTISTAGE ROTARY COMPRESSOR

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Application November 17, 1930, Serial No. 496,283

1 Claim. (Cl. 230-147)

This invention relates to certain new and useful improvements in rotary compressors, and has for its general object to provide a compound or multi-stage compressor in which the compounding or multi-staging is accomplished in one cylinder and with the use of a single rotor.

My invention is practiced by the use of a rotary compressor employing two blades cooperating with the rotor and with an inter-cooler, and by so positioning two sets of suction and exhaust ports with reference to the rotor and the inter-cooler, respectively, that the final pressure is reached by first compressing to an intermediate pressure, in what may be called the low pressure end of the machine and then sending this partly compressed gas through an inter-cooler, where the heat of compression is removed, which, of course, operates to contract the volume of the gas. From this inter-cooler, the gas is then sent to the high pressure end of the machine, where it is finally compressed to its predetermined discharge pressure. The compressed gas is then conveyed, in the case of air, to an ordinary container or, in the case of gas used for refrigerating purposes, to a condenser.

The above stated and other objects of my invention, together with certain advantages thereof to be hereafter described are accomplished by and incident to the preferred embodiment of the invention illustrated in the drawings, in which Figure 1 is a cross-sectional view through a compound rotary compressor constructed according to my invention; Fig. 2 is a longitudinal sectional view taken on the line 2-2 of Figure 1; and Fig. 3 is a sectional view taken on the line 3-3 of Fig. 2 and viewed in the direction of the arrows.

Referring to the drawings the numeral 1 indicates a casing in which is housed a cylinder 2 containing a rotor 3 which is caused to be rolled over the surface of cylinder 2 by an eccentric 4, circular in cross-section and adapted to be rotated by a shaft 5 on which the eccentric is keyed, as indicated at 6. Mounted in the wall of the cylinder are two blades 7 and 8. The cylinder is provided with a suction port 9, located immediately below the blade 7. Inclosing suction port 9 is a housing 10, having an inlet 11 which is controlled by a reed valve 12, opening inwardly. The inlet 11 communicates with a passage 13 provided in the casing of the machine with which communicates the main suction opening 14 of the machine. Located above the blade 7 is a discharge port 15, controlled by a reed valve 16 mounted in a housing 17 having an outlet opening 18 communicating with a chamber 19 from which leads a dis-

charge pipe 20. The discharge chamber 19, as will be seen, is located between the blades 7 and 8, and constitutes the discharge chamber of the high pressure end of the machine. Beyond the blade 8 I provide in the casing a discharge chamber 21 for the low pressure end of the machine, and communicating through the wall of the cylinder 2 with this chamber is a port 22 which is controlled by a valve 23, similar to the valve 16. Leading from the chamber 21 is a pipe 24 which communicates at one end with an inter-cooler 25, only the lower portion of which is shown. This inter-cooler is simply a cylinder, drum, or other form of container for receiving the gas in its first stage of compression. Leading from the other end of the inter-cooler is a pipe 26 which leads to a suction chamber 28, located immediately behind the discharge chamber 19, and having a port 29 controlled by a valve 30 in exactly the same manner as the suction port 9, previously described.

The valves 7 and 8 are held in yielding contact with the outer surface of rotor 3 by means of coil-springs 27.

In the operation of the machine, as the rotor moves beyond the port 9 it draws in gas from passage 13 through port 9, compresses the same and discharges it through port 22 and pipe 24 into the inter-cooler 25. In this inter-cooler the gas, which has been compressed to an intermediate stage or degree of compression, is deprived of some of its heat and thereby reduced in some of its volume, and this cooled gas is then withdrawn from the inter-cooler through pipe 26 into chamber 28, and through port 29 into the cylinder, compressed to its final stage and discharged through port 15 and pipe 20 into a container or condenser as the case may be.

The rotor employed in this machine is of the type illustrated, for example, in my prior Patent No. 1,632,562, dated June 14, 1927, in which the rotor flange is held in contact with the end of the cylinder by the pressure generated by the machine. The greater the pressure upon this flange the greater of course will be the friction generated, the horse-power consumption and the wear. A characteristic feature of my machine is the fact that while one part of the cylinder may be compressing to, say, a pressure of 200 pounds per square inch, the pressure upon the rotor flange, which pressure keeps the rotor and cylinder in operative contact, need only be that pressure generated by the low pressure end of the cylinder, which in this case would be approximately fifty pounds. This represents a distinct

advantage over the common form of compound compressors employing two cylinders, one being the low pressure cylinder and the other the high pressure cylinder, with a single shaft operating the rotors of these cylinders. In such an arrangement the low pressure cylinder would have to be nearly as large as the cylinder of the machine illustrated and would have as much frictional load. At the same time, the second or high pressure cylinder would have an additional shaft and bearing load and would also have a pressure load upon the rotor flange of, say, 200 pounds per square inch, this being an assumed figure for the final stage of compression.

It will be obvious therefore, that a machine operating to compound the pressure under a relatively low degree of pressure upon the rotor flange represents diminished friction between the moving parts, which is highly important from an economic standpoint, due to decreased horsepower consumption and less wear.

While I have illustrated and described a two

stage compressor, it will be understood by those skilled in the art that the machine may be built for more than two stages by the mere addition of an extra blade and an extra inter-cooler, with appropriate suction and exhaust ports arranged in the manner illustrated.

I claim:

A rotary, multi stage compressor, comprising a cylinder, a rotor of smaller diameter than the cylinder and eccentrically mounted therein for rolling movement over the wall of the cylinder, said cylinder having low pressure suction and discharge ports, a high pressure suction port communicating with the low pressure discharge port, and a high pressure discharge port, and a plurality of blades yieldingly mounted in the wall of the cylinder and cooperating with the surface of said rotor and positioned in the cylinder to separate the low pressure suction and discharge ports from the high pressure suction and discharge ports.

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