H. DECHAMPS.

COMPRESSOR.

APPLICATION FILED FEB. 20, 1914.

1,158,030.

Patented Oct. 26, 1915.

Fig. 1.

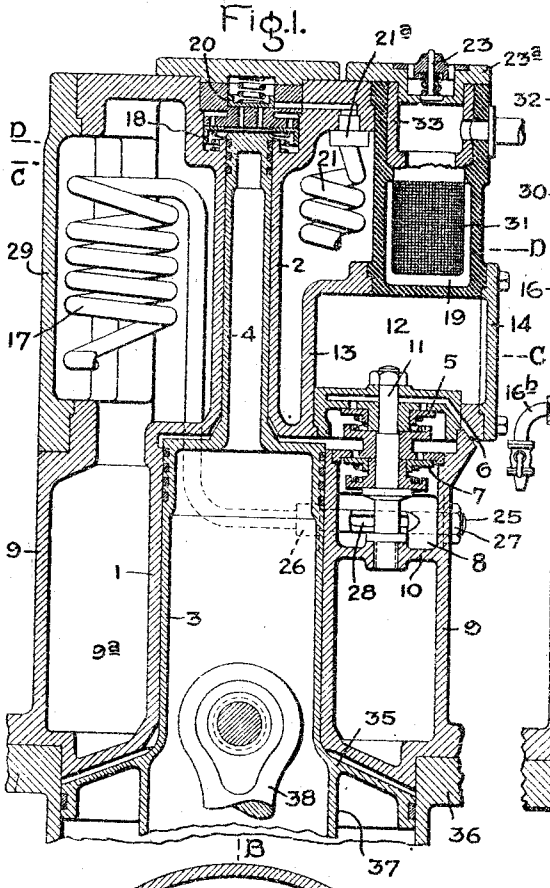
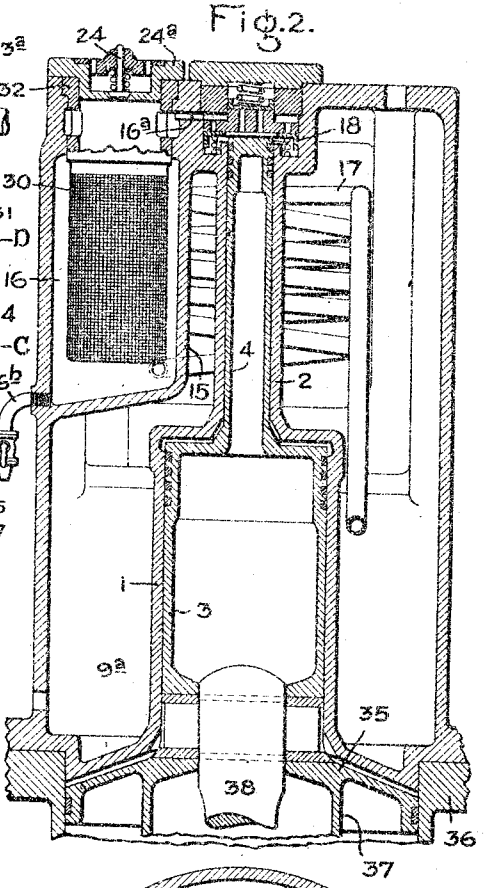


Fig. 2.



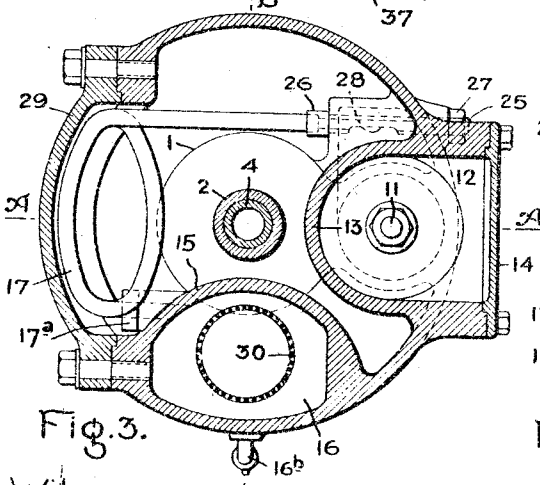


Fig. 3.

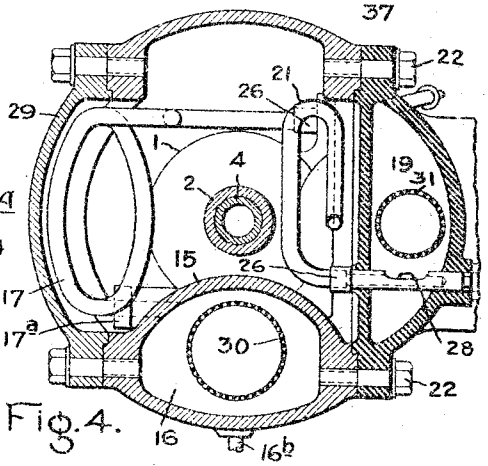


Fig. 4.

Witnesses:

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UNITED STATES PATENT OFFICE.

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COMPRESSOR.

1,158,030. Specification of Letters Patent. Patented Oct. 26, 1915.

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To all whom it may concern:

Be it known that I, HEINRICH DECHAMPS, a subject of the King of Prussia, residing at Charlottenburg, Germany, have invented certain new and useful Improvements in Compressors, of which the following is a specification.

My invention relates to compressors of the piston type and particularly to multi-stage compressors in which the cooling chamber and air chamber or chambers are arranged to surround the cylinders.

In compressors of this type as heretofore constructed it has been customary to form the cylinder or cylinders and surrounding walls of integral castings, suitable partitions being provided for forming the desired air receiving and storage chambers. Such an arrangement is desirable and advantageous since it affords a structure having a smooth symmetrical exterior and one requiring a minimum amount of material and occupying a minimum amount of space. Where the compressor has been designed to deliver fluid at a high pressure, as, for example, to furnish blast air for a high compression internal combustion engine which requires a pressure of about 1,000 pounds per square inch or more, this arrangement has necessitated that the entire casting be made of a material such as would afford the necessary strength for the chamber which was to contain the highly compressed fluid, thereby adding materially to the cost of construction.

One object of my present invention is to overcome this added cost and still retain the advantageous features which result from the arrangement described, and to this end I form my cylinder or cylinders, cooling chamber and lower pressure chambers in one main casting and of one material, and my high pressure chamber as a separate member and of a different material, the two parts being so shaped as to permit of the high pressure chamber being suitably attached to the main casting to preserve the symmetrical outline desired. By this arrangement I can use different materials for constructing the two parts, the high pressure chamber being constructed of a strong material such as is suitable to the pressure which it will be called upon to hold, while the main casting may be constructed from a much less strong and a cheaper material. In such compressors, the cooling chamber acts to cool the piston and cylinder and also the compressed fluid, and to this end the fluid after compression is passed through coils of pipe arranged in the cooling chamber. These coils must from time to time be removed for inspection and repair, and also to permit of the inspection and repair of the interior of the castings and parts therein.

A further feature of my invention relates to the arrangement whereby I am enabled to readily detach and remove the coils of pipe and quickly re-insert the same.

Other and further objects and features of my invention will be brought out in the course of the following specifications wherein I have described a structure embodying the same.

In the drawing, Figures 1 and 2 are vertical central sections on line A—A and B—B respectively of Fig. 3; Fig. 3 is a section on line C—C of Fig. 1; Fig. 4 is a section on line D—D of Fig. 1.

The compressor illustrated is of the piston type and has two stages.

The cylinders 1 and 2 of the first and second stages respectively are shown as being alined and as having integrally formed pistons 3 and 4. The first stage receives air through its suction valve 5 by way of conduit 6 and discharges the same through its discharge valve 7 into the delivery chamber 8. The suction and discharge valves are shown as being in the form of spring pressed annular disks, although any suitable form may be used as desired.

Surrounding the cylinders 1 and 2 and cast integral therewith is a shell 9 suitably spaced from the cylinders to define the cooling chamber 9^a. As best shown in Fig. 1, this shell is provided with a partition 10 forming delivery chamber 8 already mentioned. This partition supports the rod 11 upon which are threaded the valve members 5 and 7 as shown, there being a chamber 12 defined by the wall 13, (Figs. 1 and 3) and closed by the laterally detachable cover 14, through which the valves may be readily inserted and removed.

Between the outer shell and the high pressure cylinder 2 is a further dividing wall 15 (Figs. 2 and 3) forming the air storage chamber 16 for the first or low pressure stage. The inner wall of this cham-

ber 16 is spaced from the cylinder 2 so as to provide for the circulation of the cooling medium, such as water, around both the chamber 16 and the cylinder in an efficient manner.

Arranged in the cooling chamber is a coiled pipe 17 which conducts the air from the delivery chamber 8 to the storage chamber 16. The second or high pressure stage of the compressor receives air from chamber 16 by way of conduit 16^a and suction valve 18 and delivers it to storage chamber 19 by way of delivery valve 20 and coiled pipe 21, which pipe is arranged in the cooling chamber. This storage chamber 19 as shown in Figs. 1 and 4, is shaped in cross-section as the segment of a circle, and is formed as a separate casting. The main casting is formed adjacent the upper end thereof and over the chamber 12 with a flattened side against which fits the flat side of the wall of chamber 19, the base wall of such chamber forming a closure for the top of chamber 12.

The walls of this chamber 19 may be constructed of any material required in order to insure sufficient strength for withstanding, without danger, the very high pressure to which it is subjected. For instance, I may use wrought iron or steel for the chamber 19, while the remainder of the structure may be constructed of cast iron. It will be noted that the member containing the chamber 19 is so shaped that when fitted into place against the flat side of the main casting, its outer surface completes the cylindrical outline of the apparatus so that the same will present a smooth symmetrical contour. The member is held in place by suitable fastening means, as threaded bolts 22. The low and high pressure air storage chambers are each provided with a suitable spring controlled outwardly opening relief valve, as shown at 23 and 24, which are preferably arranged in the respective closures 23^a and 24^a.

Where the point of attachment is not readily accessible, difficulty is experienced in readily coupling and uncoupling the ends of the cooling pipe from the walls of the chambers with which they communicate. One of the features of my invention resides in the improved attaching means which is best shown in Figs. 1 and 4. According to this structure the end of the tube is closed by means of a plug or otherwise and threaded for a short distance as shown at 25. Spaced from the threaded closed end of the pipe is a flange or collar 26. The casing of the chamber to which the pipe is to be attached is provided with holes through the opposite sides thereof, and the pipe is passed entirely through the casing with the threaded end projecting upon the outside thereof and the collar 26 fitting against a suitable boss which surrounds the opening through the inner side of the casing. A nut 27 is then screwed down upon the threaded end of the pipe, thereby firmly clamping the parts in place. A lateral opening 28 is formed in the side of the pipe whereby the pipe communicates with the chamber.

I have shown this type of fastening as applied to the connection between the low pressure coil 17 and chamber 8, and high pressure coil 21 and chamber 19, these being particularly inaccessible in the design which I have illustrated. The other couplings 17^a and 21^a are readily accessible and are shown as being of a known and ordinary type. It will, of course, be understood that I may use my improved coupling at whatever points it may be deemed necessary.

In the side of the casing and opposite the low pressure coil 17 I provide an opening closed by a cover 29 through which the coil 17 may be readily inserted and removed from the cooling chamber. To remove the coil 17 it is only necessary to unscrew the nut 27 and loosen the coupling 17^a, when the coil can be readily taken out through the opening in the side of the casing, the cover 29 having been previously removed. Likewise, the high pressure coil 21 may be removed by first removing the member containing the chamber 19 and then loosening coupling 21^a.

Arranged in the low and high pressure chambers 16 and 19, respectively, are the strainers 30 and 31. These strainers are supported by flanged holders 32 and 33, which holders can be readily inserted and removed through the openings in the top of the respective chambers, it being only necessary to remove covers 23^a and 24^a. It will be noted that these covers when fastened in place serve to clamp the flanged holders in position. These strainers are used to remove any water or oil which may be carried along with the air. It is particularly essential to remove the oil, as it might form an explosive mixture with the air, and, owing to the temperature which the air attains due to compression, result in an explosion. Suitable strain cocks are used for drawing off the oil and water from the chambers, the one for chamber 16 being shown at 16^b.

Formed integral with the compressor pistons 3 and 4 is a scavenging pump piston 35 located in a cylinder 36, the upper end of which supports the annular wall 9 and associated parts. The piston 35 is provided with a depending cylindrical guide 37 that also forms an inner cylinder wall, said piston being double acting. The pistons are driven by a connecting rod 38 and pin from a suitable means such as the main shaft of the engine which receives air from the pump and compressor.

In accordance with the provisions of the