Feb. 24, 1953

P. MANISCALCO

2,629,543

COMPRESSOR

Filed Dec. 11, 1947

3 Sheets-Sheet 1

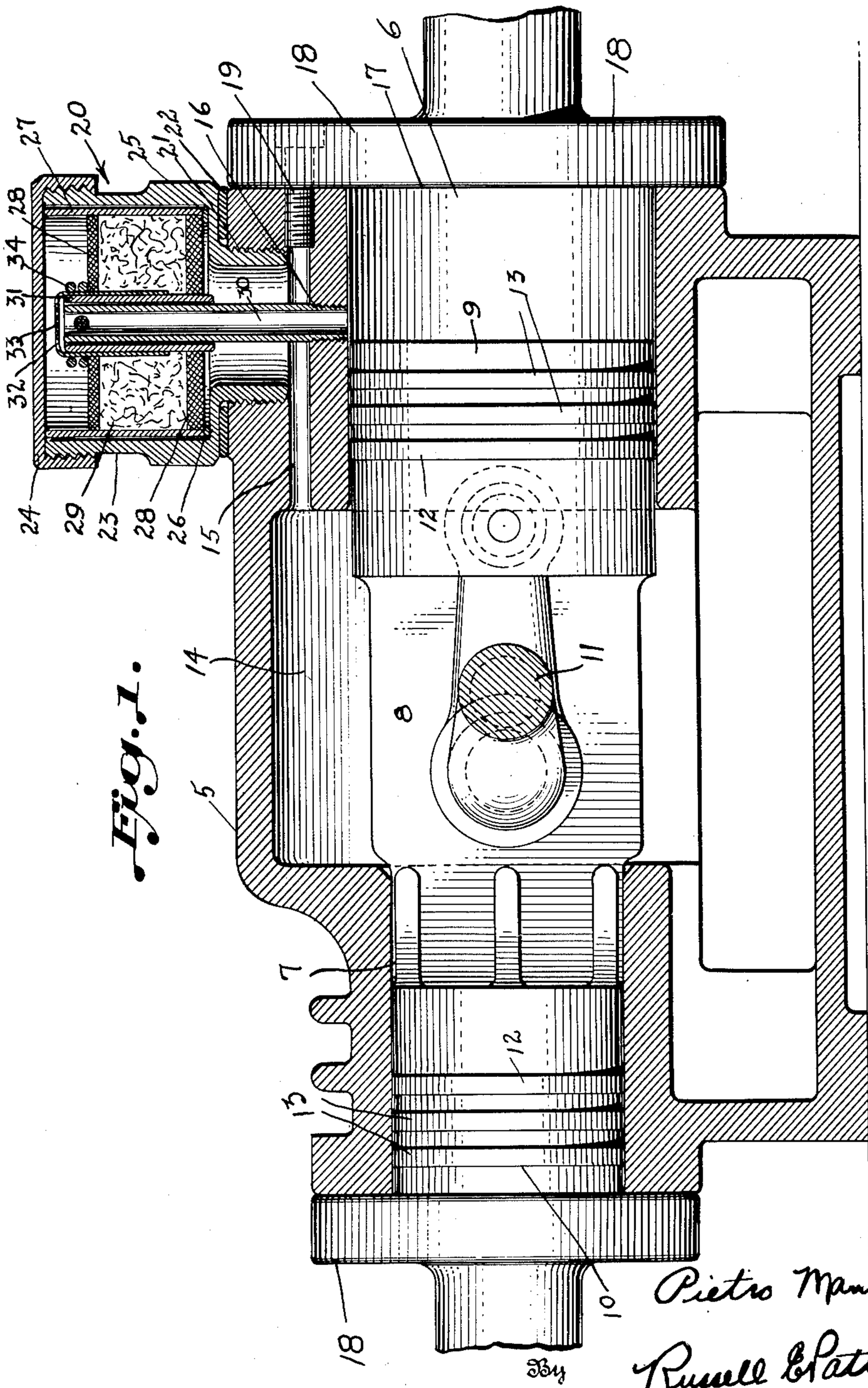

Fig. 1.

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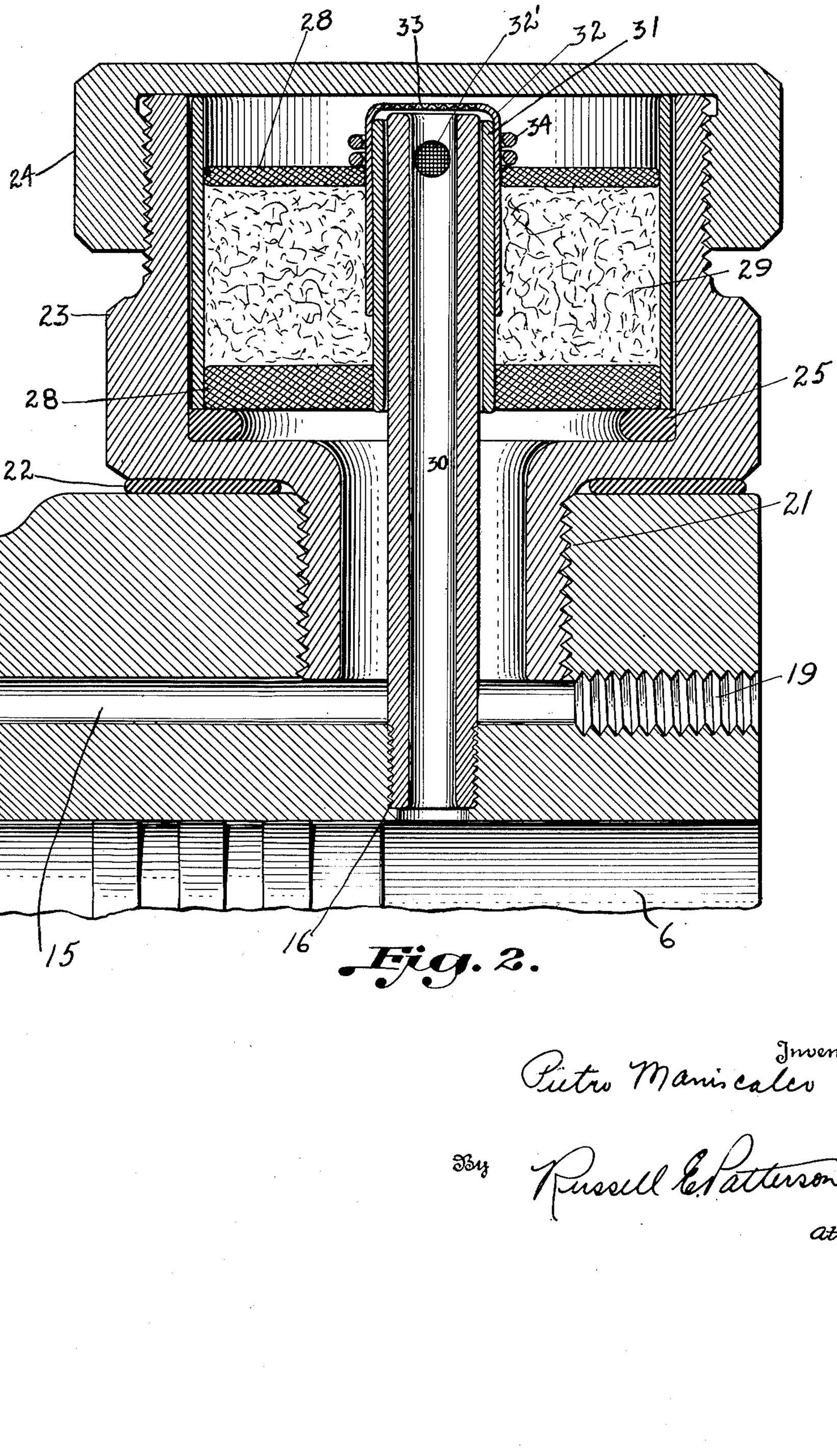

Fig. 2.

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Fig. 3.

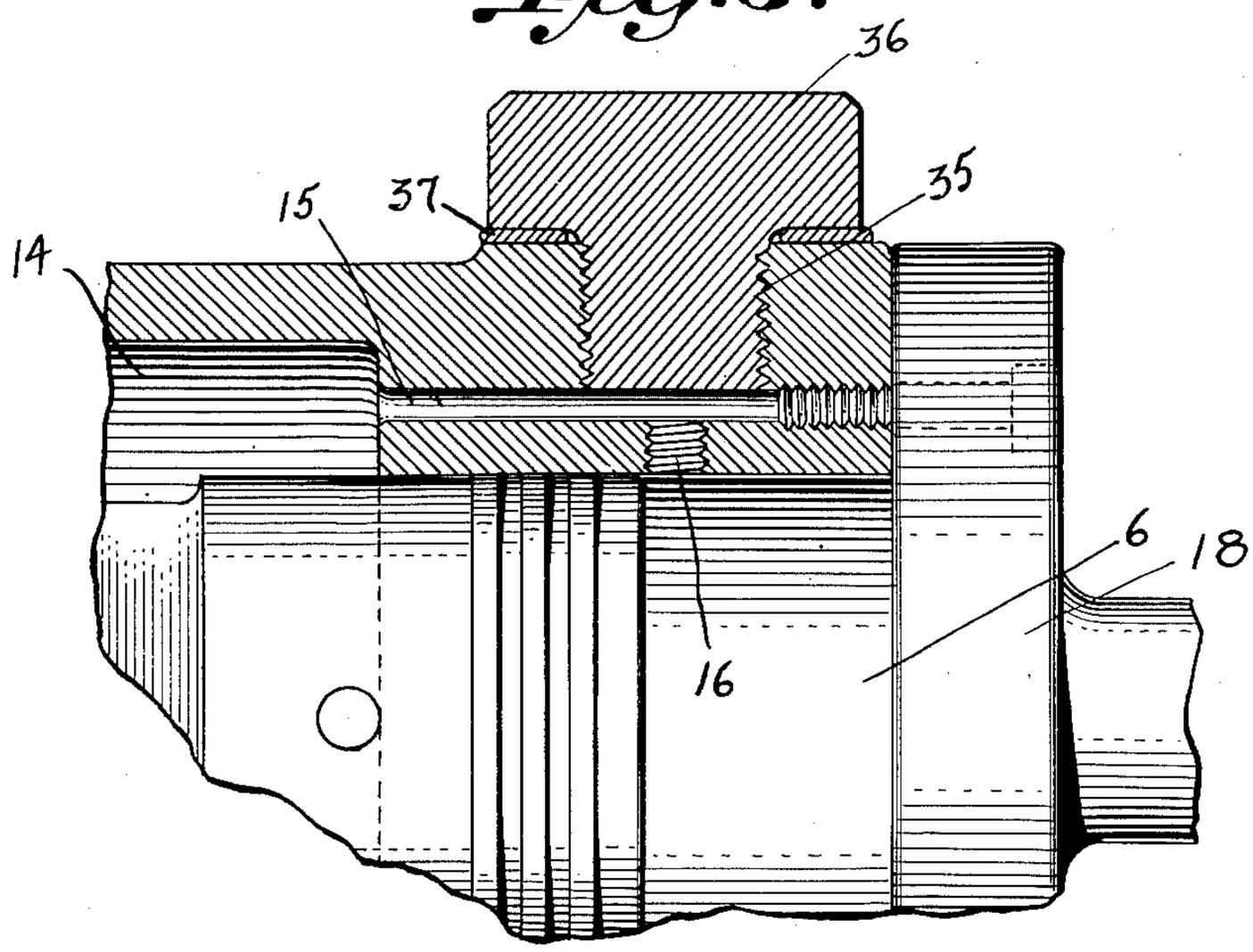
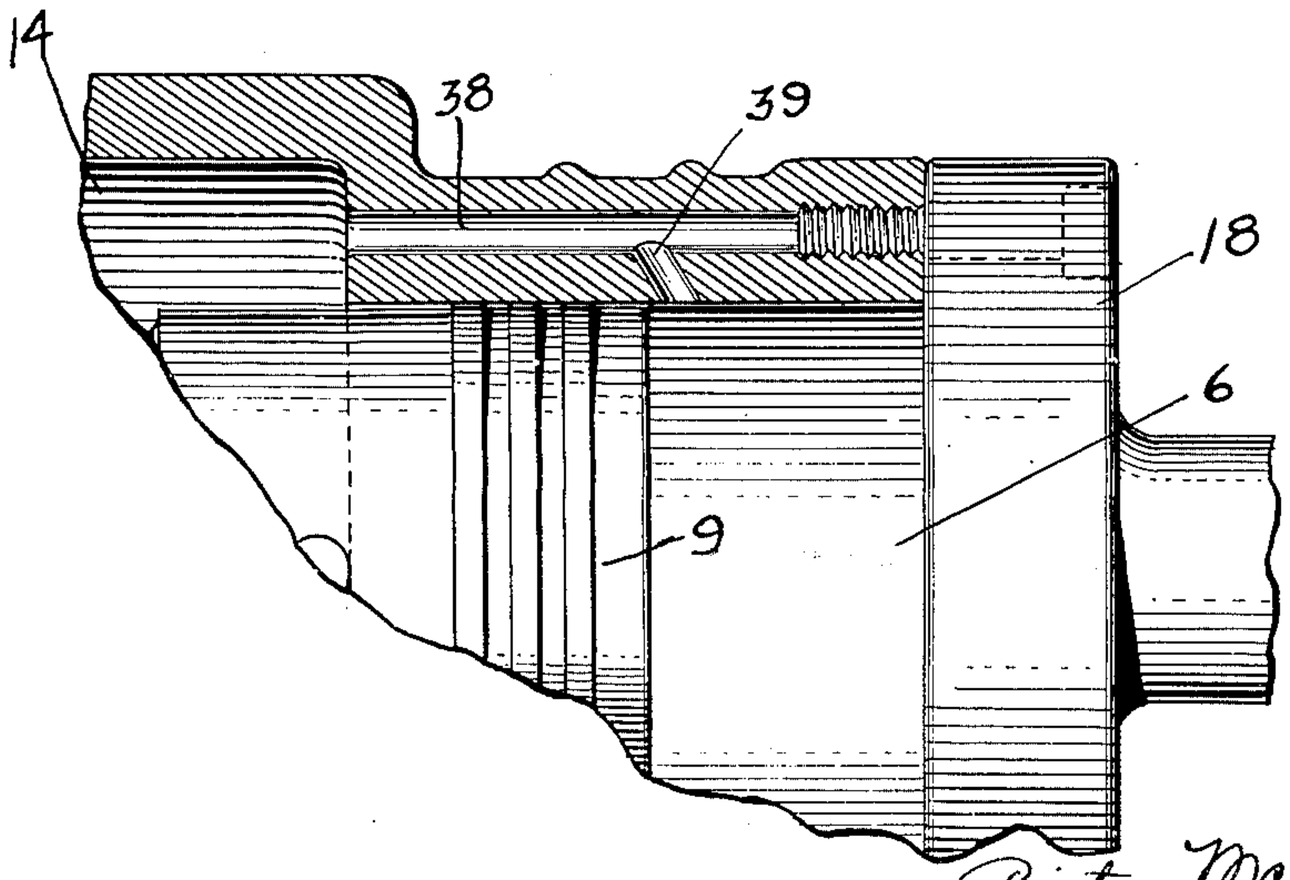


Fig. 4.



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UNITED STATES PATENT OFFICE

2,629,543

COMPRESSOR

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Application December 11, 1947, Serial No. 791,023

2 Claims. (Cl. 230—172)

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The present invention relates to improvements in compressors.

An important object of the invention is to provide a compressor having means in the housing thereof for releasing and guiding air or gas from the crank case and directing the same into the low pressure side of the cylinder.

Another object of the invention is to provide means for filtering the gas or air as it is directed from the crank case into the cylinder.

A further object of the invention is to provide an improved filtering element which is adapted to be detachably secured in the housing of a compressor and in communication with a by-pass line formed in said housing, the gas or air being directed from the crank case of the compressor through the by-pass line and into the filtering element to be thoroughly filtered, dehydrated, dehumidified, etc. by the combined agents which form a part of the filtering element.

The above and other objects will in part be obvious, and will in part be hereinafter more fully pointed out.

In the drawings:

Figure 1 is a vertical sectional view of the preferred form of the invention taken longitudinally through the compressor, with certain parts in elevation;

Figure 2 is an enlarged fragmentary vertical sectional view of the filtering element;

Figure 3 is a view similar to Figure 2, in reduced proportions, and illustrating a plug in the compressor housing in place of the filtering element; and

Figure 4 is a fragmentary vertical sectional view of a modified form of the invention in which the filtering element has been dispensed with.

Referring to the drawings for a more detailed description thereof, and more particularly to Figures 1 and 2, the present invention is disclosed herein in its preferred form of construction, being shown as a multi-stage compressor, which comprises a closed cylinder structure or unit including a casing 5 having a primary cylinder 6 integral on one end and a smaller secondary cylinder 7 integral on the other end. As shown, the cylinders extend in opposite directions and have their longitudinal axes in alignment. This type of compressor is fully disclosed in my Patent No. 2,323,068 of June 29, 1943. It is to be understood that certain details which are shown in the above-mentioned patent have been omitted from the present application since said details form no part of the invention.

As in my patent, the compressor also comprises a compact but light piston unit including a body 8 having a primary piston 9 integral at

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one end and a smaller secondary piston 10 integral at the other end, which pistons are aligned and reciprocable in the cylinders 6 and 7, respectively. Each piston 9 and 10 is provided with an oil ring and compression rings 13. The means for operating the pistons 9 and 10 has not been shown since said means forms no part of the present invention. The drive means, however, includes a shaft 11 rotatable in bearing sleeves, not shown, and driven from an eccentric of the type disclosed in my patent. Any driving means, however, can be employed so long as it provides for complementary movement of the pistons 9 and 10 within their respective cylinders 6 and 7.

In accordance with the present invention, means have been provided for directing the air or gas from a crank case 14 of the compressor into the cylinder 6. This means includes a bore 15 which extends horizontally in the casing 5 from the crank case 14 to the outer end of said casing. A vertical bore 16, which is threaded interiorly, communicates with the horizontal bore 15. The position of the vertical bore 16 is calibrated in accordance with the length of the stroke of the piston 9. For example, if the piston 9 has a one-inch stroke from the point 17 of the cylinder, the vertical bore 16 is drilled approximately 7/8 of an inch from the point 17. The reason for this calibration will become apparent as the description progresses.

As is conventional in compressors of this type, each of the cylinders has a head 18 which is removably attached by means of bolts or the like to the compressor housing. One of the bolts for attaching the head is indicated at 19 in Figure 1 of the drawings, and it will be noted that the outer end of the longitudinal bore 15 has been threaded for the reception of this bolt. In other words, this bore forms one of the holes normally used for receiving bolts which are equally spaced about the face of the head for attaching the head to the compressor housing.

The air or gas in the travel from the crank case 14 into the cylinder 6, passes through the bore 15 and upwardly to be filtered through the filtering element, generally designated by the reference numeral 20. The filtering element 20 is detachably connected in the casing 5 by being threadedly secured thereto as indicated at 21. A washer 22 is interposed between the casing and the bottom face of the filtering element 20 to prevent leakage from around the filtering element.

The filtering element 20 comprises a hollow hexagonal-shaped body 23 having a cap 24 detachably secured thereto. A gasket 25 formed of neoprene, or similar material, rests on the bottom

wall 26 of the body 23. A metallic tubular-shaped member 27 is fitted within the body 23 and rests upon the gasket 25. This tube 27 forms a housing for the filtering elements, which elements are shown to comprise a pair of spaced sintered bronze filters 28, between which there is a packing 29 of silica gel or the like. A hollow rod 30 is secured in the vertical bore 16 and extends upwardly within the filter 20. This rod 30 is partially surrounded by a length of tubing 31, and the upper ends of the rod 30 and tubing 31 are encased in a cartridge 32, which cartridge has a portion 33 formed of mesh screen. One wall of the rod 30 and tubing 31 is formed with a screened inlet 32', through which a portion of the filtered gas or oil passes for delivery into the rod 30. For retaining the cartridge 32 on the tubing 31, and also for retaining the uppermost filter 28 in position, there is provided a coil spring 34.

The filtering element 20 has been designed so that it can be easily removed from the compressor casing 5 and the parts thereof readily removed and assembled for cleaning purposes, as well as replacement of deteriorated parts. The interior of the filter is easily accessible by removing the cap or cover 24.

In the operation of the device, let it be presumed that the piston 9 has a one-inch stroke and that the vertical bore 16 has been positioned at a distance of approximately ⅞ of an inch from the point 17 of the cylinder. Thus, as illustrated in Figure 1 of the drawings, the piston 9 has completed its suction stroke and the bore 16 is completely uncovered. At the beginning of the suction stroke of the piston 9, a low pressure will be created in the crank case 14. Since gas or air is lighter than oil, it will be the first to pass out of the crank case by means of the longitudinal bore 15 for delivery into the cylinder 6. A certain amount of this gas or air will also be discharged past the oil ring 12 and compression rings 13. Since the oil within the crank case is heavier, it will not pass the rings 12 and 13. However, should a certain amount of vaporized oil pass these rings, it will become intermingled with the compressed gases and improve the operating qualities of the compressor. The gas or air is directed from the bore 15 upwardly through the lower filter 28, silica gel or the like 29, and upper filter 28, from where it passes through the mesh screen 33 downwardly through the hollow rod 30. As the piston 9 continues its suction stroke, the vertical bore 16 will be gradually uncovered, permitting the filtered gas or oil to enter the cylinder 6 from the hollow rod 30. The gas or air which has passed through the filtering element 20 will be thoroughly cleansed by the action of the combined elements of the filter. It is understood that the filtered gas or air is discharged from the cylinder 6 through suitable valves, not shown, into the system, of which the compressor forms a part.

When operating the compressor without the use of the filter 20, the threaded opening 35, in which the filter 20 is detachably secured, is closed by means of a plug 36 and washer 37. The plug 36 does not shut off the horizontal bore 15 or the vertical bore 16, so that the air or gas from the crank case 14 has unobstructed passage from the crank case into the cylinder 6. This form of the invention is shown in Figure 3 of the drawings, and it is understood that the compressor operates and the gas or air is by-passed in the same manner as previously described, the only difference being that the gas or air is not cleansed. For manufacturing purposes, it may be desirable to construct the compressor with a plugged opening, such as illustrated in Figure 3, in which case use of the filter would be optional. Also, the plug may be positioned when the filter has been removed for repair or cleansing purposes.

In Figure 4 of the drawings there is shown a form of the invention in which both the filter and the plug have been dispensed with. In this form of the invention the gas or air from the crank case 14 is by-passed through a longitudinal bore 38, from which it is directed into the cylinder 6 through a diagonally disposed port 39. The outlet end of this port 39 is positioned and proportioned so that it will be completely uncovered when the piston 9 has completed its suction stroke. The operation of the compressor and the by-passing of the gas or air in this form of the invention is exactly the same as that described in connection with the preferred form.

While the invention has been illustrated and described for use with a compressor of the type disclosed in my Patent No. 2,323,068 of June 29, 1943, it is to be understood that the filter and by-pass arrangements can be incorporated in various types of compressors as presently being manufactured. It can be readily seen that the wall of the casing or housing of any compressor can be readily modified to include the by-pass bores and/or the filtering element associated therewith.

Having thus described my invention, what I claim as new and useful is:

1. In a compressor, a cylinder, a piston mounted for reciprocation therein and a crank case to contain fluid under pressure, a wall of said cylinder having a bore communicating at one end with said crank case, a filtering element on said cylinder having an opening in one end in communication with the opposite end of said bore, a hollow rod having one end communicating with the interior of said cylinder and its opposite end extending into said filtering element, and filter means in said element opening.

2. In a compressor, a cylinder, a piston mounted for reciprocation therein and a crank case to contain fluid under pressure, a wall of said cylinder having a bore communicating at one end with said crank case, a hollow body secured to said cylinder wall and in communication at one end with the opposite end of said bore, filter means in said body, and a hollow rod in said body having its outer end in communication therewith beyond said filter means and its inner end in communication with the interior of said cylinder.

PIETRO MANISCALCO.

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