April 19, 1938. P. MANISCALCO 2,114,719

FLUID COMPRESSOR

Filed April 10, 1937 3 Sheets-Sheet 1

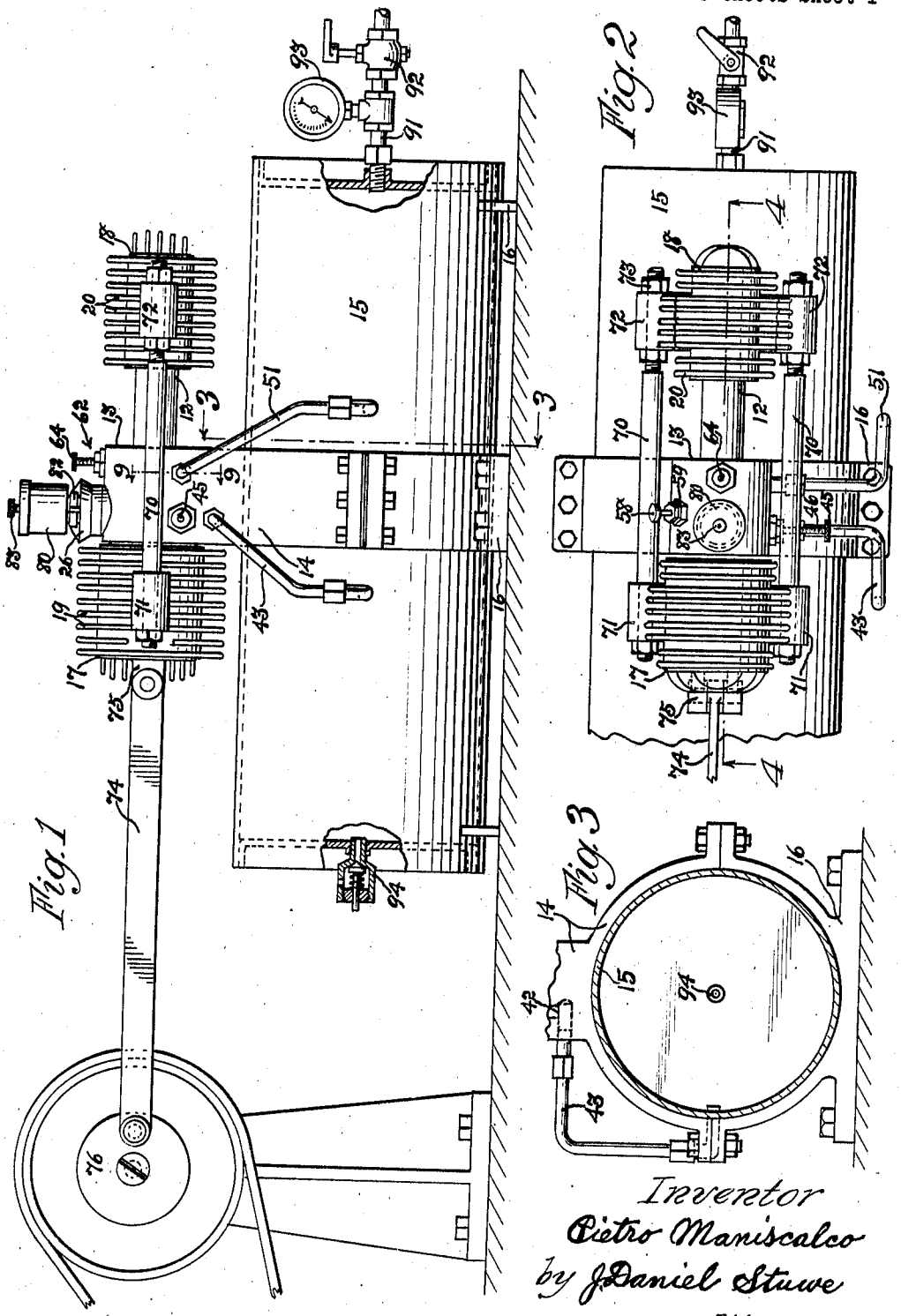


Fig. 1

Fig. 2

Fig. 3

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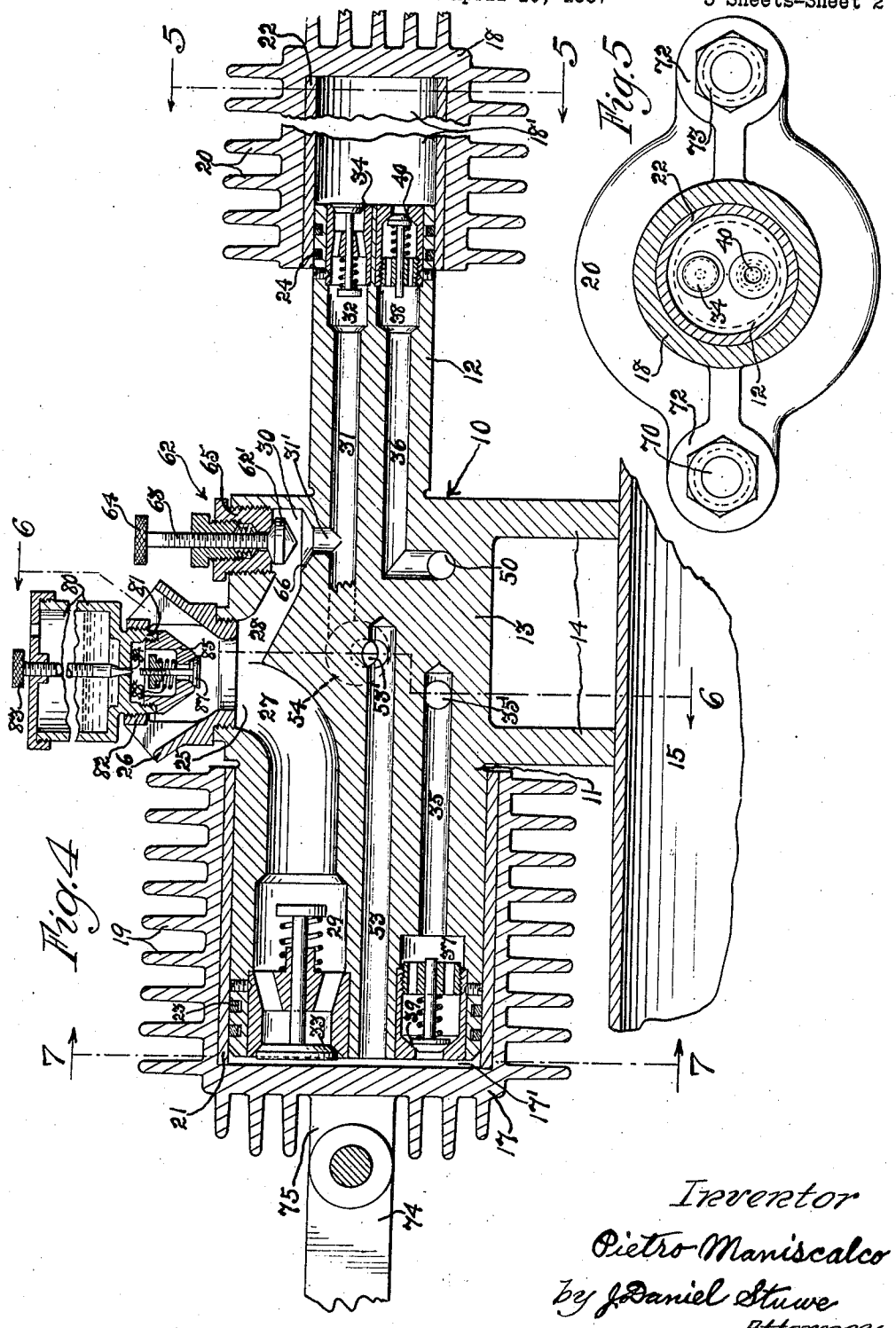


Fig. 4

Fig. 5

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Fig. 8

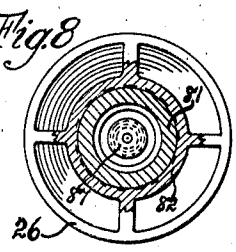


Fig. 6

Fig. 10

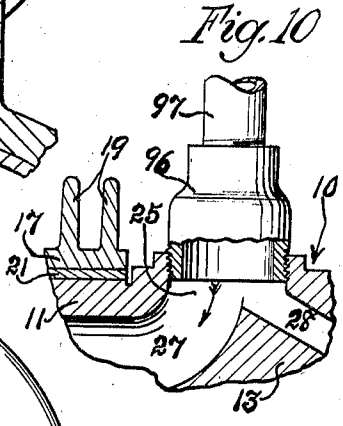


Fig. 7

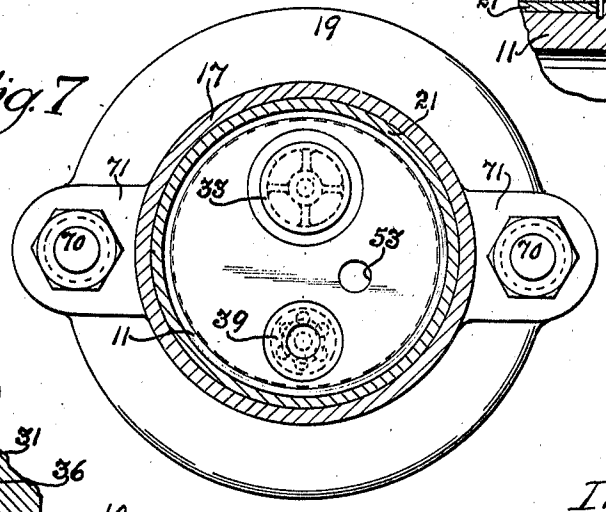
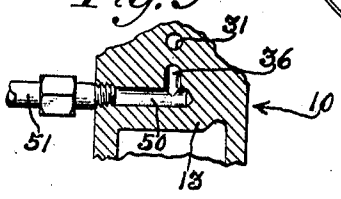


Fig. 9



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UNITED STATES PATENT OFFICE

2,114,719

FLUID COMPRESSOR

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Application April 10, 1937, Serial No. 136,114

3 Claims. (Cl. 230—40)

This invention relates to new improvements in fluid compressors.

One of the main objects of this invention is to provide a compressor of general utility which can be utilized either as a multiple stage machine for high pressure, or as a single stage machine of high volume, and which can be readily adjusted to serve for either single stage or plural stage compression.

Another object of this invention is to provide an efficient compressor which is adapted for compressing various fluids, such as air, vapor, ammoniac, and various gases; so that this compressor may be utilized for compressing fluids, whereby to operate fluid driven motors; and is also adapted for compressing refrigerants, so that it is suited for use in the refrigeration industry, the air conditioning industry, and the like.

Another object of this invention is to provide a compact and practical compressor which can be readily converted from a single stage to a multiple stage machine, and vice versa, by simply manipulating a few control valves.

A further object of this invention is to provide a fluid compressor that comprises means in the fluid intake mouth, which can be selectively adjusted, for automatically supplying a certain small quantity of lubricating means to the fluid as it is drawn into the compressor, so as to properly lubricate the movable parts.

These and various other objects and advantages are attained with this invention, as will become apparent from the following description, taken in connection with the accompanying drawings wherein the invention is illustrated in its preferred form, it being apparent that various other arrangements and forms of construction may be adopted for carrying out the objects and purposes of this invention.

In the drawings:

Fig. 1 is an elevational view illustrating an embodiment of my invention in its preferred form of construction.

Fig. 2 is a partial plan view thereof.

Fig. 3 is a cross-sectional view of the reservoir, taken on line 3—3 of Fig. 1.

Fig. 4 is an enlarged vertical sectional view of the compressor, taken on line 4—4 of Fig. 2.

Figs. 5, 6, and 7, are vertical cross-sectional views, taken respectively on lines 5—5, 6—6, and 7—7 of Fig. 4.

Fig. 8 is a horizontal cross-sectional view of the fluid inlet and of the lubricating means, taken on line 8—8 of Fig. 6.

Fig. 9 is an enlarged sectional view, taken on line 9—9 of Fig. 1.

Fig. 10 is a partial view showing a conduit for return of the refrigerant to the compressor, instead of a fluid inlet member.

Briefly, this invention comprises a stationary piston unit including a plurality of pistons which extend from its intermediate portion, each piston having a cylinder reciprocably mounted thereon, with the successive cylinders diminishing in capacity, and there being as many sets of cylinders and pistons as there are stages of compression desired. The means for converting the compressor from one stage to the other includes fluid channels in the pistons provided with control valves which can be readily adjusted, so that the fluid from all the cylinders can be directly conducted to the reservoir, to utilize the machine as a single stage compressor of high volume; or the fluid can be conducted in succession from a larger cylinder to the next smaller one, to utilize the machine as a multiple stage compressor.

In the drawings I have illustrated one embodiment of my invention, and this is shown in the form of a compressor which is readily convertible so as to be utilized either as a single stage or a double stage machine. This illustrated form comprises a stationary piston unit 10 having a pair of pistons 11 and 12 extending in opposite directions from the intermediate part or block 13 of this unit; and the unit has band means 14 depending from part 13, whereby it is conveniently mounted upon a reservoir or tank 15 to remain stationary thereon, said reservoir being supported with suitable means 16 on a base, as indicated in the drawings. A pair of cylinders 17 and 18 are reciprocably mounted on said pistons 11 and 12, respectively.

In this single stage and double stage machine as illustrated, the piston 11 and its companion cylinder 17 are larger in diameter than the piston 12 and its companion cylinder 18. The former piston and cylinder thus provide a cylinder chamber 17' of larger capacity than the cylinder chamber 18' provided by the latter; and the former ones serve as the primary piston and cylinder for the primary stage of compression, while the latter provide the secondary ones for the secondary and higher stage of compression.

The cylinders 17 and 18 are preferably made of aluminum and are provided around their exteriors with cooling fins 19 and 20, respectively. Said aluminum cylinders 17 and 18 are provided respectively with cylindrical steel rings 21 and 22 therein, which travel on the pistons 11 and 12;

while said pistons 11 and 12 are provided respectively with sealing rings or gaskets 23 and 24 around their end portions to form a fluid-tight fit.

The mechanism included for converting the compressor from one stage to the other comprises a fluid inlet mouth 25 provided on the intermediate part 13 of unit 10, and it has a fluid inlet member 26 detachably mounted therein. Two branches 27 and 28 diverge from the inlet mouth 25, the branch 27 extending thru piston 11 and terminating in a pocket 29 at the end of said piston, and the branch 28 terminating in a pocket 30 connected thru a branch 31' to a channel 31 which extends thru piston 12 to a pocket 32 in the end of said piston. A check valve 33 is mounted in pocket 29, and a check valve 34 is mounted in pocket 32. Each check valve includes the usual valve element for closing the valve seat, and a spring for normally drawing the element to its closed position. These channels and valves serve as the inlet means for conducting the fluid into cylinder chambers 17' and 18' to be compressed.

A pair of outlet channels 35 and 36 are provided in pistons 11 and 12 and terminate in pockets 37 and 38 provided at the ends of pistons 11 and 12, respectively, wherein check valves 39 and 40 are mounted to serve as outlet valves for the flow of fluid from chambers 17' and 18', respectively. A pocket 41 in the side of part 13 communicates thru a branch 35' with channel 35, and a branch channel 42 extends from said pocket toward the side of said part 13. A conduit 43 extends from this channel 42 to the reservoir, so as to conduct the compressed fluid from chamber 17' thru valve 39, pocket 37, channel 35, pocket 41, channel 42, and conduit 43 to the reservoir 15.

A control valve 44 is provided in pocket 41 and includes a valve element 44' having a control knob 45 on the outer end of its stem 46 which extends thru a valve casing 47 threaded in the outer end of pocket 41. Said element 44' is adapted to engage a valve seat 48 in the pocket 41, to close the channel 35 from communication with channel 42, and prevent the primarily compressed air from flowing directly from chamber 17' into the reservoir.

The channel 36 in piston 12 has a bent channel 50 extending therefrom downwardly and then laterally to the side of piston part 13, and has a conduit 51 connected to said bent channel and extending therefrom to reservoir 15, thus providing an outlet for the compressed air from chamber 18' thru valve 40, pocket 38, channels 36 and 50, and conduit 51 to reservoir 15. These channels and the conduit are constantly open in this two stage compressor, so that the compressed air from the secondary chamber 18' is enabled to pass thru valve 40 to the reservoir.

Channel means is also provided to furnish direct communication between primary chamber 17' and secondary chamber 18' to conduct the primarily compressed air to the second stage chamber 18'. This includes a channel 53 extending thru piston 11, from chamber 17' to intermediate part 13, and it is connected thru a branch channel 53' with a pocket 54 in said part 13, which is connected with channel 31, so that the fluid can flow from chamber 17' thru channel 53, branch 53', pocket 54, channel 31, pocket 32, and valve 34 into chamber 18'.

The control valve means, besides control valve 44, comprises a control valve 56 mounted in pocket 54 and including a valve element 56' with a stem 57 having a knob 58 on its outer end and extending thru a valve casing 59 threaded in pocket 54. Said element 56' is adapted to engage the valve seat 60 to close communication between branch channel 53' and pocket 54 on channel 31, in order to stop the direct flow of fluid from chamber 17' thru channel 53, branch 53', pocket 54, channel 31, pocket 32, and valve 34 into chamber 18'.

The control valve means further comprises a control valve 62 mounted in pocket 30 and including a valve element 62' with a stem 63 having a knob 64 on its outer end, said stem extending thru a valve casing 65 threaded in pocket 30. The element 62' is adapted to engage a valve seat 66 to close communication between branch channels 28 and 31' to be adapted to prevent passage of fluid from inlet branch 28 into channels 31' and 31, and therefrom directly into chamber 18'.

The cylinders 17 and 18 are connected to operate together, as by means of connecting rods 70 fastened in sleeves 71 and 72 provided on cylinders 17 and 18, by the use of nuts 73 threaded on said rods, so that the cylinders will be reciprocated together on the pistons. Suitable means is provided to operate the cylinders, as for example, a link 74 pivoted at one end to ears 75 on cylinder 17, and at the other end to a driving member 76 which is supported and driven in any suitable manner.

In the drawings the control valves are shown in position for the mechanism to function as a single stage compressor. The fluid then enters thru inlet member 26 and flows thru both of the inlet branches 27 and 28, passing thru inlet branch 27 and valve 29 to chamber 17'; and likewise passing thru branch 28, pocket 30, branch 31' channel 31, and valve 34 into chamber 18'. The fluid when primarily compressed in chamber 17' then flows from it thru check valve 39, channels 35 and 35', pocket 41, channel 42, and conduit 43 into the reservoir. At the same time the fluid primarily compressed in chamber 18' then flows thru check valve 40, channels 36 and 50, and thru conduit 51 into the reservoir. In a given time this provides a larger volume, but at a lower pressure, than when operating as a double stage compressor. When it is desired to operate the mechanism as a double stage compressor, then the three control valves are manipulated, to close valve seat 48 by its valve element 44'; also to close valve seat 66 by its valve element 62'; and to open valve seat 60 by retracting valve element 56' therefrom. The fluid entering thru inlet mouth 25 will then be stopped by the closed valve 62 from passing thru channel 28 into channel 31, and will flow only thru channel 27 into chamber 17' for the primary stage of compression. From there it cannot pass thru channel 35 into channel 42 and directly to the reservoir, because valve 44 is closed; but can flow only thru channel 53 and its branch 53', thru the open valve 56, pocket 54, channel 31, and check valve 34 into chamber 18' for the second stage and a higher degree of compression. From said chamber 18' this doubly compressed fluid then flows thru valve 40, channel 36 and conduit 51 into the reservoir.

The compressor is provided with lubricating means which is removably mounted thereon, for automatically supplying a desired quantity of lubricating material to the fluid as it is taken into the compressor. It comprises a cup or container 80 removably mounted on member 26, as by means of a lower neck 81 on the cup which has threaded engagement in a collar 82 in the upper

central part of inlet member 26, so that the entering fluid is drawn in around neck 81.

This lubricating means further comprises a manually controlled valve in the form of a needle valve 83 provided in the cup, and being adjustable to control the flow thru the discharge opening 84 in the bottom of the cup, or to close the opening; and it comprises an automatic control valve 85 threaded in said neck 81 and including a valve element 87 held yieldably against its valve seat by a spring 88 adjustably mounted on the valve stem. As the fluid is drawn in thru member 26, the valve element 87 is drawn open thereby, and the lubricant is spread as it descends over the tapering element 87; while the manipulating of needle valve 83 determines the desired amount of lubricant to be admixed with the entering fluid.

In the drawings I have shown the compressor in connection with a reservoir 15 for receiving the compressed fluid and storing it for use. A conduit 91 extends from the reservoir and has a control valve 92 therein, for controlling the feeding of the compressed fluid, as when used for operating a fluid driven motor or for any desired purpose. A pressure gauge 93, and a safety valve 94 are also supplied for the reservoir.

When this compressor is to be utilized in a refrigeration system, for compressing a refrigerant, which is returned for recompression after its expansion in the cooling mechanism, then the inlet member 26 with the lubricating mechanism is readily removed from inlet mouth 25, and a suitable fluid return member, as for example, a nipple 96, provided with a return pipe 97, can be readily installed in inlet mouth 25, in place of the removed member 26, as indicated in Fig. 10 of the drawings, for the return and recompression of the expanded refrigerant. The compressor is likewise adapted for use in an air conditioning system, and the like.

The fluid inlet channels 27, 28 and 31, which conduct the cool fluid from the inlet means 26 to the cylinder chambers 17' and 18', aid in cooling the pistons, while the cooling fins 19 and 20 serve to cool the cylinders, thus providing a relatively cool compressor.

I claim:

1. A fluid compressor comprising in combination a stationary piston unit including a central block having integral thereon a plurality of pistons of different diameters extending in different directions therefrom, a cylinder on each piston and providing cylinder chambers of different capacities, means for reciprocating the cylinders on the pistons, fluid inlet means on the central block and provided with a conduit branching therefrom and extending longitudinally through each piston to its cylinder chamber, a check valve in each conduit, control valve means mounted in said block and adapted to close all but one of said conduits, a channel in said unit, leading from a larger cylinder chamber to an inlet conduit of a smaller cylinder chamber to provide direct communication between said chambers and having control valve means thereon adapted to close said communication, a discharge conduit extending from each chamber through its associated piston and provided with conduit means leading to a reservoir, and control valve means mounted in the block adapted to close all but one of said discharge conduits, whereby said control valve means can be readily operated to adapt the compressor for use as a single stage or likewise as a multiple stage compressor.

2. A fluid compressor comprising in combination a stationary piston unit consisting of a central block having a smaller piston and a larger piston extending from the two opposite ends and integral therewith, a pair of cylinders reciprocably mounted on the two ends of the pistons and providing a larger and a smaller cylinder chamber, a fluid inlet mouth on said block and having branch conduits diverging therefrom and extending longitudinally through the pistons to the two chambers, a check valve in each conduit for admitting fluid to the chamber, a control valve extending into the block adapted to enter the conduit of the smaller piston to prevent inlet of fluid directly to the smaller chamber, a channel extending through the larger piston and connected to the inlet conduit of the smaller piston, adapted to provide direct communication between the two chambers, a control valve extending into the block adapted to enter said channel and close said communication, a valved outlet conduit extending from each chamber through the associated piston, and a control valve in the block adapted to close the outlet conduit leading from the larger chamber, whereby the control valves can be readily operated and the mechanism utilized either as a single stage or a double stage compressor.

3. A fluid compressor comprising in combination a stationary piston unit consisting of a substantially cylindrical central block having a smaller piston extending from one end and a larger piston extending from its opposite end, a pair of cylinders mounted on the two ends of the pistons and providing a larger and a smaller cylinder chamber, a fluid inlet mouth on said block and having branch conduits diverging therefrom and extending through the pistons to the two chambers, a check valve in each conduit for admitting fluid to each chamber, a control valve removably mounted in the block adapted to enter the conduit of the smaller piston to prevent inlet of the fluid directed to the smaller chamber, a channel extending through the larger piston and connected to the inlet conduit of the smaller piston, adapted to provide direct communication between the two chambers, a control valve removably mounted in the block adapted to enter said channel and close said communication, a valved outlet conduit extending from each chamber through the associated piston, and a control valve removably mounted in the block adapted to close the conduit leading from the larger chamber, whereby the control valves can be readily operated and the mechanism utilized either as a single stage or as a double stage compressor.

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