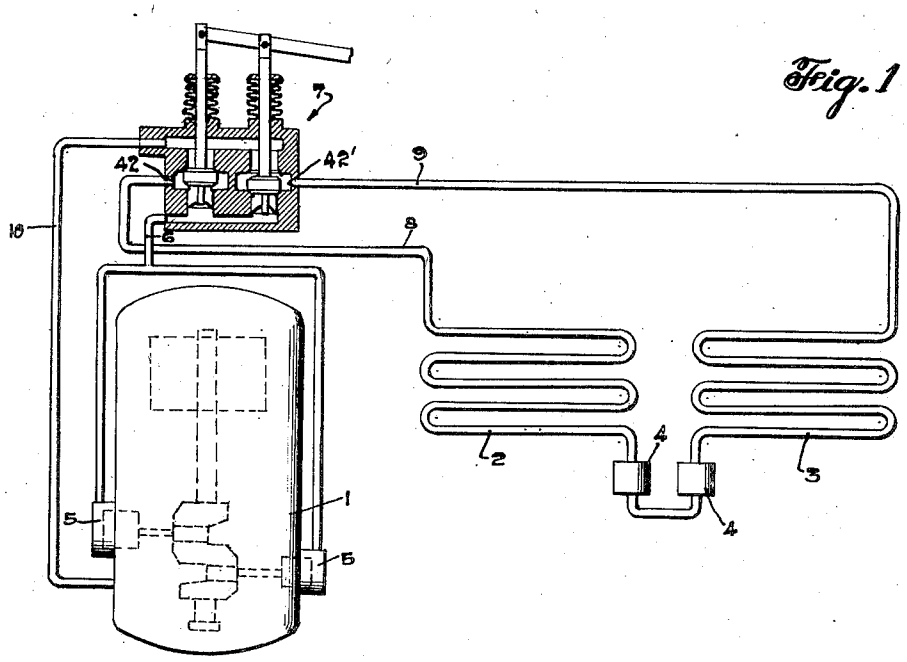
Jan. 31, 1939. J. R. ZWICKL 2,145,575

REVERSING VALVE MECHANISM

Filed Sept. 22, 1934 5 Sheets-Sheet 1

Fig. 1



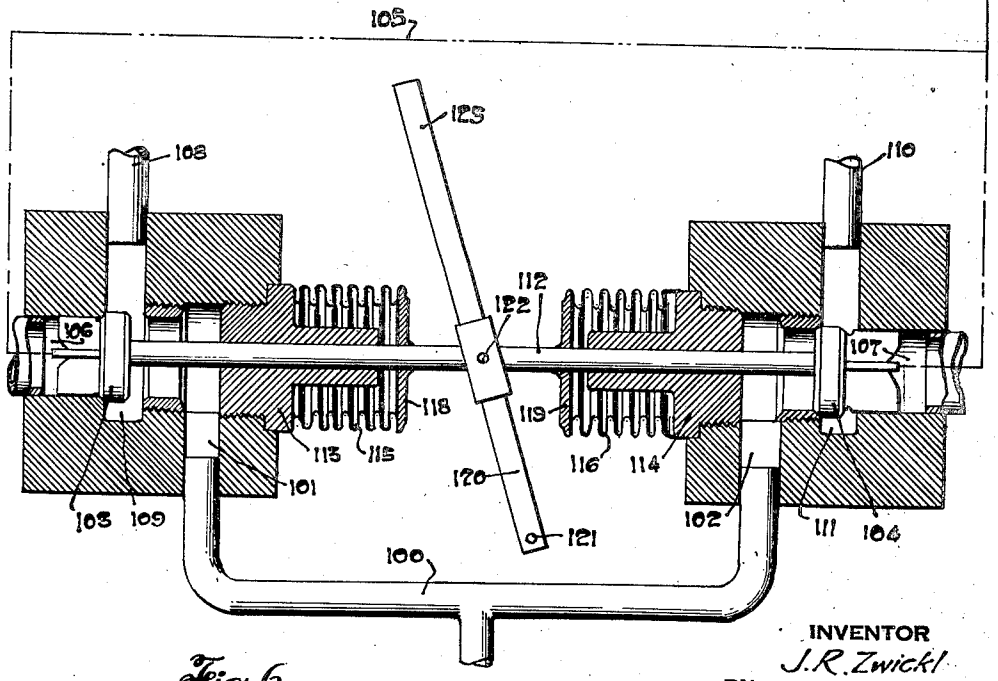


Fig. 6

INVENTOR
J. R. Zwickl
BY
ATTORNEY

Jan. 31, 1939. J. R. ZWICKL 2,145,575

REVERSING VALVE MECHANISM

Filed Sept. 22, 1934 5 Sheets-Sheet 2

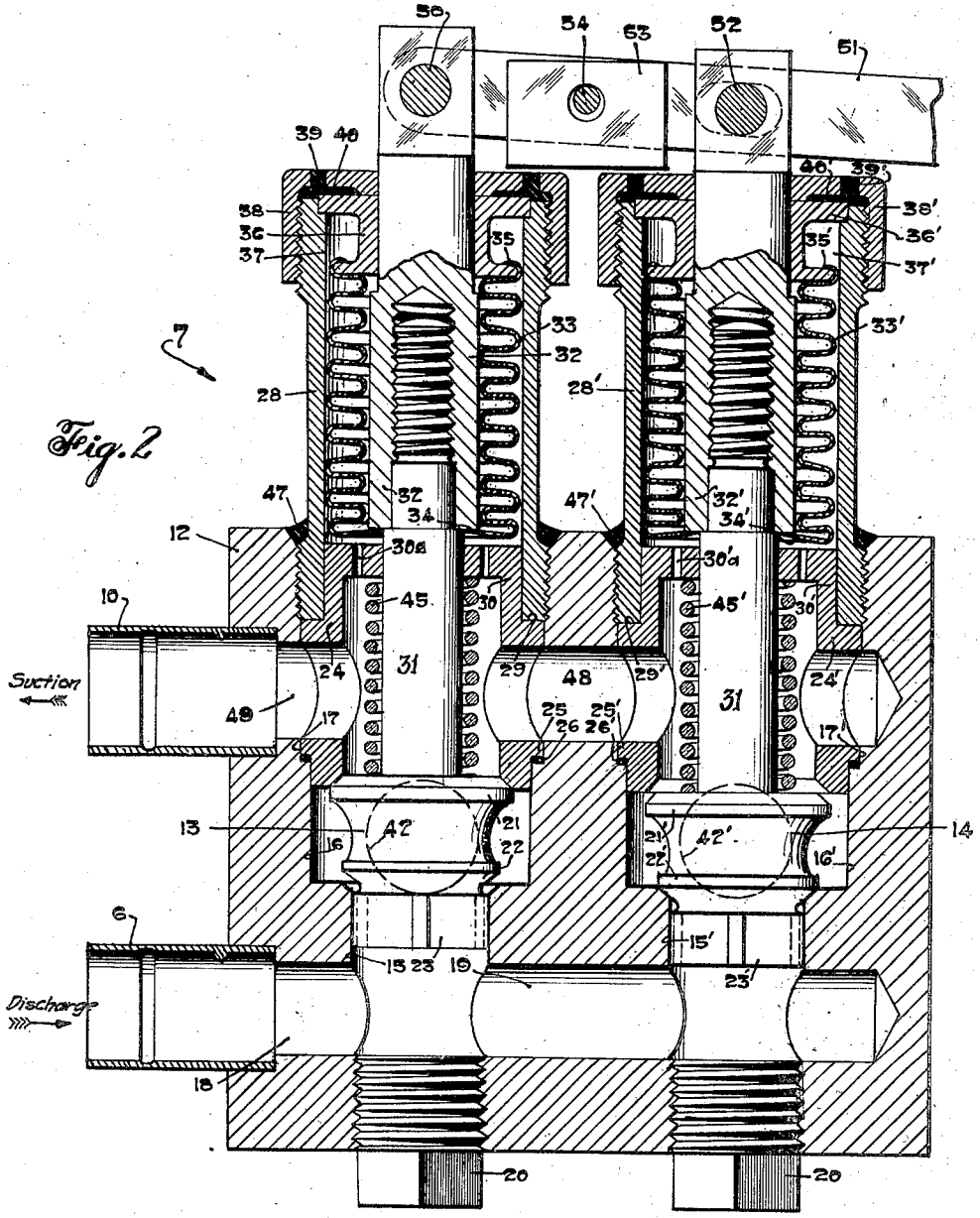


Fig. 2

INVENTOR
J. R. Zwickl
BY
ATTORNEY

Jan. 31, 1939. J. R. ZWICKL 2,145,575

REVERSING VALVE MECHANISM

Filed Sept. 22, 1934 5 Sheets-Sheet 3

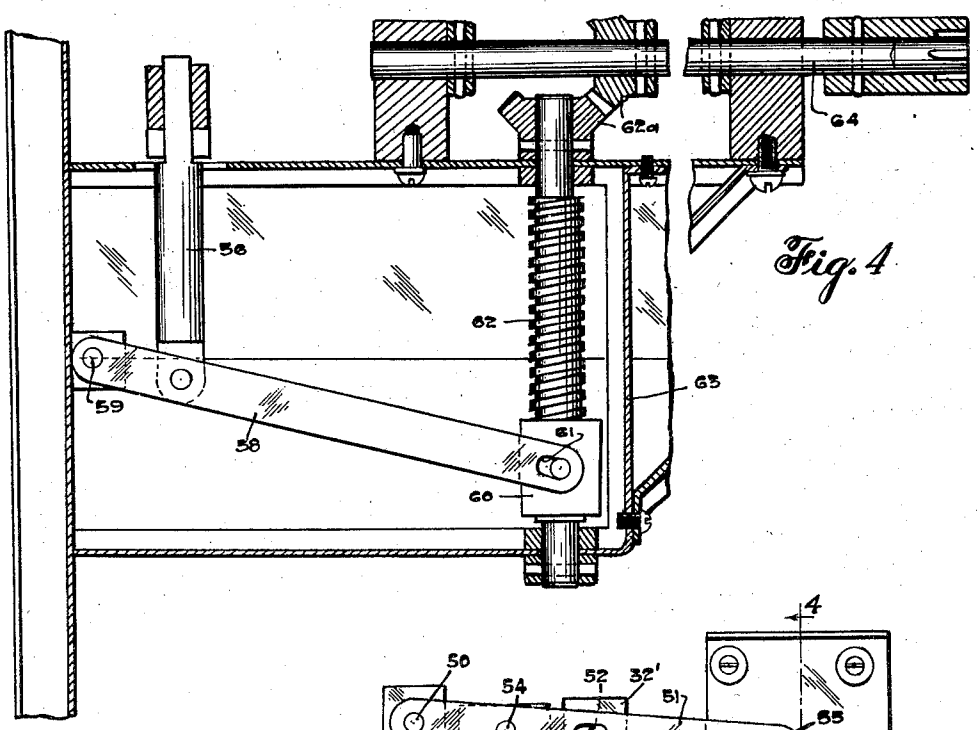


Fig. 4

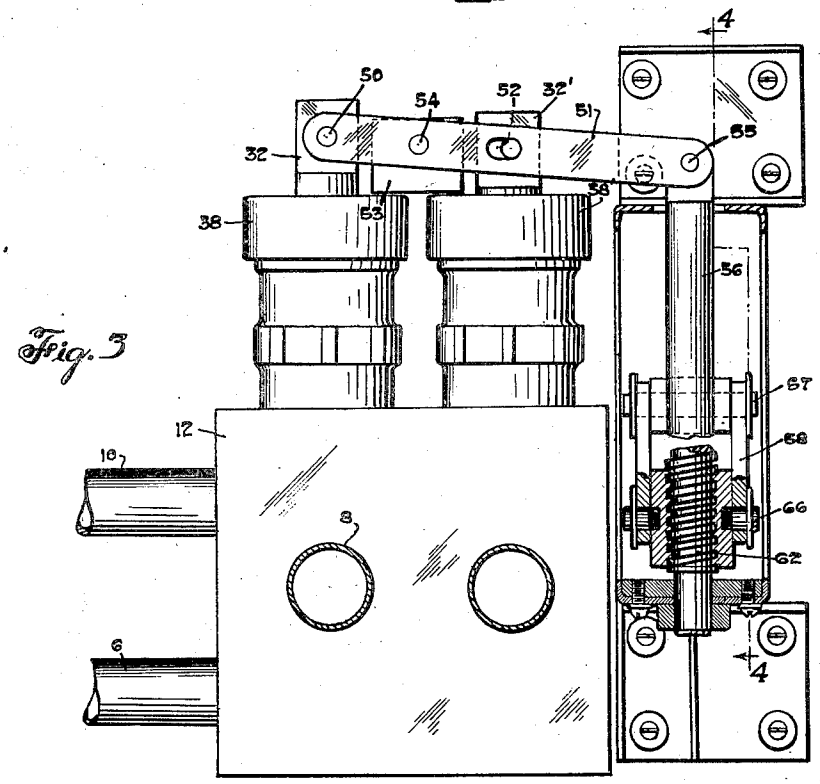


Fig. 3

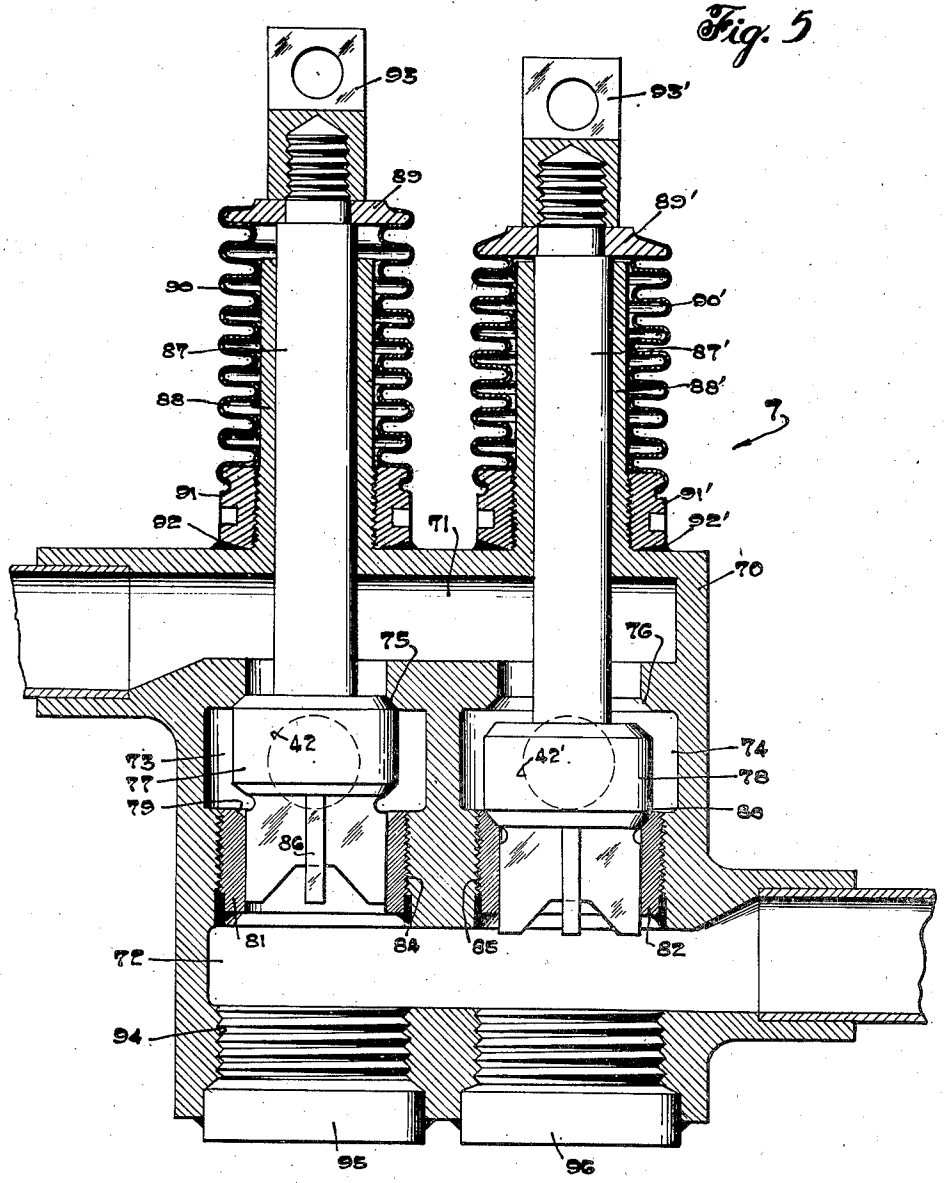
INVENTOR
J. R. Zwickl
BY
ATTORNEY

Jan. 31, 1939. J. R. ZWICKL 2,145,575

REVERSING VALVE MECHANISM

Filed Sept. 22, 1934 5 Sheets-Sheet 4

Fig. 5



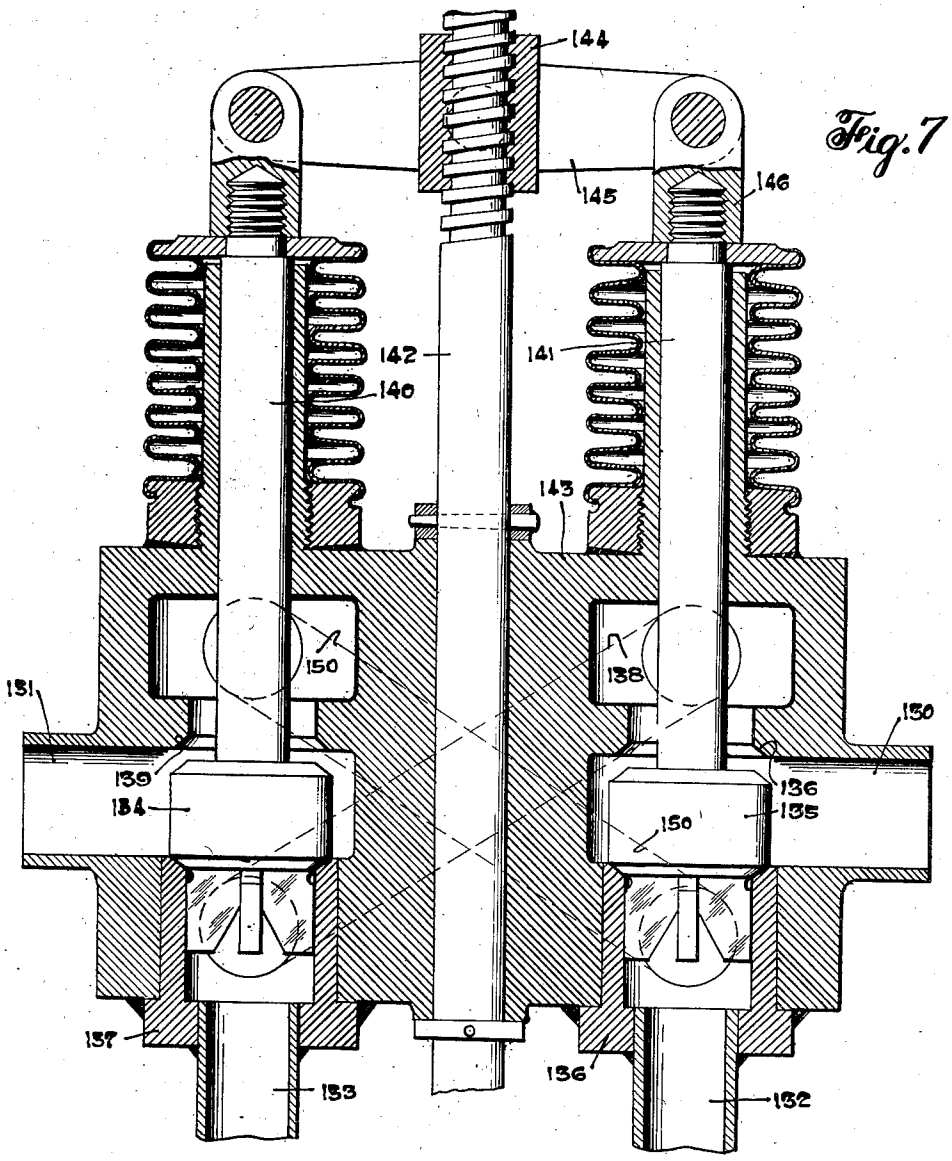
INVENTOR
J. R. Zwickl
BY
ATTORNEY

Jan. 31, 1939 J. R. ZWICKL 2,145,575

REVERSING VALVE MECHANISM

Filed Sept. 22, 1934 5 Sheets-Sheet 5

Fig. 7



INVENTOR
J. R. Zwickl
BY
ATTORNEY

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2,145,575

UNITED STATES PATENT OFFICE

2,145,575

REVERSING VALVE MECHANISM

Joseph R. Zwickl, Philadelphia, Pa., assignor to Baldwin-Southwark Corporation, a corporation of Delaware

Application September 22, 1934, Serial No. 745,123

9 Claims. (Cl. 62—115)

This invention relates generally to air conditioning apparatus employing a refrigerating system adapted to be used for either heating or cooling and more particularly to an improved valve mechanism for interchanging the functions of a condenser and evaporator whereby the refrigerating system may be employed to heat or cool the air of rooms, railroad cars or other enclosures.

It is well-known that a refrigerating system employing a condenser and evaporator may be used for either heating or cooling purposes merely by causing the conditioned medium to be circulated over the evaporator to be cooled thereby or to be circulated over the condenser to be heated thereby. Normally a condenser and evaporator, and a compressor in cases of a compression system, have a fixed physical relation to each other, and in the most desirable form of heater-cooler air conditioning apparatus, room air is passed over one of the heat exchange elements and outside air over the other, although it will of course be understood that liquid medium may be employed in place of the room air if it is desired to indulge in the expense of the necessary liquid piping and radiating surface for the room. In view of the fixed physical relation of the refrigerating elements, it is necessary, in order to interchange or reverse the functions of the condenser and evaporator, to reverse the condenser and evaporator connections with respect to the suction and discharge of the compressor. This reversal is usually effected by valve mechanisms of various types, but a great deal of difficulty has been experienced in providing valves for this purpose which would be absolutely leakproof.

It is one object of my invention to provide an improved valve mechanism for interchanging the functions of the condenser and evaporator. A further and more specific object of the invention is to provide an improved poppet type valve mechanism so constructed and arranged in combination with yieldable sealing rings so as to provide a very effective leakproof construction.

A further object is to provide an improved poppet type valve mechanism employing in an improved manner a sylphon bellows as the sealing element. A further object in this respect is to provide an improved valve mechanism so constructed and arranged in combination with bellows sealing means that the bellows is subjected to minimum pressure at all times and more specifically to the suction pressure of the system.

Another object is to provide an improved reversing valve mechanism of the multiple poppet valve type arranged in an improved manner that the valves move in opposite directions during the reversing operation. Another object is to provide improved actuating means for the valve mechanism whereby the valves may be positively and properly seated with minimum effort.

A further object is to provide a valve casing, a valve seat member, and a valve stem guide all of which are so constructed and arranged that the valve mechanism may be manufactured economically and have a high degree of durability and effectiveness in permitting the relatively movable parts to be maintained in proper relation and yet efficiently perform the reversing function.

Other objects and advantages will be more apparent to those skilled in the art from the following description of the accompanying drawings in which:

Fig. 1 is a diagrammatic view of a compressor, condenser and a refrigerating system embodying one form of my improved valve mechanism;

Fig. 2 is an enlarged sectional view of one form of my improved valve mechanism;

Fig. 3 is a side elevation of a valve mechanism showing partially in section the valve operating mechansm;

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 3;

Fig. 5 is a modified form of my improved valve mechanism whereby one set of valve seats is screwed in position on the under side of the valve casing, the sealing bellows however remaining under low pressure at all times;

Fig. 6 is a further modification wherein low pressure bellows are employed in combination with an opposed type of valve mechansm;

Fig. 7 is a further modified form of valve mechanism whereby both poppet valves simultaneously move either up or down to effect reversal, although the sealing bellows in this form is ultimately subjected to high and low pressure.

In the illustrated embodiments of the invention which are shown herein merely for the purpose of disclosing certain specific forms among possible others that the invention might take, I have diagrammatically incorporated the invention in a compression refrigerating system having a suitable motor driven compressor diagrammatically indicated at 1 and a pair of complementary heat exchange elements 2 and 3 which are interconnected by any suitable expansion valve mechanism generally indicated at 4 whereby refrigerant may be expanded in either direction of flow through the heat exchange elements 2

and 3. Compressor cylinders 5, or equivalent compressing mechanism, are connected to a common high pressure or discharge pipe 6 which communicates with my improved reversing valve mechanism generally indicated at 7. The heat exchange elements 2 and 3 are respectively connected to the valve mechanism 7 by pipes 8 and 9, while the suction or low side of the compressor is connected by a pipe 10 with the valve mechanism. The direction of fluid flow through the high side toward the valve mechanism is the same at all times and likewise the direction of fluid flow in the low side away from the valve mechanism is also in that direction at all times. Thus these passages may be hereinafter referred to as the uni-directional flow high and low passages or as the compressor and high and low passages. Such terms will of course include any continuations of said passages as hereinafter described.

As shown in Fig. 2, the reversing valve mechanism comprises a valve body 12 formed preferably of a rectangular flat block of steel or other suitable metal and having a thickness just sufficient to accommodate the maximum diameter of one of the operating valve mechanisms. The valve block encloses a pair of double seating poppet type valves generally indicated at 13 and 14. Inasmuch as the structure for each valve is identical, it will suffice to describe only the valve mechanism 13, although where it is necessary to refer to parts of the valve mechanism 14, such parts will be given the same numbers of corresponding parts of valve 13, but primed. The valve body is provided with a series of successively enlarged bores 15, 16 and 17 communicating at their lower end with a horizontal high pressure inlet passage 18 while a continuation 19 of this passage also communicates with the second valve mechanism 14. Suitable threaded plugs 20 close the lower end of the bore 15. Passages 15, 16 and the interior of sleeve 24 (and the corresponding passages of valve 14) constitute what may be herein referred to as reversing or cross-over passages.

The valve 13 is of the double poppet type preferably having differential tapered valve heads 21 and 22, while a suitably fluted guide stem 23 projects downwardly from the valve and is guided in bore 15. A lower tapered valve seat is provided at the corner of bore 15 while an upper tapered valve seat is provided on the corner of a hollow valve seat member 24. This member has a peripheral flange portion 25 received in bore 17 while suitable packing is interposed at 26 between flange 25 and the shoulder of bore 17. A portion of the valve member 24 also projects down into bore 16. The valve seat member preferably has a snug fit with bores 16 and 17 to insure the utmost accuracy in alignment of the valve and seats. To eliminate further any possibility of misalignment of the valves and seats the valve seat member 24 does not have any threaded engagement with the valve block 12 so that there is no opportunity to distort the valve seat member when placed in position as there would be if this member were screwed into position. To hold the member in position while at the same time providing a suitable housing for a sealing bellows, I have provided a cylindrical housing 28 whose lower end has threaded engagement with the upper end of bore 17 and is adapted to press the valve seat member in position by engaging a shoulder 29 thereof. The housing also telescopes with the upper portion 30 of the valve seat member to maintain a co-operating aligning relation. This upper portion 30 has a transverse portion to assist if desired in guiding the valve stem 31, while ports 30a permit equalization of pressure on each side of the transverse portion. The upper end of the valve stem has an extension 32 threadedly secured thereto.

To seal the valve mechanism against leakage along the stem, I have provided an annularly corrugated metallic bellows or diaphragm 33 whose lower flange 34 is soldered or otherwise hermetically secured to the element 32 preferably at the lowermost surface thereof. The uppermost flange 35 of the bellows is similarly secured to a sleeve 36 seated in a suitable recess 37 in the housing 28. Sleeve 36 is held in position by a collar 38 having threaded engagement with the exterior of housing 28. The collar, sleeve and housing are hermetically sealed by introducing solder or other suitable material through suitable openings 39 to an annular recess 40 commonly overlying the housing and sleeve 36. The sleeve 36 is thereby rigidly held in fixed relation to the housing 28, and hence is adapted to serve as a suitable guide for the extension valve stem 32.

An advantage of the combination of extension 32, bellows 33 and sleeve 36 is that these elements may be secured together as a sub-assembly unit and then threadedly secured to the valve stem 31, thus permitting the bellows to be soldered without any possibility of distorting the valve seat member by transmission of the soldering heat thereto.

The bores 16 and 16' function as valve chambers communicating with pipes 8 and 9, of the heat exchange elements, as through suitable lateral ports or passages diagrammatically indicated in Fig. 2 by dotted circles 42 and 42' and shown more clearly in Fig. 1. These may be hereinafter referred to as the reversible flow passages, or the heat exchange element passages.

In assembling the valve mechanism, valve 23 is first inserted in chamber 16 and then a spring 45 is placed over valve stem 31, after which valve seat member 24 is placed in position in bores 16 and 17 with suitable packing 26 at the shoulder 25. Housing 28 is then screwed into position to clamp packing 26. The bellows unit 32, 33 and 36 is inserted within the housing and stem 32 screwed into threaded engagement with stem 31, the sleeve 36 resting in the annular recess 37 at the upper end of the housing. Collar 38 is then screwed tightly into position to hold the sleeve 36 firmly to its seat after which the joint formed by recess 37 and sleeve 36 is hermetically sealed by solder or other suitable sealing material in annular recess 40. The annular joint at 47 is also soldered.

In operation of the valve mechanism per se, it is assumed that valve 13 is in its upper closed position and valve 14 in its lower closed position as shown in Fig. 2. Referring now to Fig. 1, it is seen that fluid pressure will be discharged from cylinders 5 through pipe 6 to (Fig. 2) passages 18 and 19 and thence upwardly through bore 15 to valve chamber 16 and through port 42 and pipe 8 to heat exchange element 2 now functioning as a condenser. Any suitable cooling medium such as air or water may be employed to cool the condenser, the condenser refrigerant flowing through the expansion means 4 to the heat exchange element 3 now functioning as an evaporator. The evaporated refrigerant flows through pipe 9 and port 42', thence upwardly from chamber 16' past valve head 21' and out through passages 48 and 49 (and ports in valve seat members

30 and 30' registering with passages 48 and 49) to the suction pipe 10 leading to the compressor intake.

It will be noted that during the foregoing operation the upper side of both valves is subjected to the relatively low suction pressure, and hence the bellows 33 and 33' are also each subjected to this low pressure.

To interchange the functions of the heat exchange elements 2 and 3, which is accomplished by reversing the direction of refrigerant flow therethrough, it is only necessary to move valve 13 to its lower closed position and move valve 14 to its upper closed position in which event fluid is discharged from cylinders 5 through pipe 6 to passages 18 and 19, the high pressure gas in this case flowing upwardly through bore 15' into chamber 16' and thence outwardly through port 42' to pipe 9 and heat exchange element 3 now functioning as the condenser. Any suitable medium such as air or water may be employed to cool the condenser 3. The condensed refrigerant liquid then flows through any suitable expansion mechanism 4 to heat exchange element 2 now functioning as an evaporator from which the evaporated gas under relatively low suction pressure flows through pipe 8 and port 42 to valve chamber 16 and thence upwardly past valve head 21 to passage 49 and pipe 10 to the suction side of the compressor.

It will again be noted from the immediately foregoing operation that the upper side of both valves is subjected to the low suction pressure and likewise the bellows 33 and 33' are also subjected to this same low pressure. Hence it is seen that in either position of the valve mechanism, and at all times while in use, the sealing means such as the bellows, soldering joints and the like, are subjected only to relatively low suction pressure thereby minimizing the possibility of leakage and deterioration or fatigue of the bellows as would otherwise occur in case the bellows and joints are subjected at any time to the high discharge pressure.

The springs 45 and 45' may or may not be used depending upon the particular pressure conditions under which the valve mechanism is used and also depending upon the tightness with which it is desired to seat the valves or to control the ease of operation thereof as will be more fully set forth hereinafter. The springs operate on the valves against the high discharge pressure which is always present on the under side of each valve. The flexibility of the bellows 33 and 33' will not impose any appreciable resistance to axial movement of the valves.

Valve actuating mechanism.—While various arrangements may be provided for moving the valves in opposite directions, yet I have provided as shown in Figs. 3 and 4 a relatively simple and yet very effective mechanism for insuring positive seating of each valve whereby upon seating of one valve, a fixed fulcrum is provided about which the operating lever may pivot to seat the other valve or vice versa, together with floating means for insuring that the valves will tend to be simultaneously initially unseated during a reversing operation and for preventing disalignment of the valve stems during pivotal movement of the operating lever.

The floating means just above referred to consists in having the upper end of the valve stem extension 32 pivotally connected as at 50 to a floating operating lever 51 while the other valve stem 32' is connected to said lever through a pin and slot connection 52. A floating fulcrum block 53 is pivotally connected as at 54 to the operating link 51 at a point intermediate the valve stems and, in the position as shown, this block is slightly spaced from the upper surfaces of collars 38 and 38'. The outer end of lever 51 is pivotally connected as at 55 to a vertical link 56 whose lower end is pivotally connected at 57 to a lever link 58. One end of this link has a fixed pivotal support 59 while the other end is connected to a nut 60 as by a pin and slot connection 61. This nut is normally non-rotatable but is axially movable along a screw 62 which is suitably journalled at its upper and lower ends in a housing 63. This housing may be supported in any suitable manner in fixed relation to the valve body 12. Screw 62 may be rotated in any desirable manner such as through bevel gears 62*a* and a shaft 64 likewise suitably journalled in housing 63. A hand crank, motor or other suitable actuating means may be removably or permanently secured to shaft 64 for actuation thereof.

Operation of valve and its actuating mechanism.—Discharge pressure acts on one side of the valves and suction pressure on the other side thereof, so consequently if the valves are seated on either one of the two sets of seats, any unbalancing force acting on either valve is the effective area of the valve multiplied by the pressure difference. If the valve is seated toward the suction side, then the higher pressure on the discharge side will keep the valve closed whereas if the valve is seated toward the discharge side, the discharge pressure tends to open the valve and the same must be counteracted by an adequate force. If, therefore, the effective valve area toward the suction side is made larger than the area toward the discharge side, then the force which tries to open the valve when it is seated toward the discharge side will be less than the force which keeps the valve closed when it is seated toward the suction side. By applying to the valve stem a spring 45 of such proportions that the spring force is larger than the differential pressure force acting on the valve in an opening direction when the valve is seated toward the discharge side, but is smaller than the force which keeps the valve closed when it is seated toward the suction side, then this valve will stay closed when seated toward either the suction or discharge side. If the valve is seated toward the discharge side, the spring keeps the valve closed against the pressure difference and if the valve is seated toward the suction side, then the pressure difference closes the valve against the spring force.

The foregoing relation between the suction and discharge pressures, the spring force and valve areas are expressed mathematically as follows: If F_1 designates the effective area on the smaller side of the valve, F_2 the effective area on the larger side of the valve, D_p the pressure difference, and S the spring force, then the relation which holds is F_1 multiplied by D_p is smaller than S, and this again is smaller than F_2 multiplied by D_p, or stated otherwise $F_1 \times D_p < S < F_2 \times D_p$.

Now assuming the valves 13 and 14 to be in the position shown in Fig. 2 and that it is desired to reverse their relation, shaft 64 is rotated to thereby rotate screw 62 and raise nut 60 together with lever 58, link 56 and lever 51, Figs. 2 and 3. As a result, lever 51 will swing in a counterclockwise direction about pivot 50, thereby raising valve 14 off of its high pressure seat. The high pressure in passages 18 and 19 and the low pressure in passages 48 and 49 will immediately equalize,

whereupon spring 45 will move valve 13 downwardly. However, the extent of downward movement of valve 13 is instantly limited by the fact that stem 32 in moving downwardly will also move lever 51 downwardly until floating block 53 engages the top of valve collars 38 and 38'. Only a small clearance is normally provided between block 53 and said collars so that only a very small degree of initial opening movement of the valve will take place before block 53 comes into action and rests on top of collars 38. Spring 45 will constantly urge valve 13 downwardly so that block 53 will engage collars 38 and thus prevent downward movement of valve 13 until lever 51 has moved upwardly in a counterclockwise direction. Such movement of lever 51 will insure that valve 14 will raise as valve 13 lowers until the two valves seat simultaneously or substantially so against the new set of seats, whereupon the refrigerant flow through the passages will be reversed. It is thus seen that block 53 in resting on collars 38 insures that one valve cannot move out of step with the other valve.

On the other hand, assuming the valves to be in their reversed position as just above described and that it is now desired to shift them back again to the position shown in Fig. 2, screw 62 will be reversely rotated so as to swing lever 51 in clockwise direction, whereupon one valve or the other will initially open to allow equalization of pressure on the high and low sides. Thereupon any tendency of spring 45' to move valve 14 downwardly more rapidly than valve 13 moves upwardly will be restrained by operation of floating block 53 engaging the top of collars 38 in the manner above described.

It will of course be understood that if additional seating pressure is desired on the valves, it is only necessary to rotate screws 62 and cause lever 51 to fulcrum about the pivots 50 and 52 of the valve stems in exerting more pressure on the valves. Also it is apparent that springs 45 and 45' may be omitted if it is desired to rely entirely upon seating and unseating pressures being applied solely through the screw and leverage system disclosed, although the springs are desirable under many circumstances as previously set forth.

Modification in Fig. 5.—In Fig. 5 a valve body 70 has a low pressure or suction side 71 and a high pressure or discharge side 72. Valve chambers 73 and 74 are provided with valve seats 75 and 76 whereby valves 77 and 78 are adapted to seat toward the low pressure side. Valve seats 79 and 80 are provided toward the high pressure or discharge side 72 through the provision of sleeves 81 and 82 having threaded engagement with suitable bores 84 and 85. The valves have suitable fluted guides such as 86 slidably received in valve seat sleeves 81 and 82 while valve stems such as 87 extend upwardly through guides 88 which project upwardly from the valve body 70 in axial alignment with each of the valves 77 and 78. A collar 89 is hermetically secured to valve stem 87 while a bellows 90 is suitably secured and sealed to collars 89 and 91, the latter having threaded engagement with the lower end of guide 88. Collar 91 is hermetically sealed at 92 with the valve body 70 as by solder, welding or the like. Suitable pivot elements such as 93 are secured to the upper ends of the valve stems. It will be understood that the bellows and sealing arrangement are identical for the two valves and hence only one has been described.

The passage arrangement employed in this construction permits all vertical passages to be drilled upwardly through lower openings 94 which may afterwards be suitably closed by sealed threaded plugs 95 and 96. The valve of this modification also has the advantages of the one shown in Fig. 2, namely, of maintaining both bellows under low suction pressure at all times and irrespective of the direction in which the valves are seated. The operating mechanism as shown in Figs. 3 and 4 may be employed with this arrangement also, although it will be noted that no springs are employed in Fig. 5, thereby necessitating the valve actuating means including lever 51 to exert full opening and closing forces.

Modification of Fig. 6.—In this modification the low pressure or suction side 100 communicates with chambers 101 and 102 disposed on the inside of valves 103 and 104. The high pressure or discharge side 105 of the refrigerating system communicates with chambers 106 and 107 disposed on the outside of the valves. One of the heat exchange elements is connected by a pipe 108 to a valve chamber 109 while the other heat exchange element is connected by a pipe 110 to a valve chamber 111. A common valve stem 112 connects the two valves 103 and 104, this stem passing through guides 113 and 114 which have threaded engagement with the valve bodies. Sylphon bellows 115 and 116 are secured to guides 113 and 114 respectively and to suitable collars 118 and 119 which in turn are fixed to the valve stem. All of these various elements are hermetically sealed to prevent leakage, and it will be noted that any leakage to either of the bellows chambers will be, at all times, from the low pressure or suction passage 100, thereby insuring that the bellows will operate only under minimum pressure the same as in the preferred form.

Any suitable actuating means may be employed to shift valve stem 112. One suitable means for this purpose is diagrammatically indicated as a lever 120 having a fixed pivot 121 and a suitable pin and slot connection 122 with stem 112, whereupon the upper end 123 of lever 120 may be oscillated to shift the valves. The reversal of fluid flow through the various passages is the same as in the preferred form.

Modification of Fig. 7.—In this arrangement the sealing bellows are alternatively subjected to high and low pressures. This valve arrangement comprises a high pressure inlet 130 from the compressor and a low pressure outlet 131 communicating with the suction side of the compressor. The heat exchange elements communicate with their respective valves mechanisms through passages 132 and 133. The valves 134 and 135 are simultaneously either in their lower position as shown in Fig. 7 or in their upper position. With the valves seated in their lower position upon suitable sleeves 136 and 137, high pressure fluid flows from passage 130 past upper valve seat 136, thence through a cross passage 138 to a point beneath valve 134 so as to communicate with passage 133 which leads to a heat exchange element, now functioning as a condenser. The return low pressure fluid from the heat exchange element which is now serving as an evaporator is conducted through passage 132 to a diagonal passage 150, as from a point below valve 135, and thence to a point above upper valve seat 139, the fluid then flowing downwardly past seat 139 to passage 131 which communicates with the suction side of the compressor.

When the functions of the heat exchange elements are interchanged, valves 135 and 136 are simultaneously moved to engage upper seats 136

and 138, whereupon the high side 130 communicates with passage 132 (diagonal passage 138 being closed off by valve 134 in its upper position), while passage 133 now functioning as a return passage on the low pressure side communicates directly with passage 131 which leads to the suction side of the compressor (diagonal passage 137 being closed off by valve 135 in its upper position).

The sealing arrangement for the valve stems 140 and 141 is the same as that shown in Fig. 5, and hence further detailed description is not essential here. However, the means for operating the valve stems simultaneously in the same direction comprises as shown in Fig. 6 a shaft 142 rotatably journalled in the valve body 143 but held against axial movement. The upper end of shaft 142 is provided with screw threads engaging a nut 144 upon which is pivoted an equalizing cross arm 145 in turn pivotally secured to elements 146 (corresponding to elements 93 of Fig. 5). Upon rotation of shaft 142 through any suitable means, it is seen that nut 144 will cause arm 145 to raise or lower the valves simultaneously to effect the reversing action previously described. While this arrangement subjects the sealing bellows alternatively to high and low pressures, yet it has the advantage that at least one bellows is subjected to low pressure during part of the operation in addition to having the advantages of simplicity in the valve structure and the actuating mechanism for moving the valves.

From the foregoing disclosure of the several modifications, it is seen that I have provided a very desirable and yet relatively simple and compact mechanically sealed valve for reversing fluid and flow especially through a condenser and evaporator of a refrigerating cycle.

It will of course be understood that various changes in details of construction and arrangement of parts may be made by those skilled in the art without departing from the spirit of the invention as set forth in the appended claims.

I claim:

1. A reversing valve mechanism in combination with a compressor-condenser-evaporator circuit comprising high and low pressure passages connected respectively to the compressor discharge and inlet and through which the fluid flows in only one direction, a plurality of reversing passages each communicating with said high and low pressure passages, reversible flow passages connected respectively to the condenser and evaporator and being in constant communication with said reversing passages, valve mechanisms for effecting communication between one of said reversible flow passages and only the low pressure passage and between the other of said reversible flow passages and only the high pressure side or vice versa, said valve mechanisms and all of said passages being so arranged that each valve is always subjected on the same side to low pressure, valve stems for actuating said valves on the low pressure side thereof, and means for hermetically sealing said stems and valves on said low pressure side whereby the hermetic seals are always subjected to low pressure.

2. A reversing valve mechanism in combination with a compressor-condenser-evaporator circuit comprising high and low pressure passages connected respectively to the compressor discharge and inlet and through which the fluid flows in only one direction, a pair of reversible flow passages connected respectively to the condenser and evaporator and through which the direction of fluid flow is to be alternatively reversed, a pair of reversing passages each of which is connected at one end to said low pressure passage and at their other end to said high pressure passage, each of said reversing passages having opposed valve seats disposed axially thereof and one set of seats being toward said high pressure passage and the other opposed set of seats being toward the low pressure passage, and double seating valves for said seats, said reversible flow passages communicating with said reversing passages at points intermediate said opposed valve seats, whereby when one of said valves is seated against the high pressure side and the other of said valves is seated against the low pressure side then one of said reversible flow passages is connected with the low pressure passage and the other of said reversible flow passages is connected with the high pressure passage, or vice versa when said valves are reversely seated.

3. A reversing valve mechanism in combination with a compressor-condenser-evaporator circuit comprising high and low pressure passages connected respectively to the compressor discharge and inlet and through which the fluid flows in only one direction, a pair of reversible flow passages connected respectively to the condenser and evaporator and through which the direction of fluid flow is to be alternatively reversed, a pair of reversing passages each of which is connected at one end to said low pressure passage and at their other end to said high pressure passage, each of said reversing passages having opposed valve seats disposed axially thereof and one set of seats being toward said high pressure passage and the other opposed set of seats being toward the low pressure passage, double seating valves for said seats, said reversible flow passages communicating with said reversing passages at points intermediate of said opposed valve seats, whereby when one of said valves is seated against the high pressure side and the other of said valves is seated against the low pressure side then one of said reversible flow passages is connected with the low pressure passage and the other of said reversible flow passages is connected with the high pressure passage, or vice versa when said valves are reversely seated, valve stems extending axially from said valves on the side seating toward said low pressure passage, and sealing means for said stems and valves whereby said sealing means is always subjected to low pressure in either direction of fluid flow through said reversible flow passages.

4. A reversing valve mechanism comprising high and low pressure passages through which the fluid flows in only one direction, a pair of reversible flow passages through which the direction of fluid flow is to be alternatively reversed, a pair of reversing passages each of which is connected at one end to said low pressure passage and at their other end to said high pressure passage, each of said reversing passages having opposed valve seats disposed axially thereof and one set of seats being toward said high pressure passage and the other opposed set of seats being toward the low pressure passage, double seating valves for said seats, said reversible flow passages communicating with said reversing passages at points intermediately of said opposed valve seats, whereby when one of said valves is seated against the high pressure side and the other of said valves is seated against the low pressure side then one of said reversible flow passages is con-

nected with the low pressure passage and the other of said reversible flow passages is connected with the high pressure passage, or vice versa when said valves are reversely seated, valve stems extending axially from said valves on the side seating toward said low pressure passage, and sealing means for said stems and valves whereby said sealing means is always subjected to low pressure in either direction of fluid flow through said reversible flow passages, said valves having differential valve heads and opposed valve seats, the smaller valve head and seat being toward the high pressure passage and the larger valve head and seat being toward the low pressure passage.

5. A reversing valve mechanism comprising high and low pressure passages through which the fluid flows in only one direction, a pair of reversible flow passages through which the direction of fluid flow is to be alternatively reversed, a pair of reversing passages each of which is connected at one end to said low pressure passage and at their other end to said high pressure passage, each of said reversing passages having opposed valve seats disposed axially thereof and one set of seats being toward said high pressure passage and the other opposed set of seats being toward the low pressure passage, double seating valves for said seats, said reversible flow passages communicating with said reversing passages at points intermediately of said opposed valve seats, whereby when one of said valves is seated against the high pressure side and the other of said valves is seated against the low pressure side then one of said reversible flow passages is connected with the low pressure passage and the other of said reversible flow passages is connected with the high pressure passage, or vice versa when said valves are reversely seated, valve stems extending axially from said valves on the side seating toward said low pressure passage, sealing means for said stems and valves whereby said sealing means is always subjected to low pressure in either direction of fluid flow through said reversible flow passages, said valves having differential valve heads and opposed valve seats, the smaller valve head and seat being toward the high pressure passage and the larger valve head and seat being toward the low pressure passage, and yieldable means exerting a force on said valves toward the smaller valve seats.

6. A reversing valve mechanism comprising high and low pressure passages through which the fluid flows in only one direction, a pair of reversible flow passages through which the direction of fluid flow is to be alternatively reversed, a pair of reversing passages each of which is connected at one end to said low pressure passage and at their other end to said high pressure passage, each of said reversing passages having opposed valve seats disposed axially thereof and one set of seats being toward said high pressure passage and the other opposed set of seats being toward the low pressure passage, double seating valves for said seats, said reversible flow passages communicating with said reversing passages at points intermediately of said opposed valve seats, whereby when one of said valves is seated against the high pressure side and the other of said valves is seated against the low pressure side then one of said reversible flow passages is connected with the low pressure passage and the other of said reversible flow passages is connected with the high pressure passage, or vice versa when said valves are reversely seated, valve stems extending axially from said valves on the side seating toward said low pressure passage, sealing means for said stems and valves whereby said sealing means is always subjected to low pressure in either direction of fluid flow through said reversible flow passages, said valves having differential valve heads and opposed valve seats, the smaller valve head and seat being toward the high pressure passage and the larger valve head and seat being toward the low pressure passage, and yieldable means exerting a force on said valves toward the smaller valve seats, said differential valve heads and yieldable means being so proportioned that the valves remain seated on either of their seats once the valves are moved thereto.

7. A reversing valve mechanism in combination with a compressor-condenser-evaporator circuit comprising high and low pressure passages connected respectively to the compressor discharge and inlet and through which the fluid flows in only one direction, a pair of reversible flow passages connected respectively to the condenser and evaporator and through which the direction of fluid flow is to be alternatively reversed, reversing passages for interconnecting said high and low pressure passages with said reversible flow passages, a pair of reciprocable valves having substantially parallel operating stems, and floating actuating means for moving said valves in opposite directions including means for insuring simultaneous movement of said valves.

8. A reversing valve mechanism comprising high and low pressure passages through which the fluid flows in only one direction, a pair of reversible flow passages through which the direction of fluid flow is to be alternatively reversed, reversing passages for interconnecting said high and low pressure passages with said reversible flow passages, a pair of reciprocable valves having substantially parallel operating stems, a floating lever pivotally connected to each of said valve stems, and means providing a floating fulcrum adapted to assume a temporarily fixed position during actuation of said valves thereby to insure simultaneous movement of the valves in opposite directions.

9. A valve mechanism comprising a pair of simultaneously movable valves one of which moves in a direction opposite to the other, a floating lever for actuating said valves, and means providing a combined floating and temporarily fixed fulcrum for said lever to insure synchronous movement of said valves.

JOSEPH R. ZWICKL.