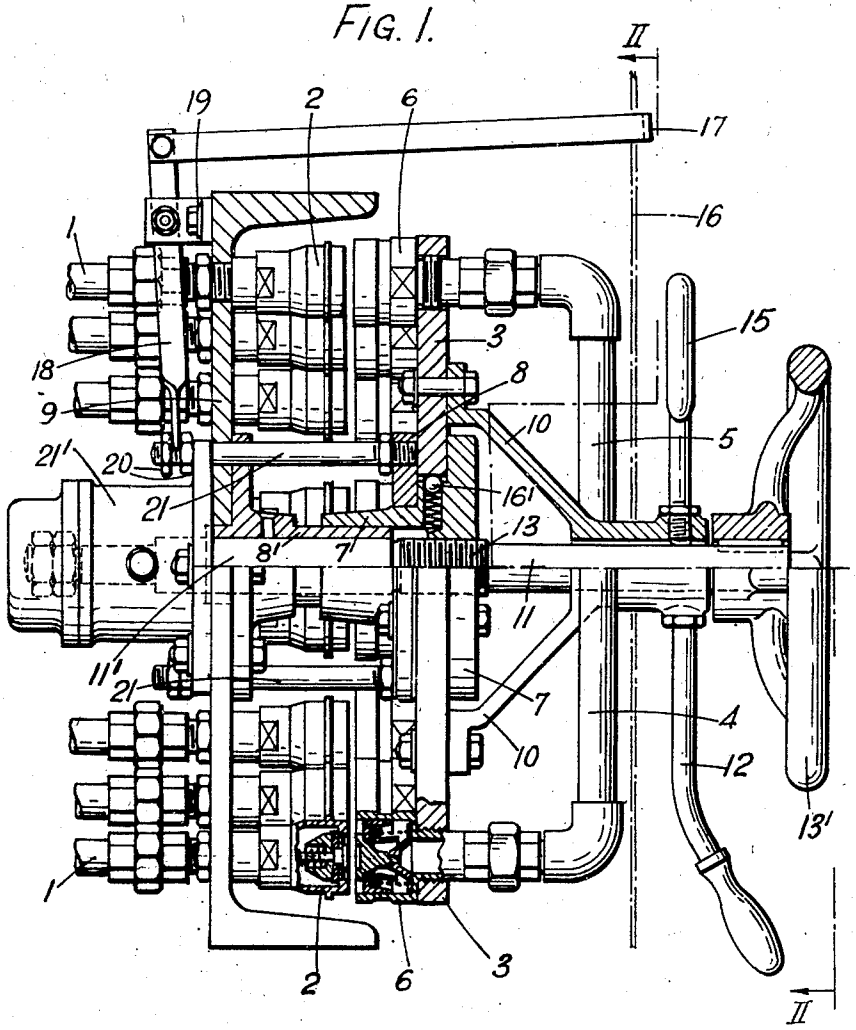
Sept. 7, 1948. P. E. THOMAS 2,448,933

CHANGE-OVER MECHANISM FOR FLUID-FLOW SYSTEMS

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FIG. 1.



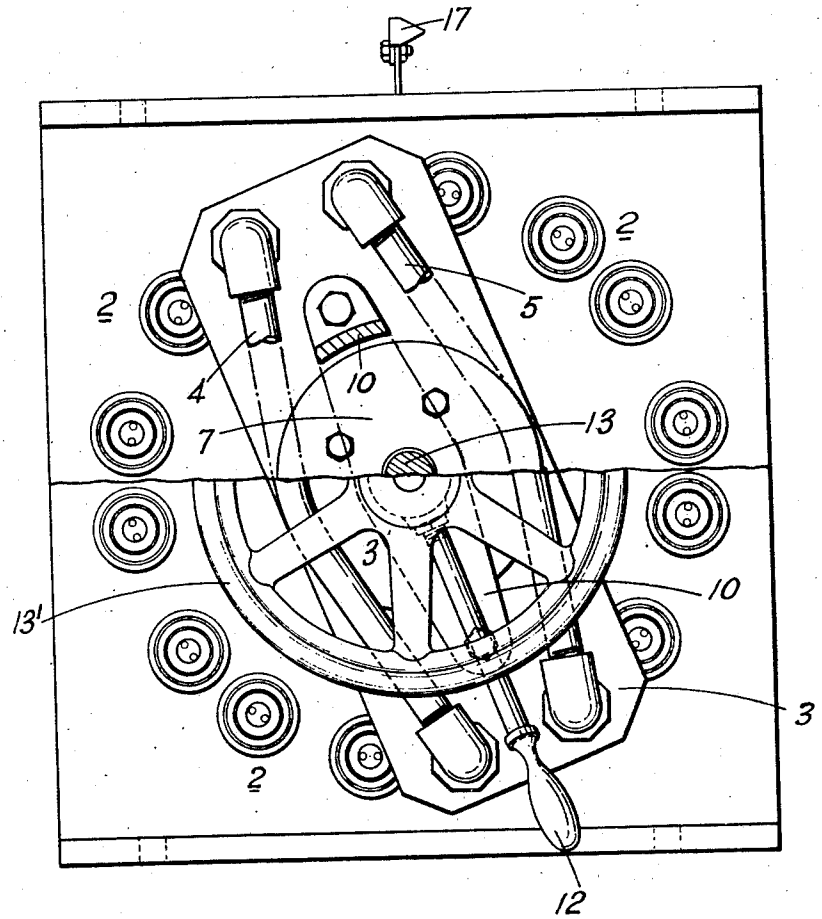
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CHANGE-OVER MECHANISM FOR FLUID-FLOW SYSTEMS

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FIG. 2.



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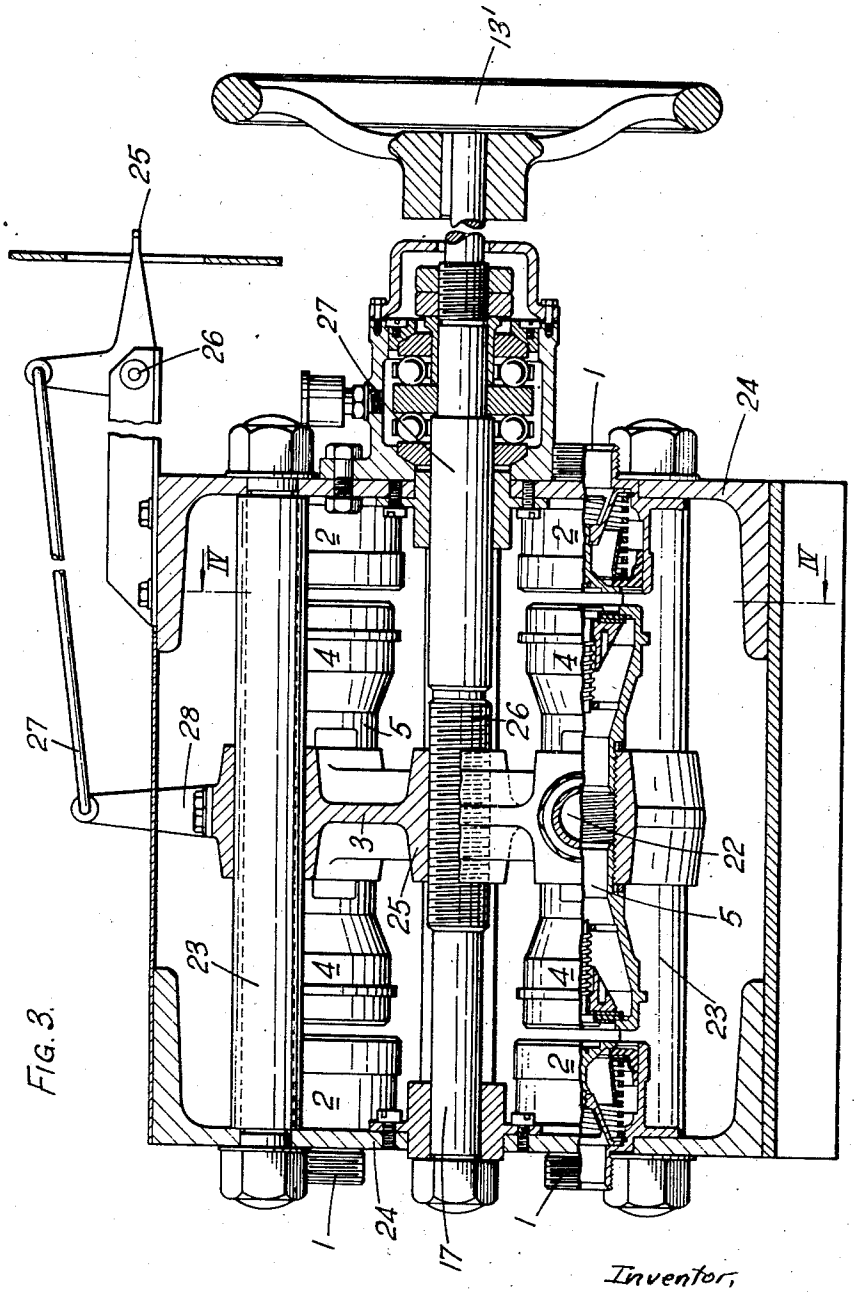


FIG. 3.

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CHANGE-OVER MECHANISM FOR FLUID-FLOW SYSTEMS

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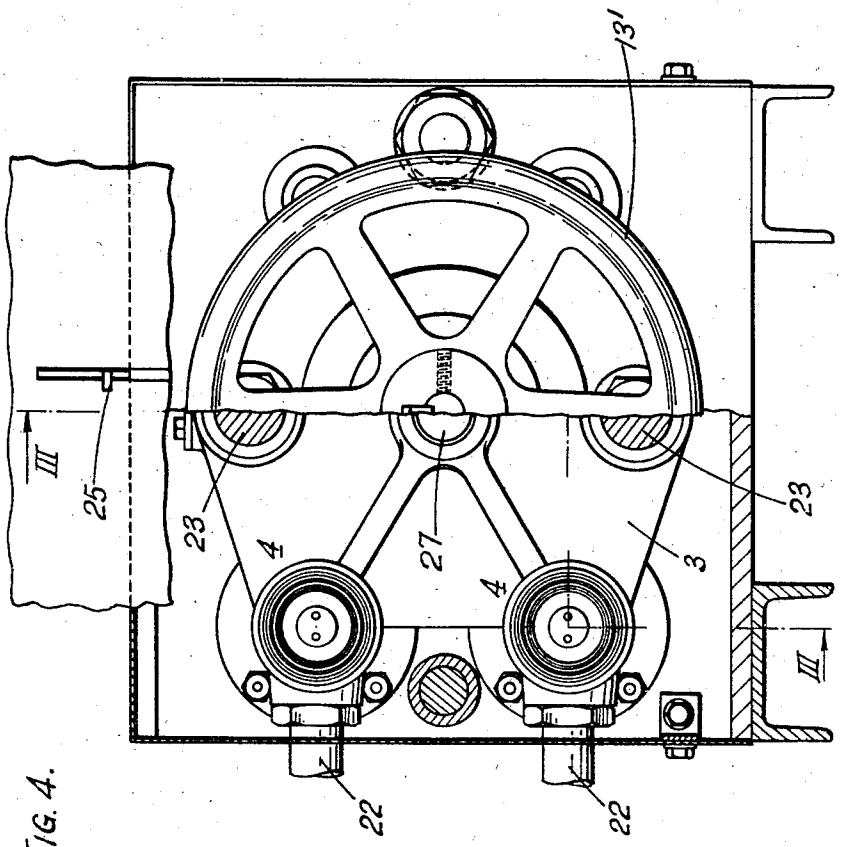


FIG. 4.

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UNITED STATES PATENT OFFICE

2,448,933

CHANGE-OVER MECHANISM FOR FLUID-FLOW SYSTEMS

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Application January 20, 1947, Serial No. 722,981
In Great Britain February 5, 1946

10 Claims. (Cl. 284—1)

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This invention relates to change-over mechanism for multiple fluid flow systems.

At the present time, when a source or sources of fluid supply have repeatedly to be connected to and disconnected from different points (i. e., changed-over) is is customary to provide control valves which are opened and closed according to requirements; in some kinds of industrial plant, the number of valves may be large and the possibility of mistake in their manipulation is proportionally high and may well happen that an industrial process under control may be ruined or damaged by an incorrect manipulation of the valves; moreover, as when some valves are required to be opened when others are required to be closed, incorrect manipulation may result in loss of the fluid under control.

Now according to the present invention, terminals of the lines (e. g., pipes) of a system are equipped with self-closing valve arrangements and a selector component (or a number of such components) is provided to interconnect the selected lines, the selector component being so formed as when presented to the lines to open automatically the self-closing valve and in most cases to form part of the line.

In general the terminal of all of the lines would be provided with a self-closing valve as also would the terminals of the selector components although in some cases it may be necessary to provide the valves only on the terminals of upstream lines.

It will be evident that the movement of the selector component away from a line results in the automatic closing of that line by the self-closing valves with the avoidance of loss of the controlled fluid; moreover, the selector component would be so arranged and controlled in its movement that only certain pre-determined lines can be interconnected and thus it is rendered impossible for incorrect fluid-supply connections to be made.

It is obvious that it is necessary to effect relative movement between the line terminals and the selector components to enable these latter to be selectively brought into register with selected terminals before the selector components are presented to those terminals to establish the desired connection. In most cases it is preferred to mount the selector components for this movement and this can be effected by carrying the components on a carriage which is movable between the terminals of the lines to be interconnected, these terminals being carried by a frame in which the carriage is mounted.

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The invention is illustrated in the accompanying drawings, in which Figure 1 is a longitudinal section elevation and Figure 2 an end elevation looking from the line II—II Figure 1, these two figures illustrating one arrangement while Figure 3 is a longitudinal sectional elevation on the line III—III Figure 4, and Figure 4 an end elevation looking from the line IV—IV Figure 3 of a modified arrangement.

Referring firstly to Figures 1 and 2, a series of pipe lines 1 terminate at self-closing valves indicated generally at 2, the pipe lines shown at 2 forming for example supply and return pipes to an industrial plant. The valves are disposed in a circle and mounted for rotation about the axis of this circle is a carriage 3 having selector pipes 4, 5, the terminating ends of which are equipped with self-closing valves generally indicated at 6. The valves 6 are disposed to co-operate with the valves 2 as both to be opened when a valve 2 and a valve 6 are presented to one another and to effect this operation, the carriage 3 in addition to being rotatable is also movable endwise.

To effect these movements of the carriage 3, it is rotatably supported on a carrier ring comprising two parts 7, 8 slidably supported on a central hub 8' secured to a back plate 9 carrying the pipe terminal valves 2, the carriage 3 being held. Secured directly to the carriage is a spoked frame 10 which is rotatable on a central spindle 11 and is connected to a selector hand lever 12; the spindle is itself screw threaded at 13 to engage a screwed aperture in the carrier ring 7, and the spindle has at its forward end an operating hand wheel 13'.

The rotation of the hand wheel 13' causes, through the screw thread 13, endwise movement of the carrier ring 7, 8 and hence of the carriage 3 which is rotatably carried by that ring; this results in moving the valve parts 6 into and out of engagement with the valve parts 2.

Operation of the hand lever 12 results in turning the carriage 3 about the axis of the pipes and so enabling the pairs of valves 6 at the extremities of the pipes 5 to be moved into register with different pairs of valves 2. Thus by manipulation of the handwheel 13' and of the hand lever 12 it is possible to select two different pairs of pipes 1 and to connect the pipes of those pairs to one another through the selector pipes 4, 5 the act of connection being achieved automatically by presenting the ends of the selector pipes 4, 5 to the ends of the selected pipes 1. Conversely, the act of disconnection is effected by the self-

closing action of the valves 2 and 6 by the act of moving the selector pipes away from the pipes 1.

To afford an indication of the setting of the carriage 3 in relation to the ring of pipes 1, the hand lever 12 is extended to provide an indicator 15 movable over a fixed indicator plate 16; a spring pressed register ball 16' is also employed to snap into notches in the carriage 3 to register that carriage in the selected angular positions. In order also to afford an automatic indication whether the valves 6 of the selector pipes 5 are "in" or "out" of coupling engagement with the valves 2 of the pipes 1, there is provided an indicator finger 17 carried by an arm 18 pivoted on a bracket 19 on the back plate 9 and the arm 18 is extended to engage between shoulders 20 on a rod 21 secured to the carrier ring 7, 8; when the carrier ring is caused to move endwise by the rotation of the hand wheel 13', the rod 21 is similarly moved and this in turn rocks the indicator pointer 17 so as by its position up or down to indicate the relationship of the valves 2 and 6. The rod 21 can form one of a series of such rods which afford additional sliding support for the carrier ring 7, 8 and the carriage 3 and parts carried thereby, the rods being slidable in the back plate 9.

The hub 8' forms a support for the shaft 11 an extension 11' of which extends through the hub and extends into a casing 21' housing a thrust bearing to absorb the axial reaction on the spindle 11, 11'.

In the arrangement shown in Figures 1 and 2, the act of selection is accomplished by the rotation of the carriage 3 and the connection and disconnection by endwise movement of the carriage. In the modification shown in Figures 3 and 4, the selection is effected by endwise movement of the carriage which movement also effects connection and disconnection. Referring now to Figures 3 and 4, in which the parts corresponding to the parts of Figures 1 and 2 are given similar references, a plurality of the pipe lines 1 and their self-closing valves 2 are disposed at each side of the carriage 3 which itself is provided at each side with a plurality of self-closing valves 4 and with a plurality of selector ducts 5 the two ends of which terminate in the valves 4 and each of which is open to a pipe 22.

In this construction the carriage 3 is slidable on guide rods 23 secured at their ends in the end plates 24, of a fixed frame supporting the pipes 1 and their valves 2. The carriage 3 is provided with a central boss 25 which is screw-threaded to engage a screw thread 26 on a rod 27 to which a hand wheel corresponding to the hand wheel 13' is secured, this rod being rotatably supported in bearings in the end plates 24.

It will be clear that by rotating the hand wheel 13' in one direction, the carriage 3 is caused to slide in one direction so that the self-closing valves 6 at one side of the carriage can co-operate with the self-closing valves 2 on one end plate 24 and so establish connection between the pipes 22 on the one hand and one set of pipes 1 on the other hand. By rotating the hand wheel 13' in the other direction, the valves 6 at the other side of the carriage 3 can be brought into co-operation with the valves 2 at the other end plate and so establish connection between the pipes 22 and that other set of pipes 1 thus effecting the required selection.

The setting of the carriage 3 is indicated in this case by a pointer 25 pivoted at 26 and coupled by a link 27 to a bracket 28 on the carriage 3.

In both arrangements there is obviously an "intermediate" position in which no connection is established between on the one hand the self-closing valves 2 and on the other hand the self-closing valves 6. In the arrangement of Figures 1 and 2, this position occurs when the hand wheel 13' has been rotated to retract the carriage 3 to move the valves 6 clear of the valves 2; in the arrangement of Figures 3 and 4 the position occurs when the hand wheel 13 is turned to bring the carriage 3 to the mid-position shown in Figure 3, at which time the pointer 25 will be at its mid-position.

Obviously other combinations of movements can be utilised to effect selection and connection and disconnection. Thus, in a further arrangement, the carriage 3 can be rotatable and the valved terminals of certain lines 1 are arranged in a circle about the axis of rotation of the carriage and at one side of the carriage while the valved terminals of other lines 1 are similarly grouped in a circle at the other side of the carriage, the movement of the carriage bringing the selector components into register with the selected opposed line terminals. For the purpose of presenting the selector components to the desired valved terminals a further or endwise relative movement is imparted to the carriage to cause the valves 2 of the selected terminals to be opened by the selector components when they are presented.

It will now be seen that the whole equipment can be set up in such manner as to render it possible to make only certain selected connections so that the element of risk arising from incorrect connections is eliminated. The precise grouping would of course be varied to suit the requirements in any particular case.

The ends of the selector components themselves being usually formed with self-closing valves, as also are the ends of the pipes 1, it will be evident that there is substantially no loss of controlled fluid when a change-over is effected and for these valves it is preferred to employ the arrangement of self-closing valve described and claimed in the application Serial No. 592,563, now Patent No. 2,416,967, such valves being shown in the drawings.

Obviously in complicated pipe line systems certain of the selectors can be "compounded" (i. e., interconnected) provided always that the terminals of the selectors are so disposed that they can only be presented to the requisite lines.

What I claim is:

1. A fluid flow change over device comprising a plurality of supports one carrying at least one self-closing valve terminating a fluid flow line and the other carrying a plurality of self-closing valves terminating respectively different flow lines and means to move the supports relatively to one another to bring the self-closing valves respectively on them selectively into opening fluid flow co-operation.

2. A fluid-flow change-over device comprising a plurality of supports, a plurality of self-closing valves grouped on one support, a plurality of sets of similarly grouped self-closing valves on the other support, the valves terminating fluid flow lines, and means to move the supports relatively to one another to bring a group of self-closing valves on one support and a group on the other support selectively into opening fluid-flow co-operation.

3. A fluid-flow change-over device comprising a plurality of supports one having a plurality of self-closing valve devices to close a corresponding plurality of flow lines and the other having a plurality of flow lines each terminating at each extremity with a self-closing valve, and means to move the supports relatively to one another to bring selected self-closing valve devices on the two supports selectively into opening flow co-operation.

4. A fluid flow change-over device comprising a stationary component carrying a plurality of self-closing valve devices terminating different flow lines, the said devices being disposed in arcuate fashion, a movable component having at least one fluid-flow conduit having a self-closing valve at each extremity, and means to move the movable component upon the axis of the arc to bring its valve into opening fluid flow co-operation with selected valves on the stationary component.

5. A fluid flow change-over device comprising a first component carrying a plurality of self-closing valves, a second component carrying a plurality of self-closing valves disposed between those of the first component and means to move the two components relatively to one another to bring selected self-closing valves on the two components selectively into opening flow co-operation.

6. A fluid-flow change-over device comprising a first component carrying a plurality of self-closing valves, a second component carrying a plurality of self-closing valves disposed between those of the first component means to move the two components angularly relatively to one another to bring selected self-closing valves on the two components selectively into flow co-operation, and means to move the components axially relatively to one another to open selected valves.

7. A fluid flow change over device comprising two components one having a plurality of self-closing valve devices and the other at least one self-closing valve device, an operating member to move the two components relatively to one another to bring valve devices on the two components selectively into register and a second operating member to move the registered valve device into valve-opening co-operation.

8. A fluid-flow change over device comprising two components one having a plurality of self-closing valve devices and the other at least one self-closing valve device, an operating member to move the two components relatively and angularly to one another to bring valve devices on the two components selectively into register and a second operating member to move the registered valve device axially into valve-opening co-operation.

9. A fluid-flow change-over device comprising a fixed support, a plurality of self-closing valve devices grouped in an arc on said support, the valve devices constituting terminals for different flow lines, a second support, means mounting the second support for angular movement about the axis of the arc and also for bodily movement along said axis, at least one fluid flow line on said second support, a self-closing valve at an extremity of the line and at a distance from the axis equal to the radius of the arc, a first operating member to move the second support angularly to bring the valve thereon into register with a selected valve on the stationary support and a second operating member to move the second support axially to bring the valve thereon into opening co-operation with the selected valves.

10. A fluid flow change over device comprising a fixed support comprising end components supporting each at least one self-closing valve terminating a fluid flow line, a second support having at least one fluid-flow line terminating at each extremity in a self-closing valve, means mounting the second support for movement between the end components, and an operating member to move said second support to bring its self-closing valve selectively into opening fluid-flow co-operation with the valves on the end components.

PERCIVAL EDWARD THOMAS.

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