Sept. 12, 1961 G. G. GRIMMER ET AL 2,999,546

SIDE PORT VALVE ASSEMBLY WELL TOOLS

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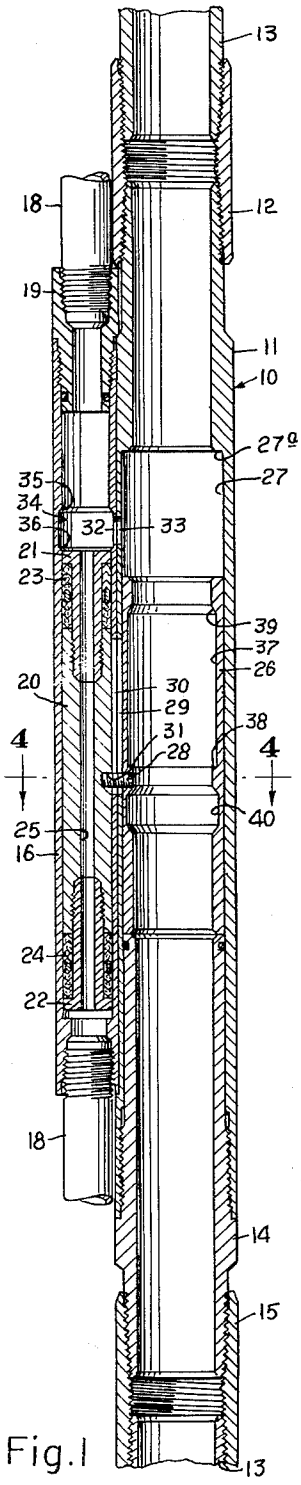


Fig. 1

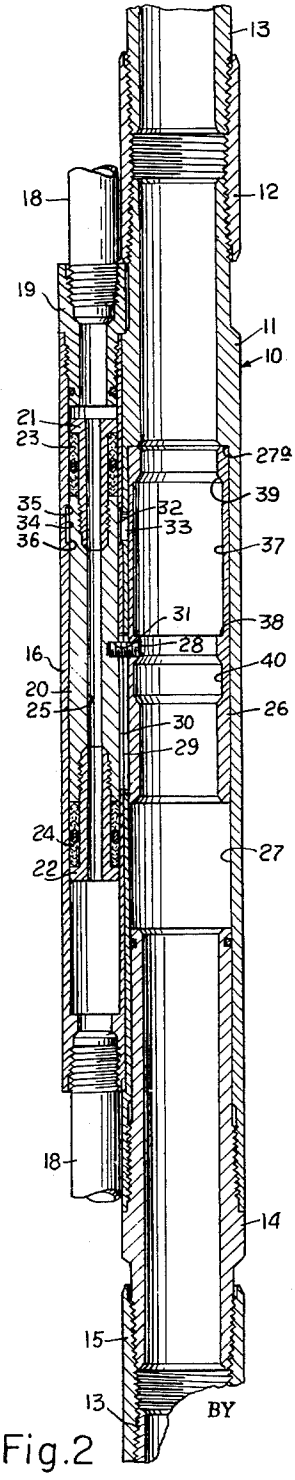


Fig. 2

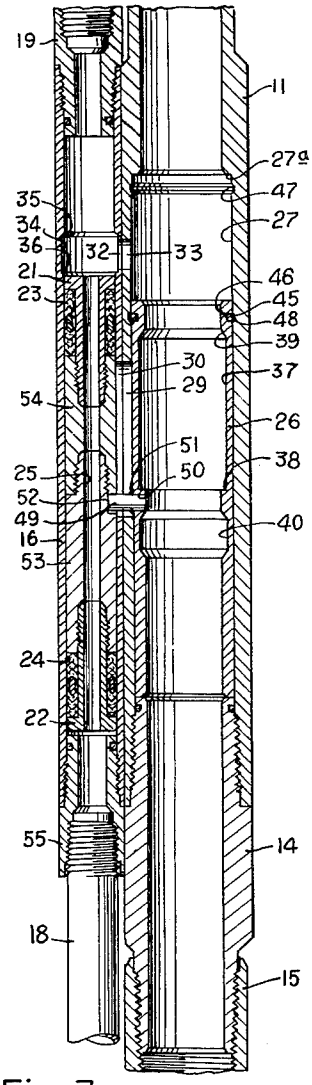


Fig. 3

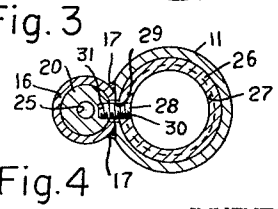


Fig. 4

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SIDE PORT VALVE ASSEMBLY WELL TOOLS

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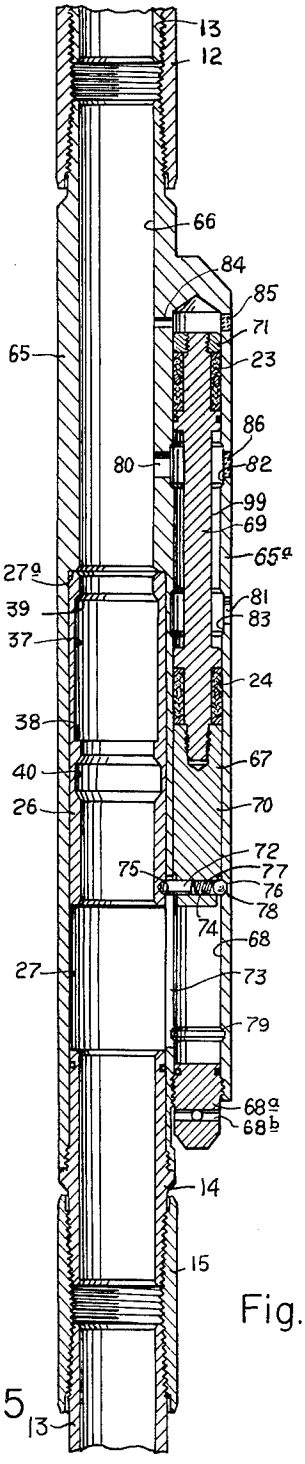


Fig. 5

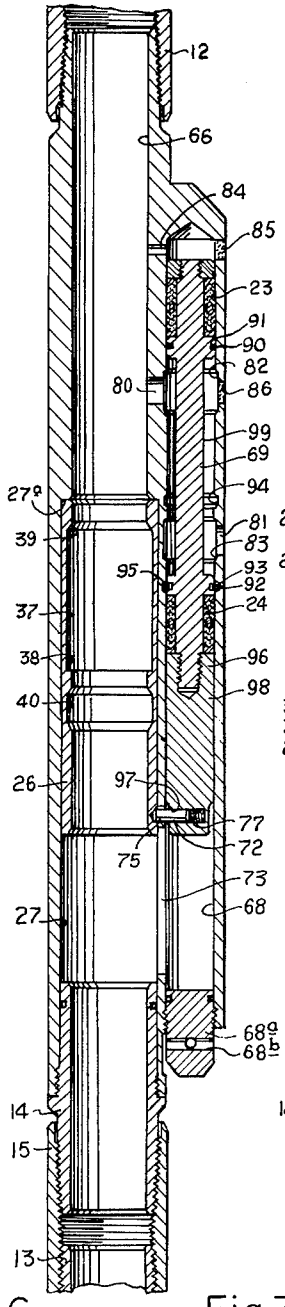


Fig. 6

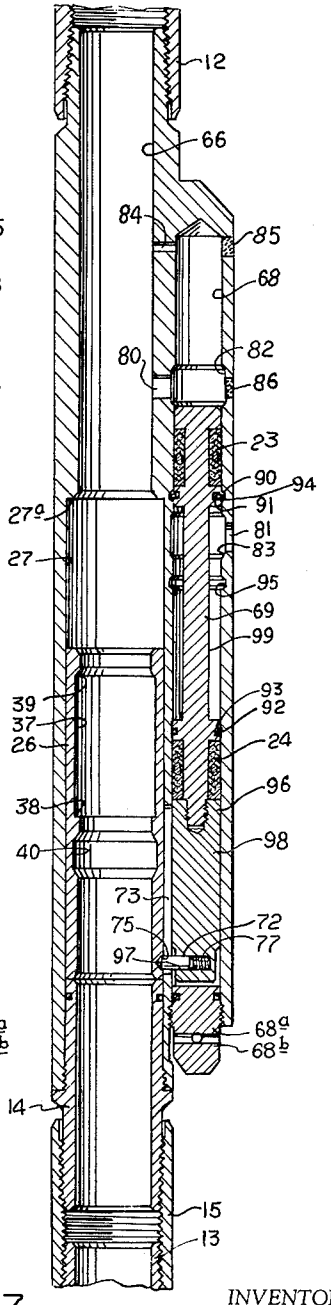


Fig. 7

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SIDE PORT VALVE ASSEMBLY WELL TOOLS

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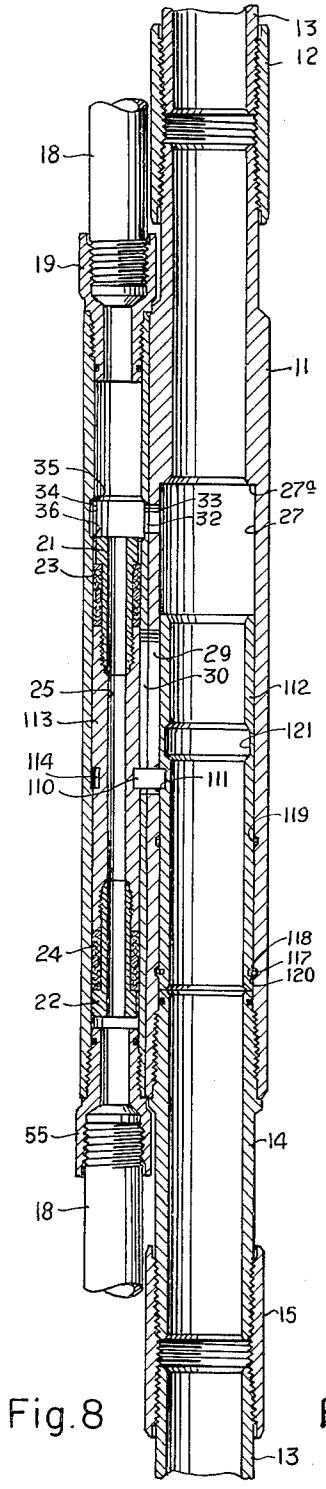


Fig. 8

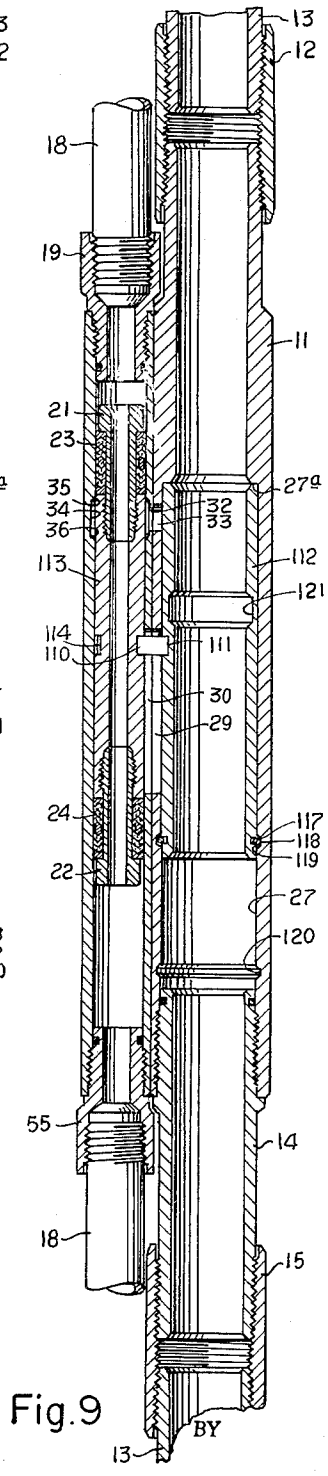


Fig. 9

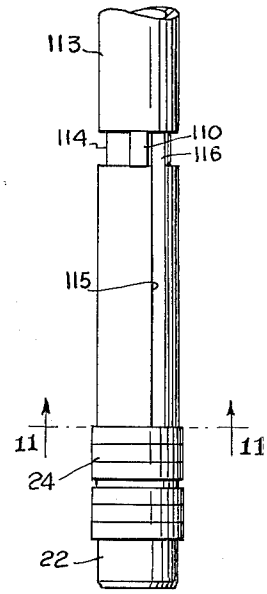


Fig. 10

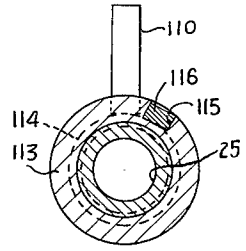


Fig. 11

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SIDE PORT VALVE ASSEMBLY WELL TOOLS

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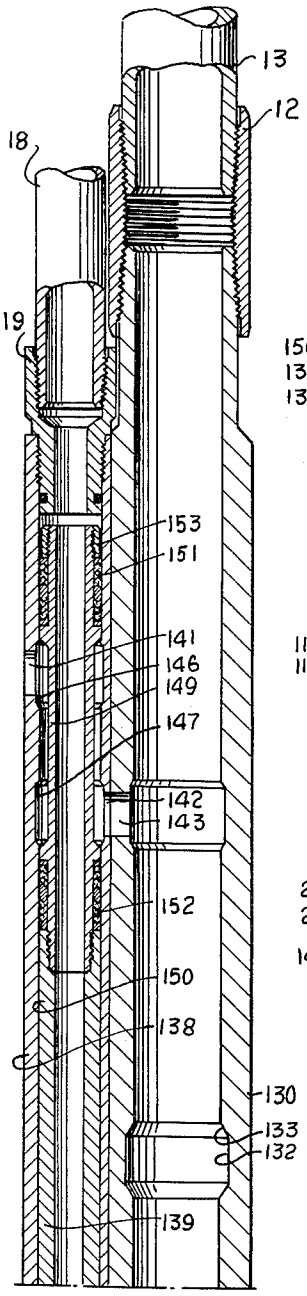


Fig. 12

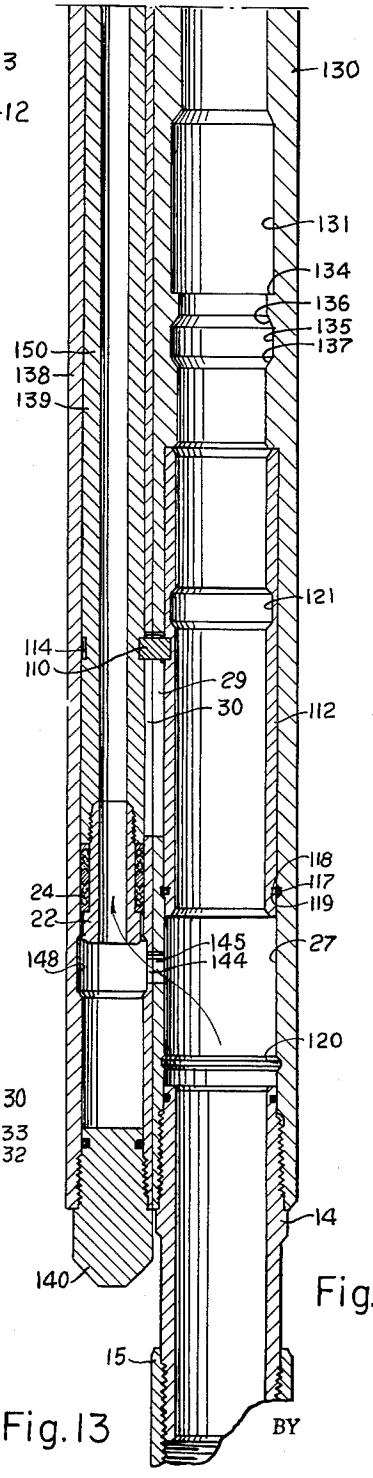


Fig. 13

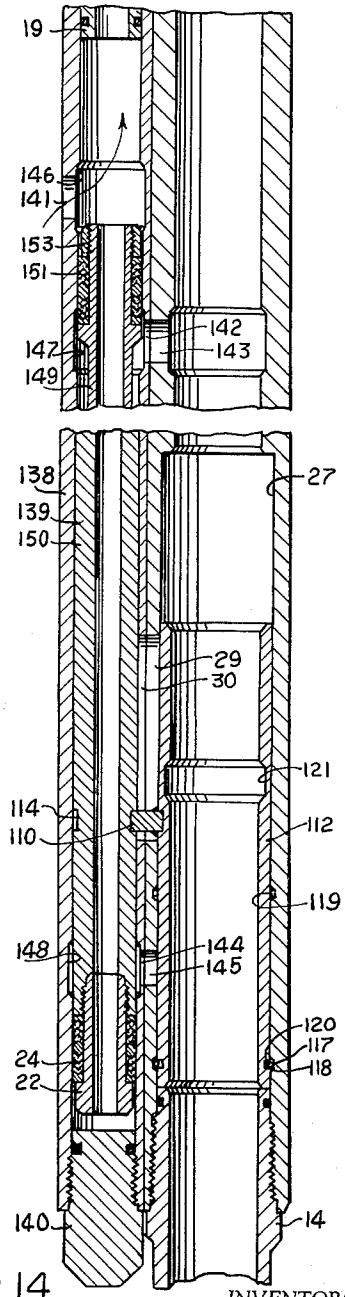


Fig. 14

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2,999,546

SIDE PORT VALVE ASSEMBLY WELL TOOLS

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Filed Jan. 30, 1957, Ser. No. 637,124
30 Claims. (Cl. 166—224)

This invention relates to well tools and more particularly to side port valves.

In wells it is often desirable to be able to establish communication between the flow pipe or flow string and the exterior thereof. It is further desirable to be able to open or close this communication at will. Also, in a well having more than one flow pipe or flow string it is similarly desirable to be able to establish or prevent fluid communication between the flow strings.

In a well in which one flow string extends from a lower producing formation in the well to the surface and in which a second flow string extends from an upper producing formation to the surface, it is desirable to be able to selectively separately produce the two formations through the two flow strings.

In all such installations it is desirable that the necessary operations be conducted without moving or otherwise disturbing the flow strings in the well. It is also desirable that the flow string extending to the lower producing zone be substantially unobstructed throughout its length.

It is therefore an object of the invention to provide a valve operable in place in the well to permit or prevent communication through the wall of the well flow string.

It is a further object of the invention to provide a valve of the character described which may be located exteriorly to the flow string whereby it may be permanently affixed to the flow string, thereby permitting the bore of the flow string to be unobstructed.

Another object of the invention is to provide a valve of the type described which can be opened or closed by means of flexible line operating mechanisms from the surface.

An important object of the invention is to provide a valve of the type described which is opened or closed by means of a sleeve movable or shiftable longitudinally in the flow string.

A still further object of the invention is to provide, in a well having two flow strings, a valve mounted exteriorly of the primary or larger flow string whereby said primary flow string is unobstructed and which may be actuated by flexible line operating mechanisms from the surface to establish or prevent communication between the two flow strings.

An additional object of the invention is to provide, in a well having a primary flow string extending to a lower producing zone and a small flow string extending to an upper producing zone, a valve in the smaller flow string movable by means of a sliding sleeve in the primary flow string whereby when the valve is in one position, fluids from outside the valve are conducted into the primary flow string and thence to the surface, while at the same time flow from the primary flow string proceeds through the smaller flow string and thence to the surface, and, when the valve is in another position, fluids from outside the valve are conducted into the smaller flow string and thence to the surface, while at the same time fluids from the primary flow string may continue to flow upwardly through the primary flow string to the surface.

It is an important object of the invention that the sleeve which moves the valve from one position to another be of an internal diameter approximately that of the flow string in which it is mounted, whereby well tools may be readily passed through said sleeve.

Another object of the invention is to provide a valve of the type described which can be moved from one position to the other only by the application of a predetermined force whereby accidental shifting of the valve due to the passage of well tools through the sleeve is minimized or eliminated.

Additional objects and advantages of the invention will be readily apparent from the reading of the following description of devices constructed in accordance with the invention, and reference to the accompanying drawings thereof, wherein:

FIGURE 1 is a view, partly in section and partly in elevation, of one form of side port valves in which the valve selectively provides communication between the interior and exterior of a flow string of a well, the valve being shown in open position;

FIGURE 2 is a view, similar to FIGURE 1, but showing the valve in closed position;

FIGURE 3 is a view, similar to FIGURE 1, wherein certain parts of the device are slightly modified;

FIGURE 4 is a horizontal sectional view taken on the line 4—4 of FIGURE 1;

FIGURE 5 is a view, partly in section and partly in elevation, of a valve mounted exteriorly of the flow string and in position to permit communication between the exterior of the flow string and the interior thereof;

FIGURE 6 is a view, similar to FIGURE 5, wherein slight modifications are made to the valve;

FIGURE 7 is a view similar to FIGURE 6 wherein the valve is in closed position;

FIGURE 8 is a view, partly in section and partly in elevation, showing the valve open to allow communication between two flow strings, said valve being a modification of that of FIGURE 1;

FIGURE 9 is a view, similar to FIGURE 8, showing the valve in closed position;

FIGURE 10 is an enlarged elevational view of the valve member of FIGURES 8 and 9;

FIGURE 11 is a cross-sectional view taken on line 11—11 of FIGURE 10;

FIGURES 12 and 13 are views, partly in section and partly in elevation, showing another from of the invention in which an outside valve is in position to permit flow from outside the flow strings into a primary flow string and simultaneously to permit flow from the lower part of the primary flow string into a smaller or secondary flow string; and,

FIGURE 14 is a fragmentary view, similar to FIGURES 12 and 13, showing the valve in a position to direct the flow from outside the flow strings into the smaller flow string and to confine the flow from the lower part of the primary flow string within said flow string.

Referring now particularly to FIGURES 1, 2 and 4 of the drawings, the numeral **10** designates generally a side port valve assembly which includes an elongate tubular sleeve housing **11** adapted to be connected by a coupling **12** to the lower end of the upper part of a flow pipe or tubing string **13**. A lower tubular bushing or sub **14** is threaded into the lower end of the sleeve housing and is adapted to be connected by a coupling **15** to the upper end of the lower part of the flow pipe **13**. A tubular valve housing **16** is affixed to the outside of the housing and is secured thereto in parallel relationship by means of welds **17** (FIGURE 4). The upper end of a lower section of secondary or smaller well pipe **18** is threaded into the lower end of the valve housing. An upper section of the secondary well pipe is connected to an adapter sub or bushing **19** which is threaded into the upper end of the valve housing.

A valve member **20** is slidable longitudinally in the valve housing **16** and includes an upper packing mandrel

21 and a lower packing mandrel 22 provided with packing assemblies 23 and 24, respectively, for sealing between the packing mandrel and the bore wall of the valve housing. A central longitudinal bore 25 through the valve member and through the valve packing mandrels provides a flow path or communication between the lower and upper portions of the valve housing through the valve itself.

A tubular actuating sleeve 26 is slidable in the bore 27 of the sleeve housing between an upper position limited by a downwardly facing internal annular shoulder 27a near the upper end of the sleeve housing and the upper end of the bushing or sub 14. A connecting screw 28 is threaded laterally through the wall of the sleeve and extends through a longitudinal slot 29 in the wall of the sleeve housing and a corresponding slot 30 in the adjacent wall of the valve housing and is threaded into a lateral threaded hole 31 in the valve member 20. The sleeve is thus positively connected or linked to the valve member so that longitudinal movement of the sleeve results in longitudinal movement of the valve member.

A lateral flow port 32 in the wall of the valve housing communicates with a corresponding port 33 in the wall of the sleeve housing. These ports are so located that, when the valve member is in its lower position in the valve housing, the upper packing mandrel and its packing assembly are moved below said ports. When the valve member is in its upper position in the valve housing (FIGURE 2), the upper packing assembly is moved above the flow port, the lower packing assembly remaining below the port and also below the slot through the housing wall. With the valve member thus in its upper position, the flow port in the wall of the valve housing is closed off by the packing assemblies. When the valve member is moved downwardly to its lower position so the upper packing assembly is below the flow port, communication is permitted through the ports between the two flow pipes. In both positions the slots 29 and 30 are sealed off by the packing assemblies and no fluid may flow therethrough. An annular recess 34 in the bore of the valve housing at the elevation of the flow port is provided with beveled upper and lower faces 35 and 36, respectively, to permit the upper packing assembly to pass the port without damage.

The bore of the actuating sleeve approximates that of the tubing to which the housing 11 is connected, and the sleeve is provided with an internal annular shifting groove or recess 37 for engagement by a suitable shifting tool (not shown) which may be lowered through the tubing string by means of a flexible line. The groove may be of any configuration to be engaged by a suitable shifting tool. As shown, the groove includes an upwardly facing abrupt shifting shoulder 38 for engagement by the shifting tool to move the sleeve downwardly and a downwardly facing beveled shifting shoulder 39 for engagement by the shifting tool to move the sleeve upwardly. A guide recess 40 below the shifting groove may be included to conform to the profile or configuration of the shifting tool. Of course, other groove configurations may be used and other means for providing the shifting shoulders may be incorporated in the shifting sleeve, if desired.

In use, the device is assembled as described and is installed in the flow conductors of a well. When it is desired to move the side port valve to open position, a suitable shifting tool for delivering a downward blow to the shifting sleeve is assembled on the lower end of a set of flexible line operated tools including the usual sinker bar and stroke jars. The shifting tool and the operating tools are lowered in the tubing of the well until the shifting tool engages the abrupt shifting shoulder 38 of the sleeve. Downward jarring blows are then delivered by means of the stroke jars to the shifting tool, thereby moving the sleeve and the valve downwardly to the open position (FIGURE 1) in which the upper packing assembly is moved below the flow ports 32 and 33. The shifting tool is then withdrawn upwardly from the shifting sleeve and from the well.

To move the valve to the close position, a shifting tool suitable to engage the beveled shifting shoulder 39 of the sleeve is lowered into the sleeve by means of the flexible line operated tools and the flexible line. Upward jarring blows are delivered by the stroke jars to the shifting tool, whereby the sleeve and the valve are moved upwardly to the closed position (FIGURE 2) in which the upper packing assembly is positioned above the flow ports.

It will be seen that a device has been shown and described which can be installed in the flow conductors of a well whereby communication between the interior and exterior of a single conductor, or between the bores of two separate conductors may be established or prevented, as desired. Further it will be seen that the device is full-opening; that is, that it offers substantially no restriction or obstruction to well tools which may be lowered through the tubing string or conductor in which the sleeve housing is connected. It will also be seen that the valve of the device may be opened or closed simply by a flexible line mechanism and that it is unnecessary to move or disturb the flow conductors in place in the well.

A slightly modified form of the device is shown in FIGURE 3, in which a detent mechanism is provided to securely resiliently restrain the shifting sleeve in the valve opening or closing position desired.

A resilient detent wire on snap ring 45 is mounted in a circumferential groove 46 in the outer surface of the sleeve. A pair of annular snap ring grooves 47 and 48 are formed in the bore 27 of the sleeve housing in such positions that when the sleeve is moved to either its upper or its lower position in the housing, the snap ring engages in the appropriate annular groove. The snap ring is of a free diameter such that it exerts a frictional force on the housing and so that the ring may move outwardly into the annular snap ring grooves. The snap ring grooves are provided with beveled upper and lower shoulders whereby the ring is cammed inwardly into the groove 46 of the sleeve when the sleeve is moved away from either groove. This detent mechanism restrains the sleeve in either its upper or its lower position until a sufficient amount of force has been exerted to cam the snap ring inwardly from the grooves in the sleeve housing, so that the sleeve is not prematurely moved out of either position.

A connecting pin or link member 49 has one end secured in a hole 50 in the shifting sleeve 26 by means of welds 51. This link member or pin extends through the longitudinal slots 29 and 30 in the walls of the sleeve and valve housing in the same manner as the connecting screw 28 shown in FIGURES 1, 2 and 4, and enters a transverse slot 52 formed near the upper end of a lower valve member mandrel section 53. The connecting pin is retained in the slot by means of the lower end of an upper valve member mandrel section 54 which is threaded onto the lower section.

A lower bushing or adapter sub 55, identical to the upper sub 19, is provided in the lower end of the valve housing 16 for connection with the lower section of the secondary well pipe 18. The bushings or subs facilitate assembly of the valve members in the valve housings.

The remainder of the parts of the device of FIGURE 3 are identical to those of FIGURES 1, 2 and 4, and includes the packing mandrels 21 and 22 threaded into the valve member mandrel section to secure thereon the packing assemblies 23 and 24, and flow ports 32 and 33 are provided through the walls of the valve and sleeve housing at a point slightly above the upper packing mandrel when the sleeve and the valve are in the lowest position.

It is obvious that to assemble the device the sleeve is first installed in the bore 27 of the sleeve housing, the snap ring being installed in its groove in the sleeve. The inner end of the connecting pin 49 is inserted through

the slot 29 in the wall of the sleeve housing and is welded in the hole 50 in the sleeve. The valve housing is then attached to the sleeve housing by the welds 17 (FIGURE 4), the pin extending through the slot 30 in the valve housing wall. The valve members can then be assembled with the outer end of the pin 49 disposed in the slot 52.

The device of FIGURE 3 is used in the same manner as that previously described. When it is desired to move the valve from open to closed position, or vice versa, a suitable shifting tool is lowered into the well to engage the appropriate shifting shoulder on the shifting sleeve 26. The detent mechanism restrains the sleeve against movement except by a predetermined force, thereby preventing undesired or accidental movement or shifting of the sleeve and the valve.

It will be seen that in addition to the advantage provided by the device of FIGURES 1, 2 and 4, the device of FIGURE 3 provides the feature of preventing accidental shifting of the valve by passage of well tools through the shifting sleeve, but permits shifting of the valve only on the application of a certain predetermined force to the sleeve.

In FIGURE 5 is shown a further modified form of the device in which a sleeve housing 65 having a through bore 66 is connectable to the upper section of the flow conductor 13 and is provided with a lower tubular bushing or housing sub 14 for connecting with the lower section of the flow conductor.

A valve member 67 is slidable longitudinally in an upwardly extending longitudinal bore 68 in a valve housing 65*a* shown formed integral with the tubular sleeve housing 65 and laterally displaced from the through bore. The valve member includes an elongate valve mandrel 69 and a valve plunger or foot piece 70 threaded onto the lower end of the mandrel. An upper packing assembly 23 and a lower packing assembly 24 are held in place on the valve mandrel by means of a retainer nut 71 and the foot piece 70, respectively, and seal with the wall of the valve housing bore 68. The lower end of the valve housing bore is closed by a threaded plug 68*a* which may be provided with lateral holes 68*b* for engagement by a suitable wrench.

The valve member 67 is linked to an actuating sleeve 26 by a connecting pin 72 which extends through a longitudinal slot 73 through the wall between the sleeve housing and the valve housing. The connecting pin is slidably mounted in a diametrical bore 74 through the lower end of the valve foot piece and extends therefrom through the slot 73 into a lateral opening or recess 75 formed in the exterior wall of the sleeve. A ball 76 is also disposed in the diametrical bore of the foot piece and a biasing spring 77 is disposed between the connecting pin and said ball to urge said pin and ball outwardly in directions opposite to each other. The connecting pin is thus resiliently biased into engagement in the recess 75 of the shifting sleeve and assembly of the sleeve and valves in the housing bore is thereby facilitated.

An upper annular groove 78 and a lower annular groove 79 are formed in the wall of the valve housing bore 68 and provide, with the spring pressed ball 76, a detent arrangement whereby when the valve is moved to its upper position, the ball engages in the upper groove and when the valve is moved to its lower position, the ball engages in the lower grove. Thus, a definite longitudinal force is required to move the valve and thereby to cam the ball out of the grooves against the biasing force of the spring, the upper and lower shoulders of each groove being beveled slightly to permit the ball to be cammed out of the groove.

An upper lateral port 80 is drilled through the wall between the through bore 66 and the valve housing bore at a position spaced downwardly from the upper end of the valve housing bore. Spaced below this port is a lower lateral port 81 opening between the valve housing bore

and the exterior of the valve housing. Annular relief grooves 82 and 83 are provided at the upper and lower ports, respectively, and have tapered upper and lower shoulders, so the packing assemblies may pass the ports as the valve is moved without damage to the packing. A smaller bleed port 84 extends through the wall between the two bores at the upper end of the valve housing bore to guard against the trapping of fluid in the upper end of such bore as the valve is moved upwardly. Plug welds 85 and 86 in the outer wall of the valve housing close the entry holes made for drilling the bleed port 84 and the upper port 80, respectively.

Operation and use of the valve assembly will be hereinafter more fully described.

In FIGURES 6 and 7 are shown a slightly modified form of the device of FIGURE 5, the principal modification being in the detent mechanism.

An upper snap wire or ring 90 is disposed in an external annular groove 91 in the valve mandrel 69 just below the upper packing assembly 23, and a lower snap wire or ring 92 is disposed in an external annular groove 93 in the valve mandrel just above the lower packing assembly 24. The snap rings are of such free size, shape and resiliency that the upper ring engages in an upper annular ring groove 94 formed in the bore wall of the valve housing when the valve is in its lower position and the lower ring is adapted to engage in a lower internal annular ring groove 95 in the wall of the valve housing when the valve is in its upper position. The upper and lower faces of each of the ring grooves are beveled to allow the rings to be cammed out of the grooves as the valve mandrel is moved longitudinally.

The valve member 96 is linked to the actuating or shifting sleeve 26 by means of a connecting pin 72 in a manner similar to that of the device of FIGURE 5. The pin is slidably mounted in a diametrical recess or hole 97 near the lower end of the foot piece 98 and is biased outwardly through the slot 73 into the recess 75 in the shifting sleeve 26 by a spring 77 confined between the pin and the bottom of the hole 97.

The remainder of the valve mechanism is identical to that of FIGURE 5, and the same numerals are applied to such parts.

The devices of FIGURES 5, 6 and 7 operate in the same manner. When it is desired to close the valve to prevent communication between the exterior of the housing 65 and the interior thereof, a suitable shifting tool (not shown) is lowered by means of a flexible line operating assembly to engage the upwardly facing shifting shoulder 38 of the shifting sleeve. Downward blows delivered to the sleeve through the shifting tool by means of stroke jars incorporated in the flexible line operating assembly cause the sleeve and the valve member to be moved downwardly to the lower position shown in FIGURE 7. The upper and lower packing assemblies 23 and 24 are thus disposed on either side of the lower lateral port 81 of the valve housing, thereby shutting off flow through this port.

With the device of FIGURE 5, the spring-pressed ball 76 engages in the groove 76 when the valve is moved to its lower position, while with the device of FIGURES 6 and 7 the upper snap ring 90 moves resiliently outwardly into the groove 94 when the valve is moved to its lower position. The resilient engagement of the ball in one case or the snap ring in the other case into their respective grooves exerts a restraining force to retain the valve in such positions.

When it is desired to open the valve for communication between the exterior and the interior of the housing, a suitable shifting tool for engaging the downwardly facing shoulder 39 of the sleeve is lowered into the sleeve. Upward jarring blows are delivered to the sleeve, and the sleeve and the valve are moved upwardly to the upper positions shown in FIGURES 5 and 6. When the valve is moved to its upper position, the upper packing assem-

bly 23 is moved to its position above the upper lateral port 80, as shown in FIGURES 5 and 6. An avenue of communication is thus opened through the lower port 81, around the central reduced part 99 of the valve mandrel, and through an upper lateral port 80 into the main bore 66 of the housing.

As the valve of FIGURE 5 is moved upwardly, the ball 76 is cammed inwardly by the beveled upper face of the lower groove 79, and the ball subsequently enters the upper groove 78. With the device of FIGURES 6 and 7, the upper snap ring 90 is cammed inwardly by the beveled upper face of the groove 94 from engagement in said groove. When the valve reaches the upper position of FIGURE 6 the lower snap ring 92 enters the groove 95. The detent arrangement of the ball and its groove, or the snap ring and its groove, causes a restraining force to be exerted to hold the valve in its upper position.

The bleed port 84 at the upper end of the valve housing bore prevents the trapping of fluids in the upper end of said bore as the valve is moved upwardly. The slot 73 similarly prevents the trapping of fluids below the valve as the valve is moved downwardly in the valve housing.

It will be seen that a valve has been shown and described which can be installed in a flow conductor of a well whereby communication can be permitted or prevented between the exterior and the interior of the flow pipe. The valve is seen to be mounted exteriorly of the flow pipe and the bore through the housing to be substantially full-opening. The valve may be opened or closed simply by a flexible line operating mechanism.

In FIGURES 8 through 11 is shown a modified form of the device of FIGURE 3 in which a slightly different means is used to link the actuating sleeve to the valve member.

A connecting link 110, shown to be rectangular in cross-section, is welded in a recess 111 in the actuating or shifting sleeve 112 and projects through the registering slots 29 and 30 in the contiguous walls of the sleeve housing and the valve housing, respectively.

The tubular valve member 113 is provided with a circumferential link groove 114 approximately midway of its longitudinal dimension. A longitudinal link slot 115 in the outer surface of the valve member extends from the circumferential groove downwardly to the packing assembly 24 at the lower end of the valve member. The valve member is thus installed in the valve housing bore with the connecting link 110 inserted in the link slot. The valve member is moved downwardly until the link enters the circumferential groove, whereupon the valve member is then rotated to move the slot away from alignment with the link. A filler key 116 is inserted in the slot and extends from the packing assembly 24 to the upper face of the circumferential groove to prevent the connecting link from reentering the slot. The filler key is retained in the slot by the lower packing 24 and the lower packing mandrel 22.

A detent wire or snap ring 117 in a circumferential groove 118 in the sleeve 112 is similar to the snap ring 45 of the device of FIGURE 3. Upper and lower internal annular snap ring grooves 119 and 120, respectively, are provided in the bore 27 of the sleeve housing whereby the snap ring may enter the lower groove when the sleeve is in the open position of FIGURE 8 and whereby said ring may enter the upper groove when said sleeve is in the closed position of FIGURE 9. The snap ring and the grooves thus restrain the sleeve in either its upper or its lower extreme positions so that a definite force is necessary to move the sleeve and the valve between open and closed positions.

The sleeve 112 is shown to be provided with an internal annular shifting groove or recess 121 which is adapted to be engaged by a suitable flexible line operated shifting tool (not shown) for moving the sleeve upwardly or downwardly.

The device is assembled and used in the same manner as the devices of FIGURES 1 through 4. With the valve and the sleeve moved upwardly to the position of FIGURE 9, flow is permitted through the primary flow conductor 13 and through the secondary flow conductor 18, but flow is not permitted from one flow conductor to the other through the device. When the sleeve and the valve are moved downwardly to the position shown in FIGURE 8, fluid communication is permitted between the two well conductors through the lateral flow ports 32 and 33 of the housing.

It will be seen that the device of FIGURES 8 through 11, in addition to the advantages of the devices of FIGURES 1 through 4, provide the further advantage of being easy of manufacture and assembly whereby the valve is positively secured to the connecting link by means of the slot and the filler key.

In FIGURES 12, 13 and 14 is shown a further modification in which the device serves the function of a selective cross-over mechanism for a well having dual flow strings.

An elongate tubular sleeve housing 130, is provided with an actuating or shifting sleeve 112 and a detent mechanism including a spring ring or wire 117 and spaced grooves 119 and 120 similar to those of FIGURES 8, 9 and 10. The sleeve housing 130 has a system of internal annular locating and locking grooves 131 and 132 provided therein at a level above the actuating sleeve. These internal annular grooves are provided for the purpose of installing therein a well tool such as that shown in the patent to I. A. Miller, No. 2,673,614. The locking groove 132 is formed with a downwardly facing beveled annular lock shoulder 133, and the locating groove 131 is formed with an upwardly facing abrupt annular stop shoulder 134. An auxiliary guide groove 135, having beveled upper and lower shoulders 136 and 137, respectively, is provided a short distance below the locating groove.

An elongate tubular valve housing 138 is welded to the sleeve housing and a tubular valve member 139 is slidable longitudinally therein. The valve housing is closed at its lower end by a plug 140 and is connected at its upper end with a secondary or smaller flow conductor or pipe 18 by means of an adapted sub 19.

An upper lateral port 141 provides communication between the interior of the valve housing and the exterior thereof, while an intermediate lateral port 142 spaced below the upper port communicates with a lateral port 143 in the wall of the sleeve housing at a point above the locking groove 132. A lower lateral port 144 communicates with a lateral port 145 in the wall of the sleeve housing at a point spaced below the connecting link slots 29 and 30. Internal annular relief grooves 146, 147 and 148, having beveled upper and lower shoulders, are provided in the valve housing bore at the levels of the upper, intermediate and lower lateral bores, respectively, for a purpose to be hereinafter more fully explained.

The valve member 139 includes an upper tubular packing mandrel 149 which has its lower end threaded into the upper end of the main valve mandrel 150 and carries an upper packing assembly and an intermediate packing assembly 151 and 152, respectively, spaced apart longitudinally thereon for sealing between the packing mandrel and the valve housing bore wall. The upper packing assembly is confined on the packing mandrel by a retainer nut 153. The outer diameter of the packing mandrel is reduced intermediate the packing assemblies 151 and 152 for a reason to be more fully explained hereinafter.

A lower packing mandrel 22 having a packing assembly 24 mounted thereon is threaded into the lower end of the main valve mandrel. The valve member is connected to or linked with the shifting sleeve by the introduction of the connecting link 110 into the annular groove 114 in the same manner as in the device of FIGURES 8 through 11. With the shifting sleeve and the valve member in the upper position shown in FIGURES

12 and 13, the upper packing assembly **151** is disposed above the upper lateral port **141**, while the intermediate packing assembly **152** is disposed below the intermediate lateral port **142** and the lower packing assembly **24** is located above the lower lateral port **144**. With the shifting sleeve and the valve member in the lower position shown in FIGURE 14, the upper packing assembly is disposed below the upper lateral port **141** but above the intermediate port **142**. The intermediate packing assembly continues to be disposed below the intermediate lateral port and above the lower port **144**, and the lower packing assembly is moved to a position below the lower port.

In use, the side port valve device is assembled as described and the sleeve housing is connected in the primary flow conductor or pipe **13** of a well. A smaller or secondary flow conductor or pipe **18** is connected to the upper end of the valve housing, and the device is installed in the well. The primary flow pipe would probably and preferably be equipped at a point below the housing with a packer (not shown) for sealing engagement with the casing (not shown) of the well.

When it is desired to permit fluids surrounding the housing to flow upwardly through the smaller flow pipe, the sleeve **112** is moved downwardly by means of a suitable flexible line-operated shifting tool to the position shown in FIGURE 14. With the device in this position, fluid entering through the upper port is blocked off from both the intermediate and the lower ports inasmuch as the upper packing assembly **151** seals with the bore wall of the valve housing between the upper and the intermediate ports and the lower packing assembly **24** seals with the bore wall of the valve housing below the lower port. Fluids entering the upper port are thus directed upwardly through the smaller flow pipe **18**, as shown by the arrow in FIGURE 14.

At the same time, fluids within the primary flow pipe **13** are permitted to flow upwardly through the shifting sleeve and the sleeve housing and thence to the surface, being prevented from communicating with the fluids entering the valve housing through the upper lateral port by the valve member and by the upper and lower valve member packing assemblies.

When it is desired to permit the fluids surrounding the housing to flow upwardly through the primary or large flow conductor or pipe, the sleeve **112** is moved upwardly to the position shown in FIGURES 12 and 13 by means of the flexible line-operated shifting tool. A well tool anchoring assembly (not shown) similar to that shown in the patent to I. A. Miller, No. 2,673,614, and having a valve closing the bore therethrough similar to the valve shown in the patent to H. C. Otis, No. 2,144,850, may be lowered by means of a flexible line lowering mechanism into the primary flow pipe, the anchoring device being stopped from downward movement by engagement with the stop shoulder **134** in the sleeve housing and being locked in position in the bore by engagement of locking dogs on the anchoring assembly with the lock shoulder **133** in the locking groove **132** in said housing.

With the well tool in place, the primary flow pipe is blocked to prevent fluid flow upwardly through the sleeve housing, and with the valve member in its upper position the flow from the lower part of the primary flow pipe passes through the lower lateral port **144** into the valve housing and upwardly through the tubular valve member itself, and thence upwardly through the secondary well pipe **18**. At the same time fluids surrounding the housing enter through the upper flow ports **141** and flow downwardly through the valve housing around the reduced central portion of the upper packing mandrel, thence through the intermediate port **142** into the sleeve housing above the well tool closing the bore thereof, and upwardly through the primary well pipe. The two fluid streams are prevented from communication one with the other by the sealing engagement of the upper packing assembly with the bore wall of the valve housing above the upper port and the engagement of the intermediate packing assembly with the bore wall of the valve housing below the intermediate port, and by the well tool closing the bore of the sleeve housing.

It will be seen that a side port valve device has been shown and described which can be installed in a primary flow pipe in a well and with a second flow pipe extending from the device to the surface, whereby flow from without the device can be directed through either of the flow pipes to the surface while at the same time flow from the primary flow pipe is directed through the other of the two flow pipes to the surface. It will be seen that this alternative direction of the flow from the two sources is accomplished by the moving of the shifting sleeve in the primary flow pipe by means of a flexible line-operated shifting tool and by the installation or removal of a plugging tool in the housing.

The foregoing description of the invention is explanatory only, and changes in the details of the constructions illustrated may be made by those skilled in the art, within the scope of the appended claims, without departing from the spirit of the invention.

What is claimed and desired to be secured by Letters Patent is:

1. A flow controlling device for use with a pair of well flow conductors including: an elongate tubular body member connectable in one of said flow conductors; a tubular valve housing disposed exteriorly of said body member and extending parallel thereto and adapted to be connected in the second of said flow conductors; said flow controlling device having a lateral port means communicating between the interior of said body member and the interior of said valve housing; a valve member mounted in said valve housing for movement therein from a first position opening said port means to a second position closing said port means; a sleeve mounted in said body member and slidable therein; means extending between and engaging said sleeve and said valve member for connecting said sleeve to said valve member for causing said valve member to move with said sleeve whereby movement of said sleeve moves said valve member from said first position to said second position; said sleeve having an upwardly facing shoulder and a downwardly facing shoulder engageable by a suitable shifting tool to move said sleeve.

2. A flow controlling device for use with a pair of well flow conductors including: an elongate tubular body member connectable in one of said flow conductors; a tubular valve housing mounted exteriorly of said body member and extending parallel thereto and adapted to be connected in the second of said flow conductors; said flow controlling device having a lateral port means communicating between the interior of said body member and the interior of said valve housing; a valve member mounted in said valve housing for movement therein from a first position opening said port means to a second position closing said port means; a sleeve mounted in said body member and slidable therein; means extending between and engaging said sleeve and said valve member for connecting said sleeve to said valve member for causing said valve member to move with said sleeve whereby movement of said sleeve moves said valve member from said first position to said second position; said sleeve having an upwardly facing shoulder and a downwardly facing shoulder engageable by a suitable shifting tool to move said sleeve; said sleeve being movable to move said valve member from said second position to said first position to reopen said port means.

3. A flow controlling device for use with a pair of well flow conductors including: an elongate tubular body member connectable in one of said flow conductors; a tubular valve housing mounted exteriorly of said body

member and extending parallel thereto and adapted to be connected in the second of said flow conductors; said flow controlling device having a lateral port means communicating between the interior of said body member and the interior of said valve housing; a valve member mounted in said valve housing for movement therein from a first position opening said port means to a second position closing said port means; a sleeve mounted in said body member and slidable therein; means extending between and engaging said sleeve and said valve member for connecting said sleeve to said valve member for causing said valve member to move with said sleeve whereby movement of said sleeve moves said valve member from said first position to said second position; said sleeve having an upwardly facing shoulder and a downwardly facing shoulder engageable by a suitable shifting tool to move said sleeve; said sleeve being movable to move said valve member from said second position to said first position to reopen said port means; and stop means in said body member engageable by said sleeve to limit movement of said sleeve whereby movement of said valve member beyond said first position and said second position is prevented.

4. A flow controlling device for use with a pair of well flow conductors including: an elongate tubular body member connectable in one of said flow conductors; a tubular valve housing mounted exteriorly of said body member and extending parallel thereto and adapted to be connected in the second of said flow conductors; said flow controlling device having a lateral port means communicating between the interior of said body member and the interior of said valve housing; a valve member mounted in said valve housing for movement therein from a first position opening said port means to a second position closing said port means; a sleeve mounted in said body member and slidable therein; means extending between and engaging said sleeve and said valve member for connecting said sleeve to said valve member for causing said valve member to move with said sleeve whereby movement of said sleeve moves said valve member from said first position to said second position; said sleeve having an upwardly facing shoulder and a downwardly facing shoulder engageable by a suitable shifting tool to move said sleeve; said sleeve being movable to move said valve member from said second position to said first position to reopen said port means; stop means in said body member engageable by said sleeve to limit movement of said sleeve whereby movement of said valve member beyond said first position and said second position is prevented; and holding means in the flow controlling device releasably holding said sleeve in position to locate said valve member in said first position and in position to locate said valve member in said second position.

5. A flow controlling device for use with a pair of well flow conductors including: an elongate tubular body member connectable in one of said flow conductors; a tubular valve housing mounted exteriorly of said body member and extending parallel thereto and adapted to be connected in the second of said flow conductors; said flow controlling device having a lateral port means communicating between the interior of said body member and the interior of said valve housing; a valve member mounted in said valve housing for movement therein from a first position opening said port means to a second position closing said port means; a sleeve mounted in said body member and slidable therein; means extending between and engaging said sleeve and said valve member for connecting said sleeve to said valve member for causing said valve member to move with said sleeve whereby movement of said sleeve moves said valve member from said first position to said second position; said sleeve having an upwardly facing shoulder and a downwardly facing shoulder engageable by a suitable shifting tool to move said sleeve; said sleeve being movable to move said valve member from said second position to said first position to reopen said port means; stop means in said body member engageable by said sleeve to limit movement of said sleeve whereby movement of said valve member beyond said first position and said second position is prevented; and holding means in the flow controlling device releasably holding said sleeve in position to locate said valve member in said first position and in position to locate said valve member in said second position; said holding means including resilient engaging means on one of said sleeve and said body member, and spaced recesses on the other of said sleeve and said body member whereby said resilient engaging means is adapted to move into said recesses to hold said sleeve in said positions.

6. A flow controlling device for use with a pair of well flow conductors including: an elongate tubular body member connectable in one of said flow conductors; a tubular valve housing mounted exteriorly of said body member and extending parallel thereto and adapted to be connected in the second of said flow conductors; said flow controlling device having a lateral port means communicating between the interior of said body member and the interior of said valve housing; a valve member mounted in said valve housing for movement therein from a first position opening said port means to a second position closing said port means; a sleeve mounted in said body member and slidable therein; means extending between and engaging said sleeve and said valve member for connecting said sleeve to said valve member for causing said valve member to move with said sleeve whereby movement of said sleeve moves said valve member from said first position to said second position; said sleeve having an upwardly facing shoulder and a downwardly facing shoulder engageable by a suitable shifting tool to move said sleeve; said sleeve being movable to move said valve member from said second position to said first position to reopen said port means; stop means in said body member engageable by said sleeve to limit movement of said sleeve whereby movement of said valve member beyond said first position and said second position is prevented; and holding means in the flow controlling device releasably holding said sleeve in position to locate said valve member in said first position and in position to locate said valve member in said second position; said holding means including resilient engaging means on said sleeve and a pair of internal recesses in said body member whereby said resilient engaging means is adapted to move into one of said recesses to hold said sleeve in position to locate said valve member in said first position and to move into the other of said recesses to hold said sleeve in position to locate said valve member in said second position.

7. A flow controlling device for use with a well flow conductor including: an elongate tubular body member connectable in said flow conductor and having a lateral port means providing a flow path between the interior and the exterior thereof; a valve housing mounted exteriorly of said body member and extending parallel thereto; said port means including a first lateral port opening from said body member into said housing and a second lateral port longitudinally spaced from said first lateral port and opening from said housing to the exterior thereof; a valve member mounted in said housing for movement therein from a first position to open said flow path to a second position closing said flow path; a sleeve mounted in said body member and slidable therein; and means extending between and engaging said sleeve and said valve member for connecting said sleeve to said valve member for causing said valve member to move with said sleeve whereby movement of said sleeve moves said valve member between said first position and said second position.

8. A flow controlling device for use with a well flow conductor including: an elongate tubular body member connectable in said flow conductor and having a lateral port means providing a flow path between the interior

and the exterior thereof; a valve housing mounted exteriorly of said body member and extending parallel thereto; said port means including a first lateral port opening from said body member into said housing and a second lateral port longitudinally spaced from said first lateral port and opening from said housing to the exterior thereof; a valve member mounted in said housing for movement therein from a first position to open said flow path to a second position closing said flow path; a sleeve mounted in said body member and slidable therein; and extending between and engaging said sleeve and said valve member for means connecting said sleeve to said valve member for causing said valve member to move with said sleeve whereby movement of said sleeve moves said valve member between said first position and said second position; said sleeve having an upwardly facing shoulder and a downwardly facing shoulder engageable by a suitable shifting tool to move said sleeve.

9. A flow controlling device as set forth in claim 8 in which the upwardly and downwardly facing shoulders in said sleeve are provided in an internal annular groove in said sleeve.

10. A flow controlling device as set forth in claim 9 including stop means in said body member engageable by said sleeve to limit movement of said sleeve whereby said valve member is prevented from moving beyond said first position and said second position.

11. A flow controlling device as set forth in claim 10 including a holding means releasably holding said valve member in said first position and in said second position.

12. A flow controlling device as set forth in claim 10 including a holding means releasably holding said valve member in said first position and in said second position; said holding means including resilient means on one of said valve member and said valve housing and recess means on the other of said valve member and said valve housing whereby said resilient means is adapted to engage said recess means to hold said valve member in said positions.

13. A flow controlling device for use with a pair of well flow conductors including: an elongate tubular body member connectable in the first of said flow conductors; an elongate tubular valve housing mounted exteriorly of said body member and extending parallel thereto and adapted to be connected to the second of said flow conductors; said flow controlling device having a first lateral port means communicating between the interior of said body member and the interior of said valve housing and a second lateral port means communicating between the interior of said body member and the interior of said housing at a point spaced longitudinally of said body member and housing from said first lateral port means; said housing having a lateral window longitudinally spaced from said first port means and communicating between the interior of said housing and the exterior thereof whereby a flow path is provided from the exterior of the housing to the interior of the body member; a tubular valve member in said housing mounted for movement therein between a first position opening said flow path and opening said second port means to provide a first flow passageway from said second port means through said valve member into said second flow conductor and a second position closing said flow path and closing said second port means whereby said first flow passageway to said second flow conductor is closed and opening said lateral window to communicate with said second flow conductor; a sleeve in said body member mounted for slidable movement therein; and means extending between and engaging said sleeve and said valve member for connecting said sleeve to said valve member for causing said valve member to move with said sleeve whereby movement of said sleeve moves said valve member between said first position and said second position.

14. A flow controlling device for use with a pair of well flow conductors including: an elongate tubular body member connectable in the first of said flow conductors; an elongate tubular valve housing mounted exteriorly of said body member and extending parallel thereto and adapted to be connected to the second of said flow conductors; said flow controlling device having a first lateral port means communicating between the interior of said body member and the interior of said valve housing and a second lateral port means communicating between the interior of said body member and the interior of said housing at a point spaced longitudnially of said body member and housing from said first lateral port means; said housing having a lateral window longitudinally spaced from said first port means and communicating between the interior of said housing and the exterior thereof whereby a flow path is provided from the exterior of the housing to the interior of the body member; a tubular valve member in said housing mounted for movement therein between a first position opening said flow path and opening said second port means to provide a first flow passageway from said second port means through said valve member into said second flow conductor and a second position closing said flow path and closing said second port means whereby said first flow passageway to said second flow conductor is closed and opening said lateral window to communicate with said second flow conductor; a sleeve in said body member mounted for sliding movement therein; means extending between and engaging said sleeve and said valve member for connecting said sleeve to said valve member for causing said valve member to move with said sleeve whereby movement of said sleeve moves said valve member between said first position and said second position; and an upwardly facing shoulder and a downwardly facing shoulder on said sleeve engageable by a suitable shifting tool to move said sleeve.

15. A flow controlling device for use with a pair of well flow conductors including: an elongate tubular body member connectable in the first of said flow conductors; an elongate tubular valve housing mounted exteriorly of said body member and extending parallel thereto and adapted to be connected to the second of said flow conductors; said flow controlling device having a first lateral port means communicating between the interior of said body member and the interior of said valve housing and a second lateral port means communicating between the interior of said body member and the interior of said housing at a point spaced longitudinally of said body member and housing from said first lateral port means; said housing having a lateral window longitudinally spaced from said first port means and communicating between the interior of said housing and the exterior thereof whereby a flow path is provided from the exterior of the housing to the interior of the body member; a tubular valve member in said housing mounted for movement therein between a first position opening said flow path and opening said second port means to provide a first flow passageway from said second port means through said valve member into said second flow conductor and a second position closing said flow path and closing said second port means whereby said first flow passageway to said second flow conductor is closed and opening said lateral window to communicate with said second flow conductor; a sleeve in said body member mounted for sliding movement therein; means extending between and engaging said sleeve and said valve member for connecting said sleeve to said valve member for causing said valve member to move with said sleeve whereby movement of said sleeve moves said valve member between said first position and said second position; an upwardly facing shoulder and a downwardly facing shoulder on said sleeve engageable by a suitable shifting tool to move said sleeve; and stop means in said body member engageable by said sleeve to limit movement of said sleeve whereby movement of said valve member beyond said first position and said second position is prevented.

16. A flow controlling device as set forth in claim 15

including holding means releasably holding said sleeve in position locating said valve member in said first position and in positon locating said valve member in said second position.

17. A flow controlling device as set forth in claim 15 including holding means releasably holding said sleeve in position locating said valve member in said first position and in position locating said valve member in said second position; said holding means including resilient engaging means in one of the sleeve and the housing and recess means in the other of the sleeve and the housing whereby said resilient engaging means is adapted to engage said recess means to hold said sleeve in said positions.

18. A flow controlling device as set forth in claim 15, in which the bore through said sleeve is as large as that through said first flow conductor.

19. A valve assembly for use with a well flow conductor including: an elongate tubular body member having a longitudinal bore and having lateral port means providing a flow path from the interior to the exterior of said body member; valve means carried by the body member adjacent said port means and disposed exteriorly of said body member, said valve means having an inlet from exteriorly thereof and a passage from said inlet to said lateral port means of said body member; a valve member movable in said valve means from a first position closing flow through said passage of said valve housing to said port means to a second position opening said passage to flow therethrough to said port means; a sleeve movably mounted in said body member and slidable therein, said valve assembly having an opening communicating with said bore and the interior of the valve means; and means extending through said opening and between and engaging said sleeve and said valve member for connecting said sleeve to said valve member for causing said valve member to move with said sleeve whereby said sleeve moves said valve member from said first position to said second position when said sleeve is moved in said body member.

20. A valve assembly of the character set forth in claim 19 in which the bore of the sleeve is substantially equal to the bore of the well flow conductor, whereby said sleeve does not restrict passage of tools or fluids through said valve assembly between the tubing below and the tubing above the assembly.

21. A valve assembly for use with a well flow conductor including: an elongate tubular body having a longitudinal bore and having lateral port means providing a flow path from the interior to the exterior of said body member; said valve means carried by the body member adjacent said port means and disposed exteriorly of said body member, said valve means having an inlet from exteriorly thereof and a passage from said inlet to said lateral port means of said body member; a valve member movable in said valve means from a first position closing off flow through said passage of said valve housing to said port means to a second position opening said passage to flow therethrough to said port means; a sleeve movably mounted in said body member and slidable therein, said valve assembly having an opening communicating with said bore and the interior of said valve means; and means extending through said opening and between and engaging said sleeve and said valve member for connecting said sleeve to said valve member for causing said valve member to move with said sleeve whereby said sleeve moves said valve member from said first position to said second position, said sleeve being movable to move said valve member from said second position to said first position to reclose said port means.

22. A flow controlling device for use with a well flow conductor, including: an elongate tubular body member having means for connecting it in a well flow conductor and having a bore and a lateral port means providing a flow path between the bore and the exterior of the body member, said port means including a valve housing disposed exteriorly of said body member and extending parallel thereto; said valve housing having an inlet from exteriorly thereof and a longitudinal flow passage therein from said inlet along said valve housing and opening into said bore of said tubular body member; a valve member in said housing mounted for movement therein from a first position opening said flow passage of said valve housing to flow therethrough from said inlet into said bore of the body member to a second position closing said flow passage to flow through said housing from said inlet into said bore of said body member; a sleeve movably mounted in said body member and slidable therein, said device having an opening communicating between said bore and the interior of said housing; means extending through said opening and between and engaging said sleeve and said valve member for connecting said sleeve to said valve member for causing said valve member to move with said sleeve whereby said sleeve moves said valve member from said first position to said second position when said sleeve is moved in said body member; said sleeve having an upwardly facing shoulder and a downwardly facing shoulder engageable by a suitable shifting tool to move said sleeve.

23. A flow controlling device as set forth in claim 22 in which the bore of the sleeve is substantially as large as that of the bore of the well flow conductor, whereby said sleeve does not restrict passage of tools or fluids through said valve assembly between the tubing below and the tubing above the assembly.

24. A flow controlling device for use with a well flow conductor including: an elongate tubular body member having means for connecting it in a well flow conductor and having a longitudinal bore and a lateral port means providing a flow path between the bore and the exterior thereof; said port means including a valve housing disposed exteriorly of said body member extending parallel thereto; said valve housing having an inlet and a longitudinal flow passage therein from said inlet along said valve housing opening into the bore of said tubular body member; a valve member in said valve housing mounted for movement therein from a first position to open said flow passage of said housing to flow therethrough from said inlet into the bore of the body member to a second position to close said flow passage to flow through said housing from said inlet into said body member; said device having an opening communicating with said bore and the interior of the housing; a sleeve mounted in said body and slidable therein; means extending through said opening and between and engaging said sleeve and said valve member for connecting said sleeve and said valve member for causing said valve member to move with said sleeve whereby movement of said sleeve causes said valve member to move from said first position to said second position; said sleeve having an upwardly facing shoulder and a downwardly facing shoulder engageable by a suitable shifting tool to move said sleeve, said sleeve being movable to move said valve member from said second position to said first position to reopen said port means.

25. A flow controlling device for use with a well flow conductor including: an elongate tubular body member having a bore, means for connecting it in a well flow conductor and a lateral port means providing a flow path between the bore and the exterior of the body member; said port means including a valve housing disposed exteriorly of said body member and extending parallel thereto; said valve housing having an inlet and a longitudinal flow passage therein from said inlet and opening into the bore of said tubular body member; a valve member in said valve housing mounted for movement therein from a first position closing said flow passage to flow through said housing from said inlet into said bore of said body member to a second position closing said flow passage of said housing to flow therethrough from said inlet into the bore of the body member; a

sleeve movably mounted in said body member and slidable therein, said device having an opening communicating with the bore of the body member and the interior of the housing; means extending through said opening and between and engaging said sleeve and said valve member for connecting said sleeve to said valve member for causing said valve member to move with said sleeve whereby said sleeve moves said valve member from said first position to said second position when said sleeve is moved in said body member; said sleeve having an upwardly facing shoulder and a downwardly facing shoulder engageable by a suitable shifting tool to move said sleeve, said sleeve being movable to move said valve member from said second position to said first position to reopen said port means; and stop means in said body member engageable by said sleeve to limit movement of said sleeve whereby movement of said valve member beyond said first position and said second position is prevented.

26. A flow controlling device for use with a well flow conductor including: an elongate tubular body member having means for connecting it in a well flow conductor and having a bore and a lateral port means providing a flow path between the bore and the exterior of the body member; said port means including a valve housing disposed exteriorly of said body member and extending parallel thereto; said valve housing having an inlet and a longitudinal flow passage therein from said inlet and opening into the bore of said tubular body member; a valve member in said valve housing mounted for movement therein from a first position closing said flow passage of said housing to flow therethrough from said inlet into the bore of the body member to a second position closing said flow passage to flow through said housing from said inlet into the bore of said body member; a sleeve movably mounted in said body member; said device having an opening communicating with the bore of the body member and the interior of the housing; means extending through said opening and between and engaging said sleeve and said valve member for connecting said sleeve to said valve member for causing said valve member to move said sleeve whereby said sleeve moves said valve member from said first position to said second position when said sleeve is moved in said body member, said sleeve having an upwardly facing shoulder and a downwardly facing shoulder engageable by a suitable shifting tool to move said sleeve, said sleeve being movable to move said valve member from said second position to said first position to reopen said port means; and stop means in said body and member engageable by said sleeve to limit movement of said sleeve whereby movement of said valve member beyond said first position and said second position is prevented.

27. A flow controlling device for use with a well flow conductor including: an elongate tubular body member having a bore, means for connecting it in a well flow conductor and a lateral port means providing a flow path between the bore and the exterior of the body member; said port means including a valve housing disposed exteriorly of said body member and extending parallel thereto; said valve housing having an inlet and a longitudinal flow passage therein from said inlet and opening into the bore of said tubular body member; a valve member in said valve housing mounted for movement therein from a first position opening said flow passage of said housing to flow therethrough from said inlet into the bore of the body member to a second position closing said flow passage to flow through said housing from said inlet into the bore of said body member; a sleeve movably mounted in said body and slidable therein, said device having an opening communicating with the bore of said body member and the interior of the housing; means extending through said opening and between and engaging said sleeve and said valve member for connecting said sleeve to said valve member for causing said valve member to move with said sleeve whereby said sleeve moves said valve member from said first position to said second position when said sleeve is moved in said body member; said sleeve having an upwardly facing shoulder and a downwardly facing shoulder engageable by a suitable shifting tool to move said sleeve, said sleeve being movable to move said valve member from said second position to said first position to reopen said port means; stop means in said body member engageable by said sleeve to limit movement of said sleeve whereby movement of said valve member beyond said first position and said second position is prevented; and holding means engageable with said valve housing and said valve member releasably holding said valve member in said first position and in said second position, said holding means including resilient detent means on said valve member and a pair of spaced internal recesses in said valve housing whereby said resilient detent means is adapted to move into one of said recesses to hold said valve member in said first position and to move into the other of said recesses to hold said valve member in said second position.

28. A flow controlling device for use with a well flow conductor including: an elongate tubular body member having a bore, means for connecting it in a well flow conductor and a lateral port means providing a flow path between the bore and the exterior of the body member; said port means including a valve housing disposed exteriorly of said body member and extending parallel thereto; said valve housing having an inlet and a longitudinal flow passage therein from said inlet and opening into the bore of said tubular body member; a valve member in said valve housing mounted for movement therein from a first position opening said flow passage of said housing to flow therethrough from said inlet into the bore of the body member to a second position closing said flow passage to flow through said housing from said inlet into the bore of said body member; a sleeve movably mounted in said body and slidable therein, said device having a slot extending between said valve housing and said body member; means extending through said slot and between and engaging said sleeve and said valve member for connecting said sleeve to said valve member for causing said valve member to move with said sleeve whereby said sleeve moves said valve member from said first position to said second position when said sleeve is moved in said body member; said sleeve having an upwardly facing shoulder and a downwardly facing shoulder engageable by a suitable shifting tool to move said sleeve, said sleeve being movable to move said valve member from said second position to said first position to reopen said port means; stop means in said body member engageable by said sleeve to limit movement of said sleeve whereby movement of said valve member beyond said first position and said second position is prevented; and holding means in the flow controlling device releasably holding said sleeve in position to locate said valve member in said first position and in position to locate said valve member in said second position, said holding means including a resilient detent means on one of said sleeve and said body member and spaced recesses formed on the other of said sleeve and said body member whereby said resilient detent means is adapted to move into said recesses to hold said sleeve in said positions.

29. A flow controlling device for use with a well flow conductor including: an elongate tubular body member having a bore, means for connecting it in a well flow conductor and lateral port means providing a flow path between the bore and the exterior of the body member; said port means including a valve housing disposed exteriorly of said body member and extending parallel thereto; said valve housing having an inlet and a longitudinal flow passage therein from said inlet and opening into the bore of said tubular body member; a valve member in said valve housing mounted for movement therein from said first position opening said flow passage of said housing to flow therethrough from said inlet into the bore of

said body member to a second position closing said flow passage to flow through said housing from said inlet into the bore of said body member; a sleeve movably mounted in said body member and slidable therein, said flow device having a slot between said bore of said body member and the interior of said housing; means extending through said slot and between and engaging said sleeve and said valve member for connecting said sleeve to said valve member for causing said valve member to move with said sleeve whereby said sleeve moves said valve member from said first position to said second position when said sleeve is moved in said body member, said sleeve having an upwardly facing shoulder and a downwardly facing shoulder engageable by a suitable shifting tool to move said sleeve, said sleeve being movable to move said valve member from said second position to said first position to reopen said port means; stop means in said body member engageable by said sleeve to limit movement of said sleeve whereby movement of said valve member beyond said first position and said second position is prevented; and holding means in the flow controlling device releasably holding said sleeve in position to locate said valve member in said first position and in position to locate said valve member in said second position, said holding means including resilient detent means on said sleeve and a pair of internal recesses in the bore of said body member whereby said resilient detent means is adapted to move into one of said recesses to hold said sleeve in position to locate said valve member in said first position and into the other of said recesses to hold said sleeve in position to locate said valve member in said second position.

30. A valve assembly for use with a well flow conductor including: an elongate body having a longitudinal bore; said body member having means providing a second longitudinal bore laterally spaced from said first longitudinal bore and extending parallel thereto; said body member having a first port means communicating with said first and second longitudinal bores and a second port means providing a flow path from the second bore to the exterior of said valve assembly, said first and second port means and said second bore providing a flow passageway between the first longitudinal bore and the exterior of said valve assembly; a valve member movable in said second longitudinal bore from a first position preventing flow through said second bore between said first and second port means to a second position permitting flow through said second bore between said first and second port means whereby fluids may flow between said first bore and the exterior of said valve assembly; a tubular slidable member mounted in said first longitudinal bore and slidable therein; and means extending between and engaging said slidable member and said valve member for causing said valve member to move with said slidable member whereby said slidable member moves said valve member from said first position to said second position when said slidable member is moved longitudinally in said first longitudinal bore.

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