No. 885,145. PATENTED APR. 21, 1908.

W. F. DAVIS.

FLUID PRESSURE VALVE.

APPLICATION FILED FEB. 23, 1906.

3 SHEETS—SHEET 1.

Fig. 1.

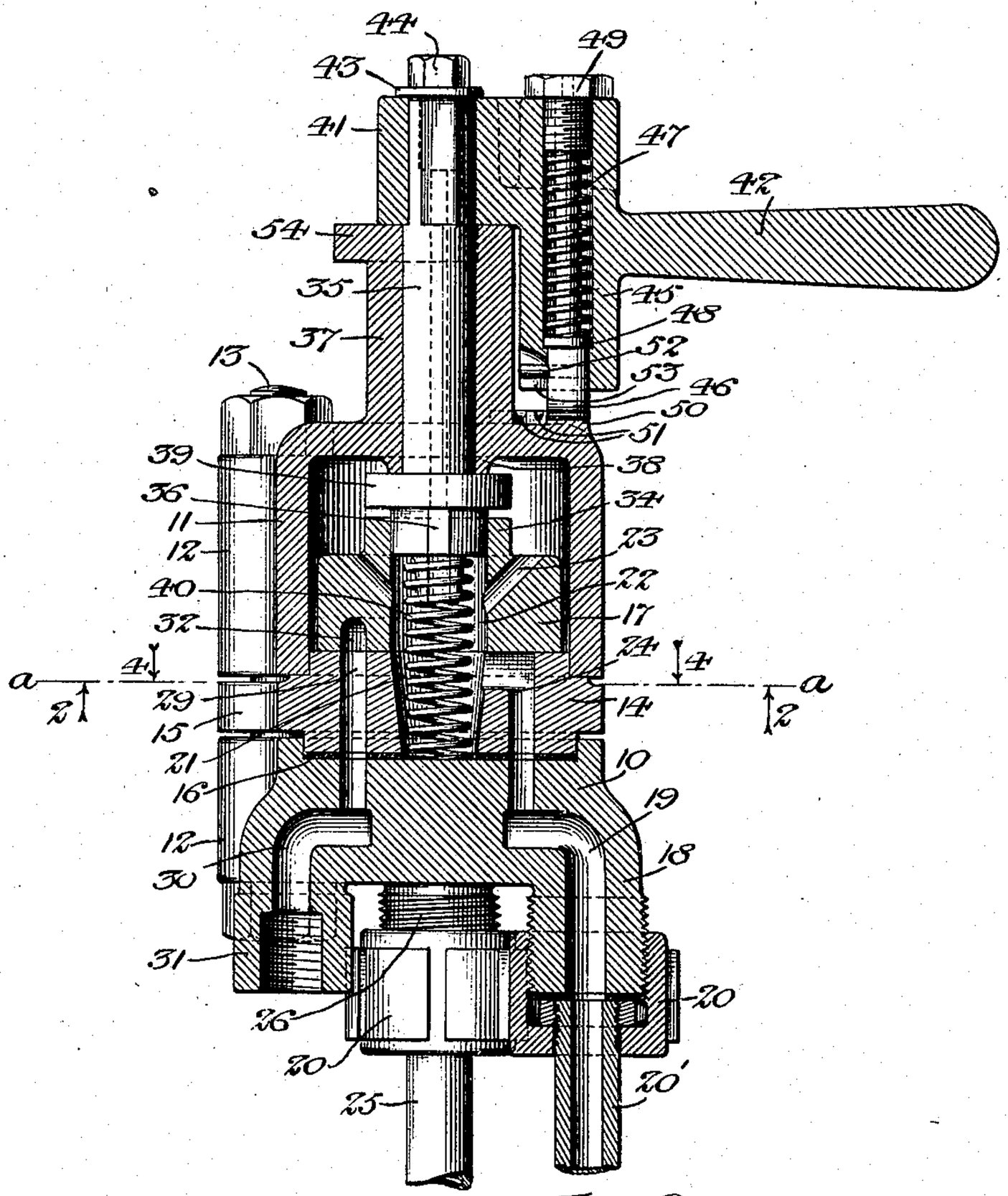
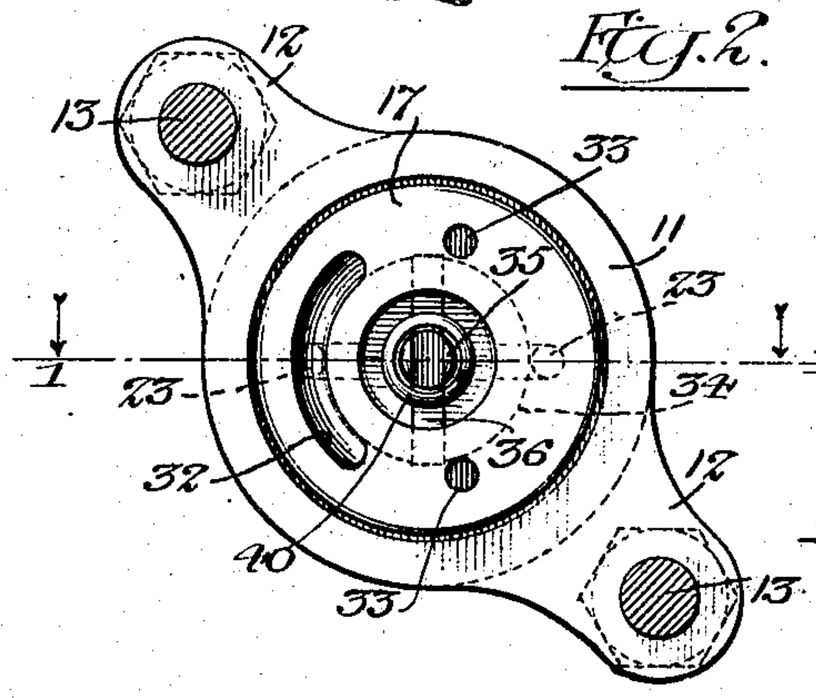


Fig. 2.



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3 SHEETS—SHEET 2.

Fig. 3.

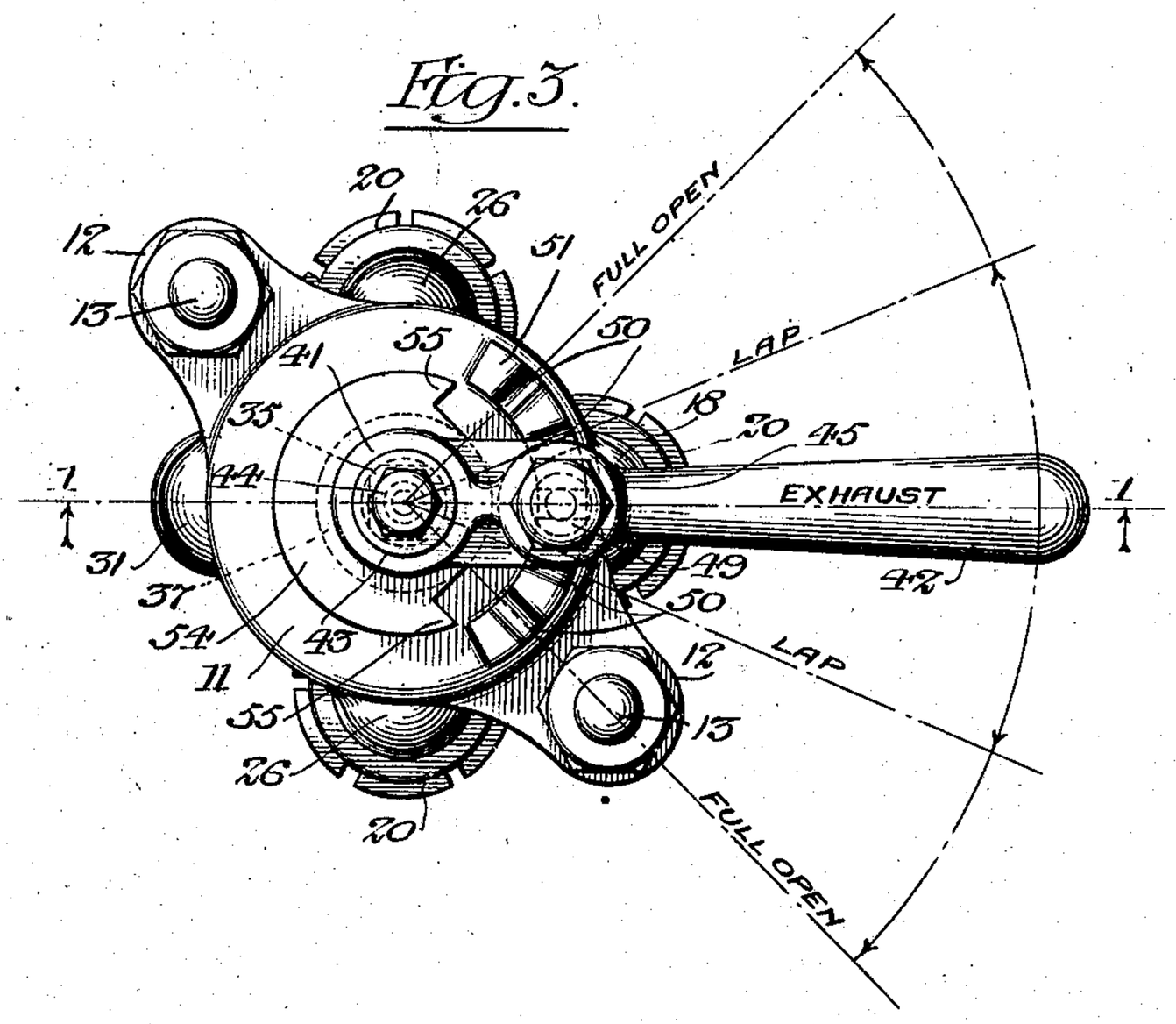
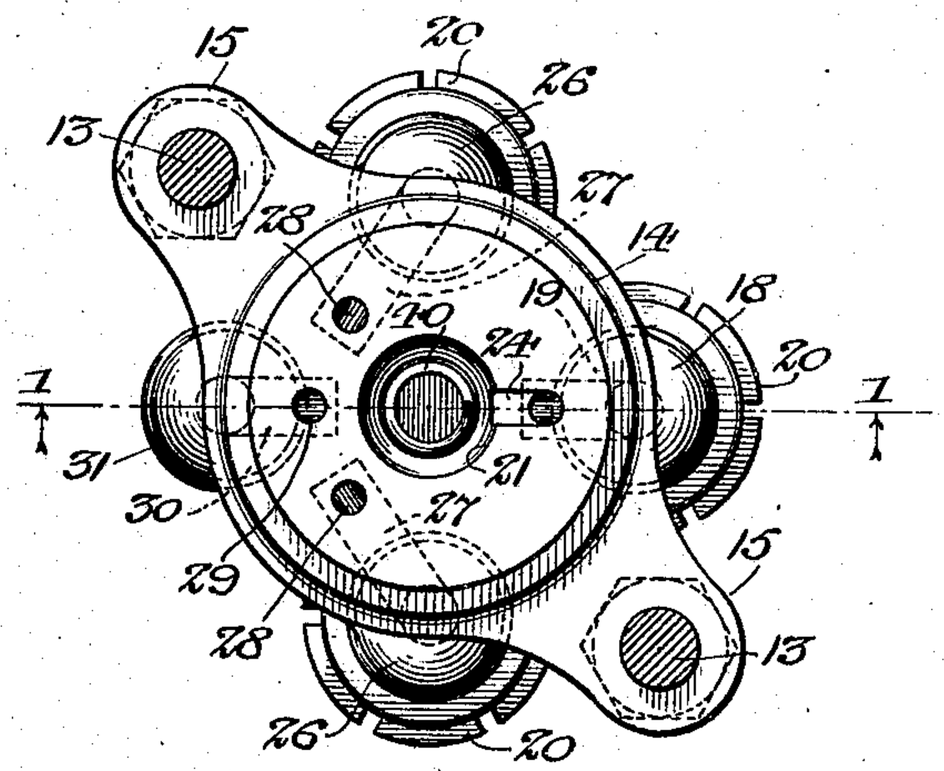


Fig. 4.



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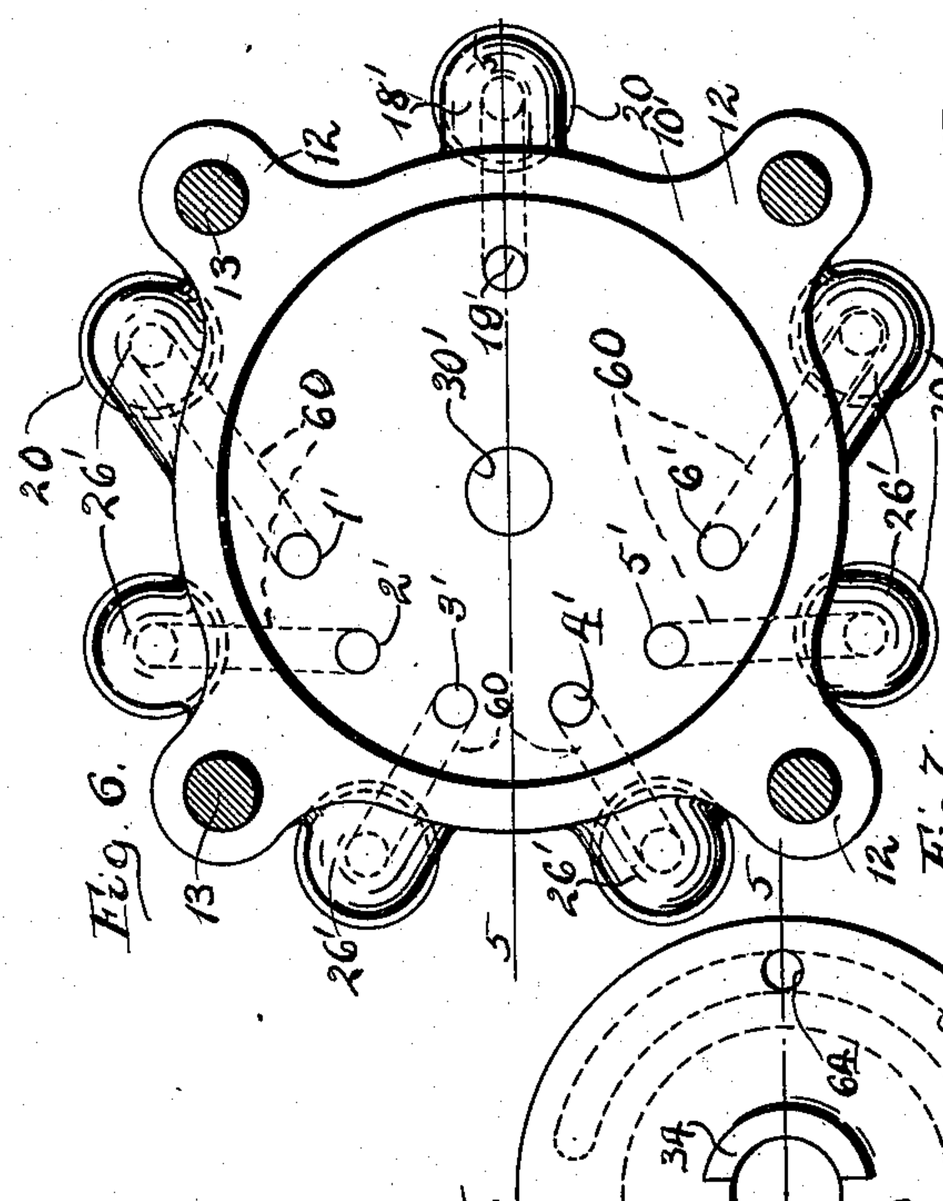
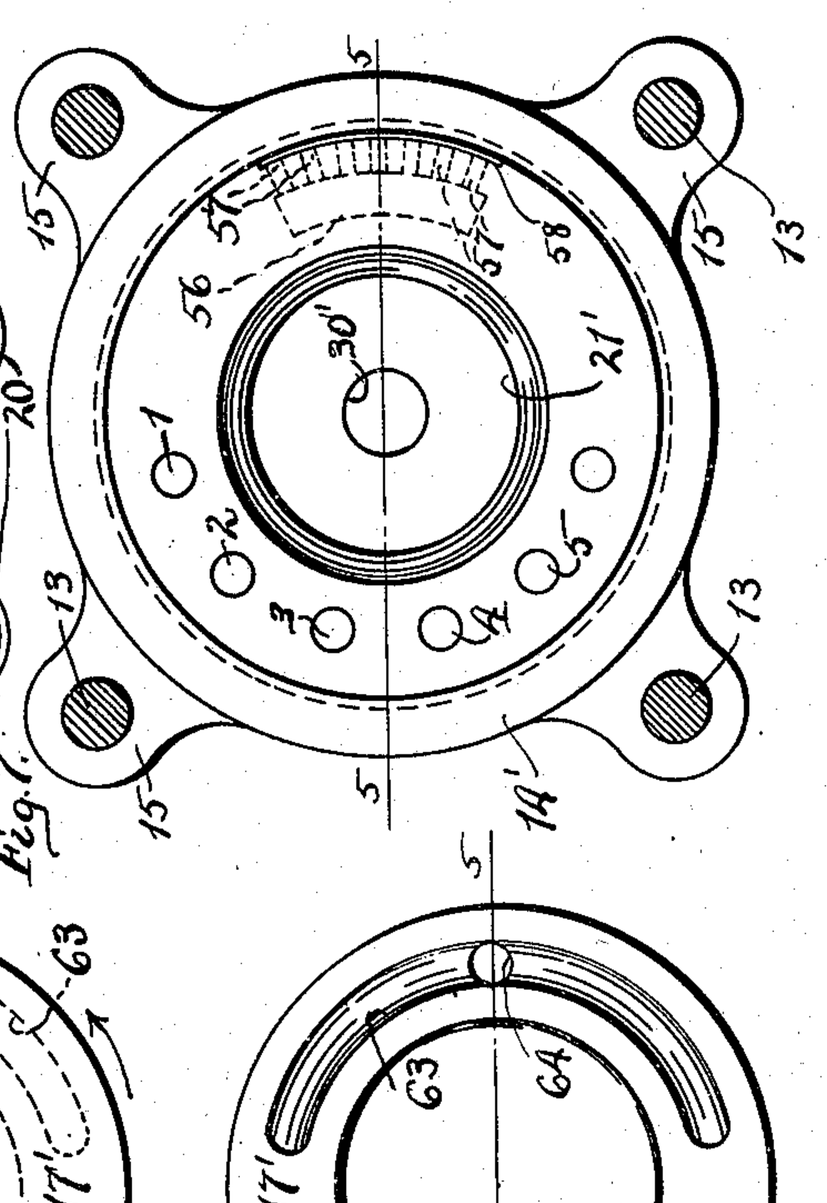
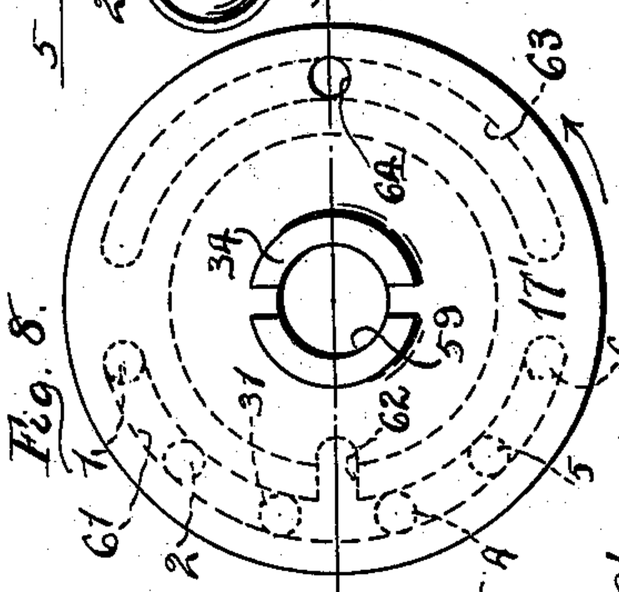
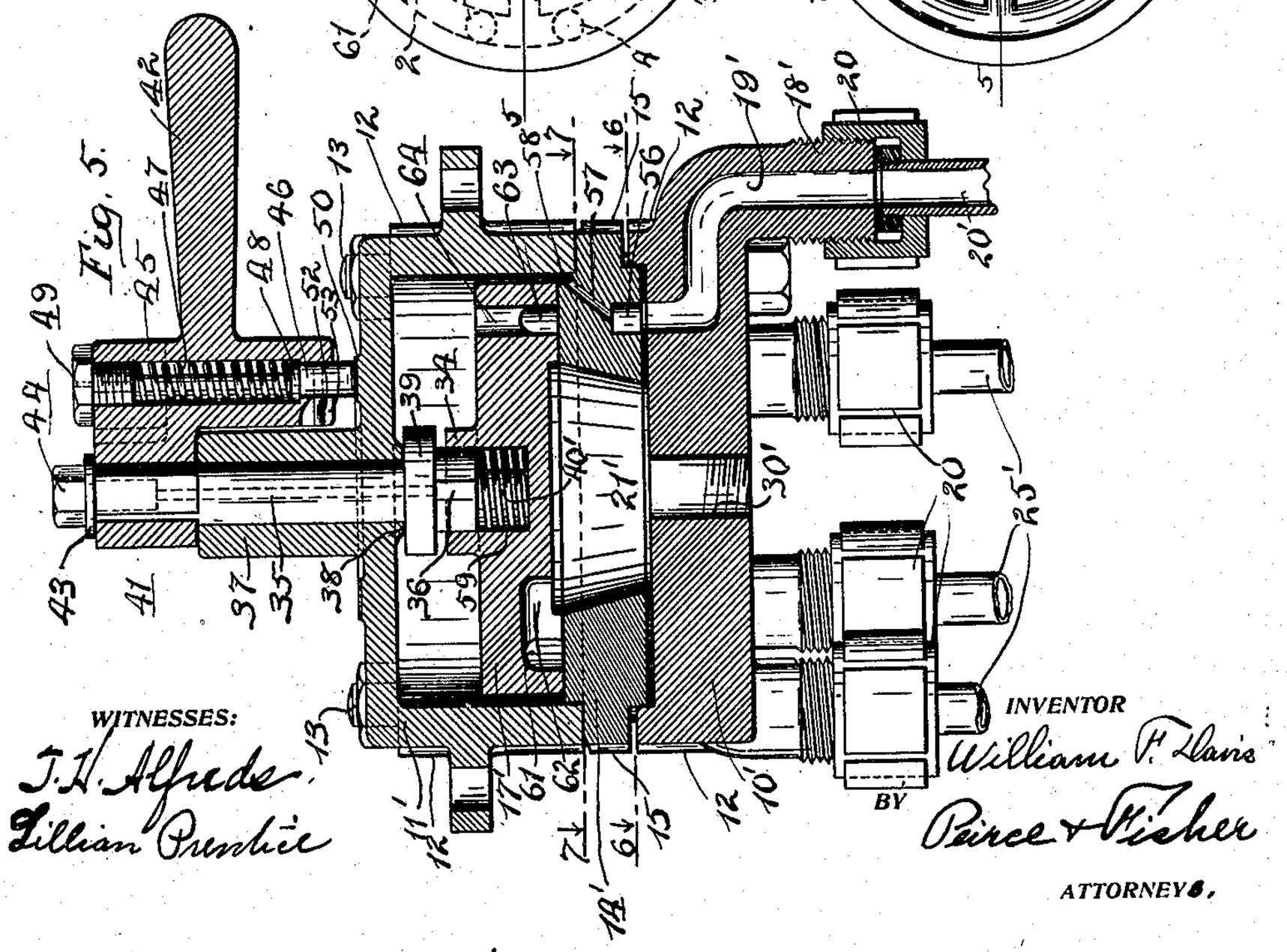
3 SHEETS—SHEET 3.









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UNITED STATES PATENT OFFICE.

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FLUID-PRESSURE VALVE.

No. 885,145. Specification of Letters Patent. Patented April 21, 1908.

Application filed February 23, 1906. Serial No. 302,428.

To all whom it may concern:

Be it known that I, WILLIAM F. DAVIS, a citizen of the United States, and a resident of Kansas City, county of Wyandotte, and State of Kansas, have invented certain new and useful Improvements in Fluid-Pressure Valves, of which the following is declared to be a full, clear, and exact description.

The invention relates to an improved form of valve designed to connect and disconnect a number of fluid pressure devices with a source of supply and with the exhaust, and seeks to provide a simple and efficient construction of valve by which the flow of fluid under pressure to and from the number of devices may be conveniently and readily controlled.

With these and other objects in view, the invention consists in the features of construction, combinations and arrangements of parts hereinafter set forth, illustrated in the accompanying drawings and more particularly pointed out in the appended claims.

In the drawings, Figure 1 is a vertical section through one form of the improved valve and taken on the line 1—1 of Figs. 2, 3 and 4. Fig. 2 is an inverted plan view of the valve and of the upper portion of the valve casing with parts shown in section on the line *a*—*a* of Fig. 1 looking in the direction of the arrows 2. Fig. 3 is a plan view of the improved valve. Fig. 4 is a plan view of the valve seat and of the lower portion of the valve casing with parts shown in section on line *a*—*a* of Fig. 1 and looking in the direction of the arrows 4. Fig. 5 is a vertical section similar to Fig. 1 illustrating another form of the invention, said section being taken on the line 5—5 of Figs. 6, 7, 8 and 9. Fig. 6 is a plan view of the lower portion of the valve casing with parts shown in section on line 6—6 of Fig. 5. Fig. 7 is a similar view showing a plan of the valve seat, parts being shown in section on line 7—7 of Fig. 5. Fig. 8 is a plan view of the rotary disk valve shown in Fig. 5, and Fig. 9 is an inverted plan view thereof.

In the form shown in Figs. 1 to 4 inclusive, the valve casing preferably comprises the lower base section 10 and an upper hollow top or cap section 11. Both of the sections of the valve casing are substantially cylindrical in outline and are provided at diametrically opposite points with projecting ears or lugs 12 through which extend the bolts 13 for securely connecting the sections of the valve casing. For convenience in manufacture and for making repairs, the valve seat is preferably formed separate from the body of the valve casing. This disk-shaped valve seat 14 is interposed between the upper and lower sections and is provided with lugs 15 through which the bolts 13 extend. The central portion of the valve seat section 14 is thickened and this thickened central portion sits within the hollow top or cap section 11 of the valve casing and within a recess formed on the upper side of the lower section 10 of the valve casing. The opposite faces of the valve seat section 14 are flat and the recessed face of the lower valve casing section 10 is also preferably flat, as shown. A suitable packing 16 is preferably interposed between the lower face of the valve seat section 14 and the bottom valve casing section 10. The upper face of the section 14 forms a seat for the rotary disk valve 17.

The supply of fluid under pressure is preferably led into the valve casing upwardly from the bottom thereof to the space above the disk valve 17. For this purpose, the lower casing section 10 is provided with a depending exteriorly threaded nipple 18 to which the supply pipe 20′ may be connected by a suitable union coupling 20. The supply port or passage 19 extends from the nipple 18 through the body of the casing section 10, first upwardly, then inwardly, and then again upwardly and opens on its upper face eccentrically or at a point to one side of the center. The valve seat and disk valve are provided with large central supply passages 21 and 22 and the valve is provided with inclined ports 23 leading from the central passage thereof to the upper side of the valve. The valve seat 14 is provided with an angular port or passage 24, the lower portion of which is in line with and leads from the upper end of the supply port or passage 19 in the lower casing section. The upper end of the port 24 extends inwardly and opens into the central passage 21 of the valve seat. In this way the fluid under pressure is led upwardly through the valve casing, valve seat and valve to the upper side of the latter and holds it securely on its seat so as to prevent leaking between the valve and its seat. This supply passage is of course always open, whatever may be the position of the rotary disk valve.

The form of valve shown in Figs. 1 and 4 is arranged to control the fluid under pressure to and from a pair of fluid pressure devices or opposite ends of the same device and the service pipes 25 from the fluid pressure devices to be controlled are connected by union couplings 20 to a pair of depending nipples 26 similar to the nipple 18 to which the supply pipe 20′ is coupled. The lower casing section 10 is provided with service passages or ports 27, similar to the supply passage 19, and opening on the upper face of the lower casing section in line with the service ports 28 that extend in axial direction through the valve seat 14. The nipples 26 (see Figs. 3 and 4) to which the service pipes 25 are connected are arranged at diametrically opposite points, but the passages 27 therefrom, as indicated in dotted lines in Fig. 4, incline to one side of the diametrical line so that the service ports 28 open upon the face of the valve seat 14 closely adjacent and on opposite sides of an exhaust port 29 extending therethrough. The lower casing section 10 is provided with an exhaust passage 30, the upper portion of which is in line with the exhaust port 29 of the valve seat, and which extends through a depending internally threaded nipple 31 arranged diametrically opposite the nipple 18. The service ports 28 and exhaust port 29 open eccentrically on the valve seat 14 or at one side of, and at equal distances from the center of the valve seat. The disk valve 17 is provided on its under face with a segmental exhaust channel 32 that is of such length that, when the valve is in central position, it extends over the exhaust port 29 and both of the service ports 28 so that, in this position of the valve, both of the service pipes are connected to the exhaust. The valve is also provided with a pair of inlet ports 33 extending in axial direction therethrough and opening onto the upper face of the valve.

The valve 17 is provided about the central opening 22 with an outwardly extending shoulder or flange 34 within which projects the lower enlarged end of a valve stem 35. The lower end of the valve stem is slotted and a key 36 extends through the slot and through cut-away portions of the flange 34. The valve stem extends through a sleeve 37 on the upper portion of the top section 11 of the valve casing and through a boss 38 on the inner face of the top section. The face of the boss 38 is ground to form a seat for a collar or flange 39 on the valve stem adjacent its lower end. The pressure within the valve casing will hold the flange or collar 39 snugly on the seat and prevent leaking around the valve stem. A coiled spring 40 within the central opening of the valve and valve seat extends between the base section 10 of the valve casing and the reduced lower end of the valve stem and assists in holding the collar 39 of the valve snugly to the seat to prevent leaking.

The upper portion of the valve stem above the sleeve 37 is squared and a lug 41 on the end of a handle 42 is provided with a correspondingly shaped orifice to sit over the end of the valve stem, and is held in place by a washer 43 and a bolt 44 threaded into the end of the valve stem. The handle is provided between the lug 41 and its grip portion with a vertically arranged part 45 that extends from the lug 41 downwardly adjacent the sleeve 37. The part 45 is hollow or is provided with a bore within which is arranged a vertically shifting catch-bolt or dog 46. A spring 47 coiled about the bolt 46 extends between a collar 48 thereon and a plug 49 that is threaded in the upper end of the bore of the handle. The lower end of the catch-bolt is properly shaped to engage a series of radial notches 50 formed on a segmental raised portion 51 on the upper face of the top casing section 11. A pin 52 extending laterally through the bolt is arranged to engage a slot 53 in the lower end of the upright portion 45 of the handle and hold the bolt against twisting and in proper position to engage the radial notches 50. The upward pressure of the spring 47 on the handle assists in holding the collar 39 on the valve stem snugly against its seat so as to prevent leaking around the valve stem. The upper end of the sleeve 37 is provided with a laterally extending flange 54 that is cut away (see Fig. 3) to form the stops or shoulders 55 which engage the vertical portion 45 of the handle and limit its shift.

The ports 28 and 29 on the valve seat and the exhaust channel 32 and inlet ports 33 of the valve are of course all located at an equal distance from the center of motion or axis of the valve, so that either the exhaust channel or the inlet ports may be brought into communication with the ports of the valve seat. In the central position of the valve shown in the drawings, the exhaust channel 32 of the valve seat connects both of the service ports 28 with the exhaust port 29. When the valve has been shifted to its extreme position on either side of the center, one of the inlet ports 33 will be in line with one of the service ports 28 while the other service port is connnected to the exhaust. If the valve is shifted in either direction to a point half way between its mid-position and its full open position, one or the other of the service ports will be connected to the exhaust. These exhaust, full open and lap portions are indicated in Fig. 3. By this arrangement either one of the service pipes may therefore be connected to the source of supply while the other is connected to the exhaust, or both service pipes may be connected to the exhaust.

The arrangement of the ports and passages

may be varied to adapt the valve for the particular purpose for which it is used. The form of valve shown in Figs. 1 to 4 inclusive is well adapted for controlling parts of a car motor by air under pressure, the valves being located on the car platform or motorman's cab and the service pipes leading to the different parts to be controlled. In an application filed by me October 10, 1905, Serial No. 282,153, I have illustrated the use of such a valve for controlling the reversing mechanism of an explosive engine employed as a car motor. In another application, Serial No. 282,154, filed October 10, 1905, a valve of this type is set forth and employed to control the shift of the clutches used to connect the motor to the wheels of the car.

The form of the invention illustrated in Figs. 5 to 9 inclusive, also comprise a valve casing formed of lower and upper sections 10′ and 11′, an intermediate valve seat 14′ and a rotary disk valve 17′. The sections of the valve casing and the valve seat are connected together as before by bolts 13 extending through lugs 12 and 15 on the connected parts. In this form however, four of such connecting bolts are preferably employed. The base section 10′ is provided about its periphery with a series of depending nipples, all of which are exteriorily threaded to receive coupling sleeves. The supply pipe 20′ is connected by a coupling 20 to the nipple 18′ and the service pipes 25′ are connected to the nipples 26′ by couplings 20. The exhaust passage 30′ is interiorly threaded and, in this form, extends centrally through the body of the lower casing section and opens on the upper face thereof into the central opening or chamber 21′ in the valve seat 14′. A passage 19′ extends from the supply nipple 18′ and communicates with a short segmental groove or channel 56 on the under face of the valve seat 14′. This groove communicates with a series of ports 57 leading to a segmental groove 58 in the upper face and at the outer periphery of the valve that opens outside of the disk valve 17′ into the valve casing above the valve. In this form, the valve has no central supply opening or passage. The arrangement of the valve stem and operating handle is entirely similar to that previously described, except that the valve may be turned to a greater number of positions, and hence the segment 51 on the valve casing is provided with a correspondingly greater number of notches. The lower end of the valve stem sits within a socket 59 in the upper face of the valve in which the spring 40′ is arranged. In this form too, the valve may be rotated in either direction through a complete circle so that the stop flange 54 is omitted.

The valve seat (see Fig. 7) is provided with a segmental row of service ports 1, 2, 3, 4, 5, and 6 which extend axially through the valve seat and which are located at equal distances from the center of the valve seat. The lower casing section 10′ is provided with a corresponding series of ports 1′, 2′, 3′, 4′, 5′ and 6′ arranged in line and communicating with the ports of the valve seat and connected by passages 60 with the several nipples 26′, which passages extend transversely from the nipples through the body of the casing section 10′ to the ports. The ports are arranged on a segment (somewhat less than a half circle in the form shown) while the nipples are disposed about the periphery of the lower casing section 10′ so that the passages 60 are inclined in different directions through the body of the valve casing to the row of ports.

The valve 17′ is provided on its under face with a segmental exhaust channel 61 of sufficient length to extend over all of the service ports. A short radial channel 62 leads centrally and inwardly from the channel 61 and opens into a central depression on the under face of the valve and thus communicates with the central opening 21′ into the valve seat and with the exhaust passage 31, so that all of the service pipes may be simultaneously connected to the exhaust. The valve is also provided on its under side with a segmental inlet channel 63 from which extends an inlet port 64 opening through the upper face of the valve. The inlet channel 63 is also of sufficient length to cover all of the service ports so that all of the service pipes may be connected to the supply. The segmental inlet and exhaust channels, each of which is slightly less than a semi-circle, are arranged opposite each other on the under face of the valve.

In Fig. 8, the service ports 1 to 6 inclusive, are indicated in dotted lines and, in this position of the valve, all of the service ports and pipes communicating therewith will be connected to the exhaust through the exhaust channels 61 and 62. By rotating the valve one step in the direction indicated by the arrow, service port 1 will be cut off from the exhaust and connected to the supply through inlet channel 63 and port 64. By a continued shift of the valve in the direction of the arrow, the remaining service ports will be successively cut off from the exhaust and connected to the supply, until the valve has been shifted far enough to connect all of the service ports to the supply. Then by a reverse movement of the valve or by continuing its movement in the same direction, the service ports and pipes connected thereto may be successively connected to the exhaust and cut off from the supply. In the application No. 282,153 above referred to, I have disclosed a valve of this sort for successively throwing the series of cylinders of the motor into and out of operation. It will also be noted that by shifting the valve from the

position shown in Fig. 8 in the direction opposite to that indicated by the arrow the ports may be successively cut off from the exhaust and connected to the supply in the reverse order.

It is obvious that the details set forth may be varied without departure from the essentials of the invention, and that the valves may be employed for a variety of purposes.

Having described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. A valve comprising a casing having a valve seat with an exhaust passage and a series of service ports opening through said seat, and a rotary disk-valve on said seat having a segmental exhaust channel on its face and an inlet port extending therethrough, said seat having a supply passage opening into the casing above the valve, substantially as described.

2. A valve comprising a casing with a valve seat having an exhaust passage and a series of service ports, a rotary disk-valve on said seat having a segmental exhaust channel on its face and an inlet port extending therethrough, said seat having a supply passage opening into said casing above said valve seat, a valve stem extending through said casing and having a collar on its inner end engaging a seat on the inner face of said casing, said stem being connected to said valve but free to move longitudinally independently thereof and a spring in a central opening of said valve for holding said valve stem in position, substantially as described.

3. A valve comprising a casing with a valve seat therein having ports, a rotary disk-valve on said seat for controlling the flow through said ports, a valve stem extending through said casing and connected to said valve but movable longitudinally independently thereof, said stem having a collar on its inner end engaging a seat on the inner face of said casing, a handle on said stem and a spring-held dog on said handle arranged parallel to said stem and arranged to engage a series of notches on said valve casing, substantially as described.

4. A valve comprising a casing with a valve seat therein having ports, a rotary disk-valve on said seat for controlling the flow through said ports, a valve stem extending through said casing, connected to said valve but movable longitudinally independently thereof, said stem having a collar on its inner end engaging a seat on the inner face of said casing, a handle on said stem and a spring-held dog on said handle arranged parallel to said stem and arranged to engage a series of notches on said valve casing, said dog having means for holding it against twisting in said handle, substantially as described.

5. A valve comprising a casing having a supply port opening into its upper portion and a valve seat therein having ports, a rotary disk-valve on said seat for controlling the flow through said ports and a valve stem extending through the upper portion of said casing and engaging a central opening in said valve, a transverse connecting key engaging slots in said stem and said valve, said stem having a collar or shoulder engaging a seat on the inner face of said casing, substantially as described.

6. A valve comprising a casing having a supply port opening into its upper portion, a valve seat therein, an exhaust passage, nipples on its lower portion to which pipes may be coupled, and a number of service ports extending from said nipples through the body of the valve casing and opening through said seat, and a rotary disk-valve on said seat having a segmental exhaust channel on its under face and an inlet port or ports extending therethrough, substantially as described.

7. A valve comprising upper and lower casing sections bolted together and having a supply port opening into its upper portion, said lower casing section having a valve seat therein, an exhaust passage, a series of depending coupling nipples, and a series of service ports extending from said nipples and opening through said valve seat, a rotary disk-valve on said seat having a segmental exhaust channel and an inlet port or ports extending therethrough, and a stem extending through a sleeve in said upper casing section and engaging said disk-valve, substantially as described.

8. A valve comprising upper and lower casing sections and an intermediate valve seat bolted together, said lower section and said seat having communicating service ports and an exhaust passage and a rotary disk-valve for controlling said ports having an exhaust channel on its lower face and an inlet port or ports extending therethrough, substantially as described.

9. A valve comprising upper and lower casing sections bolted together, said lower section having a valve seat thereon, a supply port and an exhaust passage, opening through said valve seat and a series of service ports opening eccentrically on said valve seat, and a rotary disk-valve on said seat for controlling said ports having an exhaust channel on its under face, and an eccentric inlet port or ports extending therethrough, substantially as described.

10. A valve comprising upper and lower casing sections bolted together, said lower section having a valve seat thereon, a supply port and an exhaust passage opening through said valve seat and a series of service ports opening eccentrically on said valve seat, said lower casing section having a series of coupling nipples communicating with said supply and service ports, a rotary disk-valve on said

seat having a segmental exhaust channel on its under face and an eccentric inlet port or ports extending therethrough, a valve stem extending through a sleeve in said upper casing section and engaging said valve, substantially as described.

11. A valve comprising upper and lower casing sections and an intermediate valve seat bolted together, said lower casing section having coupling nipples and service ports or passages extending from said nipples and opening on the upper face thereof, said valve seat having exhaust and service ports extending therethrough and communicating with the passages of the lower casing section and a rotary disk-valve on said seat having an exhaust channel on its under face and an inlet port or ports extending therethrough, substantially as described.

12. A valve comprising upper and lower casing sections and an intermediate valve seat bolted together, said lower casing section having coupling nipples and supply and service ports or passages extending from said nipples and opening through the upper face thereof at equal distances from the center, said valve seat resting on such upper face, and having service ports extending therethrough and exhaust and supply passages communicating with the like ports and passages in said lower casing section, a rotary disk-valve on said seat having a segmental exhaust channel on its under face and an inlet port or ports extending therethrough, and a valve stem extending through a sleeve on said upper casing section and engaging said valve, substantially as described.

13. A valve comprising upper and lower casing sections and an intermediate valve seat bolted together, said lower casing section having coupling nipples and supply and service ports or passages extending from said nipples and opening through the upper face thereof at equal distances from the center, said valve seat resting on such upper face, and having service ports extending therethrough and exhaust and supply passages communicating with the like ports and passages in said lower casing section, a rotary disk-valve on said seat having a segmental exhaust channel on its under face, an inlet port or ports extending therethrough, and a valve stem extending through a sleeve on said upper casing section connected to said valve but free to move longitudinally independently thereof, said stem having a collar or shoulder on its inner end engaging a seat on the inner face of said upper valve section, substantially as described.

14. A valve comprising a casing having a supply and a valve seat with an exhaust port and a series of service ports opening through said valve seat, and a rotary disk-valve on said seat arranged, when shifted in opposite direction, to successively connect and disconnect said service ports with said supply and with said exhaust port, substantially as described.

15. A valve comprising a casing having a supply and a flat valve seat with an exhaust passage and a number of service ports opening therethrough, said ports being arranged in segmental series on the face of said valve seat and a rotary disk-valve on said seat having a segmental exhaust and inlet channels on its face and an inlet port extending through the valve from said inlet channel, substantially as described.

16. A valve comprising a casing having a supply passage, a flat valve seat, an exhaust passage and a segmental row of service ports in said valve seat, a series of coupling nipples and passages extending through the body of the valve casing to said ports, and a rotary disk-valve on said seat having segmental exhaust and inlet channels on its face arranged to successively connect and disconnect said service ports with said supply and with said exhaust, substantially as described.

17. A valve comprising upper and lower casing sections bolted together, said lower casing section having a flat valve seat thereon, having an exhaust passage, a series of depending coupling nipples, a number of service ports or passages leading from said nipples and opening in segmental series through said valve seat, a rotary disk-valve on said seat having segmental inlet and exhaust channels on its under face and an inlet port extending therethrough and opening into said inlet channel, and a valve stem extending through a sleeve in said upper section and engaging said valve, said casing having a supply port opening thereinto above said valve seat, substantially as described.

18. A valve comprising upper and lower casing sections bolted together, said lower casing section having a flat valve seat thereon, having a central exhaust passage, a series of depending coupling nipples, a number of service ports or passages leading from said nipples and opening in segmental series through said valve seat, a rotary disk-valve on said seat having segmental inlet and exhaust channels on its under face and an inlet port extending therethrough and opening into said inlet channel, and a valve stem extending through a sleeve in said upper section and engaging said valve, said lower casing section having a supply passage leading to a passage in said valve seat that opens into the casing above the valve, substantially as described.

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