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APPARATUS FOR GENERATING AND APPLYING HYDRAULIC PRESSURE.

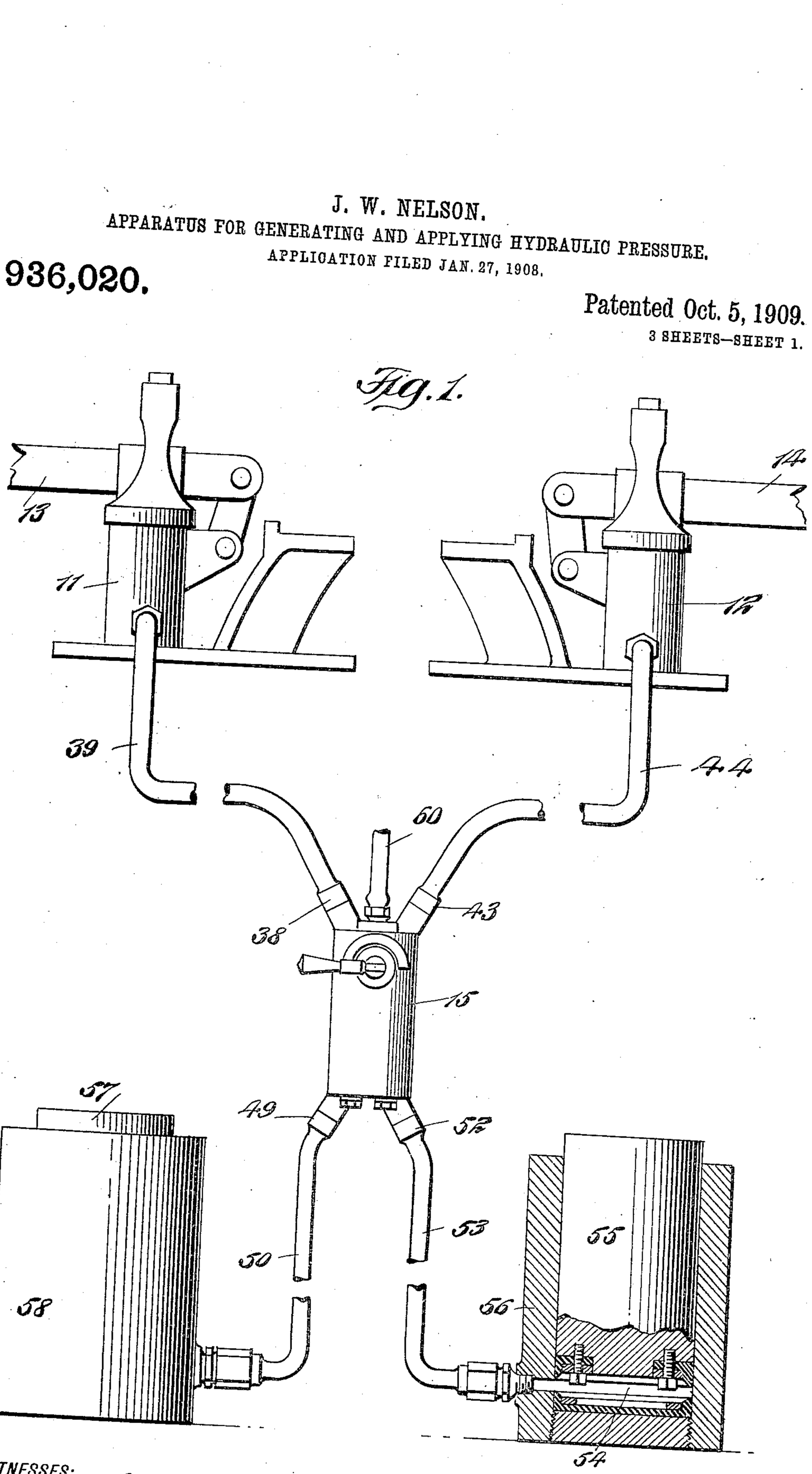
APPLICATION FILED JAN. 27, 1908.

936,020.

Patented Oct. 5, 1909.

3 SHEETS—SHEET 1.

Fig. 1.



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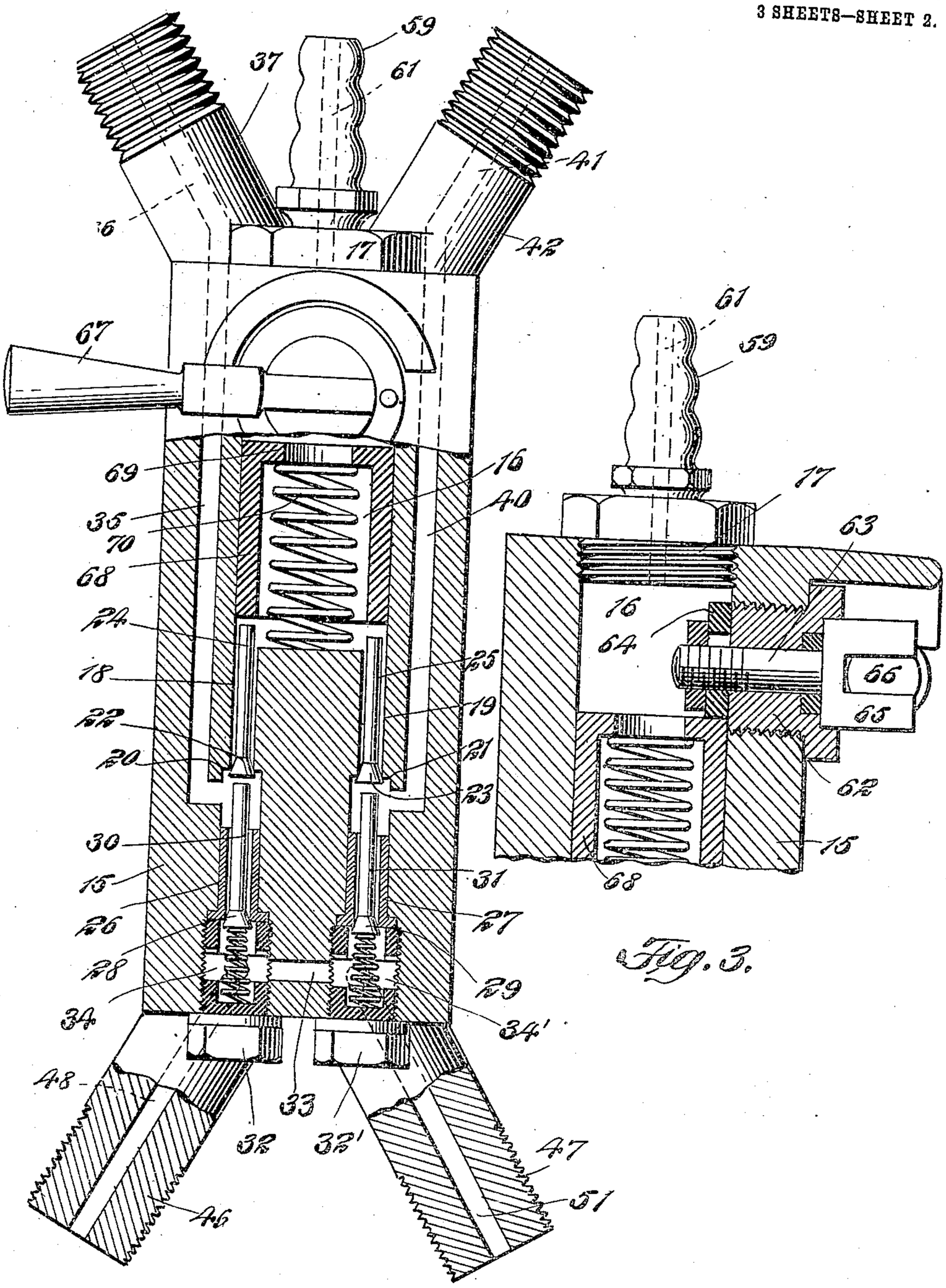

Fig. 3.

Fig. 2.

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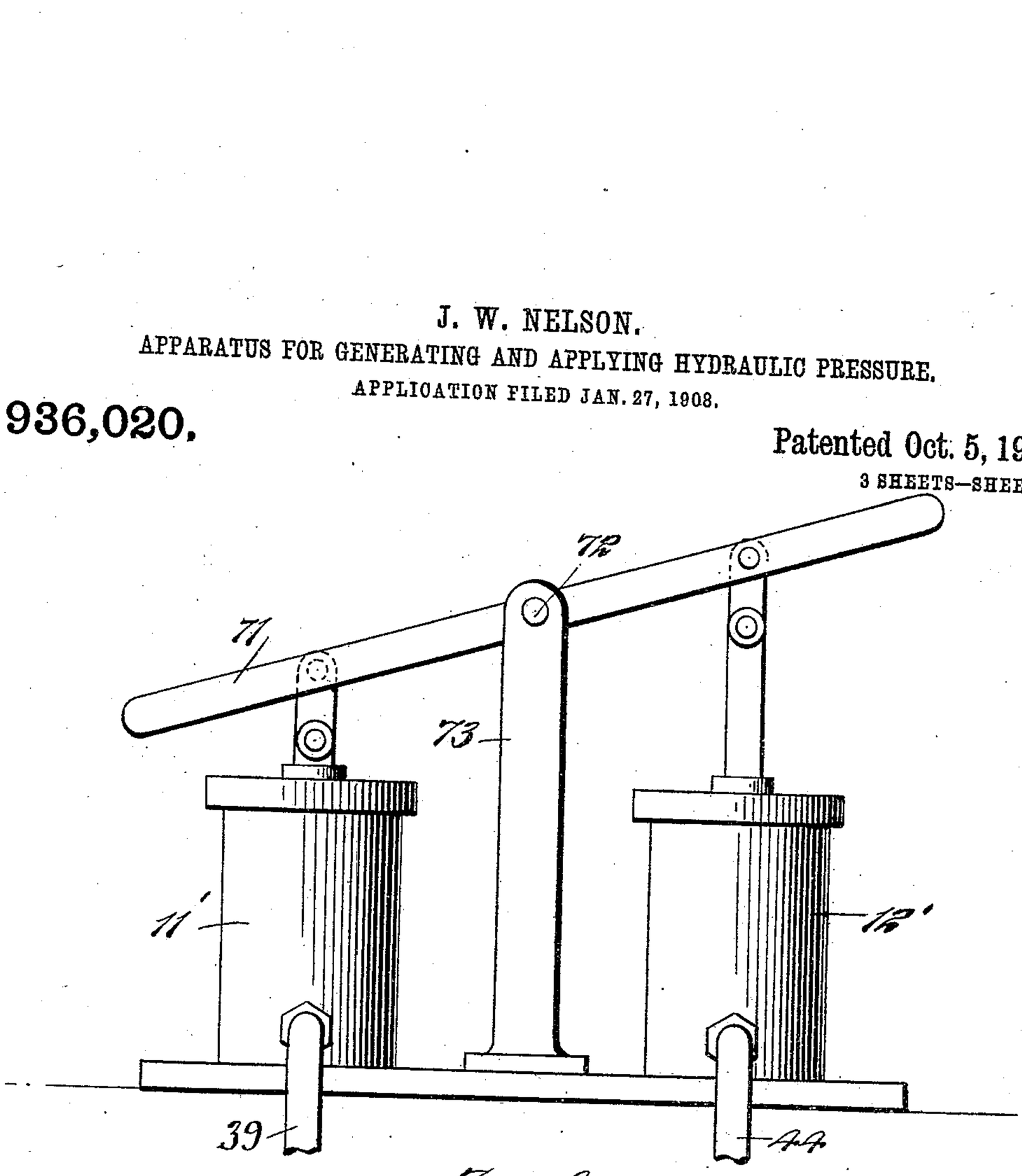

Fig. 4.

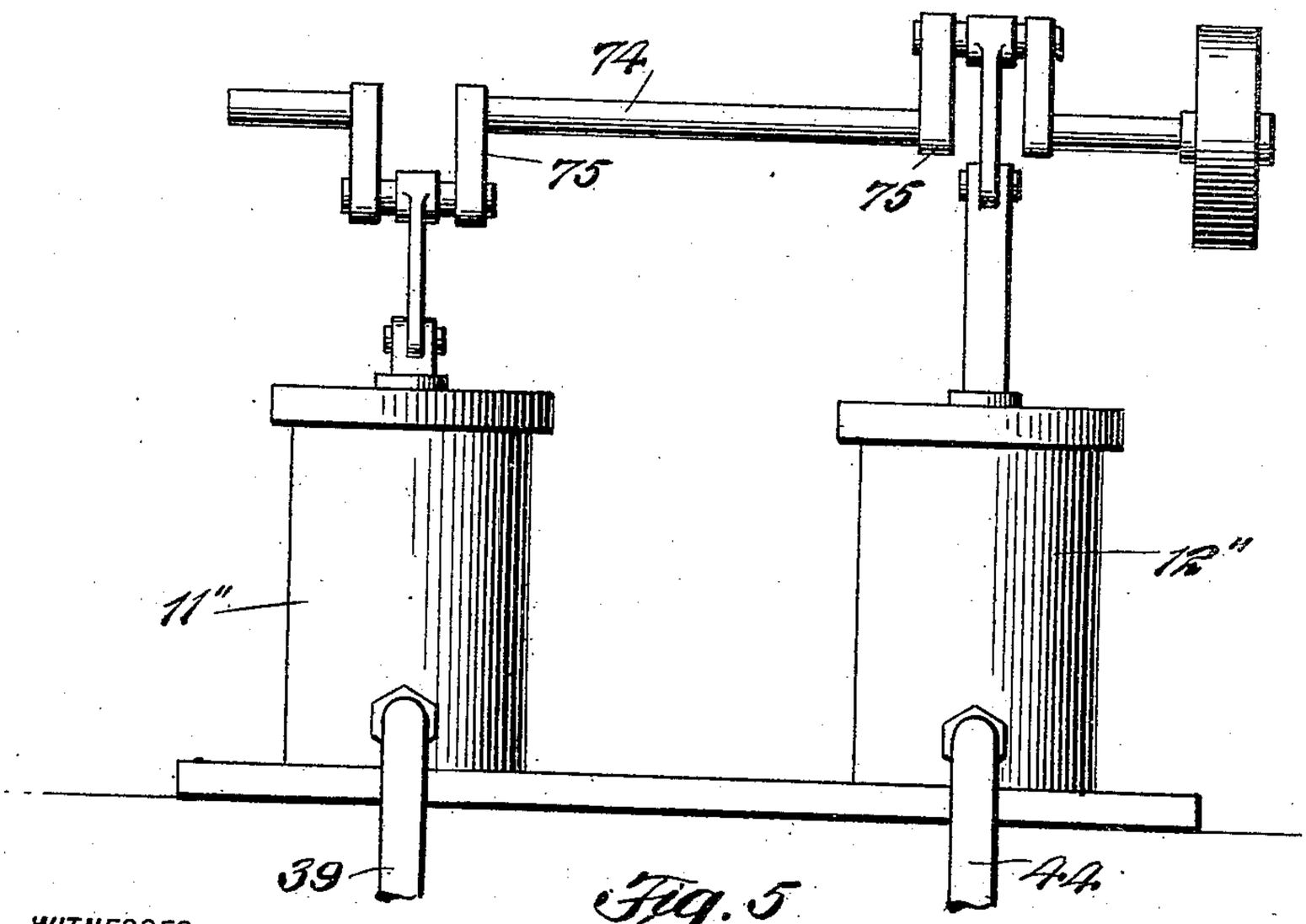

Fig. 5

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JAMES W. NELSON, OF NEW YORK, N. Y.

APPARATUS FOR GENERATING AND APPLYING HYDRAULIC PRESSURE.

936,020. Specification of Letters Patent. Patented Oct. 5, 1909.

Application filed January 27, 1908. Serial No. 412,855.

To all whom it may concern:

Be it known that I, JAMES W. NELSON, a citizen of the United States, and a resident of the city of New York, borough of Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Apparatus for Generating and Applying Hydraulic Pressure, of which the following is a specification.

This invention relates to apparatus for the generation and application of hydraulic pressure, with particular reference to devices of this character in which the means for applying the pressure to do the desired work may be located at some distance from the pressure-generating means.

On account of the fact that the distance or other local conditions frequently renders signaling difficult, it is desirable that the operator stationed where the pressure is being applied, who is in position to note the progress and effect of the work, be enabled to control the effective operation of the pressure-generating means, whereby, if such means comprise a pump or pumps, the pumping operations may be continued and yet the operator at the ram or rams be able to render such operations effective or ineffective, so far as the application of increased pressure is concerned, and, in some cases, to control the degree of effectiveness, as well as to be able to relieve the existing pressure in the pressure chamber or chambers for removal or readjustment of the pressure applying devices.

Where a single pressure-applying device is employed, the pressure-controlling means may be secured to or form a part of said device, as shown and described by me in an earlier application, filed October 29, 1907, Serial Number 399,740. It is at times desirable, however, to employ two or more pressure-applying devices separated and located at some distance from each other, and under such conditions the pressure-controlling device may comprise an individual fitting or member which is separate from and movable with respect to both the generating and applying devices but located in close proximity to all of the latter where the effect of the operations of each of the applying devices may be noted. In another copending application, filed January 20, 1908, Serial Number 411,612, I have shown and described such independently mounted means for the control of the pressures generated by a double-piston hydraulic pump. While the controlling device therein shown and described will suffice for a double pump having common operating means, it is sometimes desirable to employ two or more separate and individual pumps. For instance, instead of operating two or more pump pistons synchronously, as is the case when ordinary multiple-piston pumps are employed, it may be desired to alternate the effective strokes of two or more pistons, which must therefore be operated independently. Under such conditions a very different form of controlling mechanism is necessary, and the object of the present invention is the provision of a fitting or member adapted for relatively movable interposition between a plurality of separate and individual pumps and the pressure-applying device or devices, said fitting being located in close proximity to the latter and being provided with means for controlling the effective operations of the former.

My invention will be more readily understood by reference to the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a diagrammatic view of a complete apparatus embodying my invention; Fig. 2 is an enlarged central section of the individually movable pressure-controlling member; Fig. 3 is a transverse central section of the upper portion of Fig. 2; Fig. 4 illustrates the manner of operating two pumps with a common pump-lever to alternate the effective piston strokes, and Fig. 5 illustrates means for similarly operating power-driven pumps.

Referring now to the drawings in detail, numerals 11 and 12 refer to hydraulic pumps which, for the purposes of this description, may be considered as being of the single-piston type. As shown in Fig. 1, these pumps may be independently operated, the pump 11 by means of the pump-lever 13 which is suitably fulcrumed to effect the reciprocation of the piston, and the pump 12 in a similar manner by the pump-lever 14.

These pumps may be of the same or different capacities.

The pump and pressure valves are located in the member 15, which is of suitable metal and preferably of cylindrical form. This member 15 is provided with the longitudinal bore 16, the end of which is sealed by the screw-cap 17. From the inner end of the bore 16 to the other end of the device, extend the two smaller bores 18 and 19, each of which is increased in diameter, at 20 and 21, to provide seats for the valves 22 and 23, respectively. These valves are provided with stems 24 and 25, respectively, which project into the larger bore 16. In the wider portions of the bores 18 and 19, are the removable cylindrical plugs 26 and 27, which serve to again reduce the effective diameters of said bores and provide seats for the valves 28 and 29, respectively, which have stems 30 and 31 extending nearly but under normal conditions not quite to the valves 22 and 23. The ends of the bores 18 and 19 are sealed by means of the screw-plugs 32 and 32′, which provide small chambers 34 and 34′ between the valves 28 and 29 and the ends of the bores, these chambers being connected by duct 33.

The member 15 is provided with a duct 35 which leads from the bore 18 between the valves 22 and 28 to the longitudinal duct 36 in the arm 37, this arm being screw-threaded at its extremity, for the reception of the connection or coupling 38 at the end of the pipe 39 which leads through a suitable lateral duct in the pump-block 11 to the chamber below the piston in said pump. A similar duct 40 in said member 15 leads from the bore 19 between the valves 23 and 29 to the longitudinal duct 41 in the arm 42, the end of which is similarly threaded for the reception of the connection or coupling 43 at the end of the pipe 44 which leads in a similar manner to the pump-chamber in the pump-block 12. At the other end of the member 15 are provided similar arms 46 and 47, the arm 46 being provided with duct 48 open from the chamber 34 below the valve 28 through the coupling 49 to the pipe 50. The arm 47 is provided with a similar duct 51 leading from the chamber 34′ through the coupling 52 to the pipe 53 which communicates with the pressure-chamber 54 underneath the ram 55 in the cylinder 56. The pipe 50 similarly communicates with the pressure-chamber underneath the ram 57 in the cylinder 58, these ram-cylinders and rams being identical in all material respects.

I have shown the screw-plug 17, sealing the bore 16, provided with a nipple 59 for the reception of a rubber or other flexible tube or hose which leads from any convenient source of liquid supply, said plug and nipple having a duct 61 providing communication between the tube 60 and the chamber 16. The member 15 is provided with a lateral bore screw-threaded for the reception of the threaded plug 62, which has a central bore providing bearings for the shaft 63. At the inner end of this shaft 63 is mounted the cam 64, and the outer end thereof is provided with a head 65 slotted for the reception of the bearing portion 66 of the lever 67 which is pivoted in said slot, whereby the shaft 63 may be rotated by turning said lever.

Within the bore 16 is located the cylinder—or what I term the push-tube—68 which has an inturned flange 69 at its upper end against which acts the spring 70 in compression between the end of the bore 19 and said flange. The push-tube 68 is of such length that the lower end thereof is in proximity to but under normal conditions not in contact with either of the valve-stems 24 and 25, away from which stems it is held by the spring 70. The other end of the push-tube 68 is in coöperative positional relation to the cam 64 on the shaft 63. It will be apparent that this push-tube 68 may be moved against the action of the spring 70 by rotation of the cam 64. The valve-stem 24 is slightly longer than the valve-stem 25, whereby when said push tube is operated by said cam against the action of the spring 70, the end of said tube will first impinge against the end of the stem 24 and operate to unseat the valve 22 without, however, interfering with automatic action of any of the remaining valves. Further movement of said tube 68 will effect contact between the end of said push-tube 68 and the end of the stem 25 of the valve 23, and unseat the latter, without, however, interfering with automatic action of either of the valves 28 and 29. Still further movement of the tube 68, will effect contact between the valve 22 and the end of the stem 30 to unseat the valve 28, without, however, unseating the valve 29, which is the last of said valves to be unseated by action of the push-tube 68, this being accomplished in a similar manner by the valve 23 impinging against the end of the stem 31 of said valve 29. It will now be apparent that upon the upstroke of the operating lever 13 of the pump 11, a partial vacuum will be created in the chamber underneath the piston in said pump, and the inequality of pressures thus created will force the liquid from the source of supply through the pipe 60 and the duct 61 into the chamber 16, and from thence past the valve 22, which it unseats, into the duct 35, through the duct 36 and the pipe 39 into the pump-chamber in the pump 11. Upon the down-stroke of the lever 15, the back flow of the liquid through the duct 35, and

the resulting excess of pressure, will seat the valve 22 and unseat the valve 28, the liquid passing through the lower portion of the duct 18 and into the chamber 34 which, as has been explained, communicates with the pressure-chamber underneath the ram 57 and—if two rams are employed—with the chamber 34′ and thence to the ram chamber 54.

Upon the upstroke of the operating lever 14 of the pump 12, a partial vacuum will be created in the chamber underneath the piston in said pump which will, in a similar manner, result in the flow of liquid from the source of supply through the chamber 16, into the upper portion of the duct 19, past the valve 23, and through the duct 40 and the pipe 44 to said pump-chamber. Upon the downstroke of the lever 14, the back flow of the liquid through the duct 40 will seat the valve 23 and unseat the valve 29, and the liquid will be forced into the chamber 34′ which, as explained, communicates with the pressure-chamber 54 underneath the ram 55 and with the chamber 34. It will be noted that by means of this valvular arrangement, either of the two pumps may be operated alone or the two may be operated simultaneously. The connecting duct 33 between the chambers 34 and 34′ insures at all times equal pressures in said chambers and, therefore, equal pressures in the chambers underneath the rams 57 and 55. If, therefore, the pump 11 alone is operated, the valve 29 remains seated and the liquid is forced by said pump past the valve 28 into the chamber 34, from which the open passages to both ram chambers equally distributes the application of the pressure. Similarly, the pump 12 alone may be operated, or, if desired, the two pumps may be simultaneously operated, as stated.

While I have now described the application of my invention to separate pumps having independent means for manual operation, the present invention is particularly adapted for employment in connection with power-driven pumps, both pumps being suitably connected to a common driving member and preferably in a manner to alternate the effective strokes of the respective pistons. In this manner, instead of an intermittent generation of pressure, such generation may be made substantially continuous. The same result may be produced, of course, by manual operation, the two operators at the pump, alternating the respective downward strokes of the pump-levers. In either case the operator at the ram or rams should be enabled to control the generation of pressure from one or both of the pumps and its application to the work.

In Fig. 4 I have illustrated the manner in which the two pumps 11′ and 12′ may be operated by means of a common lever 71 fulcrumed at 72 in a suitable standard 73 mounted between the two pumps. These pumps may be operated by two workmen, one at each end of the lever 71, and it will be apparent that effective strokes of the pistons in the respective pumps 11′ and 12′ will alternate to provide a substantially continuous generation of pressure.

In Fig. 5 I have shown means by which the pumps 11″ and 12″ may be coupled to a driven shaft 74 which is provided with the double crank 75 to which the respective piston rods are suitably linked. It will be apparent that in this case the effective strokes of the pistons will similarly alternate with each other and the generation of pressure be substantially continuous. Assuming that both pumps are being operated, by hand or by power, the strokes of the pistons being synchronously or alternately effective, should it become desirable to reduce the degree of the generated pressure, the operations of one of said pumps may be made ineffective by turning the lever 67 through an arc sufficient to cause the cam 64 to move the push-tube 68 a distance sufficient to unseat the valve 22, in the manner explained, without, however, affecting automatic operations of the remaining valves. The valve 22 being held off its seat, the flow of liquid due to reciprocations of the piston of the pump 11 will follow the path of least resistance and flow idly back and forth between the pump-chamber and the source of supply. In this manner, operation of the pump 12 alone remains effective. Should it become desirable to temporarily check the application of increased pressure, without stopping operation of either pump, the lever 67 may be turned through a slightly greater arc, sufficient, through rotation of the cam 64, to cause the push-tube 68 to impinge against the stem 25 and unseat the valve 23 as well as the valve 22, the valves 28 and 29 remaining seated. Operations of both pumps will now merely cause the liquid to flow idly back and forth past the open valves 22 and 23 to and from the source of supply. The operations of both pumps may again be rendered effective by returning the handle 67 to the position indicated in Fig. 2, or that of one of said pumps only in the manner described. When it is desired to relieve the pressure in the ram chamber or chambers, for the purpose of lowering the ram or rams for removal or readjustment of these devices, the lever 67 may be turned through a still greater arc, causing the valve 22 to impinge against the stem 30 of the valve 28 and unseat the latter. I prefer that the valve 28 be in this manner unseated prior to unseating the valve 29, because both of these valves are high-pressure valves and when under great pressure are

unseated with difficulty. It is obvious that one of said valves, under such conditions, may be more readily unseated than both thereof simultaneously, and, therefore, in the manner described, I first unseat one of said valves and after having partially relieved the high pressure in the ram chamber or chambers, I continue the movement of the push-tube 68 to subsequently unseat the pressure-valve 29 and thus provide an additional passage for the flow of liquid back to the source of supply and shorten the duration of the lowering operation.

My invention will be found particularly valuable when applied to power-driven pumps, inasmuch as it eliminates the necessity for the employment of clutches or with means for quickly shutting off the power or otherwise stopping pumping operations.

Many modifications of minor details of my improved apparatus for generating and applying hydraulic pressure will doubtless readily suggest themselves to those skilled in the art to which it appertains, and I therefore do not desire to limit my invention to the specific construction and arrangement herein shown and described.

I claim as new and desire to secure by Letters-Patent:

1. In combination, a plurality of pumps, a device separate therefrom for applying the generated pressure, a flexible conduit from each of said pumps and to said applying device, said conduits uniting in a member which is provided with means for controlling the effect of operations of said pumps and for equalizing and finally relieving the applied pressures.

2. In combination, a plurality of pumps, a plurality of devices for applying the generated pressure, a flexible conduit from each of said pumps and to each of said applying devices, said conduits uniting in a member which is provided with means for controlling the effect of operations of said pumps and for equalizing and finally relieving the applied pressures.

3. In combination, a plurality of pumps, a device separate therefrom for applying the generated pressure, a flexible conduit from each of said pumps and to said applying device, said conduits uniting in a member which is provided with means for rendering effectively inoperative one or more of said pumps.

4. In combination, a plurality of pumps and a plurality of devices for applying the generated pressures, a flexible conduit from each of said pumps and to each of said applying devices, said conduits uniting in a member which is provided with means for rendering effectively inoperative one or more of said pumps.

5. In combination, a plurality of pumps, a plurality of separate devices for applying the generated pressures, a flexible conduit from each of said pumps and to each of said applying devices, said conduits uniting in a member which is provided with means for rendering effectively inoperative one or more of said pumps and with means for equalizing the applied pressures.

6. In combination, a plurality of pumps, a device for applying the generated pressure, flexible connecting conduits between said pumps and said applying devices, and a member which includes a portion of each of said conduits and means for rendering effectively inoperative one or more of said pumps.

7. In combination, a plurality of pumps, a plurality of separate devices for applying the generated pressure, flexible connecting conduits between said pumps and said applying devices, and a member which includes a portion of each of said conduits and which is provided with means for rendering effectively inoperative one or more of said pumps.

8. In combination, a plurality of pumps, a plurality of separate devices for applying the generated pressure, flexible connecting conduits between said pumps and said applying devices, and a member which includes a portion of each of said conduits and which is provided with means for rendering effectively inoperative one or more of said pumps and means for equalizing the applied pressures.

9. In combination, a plurality of pumps, a plurality of separate devices for applying the generated pressure, flexible connecting conduits between said pumps and said applying devices, and a member which includes a portion of each of said conduits and which is provided with means for rendering effectively inoperative one or more of said pumps, means for equalizing the applied pressures and means for supplying liquid to said conduits.

10. In combination, a plurality of pumps, conduits from said pumps which unite in a common pressure-distributing chamber, suitable valves in each of said conduits, and means common to all of said valves for the manual control thereof.

11. In combination, a plurality of pumps, suitable conduits from said pumps which unite in a common pressure-distributing chamber, requisite valves in each of said conduits, means common to all of said valves for the manual control thereof, and means for applying the resultant pressure in said distributing chamber.

12. In combination, a plurality of pumps, suitable conduits from said pumps which unite in a common pressure-distributing chamber, requisite valves in each of said

conduits, and means common to all of said valves for positively unseating one or more or all thereof.

13. In combination, a plurality of pumps, suitable conduits from said pumps which unite in a common pressure-distributing chamber, requisite valves in each of said conduits, means common to all of said valves for positively unseating one or more or all thereof, and means for applying the resultant pressure in said distributing chamber.

14. In combination, a plurality of pumps, suitable conduits from said pumps which unite in a common pressure-distributing chamber, requisite valves in each of said conduits, and means common to all of said valves for unseating the same in consecutive order.

15. In combination, a plurality of pumps, suitable conduits from said pumps which unite in a common pressure distributing chamber, valves in each of said conduits, one of which checks back-flow to the source of supply and another back-flow from said distributing chamber, and means having common actuating means for successively unseating the valves in each conduit.

16. In combination, a plurality of pumps, a source of liquid supply common to all of said pumps, suitable conduits from said pumps which unite in a common pressure-distributing chamber, pump valves in each of said conduits, one controlling back-flow to said source of supply and another controlling back-flow from said distributing chamber, and means having common actuating means for unseating one or both of the valves in each conduit.

17. In combination, a plurality of pumps, a source of liquid supply common to all of said pumps, suitable conduits from said pumps which unite in a common pressure-distributing chamber, pump valves in each of said conduits, one controlling back-flow to said source of supply and another controlling back-flow from said distributing chamber, and means having common actuating means for unseating one or both of said valves in each conduit and corresponding valves in all conduits consecutively.

18. In combination, a plurality of means for generating hydraulic pressure, means for applying the generated pressure, suitable conduits therebetween, requisite valves in each conduit, and common means for first consecutively unseating the initial valves in said conduits and subsequently similarly consecutively unseating the remaining valves in said conduits.

19. In combination, a plurality of means for generating hydraulic pressure, means for applying the generated pressure, suitable conduits therebetween, a source of liquid supply common to all of said conduits, a valve in each conduit checking back flow to said source of supply, and means common to all of said valves for unseating said valves consecutively.

20. In combination, a plurality of means for generating hydraulic pressure, means for applying the generated pressure, suitable conduits therebetween, requisite valves in each conduit, and common means for consecutively unseating the initial valves in said conduits, said means being further operable to similarly consecutively unseat the remaining valves in said conduits.

21. In combination, a plurality of means for generating hydraulic pressure, means for applying the generated pressure, suitable conduits therebetween, and an individually-movable member intermediate the ends of said conduits through which said conduits are directed, said member containing an independent series of valves for each pump and common means for their manual control.

22. In combination, a plurality of means for generating hydraulic pressure, means for applying the generated pressure, suitable conduits therebetween, and an individually-movable member intermediate the ends of said conduits through which said conduits are directed, said conduits in said member each containing an independent series of valves for each pump and common means for first consecutively unseating the initial valves in the several series, and subsequently similarly consecutively unseating the remaining valves in said several series.

23. In combination, a plurality of means for generating hydraulic pressure, means for applying the generated pressure, suitable conduits therebetween, an individually-movable member intermediate the ends of said conduits through which said conduits are directed, each of said conduits in said member being provided with requisite pump valves, and means for consecutively unseating the initial valves in said conduits, said means being further operable to similarly consecutively unseat the remaining valves in said conduits.

24. In combination, a plurality of means for generating hydraulic pressure, separate means for applying the generated pressure at a plurality of selective points, suitable conduits between said generating and said applying means, requisite pump and pressure valves in each conduit, and means common to all of said conduits for first consecutively unseating the initial valves in said conduits and subsequently similarly consecutively unseating the remaining valves in said conduits.

25. In combination, a plurality of means for generating hydraulic pressure, separate means for applying the generated pressure

at a plurality of selective points, suitable conduits from said generating to said applying means, requisite pump and pressure valves in said conduits, means common to all of said conduits for first consecutively unseating the initial valves in said conduits and subsequently similarly consecutively unseating the remaining valves in said conduits, and means for equalizing the applied pressures.

26. In combination, a plurality of means for generating hydraulic pressure, separate means for applying the generated pressure at a plurality of selective points, suitable conduits between said generating and said applying means, a source of liquid supply common to all of said conduits, a valve in each conduit checking back-flow to said source of supply, means common to all of said valves for unseating said valves successively, and means for equalizing the applied pressures.

27. In combination, a plurality of means for generating hydraulic pressure, separate means for applying the generated pressure at a plurality of selective points, suitable conduits leading from said generating to said applying means, requisite valves in each conduit, and means having common actuating means for consecutively unseating the initial valves in said conduits, said means being further operable to similarly consecutively unseat the remaining valves in said conduits, and means for equalizing the applied pressure.

28. In combination, a plurality of means for generating hydraulic pressure, separate means for applying the generated pressure at a plurality of selective points, suitable conduits leading from said generating to said applying means, and an individually movable member intermediate the ends of said conduits through which said conduits are directed, said member containing an independent series of valves for each pump and common means for their manual control.

29. In combination, a plurality of means for generating hydraulic pressure, separate means for applying the generated pressure at a plurality of selective points, suitable conduits leading from said generating to said applying means, an individually-movable member intermediate the ends of said conduits through which said conduits are directed, said member containing an independent series of valves for each pump and common means for their manual control, and means for equalizing the applied pressures.

30. In combination, a plurality of means for generating hydraulic pressure, separate means for applying the generated pressure at a plurality of selective points, suitable conduits leading from said generating to said applying means, and an individually-movable member intermediate the ends of said conduits through which said conduits are directed, said conduits in said member each containing an independent series of valves for its respective pump, and said member being provided with means common to all of said conduits for first consecutively unseating the initial valves in the several series and subsequently similarly consecutively unseating the remaining valves in said several series.

31. In combination, a plurality of means for generating hydraulic pressure, separate means for applying the generated pressure at a plurality of selective points, suitable conduits leading from said generating to said applying means, and an individually-movable member intermediate the ends of said conduits through which said conduits are directed, the conduits in said member each containing an independent series of valves for its respective pump, said member being provided with means common to all of said conduits for first consecutively unseating the initial valves in the several series and subsequently similarly consecutively unseating the remaining valves in said series, and means for equalizing the applied pressures.

32. In combination, a plurality of means for generating hydraulic pressure, separate means for applying the generated pressure at a plurality of selective points, suitable conduits leading from said generating to said applying means, an individually-movable member intermediate the ends of said conduits through which said conduits are directed, each of said conduits in said member being provided with requisite pump-valves, and means for consecutively unseating the initial valves in said conduits, said means being further operable to similarly consecutively unseat the remaining valves in said conduits.

33. In combination, a plurality of means for generating hydraulic pressure, separate means for applying the generated pressure at a plurality of selective points, suitable conduits leading from said generating to said applying means, an individually-movable member intermediate the ends of said conduits through which said conduits are directed, each of said conduits in said member being provided with requisite pump-valves, means for consecutively unseating the initial valves in said conduits, said means being further operable to similarly consecutively unseat the remaining valves in said conduits, and means for equalizing the applied pressures.

34. In combination, a plurality of individually-operating pumps, a plurality of individually-operating rams, a conduit from

each of said pumps to a common pressure-distributing chamber and a conduit from said chamber to each of said rams, two valves in each of said pump-conduits, the first checking back-flow to the source of supply and the second checking back-flow from the ram chambers, and means for successively unseating the valves which check back-flow to the source of supply, said means being further operable to similarly successively unseat the valves which check back-flow from said distributing chamber.

In testimony of the foregoing, I have hereunto set my hand in the presence of two subscribing witnesses.

JAMES W. NELSON.

Witnesses:
H. CROCKER,
JAS. MOORE.