

Jan. 6, 1931.

C. J. SPIES

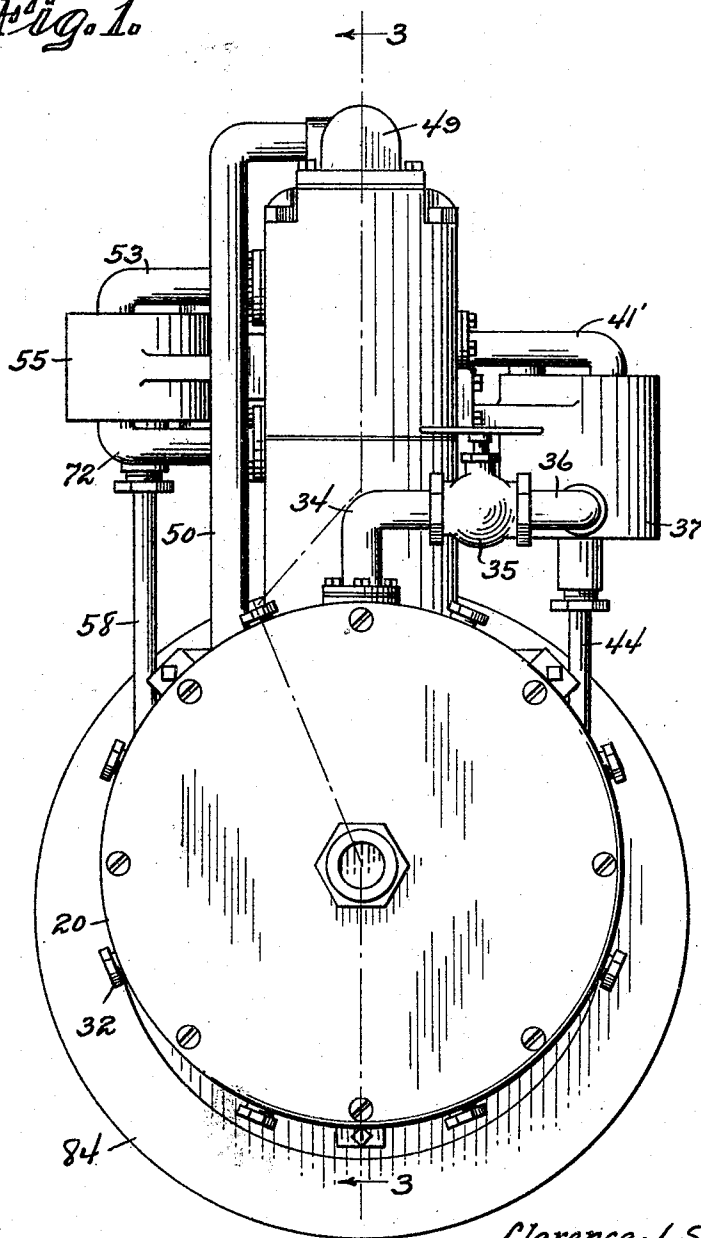
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HYDRAULIC ENGINE

Filed May 28, 1928

6 Sheets-Sheet 1

Fig. 1.



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6 Sheets-Sheet 2

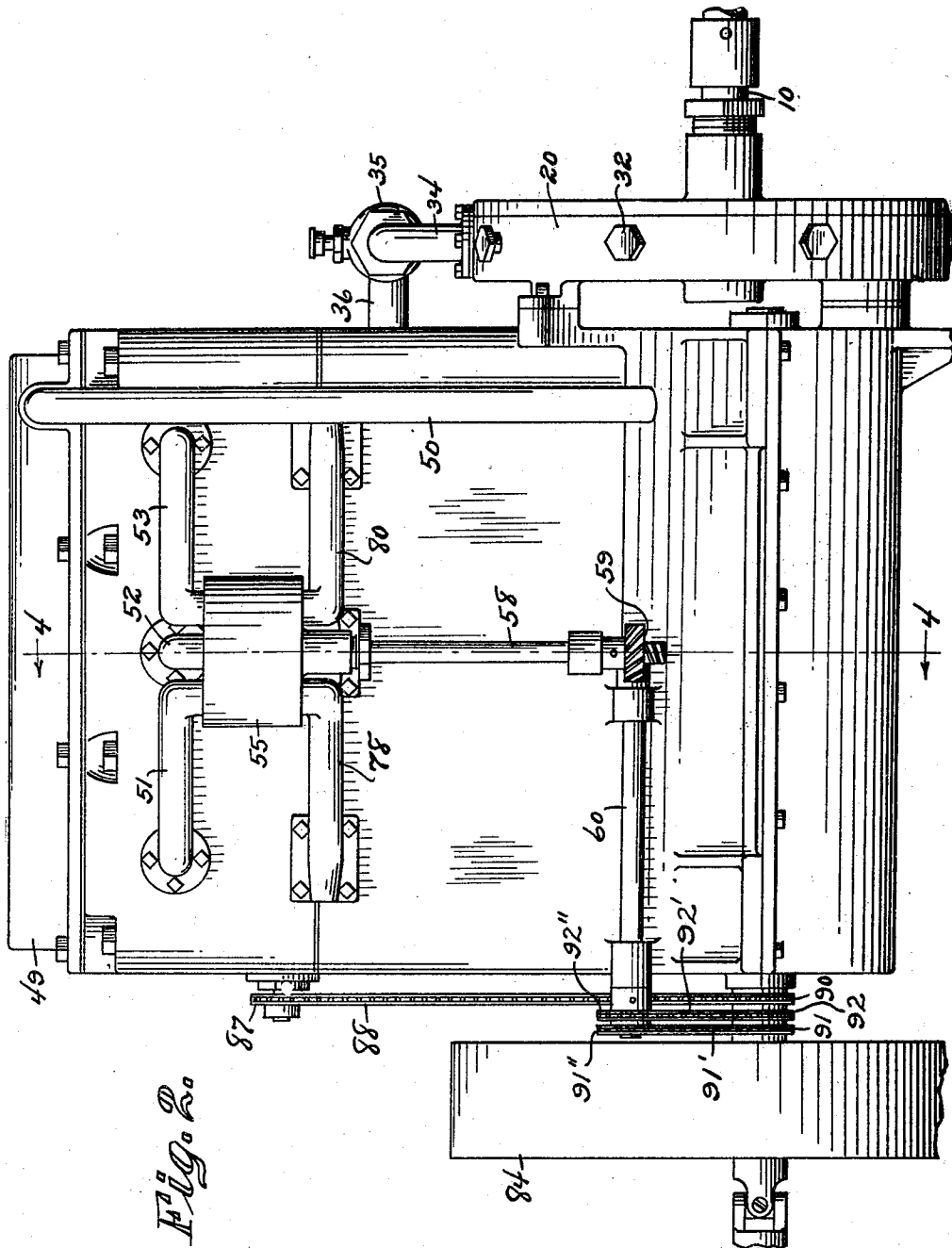


Fig. 2

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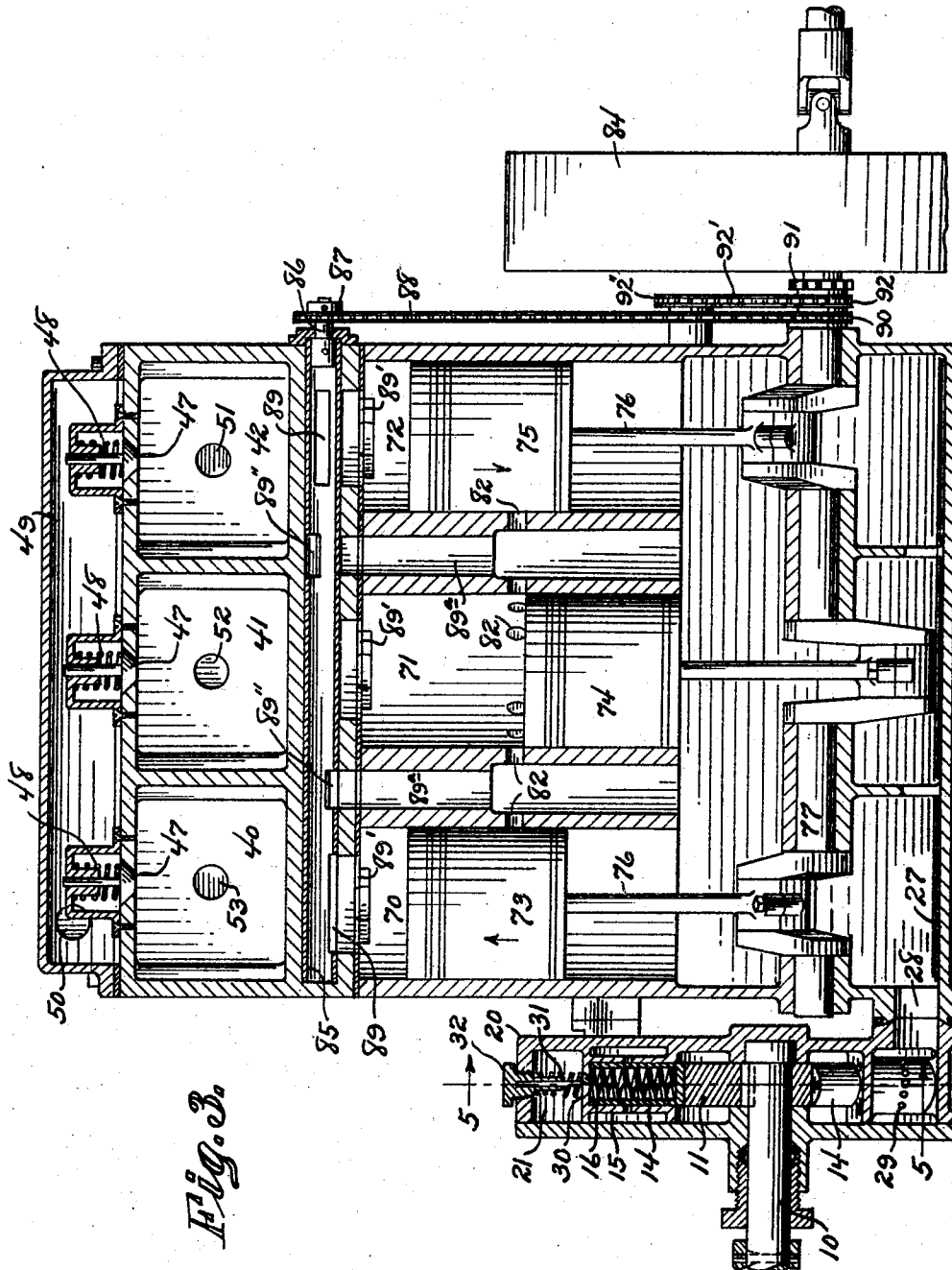


Fig. 3.

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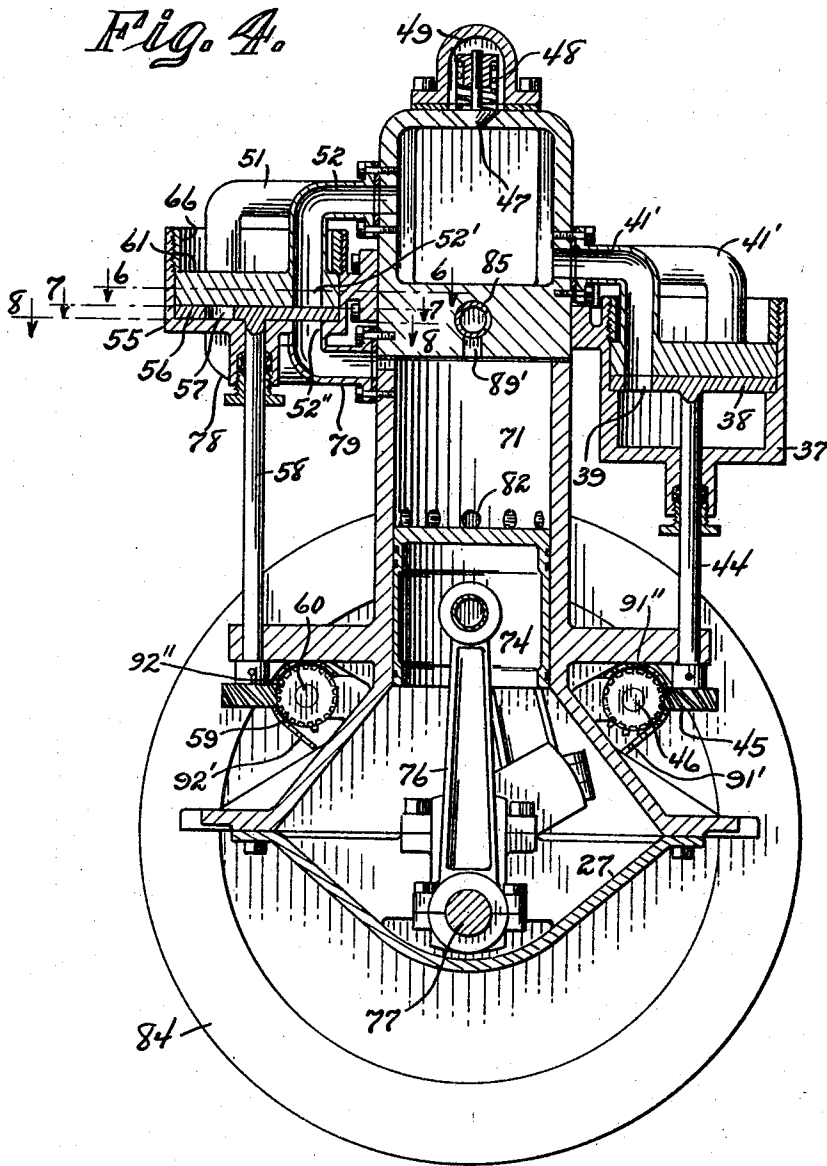
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Filed May 28, 1928

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HYDRAULIC ENGINE

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Fig. 5.

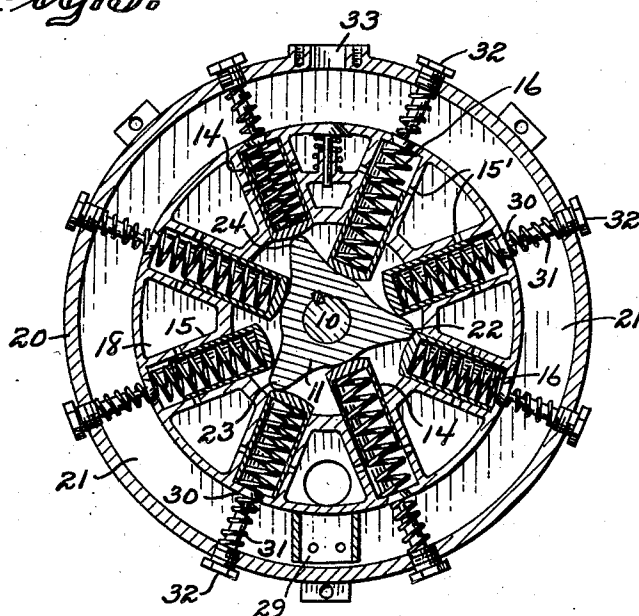


Fig. 6.

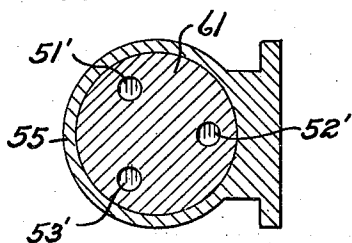


Fig. 7.

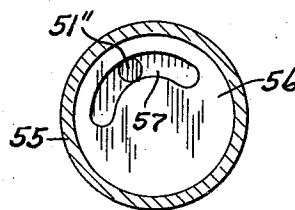
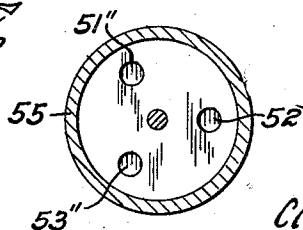


Fig. 8.



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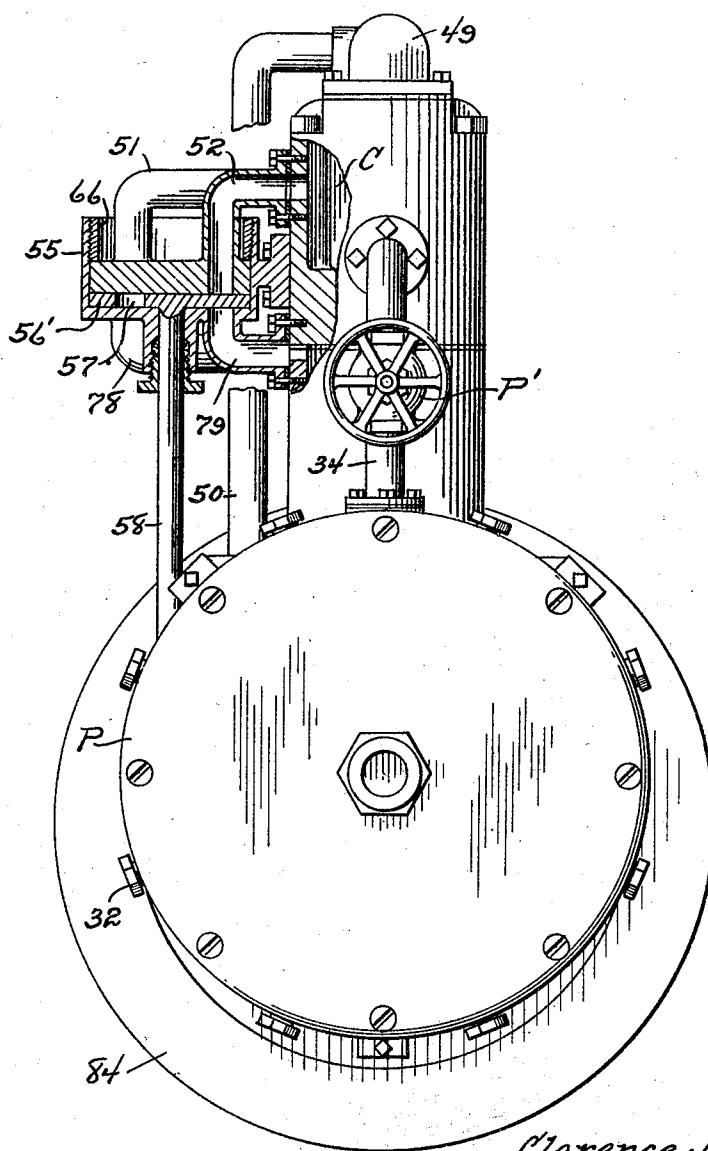
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Filed May 28, 1928

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Fig. 9.



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UNITED STATES PATENT OFFICE

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HYDRAULIC ENGINE

Application filed May 28, 1928. Serial No. 281,311.

The object of this invention is to provide a transmission mechanism in which a rotary pump is employed for placing oil or other fluid under pressure to be transferred to a plurality of pressure chambers, and transferred thence to a plurality of cylinders, the pistons of which connect with a crank shaft adapted to impart motion to any mechanism in which a flexible or variable drive is especially important.

A further object is to provide means for controlling the rate of flow of the liquid from the pump, and other means for determining the flow from a chamber connected directly with the pump to the individual pressure chambers for the cylinders.

With the foregoing and other objects in view, the invention consists in the novel construction, and arrangement of elements described, illustrated and claimed, it being understood that modifications may be made within the scope of the claims without departing from the spirit of the invention.

In the drawings forming part of this application,

Figure 1 is a view of the mechanism looking from the right in Figure 2.

Figure 2 is a view in side elevation.

Figure 3 is a vertical longitudinal section on line 3—3 of Figure 1.

Figure 4 is a vertical transverse section on line 4—4 of Figure 2.

Figure 5 is a vertical section thru the pump, and is taken on line 5—5 of Figure 3.

Figure 6 is a section on line 6—6 of Figure 4, and shows the ports with which a rotary valve cooperates in controlling the flow of fluid to the cylinders.

Figure 7 is a section on line 7—7 of Figure 4, and shows the rotary valve, at the left of Figure 4, in top plan.

Figure 8 is a section on line 8—8 of Figure 4, and shows the ports below those of Figure 6, when the elements are assembled as in Figure 4.

Figure 9 is an elevation and vertical section, showing a single upper chamber, in lieu of a plurality of chambers of the first form.

The pump at the left of Figure 3, shown in further detail in Figure 5, is adapted to

be driven by any prime mover coupled to shaft 10. Keyed on this shaft is a cam 11, approximately of triangular form and serving to operate the plurality of pistons which may be of the kind illustrated, these pistons being here disclosed as of tubular form and designated 14, being proportioned for co-operation with the walls of cylinders 15. These cylinders are disposed radially with reference to the shaft 10, and the pistons are influenced in one direction by compression springs 16 which project into the bores of the pistons, the springs being under the control so far as adjustment is concerned.

The cylinders 15 are formed in the central stationary portion 18 of the pump, this unit being surrounded by a pump casing 20 of the required size to provide an annular chamber 21. The pistons are acted upon by the high portions 22, 23 and 24 of the cam 11.

The oil or other fluid passes from the crank case 27 thru connection 28 and strainer or perforated elements 29, and enters the cylinders 15 thru ports 15'. The fluid passes from the several cylinders thru ports controlled by valves 30 which are closed by springs 31 adjusted by threaded devices 32. The fluid from the cylinders after passing valves 30 is received in annular chamber 21 and passes outwardly thru connection 33, and thence thru pipe 34, valve 35, pipe 36, and enters chamber 37 constituting a distributing reservoir or receptacle.

The flow from the receptacle 37 is controlled by valve 38 having a port 39 therein adapted to communicate successively with pressure chambers 40, 41, 42 thru pipes such as that shown at 41'.

Valve 38 is carried rigidly by a stem 44 rotated by the gearing shown at 45, which in turn is operated by a shaft 46. Any excess pressure in chambers 40, 41 or 42 is relieved by an upper valve, such as valve 47 normally seated by spring 48. These valves control ports communicating with upper chamber 49, and the latter is in communication by means of pipe 50 with the crank casing, for the return to said crank casing of the excess fluid.

Oil from chambers 40, 41 and 42 passes thru pipes 51, 52 and 53 to a valve casing 55 hous-

ing rotary valve 56. This valve has a port 57, and the valve is mounted on a stem 58 rotated by the gearing shown at 59, driven in turn by a shaft 60.

5 In Figure 6, three ports 51', 52', 53' are shown, and these are in communication with the pipes 51, 52, 53, leading from the pressure chambers, and in the housing, or in element 55 are ports 51'', 52'', 53'', as shown in Figure 8, it being the intention that oppositely
10 located ports in the stationary part of this assembly shall be controlled by the port 57 of valve 56. The ports 51', 52', 53' are in reality in a disk-like element 61; retained as
15 shown in Figure 4 by an element 66.

By way of illustration, three cylinders 70, 71 and 72 are shown in this case, and pistons 73, 74 and 75 operate in these cylinders and connecting rods such as rods 76 provide for
20 imparting motion to crank shaft 77.

The valve 56 controls the flow of oil under pressure thru pipes 78, 79 and 80 to the upper portions of cylinders 70, 71 and 72, and when the pistons reach the lower portion of their
25 strokes, ports 82 are opened, and permit return flow to the crank casing 27, toward the end of the power stroke. The crank shaft 77 carries a fly wheel 84, and the device for actuating the various valves are operatively
30 connected with said shaft 77.

A sleeve valve 85 is positioned between the cylinders 70, 71, 72, and the pressure chambers 40, 41, 42, and is mounted rigidly with reference to a stem 86 carrying sprocket wheel
35 87 driven by chain 88. This sleeve valve has ports 89 adapted to register with ports 89' in communication with the respective cylinders. Chain 88 is driven from sprocket wheel 90 on crank shaft 77, and other sprocket wheels
40 91, 92 drive respectively the chains 91' and 92' by which motion is imparted to sprocket wheels 91'', 92'' on shafts 46 and 60. These shafts last referred to control the operation of valves 38 and 56, thru the gearing previously described.
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Oil under pressure from the pump enters the cylinders through the ports of valve 56 of Figure 4 and passes from the cylinders through sleeve valve 85 of Figures 3 and 4, and through ports 82. From the sleeve valve
50 85 oil passes through ports 89'' and ducts 89a to the crank case. The rate of flow may be controlled by valve 35 of Figure 1, and the speed of the crank shaft and the element to be driven thereby, will also be controlled.
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In the modified form of the device shown in Figure 9 the pump P discharges directly through valve P' to a single upper pressure chamber C, and the flow from the latter is controlled by a valve 56'. The pipe connections with the valve housing or casing may correspond with those of the primary form.
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What I claim is:

1. In fluid transmission mechanism, a
65 chamber for containing fluid under pressure,

a valve controlling the admission of fluid to the chamber, a plurality of cylinders and pistons in the cylinders, individual pressure chambers adapted for communication with the pressure chamber first named, a second valve controlling the admission of fluid to the individual pressure chambers successively, a third valve controlling the admission of fluid from the individual chambers to the cylinders, means for operating the second and third valves in predetermined relation, a crank shaft with which said means are connected, and devices connecting the pistons with the crank shaft.

2. In fluid pressure transmission mechanism, a chamber for containing fluid under pressure, a valve controlling the admission of fluid to the chamber, a plurality of cylinders and pistons in the cylinders, individual pressure chambers adapted for communication with the pressure chamber first named, a second valve controlling the admission of fluid to the individual pressure chambers, successively, a hollow valve controlling the passage of fluid from the cylinders, a fourth valve controlling the admission of fluid from the individual chambers to the cylinders, means for operating the second, third and fourth valves in predetermined relation, a crank shaft with which said means are operatively connected, and devices connecting the pistons with the crank shaft.

In testimony whereof I affix my signature.
CLARENCE J. SPIES.

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