

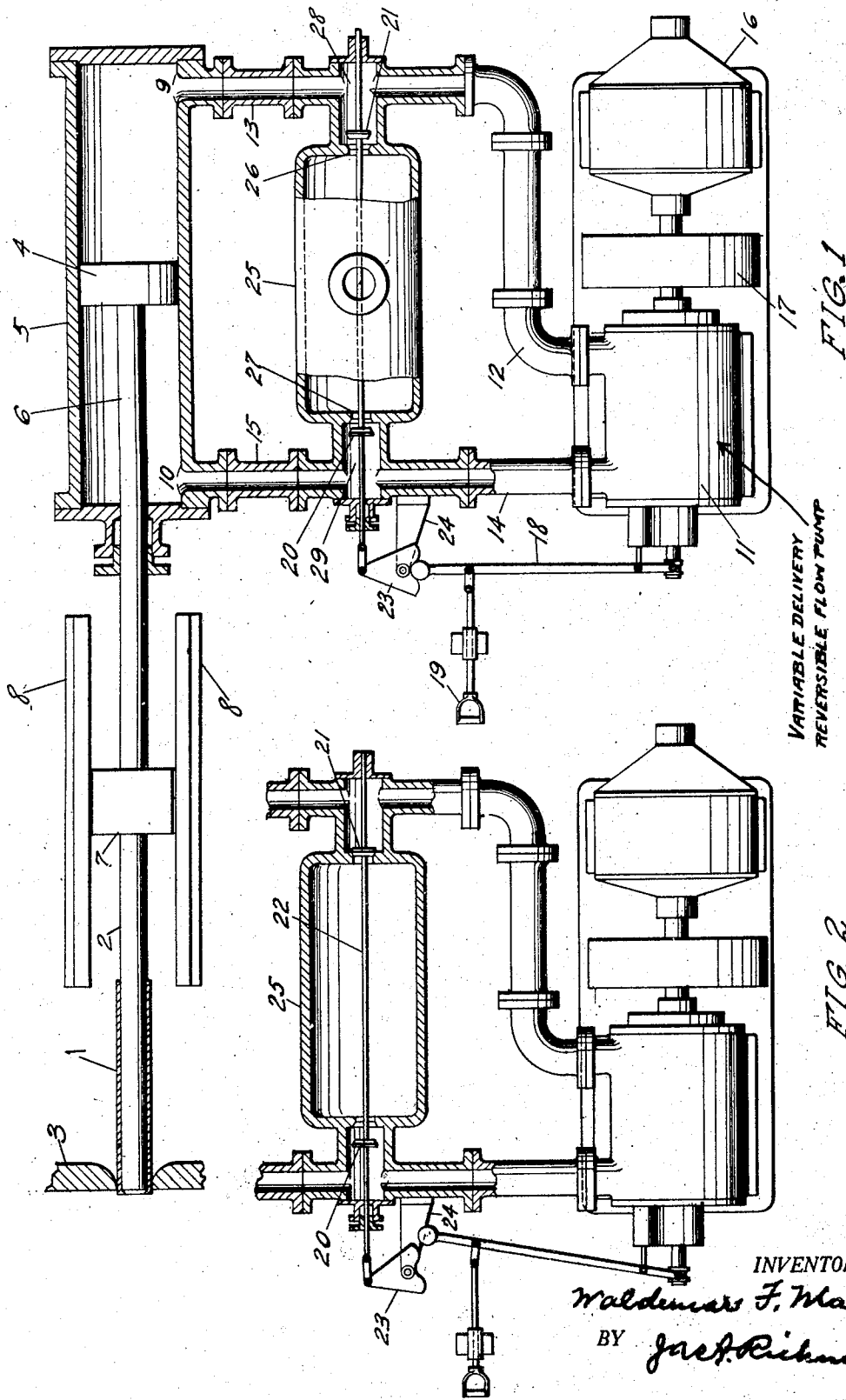
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MEANS FOR CONTROLLING FLUID OPERATED RECIPROCATING MACHINERY

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## UNITED STATES PATENT OFFICE.

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## MEANS FOR CONTROLLING FLUID-OPERATED RECIPROCATING MACHINERY.

Application filed June 27, 1919. Serial No. 307,163.

*To all whom it may concern:*

Be it known that I, WALDEMAR F. MAYER, a citizen of Switzerland, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Means for Controlling Fluid-Operated Reciprocating Machinery, of which the following is a specification.

Objects of the invention are to provide for variations in speed, change of direction, and rest to a driven device from a continuously running fluid gear; to provide for operating machinery of the reciprocating type, such as drawbenches, presses, riveting machines, stamping machines, shears, and the like, requiring different volumes of working fluid to effect the forward and reverse movements of the ram or plunger element; to provide for operating machines of the nature indicated through the agency of reversible variable fluid delivery pumps; to provide for operating standard drawbenches and the like in the manner indicated without resorting to alterations in the driven device; and to provide for controlling the variations in fluid volume without bypassing the fluid.

With such and other objects in view, the nature, characteristic features and scope of the invention will more readily be understood from the following description taken in connection with the accompanying drawings forming a part hereof, wherein—

Figure 1 is a plan view partly in section showing my invention applied to a drawbench, the fluid gear being indicated in the no-delivery position.

Fig. 2 is a similar view principally of the control system, showing the parts in operating position.

I have chosen to illustrate my invention applied to a drawbench, and, referring to the drawings, 1 designates the tube to be drawn, and 2 the ram which forces the tube through a die 3. The ram is operated by a piston 4, which is accommodated in a cylinder 5. Piston rod 6 and ram 2 are provided as usual with a crosshead 7, which travels in suitable ways 8. High pressure working fluid is admitted to the cylinder through a port 9 to effect the forward stroke of the piston and its plunger element or ram, and

the low pressure fluid in the other end of the cylinder is discharged through a port 10. In order to return the plunger and strip the tube, the conditions are reversed, high pressure working fluid being supplied to the cylinder through port 10, and the low pressure working fluid being discharged through port 9.

The working fluid pressure is generated by a variable delivery and reversible flow pump 11 such as indicated in Patent No. 1,098,280 having fluid connections 12, 13, and 14, 15, leading, respectively, to ports 9 and 10. The pump 11 is driven continuously in one direction by any suitable prime mover, for example an electric motor 16. The fly-wheel 17, when present, is useful in taking care of excessive load requirements and at the start of the stripping action.

The delivery of the pump is controlled by a lever 18, which may be operated in any approved manner, manually or otherwise, a handle 19 being indicated for use in manual operation.

I prefer to use a positive fluid delivery pump so that a certain position of the control lever 18 will correspond to a certain delivery of fluid, and hence to a certain predetermined forward and reverse speed of the ram.

Fig. 1 shows the lever 18 in the no-delivery position and the ram consequently at rest.

The control lever 18 operates simultaneously a pair of valves 20 and 21 carried by a rod 22, which is adapted and arranged to be shifted by a cam plate 23 pivotally mounted in a bracket 24.

A tank or reservoir 25 is disposed between the two fluid lines and has ports 26 and 27 and fluid-ways 28 and 29, which are controlled by the valves 20 and 21.

At no-delivery position both valves are open and the reservoir or tank 25 is in communication with both ends of the cylinder. The tank is at a higher level than the pump and is partly filled with the working fluid, preferably oil, and tends to keep the pump and cylinder filled to their capacity.

The forward or working stroke of the ram is accomplished by shifting the control lever 18 to the right, as shown in Fig. 2. The effect of this is to rock the cam plate 23 and consequently shift the valve-stem

22, and cause valve 21 to bear against its seat and thus close the port 26, so that high pressure working fluid is forced by the pump through the connections 12 and 13 to the cylinder. The low pressure fluid at the other end of the cylinder is caused to return to the pump, and, valve 20 being open, any deficit is supplied by the storage tank 25. By shifting the control lever to the no-delivery position the ram is stopped.

The return or stripping stroke of the ram is effected by shifting the lever 18 to the left, whereupon valve 20 is closed and valve 21 opened. Under such conditions the pump forces the working fluid through connections 14 and 15 leading to cylinder port 10, and low pressure is discharged through port 9. Obviously during its retrograde movement the piston ejects more fluid than the cylinder receives and this excess is absorbed by the tank 25.

Having described the nature and objects of the invention, I claim:—

1. The combination with a member to be driven, including a piston and its cylinder, of a variable and reversible flow fluid delivery pump, fluid connections between the pump and both ends of the cylinder, and means including a reservoir having valved communications for controlling the variations in fluid volume on the low pressure side.

2. The combination with a member to be driven, including a piston and its cylinder, of a variable and reversible flow fluid delivery pump, fluid connections between the pump and both ends of the cylinder alternately operating to supply high pressure and discharge low pressure, and means for controlling the variations in fluid volume on the low pressure side, said means being manually controlled to be necessarily open to the low pressure side of such connections when closed against the high pressure side.

3. The combination with a member to be driven, including a piston and its cylinder, of a pressure element for delivering a fluid under pressure to said cylinder, connections between said pressure element and cylinder including a storage device, and simultaneously operating manually governed valves for

controlling communication between said connections and the storage device.

4. The combination with a member to be driven, including a piston and its cylinder, of a variable and reversible fluid flow delivery pump, fluid connections between the pump and cylinder, and means including a storage device, having manually controllable communication with said fluid connections to supply deficit and absorb excess fluid between the pump and cylinder.

5. The combination with a member to be driven, including a piston and its cylinder, of a variable and reversible flow fluid delivery pump, fluid connections between the pump and cylinder, a fluid containing chamber having communication with said connections, valves for controlling communication between said chamber and said connections, and means for operating the valves to open the chamber to the pump circulation or to close it against pump flow in one direction.

6. In combination with a member to be driven, including a piston and its cylinder, of a variable and reversible flow fluid delivery pump, connections between the pump and cylinder, a fluid containing chamber on a higher level than the pump and communicating with said connections, and a valve controlling the communication of said chamber with each connection, said valves being simultaneously operable to open the chamber to both connections or to close it against either at will.

7. In combination with a member to be driven, including a piston and its cylinder, of a variable and reversible flow fluid delivery pump, connections between the pump and cylinder, a fluid containing chamber on a higher level than the pump and communicating with said connections, a valve controlling the communication of said chamber with each connection, and means, operated in the control of the pump to simultaneously adjust said valves to selectively open the chamber to both connections or close it against either.

In testimony whereof I affix my signature.

WALDEMAR F. MAYER.