

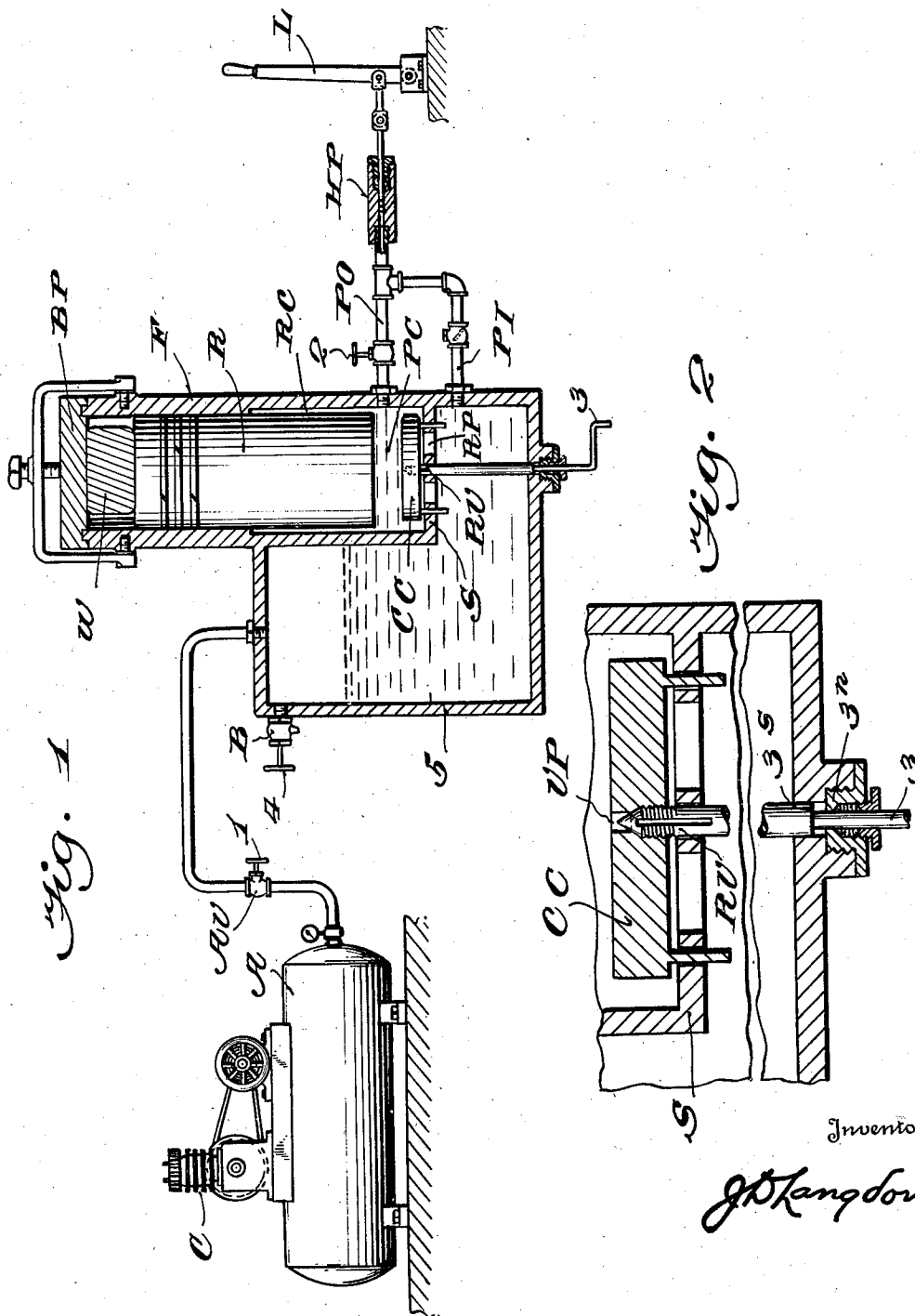
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PNEUMO HYDRAULIC RAM

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PNEUMOHYDRAULIC RAM

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1 Claim. (Cl. 60—51)

This invention relates to machines for operating hydraulic rams of the class used for production where it is desired to extrude or shape materials using extremely high hydraulic pressures and at the same time maintain a high speed rate of production.

The primary object of the invention is to provide a machine using combined means whereby air or other pneumatic pressure is used to transfer liquid rapidly from a reservoir into a ram chamber including means to trap the liquid in said ram chamber and means to build up additional hydraulic pressure in said ram chamber to any desired extent in addition to or independent of the pneumatic pressure required to force liquid into said ram chamber from a reservoir together with means to bleed the pressure from the ram chamber and bring the ram to a normal position of rest after moving the ram from normal position.

Another object is to provide means to easily relieve extremely high pressure from the ram chamber through a bypass between the ram chamber and the reservoir.

A further object is to recover and reuse the liquid in the reservoir and exhaust the gas pressure from the reservoir to allow the ram to return to normal position after being moved and return the liquid to the reservoir.

Other and further objects of the invention will appear as the specification proceeds.

The drawing is schematic and shows only one form of structure which may be changed by reduction to practice to any form within the scope of the claim.

Of the drawing—

Figure 1 is a diagrammatic elevation of the liquid reservoir or tank 5 cut away to show schematic arrangement of form and parts therein.

Figure 2 is a detailed sectional view of relief valve RV with adjacent fragmentary portions of assembly.

The structure involving the invention comprises a reservoir or tank 5 having liquid therein up to a predetermined level leaving a space above the liquid for the admission of any suitable pneumatic pressure in the storage tank A providing volume storage space supplied by means of compressor C.

Adjacent to tank 5 and communicating therewith is a ram cylinder RC embraced longitudinally by a frame F which is attached to and supports a butt plate BP there being a space for

work W provided between the top of ram R and butt plate BP.

A relatively large and heavy check valve CC is seated across a port in the lower end of ram cylinder RC communicating with reservoir 5. A pump inlet PI communicates with high pressure pump HP which is adapted to deliver liquid to high pressure chamber PC via liquid pressure outlet PO from high pressure pump HP which has a piston of relatively very small diameter compared to the diameter of the ram R.

Valve handle 1 controls the passage of air pressure through the supply line from air storage reservoir A. The air enters the pneumatic chamber above the liquid in said reservoir. A discharge check valve 2 controls the passage of the high pressure liquid from reservoir 5 via high pressure pump HP into pressure chamber PC. Valve handle 3 controls relief valve RV which is threadedly disposed in valve port VP through check valve CC. The stem of relief valve RV is provided with a shoulder 3s spaced above the end of the male nut 3n which serves as a rest for shoulder 3s when crank 3 has been turned in an anticlockwise direction for a predetermined distance to bleed chamber PC prior to unseating check valve CC. The check valve CC has two guides to prevent rotation projecting downward through the spider S, which is integral with the valve seat surrounding it and acts as a guide for the stem of relief valve RV which normally closes valve port VP.

Starting with all valves closed the device is operated as follows: Valve 1 is opened permitting air pressure from storage to enter reservoir 5 and act against the surface of the liquid forcing the same through large sized ram port RP raising ram R quickly against work W. When ram R reaches home to the limit of pneumatic pressure against liquid and work W abutting against butt-plate BP, then the valve CC drops of its own weight to seat across ram port RP. Check valve 2 is provided with a handle to open same if desired. PO from high pressure pump HP which by the use of lever L immediately draws liquid from reservoir 5 and forces same into chamber PC where liquid pressure is built up to any desired point. The liquid in chamber PC being of an incompressible nature provides the required pressure medium quickly forcing ram R solidly "home" and a very small volume of liquid is required to complete the work W, while the pneumatic pressure such as air or the like provides an elastic quick moving comparatively frictionless

low pressure medium for the initial movement of liquid from reservoir 5 for operation of the ram R to abut the work. The work is released by the operation of valve RV and the anticlockwise movement of crank 3 which opens valve port VP and allows pressure fluid in pressure chamber PC and reservoir 5 to become equalized. Thereafter further rotation of the crank 3 causes shoulder 3s to impinge nut 3n thereby jacking the valve CC from its seat and allowing the ram R to return by gravity to its seat when valve AV is closed by handle 1 and blow out valve B is opened exhausting the air pressure from chamber 5. All valves are again closed and the ram is ready for further operation.

Therefore it will be seen that a quick transfer from pneumatic to straight hydraulic actuation for the ram R is attained and the performance of work speeded up.

Having described the invention and the operations thereof the following claim is made:

A pneumohydraulic ram comprising a cylinder; a ram piston in the cylinder; a liquid filled space below the ram; a check valve below the ram of substantial dimension approximating the di-

ameter of the ram and seating across a port only slightly smaller in area than the check valve, said check valve being substantially in alignment with the ram and being held against rotation and guided in alignment with the port, a passage thru said check valve, bleeder valve means disposed to close said passage, means to open said bleeder and said check valve in succession, said port communicating with a reservoir filled with liquid to a pre-determined level, the liquid level in the reservoir defining one side of a pneumatic pressure chamber, a valve controlled pneumatic pressure supply line communicating with the pneumatic chamber, a liquid conduit communicating between the reservoir and said liquid filled space above the check valve, a pump for forcing liquid thru said conduit to said space to boost the liquid pressure in the space under the ram, whereby liquid is pneumatically urged from the reservoir into the liquid space for rapid movement of the ram and an increased liquid pressure is forced into said liquid space by the pump to move the ram against any work with increased force.

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