(No Model.) 2 Sheets—Sheet 1.

J. MOLAS.

HYDRAULIC PRESSURE MACHINE.

No. 556,196. Patented Mar. 10, 1896.

Fig. 3.

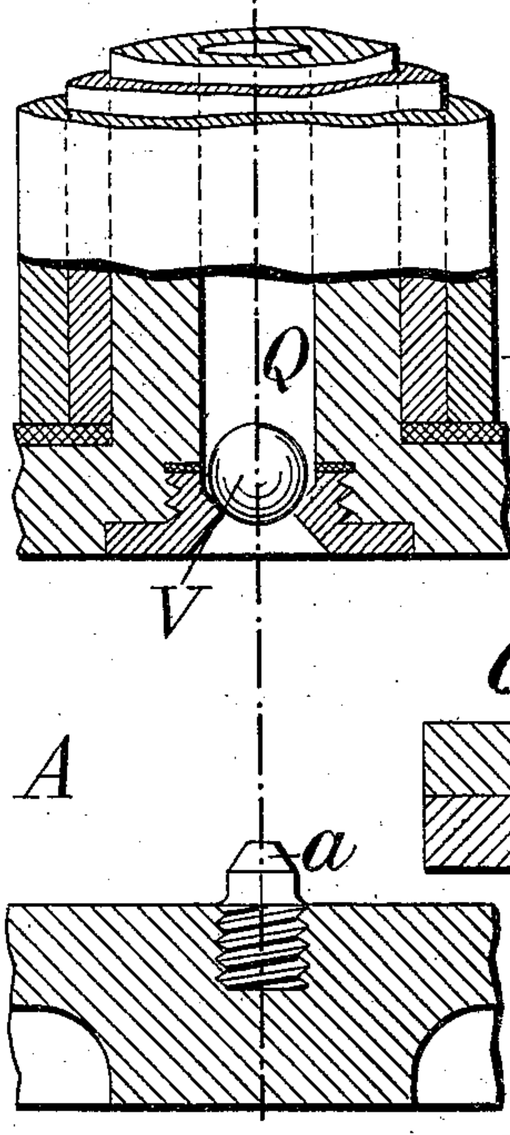
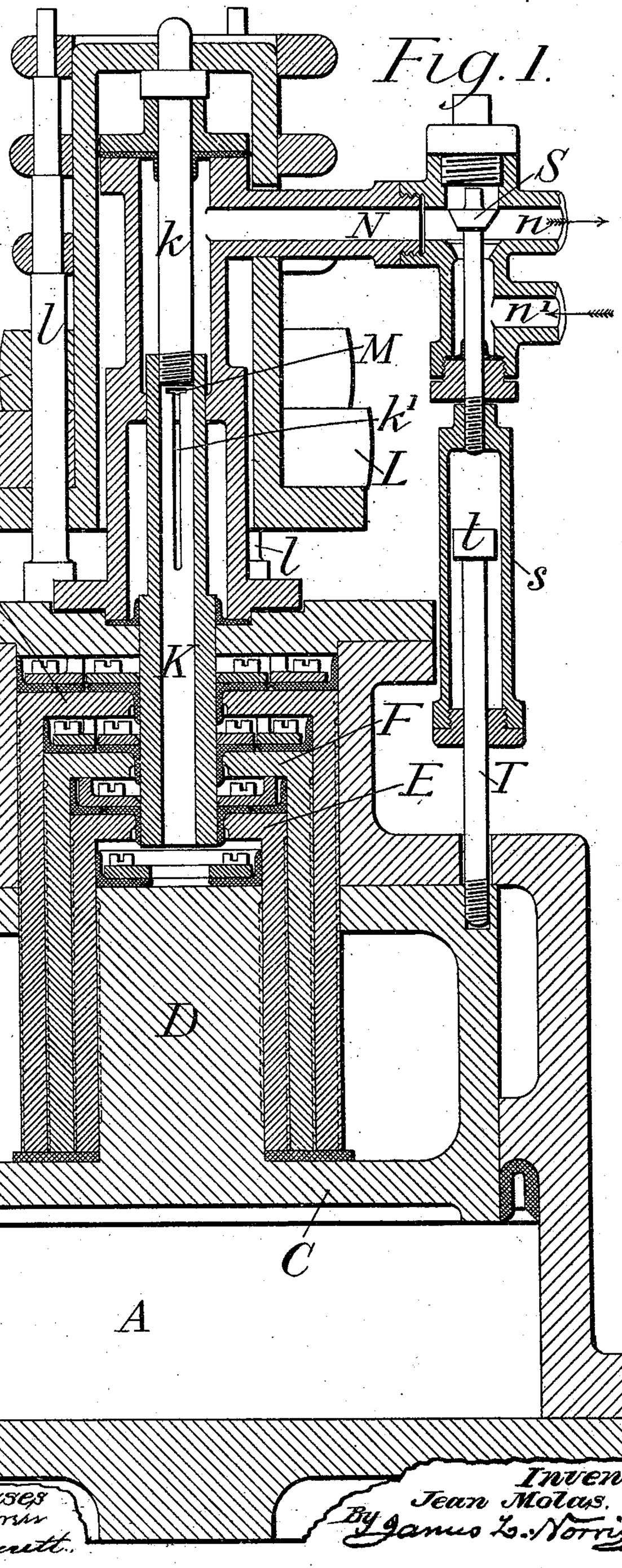


Fig. 1.



Witnesses
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2 Sheets—Sheet 2.

(No Model.)

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HYDRAULIC PRESSURE MACHINE.

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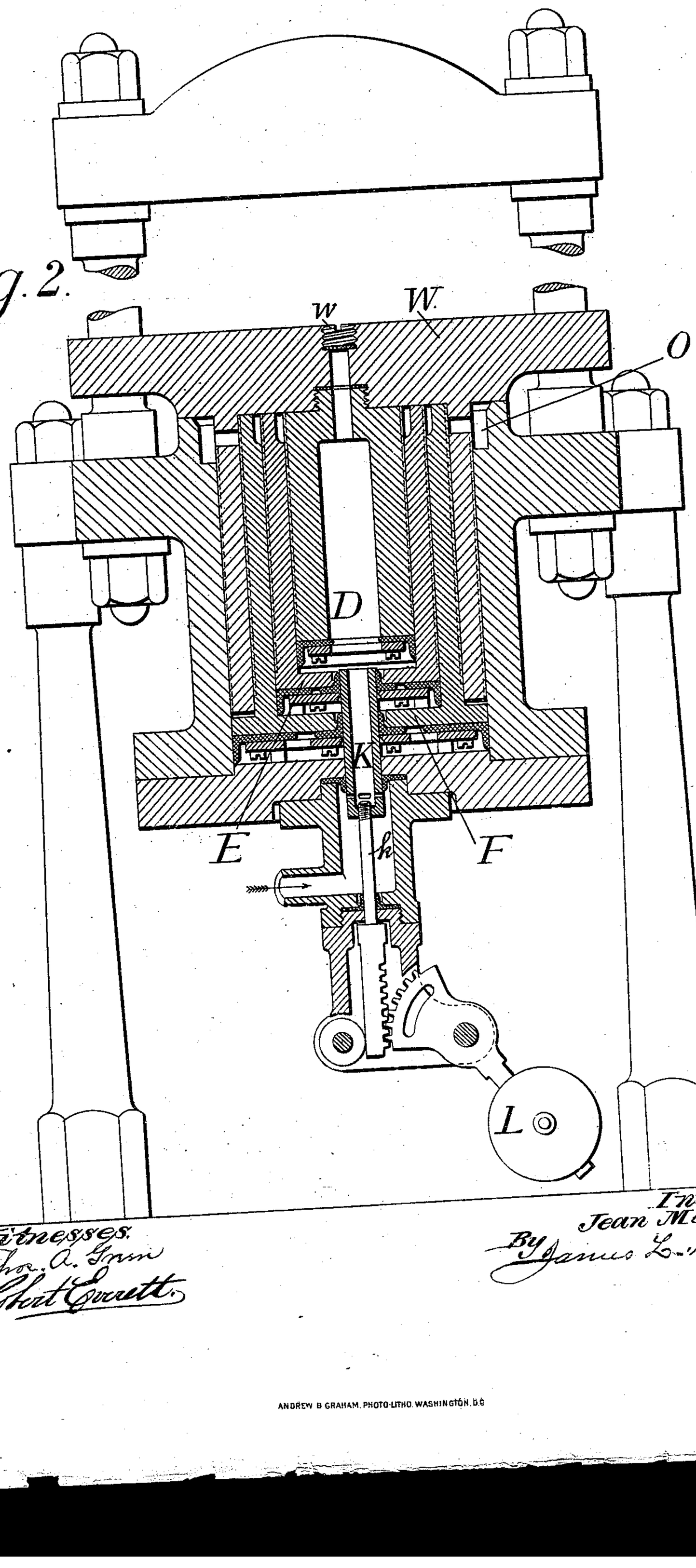
Fig. 2.



Witnesses.
Thos. A. Grant
Robert Everett.

Inventor.
Jean Molas.
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UNITED STATES PATENT OFFICE.

JEAN MOLAS, OF LONDON, ENGLAND.

HYDRAULIC-PRESSURE MACHINE.

SPECIFICATION forming part of Letters Patent No. 556,196, dated March 10, 1896.

Application filed October 21, 1895. Serial No. 566,411. (No model.) Patented in England January 3, 1895, No. 224; in Belgium October 28, 1895, No. 118,081, and in Italy December 2, 1895, LXXVIII, 371.

To all whom it may concern:

Be it known that I, JEAN MOLAS, a citizen of England, residing at 247 High Road, Queen Anne's Avenue, South Tottenham, London, in the county of Middlesex, England, have invented certain new and useful Improvements in Hydraulic-Pressure Machines, (for which I have obtained Letters Patent in Great Britain, dated January 3, 1895, No. 224; in Belgium, dated October 28, 1895, No. 118,081, and in Italy, dated December 2, 1895, LXXVIII, 371,) of which the following is a specification.

My invention relates to the construction of hydraulic-pressure machines, such as hydraulic presses, lifts, cranes, or engines, in such a manner that the expenditure of the motive fluid, such as water at high pressure, is approximately proportioned to the work that has to be performed. I effect this by arranging in a hydraulic cylinder a number of concentric annular pistons, in combination with a tubular supply-valve differentially loaded in such a manner that according as less or greater working pressure is required the valve is automatically made to take such a position that the motive fluid is brought to act on a piston-surface of less or greater area, a less or greater fraction of the total capacity of the cylinder being thus charged with motive fluid, so that the expenditure of fluid is made to correspond approximately with the work done by it.

My invention may be applied in a regulating-cylinder from which fluid under pressure is sent to the working cylinder of a hydraulic lift, press, crane, or the like, the same fluid returning to the regulating-cylinder after performing work, or it may be applied in a direct-acting cylinder in which the motive fluid acts directly on the ram or plunger of the lift, press, or crane, as I shall describe, referring to the accompanying drawings.

Figure 1 is a vertical section of a regulating-cylinder for transmitting pressure to a working cylinder, with means according to my invention for automatically suiting the pressure and expenditure of motive fluid to the load on the piston or plunger of the working cylinder. Fig. 2 is a vertical section of a direct-acting press or lift cylinder also arranged according to my invention. Fig. 3 is a part section of the apparatus shown in Fig. 1, showing a modification.

Referring first to Fig. 1, the regulating-cylinder A, which communicates by a pipe or conduit B with the working cylinder of a hydraulic lift, press, crane, or the like, and which has the same capacity as that working cylinder, is fitted with a piston C having a central boss D and several concentric annular plungers, the upper ends of which are formed as pistons E, F and G, each provided with suitable external and internal packings.

K is a central supply-valve in the form of a tube, which is fitted to slide vertically and extends up through cavities formed in the head of the cylinder. It terminates in a rod *k* of smaller diameter, which passes out through packing and has a cross-head and side rods to carry weights L in the form of segments resting on shoulders of guides so arranged that as the rod *k* rises one after another of the weights is lifted, the load on *k* being thus increased step by step as it ascends.

In the upper part of the tube K there is a lateral orifice M, which is always open to a cavity in the cylinder-head, this cavity communicating by a pipe or conduit N with the operating valve or valves for supplying high-pressure water and discharging the water when the work is done. The conduit N has two branches *n* leading to a discharge-valve, and *n'* leading to a supply-valve, both of these valves being of any known kind arranged to be worked separately. In the branch *n'* there is a valve S, the stem of which passes through packing and is externally connected to a tube *s* having within it free to slide a rod T, which is attached to the piston C and has a head *t*, the length of the tube *s* being such that when the piston C approaches the lower extreme of its stroke the head *t*, acting on the lower end of the tube *s*, draws it down and closes the valve S.

The apparatus operates as follows: Assuming that a light load has to be raised by the piston or plunger of the working cylinder, the high-pressure water raising the valve S is supplied at N and enters the tube K by the orifice M and acts on the area of the boss D, causing the piston C to descend and to force fluid by the conduit B into the working cylinder.

Should the pressure thus transmitted to the working cylinder be insufficient to overcome the load, then as the piston C and its boss D cannot descend the pressure in and under the tube K increases, and the tube is forced upward in opposition to the weight L until the lower mouth of K is in such a position that the service-pressure acts on the larger area of E, as well as on D. If this pressure on the larger area be still insufficient to force down the piston C, the tube K is still farther raised, lifting an added weight and allowing the pressure to act also on F, and it may be then on G until the total area on which the pressure of the water acts is such that the piston C is forced down, transmitting to the working cylinder pressure sufficient to overcome the load therein.

The movement of the lift or other machine worked by the pressure transmitted from the regulating-cylinder may be arrested at any part of the stroke by closing the supply-valve in the branch n', and when the stroke is completed the valve S is automatically closed. On opening the discharge-valve in the branch n, allowing the water to escape at N, the fluid returning by B from the working cylinder raises the piston C, and the pressure acting on the rod k being relieved the tube K is pushed down by the weight L. I prefer to form a lateral slit k' extending some distance down the tube K, so as to give a larger area of passage for water as the tube rises and has to supply water to a larger space. When the fluid under the piston C is water, or the same as the service fluid which acts above the piston, I provide, as shown in Fig. 3, a passage Q with a check-valve V, and on the bottom of the cylinder A a projection a.

When the piston C reaches the bottom of the cylinder A the valve V is slightly lifted by a, allowing fluid to flow by the passage Q from above the piston into the space below it, so as to make up for any loss by leakage from the working cylinder or its connections. The concentric annular pistons, as well as the main piston, are lubricated by oil supplied to cavities O, and the annular pistons are grooved for passage of oil except near their packings.

Referring now to Fig. 2, in which the same reference-letters are employed to denote parts corresponding to those in Fig. 1, instead of the service-water being applied to push down a piston C, it is applied to push up the table W of a press or lift, acting, as described with reference to Fig. 1, on a larger or smaller one of the piston areas D, E or F, according as the load on W is greater or less, this being determined by the position of the sliding tube K. Instead of employing weights successively lifted to resist the outward pressure acting on this tube, a single weight L may be attached to a lever-arm raised to successive positions by a rack on the rod k acting on a toothed segment. w is a screw-plug which can be loosened to allow escape of air.

Instead of the number of concentric pistons shown in the drawings, a greater or less number may obviously be employed, according as it may be desired to have smaller or greater gradations in the variations of the pressure and of the expenditure of motive fluid.

Having thus described the nature of my invention and the best means I know for carrying the same into practical effect, I claim—

In a hydraulic cylinder, a number of concentric annular pistons presenting successively-increasing areas, in combination with a central supply-tube automatically moved by pressure of the motive fluid to such a position as to bring the fluid to act on a greater or less one of the piston areas, according as the main piston or plunger of the cylinder is subject to a greater or less load, substantially as and for the purpose set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 4th day of October, A. D. 1895.

J. MOLAS.

Witnesses:
HAROLD IMRAY,
JNO. P. M. MILLARD.