J. N. WOOD.

HYDRAULIC PRESS.

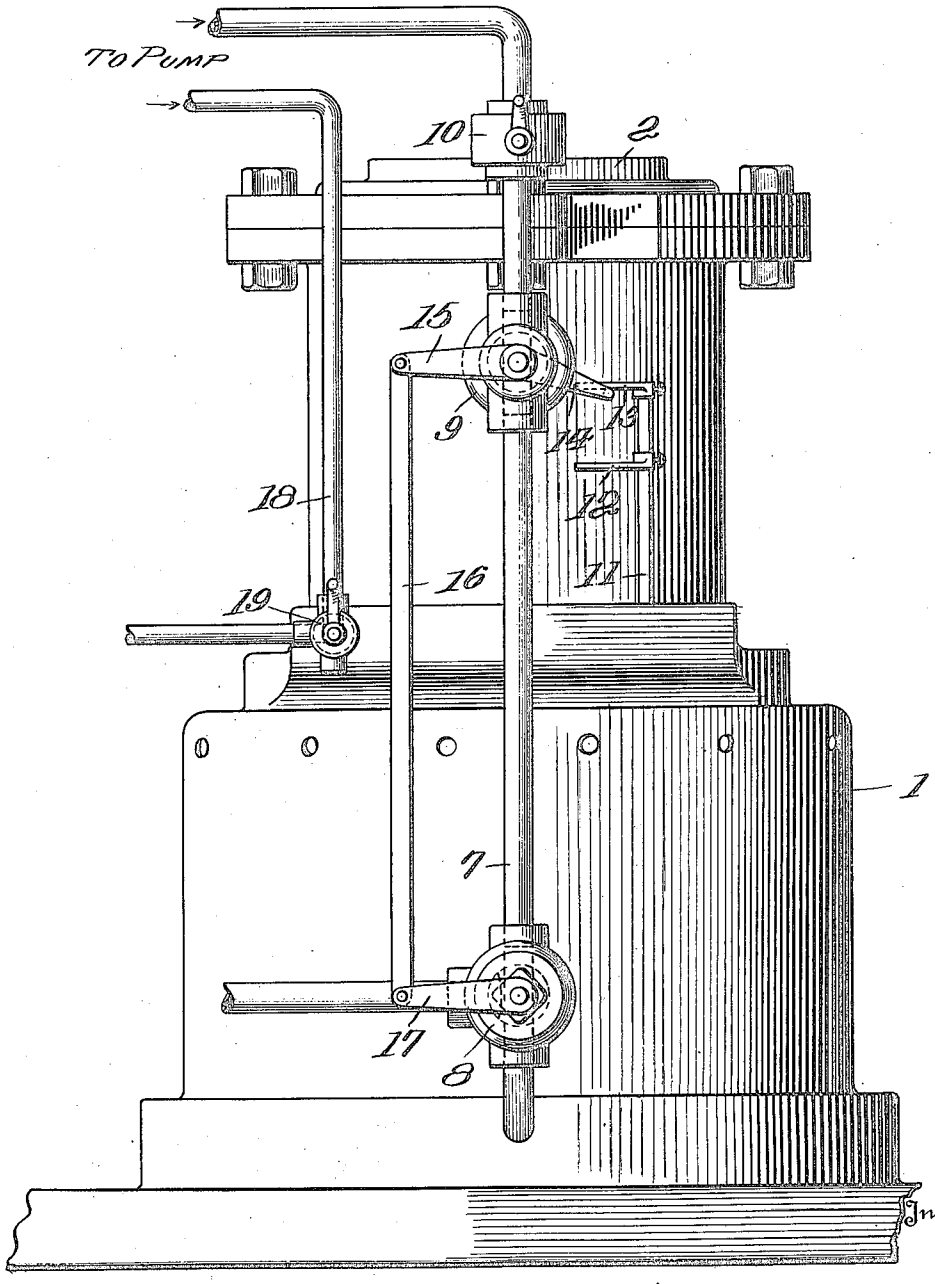
APPLICATION FILED JULY 19, 1920.

1,429,665.

Patented Sept. 19, 1922.

2 SHEETS—SHEET 1.

Fig. 1.



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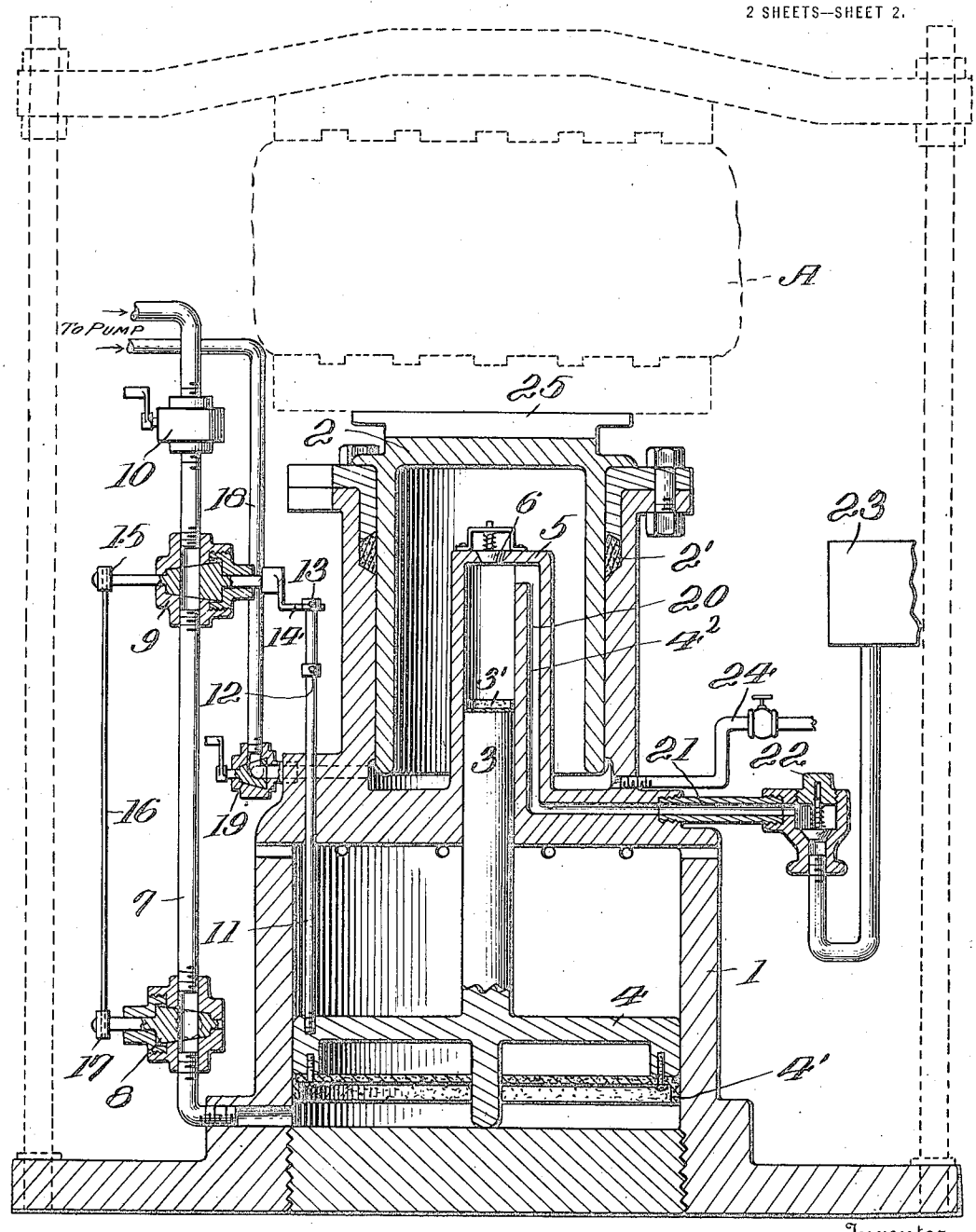
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Fig. 2.

Patented Sept. 19, 1922. 1,429,665

UNITED STATES PATENT OFFICE.

JAMES N. WOOD, OF WASHINGTON, DISTRICT OF COLUMBIA.

HYDRAULIC PRESS.

Application filed July 19, 1920. Serial No. 397,276.

To all whom it may concern:

Be it known that I, JAMES N. WOOD, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Hydraulic Presses; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to hydraulic presses, and consists of certain new and useful improvements in what I may term, a compound hydraulic press by which I obtain great lifting power, together with a simplicity of construction and operation which makes the device desirable and effective.

My invention involves the application of the principle of the hydraulic intensifier, but instead of using a long auxiliary stroke as in that device, a series of short intermittent strokes is employed, enabling the application of the principle, to pressing or jacking machines, where the question of space is important and producing an economical construction by reason of a shortening of the machine and a consequent decrease in weight and size.

Through the multiple effect gained by transmitting the pressure from a large primary piston to a smaller one, and causing the latter to transmit its augmented pressure to a third piston, it becomes possible to reach a high total pressure on the third piston termed the pressing or lifting piston, with a comparatively low gauge pressure from the power pump.

The pressure on the final piston will be governed by the relative areas of the piston heads, and the initial pressure in the primary pump, according to Pascal's law.

It may be noted that low pressure makes possible the use of a cheaper grade of pump, as the valves and fittings necessary to a high pressure pump are not required, and at the same time, a comparatively small increase of gauge pressure at the pump or other source of power, will lead to a great increase of total pressure exhibited by the final piston or ram.

This gives my improved machine a great flexibility and adaptability to loads of various kinds.

It is also a feature of my improvement that I cause the pressure to be retained and the load to be maintained at a desired point, by the enclosed water, thereby obviating the use of screws or racks for that purpose, making the machine homogeneous and self contained.

The invention is more specifically set forth in the following detailed description, which should be read in connection with the accompanying drawings.

In said drawings:—

Fig. 1 is a side view of the completed structure, and

Fig. 2 is a sectional view of the same.

In the drawings 1 represents a cylinder which is so constructed as to provide bearings for three pistons 2, 3, 4, in which they slide. The heads of these pistons, it will be noted, are of different diameters and areas, and the small piston 3 moves in a central supplemental cylinder 4^2 closed at its upper end 5, in which there is placed a check valve 6, provided with the usual spring and connection to hold it normally closed.

The piston head 4 is larger than the piston heads 3 and 2 and the piston head 2 is larger than the piston head 3.

Packing 2′ is provided for the piston 2 and a cup leather 3′ serves as packing for the piston 3 while cup leather 4′ serves the same purpose for the piston 4.

The numeral 7 represents a pipe which opens at one end into the main cylinder 1, beneath the piston head 4, and connects at its other extremity with a hydraulic pump, not shown. In the pipe 7, are placed two valves 8 and 9 which are of the tapered plug type, the valve 9 being a one-way valve and the valve 8 a two-way structure.

The pipe 7 is also provided with a taper valve 10 having a handle for manually operating the same.

11 represents a rod secured to the piston 4 and passing through the cylinder wall provided with projections or forks 12 and 13, adjustably mounted thereon, which engage a crank 14, thereby opening or closing the valve 9, cutting off or admitting water from the hydraulic pump.

Mounted upon the other end of the taper plug pin of the valve 9, is a crank 15 to which there is attached one end of a link connection 16, the other end of which is secured to a crank 17, with which the two-way valve 8 is provided.

A pipe 18 leads from the bottom of the

upper portion of the cylinder to the hydraulic pump (not shown) and in this pipe there is mounted a manually operable taper valve 19.

In the wall of the supplemental cylinder, there is a cored passage 20, which communicates with the interior of the cylinder at its upper extremity, and with a pipe 21 at its other extremity. In the pipe 21 there is mounted a check valve 22 provided with a pipe connection which leads to a reservoir 23, having a pressure at or above atmospheric.

24 represents an exhaust connection, provided with a valve which is manually opened to permit the exit of water from the chamber of piston 2. When it is desirable to remove the bale, the valve is opened and the outflow of fluid and weight of the piston 2, causes the latter to descend, thereby releasing the bale.

From the foregoing, it is thought the mode of operation of the device is apparent.

For purposes of illustration, we will assume that a bale is to be compressed. To this end the bale A (indicated in dotted lines) which may be of cotton or other material, and which may or may not be partially compressed, is placed upon the platform 25 connected with the piston 2.

The tapered plug cock 19 which communicates with the hydraulic pump, is then manually opened, admitting fluid to the upper part of the cylinder and beneath the piston 2, forcing the latter upward. As soon as the piston 2 has reached the desired upward limit of its stroke, the valve 19 is closed manually and the taper valve 10 is opened admitting water from the pump to the pipe line 7, the valves 8 and 9 being then open as shown in the drawings.

Fluid from the pump enters the cylinder beneath the piston 4, and forces it to rise, the extension piston 3 attached thereto, rising simultaneously therewith.

The chamber above the piston 3, at this time is filled with water, which has been admitted through the cored passage 20 from the reservoir or other source of supply 23 at a pressure at or above atmospheric, being admitted through the check valve 22. It is obvious that the check valve 22 permits the water to flow into the chamber above the piston 3, but will not allow it to return.

As the pistons 4 and 3 rise, the pressure on the confined water lifts the check valve 6 and the water in the chamber above the piston 3, is forced into the chamber of the cylinder, beneath the piston 2, which is forced upward to an additional extent, it being obvious that the pressure of the water in the chamber above the piston 3 will exert a pressure on the water in the chamber into which it is forced and hence upon the piston 2, equal to the total pressure on the piston 4.

Assuming any given total pressure on the piston 4, and that the area of the piston 3 is one fifth of the area of the piston 4, then the total pressure communicated to the piston 2 will be five times the total pressure on the piston 3.

The pressure of the piston 3 will be communicated to the piston 2 as the valve 6 lifts, the pressure per square inch on the piston 2 being the same as on the piston 3.

While the piston 2 will rise the fact of its being larger in cross section than the piston 3, will cause it to move only a fraction of the distance of the stroke of the piston 3.

Now then assuming that the area of the piston 2 is eight times that of the piston 3, the total pressure on the piston 2 will be eight times the pressure on the piston 3. In other words, the pressure on the piston 2 will be increased but its movement will be less. Of course it follows that the increase of pressure upon the piston 2 will further compress the bale A.

Upon the piston 4 reaching the upward limit of its stroke, the fork 12 on rod 11 will engage the crank 14 of the valve 9 closing the valve and cutting off the flow of water from the pump, while the crank 15 on the other end of the taper plug of valve 9 operating through the link connection 16, opens the two-way valve 8 so as to allow the water to escape from the cylinder under the piston 4.

The weight of the piston 4 being considerable, it descends by gravity as the water recedes, the piston 3 also descending at the same time.

As the piston 3 falls, the check valve 6 resumes its seat causing the piston 3 to act as a suction device through the passage to the check valve 22.

Owing to the suction thus created, the valve 22 opens and water from the reservoir 23 or other source, enters the space above the piston 3, filling the same as the piston descends, thereby preventing the formation of a vacuum which would tend to retard the downward stroke of the pistons 3 and 4.

As soon as the water under the piston 4 has escaped, the latter falls to its original and lowest position and the fork 13 opens the valve 9 and closes the two-way valve 8 and so again prevents the outflow of water from beneath the piston 4 and again admits water to lift the piston 4, and the supplemental compression cycle is repeated, until the bale is compressed to a desired density. When this has been accomplished, the valve 24 is opened to permit the water to escape from beneath the piston 2, allowing the said piston to drop to its lowest position, and the bale to be removed.

At the end of each upward stroke of the pistons 3, 4, the valve 6 resumes its seat and the valve 22 is closed by means of the

pressure through the cored passage, and water being uncompressible, or nearly so, the enclosed fluid under the piston 2, sustains the load upon that piston, and maintains the pressure thereon, awaiting further pressure from the intermittently acting supplemental pistons 3 and 4.

As a means of forming bales of all descriptions, I provide for a preliminary moderate pressure to be applied at one stroke thereby reducing the bale to one of air density and then causing a further reduction by operating the secondary reciprocating supplementary pistons as described.

As a lifting jack for heavy loads, the device provides a simple means of securing extraordinary lifting effect, from an hydraulic pump of an inferior grade.

It is obvious that my improved press mechanism may be so arranged that pressure may be exerted downwardly or laterally and yet be within the scope of my invention.

What I claim and desire to secure by Letters Patent is:—

1. An hydraulic press comprising a main cylinder, provided with three interior cylindrical chambers of different diameters, pistons slidably mounted in said cylindrical chambers having piston heads of different areas, means for admitting fluid under pressure beneath said pistons and to the cylindrical chamber above the smaller of said pistons, and means for permitting the exit of fluid from said chamber under pressure.

2. An hydraulic press comprising a main cylinder provided with interior cylindrical chambers of different diameters, pistons slidably mounted in said cylindrical chambers, means for admitting fluid under pressure beneath said pistons and to the cylindrical chamber above one of said pistons, a valve mounted in the end wall of the smaller cylindrical chamber opening upon the outward stroke of the smaller piston, means for closing the said valve upon the downward stroke of said piston, and means for admitting fluid to said chamber above said piston as the latter descends.

3. An hydraulic press comprising a main cylinder provided with interior cylindrical chambers of different diameters, pistons slidably mounted in said cylindrical chambers, a pipe connecting the lower chamber, beneath the piston mounted therein, with a pump, valves mounted in said pipe, and means mounted on said piston for operating said valves, upon the rising and fall of the piston.

4. An hydraulic press comprising a main cylinder provided with interior cylindrical chambers of different diameters, pistons slidably mounted in said chambers, a pipe connecting the lower chamber, beneath the piston mounted therein with a pump, a two-way and one-way valve mounted in said pipe, the former opening into the atmosphere when turned in one direction, and means for operating said valves simultaneously upon the raising and lowering of the said piston.

5. An hydraulic press comprising a main cylinder provided with interior cylindrical chambers of different diameters, pistons slidably mounted in said chambers, a pipe connecting the lower chamber, beneath the piston mounted therein, with a pump, a two-way and a one-way valve mounted in said pipe, means for operating said valves simultaneously upon the raising and lowering of said piston and a manually operated valve, also mounted in said pipe at a point between the one-way valve and the pump.

6. An hydraulic press comprising a main cylinder provided with three interior cylindrical chambers of different diameters, pistons slidably mounted in said chambers, a pipe connecting the lower chamber, beneath the piston mounted therein, with a pump, valves mounted in said pipe, means connected with the said piston for operating said valves upon its upward and downward strokes, a pipe connecting the next smaller chamber at a point beneath the piston mounted therein, with the pump and a manually operated valve mounted in said pipe.

In testimony whereof I affix my signature.

JAMES N. WOOD.