

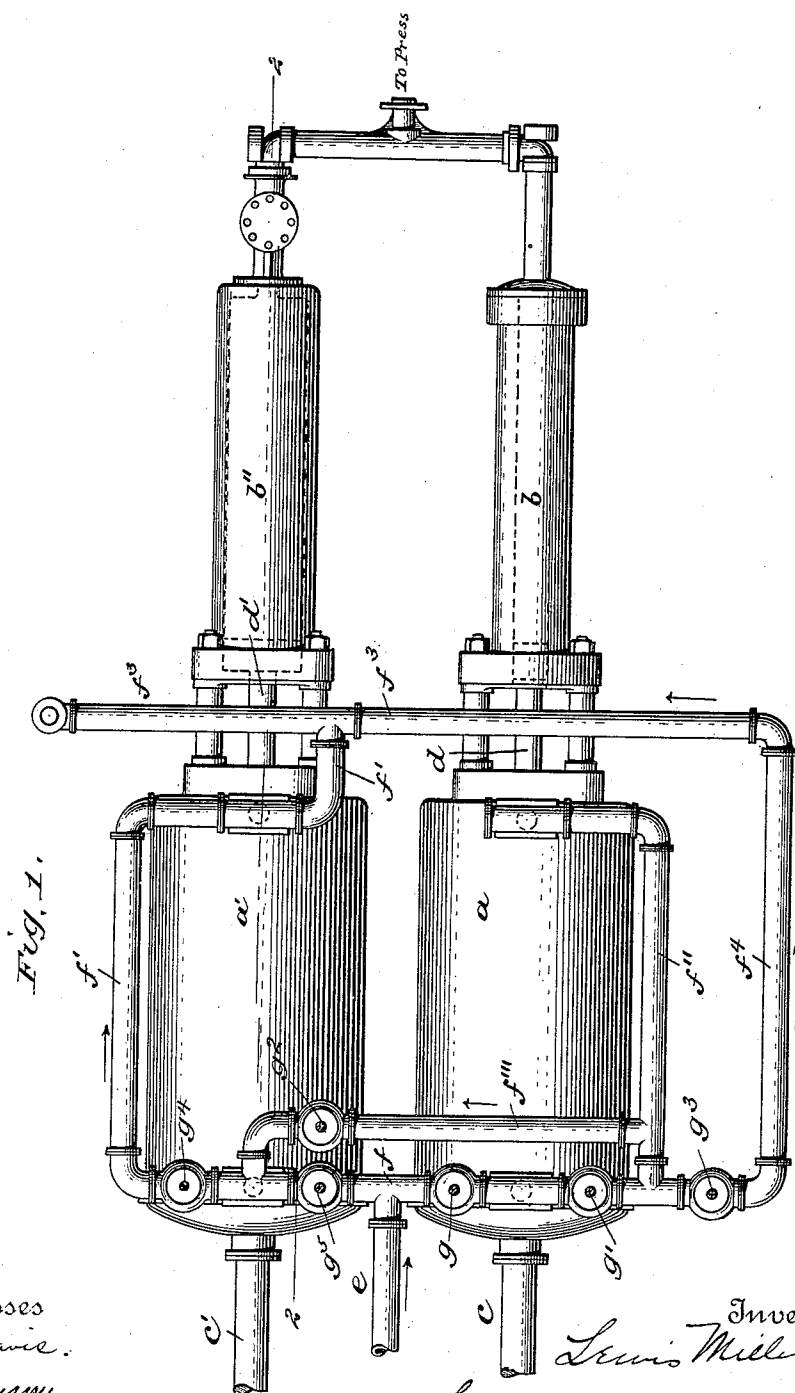
(No Model.)

2 Sheets—Sheet 1.

L. MILLER.
HYDRAULIC PRESS.

No. 466,175.

Patented Dec. 29, 1891.



Witnesses
W. R. Davis.
C. J. Lusk.

Inventor
Lewis Miller
By his Attorneys
Alexander Davis

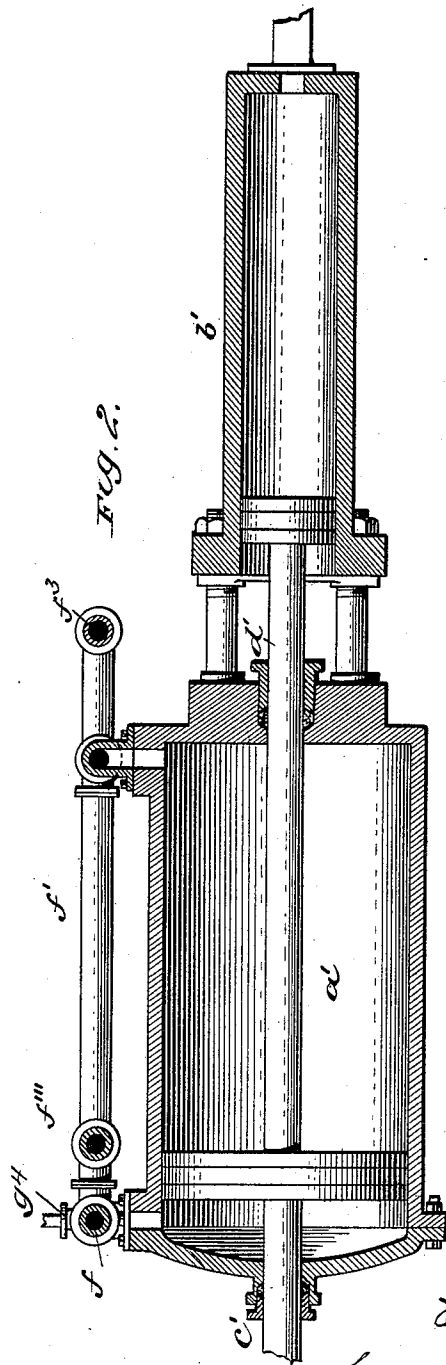
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UNITED STATES PATENT OFFICE.

LEWIS MILLER, OF PHILADELPHIA, PENNSYLVANIA.

HYDRAULIC PRESS.

SPECIFICATION forming part of Letters Patent No. 466,175, dated December 29, 1891.

Application filed July 29, 1891. Serial No. 401,052. (No model.)

To all whom it may concern:

Be it known that I, LEWIS MILLER, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Hydraulic Presses, of which the following is a specification, reference being had therein to the accompanying drawings.

Figure 1 represents a plan view of my improvements, the press being omitted; and Fig. 2, a vertical longitudinal sectional view of the low-pressure cylinder and ram, taken on the line 2 2, Fig. 1.

This invention has relation to certain improvements upon that class of hydraulic cotton-presses wherein two successively-operating steam-cylinders and rams are employed to force the pressing-liquid into the pressing-cylinders of the press, one of the cylinders—the low-pressure—being adapted to impart the initial light pressure to the bale and the other—the high-pressure cylinder—being adapted to impart the final heavy pressure thereto, a portion of the exhaust-steam from the high-pressure cylinder being utilized to operate the low-pressure piston. Previous to actual pressing operation the steam is let into the rear end of the high-pressure cylinder and serves to force its piston up to the forward end of the same. Then the same steam is conducted around to the forward end of the same cylinder in front of the piston, whereupon the piston is forced back to the rear end of the cylinder. Thus running the steam around in front of the high-pressure piston serves to thoroughly warm the interior of the cylinder so that the live steam let into it in the subsequent operations will not be unduly condensed thereby. When this preliminary operation is gone through, the press is ready for operation. When a bale is properly adjusted between the platens of the press, a portion of the steam confined in the forward end of the high-pressure cylinder is discharged behind the low-pressure piston and serves to force the same forward and impart the initial pressure to the bale, the steam in the two cylinders equalizing itself. The low-pressure piston remains at the forward end of its stroke, while the high-pressure piston is forced forward by live steam from the

boiler to complete the pressing of the bale by imparting thereto the final heavy pressure, the steam that remained in front of the high-pressure piston after filling the low-pressure cylinder being exhausted into the air. When the bale is tied, valves are opened to let the steam escape from behind the pistons, so that the pistons and rams may return for another operation, the live steam in the high-pressure cylinder being conducted around in front of its piston, as before, and there confined until discharged into the low-pressure cylinder, and the steam from the low-pressure cylinder being exhausted into the air, cold air being admitted in front of the piston as the same recedes. One objection to such a press is that the large volume of cold air admitted in the forward end of the low-pressure cylinder to destroy the vacuum caused by the piston dropping back after each operation cools the cylinder and causes it to contract at its forward end and take a slightly-tapering form. Then when the low-pressure piston would be again forced forward great binding and friction would obviously result, thereby retarding the piston and preventing it moving as rapidly as it should. Another defect with the old plan of operating the press is that the plunger employed in the low-pressure ram-cylinder is a solid thick cylinder connected to the low-pressure piston and nearly fitting the interior of the ram-cylinder. This solid thick cylinder is objectionable for the reason that it not only so overheats the pressing-liquid, as to make it dangerous to work the press rapidly, but it also materially assists in contracting the forward end of the steam-cylinder every time it passes into the same, as will more fully hereinafter appear.

It is the design of the present invention to obviate the foregoing defects in this class of presses and not only render them capable of operating with a materially less quantity of fuel, but also enable them to be operated much faster than heretofore, as will presently appear.

In the drawings, *a a'* designate, respectively, the high and low pressure steam-cylinders, which have respectively connected to their forward ends the usual water-cylinders *b b'*, which latter are connected by the usual conduits to the press. Working in the steam-

cylinders are the usual pistons, which have attached to their rear sides the usual rods c c' , working through stuffing-boxes in the rear heads of the cylinders. Secured to the front sides of the pistons are piston-rods d d' , which work through stuffing-boxes in the front heads of the respective cylinders and are provided at their forward ends with pistons working in the respective water-cylinders b b' . The rear ends of the water-cylinders are open, as shown.

The live-steam pipe e connects about midway the length of a transverse pipe f , extending across and above the rear ends of the steam-cylinders, which latter pipe communicates with the interior of the cylinders, behind their pistons, by vertical branches. One end of the pipe f is connected to the forward end of the low-pressure cylinder and to the main exhaust-pipe f^3 by a pipe f' , and the other end of said pipe f is also connected by a branch f^4 to the main exhaust-pipe f^3 . Another pipe f'' connects the forward end of the high-pressure cylinder to the pipe f at a point to the right of where the same is connected to the high-pressure cylinder, and a transverse branch f''' of this pipe connects it to the pipe f at a point immediately over where it connects with the low-pressure cylinder.

Balanced valves of the ordinary construction are suitably placed in the above-mentioned steam-pipes, so that the steam may be directed in the desired course. I prefer the arrangement of valves shown, which is as follows: A valve g is placed in pipe f between the live-steam pipe e and the connection to cylinder a ; another valve g' in said pipe f between its connection with the cylinder a and the connection to pipe f'' ; another valve g^2 in branch pipe f''' . A valve g^3 is placed in pipe f^4 near where it communicates with pipe f'' , a valve g^4 is placed where pipe f' communicates with pipe f , and another valve g^5 is placed in pipe f between its connection with pipe e and the low-pressure cylinder.

Before commencing the actual pressing operations valve g is raised and a quantity of live steam let into the cylinder a , which advances the piston to the forward end of its stroke, when valve g is closed and valve g' opened, whereupon the steam behind said piston passes around in front of the same and permits the pressing-liquid in the water-cylinder and connections to force it back to its starting position. When the bale is placed between the press-platens, valve g^2 is opened and steam in the forward end of cylinder a is permitted to expand into the low-pressure cylinder until the pressure in both cylinders equalizes itself, the piston in the low-pressure cylinder being forced forward to make the initial pressure. When the low-pressure piston reaches the forward end of its stroke, it stops and valve g^2 is closed and valves g g^3 are temporarily opened, whereupon live steam is admitted behind the piston in cylinder a , forcing this piston forward

to impart the final heavy pressure to the bale, the steam that was left in the forward end of the cylinder a , after filling cylinder a' , escaping through valve g^3 and pipe f^4 to the main exhaust-pipe f^3 .

When the bale is bound ready for ejection, the pistons in the cylinders are permitted to run back ready for another operation by opening valves g^4 and g' , the former permitting the exhaust-steam to pass freely into the cylinder a' in front of its piston and exhaust-pipe f^3 and the latter (valve g') permitting its exhaust-steam to pass around in front of its piston ready for use in propelling the low-pressure piston on the next operation.

The valve g^5 is only employed when it is desired to admit live steam directly into the low-pressure cylinder.

The advantages of my present arrangement are obvious. Filling the forward part of the low-pressure cylinder with exhaust-steam prevents its interior being cooled off and contracted by the introduction of cold air therein, whereby all undue binding of the piston therein is avoided and the press is permitted to work rapidly with a minimum expenditure of fuel. The plan of admitting air into the low-pressure cylinder to destroy the vacuum as the piston recedes is seriously objectionable in all sizes of presses; but especially is it so with large presses, where the volume of air sucked in and expelled at every operation of the piston is very large. It is not only objectionable for the above reasons, but it is also objectionable because the drawing in and forcibly expelling of so large a quantity of air at each operation of the press materially retards the rapid movements of the piston, as is evident.

Using a comparatively small piston-rod and piston in the water-cylinder of the low-pressure ram instead of a large cylindrical plunger nearly fitting the cylinder, as heretofore used, is advantageous. After each pressing operation, it will be observed, the piston in the low-pressure cylinder recedes and draws the plunger into the cylinder, where it remains until the next bale is placed upon the press-platen, during which time it is exposed to the heat of the steam in the cylinder. It thus becomes nearly as hot as the steam itself, and therefore when forced into the water-cylinder again would impart its heat to the water therein. When the press is worked rapidly, (say seventy or eighty bales per hour,) this continual entrance of the large heated plunger into the pressing-liquid would soon raise its temperature sufficiently to vaporize it, when the press would have to be stopped and the water changed in order to avoid danger.

To avoid the foregoing difficulty I bore the water-cylinder out its full length leaving its rear end open, and use a piston therein, connecting said piston to the piston in the low-pressure cylinder by a comparatively small rod. In this way all heating of the pressing-

liquid is avoided, as it only comes in contact with the front side of the piston. This piston arrangement also avoids the trouble caused by contracting the forward end of the steam-cylinder by the entrance therein of the wet plunger.

By my improvements the low-pressure ram works quicker and easier. In actual practice it has been found that by my improvements the saving in fuel in pressing a given number of bales is over one-half, while there is an increase of about one-third in the speed of the press.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a hydraulic press, the combination of the high and low pressure steam-cylinders a and a' and their pistons, the water-cylinders connected to the steam-cylinders and having their rear ends open, pistons working in the water-cylinders and connected to the steam-pistons by piston-rod extending through stuffing-boxes in the front head of the steam-cylinders, a pipe f , extending across the rear ends of the steam-cylinders and connected therewith by branch pipes, a supply-pipe e , connected to the pipe f at a point between the steam-cylinder, a pipe f' , connecting one end of the pipe f to the front end of the low-pressure cylinder, connected exhaust-pipes $f^4 f^5$, connecting the other end of pipe f to the for-

ward end of pipe f' , a pipe f'' , connecting pipe f to the forward end of the high-pressure cylinder, a pipe f''' , connecting this pipe f'' to the pipe f near where it enters the low-pressure steam-cylinder, and valves arranged in said pipes, substantially as described.

2. The combination of the high-pressure and low-pressure cylinders and their water-cylinders and pistons, a steam-pipe f , extending across the rear ends of the cylinders and connecting therewith, a supply-pipe e , connected to said pipe f between the two cylinders, valves g g^3 in pipe f between entrance of the same into the two cylinders and the supply-pipe e , an exhaust-pipe f^3 , a valved pipe f'' , connecting one end of the pipe f to the forward end of the low-pressure cylinder and to the exhaust-pipe f^3 , a pipe f^4 , connecting the other end of pipe f to the exhaust-pipe f^3 , a pipe f'' , connecting pipe f to the forward end of the high-pressure cylinder, a valved pipe f''' , connecting pipe f'' to the pipe f near its entrance into the low-pressure cylinder, and valves $g' g^3$ in the pipe f on either side of pipe f'' , substantially as and for the purpose described.

In testimony whereof I affix my signature in presence of two witnesses.

LEWIS MILLER.

Witnesses:

E. T. ROBB,
L. M. NUGENT.