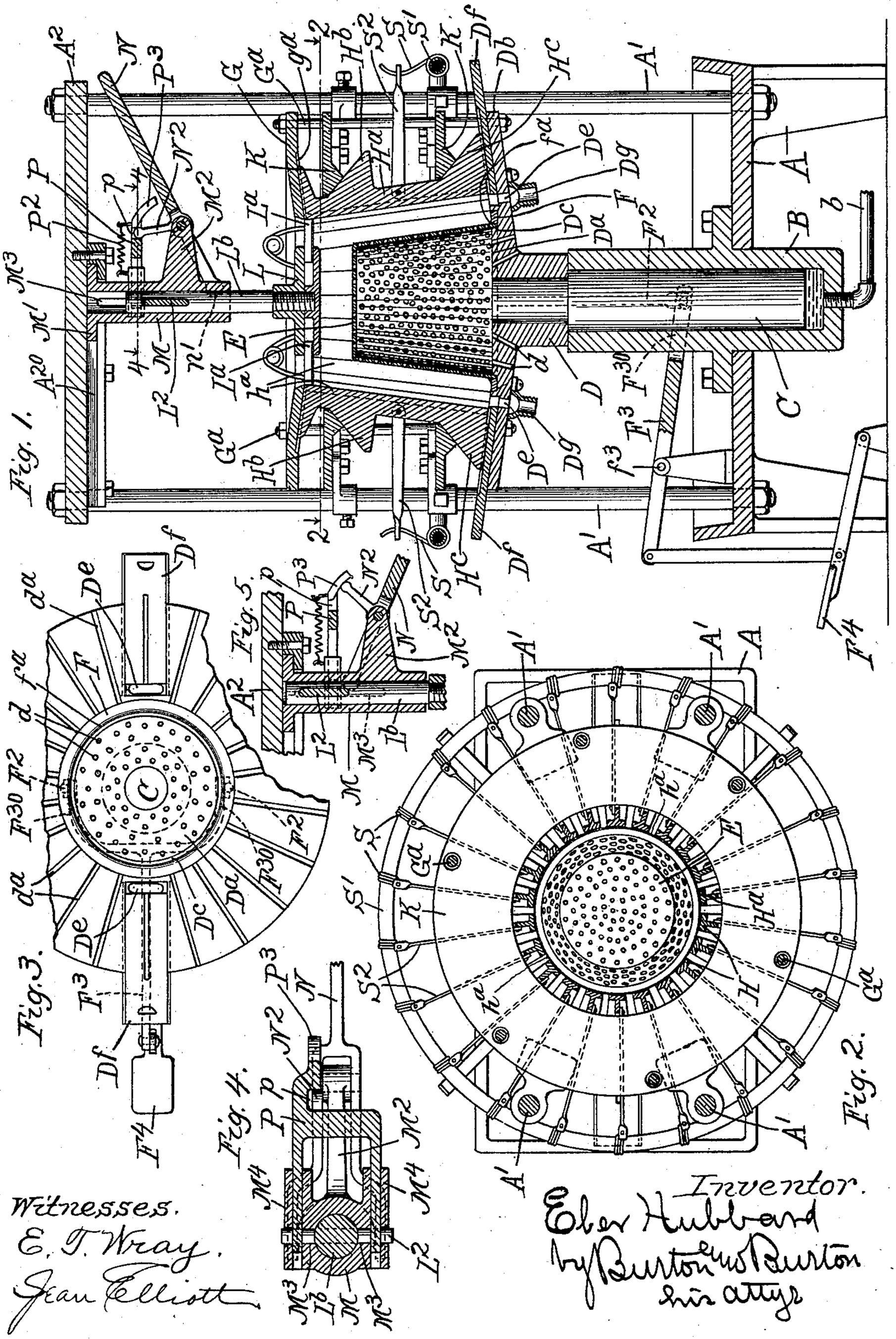
No. 671,517. Patented Apr. 9, 1901.

E. HUBBARD.

PULP MOLDING MACHINE.

(Application filed Nov. 22, 1897. Renewed Aug. 15, 1900.)

(No Model.)



Witnesses.
E. T. Wray.
Jean Elliott.

Inventor.
Eber Hubbard
by Burton & Burton
his attys

UNITED STATES PATENT OFFICE.

EBER HUBBARD, OF BERWYN, ILLINOIS, ASSIGNOR TO CHARLES S. BURTON, OF OAKPARK, ILLINOIS.

PULP-MOLDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 671,517, dated April 9, 1901.

Application filed November 22, 1897. Renewed August 15, 1900. Serial No. 27,116. (No model.)

To all whom it may concern:

Be it known that I, EBER HUBBARD, a citizen of the United States, residing at Berwyn, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Machines for Making Vessels from Fibrous Pulp, which are fully set forth in the following specification, reference being had to the accompanying drawings, forming a part thereof.

In the drawings, Figure 1 is a vertical section of my improved machine. Fig. 2 is a section at the line 2 2 on Fig. 1. Fig. 3 is a detail plan of the table with the outer jacket and inner form removed. Fig. 4 is a detail section at the line 4 4 on Fig. 1. Fig. 5 is a detail vertical section at the same plane as Fig. 1, showing the devices for withdrawing the head in the position occupied when it is thus withdrawn from the remainder of the form.

My improved machine is substantially a press which comprises the mold for forming the vessel, the mold constituting a chamber into which the pulp is pumped or otherwise fed, preferably at the bottom, and through whose walls the water is drained away, while the mold is condensed or reduced in exterior dimensions to compress to proper density the fibrous pulp which remains. I have represented the press as adapted to be operated by hydraulic pressure; but this is not essential.

A is a base or standard which supports the remainder of the structure.

B is the cylinder of a hydraulic ram, which is mounted at the center of the base A and supplied with water through the pipe *b*.

C is the ram. At its upper end it carries the table D, which is secured rigidly to said end. This table comprises a central circular portion which is flat or horizontal, as seen at D^a, and a peripheral annular portion which is inclined, so that as a whole the table is dished, concave upward. The inclined portion D^b is radially at right angles to the inclined sides of the form which is mounted on the table and corresponds to and produces the inclined sides of the vessel which is to be molded. The mold comprises the inner form E, which is perforated and constructed in other respects in the customary manner of inner forms for molds for vessels of fibrous pulp. This inner form rests in an annular groove D^c, formed in the table D at the margin of the flat portion D^a—that is, between said flat portion and the inclined portion D^b. The inner form E is accurately held in place by having at its lower end a diameter equal to the inner diameter of the annular groove D^c, so that it embraces closely the periphery of the flat portion D^a. The remainder of the groove D^c is occupied by an annular ring or collet F, which at its upper side and inner circumference terminates in a fin f^a, concave outwardly and having a feather-edge which bears and fits against the outer surface of the inner form E, so that the concave surface of the collet merges in the sloping surface of the inner form. The purpose of this collet is to cause the vessel to be molded with a rounded inner edge, as is customary and desirable, this edge being the upper inner edge of the vessel when completed. The table D is provided at the flat portion D^a with drainage-passages *d* in sufficient number to carry off the water which drains through the inner form. The outer jacket of the mold is made up of a series of staves H H H, &c., having their inner faces covered with thin metal h^a, which projects at one side and laps the corresponding face of the next stave, so that the jacket is adapted to be closed up by moving the staves inward radially or to be expanded by moving them outwardly. The staves are retained between the inclined annular portion D^b of the table D and an upper annular plate G, which is connected by rods or posts G^a G^a, &c., to the table D and made practically rigid with it. The upper face of the inclined portion D^b and the lower face of the annular plate G are provided with radial grooves d^a and g^a, respectively, in which the lower and upper ends of the radial ribs H^a of the staves H are seated and guided in the radial movement of the staves, which occurs in expanding and reducing the jacket. These ribs H^a have two inclined edges or cam-grades H^b and H^c near the upper and lower ends of the ribs, and these cam-grades are adapted to coöperate with the inclined under sides of the annular plates K K, which are rigidly secured to the posts A′ A′ of the principal frame and are

therefore fixed relatively to said frame. It will be seen that as the ram is advanced upward, carrying the table and the form thereon, the engagement of the cam-grades on the stave-ribs with the annular plates will cause the staves to be forced radially inward, reducing the jacket and compressing the contents.

For the purpose of closing the top of the form I employ a reducible and expansible head which comprises the center L and radial sections L^a, with lapping edges, all of which is fully shown in patents heretofore granted to me—as, for example, Patent No. 515,958, granted March 6, 1894; and it is unnecessary, therefore, to describe this head in detail more fully. Such head is secured to a vertical spindle or head L^b, which is guided in a sleeve M, in which it has sufficient range of movement to permit it to be lifted entirely above the plane of the plate G. The sleeve M is supported by the top plate A^2 of the press, and for this purpose it has a flange M′, which is engaged between and above the rabbeted bearings A^{20} A^{20}, which are secured to the top plate A^2, as seen in Fig. 1. For raising and lowering the head I provide a lever N, fulcrumed on a bracket M^2, which projects from the sleeve M. The lever N is forked, the two branches extending one upon each side of the sleeve, and the spindle L^b is provided with a cross-bar L^2, which protrudes at both sides through suitable slots M^3 in the sleeve M, and the ends of the fork-arms of the lever N are adapted to engage under the lower edges of the oppositely-projecting ends of this cross-bar L^2, and thereby to lift the head, the weight of which is sufficient to insure its descent at proper time and manner. In order to secure the head positively in its lowered position, as is necessary in order to make the form-mold tight while it is being filled and closed to compress the vessel, I employ a forked or double-armed locking-bolt P, which is provided with horizontal slide-bearings M^4 M^4 at opposite sides of the sleeve M, at such position that the fork-arms of the bolt may be shot in above the upper edges of the cross-bar L^2 when the latter is at its lowest position—that is, when the head is in position to close up the mold. To withdraw this bolt when the head should be lifted, I provide the lever-arm N with a finger N^2, which engages the notch p in the bolt P, and I cause this finger to extend at such angle to the inner end portion of the lever that the said inner end, which engages the cross-bar L^2 to lift the head, shall stand some distance below said lower edge when the lever is lifted at its outer end to the position necessary to cause the finger N^2 to let the bolt P into locking position. When the operator desires to lift the head to open the mold, the lever N, being depressed at the outer end, first causes its finger N^2 to withdraw the bolt P, and by the time it is withdrawn the inner lever N has encountered the lower edge of the cross-bar L^2 and begins to lift the head. I form the inner ends of the fork-arms of the lever N with knob-like terminals, as seen at n', and the length of the fork-arms from the fork of the lever is such that when the head L is lifted by the lever to the position at which it is clear of the plate G, which is the highest position to which it is necessary to raise it, the knob ends of the fork-arms have come to the position shown in Fig. 5, where the lever acts as a lock to hold the head elevated—that is, the downward pressure exerted at the point of contact of the lower edge of the cross-bar L^2 with the knob ends of the fork-arms of the lever N operates substantially at the end of a radius of the knob, which is in a line which, produced, would pass through the fork of the lever, so that the weight does not tend to swing the lever. A spring P^2 may be provided to throw the bolt P into locking position; but such spring may be omitted. In order to avoid giving the bolt an unnecessary range of movement in withdrawing it, I construct its outer end with a tail P^3, against which the end of the finger N^2 travels after the bolt is withdrawn to unlocking position, the under side of this tail being curved, so that it stands concentric with the lever when the bolt is withdrawn to unlocked position, as seen in Fig. 5.

The pulp is supplied through ports D^e D^e in the annular portion D^b of the table just outside the collet F, and slide-valves D^f D^f are provided to close these ports after the mold is filled with liquid pulp. D^g D^g represent terminals of pipes by which the pulp may be fed in through these ports. The lateral compression due to the closing up of the staves as the entire mold is lifted would be made equal to the vertical compression which the bottom of the vessel formed at the top of the mold experiences by making the cam-grades H^b H^c inclined at an angle of forty-five degrees to the vertical movement if said staves in that movement were guided in horizontal tracks. Inasmuch, however, as they are guided in tracks which are inclined downward toward the axis, so as to produce the lateral pressure in lines at right angles to the inclined walls of the vessel, this downward inclination operates with the same tendency as the slope of the cam-grades—that is, with a tendency to resist the inward movement—and the slope therefore of the cam-grades may be more precipitous than forty-five degrees to an extent which is compensated by the inclination of the tracks in which the stave-ribs are guided, thus making the cam movement or movement which produces lateral compression easier than it would otherwise be and at the same time affording special advantage in the resulting structure of the vessel, because the sides are compressed directly at right angles to their surfaces instead of in a direction oblique to those surfaces.

When the pail is suitably compressed, the operator lifting the head by means of the le-

ver N to a position where it is clear of the annular plate G, the lever being for that purpose moved to the position shown in Fig. 5, and locking it in that position is able to slide it laterally, the sleeve M′ traveling in the slide-bearings A^{20}. The head being thus moved entirely out of the way of the mold the latter is lowered to original position, and in this movement the staves are withdrawn radially by means of the springs S S S, &c., mounted on the ring S′ and engaging the links S^2, which extend to the staves, respectively. The mold being thus opened and the molded vessel being freed from the outer jacket, such vessel may be lifted out by the operator. To facilitate this, however, is one purpose of the collet F, which is provided with rods F^2 F^2, extending down through the table D and connected at their lower ends to the fork-arms F^{30} F^{30} of a lever F^3, which is fulcrumed at f^3 and connected to a pedal F^4, which the operator depresses to lift the vessel off the inner form E far enough so that the operator may readily take hold of it and lift it out of the mold.

I claim—

1. In a pulp-press for making tapering bodies from fibrous pulp, the combination of a jacket composed of a multiplicity of narrow lapping staves constructed and arranged to be moved inward to increase their lap to reduce the jacket; a head for closing up the mold at the lesser end; a support upon which the jacket rests adapted to close the larger end of the mold; said table being constructed with an outer annular portion sloping radially at right angles to the inclination of the sides of the body, throughout the entire circumference; and means for closing up the jacket by radial movement of its staves on said radially-sloping portion of the table.

2. In a press for molding tapering vessels from fibrous pulp, in combination with an inner perforated form and an outer jacket composed of a multiplicity of narrow lapping staves constructed and arranged to be moved inward radially to increase their lap to reduce the jacket, between which form and jacket the tapering sides of the vessel are molded and pressed; a head for closing up the mold at the end corresponding to the bottom of the vessel; and a table upon which the inner form and outer jacket rest; a head adapted to close the other end of the mold; said table being constructed with a portion which extends outward from the margin of the inner form throughout the entire circumference sloping radially at right angles to the inclination of the sides of the vessel; and means for closing up the outer jacket by radial movement of its staves on the sloping portion of the table.

3. In a press for molding bodies from fibrous pulp, in combination with a fixed frame, a mold structure comprising a head, and, except as to such head, constructed and arranged to be advanced bodily in an axial direction in the frame; means for reducing the lateral mold structure radially as it is advanced axially, and for causing the head to remain in position with respect to said lateral mold structure to keep the head end of the mold closed during radial reduction of said lateral structure; a carrier or holder for the head, with respect to which said head is axially movable, said carrier being laterally movable with respect to the fixed frame; and means for moving the head axially with respect to said carrier, and for subsequently moving the carrier laterally with respect to the frame.

4. In a pulp-press, the combination with a table having an outer annular portion sloped radially down toward the central portion, an annular head-plate having radial slope parallel to that of the annular sloping portion of the table; a head to close the central aperture in said annular head-plate; said table and head-plate having corresponding radial grooves facing each other; and a jacket composed of staves which are guided in said grooves and which have cam-grades inclined with respect to the axis of the jacket; a fixed frame, with respect to which the structure comprising said table, annular head-plate and jacket is adapted to be advanced axially, the head being adapted to be fixed with respect to the frame, and the annular plates K, K also fixed with respect to the frame and having sloping faces corresponding to the cam-grades and adapted to coöperate therewith to force the staves of the jacket radially inward as the table and jacket are advanced with respect to the fixed frame.

5. In a pulp-press, in combination with a table having an outer annular portion sloped radially down toward the central portion, an inner form supported on said central portion; an annular head-plate having radial slope parallel to said annular sloping portion of the table; a head to close the central aperture of said annular head-plate; said table and annular head-plate having corresponding radial grooves facing each other; an outer jacket, composed of staves which are guided in said grooves and which have cam-grades inclined with respect to the longitudinal axis of the jacket; a fixed frame with respect to which said mold structure, comprising the table, head-plate, inner form and outer jacket, is adapted to be advanced axially, the central head being fixed with respect to such frame; and the annular plates, K, K, also fixed with respect to such frame, and having sloping faces corresponding to the cam-grades, and adapted to coöperate therewith to force the staves radially inward as the mold structure is advanced with respect to the fixed frame.

6. In a press for molding bodies of fibrous pulp, in combination with a fixed frame; the mold structure comprising a head adapted to be fixed with respect to the frame; such mold structure, except such head, being adapted to be advanced axially in the frame; suitable means for reducing the mold structure radi-

ally as it is advanced; such fixed head being inserted within the lateral portions of the mold structure and adapted to be reduced radially by the reduction of the lateral mold structure; suitable means for advancing and withdrawing the latter; a carrier or holder for the fixed head with respect to which said head is axially movable; said carrier being laterally movable with respect to the fixed frame, and suitable means for moving the head axially with respect to the carrier and for subsequently moving the carrier laterally.

7. In combination substantially as set forth, the fixed frame and the head L; the sleeve M which constitutes a carrier for the head, and a horizontal guide-bearing for said carrier on the top plate of the frame; a suitable locking-bolt to secure the head at its most depressed position with respect to the carrier; a lever to elevate the head, and connections by which such lever operates the bolt to withdraw the same before the upward movement of the head commences.

Signed at Chicago, Illinois, November 13, 1897.

EBER HUBBARD.

Witnesses:
CHAS. S. BURTON,
JEAN ELLIOTT.