

E. W. NAYLOR.
MECHANISM FOR CONTROLLING THE OPERATION OF HYDRAULIC
PRESSES, SHEARS, &c.

No. 513,133.

Patented Jan. 23, 1894.

FIG. 2

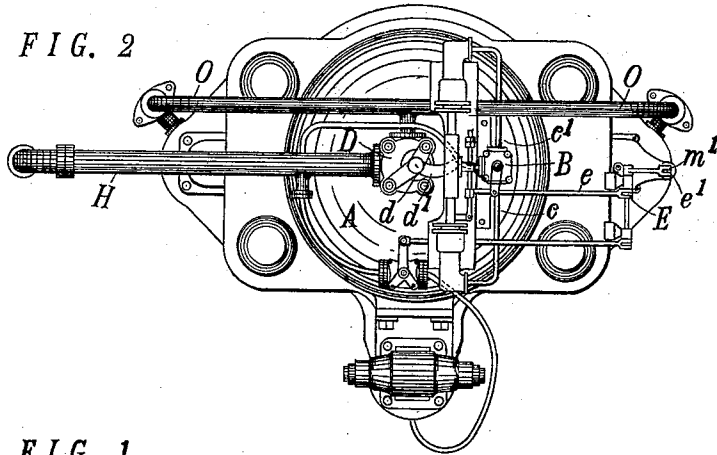
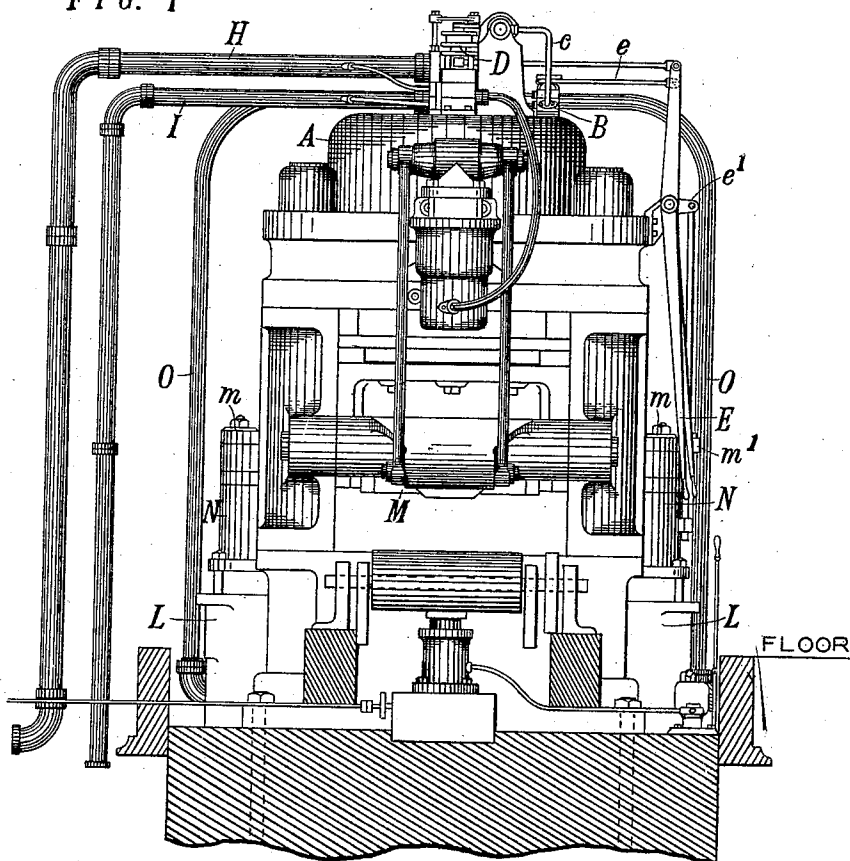


FIG. 1



WITNESSES.

A. Griswold

Emil Sless

INVENTOR.

Ernest W. Naylor

By E. L. Thurston

his attorney

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Fig 3.

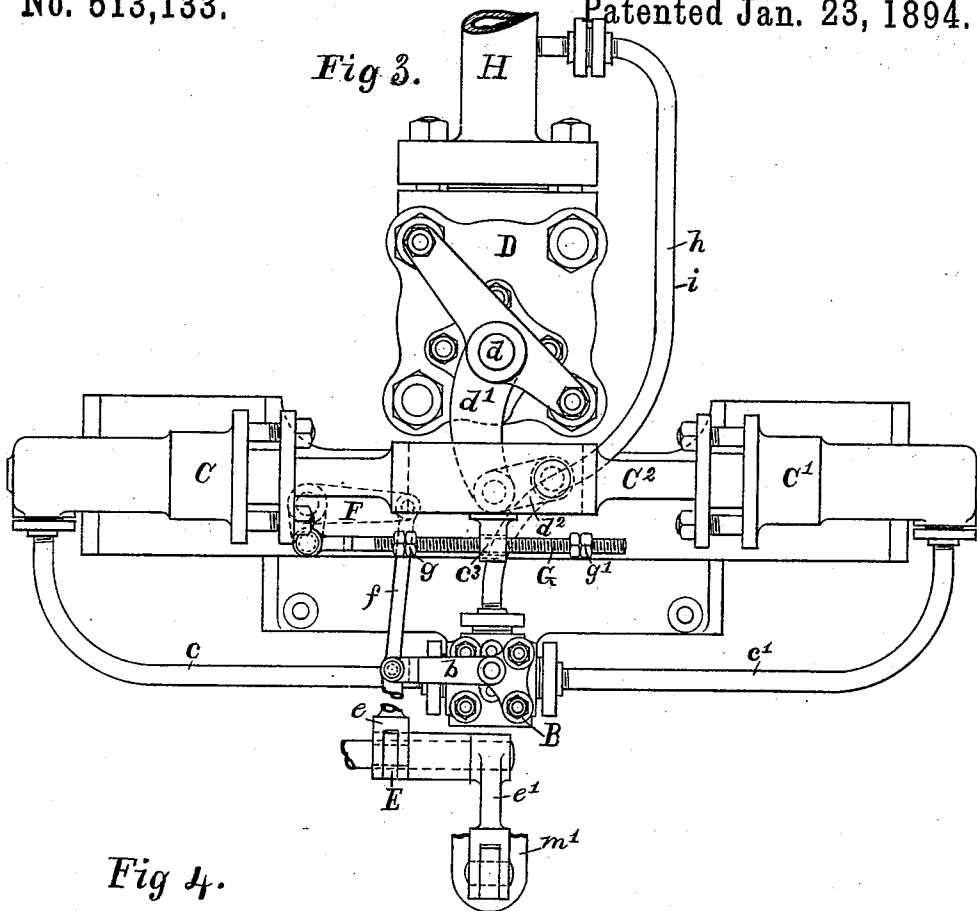
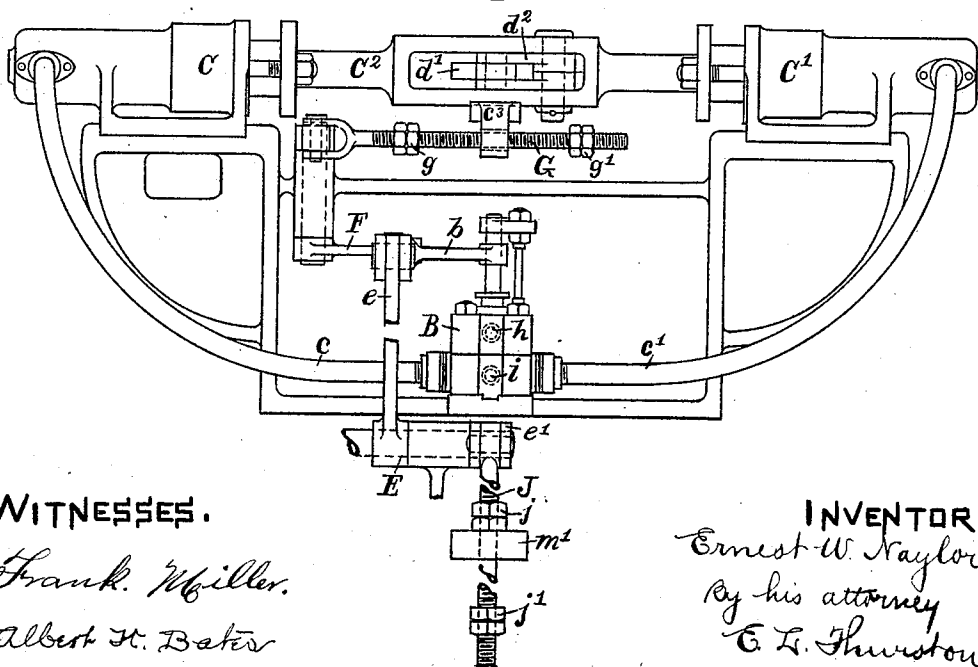


Fig 4.



WITNESSES.

Frank. Miller.

Albert H. Baker

INVENTOR.

Ernest W. Naylor
By his attorney
C. L. Thurston

UNITED STATES PATENT OFFICE.

ERNEST W. NAYLOR, OF CLEVELAND, OHIO.

MECHANISM FOR CONTROLLING THE OPERATION OF HYDRAULIC PRESSES, SHEARS, &c.

SPECIFICATION forming part of Letters Patent No. 513,133, dated January 23, 1894.

Application filed June 18, 1891. Serial No. 396,682. (No model.)

To all whom it may concern:

Be it known that I, ERNEST W. NAYLOR, a subject of the Queen of Great Britain, residing at the city of Cleveland, county of Cuyahoga, and State of Ohio, have invented certain new and useful Improvements in Mechanism for Controlling the Operation of Hydraulic Presses, Shears, &c., of which the following is a specification.

My invention relates to hydraulic shears, presses, punches, and like machines, which contain a reciprocating hydraulic ram to which is secured the punch, shearing knife, or die, as the case may be.

The principal object of my invention is to provide means whereby the movement of the said ram may be automatically controlled both with respect to the extent of its movement in both directions, and the rapidity of its movement in the direction which it moves in performing its work.

To this end my invention consists in the construction and combination of parts hereinafter described, as pointed out definitely in the claims.

In the drawings, Figure 1 is a front elevation of a hydraulic shearing machine having my invention applied thereto. Fig. 2 is a top plan view of the same. Fig. 3 is an enlarged top plan view of the pilot valve, mechanism for operating the same, and the mechanism for operating the main cylinder valve. Fig. 4 is an enlarged view of the same parts, viewed from the right hand side of the machine, as shown in Fig. 1.

Referring now to the parts by letter, A represents the main hydraulic cylinder, the ram of which protrudes from its lower end. This cylinder, and the other parts of the machine, are supported in their proper relation to each other by suitable frame work. To the lower end of the main ram is secured a cross-head M; and the die, shearing knife, or punch, as the case may be, is secured to this cross-head. On each side of the machine, the cross-head is provided with a projection *m* which extends beyond the frame work.

N N represent two vertically movable hydraulic rams which protrude from the tops of fixed cylinders L L, and engage the under sides of the projections *m m*, above referred to. The pipes O O, which are connected with

the cylinders L L, may be in open communication with the pressure column; or valves may be provided with which said pipes are connected with the pressure column when the main cylinder is connected with the exhaust column, and vice versa. When the main cylinder A is connected with exhaust column, the rams N N raise the cross-head M and main ram.

H represents the supply pipe, and I the exhaust pipe of the main cylinder.

D represents the main cylinder valve, which may be of any suitable construction with which said cylinders may be connected with the supply pipe or exhaust pipe, or be shut off from both. This valve is provided with a valve stem *d* to which is rigidly attached a crank arm *d'*. A link *d²* connects this arm *d'* with a reciprocating ram C², the ends of which enter the horizontal cylinders C' C, respectively, and said ram is moved to and fro, as hereinafter explained, by the pressure against its ends within said cylinders.

The admission of water to, and escape of water from the cylinders C' C respectively, is controlled by the pilot valve B. *c' c* represent pipes through which the water flows to and from said cylinders, and *h* and *i* represent pipes connected with the main supply pipe H and exhaust pipe I respectively. The pilot valve B occupies a position intermediate of said pipes *c' c* and *h* and *i*; and it may be of any suitable construction with which either one of the pipes *c c'* may be connected with the supply pipe *h*, while the other is connected with the exhaust pipe *i*; or both pipes may be disconnected from both of the pipes *h* and *i*. When the pilot valve is so turned that the pipe *c'* is connected with the pressure column, then the pipe *c* connects with the exhaust column, and the ram C² is forced out of the cylinder C' and into the cylinder C. When the pipe *c* is connected with the pressure column, and the pipe *c'* with the exhaust column, the ram C² is moved in the reverse direction. The movement of the ram C² is transmitted to the main valve D through the link *d²* and crank arm *d'*, and said valve is thereby turned to open the port from the supply pipe or to the exhaust pipe, as the case may be, depending upon the direction in which said ram is moving. When the pilot

valve is closed, the movement of the ram C² ceases and, consequently, the movement of the valve D ceases. The pilot valve B may be operated by hand by means of the lever E pivoted to the side of the frame, and connected with the arm *b*, on the valve stem of the pilot valve, by means of a link *e*.

It is desirable that the movements of the valves in the machines in which the main ram reciprocates in a fixed path, should be automatic in their action, so that the extent of the movement, as well as the rapidity of the movement of the main ram will be constant and regular.

The mechanism contained in the machine shown in the drawings, which controls the extent to which the main valve shall be opened in making the connection between the main cylinder and the pressure column, and consequently, controls the rapidity of the action of the main ram, consists of the following parts, to wit:—a bell-crank lever F pivoted on the top of the main cylinder; a link *f* connecting one arm of said lever with the arm *b* of the pilot valve; a tappet rod G pivotally connected with the other arm of said lever F and passing through an eye in a lug *c*³ rigidly connected with the ram C²; the tappets *g g'*, in the form of adjustable set nuts, which are secured to said tappet rod on opposite sides of the lug *c*³, and the connections, hereinbefore described, between the main valve and the ram C².

The mechanism shown by which the extent of the movement of the main ram in either direction is automatically controlled, consists of the following parts, to wit:—the angle-arm *e'* on the lever E; the lug *m'* projecting to one side from the cross-head M; the tappet rod J which is pivoted to said angle-arm *e'* and passes through an eye in said lug *m'*, and is provided with adjustable tappets in the form of the set nuts *j' j*; and the above described connections between the lever E and pilot valve, and between the ram C² and the valve B.

If we assume that the machine is stationary, with the main ram at its extreme of upward movement, it is started, and its action is automatically continued in the following manner: The lever E, is moved to the right, as shown in Fig. 1. In this movement, the tappet rod J is drawn upward by means of the angle-arm *e'*. The arm *b* of the pilot valve is moved upward, (as shown in Fig. 3,) thereby so turning the pilot valve that the cylinder C' is connected with the pressure column, and the cylinder C with the exhaust column. During this movement of the pilot valve, the lever F has been rocked and the tappet rod G thereby moved to the right, (as shown in Figs. 3 and 4.) The pressure in the cylinder C' causes the ram C² to move to the left, thereby opening the main valve D, and connecting the cylinder A with the pressure column. When this valve has been opened nearly wide enough to cause the main ram to move downward at the desired rate, the lug

*c*³ strikes the tappet nut *g* which has been previously adjusted into the proper position. This moves the tappet rod G, and rocks the lever F, thereby, through the link *f*, moving the arm *b* downward, (as shown in Fig. 3,) and closing the pilot valve, whereupon the ram C² and, by consequence, the valve D, stop their movements. The water entering the main cylinder from the pipe H causes its ram to descend until the lug *m'* strikes the tappet nut *j'* on the rod J. The rod J is thereby drawn downward. This downward movement of the rod J rocks the lever E, and thus, through the link *e*, draws the valve arm *b* farther down, (as shown in Fig. 3,) which turns the pilot valve into such position that the cylinder C is connected with the pressure column and the cylinder C' with the exhaust column. The ram C² is thus driven out of the cylinder C and into the cylinder C', which movement causes the movement of the main valve B. This movement of the main valve closes the inlet port and opens the exhaust port of the main cylinder, whereupon the rams N N lift the cross-head and the main ram to which it is attached. When the main valve has reached the above described position, the lug *c*³ strikes the tappet nut *g'*, thereby moving the rod G, lever F, and pilot valve until said valve is closed, whereupon the ram C² and valve D stop their movements. These parts remain in this position until the lug *m'* on the cross-head M in its upward movement, strikes the tappet nut *j* which causes the lever E to be rocked in the same manner and with the same results as when moved by hand, as hereinabove first described.

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

1. The combination of a main hydraulic cylinder, its valve, a supplemental hydraulic ram, and suitable connections between said valve and supplemental ram, with a pilot valve adapted to direct the pressure column against either end of said supplemental ram, a bell crank lever F, a link connecting one arm of said lever with the pilot valve, a tappet rod connected with the other arm of said lever, adjustable tappets on said rod, a lug on the supplemental ram adapted to engage with said tappets, whereby said tappet rod is moved, the pilot valve closed and the movement of the supplemental ram thereby stopped, substantially as set forth.

2. The combination of a main hydraulic cylinder, its valve, its ram, a supplemental hydraulic ram, and suitable mechanism connecting said valve and supplemental ram, with a pilot valve adapted to direct the pressure column against either end of the supplemental ram, a bell crank lever E *e*, a link connecting one arm thereof with the pilot valve, a tappet rod J connected with the other arm, adjustable tappets *j j'* on said tappet rod, and lugs on the main ram adapted to engage with said tappets whereby the pilot

valve is automatically opened, substantially as and for the purpose specified.

3. The combination of the main hydraulic cylinder, its ram, its valve with which it may
5 be put into communication with either the pressure or exhaust columns, a cross-head on the main ram, hydraulic cylinders in constant communication with the pressure column, and rams operating in said cylinders and en-
10 gaging with the said cross-head, with a ram suitably connected with said valve, supplemental cylinders in which said ram operates, a pilot valve adapted to direct the pressure column against one end or the other of said
15 ram, a lever for operating said pilot valve, and a tappet rod adapted to engage with said cross-head, whereby said lever is operated, substantially as and for the purpose specified.

4. The combination of a hydraulic cylinder, its ram, and its valve, with a supplemental hydraulic ram, suitable connections

between said supplemental ram and main valve, a pilot valve adapted to direct the water column against either end of said supplemental ram, a bell-crank lever F, a link *f* 25 connecting one arm thereof with an arm on the pilot valve, a tappet rod G secured to the other arm by said lever, having adjustable tappet nuts *g g'* thereon, a lug *c³* on the supplemental ram arranged between said tappet 30 nuts, a bell-crank lever *e'*, a link *e* connecting one arm thereof with an arm of the pilot valve, a tappet rod J secured to the other arm of said lever, adjustable tappet nuts *j j'* on said rod, and a lug *m'* attached to the main 35 ram and adapted to engage said tappet nuts, substantially as and for the purpose specified.

ERNEST W. NAYLOR.

Witnesses:

HAROLD SMITH,
E. L. THURSTON.