

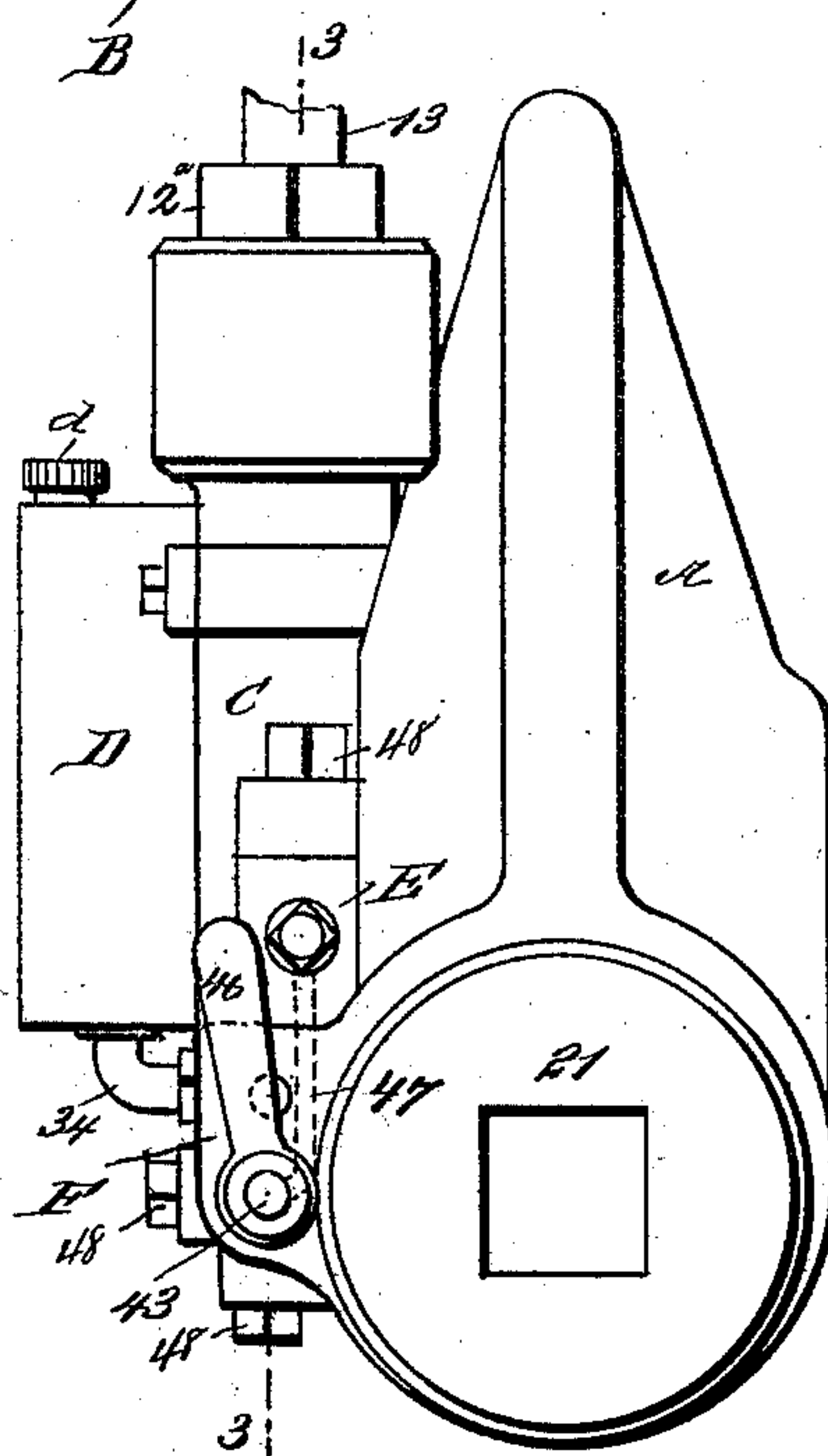
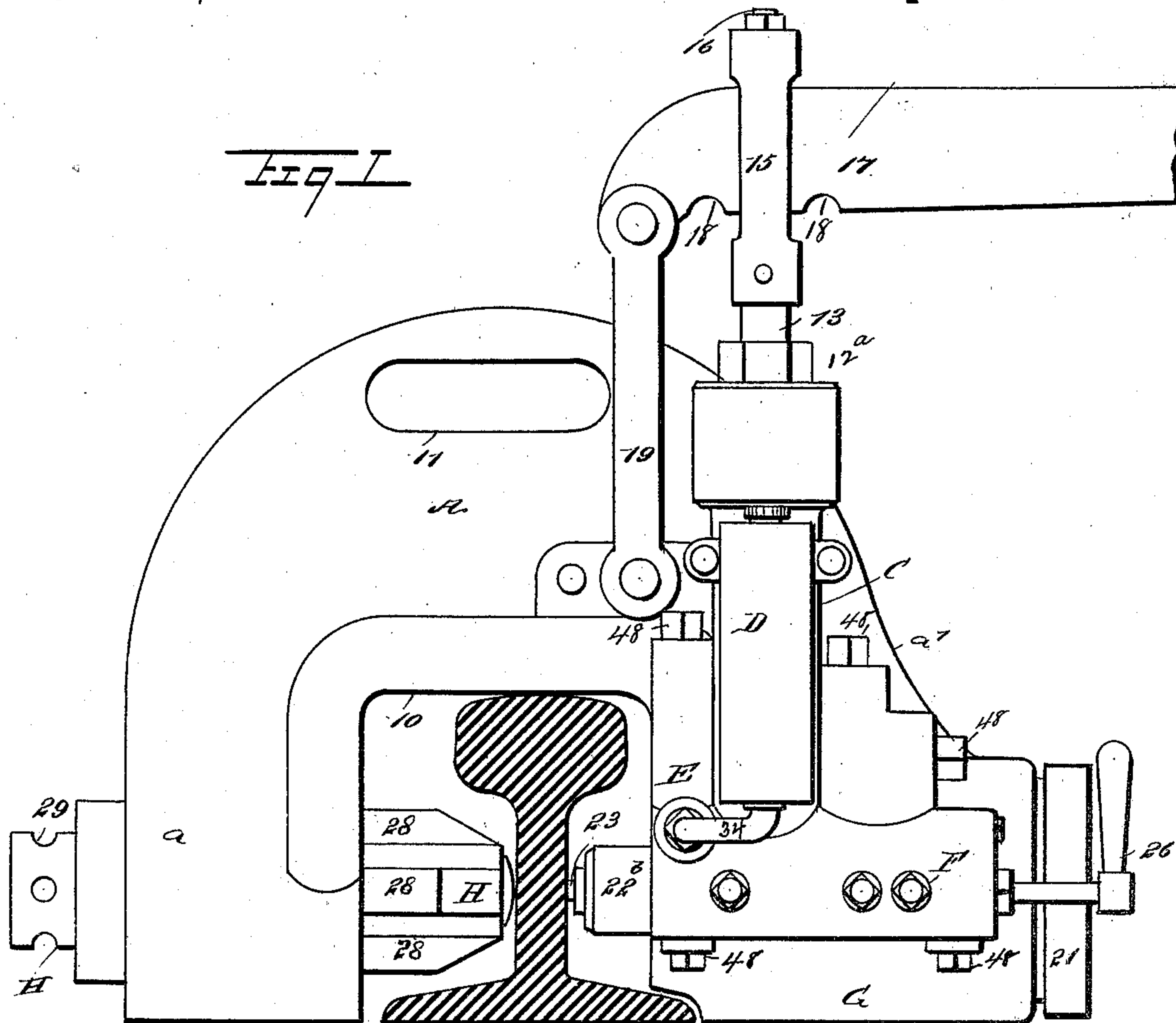
(No Model.)

2 Sheets—Sheet 1.

E. B. CORNELL,  
PORTABLE HYDRAULIC PUNCH.

No. 545,777.

Patented Sept. 3, 1895.



WITNESSES:

H. Walker  
J. H. Acker

INVENTOR

E. B. Cornell  
BY  
Munn & Co  
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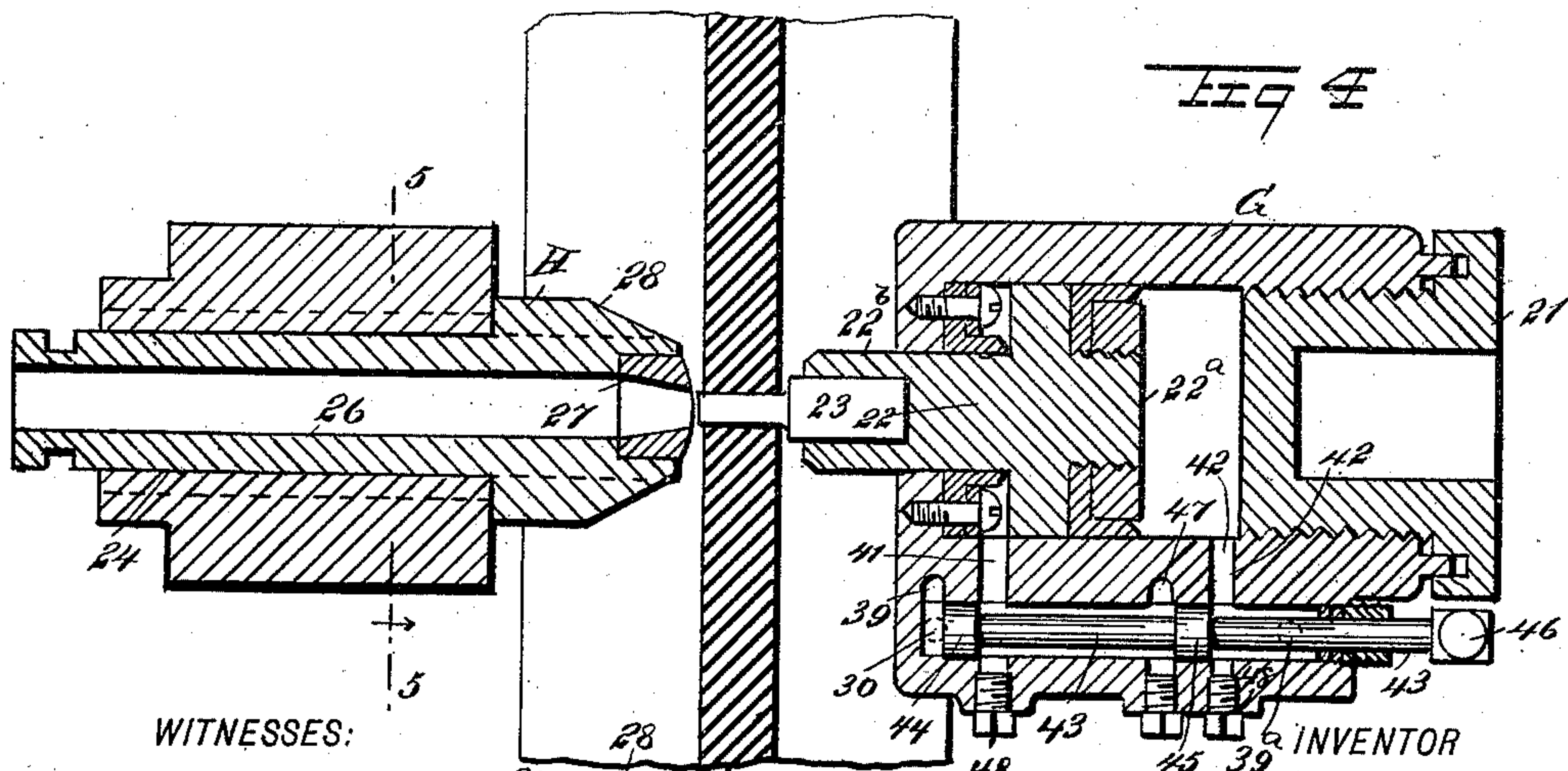
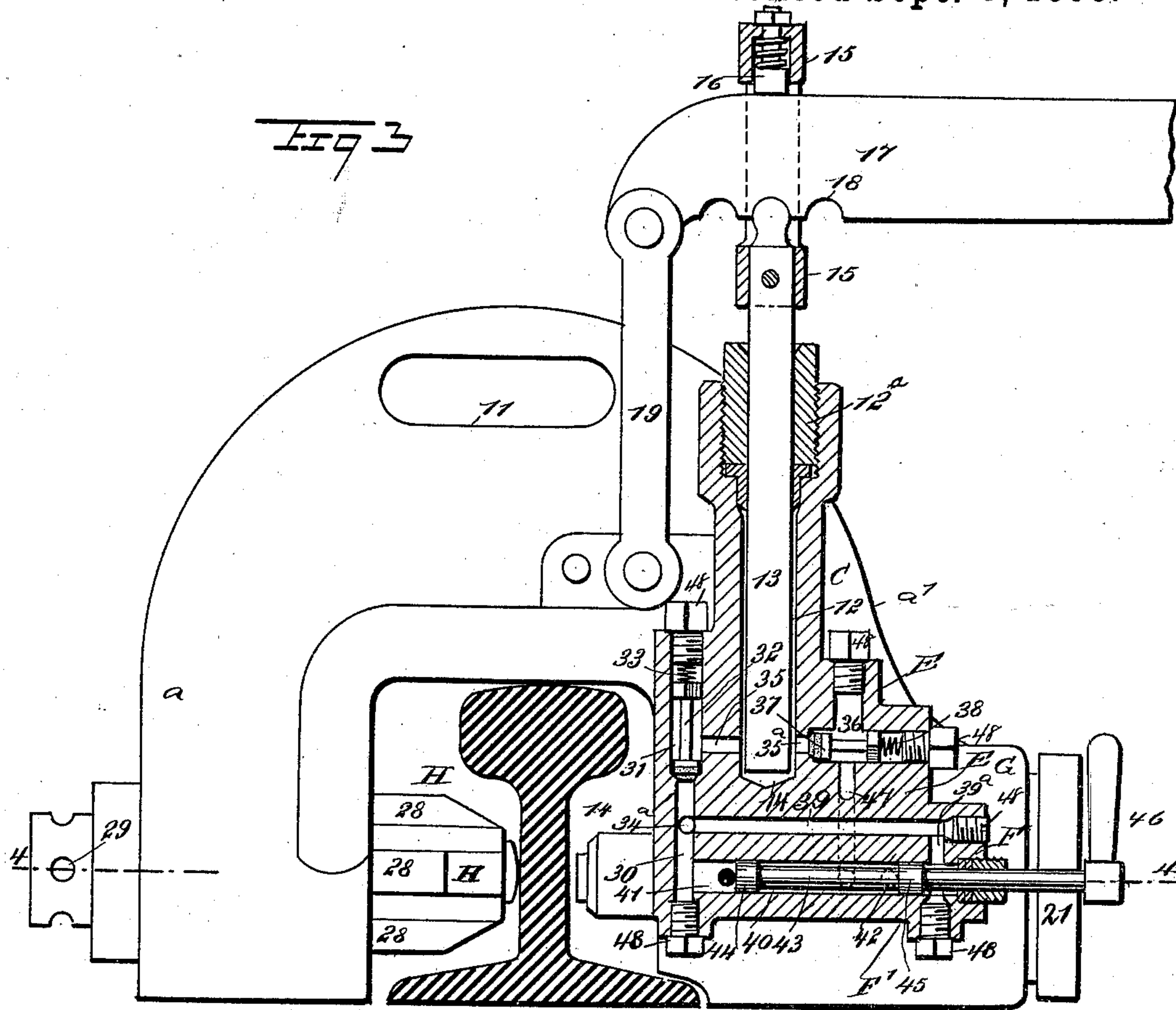
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E. B. CORNELL.  
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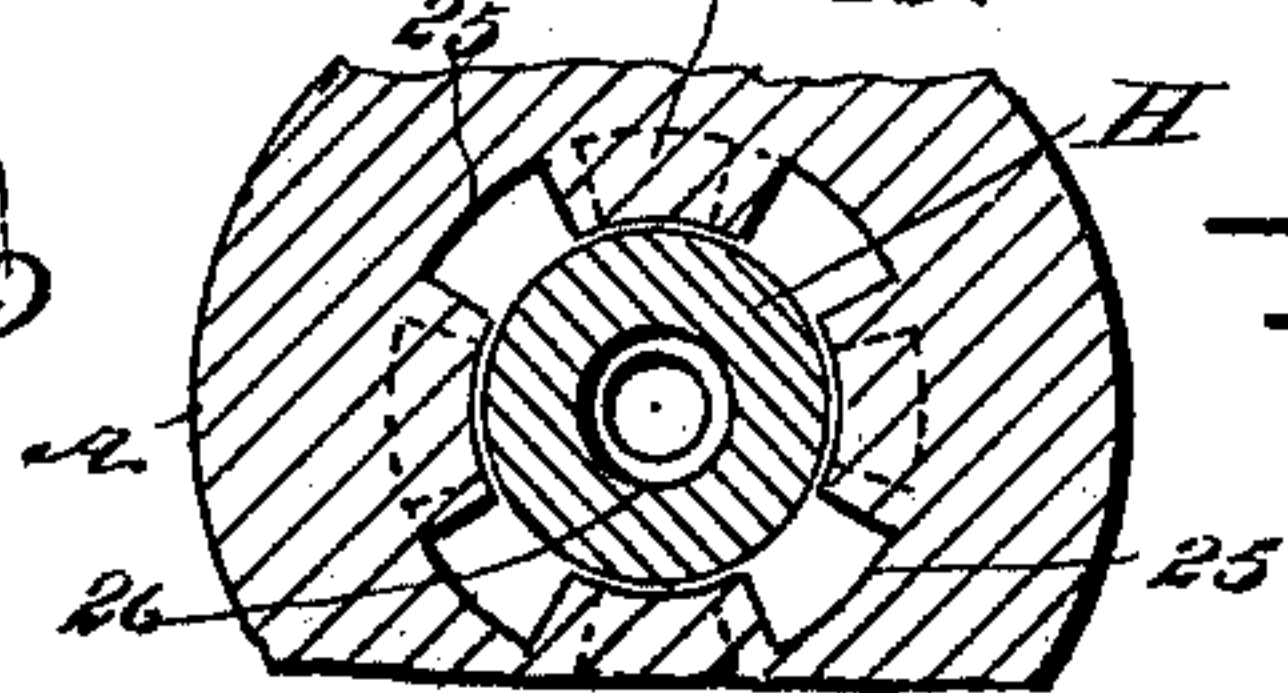
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# UNITED STATES PATENT OFFICE.

ELIJAH BEANS CORNELL, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR  
OF FIVE-SIXTHS TO SAMUEL T. KERR, SMITH HARPER, AND FRANCIS  
ASBURY, OF SAME PLACE, AND WILSON B. SOLLIDAY AND AUGUSTUS  
H. R. GUILLEY, OF SOUTH EASTON, PENNSYLVANIA.

## PORTABLE HYDRAULIC PUNCH.

SPECIFICATION forming part of Letters Patent No. 545,777, dated September 3, 1895.

Application filed December 3, 1894. Serial No. 530,686. (No model.)

*To all whom it may concern:*

Be it known that I, ELIJAH BEANS CORNELL, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and Improved Portable Hydraulic Punch, of which the following is a full, clear, and exact description.

My invention relates to a portable hydraulic punch especially adapted for use in producing apertures or openings in the webs of railway-rails, or in metal beams or plates of any description, being likewise adapted for use in structural, architectural, bridge, and other iron work.

The object of this invention is to provide a portable machine in which the punch will be not only hydraulically forced through the metal, but which will be likewise hydraulically withdrawn therefrom, the operation of withdrawal being accomplished in as expeditious and convenient a manner as the operation of punching.

A further object of this invention is to improve upon the construction of the punch for which application for Letters Patent was filed by me December 2, 1893, Serial No. 492,568.

The invention consists in the novel construction and combination of the several parts, as will be hereinafter fully set forth, and pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar figures and letters of reference indicate corresponding parts in all the views.

Figure 1 is a side elevation of the improved punch, illustrating a rail in section to be operated upon. Fig. 2 is an end view of the punch. Fig. 3 is a section taken substantially on the line 3 3 of Fig. 2. Fig. 4 is a horizontal section taken substantially on the line 4 4 of Fig. 3; and Fig. 5 is a transverse section taken through the die-stock and its bed, the said section being taken substantially on the line 5 5 of Fig. 4.

In carrying out the invention what may be termed the "frame A" of the punch is shaped substantially as an inverted U, the limbs be-

ing designated, respectively, as *a* and *a'*. Under this formation a recess 10 is provided, adapted to receive the rail B or other article to be operated upon. In the bow-section of the frame a hand-hole 11 is ordinarily produced, whereby the machine may be carried by hand from place to place in a convenient manner.

The main cylinder C is preferably formed upon one face of the limb *a'* of the frame, and upon the same face, forming ordinarily a portion of the said cylinder, a valve-box E is produced, and immediately below this valve-box a valve-chest F is constructed, while ordinarily upon the outer face of the cylinder C a reservoir D is bolted or otherwise permanently secured. In the lower portion of the said limb *a'* a plunger-cylinder G is constructed, the said plunger-cylinder being alongside of the valve-chest F, as shown in Figs. 3 and 4. The bore 12 of the main or pumping cylinder C is made to extend down a predetermined distance in the valve-box E, as shown in Fig. 3, and the said bore, below its gland 12<sup>a</sup>, is of greater diameter than that of the piston 13, and the depth of the bore is such that when the piston is in its lowest position a space 14 will remain between the bottom of the bore and the bottom of the piston, as is likewise shown in Fig. 3. A yoke 15 is secured to the upper or outer end of the piston 13, and this yoke carries in its upper or bow portion a spring-controlled pin or bolt 16, and this bolt or pin has bearing upon the upper edge of a lever 17, having multiple recesses 18 produced in its under face to receive the upper end of the piston 13, whereby the leverage on the piston may be changed, and to that end the inner extremity of the lever 17 is pivotally connected with the frame A through the medium of links 19.

The outer end of the plunger-cylinder G is closed, preferably through the medium of a screw-cap 21, provided with a polygonal opening, in order that it may be manipulated by a suitably-formed wrench. The plunger 22, which is located in the said cylinder G, comprises a head 22<sup>a</sup>, adapted to have movement



within the cylinder, and a stem 22<sup>b</sup>, which extends out through an opening provided for that purpose in the inner end of the said cylinder, as shown in Fig. 4. The outer end of the stem of the said plunger is provided with a socket which receives a punch 23, and in the limb  $\alpha$  of the frame, immediately opposite the stem of the plunger 22, a bearing 24 is provided for a die-stock H, and the inner wall of the bearing 24 is provided with a series of longitudinal grooves or channels 25, as shown best in Fig. 5. The main body of the die-stock H is of such diameter as to neatly fit into the bearing 24, and the said die-stock is provided with a bore 26, extending through from end to end, the inner end of the bore being made to receive a die 27, which in its turn receives the punchings produced by the punch 23 and also the end of the punch, when necessary.

In order that the die-stock shall be locked in its bearing in a convenient and expeditious manner, the inner end of the die-stock has a series of wings 28 produced longitudinally thereon, the wings being of a size and shape to enable them to readily pass through the grooves 25 in the bearing, and they are fitted in these grooves when the die-stock is to be placed in position in the frame. After the stock is in place it is given a partial turn, which will cause its wings 28 to register with the ungrooved under wall of its bearing, and the stock is readily removed by producing in its outer end openings 29, into which a pin, bar, or suitable tool may be introduced to form a handle. A vertical port 30 is made in the valve-chest F at or near its inner end, as shown best in Fig. 3, and the said port leads to and connects with a valve-chamber 31, produced in like manner in the valve-box E, as shown in the same figure. The valve 32, located in the chamber, and which valve is a suction-valve, is normally held in its seat by a spring 33 bearing constantly upon its upper end. A reservoir D is adapted to contain the liquid employed, and it is filled through the medium of an opening in its top closed by a cap  $d$ . A pipe 34 is connected with the bottom of the said reservoir and leads into the valve-chest, as shown in Figs. 1 and 2, and the port 34<sup>a</sup>, with which it communicates in the valve-chest, is at right angles to the inlet-port 30, and the blind end of this port 34<sup>a</sup> is shown in Fig. 3. A port 35 leads from the suction-valve chamber 31 into the main cylinder C, near the bottom thereof, and a corresponding port 35<sup>a</sup> leads out from the said main or pumping cylinder C into a valve-chamber 36, in which a discharge-valve 37 is located, normally seated by means of a spring 38. The valve-chamber 36 is at right angles to the valve-chamber 31, and beneath both of these chambers, and likewise beneath the pump or main cylinder C, a port or channel 39 is produced horizontally in the valve-chest F, and this port or channel communicates at its inner end with the inlet port or channel 30, as shown

in Fig. 3. At its outer end the port or channel 39 communicates by means of a short channel 39<sup>a</sup> with the bore 40 of what may be termed a "cylinder" F', formed in the lower portion of the valve-chest, the latter cylinder being adapted as a reversing-cylinder. The reversing-cylinder F' is provided with two ports 41 and 42 in communication with its bore, so placed that one of them will enter the back portion of the plunger-cylinder G and the other the forward or inner portion, as shown in Fig. 4. A piston 43 is held to slide in the bore 40 of the reversing-cylinder F', the said piston being provided with two heads 44 and 45, so spaced with relation to the ports or channels 41 and 42, communicating with the plunger-cylinder, that when one of these ports or channels is in use in supplying the plunger-cylinder the other port or channel will be acting as a discharge, being cut off from communication with the pump. Both of these ports 41 and 42 are in communication with the source of supply and may be alternately brought in communication with the pump. In this manner a perfect circulation is obtained, and the punching mechanism is hydraulically operated both in punching and in withdrawing the punch. The piston of the reversing-cylinder is operated through the medium of a handle 46, located at its outer end, as this piston extends beyond the outer end face of the valve-chest. Communication is established between the chamber of the discharge-valve and the reversing-cylinder between the heads of its piston, by means of a port or channel 47. (Shown in dotted lines in Fig. 2 and 3 and in section in Fig. 4.)

In the operation of this punch, the reservoir D, having been charged with liquid, the frame set in position over the beam to be punched, and the plunger 22 being in its inner position, the pump-piston 13 will be in its lower position, as shown in Fig. 3, and the piston of the reversing-cylinder will be in the position shown in the same figure, in which the port 42, communicating with the rear of the plunger 22, is in communication with the pump. When the lever 17 is lifted upward, the valve 32 will be drawn up by suction against the tension of its spring 33, and the liquid contained in the inlet 30 and fed thereto from the reservoir D will thereupon enter the suction-valve chamber 31 and fill the ports or channels 35 and 35<sup>a</sup> and likewise the pump-cylinder, it being understood, also, that at this time the liquid will also fill the horizontal discharge-channel 39 for the port 42, and that the liquid will also be in front of the inner head 44 of the reversing-piston. Now, upon the downstroke of the lever 17 the suction-valve will seat itself, the liquid will be forced against the discharge-valve, the said valve will be opened, and the liquid will be forced from the discharge-valve chamber, through the channel or port 47, into the reversing-cylinder between the heads 44 and



45, and will enter under pressure the plunger-cylinder G at the rear of the plunger, passing through the port 42, and said plunger will be forced outward and the punch carried through the article to be operated upon. The liquid that was in front of the plunger 22 will have escaped through the port 41 and the open inner end of the reversing-cylinder into the inlet 30, from whence it will be forced back into the reservoir.

In order to hydraulically withdraw the punch from the metal, the reversing-piston 43 is pushed inward to the position shown in Fig. 4, and the port 41 will now be placed in communication with the discharge-valve chamber, since it will be between the heads 44 and 45 of the said reversing-cylinder, and the port 42, communicating with the plunger-cylinder at the rear of the plunger, will be in communication, through the medium of the channels 39<sup>a</sup> and 39, with the inlet, and consequently with the reservoir, while communication with the discharge-valve chamber will have been cut off.

Upon moving the lever 17 upward the same action will take place as heretofore stated, and upon the downward movement of the lever the liquid will be forced into and from the discharge-valve chamber through the channel 47 in the reversing-cylinder between the heads of its piston and through the port 41 to the front of the plunger 22, forcing said plunger inward, and the liquid at the back of the plunger will meantime escape, as heretofore stated, through the medium of the channels or ports 39 and 39<sup>a</sup> back to the reservoir.

The several passages or ports at their outer ends extend through to the exterior of the machine, and are normally closed at their outer ends by plugs 48, preferably threaded. Thus all valve-chambers to which such passages lead are accessible for making repairs without taking the punch or pump apart, and in addition to the punch being portable it is evident that all parts are accessible for repairs.

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

1. In a hydraulic punching machine or the like, the combination of a main cylinder, a piston therein, a link pivoted adjacent to the piston, a lever pivoted to the free end of the link and having a series of apertures in its under side, and a yoke mounted on the piston below its upper end and embracing said lever, the extremity of the piston being adapted to enter the recesses in the under side of the lever, substantially as set forth.

2. In a hydraulic punching machine, the combination of a reservoir, a pump having inlet and outlet ports provided with valves, a plunger cylinder having inlet and outlet ports and having its inlet connected to the reservoir, a plunger therein adapted to carry a punch, a reversing cylinder having ports connecting with the inlet and outlet ports of the plunger cylinder, a valve having a chamber adapted to connect alternately with said ports, said chamber having a connection with the outlet of the pump, a connection between said reversing cylinder and the reservoir, and also between the reversing cylinder and the inlet of the pump, substantially as set forth.

3. In a hydraulic punching machine or the like, the combination of a main cylinder, a piston therein a lever adjustably pivoted adjacent to the cylinder and having apertures in its under side, a yoke mounted on the piston embracing the lever, the extremity of the piston being adapted to enter the apertures in the under side of the lever, and a spring bolt mounted on the yoke and adapted to engage the upper face of the lever whereby the end of the piston is held in engagement with the apertures on the under side thereof, substantially as set forth.

ELIJAH BEANS CORNELL.

Witnesses:

THOMAS M. ROWLAND,  
A. HEATON MINNICK.