(No Model.) 3 Sheets—Sheet 1.

F. H. HARDMAN.

FEED MECHANISM FOR PUNCHING MACHINES.

No. 474,321. Patented May 3, 1892.

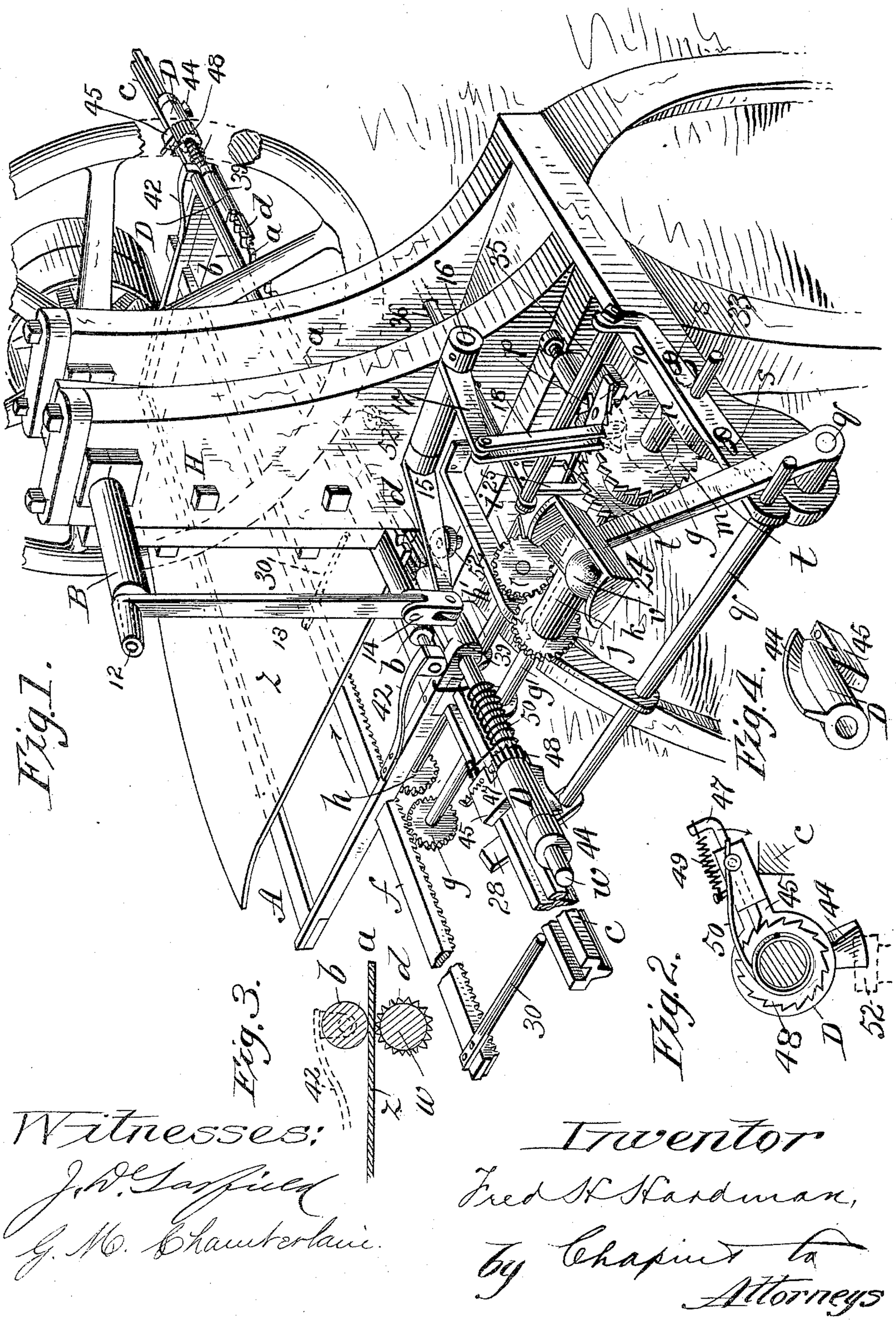


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Witnesses:
J. W. Sanford
G. M. Chamberlain.

Inventor
Fred H. Hardman,
by Chapin & Co
Attorneys

(No Model.) 3 Sheets—Sheet 2.

F. H. HARDMAN.

FEED MECHANISM FOR PUNCHING MACHINES.

No. 474,321. Patented May 3, 1892.

Fig. 5.

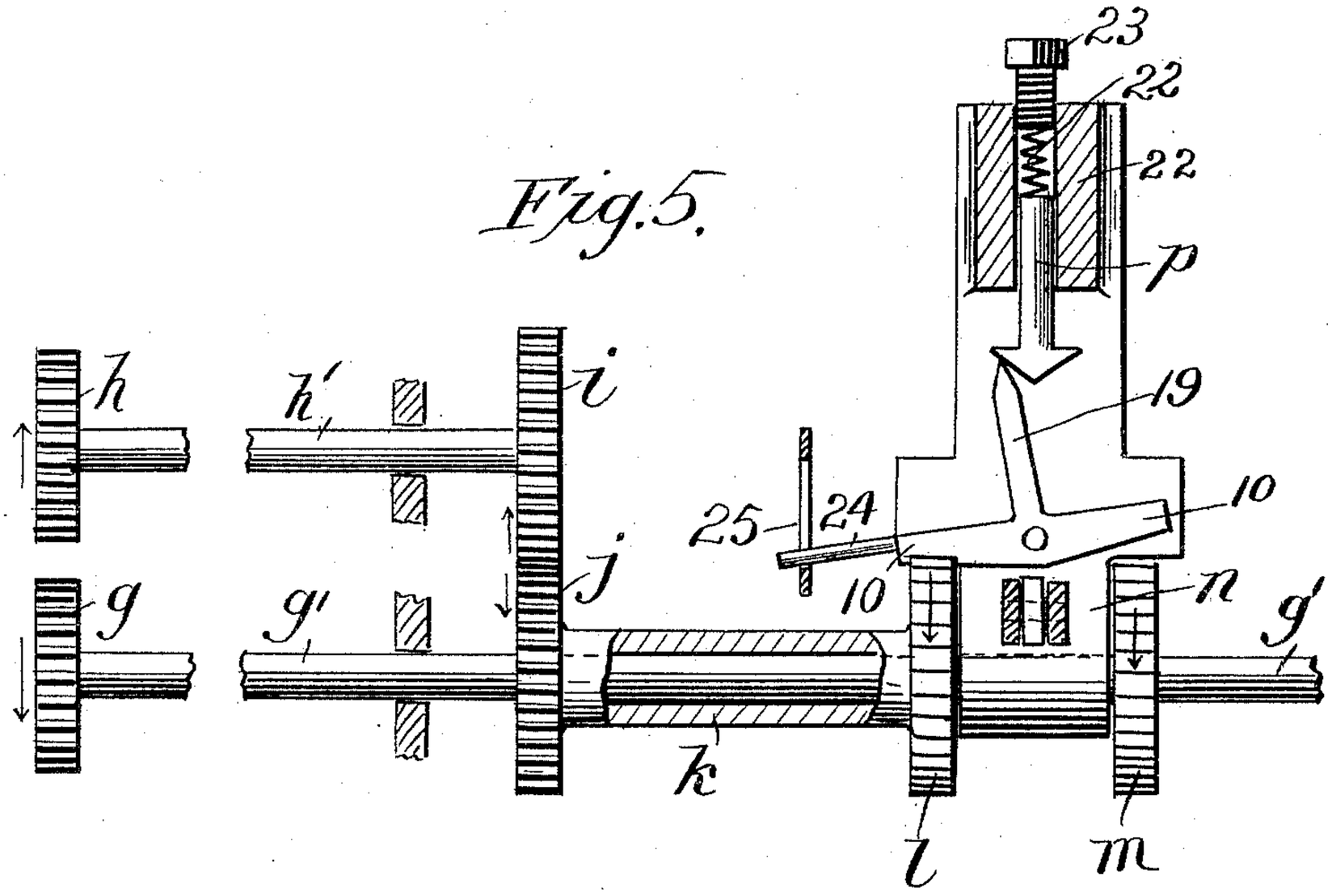
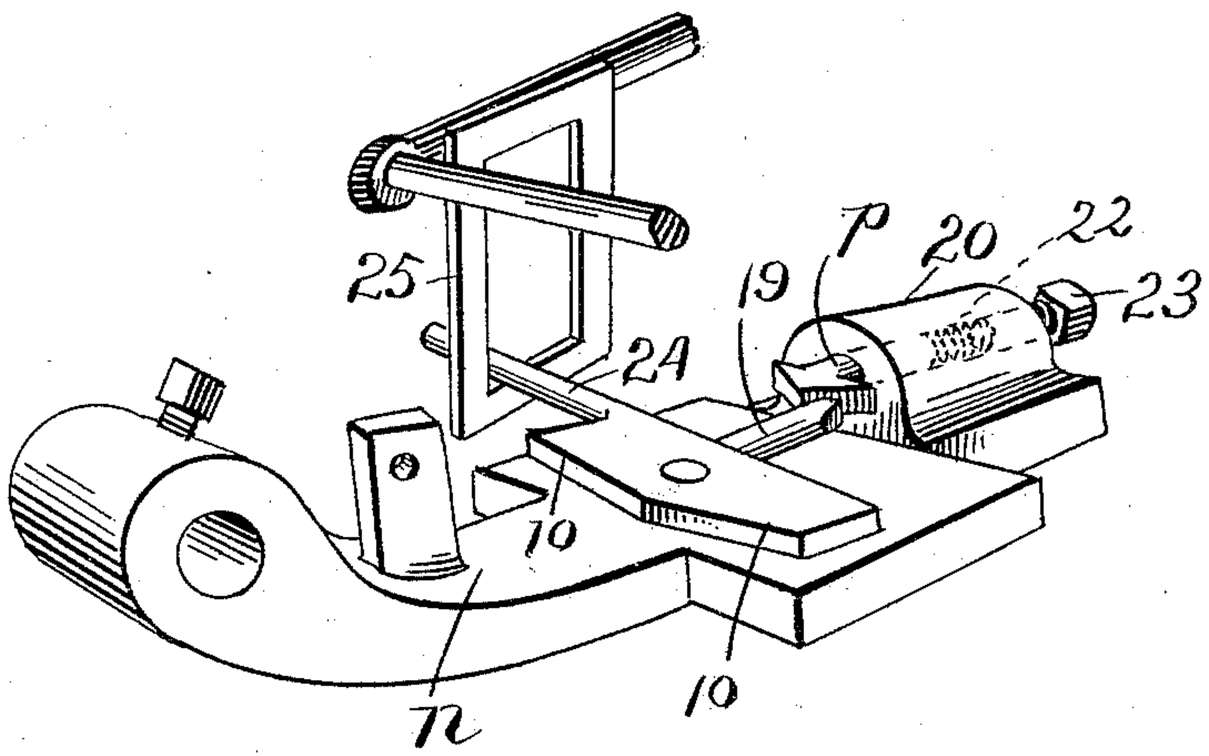


Fig. 6.



Witnesses:
J. W. Garfield
G. H. Chamberlain

Inventor,
Fred H. Hardman,
by Chapin & Co—
Attorneys.

(No Model.) 3 Sheets—Sheet 3.

F. H. HARDMAN.

FEED MECHANISM FOR PUNCHING MACHINES.

No. 474,321. Patented May 3, 1892.

Fig. 7.

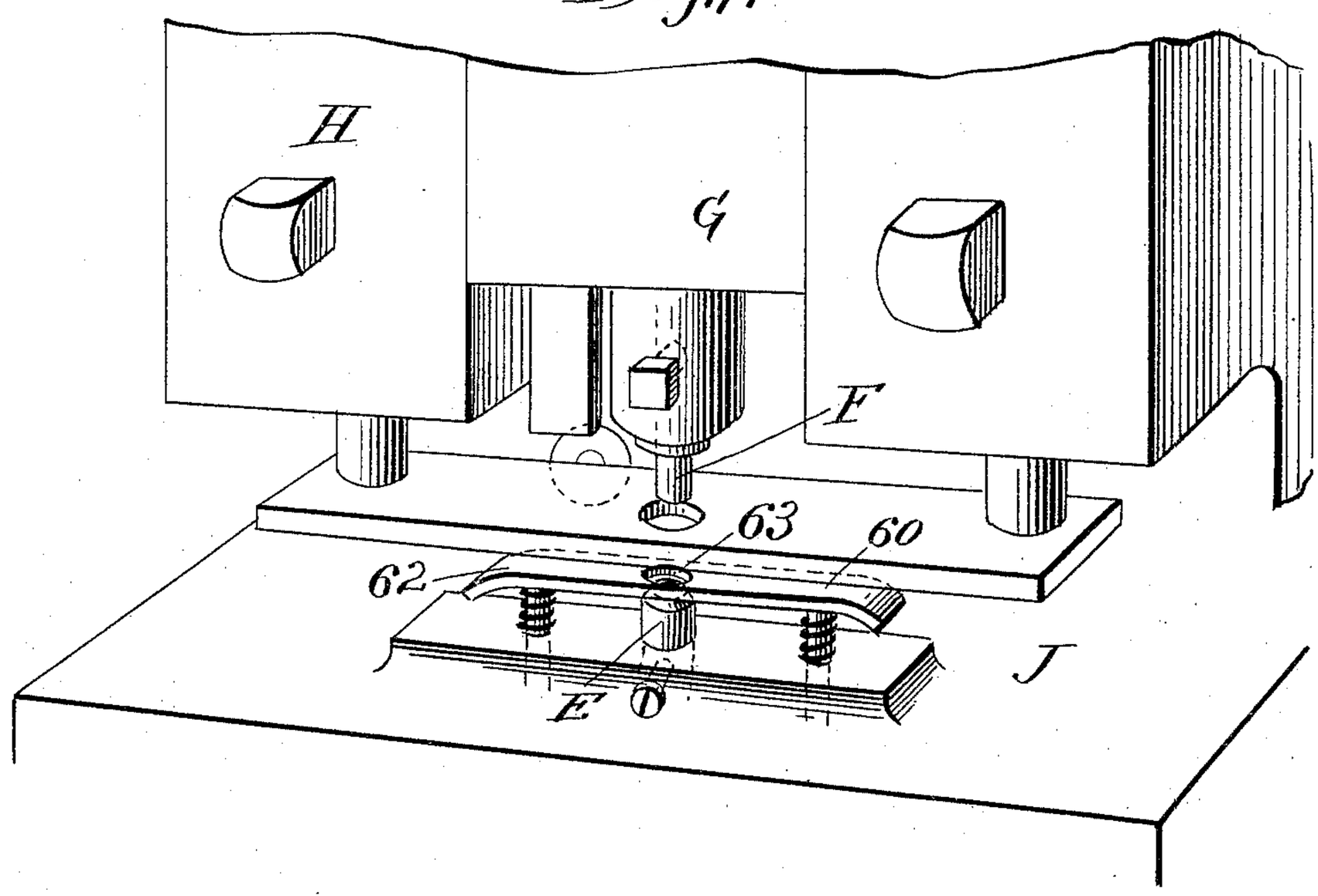
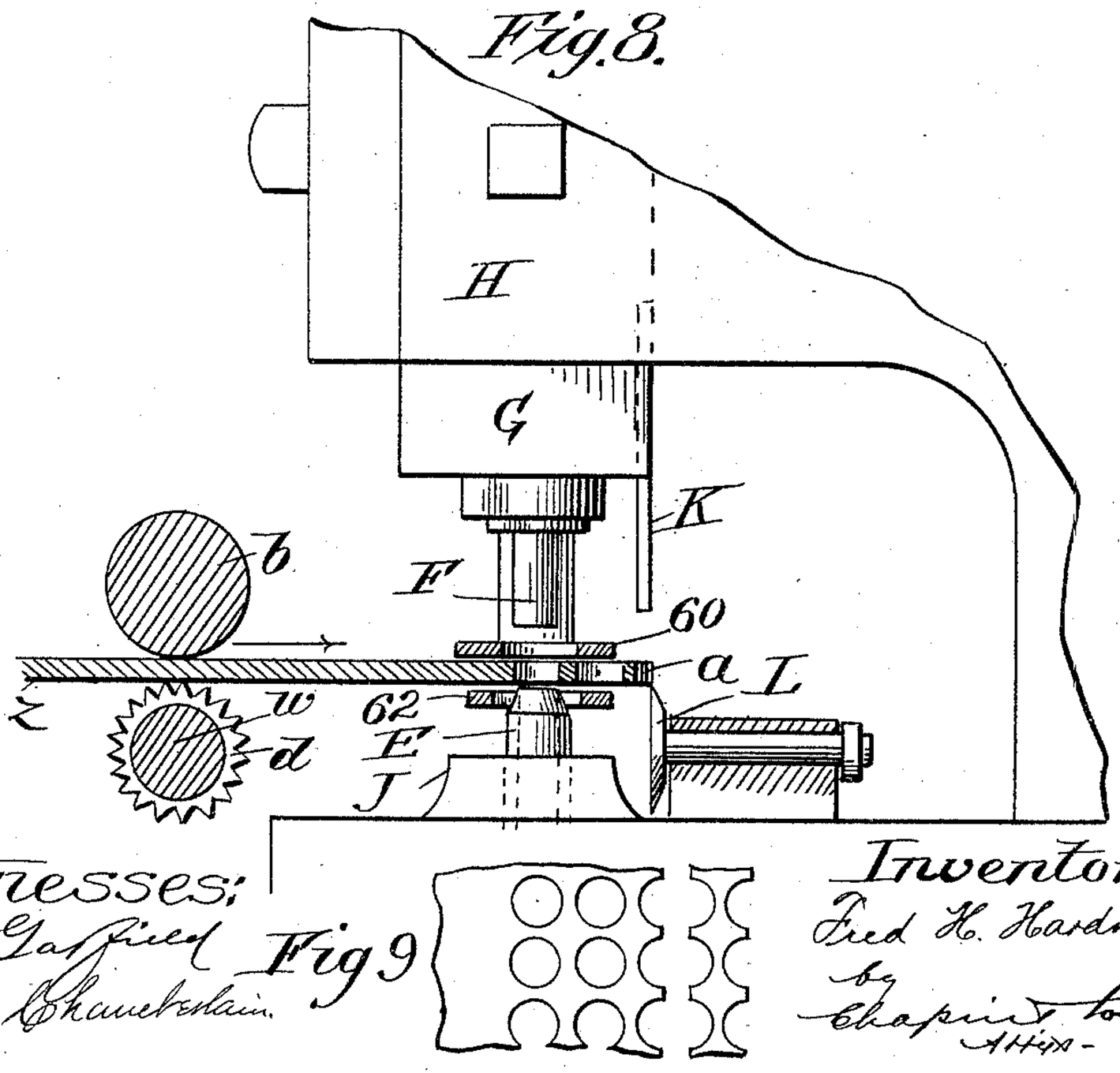


Fig. 8.



Witnesses:
J. A. Garfield
G. M. Chamberlain.

Fig 9

Inventor:
Fred H. Hardman
by
Chapin & Co.
Attys.

UNITED STATES PATENT OFFICE.

FRED. H. HARDMAN, OF BEVERLY, ASSIGNOR TO WALTER E. BENNETT, OF BOSTON, MASSACHUSETTS.

FEED MECHANISM FOR PUNCHING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 474,321, dated May 3, 1892.

Application filed August 21, 1891. Serial No. 403,370. (No model.)

To all whom it may concern:

Be it known that I, FRED. H. HARDMAN, a citizen of the United States, residing at Beverly, in the county of Essex and State of Massachusetts, have invented new and useful Improvements in Feed Mechanism for Punching-Machines, of which the following is a specification.

This invention relates to improvements in machines for punching blanks from a sheet of card or pasteboard or other appropriate material, which blanks may be utilized for whatever purpose required. One special use for the blanks is for the formation of the head in the making of shoe-buttons or other eye-shank buttons, as well known. The functions of the present machine are to automatically feed the sheet of stock material step by step in one direction, so that a plurality of blanks may be successively punched out at one edge portion of the sheet, to then feed the sheet a short distance forward in a direction at right angles to the first-mentioned feed to present a fresh portion of the paper, and to then secure a return-feed movement of the sheet in the direction the reverse to that of the said first-mentioned feed movement, and to continue these operations for an indefinite period.

The invention consists in the combination or arrangement of parts and devices and in the construction of certain of the parts, all substantially as will hereinafter more fully appear, and be comprehended in and by the claims.

For the purposes of uniformity and brevity the movement of the sheet of stock material in the direction of its forward edge for the punching out of a row of the blanks will be termed the "line-feed," while the forward feed to present the sheet for the punching out of a new row of blanks will be designated the "forward feed."

Reference is to be had to the accompanying drawings, in which an embodiment of the invention is illustrated, Figure 1 being a perspective view of the blank-punching and stock-feeding machine. Figs. 2 and 3 are cross-sections of parts in detail. Fig. 4 is a perspective view of a form of pawl and cam employed in duplicate in the machine, the same being shown as bottom side up. The parts shown in the said last three figures constitute important factors in the forward-feed mechanism. Fig. 5 is a partial plan and horizontal section of mechanism comprised in the line-feed, Fig. 6 being a perspective view of portions of the same. Fig. 7 is a perspective view of the blank-punching mechanism, Fig. 8 being a vertical section of the same, taken in the direction of the forward feed of the paper. Fig. 9 is a plan view of a part of the sheet of stock material from a portion of which blanks have been punched.

In the drawings, A represents the support and carriage for the paper. This carriage A is mounted on suitable supporting and guiding parts of the stationary frame for a backward and forward movement in a direction parallel with the forward edge *a* of the sheet *z* of material from which the blanks are to be punched, and near the forward edge of the said frame A are pressure and feed rolls *b* and *d d* for confining and imparting the forward feed to the paper on the said frame A when said rolls are properly actuated.

The frame A for the line-feed movement thereof is guided upon the grooved support and way *c*, and is provided at an under portion with the extended rack-bar *f*, with which engage two separated pinion gear-wheels *g* and *h*, which, through automatic mechanism to be described, are alternately turned in opposite directions, one at one time being positively turned in one direction to correspondingly insure the feed movement of the frame A, the other then running free in the same direction, and then the other is positively turned in the reverse direction, the adjacent pinion-wheel then also being rendered free to turn as the movement of the said frame A is reversed. The said pinion gear-wheels, as indicated in Figs. 1 and 5, are mounted upon arbors *g' h'*, respectively provided therefor, which arbors are supported in suitable fixed bearings in the machine in parallelism, and the arbor *h'* has a gear-wheel *i* thereon, which is in engagement with another gear-wheel *j*, that is carried on a sleeve *k*, which is loosely mounted upon the arbor *g'*, said sleeve at the end thereof opposite that carrying gear *j* being provided with the ratchet-wheel *l*. The said arbor *g'* is extended for a suitable dis-

tance beyond the end of the sleeve and the ratchet *l* thereon, and at a suitable distance from said ratchet-wheel the said arbor has the ratchet-wheel *m* fixed thereon, which is separated from, but of course axially coincident with, the other ratchet-wheel *l*.

n represents a pawl-carrier, which at one extremity is hung to swing in a vertical plane on the arbor *g'*, between the ratchet-wheels *l* and *m*, and a device comprising the two pawl members 10 10 is intermediately pivoted on the pawl-carrier to be swung so that either the one or the other of the said pawl members may be in engagement with one or the other of the ratchet-wheels. The swing movement of the pawl-carrier is imparted in proper relation to each blank-punching operation of the machine by means of the crank-pin 12 on the driving-shaft B of the machine, which pin is connected by rod 13 and link 14 to the radial arm 15 on the rock-shaft 16, which latter is mounted in bearings of the main frame, and the link 18 connects the other radial arm 17 of the rock-shaft with the pawl-carrier. One or the other of the pawl members being in engagement with the ratchet-wheel, of course on each rising of the carrier the so-engaged ratchet-wheel will be moved around to the extent of a tooth, or several, if the teeth are comparatively fine. Of course on the downward movement of the pawl on its carrier the engaging pawl recedes to pass back over the next tooth; but in order that the engagement of the pawl with the ratchet-teeth may be insured the double pawl is provided with a fixed arm 19, extended radially from the pivot of the double pawl, (see particularly Figs. 5 and 6,) and to bear yieldingly on this arm a forwardly spring-pressed member *p*, herein termed an "arrow-head," is provided. The shank of the arrow-head plays in the bored portion 20 of the pawl-carrier *n*, back of which shank is the spring 22, while behind the spring is the screw-plug 23. The said double pawl has the extension-lug 24, which has a certain engagement with the yoke 25. The yoke is at proper intervals, on desiring to reverse the line-feed, given a movement in the proper direction across the line of the lug 24 sufficient to, through the engagement of the yoke with the lug 24, insure the swinging of the double pawl, so that the other pawl member will then be in engagement with the other ratchet-wheel than the one which had last been positively actuated, the arm 19 at such shifting of the pawl crowding past and to the other side of the point of the arrow-head. The means and manner of effecting this movement of the yoke will be now explained, particular reference being had to Fig. 1. *q* represents a rock-shaft suitably mounted and supported on the main frame of the machine to extend at right angles to the run of the frame A, the same being provided with a fixed radial arm 28, which may be engaged, as the frame A completes its movement for line-feed either forward or backward, by the rigid abutment-lugs 30 30, the one or the other, which are indicated as being mounted on a suitable part of the said frame A—as, for instance, the rack-bar *f*—the distance between the said abutment-lugs 30 30 corresponding substantially to the length of run of the said movable frame A. *s* represents a slide supported and guided for movement on the machine-frame at right angles to the length of the rock-shaft *q*, and is provided with the abutment-studs 33 33, located at suitable distances from each other, substantially as indicated, and the said slide *s* has suitable extension and supporting members, as indicated at 35 and 36, upon which the said yoke is fixed to move as one therewith. *t* represents a radial and upwardly-extended arm fixed on the rock-shaft *q*, the same being arranged for a swinging movement as the shaft *q* rocks adjacent the slide *s* and to have an abutment with one or the other of the said studs 33, according as the shaft *q* is rocked in the one or the other direction, and the said radial arm *t* is provided at its upper end with a trough *u*, having end walls. Now assuming that the machine is being run so that the line-feed of the frame A is in the direction of the arrow in Fig. 1, one of the pawl members 10 being in engagement with the sleeve-carried ratchet-wheel *l*, whereby, through gears *j* and *i*, the arbor *h'* and pinion *h* are turned to secure the movement of the said frame in the direction stated, the frame on completing its movement brings the left-hand abutment-lug 30 into engagement with the then oblique radial arm 28, thereby rocking the shaft *q* and carrying the radial arm *t* into substantially a vertical position, which effects just enough movement of the slide *s* and yoke 25 to so swing the double-membered pawl that both members 10 10 thereof stand out of engagement with the ratchet-wheels *l* and *m*, and the arm 19 at such time bears on the point of the arrow-head; but such rocking movement of the shaft and swinging of the comparatively long trough-carrying arm *t*, which has to roll therein from end to end the ball *v*, imparts, though slight, a sufficient impetus to the ball to roll it to the other end of the trough from that which it had theretofore occupied, the same causing the necessary further swinging movement of arm *t* to force the slide to the limit of its movement, and consequently the carrying of the pawl-arm 19 past the arrow-head and the pawl member which had last been free of the ratchet-wheel *m* into engagement therewith. Now of course on each reciprocatory movement of the pawl-carrier the arbor *g'* and pinion *g* will be positively turned, securing the reverse line-feed of the frame A and the sheet of stock material supported thereupon. This reverse feed movement having been completed, the inner abutment-lug 30 (indicated by the dotted lines in Fig. 1) effects the swinging of the radial arm 28, rock-shaft *q*, and trough-carrying arm *t*, assisted by the rolling ball into

the position shown in Fig. 1, again shifting the pawls and securing another reversal of the line-feed. A plurality of the blanks having been punched out from the forward edge portion *a* of the sheet of stock material at the completion of the line-feed in one direction and before the reversed line-feed is commenced, the mechanism for effecting the forward feed is actuated, and such mechanism will be now described. *w* represents a shaft or arbor on which the under feed-rolls *d* for the sheet of stock material are mounted, or of which shaft said rolls form a peripheral part, and said shaft *w* is supported for its intermittent rotational movement in bearings 39 at the forward edge portion of the frame A, and the shaft extends in the direction of the line-feed movement and is not intended to have any endwise movement. The upper pressure and feed roll *b* is carried above and parallel with the rolls *d d* by the spring-arms 42 42, which are attached on frame A. D D represent sleeves mounted upon the shaft *w* at different portions thereof, which are separated by a distance corresponding to the length of line-feed movement, and each of said sleeves is provided with a lengthwise rib 44, which is of helical contour or otherwise suitable to form a cam, and each of said sleeves D is also provided with an angularly-extended member 45, which constitutes a carrier for the pawl 47, which pawl has an engagement by the tooth thereof with the ratchet-wheel 48, which is fixed upon the shaft *w* next to the end of the sleeve D. The spring 49, Fig. 2, is applied to maintain the pawl in engagement with the ratchet-wheel. The spring 50 is applied with relation to the sleeve D to maintain the cam 44 in the normal position under the shaft, as indicated in Figs. 1 and 2. 52 52 represent impingement-studs supported at proper positions on the main frame of the machine near the shaft *w*, and all so that the frame A, running in one direction to the completion of its movement, brings the sleeve D adjacent one of the studs 52, which, impinging upon the cam-rib 44, partially rotates the sleeve, rocking the pawl-carrier 45 forward and effecting the forward feed of the sheet of stock material. The reversal of the line-feed then taking place, the spring 50 restores the sleeve, with the pawl-carrier and the cam-rib thereon, to their normal positions. As this reversed line-feed movement is completed, the other sleeve D is brought into proximity to the other impingement-stud 52 and another forward-feed movement is effected.

The punching mechanism is not deemed to involve any particular or important novelty, the same comprising the tubular and stationary punch member E and the male plunger-punch F, carried on the slide G, which is movable upon the head H of the machine, the reciprocatory movement of said slide being imparted in any usual way—as, for instance, by a crank (not shown) on the main shaft B. The paper is by its forward portion, as indicated in Figs. 7 and 8, carried between the horizontal and apertured plate 60, which is supported at the lower portion of the head H, and the plate 62, which is spring-supported on the main supporting part J of the machine, said plate 62 being apertured, as at 63.

K, Fig. 8, represents a member of a shear carried on the slide G forward of the punch F, the same coacting with the stationary shear member L to sever a portion of the waste and perforated section of the sheet of stock material which is just in advance of the line being punched.

What I claim as my invention is—

1. In a blank-punching machine, the combination of the frame, as A, and supports therefor on which the same is movable, said frame being provided with a rack-bar which extends in the direction of the movement thereof, a pair of separated pinions *g* and *h*, engaging the said rack-bar, and the arbors *g'* and *h'*, on which said pinions are carried, and the one *g'* having thereon the ratchet-wheel *m*, and the arbor *h'* having thereon the gear-wheel *i*, the sleeve *k*, loosely mounted on the arbor *g'* and having the gear-wheel *j*, which meshes with the one *i*, and also having the ratchet-wheel *l* thereon, and mechanism for alternately actuating said ratchets *l* and *m*, for the purpose set forth.

2. In a blank-punching machine, the combination, with a frame, as A, supported and movable, substantially as described, and the separated ratchet-wheels *l* and *m*, respectively mounted on rotary bearing-supports therefor and connected with the said frame for reversely moving same, substantially as described, of the pawl-carrier *n*, mounted for a reciprocating movement, and means for imparting the same thereto, the double-membered pawl pivoted on the carrier, and devices intervening between and connected to the said movable frame and said double pawl for periodically shifting the latter, whereby the one or the other member thereof may be in engagement with the one or the other of the said ratchet-wheels, for the purpose set forth.

3. In a blank-punching machine, the combination, with the ratchet-wheels *l* and *m* and axial rotary parts on which same are mounted, of the reciprocating pawl-carrier *n*, having the double-membered pawl pivoted thereon and the same being provided with the extension-lug 24, the yoke 25, engaging said lug, and the slide *s*, on which the same is carried, having the studs 33 33, the rock-shaft *q*, having the radial arm 28 thereon, and the arm *t*, provided with the trough and ball, and the movable frame A, provided with separated lugs 30 30, adapted to alternately engage the said arm 28, and intervening movable connections connected to the said frame and to the rotary ratchet-supporting parts, substantially as and for the purposes set forth.

4. In a blank-punching machine, in combination, the frame A, supported and movable, as described, the ratchet-wheels *l* and *m*, hav-

ing separate rotary supports which are gear-connected to the said frame for respectively insuring a line movement thereof in reversed directions, the swinging pawl-carrier *n*, having the double pawl pivoted thereon, the rock-shaft 16, having arms 15 and 17, the link connecting the latter with the pawl-carrier, the driving-shaft having the crank-pin, and a connection between the same and the arm 15, substantially as described.

5. The combination, with the ratchets *l* and *m*, of the reciprocatory pawl-carrier having the double-membered pawl pivoted thereon provided with the arm 19, the arrow-head mounted on the pawl-carrier and forwardly spring-pressed and having a yielding pressure on the said arm, the frame A, having the abutment-lugs 30 30, the rock-shaft *q*, having the radial arm 28, and the trough and ball and carrying-arm *t*, the slide *s*, having the studs 33 33 and supporting a yoke which has an engagement with said double-membered pawl, all for operation substantially as and for the purpose set forth.

6. In a blank-punching machine, the combination, with a frame, as A, having thereon the feed-roll shaft *w* and a coacting feed-roll *b*, and said shaft *w* having thereon the fixed ratchet-wheels 48 48, and the sleeves D D, each having the cam 44, and the spring-pressed pawl 47, the stationary impingement-studs 52 52, and means for moving the said frame, all as and for the purposes set forth.

FRED. H. HARDMAN.

Witnesses:
H. A. CHAPIN,
M. A. BIGELOW.