No. 610,746. Patented Sept. 13, 1898.

# M. H. MERRIAM.

## PERFORATING MACHINE.

(Application filed June 12, 1895.)

(No Model.) 2 Sheets—Sheet 1.

Fig: 1.

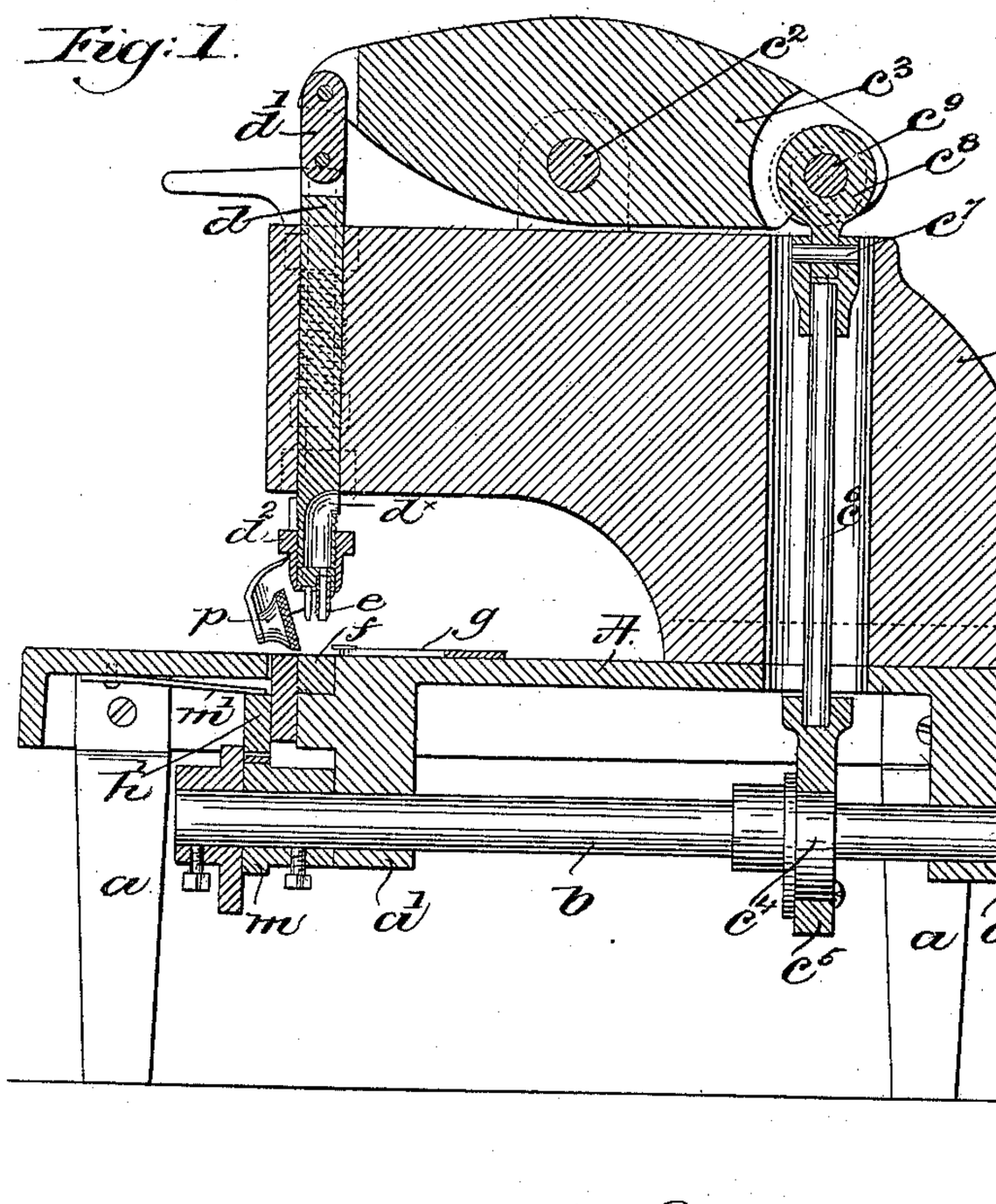



Fig: 5.

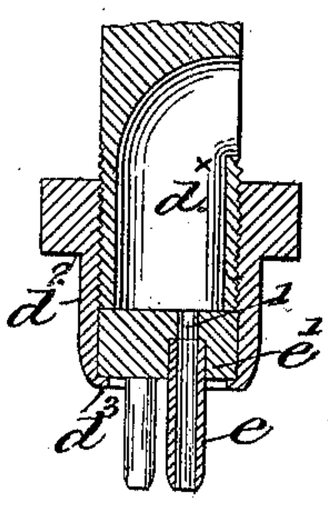



Fig: 6

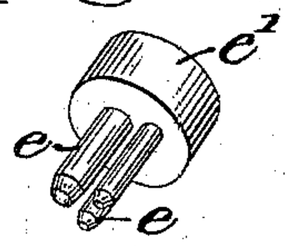



Fig: 2.




Witnesses.
Edward F. Allen.
Frederick L. Emery.

Inventor.
Matthew H. Merriam
by Crosby & Gregory.
Attys

No. 610,746. Patented Sept. 13, 1898.

# M. H. MERRIAM.

## PERFORATING MACHINE.

(Application filed June 12, 1895.)

(No Model.) 2 Sheets—Sheet 2.

Fig: 4.

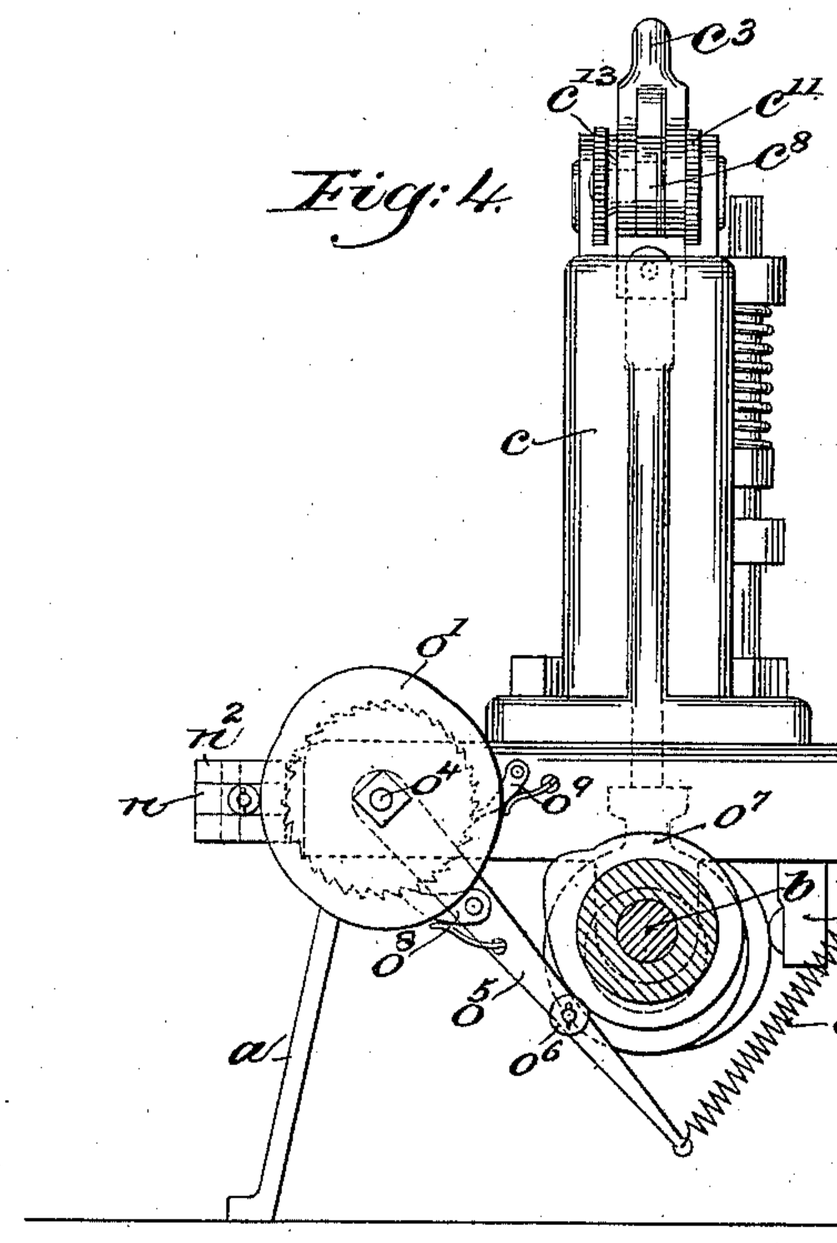



Fig: 8.

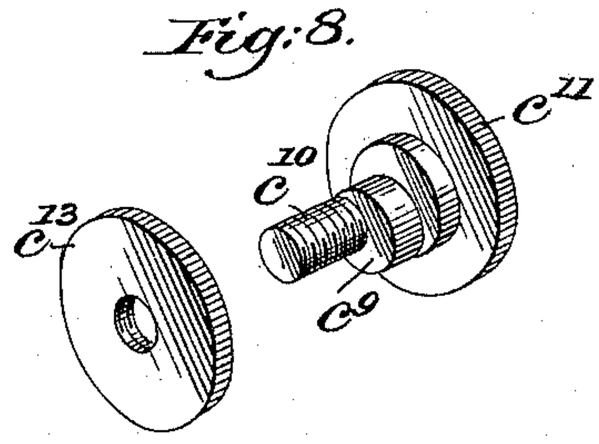



Fig: 3.

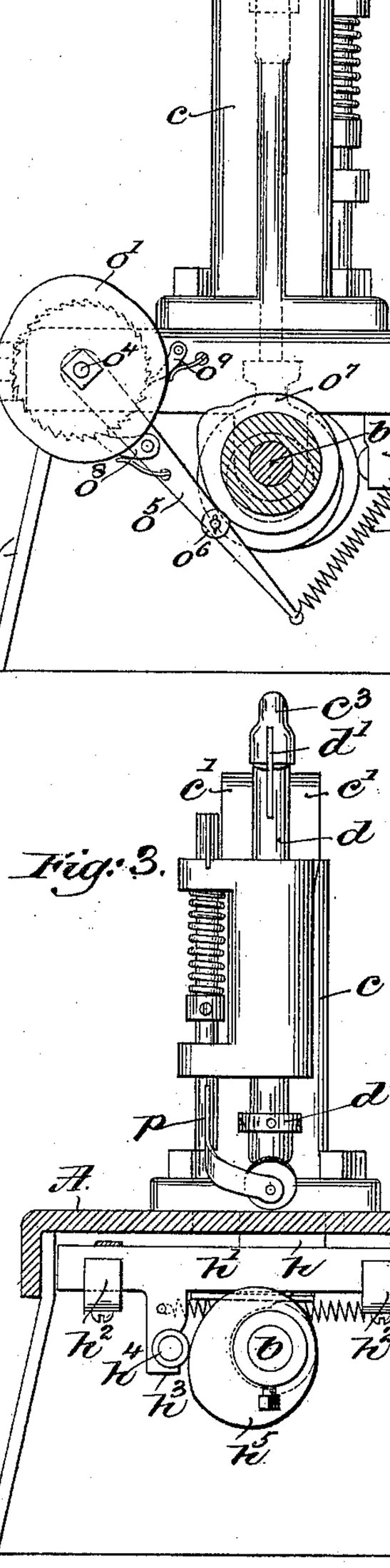
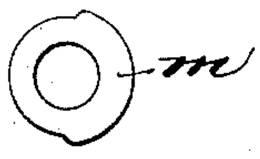



Fig: 7.




Witnesses.
Edward F. Allen.
Frederick L. Emery.

Inventor:
Matthew H. Merriam
by Crosby & Gregory
Attys

# UNITED STATES PATENT OFFICE.

MATTHEW H. MERRIAM, OF LEXINGTON, MASSACHUSETTS.

## PERFORATING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 610,746, dated September 13, 1898.

Application filed June 12, 1895. Serial No. 552,593. (No model.)

*To all whom it may concern:*

Be it known that I, MATTHEW H. MERRIAM, of Lexington, county of Middlesex, State of Massachusetts, have invented an Improvement in Perforating-Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention relates to what are commonly known as "perforating-machines," the invention having especial reference to machines provided with suitable feeding devices for feeding the stock or material relatively to the perforators to cause the perforations to be made in series of any desired length and of any desired style or character, according to the number, size, or arrangement of perforators employed.

Among other features my invention relates to the construction of the perforator or perforators employed and to the means for holding the same in operative position, and, further, to enable said perforators to be readily changed as may be necessary to vary the style or character of the perforated product.

My invention further relates to the feeding mechanism for feeding the stock or material, my invention comprehending means for automatically varying the throw of the feed during operation of the machine to render uniform the spacing of the perforations on straight lines and in curving.

Other features of my invention will be hereinafter described, and pointed out in the claims.

In the drawings, Figure 1 is a vertical longitudinal section of a machine containing one embodiment of my invention; Fig. 2, a plan view of the table or bed of the machine and parts carried thereby, with the overhanging arm and its parts removed. Fig. 3 is a left-hand end elevation of the machine shown in Fig. 1, with the end flange of the table broken away to expose the operating parts back of the same. Fig. 4 is a vertical cross-section taken on the dotted line $x\,x$, Fig. 1, looking to the left. Fig. 5 is an enlarged sectional detail showing the lower end of the perforator-carrying bar, said view showing the preferred construction of perforators and means for attaching the same to the carrying-bar; Fig. 6, a perspective view of one of the perforator-holders, with a plurality of perforators or tools mounted thereon and constituting what is known as a "gang" of perforators or tools; Fig. 7, a detail view of the lift-cam of the feeding mechanism; and Fig. 8, in perspective, shows the preferred form of device for varying or adjusting the throw of the perforator or tool-holder.

In the embodiment of my invention herein selected for illustration and shown in the drawings, A is the bed or table, of desired shape and construction to sustain the various working parts, the same in the present instance being shown as mounted upon suitable legs or supports $a\,a$.

At its under side the table A is provided, as shown, with depending hangers $a'$, in which is journaled the main or driving shaft $b$, provided at one end with a suitable pulley or driving wheel $b'$, shown as grooved for the reception of a belt, and it may be provided with a suitable handle $b^2$.

Upon the bed A is erected the standard or gooseneck $c$, provided, as herein shown, at its upper side with suitable ears $c'$, between which is pivoted at $c^2$ a rocker or beam $c^3$.

The shaft $b$ is herein shown provided with a suitable eccentric $c^4$, encircled by an eccentric-strap $c^5$, the rod $c^6$ of which extends vertically through the gooseneck $c$ and at its upper end is loosely connected with one end of the rocking beam $c^3$, so that rotation of the said shaft will cause rocking or vibration of said beam. In the present instance of my invention the upper end of the eccentric-rod $c^6$ is not pivoted or connected directly to the beam $c^3$, but is pivoted at $c^7$ to an independent or loose bearing-block $c^8$, which receives (see Fig. 8) the pivot-bearing $c^9$, eccentrically mounted upon the pivot pin or stud $c^{10}$, extended through and held in the forked end of the beam. The pivot-pin $c^{10}$ at one side said beam is provided with a suitable head $c^{11}$, and said pin at is opposite end, also outside said beam, is threaded at $c^{12}$ for the reception of a clamping-nut $c^{13}$. By slackening the nut $c^{13}$ the pivot-pin may be rotated more or less to change the position of the eccentric portion of the pivot-stud in order to

vary the effective length of the connection between the driving-eccentric $c^4$ on the shaft and the rocking beam $c^3$.

In the overhanging end of the gooseneck $c$ I have arranged in suitable bearings the vertically-reciprocating bar $d$, connected at its upper end by means of a link $d'$ with that end of the rocking beam opposite the pivot $c^9$, said bar $d$ at its lower end (see Fig. 5) being threaded to receive the tool-holding sleeve $d^2$, shown as provided at its lower end with a slight inturned lip or flange $d^3$.

The tools $e$, herein shown as perforating-tubes, of any desired number, are suitably mounted in a disk-like holder $e'$, which is clamped between the lower end of the reciprocating bar $d$ and the inturned lip $d^3$ on the sleeve $d^2$ referred to. This means of securing the tools in operative position—viz., by mounting them in or upon a suitable disk-like holder and clamping this holder between the threaded sleeve and the end of the bar $d$—admits of ready change of tools at any time and for any purpose.

Referring to Figs. 5 and 6, in constructing the tools and mounting the same in the holder I prefer to first drill a hole $l$ completely through the holder for each tool, this hole furnishing a passage for the escape of the punch-blank. I then counterbore this hole $l$ from the under side—that is, from the side which is to be next the acting end of the tool—and drive into the counterbored portion the tool $e$, the latter being driven to a seat upon the square shoulder at the end of the counterbore. When the tool is a tubular one, as shown, provision must be made for the escape of the punch-blank, and I have accordingly provided the lower end of the bar $d$ with a large passage $d^\times$, leading from the lower end of the bar directly above the tool-holder $e'$ upwardly and preferably opening out through one side of the bar $d$. The bed or table A is shown as grooved transversely for the reception of the bar-like punch-bed $f$, preferably of brass or other suitable substantially soft material. At one side this punch-bed $f$ the table A is slotted at $a^\times$ for the reception of the feed dog or block $h$, mounted at one side of the horizontal feed-bar $h'$, (see Fig. 3,) shown as held in suitable guides $h^2$, which admit of both a longitudinal and vertical movement of the feed-bar. The feed-bar, as herein shown, is provided with a depending arm $h^3$, upon which is mounted the roller $h^4$, held in operative contact with a peripheral feed-cam $h^5$ on the shaft $b$ by a spring $h^6$, connecting said arm with the table at one side the machine. Immediately back of the feed-cam $h^5$ and also mounted fast upon the shaft $b$ is the lift-cam $m$, which at the proper time acts to lift the feed-block $h$ against the tension of the spring $m'$. (See Fig. 1.) During rotation of the shaft the cam $h^5$ imparts a longitudinal or forward-and-back movement to the feed-block and the cam $m$ an up-and-down movement, the whole constituting one type of the well-known four-motion feed for machines of this and other types.

Referring now to Fig. 2, the end of the feed-bar $h$ is projected through the table-flange at one side the machine and rests, it may be, in contact with one end of a lever $n$, shown as pivoted at $n'$ in a suitable bracket $n^2$ on the machine-table. In the present instance of my invention the end of the feed-bar seats against a screw $n^3$, tapped in the end of the lever $n$ for purposes of adjustment. By means of this lever $n$ the return or spring-controlled movement of the feed-bar $h$ may be varied—that is, made longer or shorter. For example, if the screw $n^3$ and its end of the lever $n$ be moved nearer the edge of the table the feed-bar will contact with the same and be prevented from following the cam to the full extent of its retreating motion, thereby shortening the return movement of the feed-bar, and consequently shortening the subsequent forward or feeding movement of the bar by its cam, and therefore necessarily shortening the feeding movement of the material and the spacing between the perforations or impressions of the tool. By moving the screw $n^3$ in or out the feed-varying mechanism is made operative at will—*i. e.*, the means provided is capable of rendering the automatic feed-varying device operative or inoperative whenever desired and without dismembering the machine in any way.

In making borders upon the curved or irregular edges of shoe-vamps, shoe-uppers, &c., it is necessary to vary the feed of the machine in rounding curves in order that the impressions or perforations made by the constantly-reciprocating tool shall be uniformly spaced, this being made necessary by the necessary feeding action at one side the tool. My invention therefore comprehends means for automatically moving the lever $n$ for the purpose of varying the return movement of the feed-bar, and thereby the effective feeding movement of the feed mechanism. Referring to Figs. 2 and 4, such mechanism in the present embodiment of my invention consists in a roller $o$ on the end of the lever $n$ which is opposite the screw $n^3$, said roller resting against the periphery of a more or less irregularly-shaped pattern-plate $o'$, shown as secured by screws or, it may be, other suitable devices $o^2$ to the face of a toothed wheel $o^3$, shown as a ratchet-wheel loosely journaled upon a stud $o^4$, projecting from the table-flange at the rear end of the machine. Loosely mounted upon the stud $o^4$ between the ratchet-wheel $o^3$ and the table is a lever-like pawl-carrier $o^5$, held with its roller-stud $o^6$ in operative contact with a suitable cam $o^7$ on the shaft $b$ by a suitable spring $o^{7\times}$, attached to the table-flange. This pawl-carrier is provided with a suitable spring-controlled pawl $o^8$, engaging the teeth of the ratchet-wheel, a suitable retaining-pawl or

detent $o^9$ also coöperating with said ratchet-wheel to prevent retrograde movement of the same.

Given a certain curved edge of material to perforate or cut by my improved machine, a properly-shaped pattern-plate $o'$ is placed upon or secured to the ratchet-wheel $o^3$ and the machine set in operation, the operator feeding or guiding the material beneath the reciprocating tool in contact with a suitable guide $g$, and during the subsequent operation of the machine the cam $o^7$ on the rotating shaft $b$ will impart to the pawl-carrier a vibrating movement, causing it to rotate the ratchet-wheel $o^3$ and its attached pattern-disk step by step to gradually change the position of the lever $n$ to vary the feed of the feed mechanism as required and as determined by the pattern-plate, the changes occurring in each instance while the tool is in an elevated position—that is, out of the material.

I have herein shown my invention in connection with a machine provided with tubular perforators or punches; but it is evident that my invention is not limited to any particular construction or shape of the tool, nor is my invention necessarily limited to a machine wherein the tool at each reciprocation fully penetrates the material, for in some classes of work it is desirable to limit the descending movement of the tool before it has penetrated the material. Neither is my invention limited in other respects to the particular detailed construction herein shown and described, for it is evident that the same may be varied without departing from the spirit and scope of my invention.

The adjustment referred to for varying the effective length of the eccentric-rod $c^6$ is useful in varying the reciprocating movement of the tool to cause it to contact with greater or less force with the punch-bed $f$ or for varying the depth to which the tool enters or penetrates the material and also in compensating for wear of the tool or its bed due to long-continued operation of the machine.

In practice the machine will be provided with a suitable (preferably roller) presser $p$.

I claim—

1. In a perforating-machine the following instrumentalities viz: a work-support, a reciprocating bar provided with a punch, a presser to bear on the work, a feeding device, means to raise and move the said feeding device forward to feed the material being acted upon, a pattern-cam, means to actuate it, and means between said pattern-cam and said feeding device to control the extent of the backward movement of the latter, said means coöperating with said pattern-cam for automatically varying the said backward movement for punching in curves and maintaining the said backward movement unvarying for punching in straight lines, thereby insuring equal spacing of the perforations in curved as well as in straight lines, substantially as described.

2. In a machine of the class described, a table, a feeding device, means to positively move the same in one direction, a spring to return the same, a movable stop to vary the spring-controlled return movement of said feeding device and to and from which the latter is moved, a shaft, and a pattern-surface moved thereby, and connected with and to vary the position of said stop, substantially as described.

3. A perforating-machine, comprising a reciprocating tool-carrier, one or more punches or perforating-tools carried thereby, means to reciprocate said tool-carrier, an intermittent-feed mechanism including a feed device, means intermittingly to move said feed device to engage in a new position the material to be fed prior to each change in extent of feed, and a pattern-surface to automatically vary the extent of intermittent feed of said feed device, substantially as described.

4. A perforating-machine, comprising one or more punching-tools, means to reciprocate them for perforating the work, a feed-bar, means to give a four-motion feeding movement thereto, a stop to be engaged by said feed-bar on the latter's return movement, a pattern to move said stop for shortening or lengthening the said return movement, and automatic means for giving said pattern a step-by-step motion for correspondingly varying the feed, substantially as described.

5. A perforating-machine, comprising one or more punching-tools, means to reciprocate them for perforating the work, a feed-bar, means to reciprocate the feed-bar longitudinally and to engage and disengage it with the work for feeding the latter when so engaged, said feed-bar invariably disengaging the work at the same point in its movement, and automatic means for varying the point of engagement of the feed-bar with the work, substantially as described.

6. A perforating-machine, comprising one or more punching-tools, means to reciprocate them for perforating the work, a feed-bar, means to engage the feed-bar with the work and feed it during said engagement, means to disengage the feed-bar from the work and return it for another feed, and automatic means for varying the durations of said feeding engagements, substantially as described.

7. A perforating-machine, comprising one or more punching-tools, means to reciprocate them for perforating the work, a feed-bar, means to give a four-motion feeding movement thereto, a pivoted lever carrying a stop to be engaged by said feed-bar on the latter's return movement, a pattern to move said lever for varying the extent of movement of said feed-bar, and automatic means for moving said pattern, substantially as described.

8. In a machine of the class described, the combination with a tool-holder, of a tool-

holding disk applied to the lower end thereof, and provided with one or more tubular tools, of a clamping-sleeve to engage the said disk near its periphery and attach the same to said tool-holder, and a passage leading from the lower end of said tool-holder, upwardly within the latter and terminating in a lateral discharge-opening above said clamping-sleeve, substantially as described.

9. The combination with a tool-holder, of a disk engaged at its periphery thereby and provided with one or more perforations, counterbored to receive and hold as many tubular tools, the latter being seated against the shoulders formed by the counterboring within said perforations, and means to attach said disk to said tool-holder, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

MATTHEW H. MERRIAM.

Witnesses:
FREDERICK L. EMERY,
EMMA J. BENNETT.