

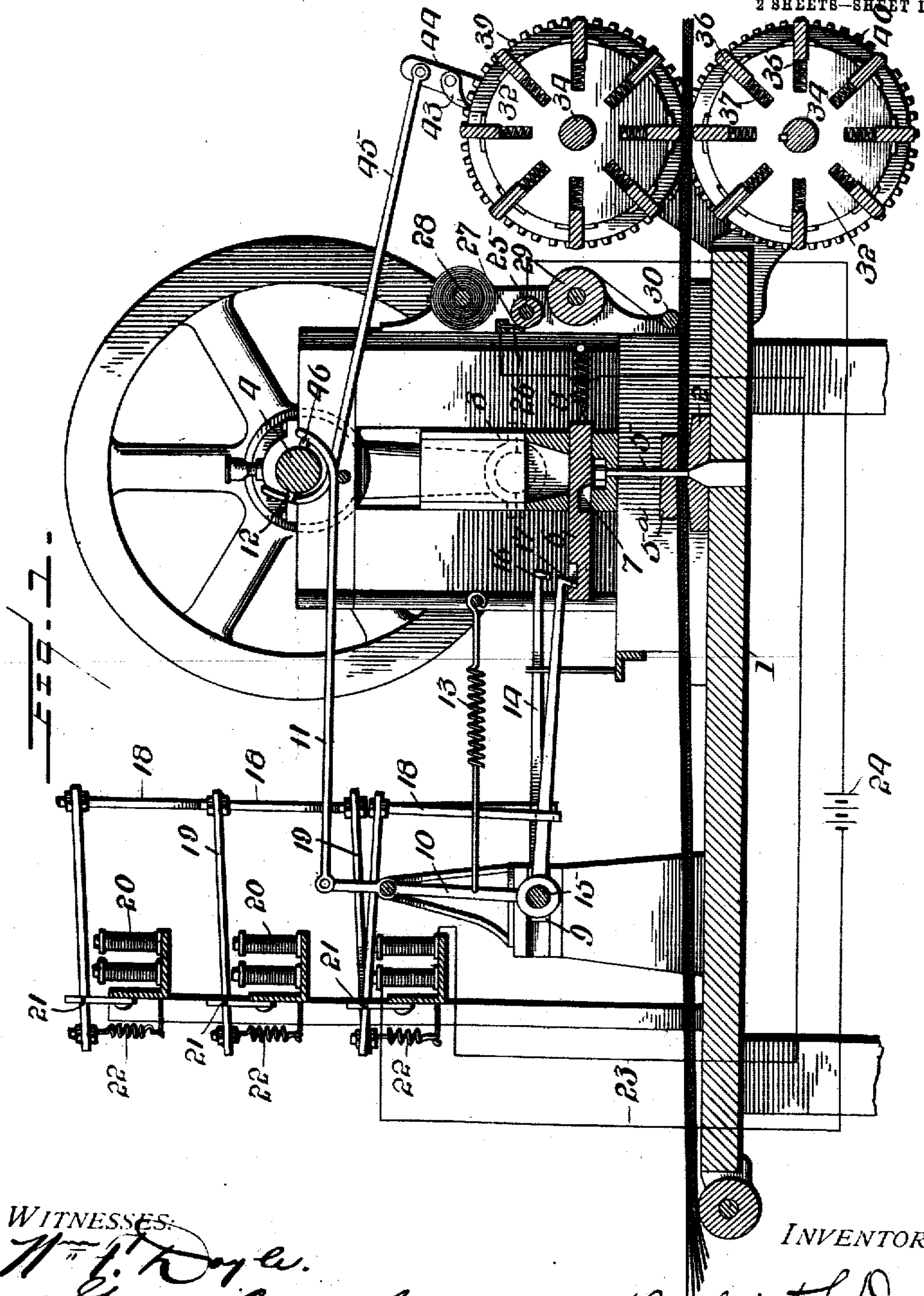
No. 811,621.

PATENTED FEB. 6, 1906.

H. L. DAVIS.  
AUTOMATIC PAPER PERFORATING MACHINE.

APPLICATION FILED MAY 9, 1903.

2 SHEETS—SHEET 1.



WITNESSES:  
*Wm. J. Doyle.*  
*J. Franklin Meyers.*

INVENTOR  
*Herbert L. Davis*

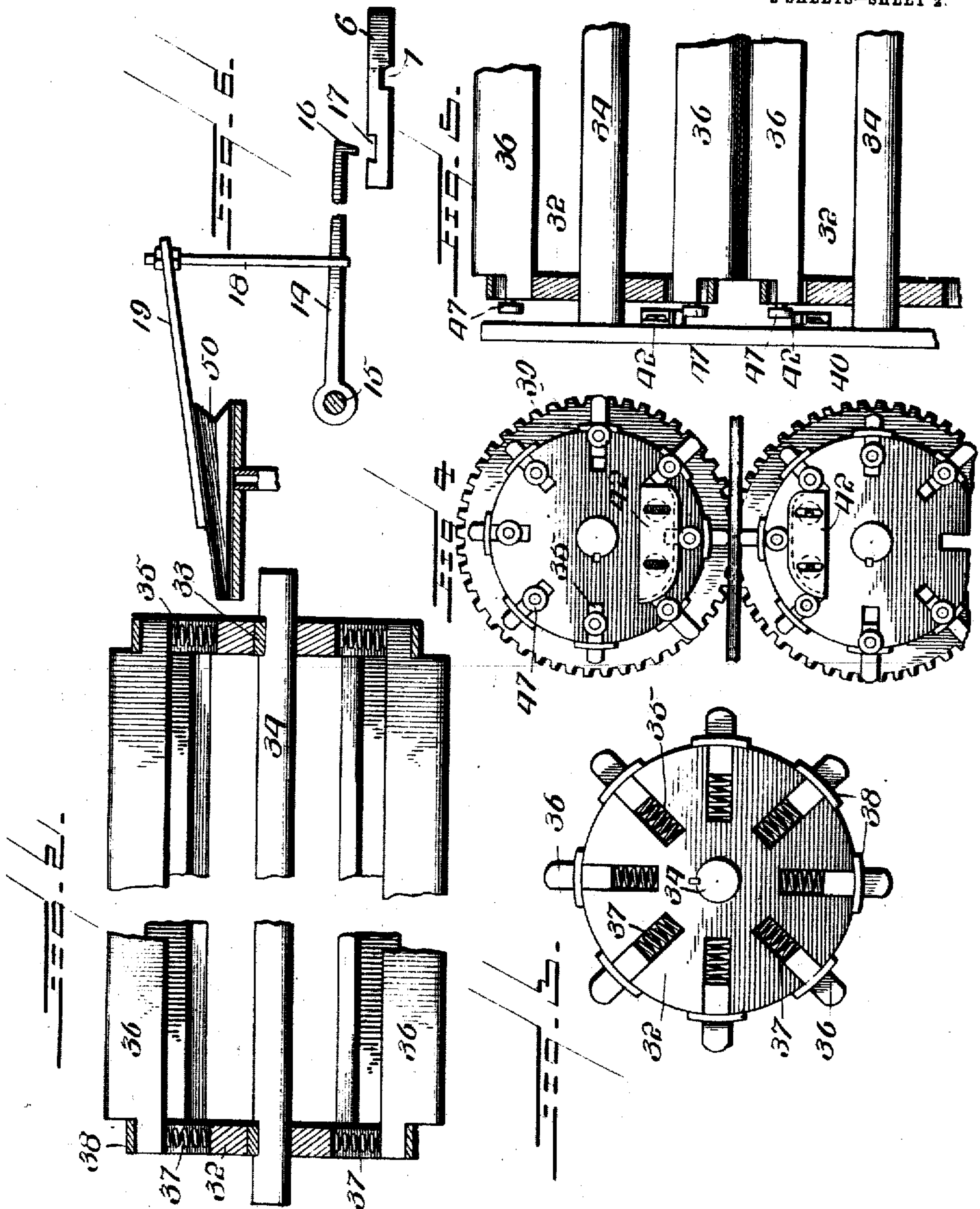
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# UNITED STATES PATENT OFFICE.

HERBERT L. DAVIS, OF WASHINGTON, DISTRICT OF COLUMBIA.

## AUTOMATIC PAPER-PERFORATING MACHINE.

No. 811,821.

Specification of Letters Patent.

Patented Feb. 6, 1906.

Application filed May 9, 1903. Serial No. 156,390.

*To all whom it may concern:*

Be it known that I, HERBERT L. DAVIS, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Automatic Paper-Perforating Machines, of which the following is a specification.

My invention relates to automatic paper-perforating machines, and more particularly to that class of paper-perforating machines designed to perforate music-sheet paper for use with automatic piano-players and similar instruments.

The main object of my invention is to improve and simplify machines of this type, and the machine, hereinafter described, may be considered, broadly, as an improvement upon the machine set forth in the prior patent granted to my brother, George Howlett Davis, No. 659,053, dated October 2, 1900, to which reference may be made for a detailed description of a machine of this class.

More particularly one part of my invention relates to the means for actuating the punch-locking devices in the reciprocatory plunger. In the above-mentioned patent electromagnets are employed to move said locking devices from inoperative into operative position. This necessitates the use of relatively powerful magnets, whereas in my present machine the movement of the locking devices to operative position is performed by mechanical means, electromagnets, pneumatics, or other means being used only for the purpose of making the connection between said mechanical means and the locking devices. Consequently relatively small and weak magnets are sufficient, and thereby a considerable saving in the first cost and the operating expenses of the machine is obtained.

Another part of my invention relates to the means employed to intermittently feed the paper under the punches. In the aforesaid patent is described and claimed an endless apron-feed comprising pairs of clamping-plates for gripping the material so arranged that more than one pair of such plates are always in operative position. There was also provided a pair of cooperating feed-rolls to be used when a single strip is being fed and perforated, as when a piano-record is made, the apron-feed being required when a plurality of duplicates were simultaneously perforated in order to prevent some of the sixteen or more sheets from working out of line with the others. In my present

machine I have devised an improved roller-feed which accomplishes the same result as the aforesaid apron-feed, thus obviating the necessity of providing two feeding mechanisms and procuring a great saving of space, as well as in the cost of the machine.

In the accompanying drawings, Figure 1 is a side elevation, partly in section, of my complete machine. Fig. 2 is a sectional view of one of my improved feed-rolls. Fig. 3 is an end view of the same. Fig. 4 is an end view of a modified form of feed-roll. Fig. 5 is a partial sectional view of the same, and Fig. 6 illustrates a modification of the punch-controlling means.

Proceeding with a detailed description of my invention, 1 in the accompanying drawings is the frame of the machine, 2 the stationary die, and 3 the plunger, which is arranged to be continuously reciprocated at a high rate of speed by the driving-shaft 4. The lower end of said plunger carries a series of punches 5, which are normally free to move longitudinally therein. The other ends of the punches 5 are guided in the upper part of the die-block 5<sup>a</sup>, thus preventing any inaccuracy in the work, owing to wear of the cooperating edges of the punches and die-block. Transverse passage-ways are also provided in the lower part of the plunger, in which the locking-dogs 6 are slidably mounted. These dogs are recessed, as at 7, and are normally held by the springs 8 with said recesses over the heads of the punches, in which position the punches do not reciprocate with the plunger. I will now describe my improved mechanism for moving said locking-dogs against the tension of the springs 8 into position to lock the punches to the plunger.

Slidably supported by a standard on the frame is a cross-head 9, which is reciprocated in a direction transverse to the movement of the plunger 3 by the lever 10, rod 11, and cam-finger 12 on the driving-shaft 4, said connecting mechanism acting in opposition to the spring 13, which tends to keep said cross-head in its position nearest to the plunger. It will thus be seen that once in every revolution of the shaft 4 the cross-head 9 will be moved away from the plunger and that one such movement occurs for each stroke of the plunger. The means employed to connect said cross-head with the aforesaid locking-dogs consists of a series of draw-bars 14, pivoted at 15 on said cross-head and provided with the hooked ends 16. Said hooked



ends reciprocate normally slightly above the said locking-dogs, which latter are recessed, as at 17, to permit the engagement of said hooked ends 16 of the draw-bars therewith when the latter are depressed sufficiently to engage in said recesses 17. Said draw-bars are elevated and depressed by means of slotted rods 18, embracing said bars, said rods being carried by extensions of the armatures 10 19 of the electromagnets 20, which armatures are pivoted at 21 to a standard on the frame and are normally held elevated by the coil-springs 22.

It will be understood that there are as many electromagnets, armatures, rods, draw-bars, and locking-dogs as there are punches and that the operation of each punch can be controlled by the corresponding combination of mechanisms independently of all the other punches. All that is required to operate any one punch at a given moment is to close the circuit of the corresponding electromagnet, whereupon its armature is attracted, the corresponding draw-bar depressed, and on the next movement of the cross-head away from the plunger the particular locking-dog appertaining to the punch in question will be drawn out, so as to remove the recess therein from over the punch, and the latter will then be operated by the reciprocation of the plunger.

Each of the circuits of the electromagnets 20, one of which is diagrammatically shown at 23, includes a battery 24 and is connected at one end to a contact-roller 25 and at the other end to a contact finger or selector 26. It will be understood that while all the circuits are connected to the same contact-roller there is a separate contact-finger for each circuit. Between said roller and fingers the stencil 27, which may conveniently be an ordinary music-sheet such as this machine is adapted to make, is fed. Said stencil-sheet is carried by a roll 28, carried by the frame, and after passing over the contact-roller 25 is guided by the idle rollers 29 and 30 to the same feeding means which feeds the sheets being perforated. Thus the production of exact duplicates of the stencil-sheet is assured.

Before describing my improved feeding means it will be opportune to state here that in place of the electrical controlling means described above pneumatic means can be employed. In Fig. 6 I have shown the arrangement by which primary pneumatics 50 replace the electromagnets 20, and it will be obvious to any one skilled in the art that a pneumatic tracker-board may be substituted for the electric contact devices 25 26.

As before stated, I have devised novel feeding-rollers by which sixteen or even a more or less number of sheets can be fed simultaneously without danger of their becoming relatively displaced. The roller

shown in Figs. 1, 2, and 3 comprises a pair of disks 32 and 33, keyed to a shaft, as 34, and radially slotted at regular intervals, as at 35. In these slots are slidably mounted clamping-jaws 36, which are pressed radially outward by springs 37. The center portions of said jaws, or those portions lying between the inner faces of the disks, project beyond the periphery of said disks, while the end portions, which are guided in the radial slots, are prevented from passing out of said slots by lugs or plates 38, which close the outer ends of said slots. Preferably two similar opposing rollers are employed, as shown in Fig. 1, and in that case the shafts 34 of the two rollers are geared together by the intermeshing gears 39 40, keyed to said shafts.

One roller only of the type just described might be employed, in which case a smooth roller or other suitable surface traveling at the same linear speed as the periphery of the clamping-roller would be used to cooperate therewith; but I prefer to employ a cooperating pair of my improved rollers, as shown in Fig. 1.

A modified form of roller is illustrated in Figs. 4 and 5. In this case the clamping-jaws 36 instead of being continuously pressed radially outward by springs are free to slide in the radial slots 35; but as they come into position to engage the material being fed they are positively moved radially outward by a cam 42, which is adjustably fixed to the frame in position to engage the antifriction-rollers 47 on inner ends of the jaws 36. In either case the upper roller is intermittently rotated by a pawl 43, carried by a swinging arm 44, pivoted on the shaft 34, and engaging the teeth of the gear 39 or of a suitable ratchet-wheel. The arm 44 is oscillated by a rod 45, similar to the rod 11, and is also actuated by a pin, as 46, on the driving-shaft 4. Modifications or changes other than those herein specified may be made without avoiding the spirit of my invention.

What I claim is—

1. In a perforating-machine, the combination of a relatively movable plunger and die-block, a plurality of punches slidably mounted in said plunger, punch-locking devices carried by said plunger and held normally in inoperative position, and electrically-operated means controlled by a pattern-sheet, normally disengaged from said locking devices, to move said devices into position to lock said punches to said plunger in predetermined sequence, substantially as set forth.

2. In a perforating-machine, the combination of a relatively movable die-block and plunger, a plurality of punches slidably mounted in said plunger, a punch-locking dog for each punch normally held in inoperative position, means normally disengaged from said locking-dogs to move the latter into position to lock said punches to the



plunger, and means controlled from a pattern to actuate said engaging means, substantially as described.

3. In a perforating-machine, the combination of a relatively movable plunger and die, a plurality of punches slidably mounted in said plunger, a locking-dog for each punch normally held in inoperative position, a reciprocatory catch for each dog normally held out of engagement therewith, means to cause the catches and dogs to engage, and automatic means to control the sequence of said engagements.

4. In a perforating-machine the combination of a relatively movable plunger and die, a plurality of punches slidably mounted in said plunger, an independent locking-dog for each punch having a recess therein normally held in line axially with the punch, means to move each of said dogs into position to lock the corresponding punch to the plunger, said means comprising a reciprocatory member, a series of catches pivoted thereto one for each dog, the ends of said catches passing adjacent to the ends of said dogs but normally held out of engagement therewith, and means to cause said catches to engage the corresponding dogs in predetermined sequence.

5. In a perforating-machine, the combination of a relatively movable plunger and die, a plurality of punches slidably mounted in said plunger, an independent locking-dog for each punch normally held in inoperative position, a reciprocatory member carrying a series of pivoted catches, means to reciprocate said member back and forth once for every up-and-down stroke of the plunger, the ends of said catches being adapted to engage the ends of said locking-dogs but normally held out of engagement therewith, supporting-rods carrying said catches, levers attached to said rods and means to actuate said levers in predetermined sequence to cause said catches to engage said dogs and the latter to be moved into operative position to lock the punches to the plunger.

6. In a perforating-machine, the combination of a relatively movable plunger and die, a plurality of punches slidably mounted in said plunger, independent locking-dogs mounted to slide transversely in said plunger adjacent to the ends of said punches, said dogs having recesses normally maintained in alignment with said punches, and means to move said dogs to lock said punches to said plunger, said means comprising a member carrying a plurality of hooked catches, means to reciprocate said member in a direction substantially transverse to the movement of the plunger, the hooked ends of said catches passing adjacent to the ends of the locking-dogs, means to normally maintain said ends out of engagement with the locking-dogs, and means to place said ends in position to en-

gage said dogs during the reciprocation of said member whereby said dogs will lock the punches to the plunger, said last-mentioned means being automatically controlled by pattern mechanism.

7. In a perforating-machine, the combination of a relatively movable plunger and die, a series of punches axially movable in said plunger, independent locking means for said punches, a vibratory member carrying devices adapted to engage and operate said locking means, means to reciprocate said member, means to normally hold said devices and locking means disengaged, a series of electromagnets, and connections from the armatures thereof to said devices, and pattern mechanism arranged to control the circuits of said electromagnets.

8. In a perforating-machine, the combination of a relatively movable plunger and die, a series of punches axially movable in said plunger, locking-dogs for said punches transversely mounted to slide in said plunger, springs to normally maintain said dogs in inoperative position, a sliding member carrying a series of draw-bars adapted to engage and operate said locking-dogs, means to reciprocate said member, a series of electromagnets having pivoted armatures connected to said draw-bars, springs to normally maintain said armatures and draw-bars in inoperative position, means to close and open the circuits of said electromagnets comprising a contact-cylinder and a series of contact-fingers and means to feed a stencil or pattern sheet between said cylinder and fingers.

9. In a perforating-machine, the combination with a reciprocatory plunger carrying a plurality of punches capable of movement relative thereto, and a lock for each punch to hold it against movement, of actuating devices to place the locks in locking position with relation to the punches said devices being normally out of engagement with said locks, and pattern-controlled means to bring the actuating devices into engagement with their respective locks.

10. In a perforating-machine, the combination with a reciprocatory plunger carrying a plurality of punches capable of movement relative thereto and a lock for each punch to hold it against movement, of actuating devices to place the locks in locking position with relation to the punches said devices being normally out of engagement with the locks, and reciprocable toward and away from the latter, means to reciprocate said devices, and pattern-controlled means to place said devices in engagement with the locks during movement toward the same.

11. In a perforating-machine, the combination with a reciprocating plunger carrying a plurality of punches having movement relative thereto, and locks to lock the punches against movement, of actuating devices for



the locks normally out of engagement there-  
with and having movement toward and away  
from said locks, and electrically-operated  
means controlled by a pattern-sheet to throw  
said devices into engagement with the locks  
during movement of said devices in one di-  
rection and to retain the said devices engaged  
with the locks during the reverse movement  
of said devices whereby the locks are actu-  
ated to lock the punches to the plunger.

12. In a perforating-machine, the combi-  
nation with a reciprocating plunger carrying  
a plurality of punches having movement  
relative thereto, and locks to lock the punches  
against movement, of actuating devices for  
said locks normally disengaged therefrom,  
electrically-operated means controlled by a  
pattern-sheet to throw said devices into en-  
gagement with the locks to actuate the lat-  
ter to lock the punches, and means to return  
the locks to normal position when out of op-  
erative relation to the actuating devices.

13. In a perforating-machine, the combi-  
nation with a reciprocating plunger carrying  
a plurality of punches having movement  
relative thereto, and locks to lock the punches  
against movement, of actuating devices for  
the locks normally out of engagement there-  
with and having movement toward and away  
from said locks, electrically-operated means  
controlled by a pattern-sheet to throw said  
devices into engagement with the locks dur-  
ing movement of said devices in one direction  
and to retain the parts engaged during the  
reverse movement of said devices whereby  
the locks are actuated to lock the punches to  
the plunger, and means to return the locks to  
normal position when out of operative rela-  
tion to the actuating devices.

14. In a perforating-machine, the combi-  
nation with a reciprocating plunger carrying  
a plurality of punches having movement  
relative thereto, and locks to lock the punches  
against movement, of actuating devices for  
the locks normally out of engagement there-  
with and having continuous movement to-  
ward and away from said locks, and means  
to throw said devices into engagement with  
the locks during movement of said devices  
in one direction and to retain said devices  
engaged with the locks during the reverse  
movement of said devices whereby the locks  
are actuated to lock the punches to the plun-  
ger.

15. In a perforating-machine, the combi-  
nation with a reciprocating plunger carrying  
a plurality of punches having movement  
relative thereto, and locks to lock the punches  
against movement, of actuating devices for  
the locks normally out of engagement there-  
with and having movement toward and away  
from said locks, and pattern-controlled elec-  
trically-operated means controlled by a pat-  
tern-sheet to throw said devices into engage-  
ment with the locks during movement of said  
devices in one direction and to retain said de-  
vices engaged with the locks during the re-  
verse movement of said devices whereby the  
locks are actuated to lock the punches to the  
plunger.

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

HERBERT L. DAVIS.

Witnesses:

JNO. J. COOK,  
NATHAN HAZEN.