No. 630,598. Patented Aug. 8, 1899.

G. H. DAVIS.

ELECTROMECHANICAL PERFORATING MACHINE.

(Application filed Dec. 12, 1894.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

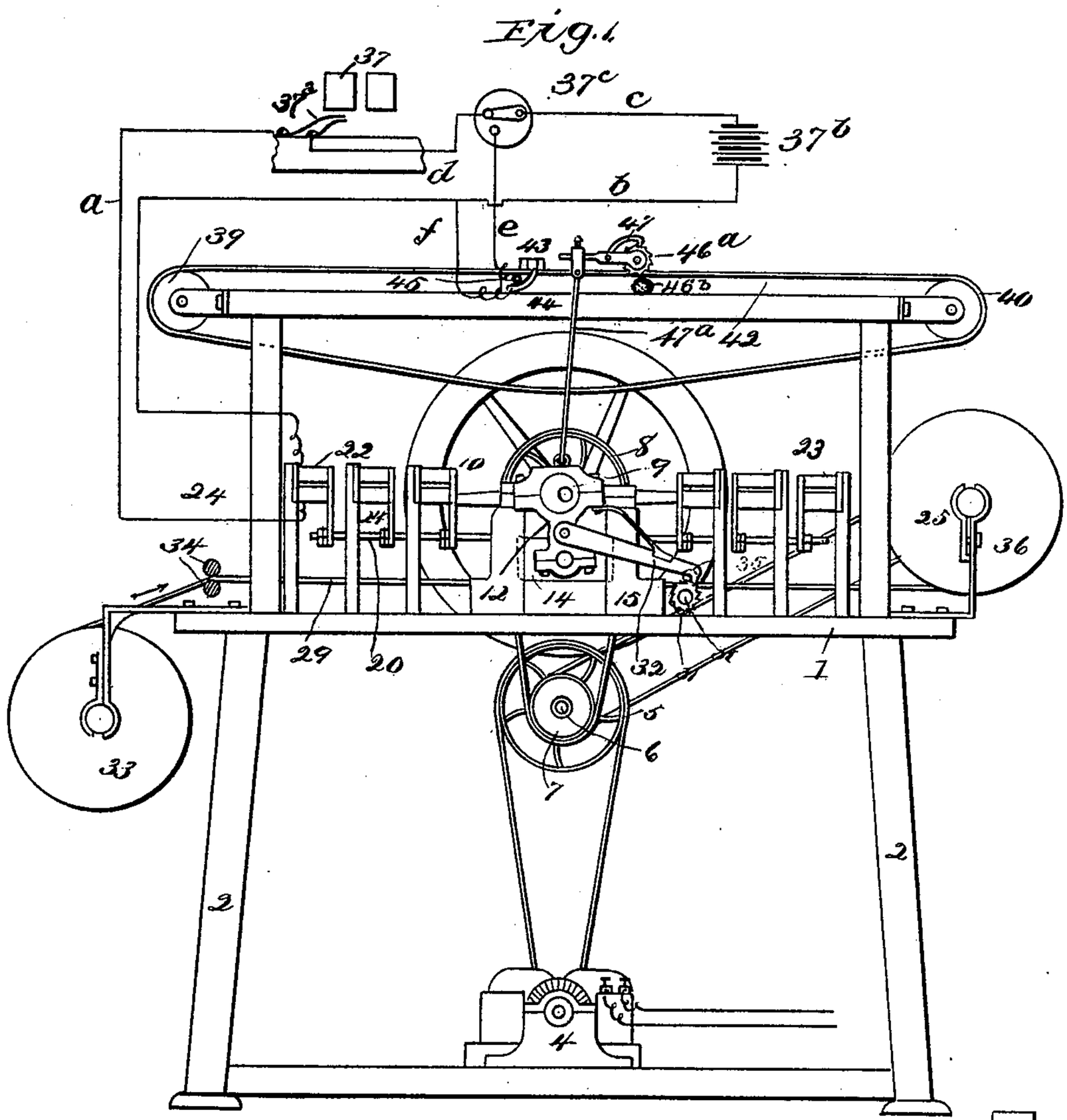


Fig. 2.

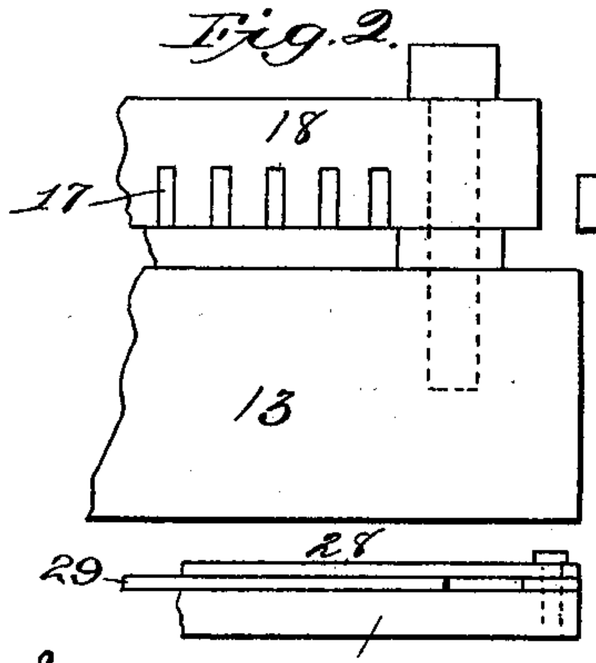
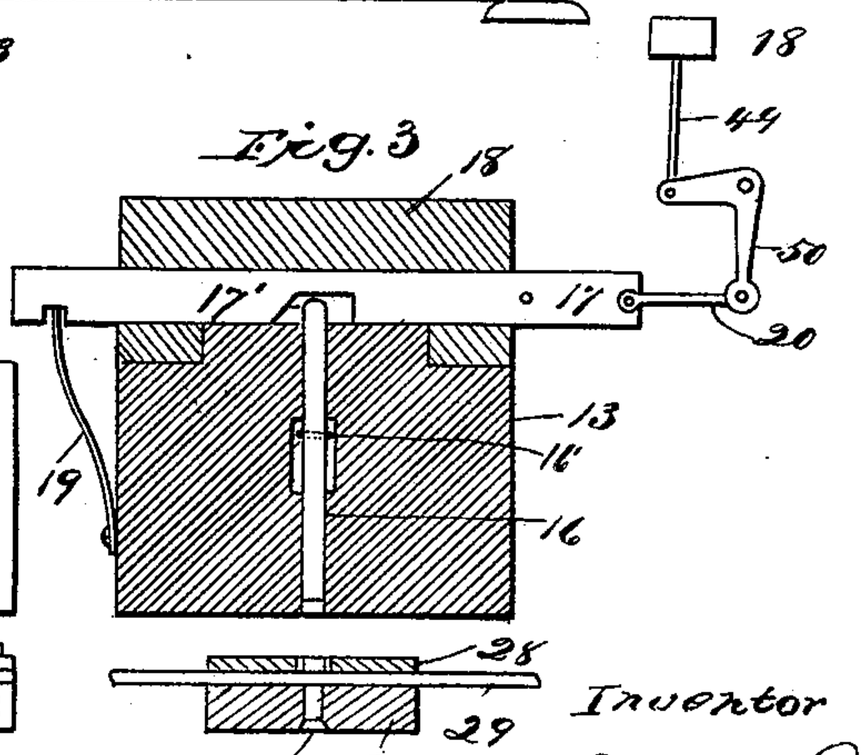


Fig. 3.



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(No Model.) 3 Sheets—Sheet 2.

Fig. 4.

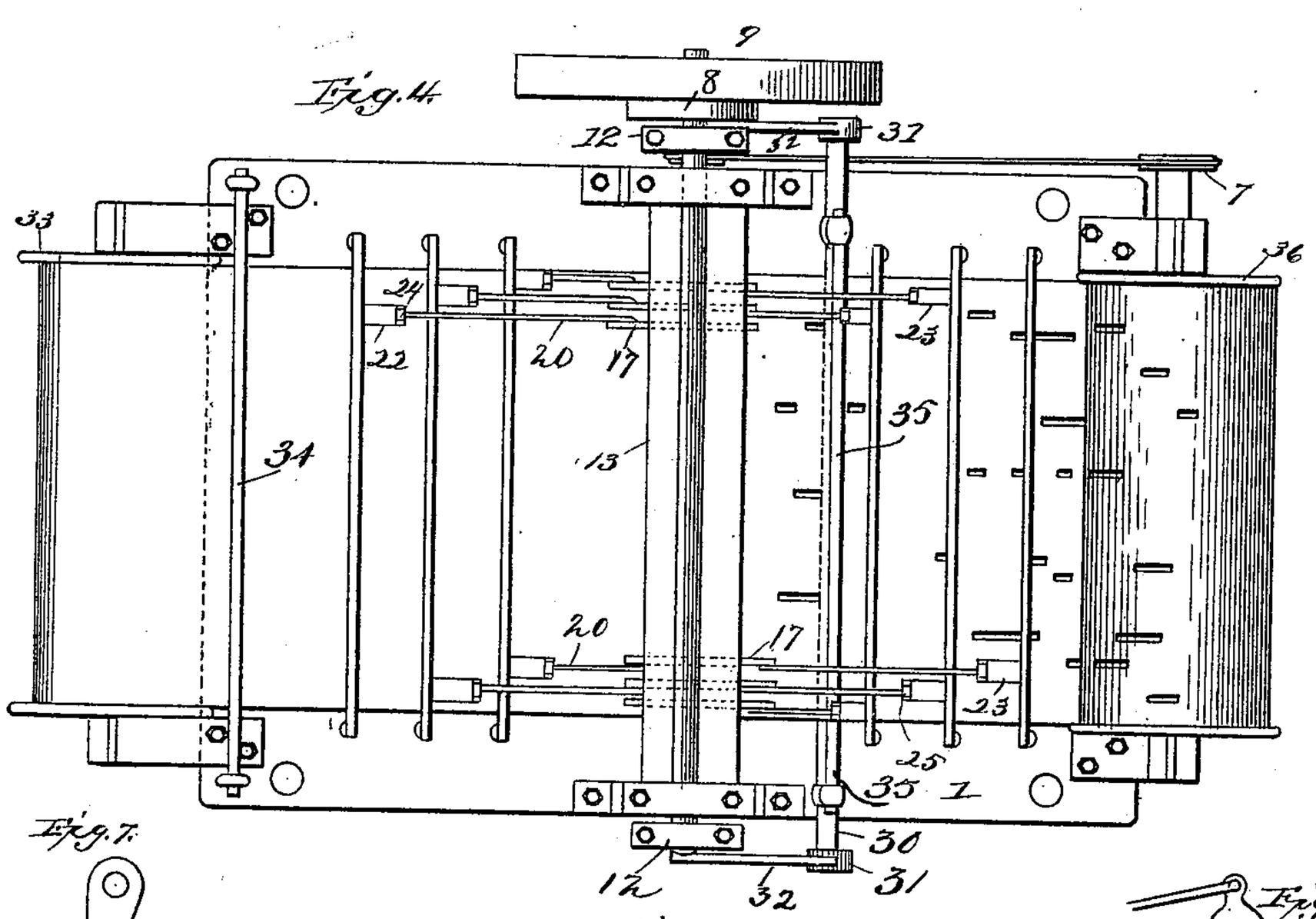

Fig. 7.

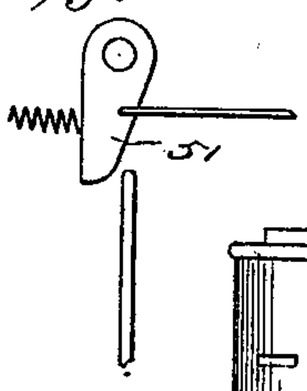

Fig. 8.

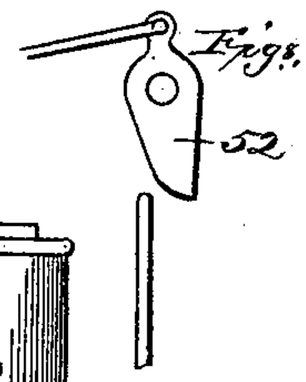

Fig. 5.

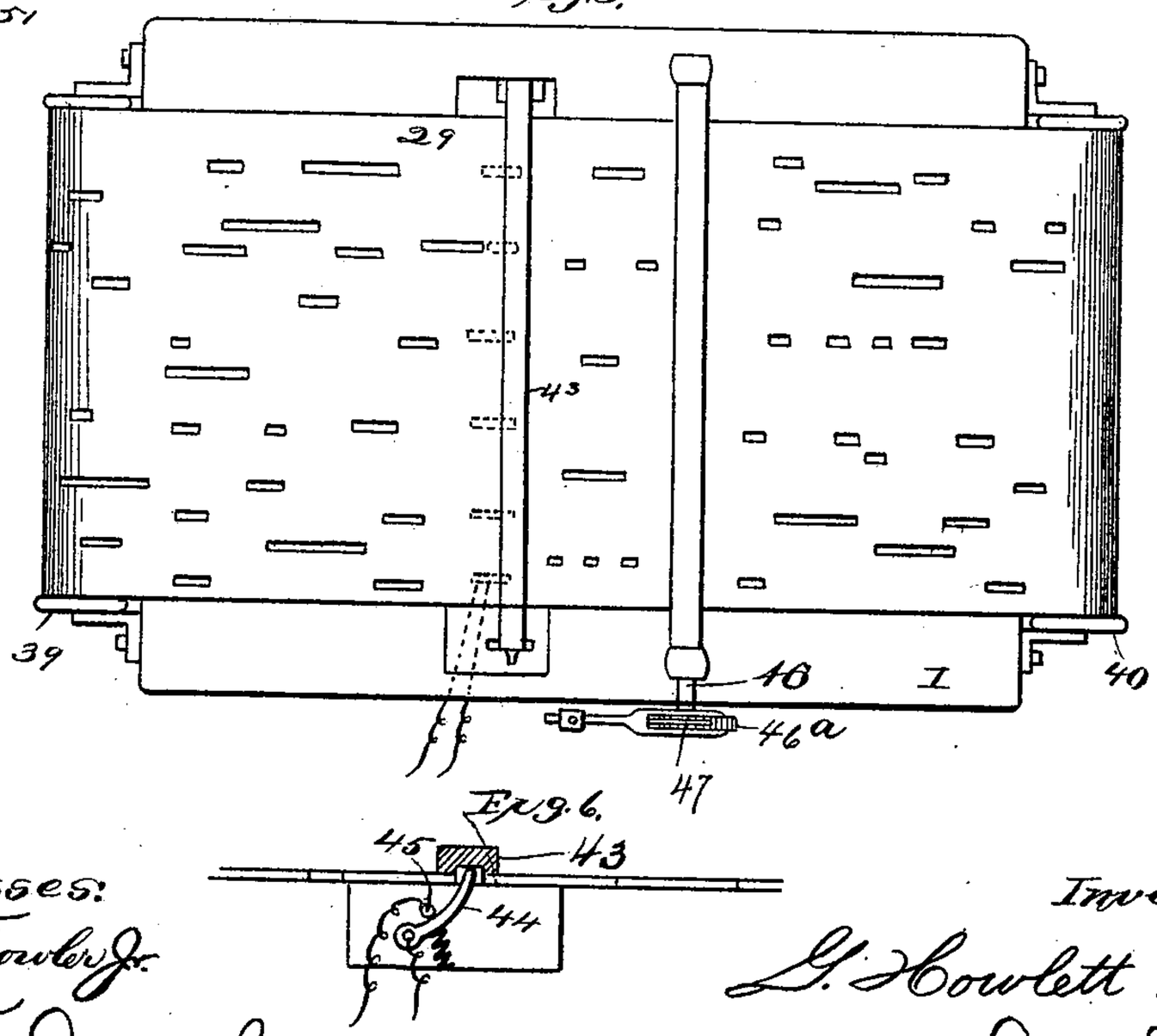

Fig. 6.

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(No Model.) 3 Sheets—Sheet 3.

Fig. 9.

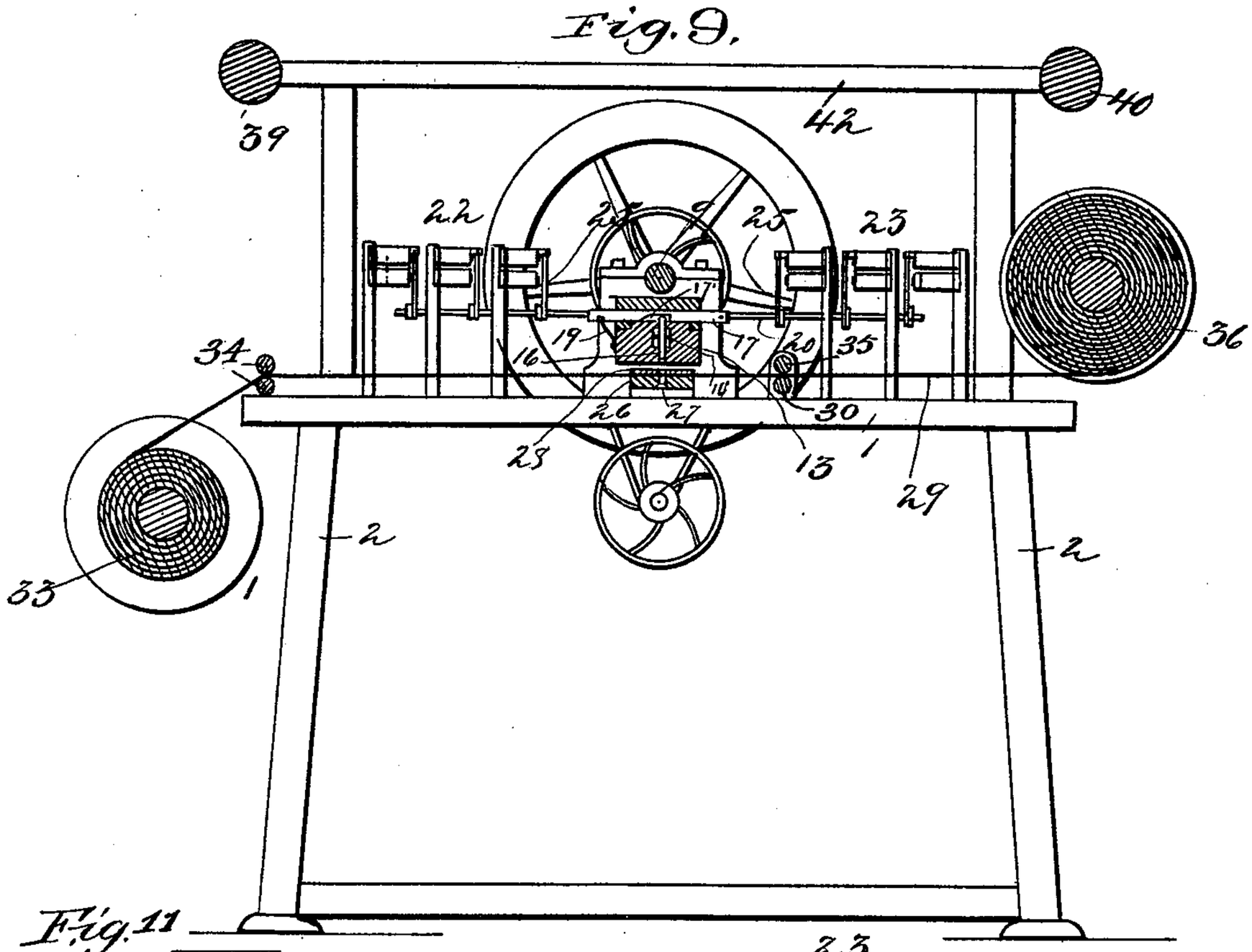


Fig. 11.

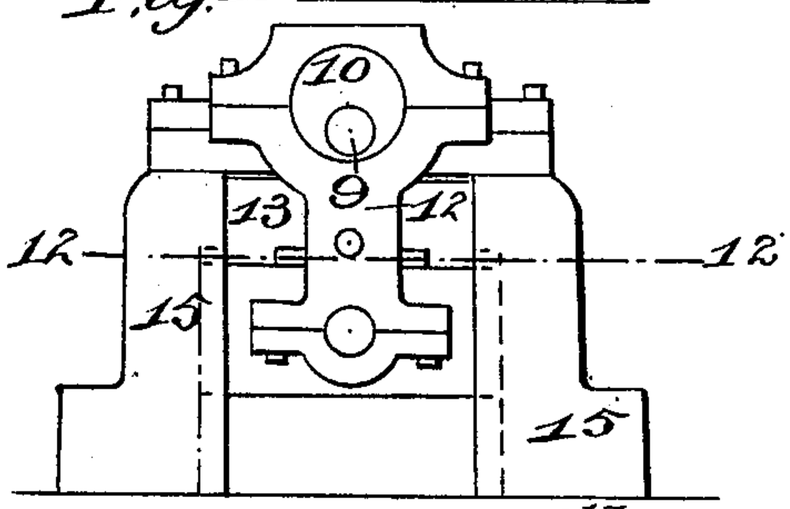
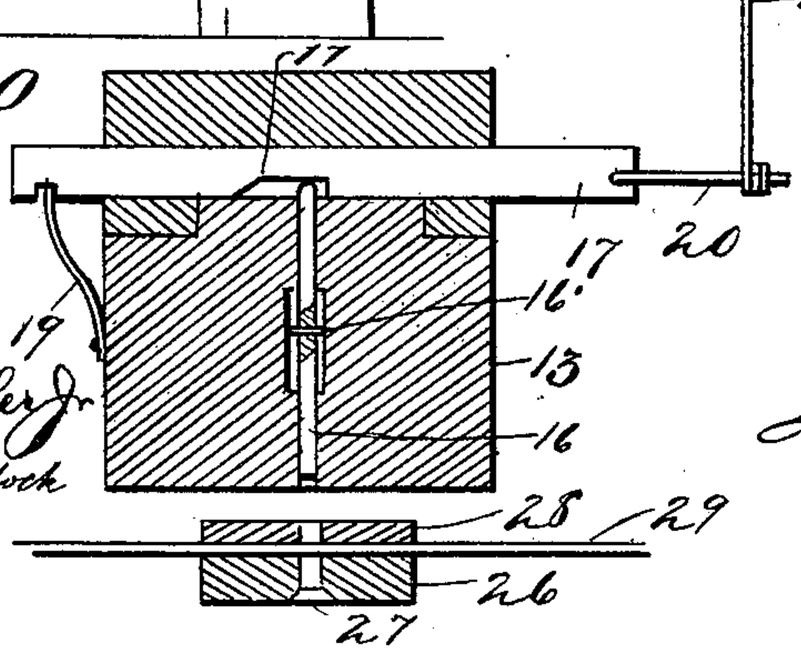


Fig. 10



Witnesses:
J. M. Bowler Jr.
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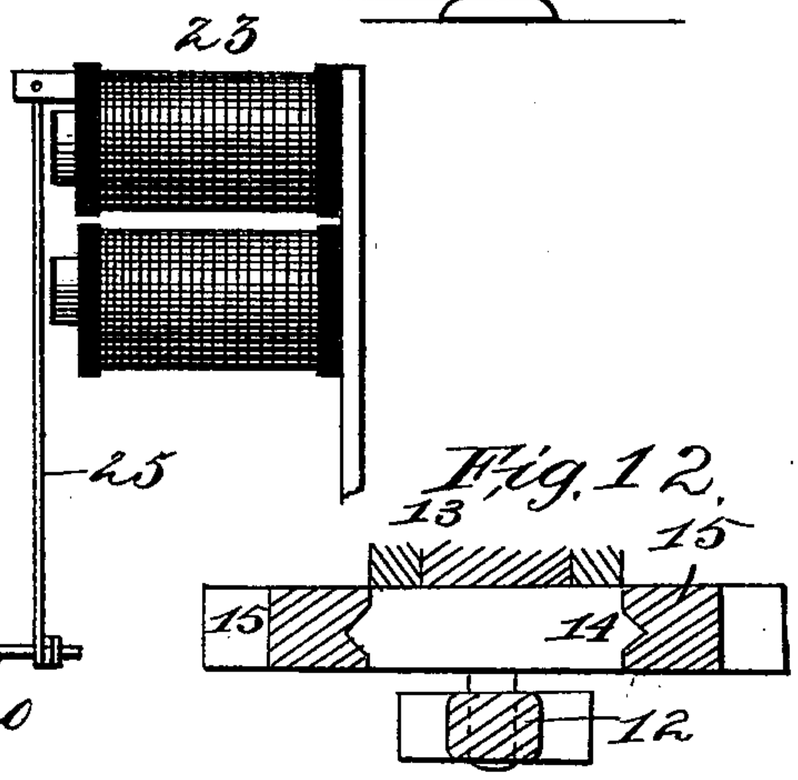
Fig. 12.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

GEORGE HOWLETT DAVIS, OF NEW YORK, N. Y., ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO THE AEOLIAN COMPANY, OF SAME PLACE.

ELECTROMECHANICAL PERFORATING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 630,598, dated August 8, 1899.

Application filed December 12, 1894. Serial No. 531,594. (No model.)

To all whom it may concern:

Be it known that I, GEORGE HOWLETT DAVIS, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented a certain new, useful, and valuable Improvement in Electromechanical Perforating-Machines, of which the following is a full, clear, and exact description.

This present invention relates to electromechanical perforating-machines, and particularly to that class designed to perforate roll-paper into music-sheets used to actuate such automatic instruments as the automaton piano, æolian, orchestrion, &c.

My machine is also adapted to perforate sheet metal, cardboard, &c.

Furthermore, my machine is adapted to be connected with a piano or organ, preferably electrically, so as to produce a perforated music-sheet simultaneously with the depression of the keys of the instrument, and upon running the sheet so produced through an automaton piano or organ it will produce a correct reproduction as to tempo of the piece as originally played.

I accomplish these ends by the form, combination, and arrangement of parts substantially as illustrated in the accompanying drawings, forming a part of this specification.

In said drawings, Figure 1 is a side elevation of my complete machine. Fig. 2 is an enlarged side view of a part of my reciprocating punch-bar, die, stripper, &c. Fig. 3 is a transverse sectional view of the punch-block, illustrating a modification of the mechanism for operating the draw-bars. Fig. 4 is a plan of the lower table; Fig. 5, a plan of the upper table; Fig. 6, an enlarged transverse sectional view of the contact-board. Figs. 7 and 8 show modified forms of punch-setters. Fig. 9 is a longitudinal sectional view of Fig. 1, the reproducing-templet and the connections between the piano-keys and the operating-magnets being removed. Fig. 10 is a transverse sectional view of the punch-block, showing the die and stripper and the mechanism for operating the draw-bars. Fig. 11 is a detail view, on an enlarged scale, of the eccentric, eccentric-arms, punch-block guides, and the standards. Fig. 12 is a sectional view taken upon the line 12 12 of Fig. 11.

In the following detailed description like letters and numerals of reference indicate corresponding parts differently shown in the several views.

Referring to the construction shown in Figs. 1 to 6, inclusive, I provide a table 1, having the legs 2, connected at the bottom by the shelf 3, upon which rests the electric motor 4, of any suitable form, and which drives the pulley 5, rigidly secured to the counter-shaft 6, carrying the driving-pulley 7, belted to the pulley 8, which is rigid with the shaft 9, upon the ends of which are secured the eccentrics 10, operating the eccentric-arms 12, which when in motion give a reciprocating movement to the punch block or bar 13, the V-shaped guides 14 of which work in corresponding grooves in the standards 15, rigidly bolted to the table 1, as shown.

The punch-block 13 is so mounted as to have a constantly reciprocating or vibrating movement imparted thereto. Said punch-block extends entirely across the machine and carries a series of loosely-mounted punches 16, said punches being normally free to vibrate or jump up or down with the movement of the punch-block, but held or prevented from entirely falling from said block by means of short pins or studs 16′, formed with or passed through the punches, said pins or studs working in an enlarged slot or cut-out portion in the punch-block. At the upper part of the vibrating punch-block and passing transversely therethrough are a series of locking-bars 17, each having a notch 17′ cut therein, said notch being normally in alinement with the punches. The notches in the locking-bars are normally held in alinement with the punches by means of the springs 19, secured to one side of the punch-block. When it is desired to lock the punches in position for cutting, it is simply necessary to draw the locking-bars 17 against the tension of spring 19 by means of the rods 20 until the solid portions of the locking-bars adjacent to the notches are directly over the punches, whereupon they will be thrown downwardly and locked, and as the punch-block vibrates the punches will act upon the

paper or other material to be perforated, as hereinafter described. Arranged at either side of said punch-block is a series of magnets 22 23, supported above the table, as shown, to the armatures 24 25 of which is pivotally secured one end of the draw-rods 20. Directly under the reciprocating punch-block is arranged the die 26, having a series of holes 27 to receive the lower ends of punches 16, and over said die is secured the stripper 28 and under which the paper 29 passes.

The feed-roller 30, preferably having a roughened surface, is provided at one end with a ratchet-wheel 31, engaged by pawl 32, connected to and given motion by the eccentric-arm 12.

The paper or other material to be perforated is first led from the supply-roller 33 between the guide-rollers 34, under the stripper 28, between the feed-rollers 30 and friction-roller 35, onto the receiving-roller 36.

Assuming that it is desired to produce a templet or perforated sheet which shall reproduce when run through an automaton piano a piece to be played by a pianist, then I provide any suitable form of electrical contacts 37^a for each key 37 and so arrange them that the depression of any key or series of keys will complete the circuits through said contacts, each key or contact being electrically connected to its respective magnet 22. This circuit may be arranged as follows: A wire *a* connects one of the contact-pieces 37^a to the coil of the corresponding magnet 22. The current then passes through the magnet-coil, then by the wire *b* to a battery 37^b, thence by the wire *c* to a switch 37^c, and thence by the wire *d* to the other contact-piece of the contact 37^a. With this arrangement the depression of the key 37 closes the circuit through the contact 37^a, and thus energizes the magnet 22. *e* and *f'* are wires led from the switch 37^c and the wire *b*, respectively, and are adapted when the switch is thrown to connect the magnet 22 with the copying device upon the table 44, the operation of which will be described hereinafter.

Assuming now that the performer is ready to play, then my machine is set in motion by the motor 4, or otherwise, and the paper 29 is being fed regularly and steadily under the now rapidly-reciprocating punch-block 13, shortly after which the performer commences to play upon the connected piano just as though my machine were not in existence, and, in fact, I contemplate having electrical connections made inside the piano out of sight and my machine set in a different room, so that a performer need not know he is playing for reproduction. During the performance the depression of any particular key, such as 37, completes an electrical circuit through its contact-point and instantly causes the energization of its particular magnet 22, connected by wires, as shown, whereupon its armature is attracted and the draw-rod 20 and draw-bar 17 pulled toward said magnet, and upon said draw-bar sliding forward it locks or sets its punch 16 and keeps said punch set so long as the piano-key is kept depressed, and the longer said punch is kept set the longer will be the perforation or slot it will make in the paper, which is kept moving at a uniform rate below it—*i. e.*, a long note will cause a long slot and a short note a short slot. A note struck even an instant after another would commence to perforate the paper farther along and in a different longitudinal line, or, in other words, the duration of the notes will be indicated by the length of the perforation it causes and the tempo by the relative transverse positions of the slots.

Supposing a correct templet or first sheet to have been produced and it is desired to make a duplicate or duplicates of said templet or first sheet, in this instance it is simply necessary to join the ends of said first sheet and place it upon the rollers 39 40 of my upper table 42, having the contact-board 43 thereon, the fingers or selectors 44 of which are normally kept pressed upward, and being arranged in line with the perforations in the templet they project therethrough and thereby allow said selector to make an electrical contact with the point 45, and as these selectors are now in electrical connection with the magnets instead of the piano-keys it is obvious that if the templet is fed by its feed-roller 46, operated by the ratchet 46^a, and the pawl 47, having a uniform movement with the pawl 32, the templet and under paper 29 will travel at the same speed and that the templet will continuously reproduce itself upon the paper below. The templet-strip is fed forward by means of a rod 47^a, which is connected at its ends with the pawl 47 and the reciprocating head 12, respectively, and thus causes the pawl to rotate the ratchet and the feed-roller 46. A friction-roller 46^b is adapted to press the strip against the feed-roller while the copying mechanism is in operation.

By arranging to feed the templet at, say, half the speed or travel of the under paper then the slots in the latter will be twice the length of those in the templet, and of course their distance apart will be relatively longer. In this way the manufactured under sheets may be made in any desired proportions longer or shorter than the templet.

Instead of actuating the draw-bars 17 electrically I may choose to make mechanical connections therefrom to the piano, such as that shown in Fig. 3, in which the key 48 depresses the bar 49, actuating the bell-crank 50, thus giving an outward movement to its lower end, to which the draw-rod 20 and lock 17 are connected, and instead of employing the lock 17 to set the punches I may substitute the arms 51 and 52. (Shown in Figs. 7 and 8, respectively.)

Instead of having the punch-bar movable I also contemplate making this stationary and arranging the die to reciprocate, in which case the paper would have an up-and-down move-

ment with the die, and in view of this objectionable feature I prefer to make the punch-bar to reciprocate, as shown in the drawings and described.

I claim—

1. The combination with a piano or similar musical instrument operated by keys, of a perforating-machine having a rapidly and constantly reciprocating punch-block, a suitable die, a series of punches loosely carried by said punch-block, locking devices carried by said punch-block and means operatively connecting said keys with said locking devices whereby a punch or punches will be locked to said punch-block during the depression of a suitable key or keys, substantially as specified.

2. The combination with a piano or similar musical instrument having keys for operating the instrument, of a punch-block, a series of punches carried thereby, a suitable die therefor, and means for rapidly reciprocating said punch-block whereby said punches may engage said dies; a locking device for each of said punches, and means operatively connecting the keys of said musical instrument and said locking devices, whereby the depression of said keys will lock said punches and render them operative.

3. The combination with a piano or similar musical instrument having operating-keys, of a perforating-machine comprising a rapidly and constantly reciprocating punch-block and a suitable die, a series of punches loosely carried by the punch-block, locking devices mounted upon and carried by the punch-block, and means operatively connecting said keys and said locking devices, whereby a punch or punches will be locked to the punch-block during the depression of a suitable key or keys; and means for copying a perforated strip formed by said perforating-machine, said means comprising a series of arms, a device for passing the strip over said arms, and means operatively connecting said arms and said punch-locking devices, said means operated by the passage of the perforated strip over said arms, whereby a punch or punches will be locked in the punch-block when a perforation in said strip passes over a suitable arm or arms, substantially as specified.

In testimony whereof I affix my signature in presence of two witnesses.

GEO. HOWLETT DAVIS.

Witnesses:

SAMPSON H. SCHWARZ,

WILLIAM ROSENFELD.