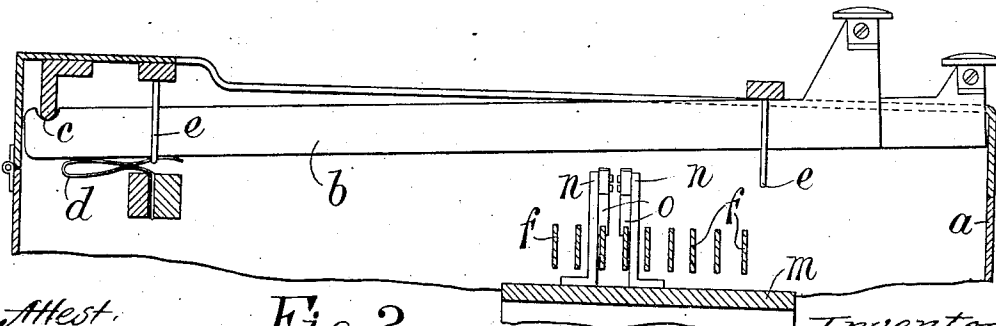
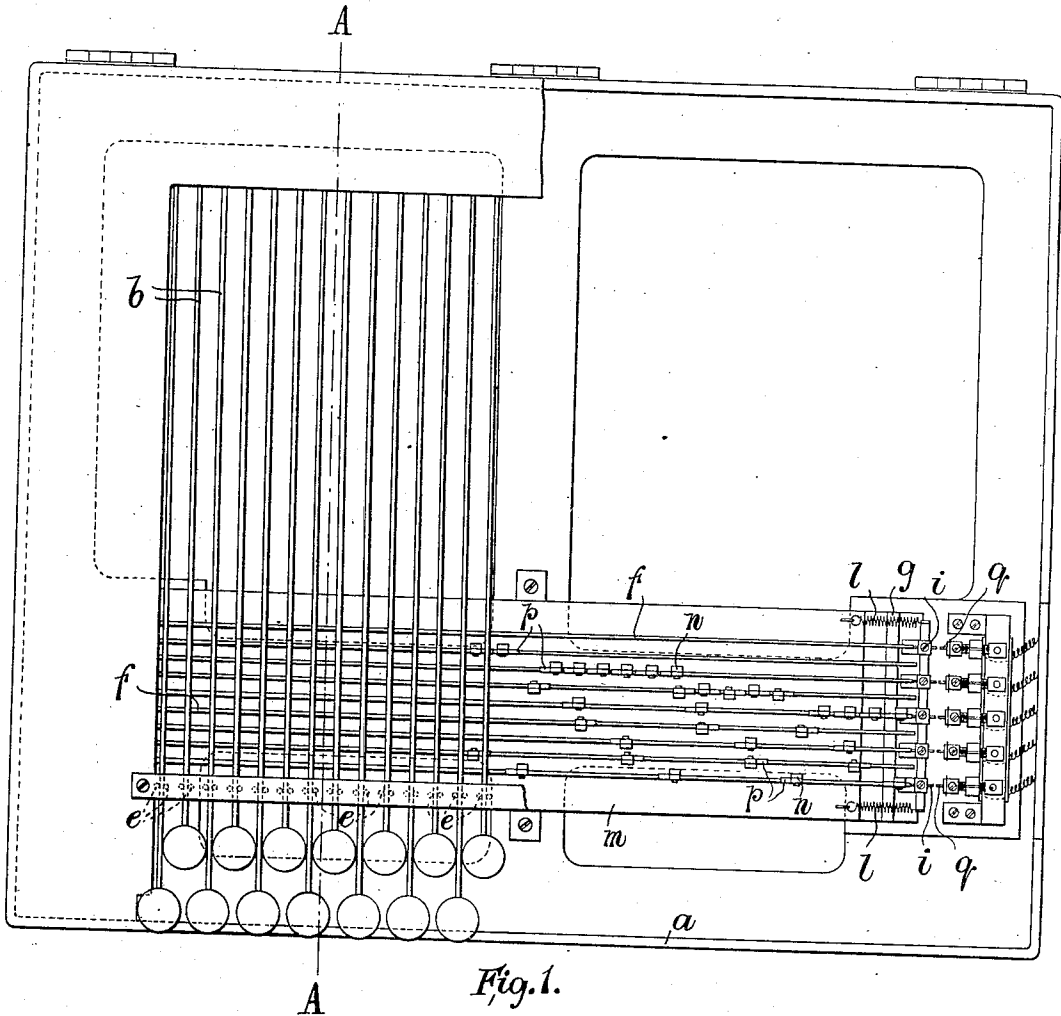


F. H. W. HIGGINS.
PERFORATING, PUNCHING MACHINE, &c.

APPLICATION FILED OCT. 15, 1906.

7 SHEETS—SHEET 1.



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Fig. 2.

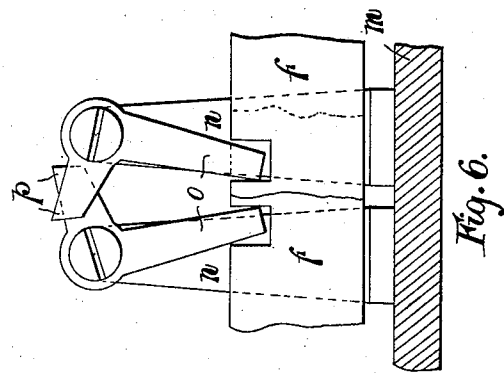
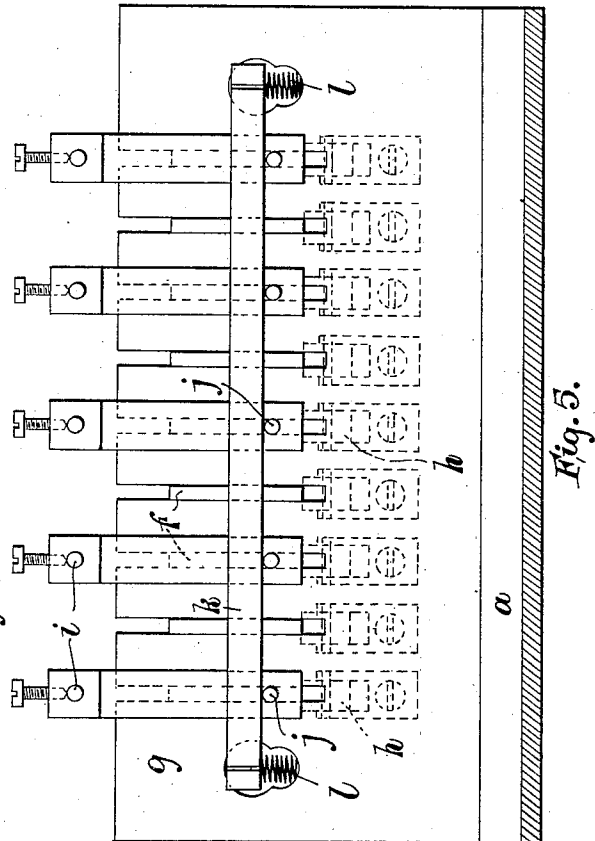
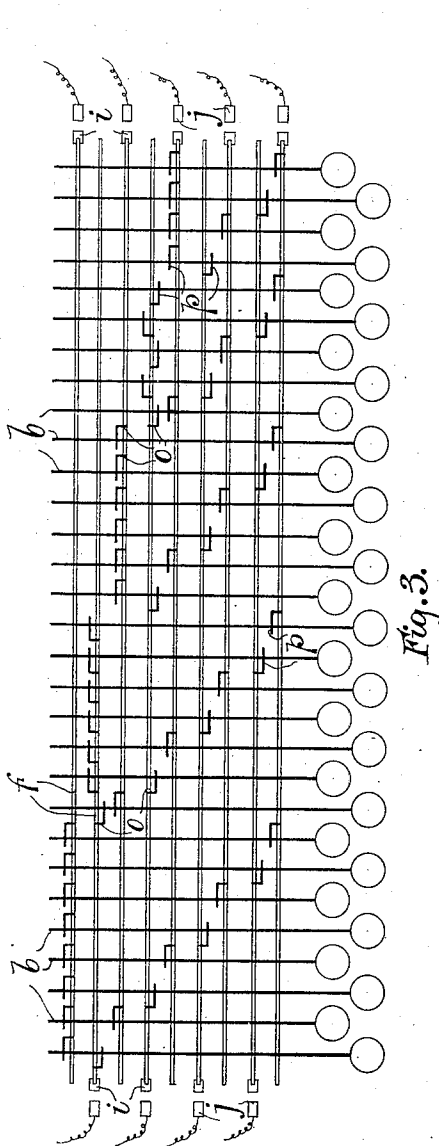
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7 SHEETS—SHEET 2.



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7 SHEETS—SHEET 3.

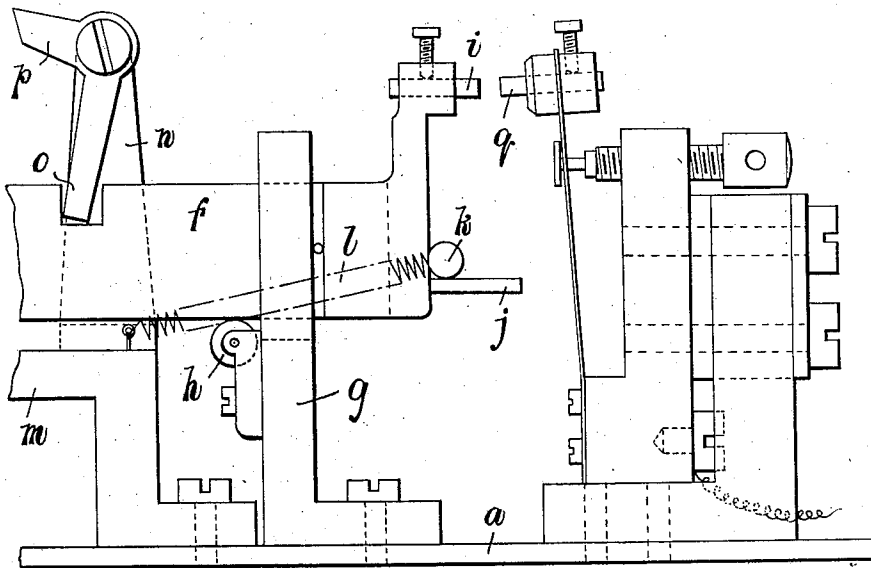


Fig. 4.

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7 SHEETS—SHEET 4.

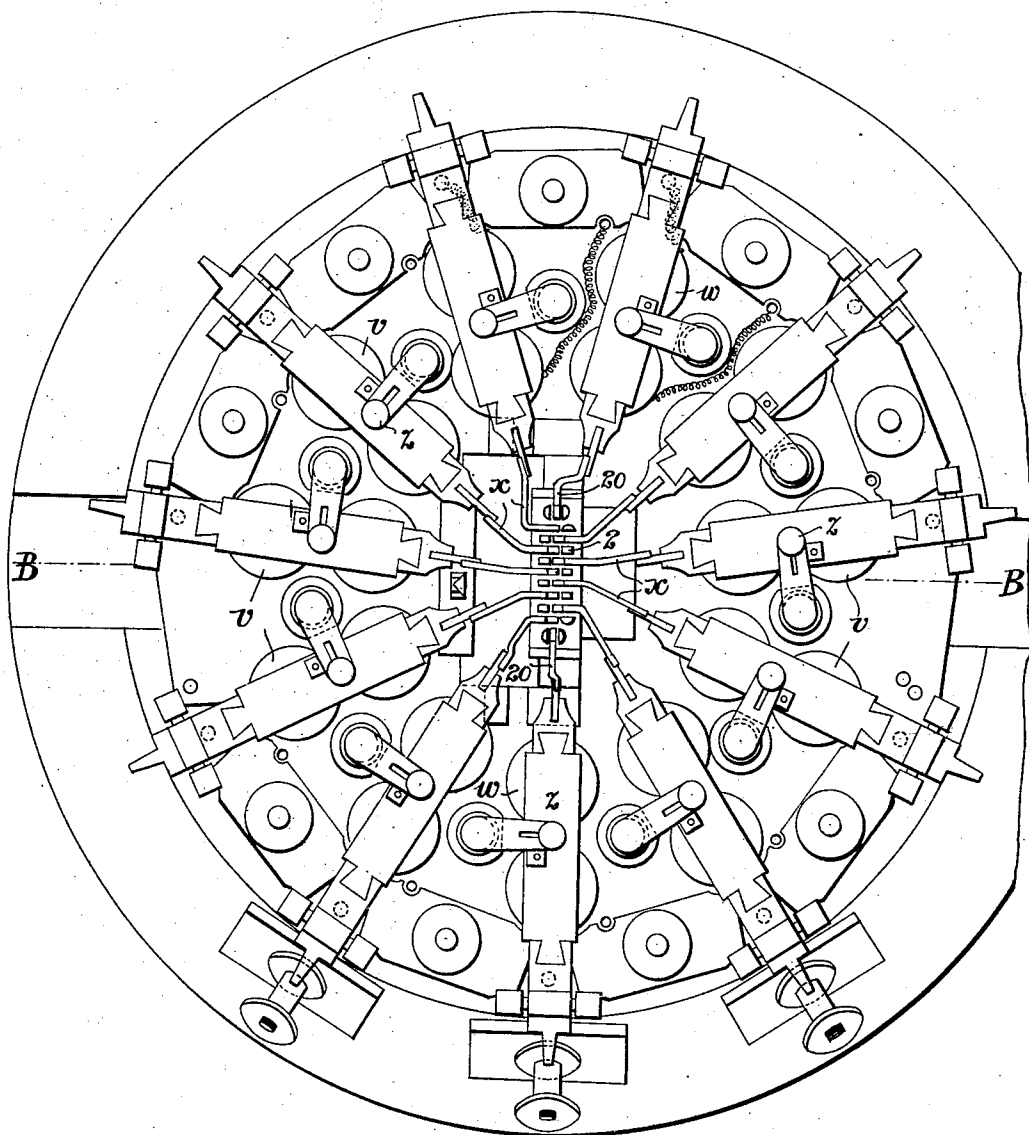


Fig. 7.

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7 SHEETS—SHEET 5.

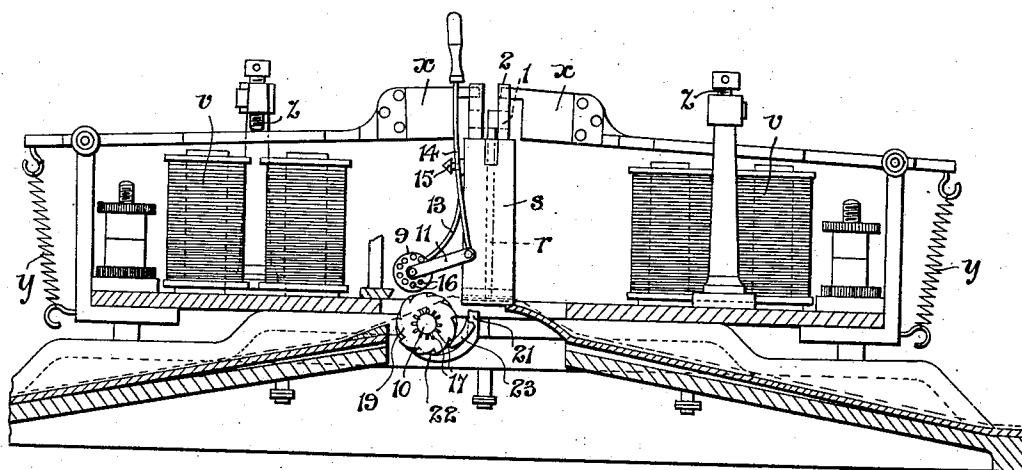


Fig. 8.

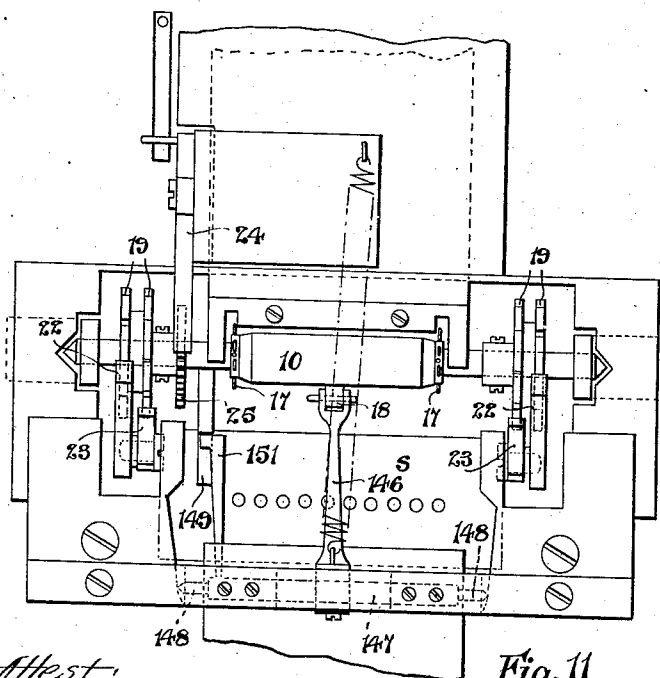


Fig. 11.

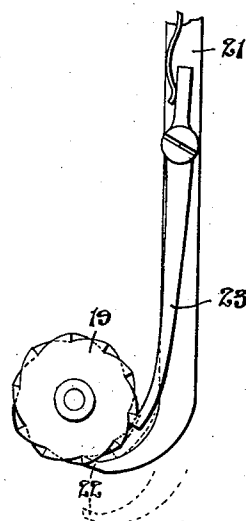


Fig. 12.

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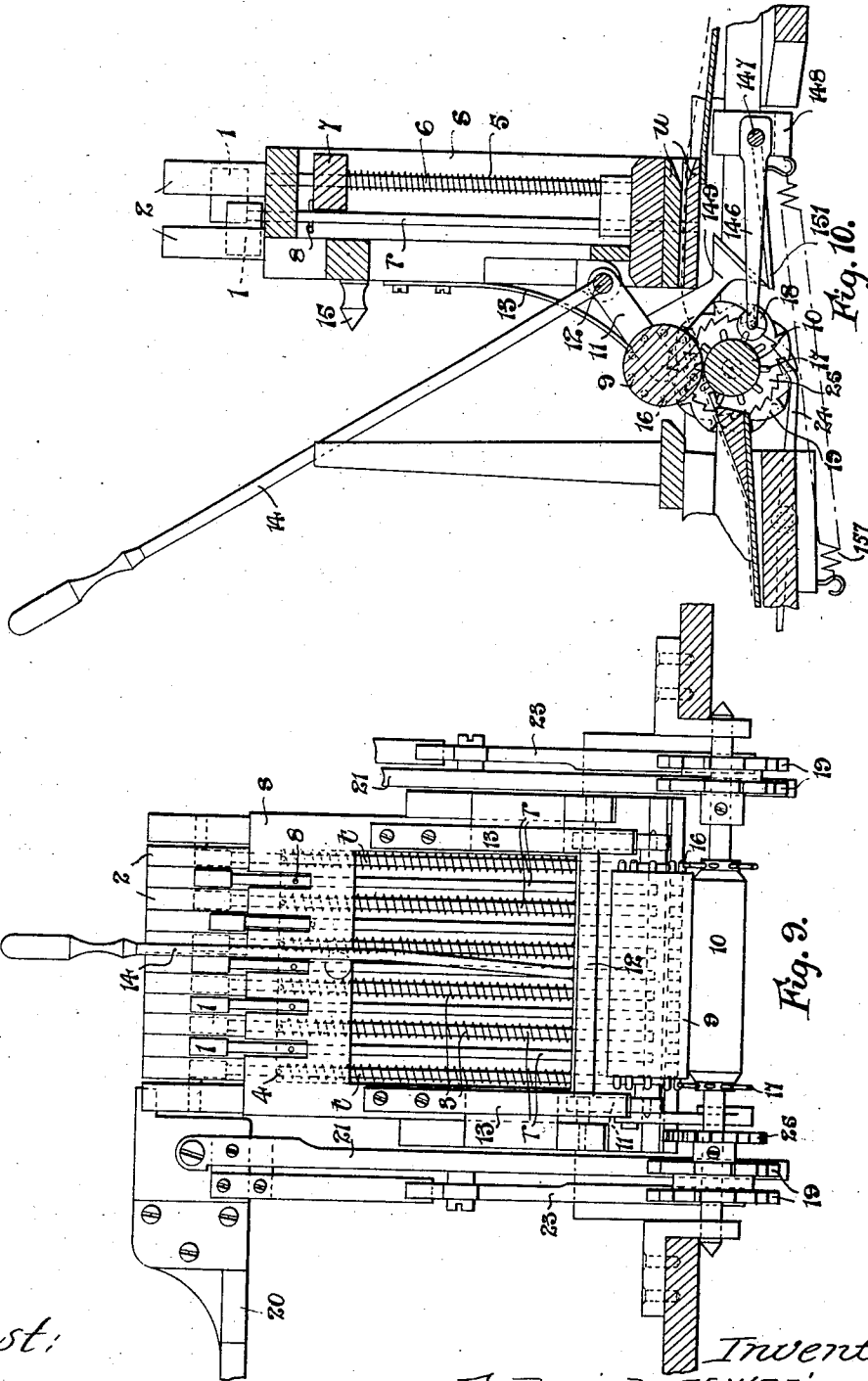
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7 SHEETS—SHEET 6.



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7 SHEETS—SHEET 7.

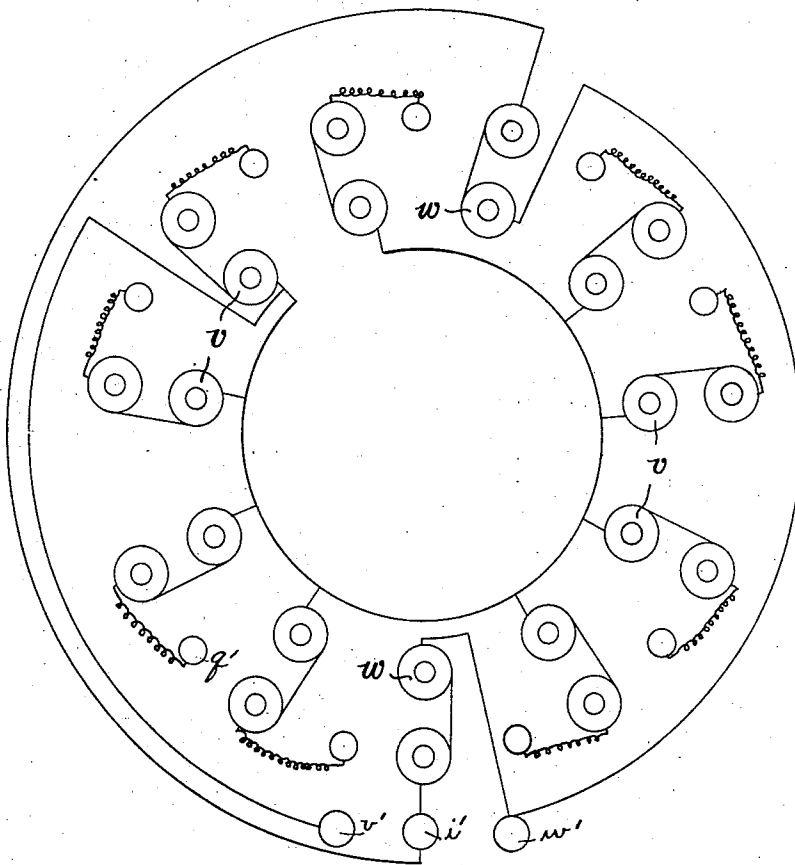


Fig. 13.

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Frederick H. W. Higgins

By *Geo. Middleton* *Ambleton* *Geo.*
Atty

UNITED STATES PATENT OFFICE.

FREDERICK HERBERT WILLIAM HIGGINS, OF LONDON, ENGLAND.

PERFORATING, PUNCHING MACHINE, &c.

No. 894,143.

Specification of Letters Patent.

Patented July 21, 1908.

Original application filed December 12, 1905, Serial No. 291,472. Divided and this application filed October 15, 1906. Serial No. 339,039.

To all whom it may concern:

Be it known that I, FREDERICK HERBERT WILLIAM HIGGINS, a subject of the King of Great Britain and Ireland, and residing at 17 and 18 Cornhill, London, E. C., England, have invented certain new and useful Improvements in and Relating to Perforating, Punching Machines or the Like, of which the following is a specification.

My invention relates to perforating and punching machines and has especial reference to such machines as are used for perforating tape, ribbon or the like for operating type printing telegraph transmitters.

This invention consists in a perforating or punching instrument actuated electromagnetically on the depression of a key on a keyboard so that a definite number out of a greater number of punches are operated to form a code symbol on the tape, ribbon or the like corresponding to the key depressed.

My invention also consists in the improved keyboard and perforating mechanism to be hereinafter described.

Referring now to the accompanying drawings which illustrate my invention and form part of my specification, Figure 1 is a plan of a keyboard constructed according to my invention, the lid on the right hand half being removed. Fig. 2 is a cross sectional elevation of the key board shown in Fig. 1, the section being taken on the line A A of that figure. Fig. 3 is a diagrammatic view of the keyboard shown in Fig. 1. Fig. 4 is a detail view of the contacts shown in Fig. 1. Fig. 5 is an end elevation of the transverse bar contacts shown in Fig. 4. Fig. 6 is a detail view of the bell cranks for operating the transverse bars shown in Fig. 5. Fig. 7 is a plan of the perforator constructed according to my invention, Fig. 8 is a sectional elevation of the perforator shown in Fig. 7, the section being taken on the line B B of that figure. Fig. 9 is a front elevation of the punch frame of the perforator shown in Figs. 7 and 8. Fig. 10 is a sectional elevation and Fig. 11 is a plan looking from below of the punch frame shown in Fig. 9. Fig. 12 is detail view of the ratchet feed mechanism shown in Figs. 8, 9 and 10, Fig. 13 is a diagrammatic view of the circuits of the perforator shown in Figs. 7 and 8.

In the drawings similar parts are denoted by the same reference symbols.

The perforating instruments which will be

hereinafter described are adapted to punch or perforate a tape or code symbol registering element of sufficient breadth to take say nine signaling perforations in each row. I also provide certain other perforations for feeding purposes to be described hereafter. As I actually only make two perforations in each row out of a possible nine this provides for 36 different combinations each of which may represent a complete code symbol corresponding to a letter, figure or the like.

In constructing a key-board according to one modification as shown in Figs. 1 to 6, I dispose in the upper part of a suitable hinged box or casing, *a*, a number of levers, *b*, one to each key arranged lengthwise from front to back of the casing. The levers, *b*, are fulcrumed at *c*, and operate against the resistance of springs, *d*, guides, *e*, being provided between each lever to maintain them in their respective positions. Directly beneath the levers, *b*, and situated transversely thereto, bars, *f*, are arranged nine in number mounted in guides, *g*, fixed to the lever part of the casing, *a*. These bars, *f*, preferably rest on roller bearings, *h*, and have contacts *i*, fixed on one end, the contacts being arranged so that five are on one side and four on the other, as shown in Fig. 3.

From each contact end of the bars, *f*, a pin, *j*, projects, upon which a rod, *k*, rests, having springs, *l*, attached to each end so that the bars are returned to their original position when the pressure on the keys is removed. A base-plate, *m*, is attached to the bottom of the casing and supports bearings, *n*, for bell crank levers, one arm, *o*, of which engages with slots formed in the bars, *f*, while the other arm, *p*, is adapted to lie in the path of the levers, *b*, so that on depressing the keys the bars are caused to close the contacts, *i*, and *q*, thereby causing the punches of the perforator to operate and produce a signal corresponding to the key depressed. The key board as shown is provided with thirty keys, the depression of each key causing always two of the bars make contact, as shown in Fig. 3.

Turning now to the perforator which is shown according to one form in Figs. 7 to 13, I arrange nine signaling punches, *r*, which preferably take the form of steel rods, side by side in a suitable frame, *s*, the row of punches being disposed in a direction transverse to the length of the tape, shown by a dotted

line in Fig. 8. At the ends of this row corresponding to the edges of the tape, and one at each end I arrange other two punches, *t*, for feeding purposes, which may be of smaller diameter than the others. The tape is fed by means to be described hereinafter, between two plates, *u*, suitably perforated and disposed immediately below the punches.

For the operation of the punches, a series of electromagnets, *y*, are arranged in pairs, those marked *w*, operating the punches at the ends of the row, each pair actuating a lever, *x*, provided with a returning spring, *y*, and an adjustable stop, *z*. In the form of my invention now being described, the levers are disposed in a radial manner, their inner ends being shaped (see Fig. 8) so as to be directly above their respective punches. Each punch is provided at its upper end with a cross piece, 1, on which its corresponding lever presses, the various parts being maintained in their correct relative positions by guides, 2, secured to the frame, *s*. In order to return the punches after depression of the levers, I provide suitable helical springs, 3, and with a view to keeping the punches close together so as to reduce the width of the tape, I arrange certain of these springs only in positions directly surrounding their respective punches, while the other springs I arrange to one side. Thus referring to Figs. 9 and 10, it will be seen that the alternate springs, 3, directly surround their respective punches and bear against pins, 4, passing through them, while the remaining springs, 5, are arranged in a row around stationary guide rods, 6, disposed at one side of the punches, these springs acting on small blocks, 7, sliding on the guide rods, 6, and bearing against the pins, 8, in the corresponding punches.

According to the arrangement above described, four holes are punched simultaneously, two for signaling purposes, these varying according to the signal to be transmitted and the two at the edges of the tape for feeding purposes. A diagram of the connections is shown in Fig. 13.

Each of the contacts, *q*, of the keyboard, Fig. 4, is connected to one of the terminals, *q'*, of the electromagnets, *v*, while all the contacts, *i*, are connected to the terminal, *i'*, a battery or other source of current is inserted between the terminals, *v'*, and *w'*, so that the depression of any key energizes two sets of connected magnets for punching the signaling perforations and two sets of magnets for punching the feed perforations in the manner above described.

In order to feed the tape forward step by step, it is passed between two rollers, 9 and 10, the upper of which is carried by a lever, 11, which is mounted on a spindle, 12, and pressed down by springs, 13. Rotation of this spindle by means of the finger lever, 14,

attached to it enables the upper roller to be raised for insertion of the tape, the lever being held by any suitable means such as the grooved button, 15. The upper roller, 9, is provided with teeth, 16, at each end which mesh with corresponding teeth, 17, on the lower roller, 10, when the parts are in an operative position, a small roller, 18, co-acting with the lever, 14, being provided for disengaging the perforations of the tape from the teeth, 17, of the lower roller. The roller, 18, is rotatably mounted on an arm, 146, rigidly attached to the shaft, 147, journaled in bearings, 148, and carrying the arm, 151, which arm is actuated by a cam piece, 149, fixed to the lever, 11, the lever, 11, being connected to the lever, 14, the operation of the latter in addition to raising the upper feed roll out of contact with the lower one as before described allows the roller, 18, to be raised by the action of the spring 157, so as to disengage the feed perforations in the tape from the teeth, 17, on the lower feed roll, 10. The axle on which the lower roller is mounted also carries at each end, two ratchet wheels, 19, having oppositely disposed teeth.

Each of the levers, 20, which operate the feed punches carries a rod, 21, having a detent, 22, at the end disposed to coöperate with one of the oppositely disposed ratchet wheels of each pair, 19, the rod in its turn carrying a spring pressed pawl, 23, disposed to coöperate with the other ratchet wheel. The lower roll is rotated after the magnetic impulse has ceased, *i. e.*, when the levers, 20, are being returned by the springs, *y*, to their normal position in contact with the adjustable stops, *z*. The pawls, 23, then engage with the appropriate teeth of the ratchet wheels thereby rotating the rolls the motion being determined by the detents, 22, against each of which respectively, a tooth of the remaining ratchet wheel of each pair butts. Just at the end of this operative feeding stroke, another pawl, 24, engages with a tooth of the ratchet wheel, 25, also mounted on the axle of the lower roll and thereby prevents any possibility of a backward motion of the rolls during the ensuing punching operation when the detent rod, 21, and pawl are lowered in readiness for another feeding action.

Although the punches have been described as arranged side by side in a row, it will be obvious that if desired they may be arranged in a "staggered" manner so as to reduce somewhat the breadth of the tape.

It will be evident that by my invention the registering of code symbols for telegraphic purposes can be performed in a very expeditious and simple manner, while arranging that the punching operation is effected by electromagnetic means calls for less exertion on the part of the operator. Further by means of my invention the neces-

sity for skilled operators is dispensed with as when the tape is perforated it may be transferred to an automatic transmitter apparatus such as I have described in my patent application Serial No. 291,472 and automatically recorded in type characters at the receiver instrument.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. In a machine of the type indicated the combination of a plurality of key levers; a plurality of slidably mounted bars; a plurality of rotatably mounted bell-cranks in operative connection with said slidably mounted bars and mounted independently of said key levers, together with means coacting with said slidably mounted bars for closing an invariable number of electrical contacts on the depression of a key lever as set forth.

2. In a machine of the type indicated, the combination of a plurality of key levers, a plurality of slidably mounted bars, a plurality of rotatably mounted bell cranks in operative connection with said slidably mounted bars and mounted independently of said key levers, a plurality of electrical contacts; and a plurality of electro-magnetic punches the depression of any key lever closing an invariable number of contacts and thereby operating an invariable number of punches, as set forth.

3. In a machine of the type indicated, the combination of a plurality of key levers, a

plurality of sliding bars arranged transversely to said levers; friction reducing bearings for said sliding bars, a plurality of electrical contacts coöperating with said sliding bars; a plurality of bell cranks in operative engagement with said sliding bars and operating to close an invariable plurality of said contacts on the depression of any key lever together with means for returning said sliding bars and said key lever to their initial position on release of said key lever; as set forth.

4. In a machine of the type indicated the combination of a casing, a plurality of key-levers disposed in said casing; resilient mounts for said key levers; a plurality of sliding bars mounted in said casing and disposed transversely to said key levers; friction reducing bearings for said sliding bars; a plurality of electrical contacts coöperating with said sliding bars; a plurality of bell-cranks in operative engagement with said sliding bars mounted independently of said key levers and operating to close an invariable number of said contacts on the depression of any key lever, together with means for returning said sliding bars to their initial position on release of said key lever as set forth.

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

FREDERICK HERBERT WILLIAM HIGGINS.

Witnesses:

T. J. SEAFORD,

G. F. WARREN.