

E. O. C. KUHNEL.

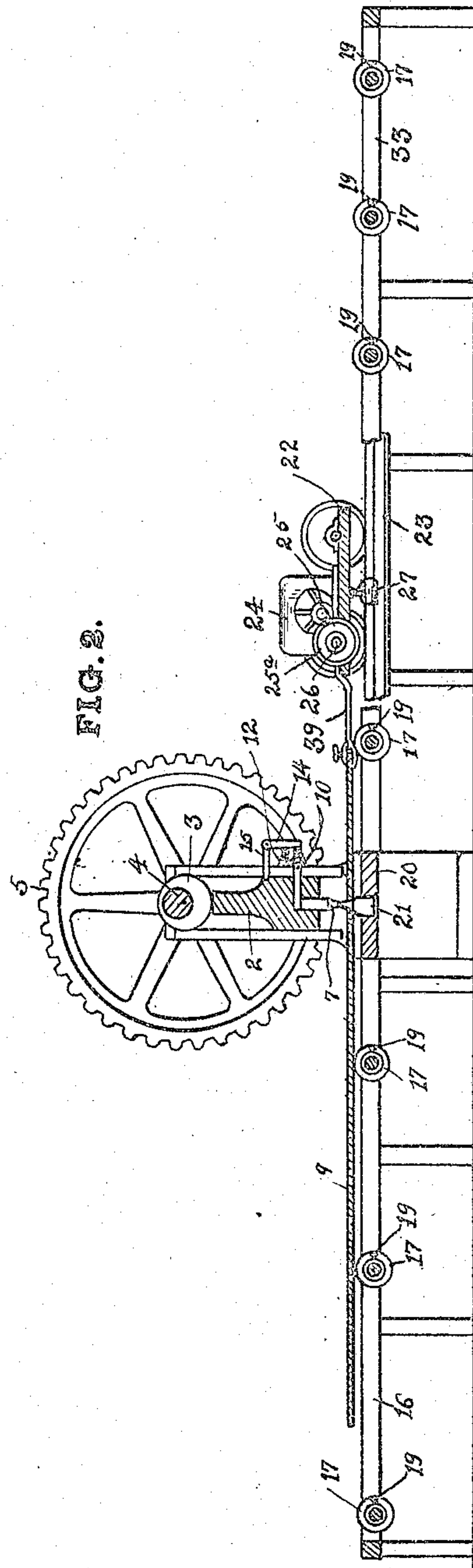
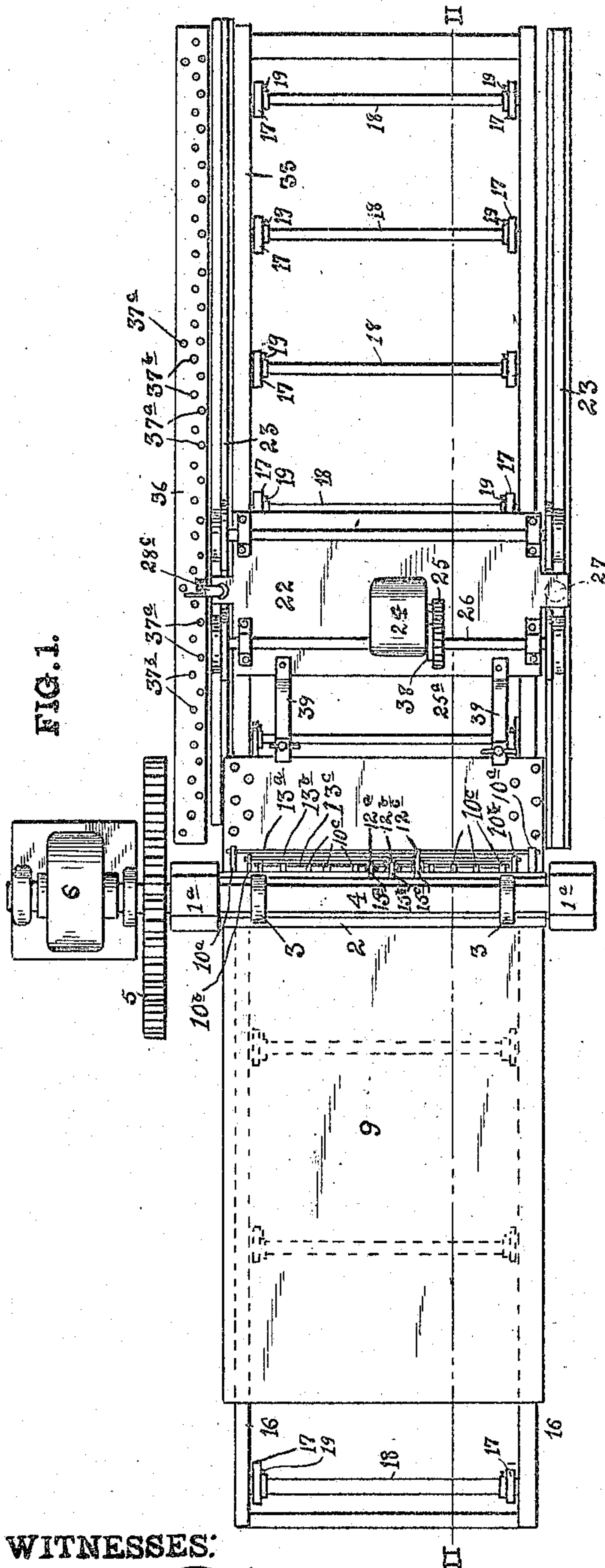
PUNCHING MACHINE.

APPLICATION FILED MAY 25, 1908.

930,867.

Patented Aug. 10, 1909.

2 SHEETS—SHEET 1.



WITNESSES:

Robt. F. Dilworth
Mary J. Smith

INVENTOR

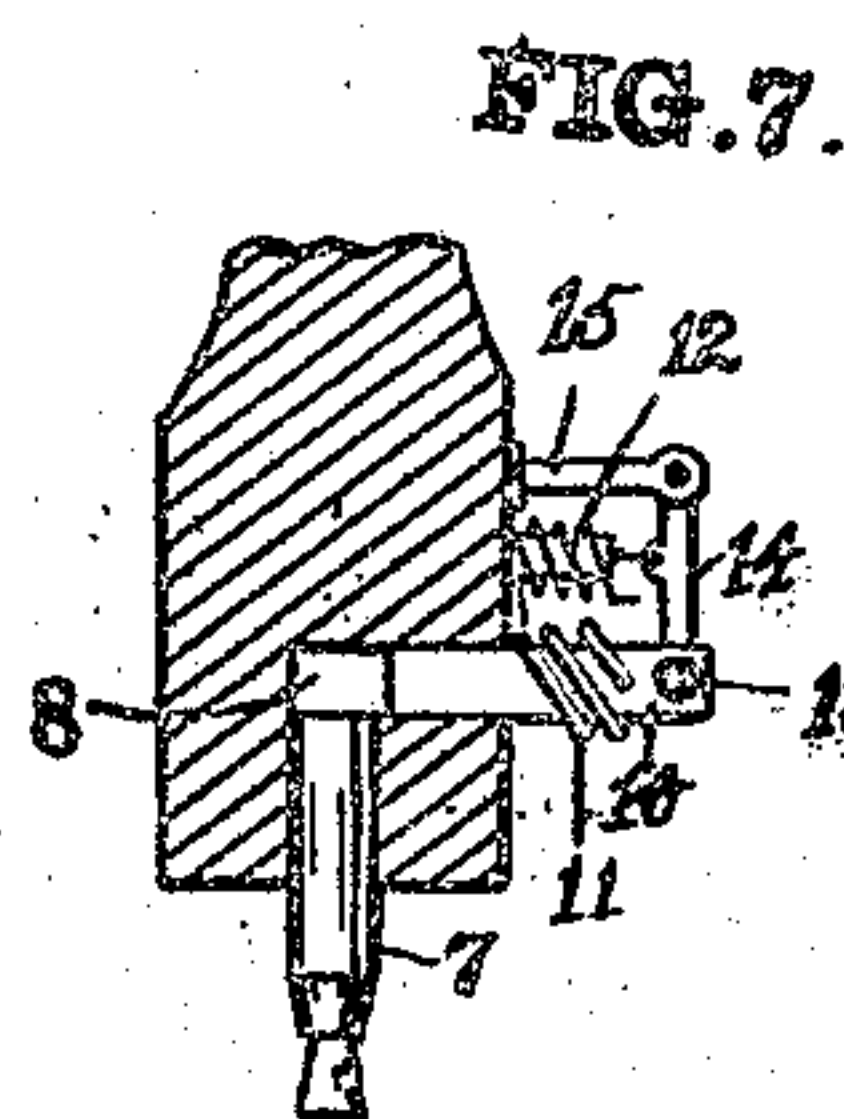
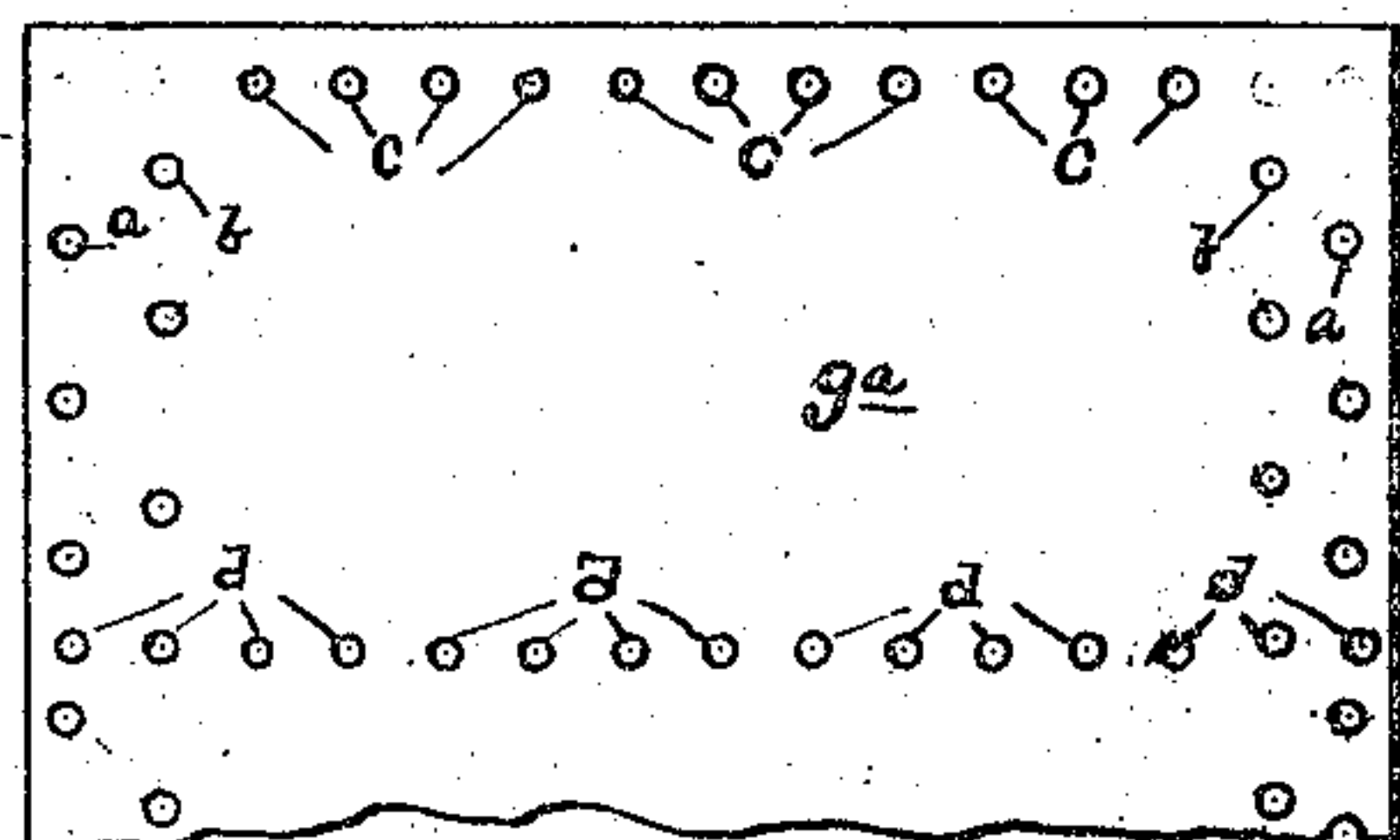
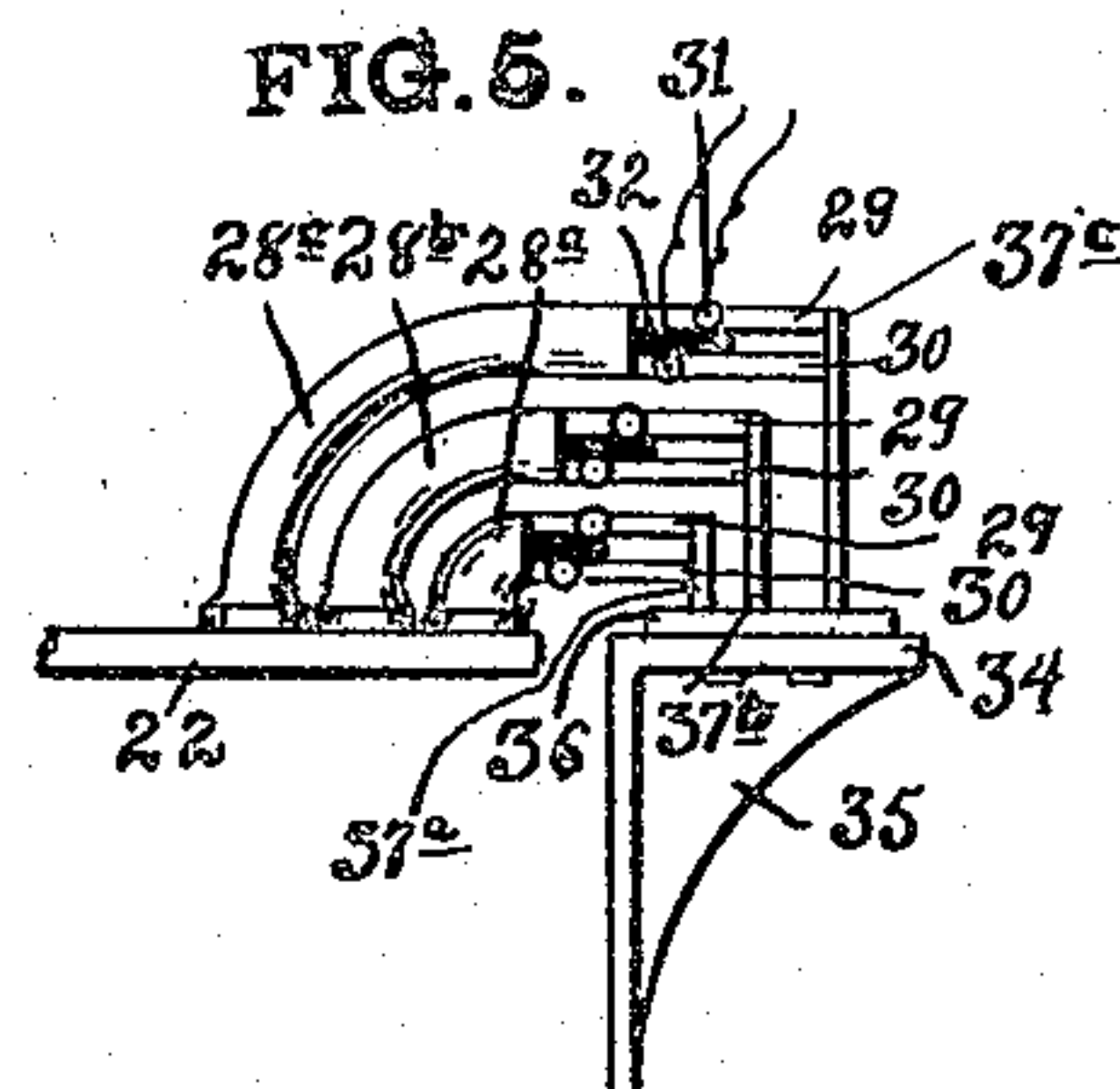
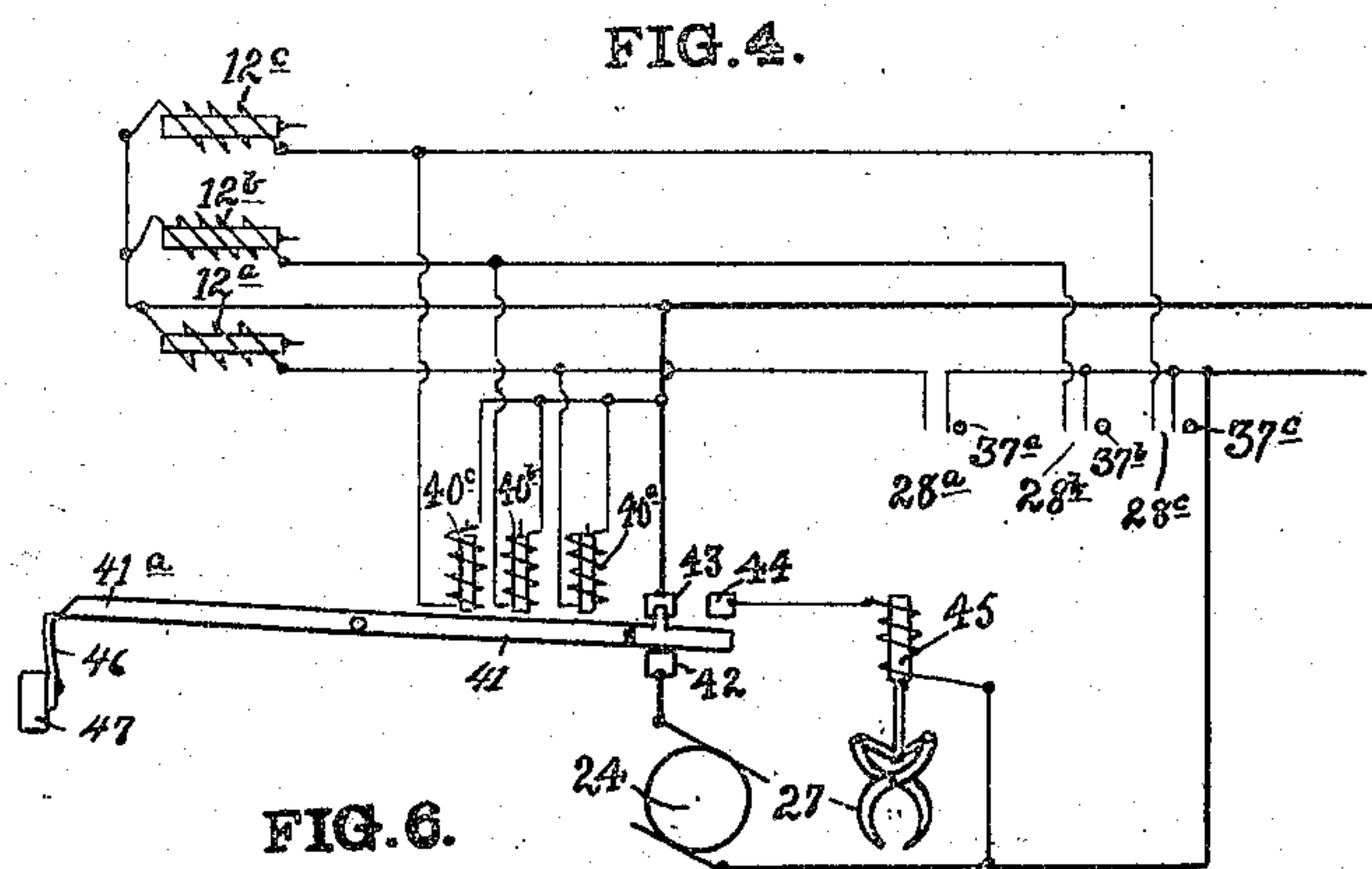
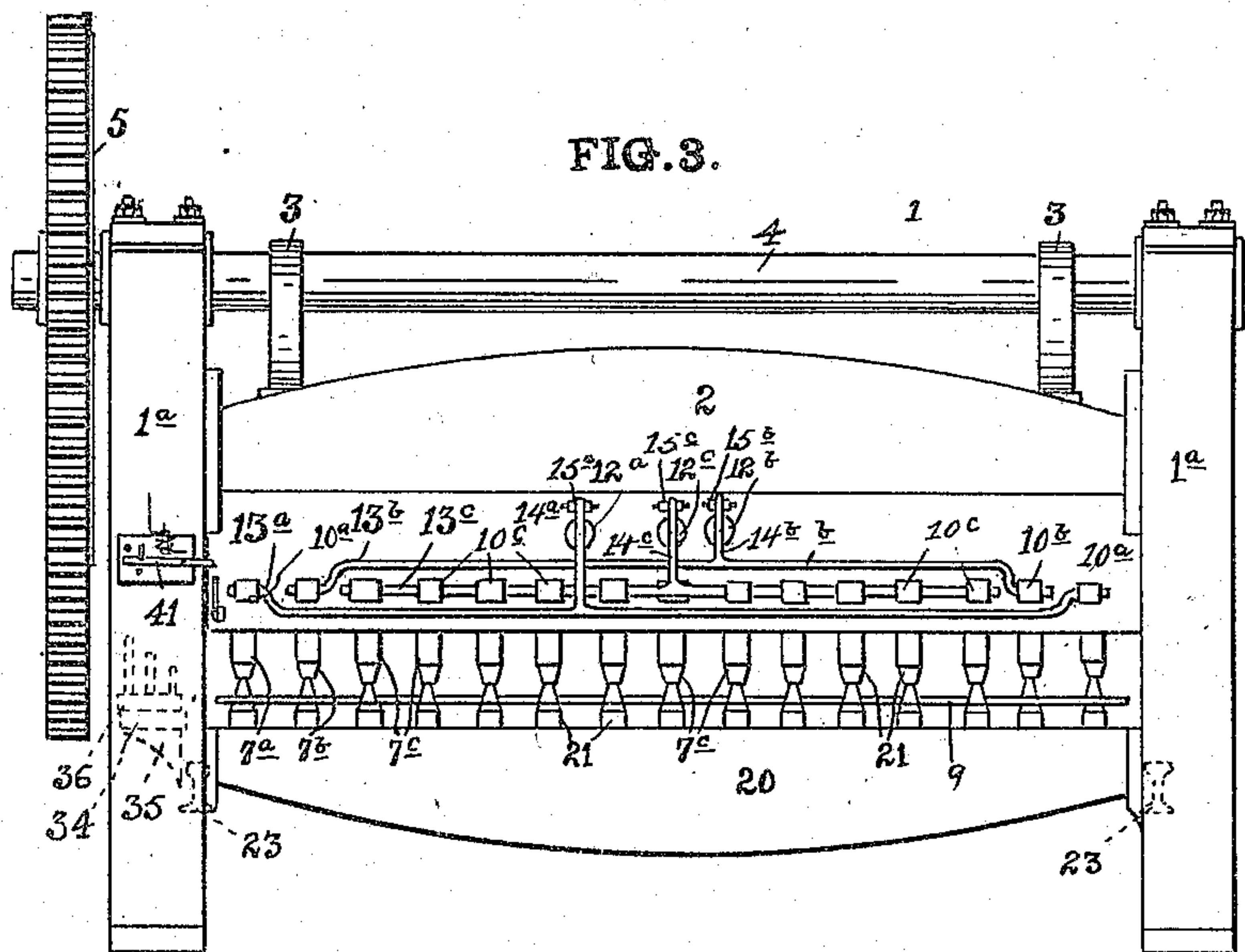
BY Ernest C. C. Kuhn
Charles H. Brown

HIS ATTORNEY

E. O. C. KUHNEL.
PUNCHING MACHINE.
APPLICATION FILED MAY 25, 1908.

930,867.

Patented Aug. 10, 1909.
2 SHEETS—SHEET 2.



WITNESSES:
Robt. F. Dilworth
Mary J. Samak

INVENTOR
Ernest O. C. Kuhnelt
BY *Charles S. Singson*
HIS ATTORNEY.

UNITED STATES PATENT OFFICE.

ERNEST O. C. KUHNEL, OF CRAFTON, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO WILLIAM B. KILGORE, OF CRAFTON, PENNSYLVANIA.

PUNCHING-MACHINE.

No. 930,837.

Specification of Letters Patent.

Patented Aug. 10, 1909.

Application filed May 25, 1908. Serial No. 434,794.

To all whom it may concern:

Be it known that I, ERNEST O. C. KUHNEL, citizen of the United States, residing at Crafton, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Punching-Machines, of which the following is a specification.

My invention relates to punching machines and particularly to punching machines adapted to make a plurality of perforations in a plate or similar metal object, and has for its object to provide a multiple or gang punch the punching members of which may be selectively operated automatically either individually or in varying groups.

A further object of my invention is to provide a punching machine and accompanying apparatus which will accomplish the punching of the rivet holes in a plate automatically and without the necessity of handling said plate or its supporting table, said plate having been once fixed upon said table.

A still further object of my invention is to provide for absolute accuracy in the location of the punched holes in the plate and the automatic movement of the plate combined with said punching operation; all of which I accomplish by the novel combination of parts and construction hereinafter described.

Other objects of my invention will appear from the following description.

In the accompanying drawings, which form part of this specification Figure 1 is a plan view of my improved punching machine with a plate undergoing the punching operation. Fig. 2 is a vertical sectional view longitudinally thereof at the line II—II and discloses the relative position of the punch, plate, supporting bed, and carriage. Fig. 3 is a vertical end view of the multiple punch, disclosing a convenient method of connecting punching members into gangs, and means for operating each of said gangs. Fig. 4 is a diagrammatic view of the electrical circuits by which the several steps in the operation of punching a plate are performed, it being understood that other and probably more convenient arrangements of the electrical circuits may be used without departing from the essence of my invention. Fig. 5 is a detailed view of the contact arms upon the moving carriage showing their

relative position with the pins in the accompanying templet. Fig. 6 is a plan view of a portion of a plate showing one of the possible combinations of rivet holes which may be automatically located and punched by my improved device; and Fig. 7 is a detailed view of one of the punches in the head, with its engaging means.

Referring again to the drawings for a detailed description of my invention: 1 represents a punch, the frame of which may be of any convenient or usual design and arrangement, the one shown being provided with a head 2 supported in suitable guides 1^a—1^a and operated by the cams 3—3 attached to a shaft 4 and rotated by suitable gearing 5 connecting with a motor 6. Any other convenient means for rotating the cams and oscillating the punch head 2 may be substituted. In the form of punch illustrated and described it is designed that the shaft 4 shall rotate continuously and that the head 2 shall reciprocate at uniform intervals irrespective of whether the punches shall operate or not. It will be understood that an intermittently operating punch may be used in lieu of the one described, suitable means being provided for starting and stopping said punch, but for convenience I will confine myself to the description and operation of the punch shown.

Punches 7, 7^a, 7^b and 7^c are loosely mounted in recesses 8 in the head 2 and are free to penetrate upwardly in the said recesses 8 when the head 2 descends so that they will not penetrate the plate 9 or other object which may be brought into contact with them unless certain ones of said punches have previously been fixed in their sockets 8. To accomplish this selective fixing of certain groups of punches 7 I employ gags 10 adapted to enter the upper portion of the sockets 8 to lock said punches 7. Suitable springs 11 serve to retain these gags 10 out of contact with the punches 7 except at such times as certain ones of the gags are seated in the recess 8 by some suitable means. To accomplish this seating of the gags and the consequent locking of the respective punches I employ magnets or solenoids 12 which may be connected with individual gags, or preferably as shown in Fig. 3, with groups of gags.

In Fig. 3 I show the punches divided into three groups represented respectively by the

reference numerals 7^a, 7^b and 7^c, controlled by their respective gags 10^a, 10^b and 10^c. These groups of gags are connected as shown into groups by the connecting rods 13^a, 13^b and 13^c provided with arms 14^a, 14^b and 14^c pivoted to brackets 15^a, 15^b and 15^c and respectively provided with solenoids 12^a, 12^b and 12^c, so that when any one of these solenoids 12^a, 12^b or 12^c is energized it operates its respective gang of gags to fix the said punches connected therewith, as will be more fully set out hereinafter: The plate 9 or other object to be punched is mounted upon a frame 16 having rollers 17 mounted on shafts 18, said rollers being provided with set screws 19 to permit the setting of said rollers in any desired position on said shafts 18. The punch 1 is provided with a bed piece 20 having thereon suitable dies 21 co-operating with the punches 7. The plate or other object to be punched is drawn through the punch 1 and between the punches 7 and their coöperating dies 21 by any suitable means.

I prefer to draw the plate or similar object through the punch by means of carriage 22 mounted on the rails 23—23 and provided with a motor 24 with suitable gearing 25 connecting with one of the axles 26 of said carriage. An electric brake 27 is also mounted on said carriage 22 and may be of any suitable design, but should be instantaneous and positive in its action. The form shown in the diagrammatic view of Fig. 4 accomplishes these objects, being designed to clutch the rail and hold same firmly.

Upon the carriage 22 adjacent one side thereof, are mounted a plurality of arms 28^a, 28^b, and 28^c, having at one extremity contact fingers 29 and 30 insulated from said arm and from each other and provided with binding posts 31 and 32 for connection with electrical circuits hereinafter described. These contact arms are shown in detail in Fig. 5.

Adjacent one side of the bed 33 is mounted a table 34 upon suitable brackets or other supporting means 35, said table being adapted to receive a templet 36. This templet may be made of wood or other convenient substance and is provided with holes to receive contact pins 37^a, 37^b, and 37^c, the holes of each series being parallel with the travel of the carriage 22. It will be seen from an inspection of Fig. 5 that the pins of each series are of varying height. The pins 37^b being longer than the pins 37^a and the pins 37^c extending above the pins 37^b. By this arrangement of the pins and the arms it will be seen that the arm 28^a as the carriage advances will be brought into contact with its coöperating pins 37^a and when the contact is made between the contact fingers of said arm by means of said pin, which is of metal, the circuit of which the said fingers

form a part, will be closed. In like manner the arm 28^b makes contact with the pins 37^b and so also does the arm 28^c with its co-operating pins 37^c.

The gear wheel 25^a on the axle 26 of the carriage is free to turn independently of said axle 26 except when held rigidly thereto by an electric clutch shown in outline at 38. In the diagram shown in Fig. 4 I do not show the circuit of this clutch but show means for making and breaking the motor circuit. As the end to be accomplished is the same in either case, that is, the stopping of the carriage, I have omitted the said circuit to avoid multiplicity of the circuits which would tend to confusion of the diagram.

The operation of my apparatus is as follows:—The plate or other material to be punched is placed upon the bed rollers 17 the forward end of said plate being connected by suitable clamps 39 to the carriage 22. The templet 36 is provided with pins and pin holes arranged to conform with the punch holes which are to be punched in the plate. This templet in practice I make of the same length as the plate to be punched and the holes with the pins are spaced longitudinally the same distance apart as the holes which are to be punched in the plate, but laterally the templet holes and their pins are spaced only sufficiently to allow for clearance of arms. It will therefore be seen that the templet, while of necessity as long as the plate, need only be a few inches in width, sufficient to accommodate as many rows of pins as there are varieties of punch holes, that is, if the punches are connected into three groups or gangs, there will be three rows of contact pins in the templet; and it will be apparent that there may be any desired number of these combinations or gangs of punches, but in practice the three gangs arranged as shown in the drawing will punch the most usual plates. Fig. 6 shows a portion of a plate and the arrangement of holes which may be punched by the gangs of punches arranged in three sets as shown in the drawings. I will assume for convenience that it is desired to punch a plate with the holes located as shown in Fig. 6 and will describe the successive operations of my apparatus to accomplish this purpose automatically and without any attention from the operator after the current is thrown on and the carriage started.

The motor circuit being once closed the carriage advances slowly drawing with it the plate 9. The arm 28^c engages the pin 37^c thus completing the circuit across the contact fingers 29 and 30 of said arm 28^c which causes the solenoid 12^c to be energized, throwing in the gags 13^c and locking the punches 7^c in the head 2. At the same time the solenoid 40^c is energized and draws

up the lever arm 41 breaking contact of the motor circuit at the terminals 42, 43 and making contact across the terminal 43, 44 which shunts the current through the solenoid 45 applying the electric brake and holding the carriage rigid. The head 2 as it descends carries the punches 7^c through the plate making the perforations *c* as shown in Fig. 6. In the upward movement of the head a spring clip 46 mounted on a suitable block 47 at any convenient point of said head engages the extremity 41^a of the lever arm 41 thus causing said arm to break the connection 43—44 and closing the connection 43 to 42 as shown in the diagram Fig. 4 thus throwing off electric brake and again starting the motor, the circuit to the solenoid 12^c is broken as the contact arm 28^c passes clear of its pin 37^c and the carriage advances until the arm 28^b comes into contact with its pin 37^b when a similar operation takes place; the solenoid 12^b being energized, the gags 13^b being thrown into position and the punches 7^b locked ready for the punching operation. The motor circuit is then broken by the solenoid in that circuit, shown diagrammatically as 40^b in Fig. 4 and the electric brake again thrown on. The descending punch head then brings the punches 7^b into contact with the plate making the perforations *b* shown in Fig. 6. The subsequent operations or steps in the operation are similar to those already described. The arm 28^a making contact with the pin 37^a to produce the perforations *a* in the plate. Any two or more of these punching operations may be combined by having pins of two or more rows make contact with their arms simultaneously; for instance, to procure the row of perforations shown on plate 9^a at *d* the three arms making contact simultaneously would throw in the three gangs of gags thus locking all the punches.

It will be seen that the operation is continuous, each successive step being performed automatically without any manual attention of the operator and in fact the most intricate punching operations may be performed automatically without the necessity of any attendant or physical labor whatsoever, the table once having been set requires no attention until completely punched. By this means I dispense with the necessity for skilled operators and obtain accuracy of punching exact location of the required perforations and great increase of speed in the operation.

The arrangement of circuits and connections shown in Fig. 4 is purely diagrammatic and may be varied from and other means substituted therefor without departing from the spirit of my invention. For example:—In practice it has been found desirable to maintain the motor at uniform speed and secure the starting and stopping

of the carriage by the use of any electric clutch as suggested above.

Many other modifications will be apparent to those skilled in the art, and as I have attempted to describe my invention in broad terms to cover broadly the continuous and automatic operation of punching variously disposed perforations and gangs of perforations in an extended plate or similar object, I do not wish to be confined to the specific means herein described but claim broadly:—

Claims:

1. In a punching machine the combination with a multiple punch having a plurality of movable punches mounted therein, means for moving a blank continuously in one direction below said punches, means for automatically locking in operative position predetermined groups of punches, and means for automatically stopping and starting the blank moving means at predetermined intervals.

2. In a punching machine, the combination with a multiple punch having a plurality of independently movable punches mounted therein, means for automatically locking in operative position each predetermined punch, mechanism for continuously moving a blank to be punched in one direction, a single means for automatically stopping the blank moving mechanism at predetermined intervals and simultaneously locking the punches to be operated, and means for releasing the locked punch after the punching operation.

3. In a punching machine, the combination with a multiple punch having a plurality of movable punches mounted therein, means for connecting said punches into co-operative groups, a table below said multiple punch to receive a blank to be operated upon, means independent of the punch operating mechanism for moving said blank over said table, means for automatically stopping and starting said moving means, independent means for automatically locking a predetermined group of punches, and means for releasing the locked punches after the punching operation.

4. In a punching machine the combination with a multiple punch having a plurality of movable punching members divided into groups, a supporting bed, means for drawing over said supporting bed a blank to be punched, means for automatically stopping and starting the blank advancing means at predetermined intervals, means for selecting and locking in operative position such groups of punching members as are required at the time, and means for releasing the punches after the punching operation.

5. In a punching machine the combination with a plurality of punches adapted to be connected in groups or gangs, a supporting bed for a blank to be perforated, means for advancing the blank over said bed, means

for automatically applying intermittent movements to said blank advancing means, means for independently and automatically locking predetermined groups of punches to
 5 lock the same in operative position, and means for automatically stopping the blank advancing means.

6. In a punching machine, the combination with a plurality of movable punches
 10 provided with gags adapted to lock individual punches, a lever connected to such gags as are to be operated simultaneously, a blank supporting bed, mechanism for moving over said bed a blank to be punched,
 15 electrical means for automatically stopping the blank moving mechanism at predetermined and variable intervals, independent electrical means for automatically operating each of said gag levers and gags attached
 20 thereto, and automatic means for again advancing the blank moving mechanism after the punching operation.

7. In a punching machine, the combination with a plurality of movable punches
 25 each provided with a locking gag, a supporting bed for a blank to be punched, a carriage for advancing a blank beneath said punches, electrically operative mechanism for locking simultaneously a group of said punches, a
 30 fixed templet adjacent the supporting bed, circuit closing pins in said templet, arms carried by the blank moving carriage adapted to close independent electric circuits communicating with a punching mechanism,
 35 and means for stopping and starting the blank moving carriage at predetermined intervals through the medium of the templet pins.

8. In a punching machine, the combination with a punch head having a plurality of
 40 movable punches mounted thereon, means for connecting said punches into coöperative groups, a table below said punch head to receive a blank to be operated upon, a
 45 plurality of pairs of contact points mounted on said table at one side thereof, a templet fastened to the same side of said table and

provided with a plurality of rows of contact pins, electrical means independent of the punch operating mechanism for moving
 50 said blank over said table, independent electrical means for locking a predetermined group of punches, and means for simultaneously arresting the movement of the blank operating mechanism and locking said
 55 groups of punches when one of said pairs of contact points is brought into contact with one of the contact pins of the templet.

9. In a punching machine, the combination with a punch head having a plurality of
 60 punches mounted therein, means for connecting said punches into coöperative groups, a table below said punch head to receive a blank to be operated upon, electrically operating means for moving said blank over the
 65 table, and electrically operated means for locking each coöperating group of punches, and means for simultaneously arresting the movement of the blank operating mechanism and locking a predetermined group of
 70 punches.

10. In a punching machine, the combination with a punch head having a plurality of movable punches mounted therein, means
 75 for connecting said punches into coöperative groups, a table below said punch head to receive a blank to be operated upon, electrical devices for locking each predetermined group of punches, a pair of contact points in electrical connection with each of the
 80 electrical devices for operating a group of punches, and means for closing the circuit through any pair of contact points to energize its coöperating electrical device and locked the group of punches controlled thereby in position and simultaneously arresting
 85 the movement of the blank operating means.

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

ERNEST O. C. KUHNEL.

Witnesses:

JAMES A. NUGENT,
 MILDRED CHILLEN.