

W. B. KILGORE.
PUNCHING MACHINE.
APPLICATION FILED JUNE 8, 1908.

Patented Sept. 21, 1909.

2 SHEETS—SHEET 2.

934,672.

FIG. 3.

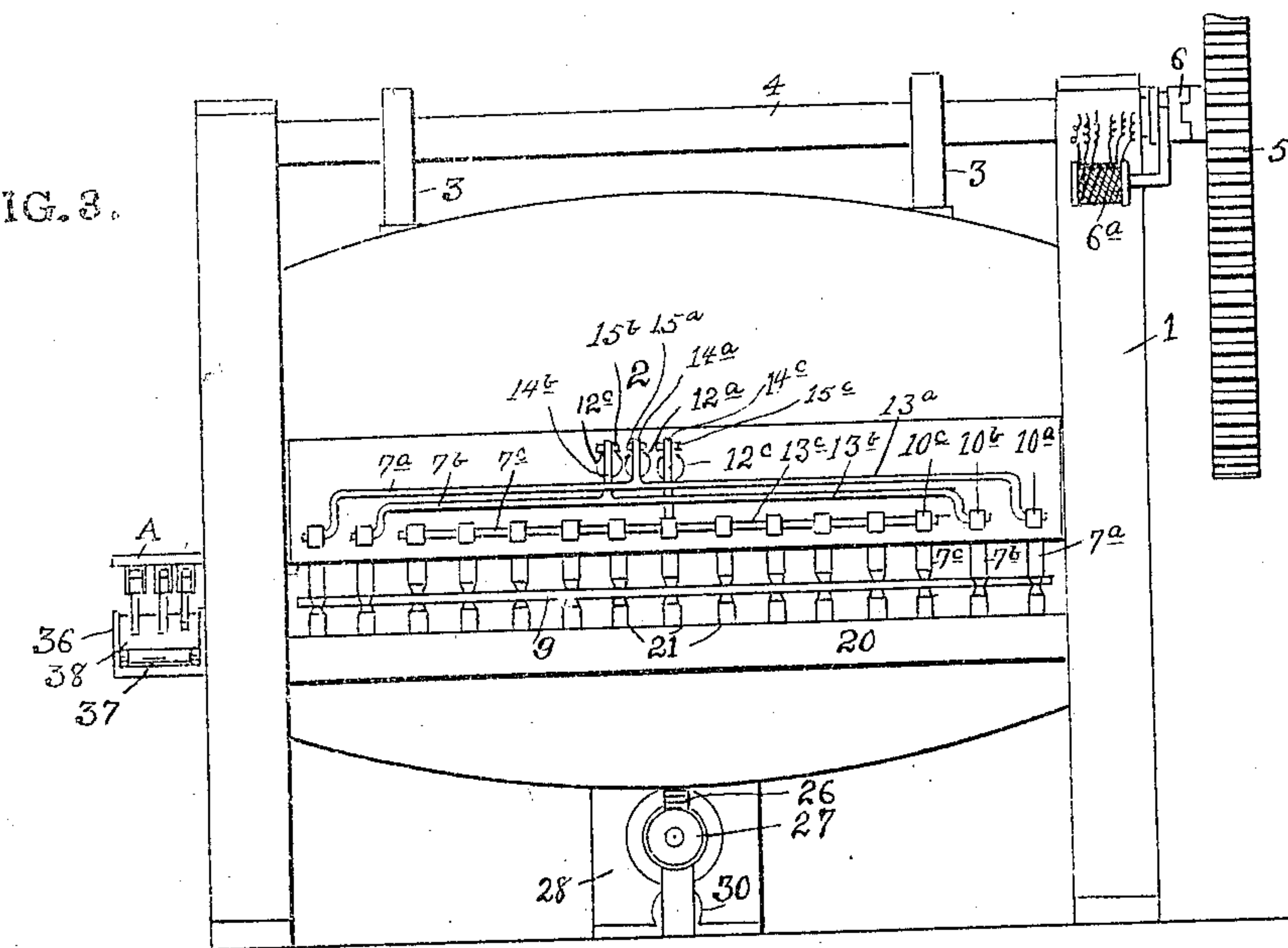


FIG. 4.

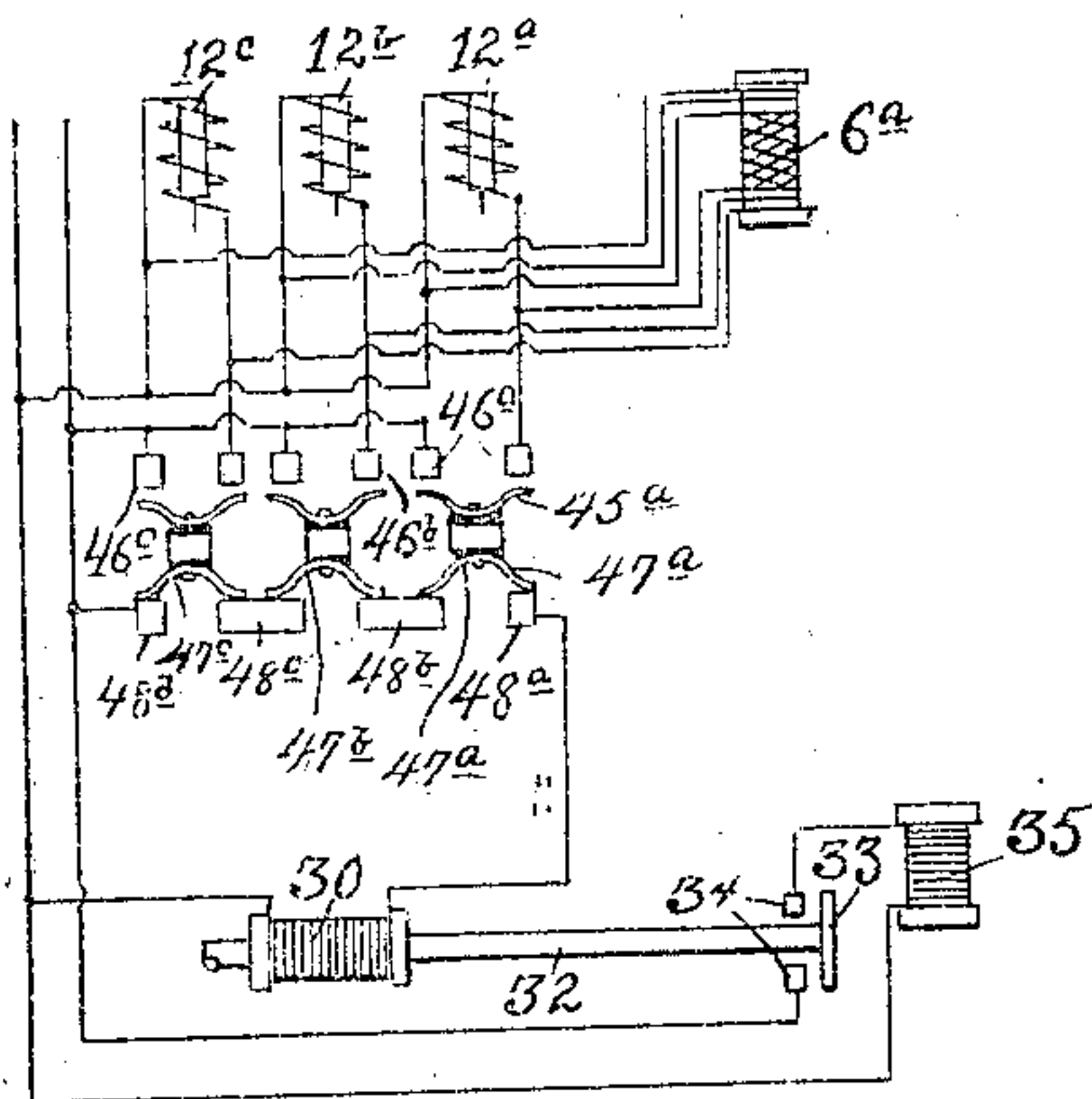


FIG. 5.

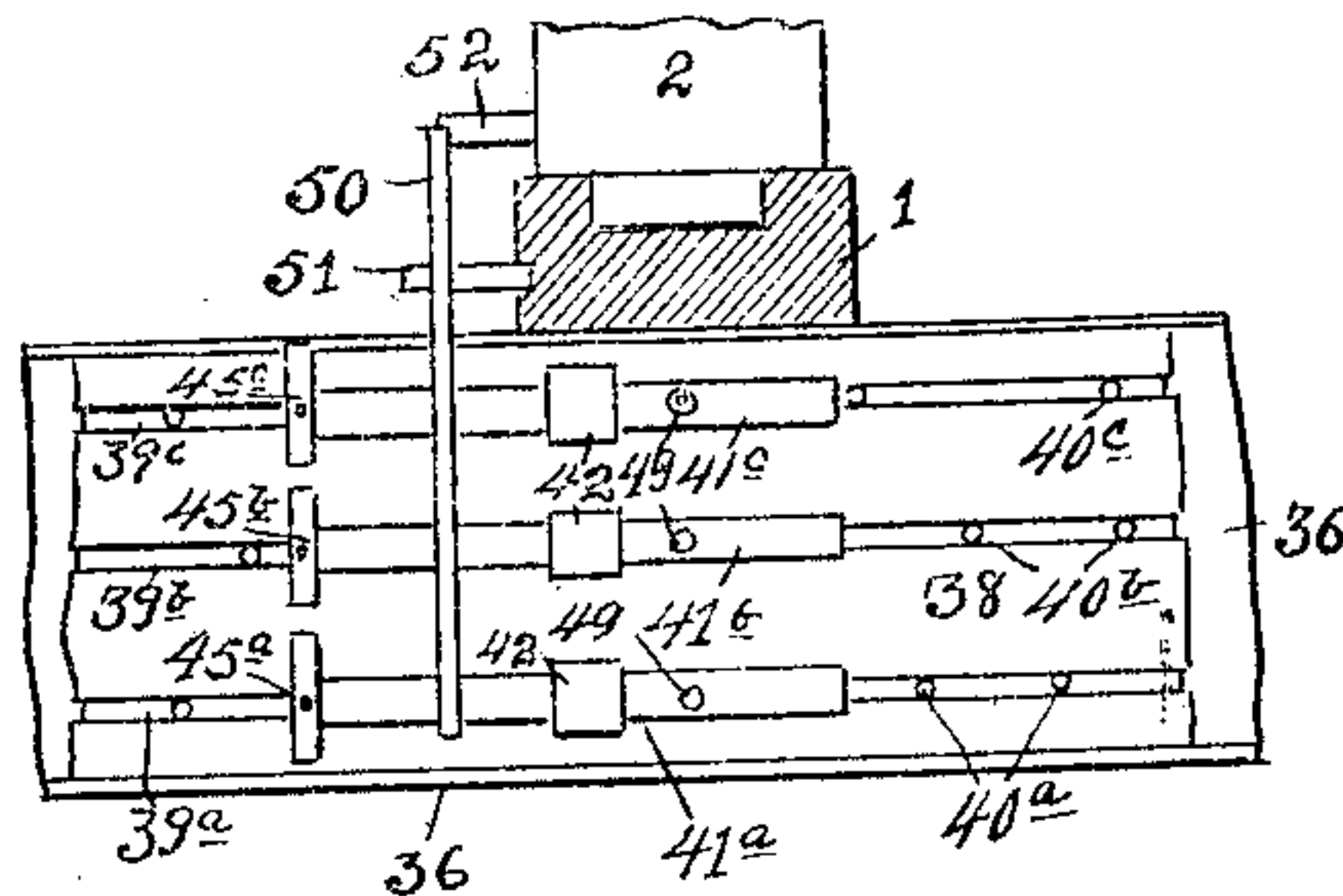


FIG. 7.

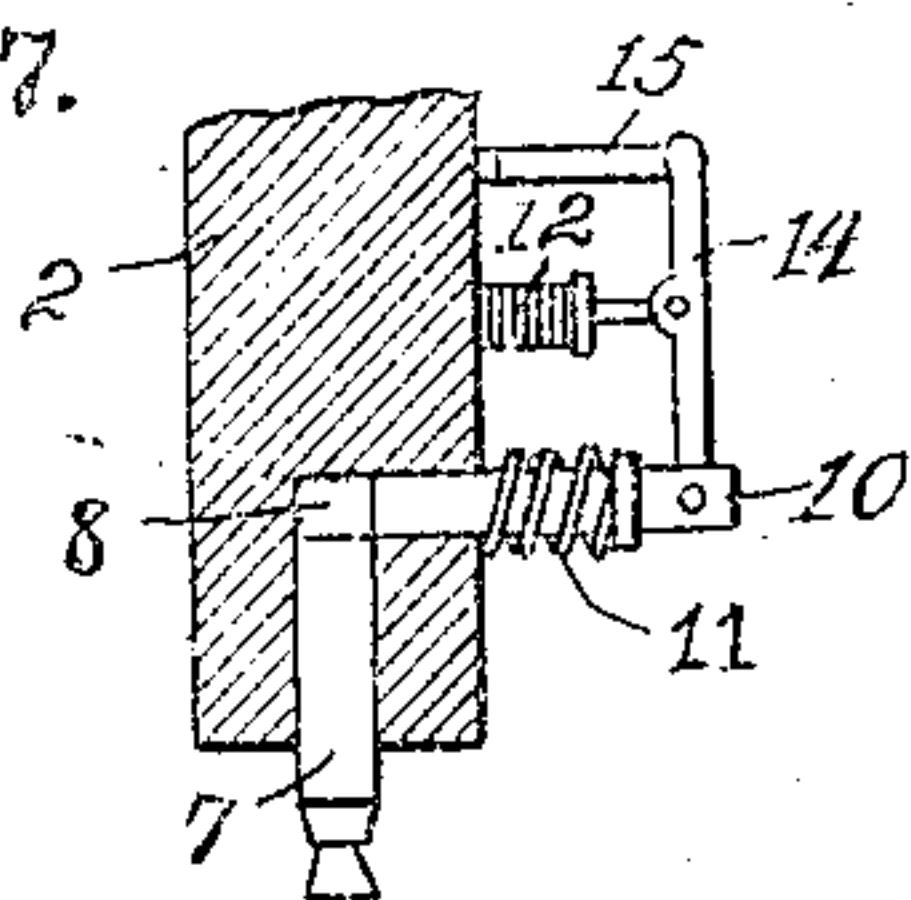
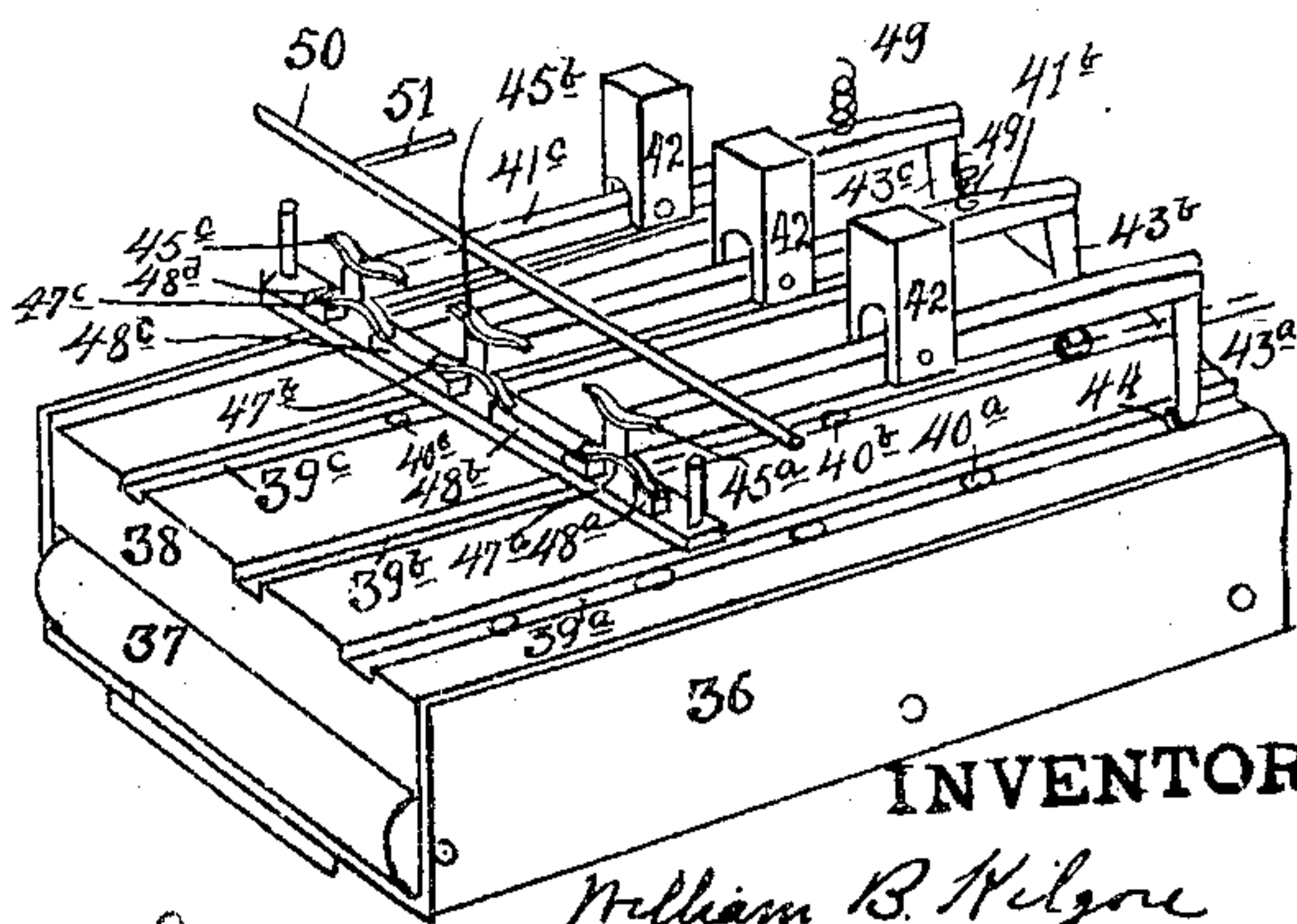


FIG. 6



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PUNCHING-MACHINE.

934,672.

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To all whom it may concern:

Be it known that I, WILLIAM B. KILGORE, 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 blank, 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 various groups, to punch rivet or bolt holes in plates, angles and similar structural members.

A further object of my invention is to provide a punching machine and accompanying apparatus which will accomplish the punching of the rivet holes or similar structural member automatically and without the necessity of handling said blank or its supporting table, said blank being 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 blank and for the automatic movement of the blank combined with said punching operation; all of which I accomplish by the novel construction, combination and arrangement of parts hereinafter described.

The objects of my invention will appear from the following description, reference being had to the accompanying drawings which form part of this specification.

In the accompanying drawings, Figure 1 is a plan view of my improved punching machine shown in connection with a plate undergoing the punching operation. Fig. 2 is a vertical sectional view longitudinally thereof and illustrates the relation of the punch, blank, supporting bed and the means for imparting movement to the blank. Fig. 3 is a vertical view of the multiple punch, illustrating a convenient method of connecting punch members into groups or gangs and the means for operating each of said groups or gangs selectively. Fig. 4 is a diagrammatic illustration of the electrical circuits controlling the various actions of the apparatus. Fig. 5 is a fragmentary view

of a portion of the templet, and the lever arms actuated thereby in connection with a fragment of the punch. Fig. 6 is a perspective view of the said templet, the channel in which said templet is moved, the lever arms co-acting with said templet, and the circuit closing means at the extremity of the lever arms. Fig. 7 is a detailed view of one of the punching members and its operating magnet. Fig. 8 illustrates a portion of the plate after having been punched and shows the possibilities of the machine; and Fig. 9 is a view of the parts shown in Fig. 6, showing one of the pins seated in a templet hole and the changed position of the lever arm.

Referring again to the drawings for a detailed description of my invention: Fig. 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 and operated by cams 3—3 attached to a shaft 4 and rotated by a suitable gearing 5, connecting with any suitable source of power. A clutch 6 is provided and operated by a suitable magnet or other electric device 6^a by which the reciprocatory movement of the punch head is controlled. Any other convenient means for applying power to the punch to rotate the cams and oscillate the punch head 2 may be substituted and, if desirable, a continuously running punch may be substituted for the one shown, in which case, the circuit controlling the clutch could be dispensed with; but for convenience, I will describe the operation of my machine in connection with the type of punch illustrated.

Punch members 7 are loosely mounted in recesses —8 in the punch head —2 and are free to penetrate upwardly in the said recesses 8 when the head —2 descends so that they will not penetrate plate 9 or any other objects which may be brought into contact with them unless certain ones of said punches have previously been fixed in the socket —8. I have arranged the punch members —7 into groups or gangs which for convenience I designate by the reference letters *a*, *b*, and *c*, as exponents of the reference numerals designating the respective punch members and other connections.

To accomplish the selective fixing of certain groups or gangs of punches 7^a, 7^b, or 7^c,

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 one of the gages —10 are seated in their recesses —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 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 all 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 or table —16 having rollers —17 mounted on shafts —18, said rollers being provided with a set screw —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 on which are set suitable dies 21 coöperating with the punches 7.

The plate or other object to be punched is drawn under the punch 1 and between the punch members 7 and their coöperating dies 21 by any suitable means. I prefer to draw the plate or blank through the punch by means of a buggy 22 mounted on the rails 23 and, for the purpose of drawing said buggy I prefer to make use of the arrangement shown in Fig. 2. This drawing means consists of a link belt or chain 24, one end of which is attached to the forward end of the said buggy 22 and passes over a sheave 25 at the extreme end of the table; whence said chain or belt returns and passes around a driving drum 26 and connects with the rear end of the aforesaid buggy 22. The drum 26 is driven by a suitable worm 27 connecting with a motor 28 or other suitable driving means and is provided with a clutch 29 operated by a solenoid 30 and suitable lever 31 connecting therewith. The armature 32 of said solenoid 30 is extended through said solenoid and is provided with a contact finger 33 adapted to make and break contact across the terminals 34 so that the movement of said armature which throws out the clutch 29 at the same time closes the circuit across the said terminals 34 and energizes an electric brake 35, thus stopping instantly the travel of the drum 26 and the buggy 22. It

will be understood that any other convenient arrangement of these parts may be substituted, the purpose being to control automatically the starting and stopping of the buggy and the positive locking of said buggy when the clutch is thrown out.

Adjacent one side of the table 16 is a channel or run-way 36 provided with rollers 37 and adapted to receive a templet 38. This templet may be of wood or other suitable material in the form of a long narrow strip of sufficient length to correspond with the length of the plate or other blank to be punched but need be only of sufficient width to accommodate as many rows of templet holes as there are varying groups or gangs of punches. For example, in the drawings I have arranged the punches into three gangs; the templet therefore would be provided with three rows of templet holes, one for each gang of punches. The templet 38, I prefer to make with grooves 39^a, 39^b and 39^c and in said grooves are located templet holes 40^a, 40^b and 40^c. These templet holes correspond in longitudinal position with the holes to be punched in the plate or other blank as will appear more clearly from description of the operation of my apparatus. The templet 38 is adapted to be attached to the buggy 22 or by suitable clamps to the edge of the plate or other blank being punched so as to be held in rigid position with relation to said blank and free to move uniformly with said blank in its progression through the punch.

Attached to the end of the punch is a suitable plate bracket A supporting a plurality of lever arms 41^a, 41^b, and 41^c fulcrumed to supports 42 suspended from said bracket. These arms 41^a, 41^b, and 41^c are provided with pins 43^a, 43^b, and 43^c respectively and are preferably provided with a small friction roller 44 to allow of the free movement of the templet 38 beneath said pins 43^a, 43^b, and 43^c without undue friction. At the opposite end of said lever arms 41^a, 41^b and 41^c are provided spring contact fingers 45^a, 45^b, and 45^c located on the upper side of the extremities of said arms and insulated from said arms by suitable blocks of insulating material. Directly above and opposite to said contact fingers 45^a, 45^b, and 45^c attached to said bracket A are pairs of terminals 46^a, 46^b and 46^c in the circuits of the magnets 12^a, 12^b and 12^c. Directly beneath the aforesaid contact fingers 45^a, 45^b and 45^c are similar contact fingers 47^a, 47^b and 47^c adapted to coöperate with terminal blocks 48^a, 48^b, 48^c and 48^d located upon a suitable support suspended from said bracket and arranged in series with the circuit to the clutch magnet 30 which controls the movement of the buggy 22 and so designed that the contact fingers 47^a, 47^b and 47^c must all be in contact with the terminals 48^a, 48^b, 48^c and 48^d.

to complete the circuit to the magnet, the raising of any one of the arms 41^a, 41^b and 41^c breaking said circuit.

The springs 49 serve to exert pressure on the pin ends of the levers 41^a, 41^b, and 41^c to insure the entering of pins 43^a, 43^b and 43^c into the templet holes and maintain the contacts 45^a, 45^b and 45^c against the terminals 46^a, 46^b and 46^c when the said pins are in the said templet holes.

A secondary lever 50 pivoted at 51 has one arm extended in proximity to the head 2 of the punch so as to be engaged by a lug 52 on said head 2 whereby in the upward movement of the head 2 the said lug 52 raises the adjacent arm of said secondary lever 50 and tilts same to bring the opposite arm of said lever 50 down upon the lever arms 41^a, 41^b and 41^c to free the pins 43^a, 43^b and 43^c from the templet holes, in which they may be seated.

I will now proceed with the description of the operation of my machine:—Assuming that the blank to be punched is a plate of the form shown in the fragmentary view in Fig. 8 of any indefinite length and width and that it is desired to punch rivet holes in same in the positions indicated in said Fig. 8. This view illustrates a usual type of plate having a double row of alternating rivet holes along either edge of the plate and intermittently occurring rows of rivet holes extending across said plate. It will be understood that any arrangement of holes may be punched but, confining myself in my description for convenience to the above plate, I will proceed with the details of the operation.

A templet of wood or other convenient material is prepared having rows of templet holes arranged in longitudinal grooves, there being provided a separate groove for each of the lever arms and their connecting pins 43^a, 43^b and 43^c and as many more as may be needed. Assuming that the row of rivet holes adjacent the two edges of the plate, which I have indicated on said plate in Fig. 8 by the reference characters *a'*, *a''*, etc., are operated by the lever arm 41^a, that the adjacent row of rivet holes, *b'*, *b''*, etc., are controlled by the lever arm 41^b, and that the remaining holes, indicated by *c'*, which extends across the plate are operated by the lever 41^c. It will be seen that the templet will have corresponding grooves 39^a, 39^b and 39^c, and that the templet holes in each of said grooves will be spaced longitudinally to coincide with the longitudinal spacing of the correlating rivet holes to be punched in the plate. The plate is placed upon the table 16 and the forward end of said plate clamped by any suitable means to the buggy 22. The templet is in like manner placed in the channel 36 parallel to the plate and clamped to the buggy or, if found more con-

venient, directly to the adjacent edge of the plate so as to be held in rigid correlation with the said plate to move uniformly therewith. The contact fingers of all three lever arms being down by reason of their pins being out of engagement with any of the templet holes, the circuit to the magnet 30 is closed, thus starting the drum 26 and the buggy 22 moves forward drawing with it the plate 9 and the templet 38. As the templet holes come into engagement beneath the pins 43^a, 43^b and 43^c, (it being apparent from the drawing, Fig. 1, that the first templet holes in each groove are in line), the said pins of all three arms will drop and seat in said templet holes whereupon under the action of the springs 49, the opposite ends of said lever arms will fly upwardly breaking the circuit to the clutch magnet 30, closing the circuit to the electric brake by the contact finger 33 actuating the said clutch magnet 30 thereby bringing the buggy to a dead stop. At the same time the contact fingers 45^a, 45^b and 45^c make contact across their respective co-acting pairs of terminals 46^a, 46^b and 46^c, thus closing the circuits to each of the gag magnets 12^a, 12^b and 12^c, which are thereby energized and actuate their connecting levers to lock the three gangs of punches 7^a, 7^b and 7^c. At the same time the magnet 6^a which connects by separate windings with each of the three aforesaid circuits is energized and actuates the clutch 6 whereupon all of the punches are brought down into action with the plate and produce the transverse line of rivet holes indicated in Fig. 8 by the reference characters *a'*, *b'* and *c'*.

As the punch head 2 rises in the upward movement, the lug 52 lifts the adjacent end of the secondary lever 50, the opposite end of said secondary lever forces down the finger ends of the levers 41^a, 41^b and 41^c, breaking the circuits to the clutch magnet 6^a and to the gag magnets 12^a, 12^b and 12^c and bringing the contact fingers 47^a, 47^b and 47^c into contact with the terminals 48^a, 48^b, 48^c and 48^d, thereby closing the circuit to the clutch magnet 30, throwing off the electric brake by breaking the contact at 33 and again starting the buggy, the pins 43^a, 43^b and 43^c at the same time being lifted from the templet holes. The buggy then draws the plate and templet forward until the next templet hole comes into engagement with a pin, which from the drawing will be seen to be the pin 43^b, which as above described enters the templet hole in its corresponding groove whereby the circuit to the magnet 30 is broken and the circuit to the magnet 12^b is closed, the magnet 6^a again energized, the punch started, and the same operation takes place producing the perforations indicated in Fig. 8 by the reference letters *b''*. In like manner the subsequent punching proceeds, the apparatus

working automatically without any attention whatever from the operator, the plate and templet once having been set and the current applied. The buggy starts and stops automatically; is immediately locked and the appropriate gag or gags thrown in; the punch brought into action; the punching operation performed; the punch again stopped; the gags released; the brake thrown off; the buggy started and the plate and templet advanced for each successive punch, all of which is continuous as above described.

It will be apparent that if a continuous punch is used the circuit to the clutch 6^a may be dispensed with. Many slight modifications of circuits, contacts and mechanical means for embodying the above described features will be apparent and I do not wish to confine myself strictly to the embodiments herein described, but

Having thus fully described my invention, I claim as new and desire to protect by Letters Patent of the United States.

1. In a punching machine, a movable work support adapted to receive a blank, a templet support adapted to receive a movable templet, a punch head, the elements of which are movable and adapted to be locked in operative position in groups, means for advancing the blank and templet in unison, and a common means for simultaneously stopping the movement of the templet and locking certain of said punches.

2. In a punching machine, a work support adapted to receive a blank, a templet support adapted to receive a templet, a connection between said work support and said templet, a reciprocating punch head provided with a plurality of punching members mounted therein, means independent of the punch head moving means for advancing the blank support and templet in unison, a common means for simultaneously stopping said templet and locking certain of said punch members in operative position, and means adapted to disengage the locking means for said punching members and release the blank advancing means and the templet.

3. In a punching machine, a work support adapted to receive a blank, a templet support parallel with and at one side of said work support and adapted to receive a movable templet, a punch head provided with a plurality of punching members, a connection between said work support and the templet, means for advancing the blank support and the templet and simultaneously locking said punching members in predetermined groups, and a clutch for controlling the movement of the punch head actuated at the same instant as the blank support and the punch gags.

4. In a punching machine, a work support adapted to receive a movable blank, a templet support parallel therewith, adapted to receive a movable templet, a punch head pro-

vided with a plurality of punching members loosely mounted therein and connected in groups, means for advancing the blank and templet in unison, electro-mechanical means for locking said groups of punching members, fixed pivoted arms adapted to cooperate with said templet to actuate the said punch locking means and the blank advancing means.

5. In a punching machine, a work support adapted to receive a blank to be punched, a templet support parallel therewith adapted to receive a templet, a templet provided with longitudinal grooves and templet holes in said grooves, a punch provided with a plurality of punching members connected in groups and adapted to be selectively locked in the head of said punch, means for locking said punching members, means for advancing the blank and templet in unison, arms pivoted adjacent the punch and provided with pins adapted to cooperate with grooves in said templet and enter the said templet holes in said grooves, and means attached to said pivoted arms to actuate the aforesaid punch locking means and the blank advancing means.

6. In a punching machine, a work support adapted to receive a blank to be punched, a templet support parallel therewith adapted to receive a templet, a templet provided with longitudinal grooves and templet holes in said grooves, a punch provided with a plurality of punching members connected in groups and adapted to be selectively locked in the head of said punch, magnets connected with each of the said groups of punching members adapted to lock said punching members in the head of the punch, a buggy for drawing the blank and templet in unison, electrically controlled driving means for said buggy, electric means for locking said buggy co-acting with said driving means, arms pivoted adjacent the punch provided at one extremity with pins co-acting with the grooves of said templet adapted to enter the templet holes in said grooves, contact fingers at the opposite extremity of said pivoted arms adapted to actuate the buggy moving means, and similar contact fingers adjacent thereto adapted to actuate the punch locking magnets.

7. In a punching machine the combination with a punch having a plurality of punching members and provided with gags adapted to lock said punching members, a supporting bed therefor, a blank to be perforated, of a templet provided with longitudinal grooves having templet holes therein corresponding longitudinally with the perforations to be punched in the blank, means for advancing said blank and templet in unison, magnets adapted to actuate the aforesaid gags, arms pivoted adjacent the punch and provided with pins adapted to enter the templet holes

in said templet, contact fingers on the opposite end of said arms adapted to make and break an electric circuit controlling the blank advancing means, similar contact fingers adapted to make and break electric circuits communicating with said gag magnets, and means for intermittently starting and stopping the punch.

8. In a punching machine, a fixed work support adapted to receive a movable blank, a fixed templet support parallel therewith adapted to receive a movable templet, a punch head provided with a plurality of punching members selectively mounted therein and connected in groups, and means for advancing the blank and templet in unison.

9. In a punching machine, a work support

adapted to receive a movable blank, a templet support parallel therewith adapted to receive a movable templet, a punch head provided with a plurality of punching members loosely mounted therein and connected in groups, means for advancing the blank and templet in unison, and electro-mechanical means for simultaneously locking said groups of punching members and arresting the movement of the blank and templet.

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

WILLIAM B. KILGORE.

Witnesses:

L. BOSAK,

A. H. KAUFMAN.