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4 Plates. Plate 1

Isaac Hall. Telegraph Apparatus.

PATENTED AUG 8 1871

Fig. 1

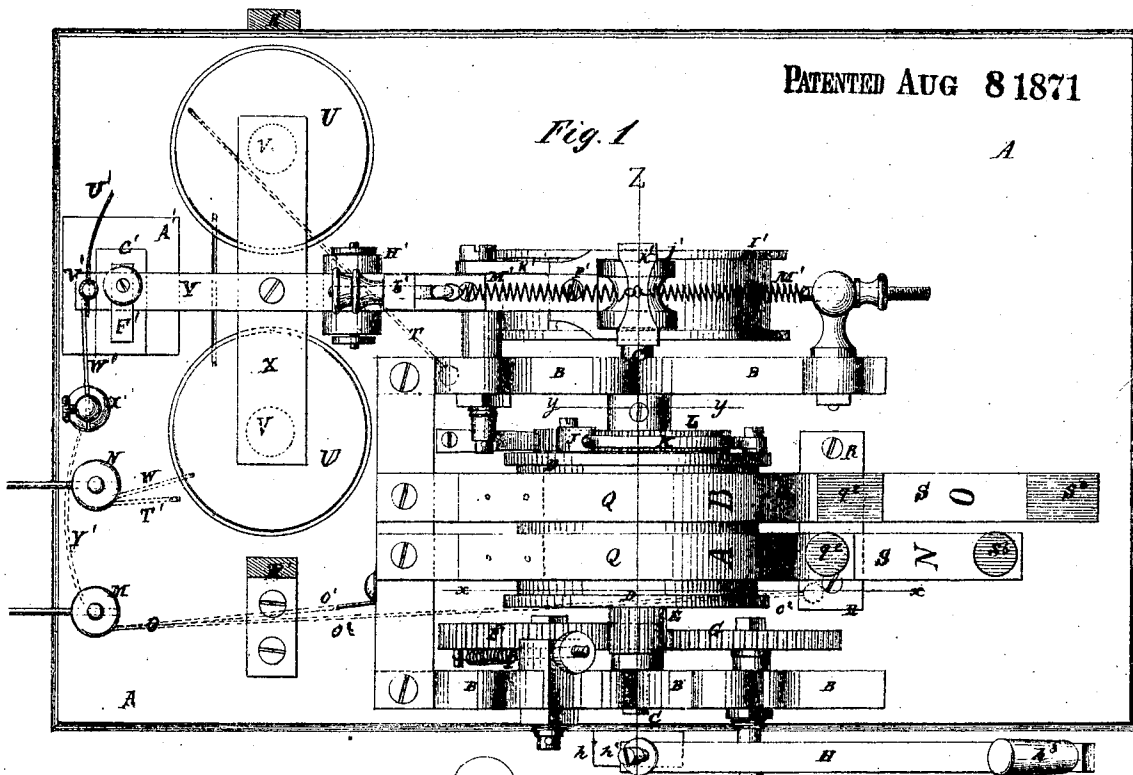
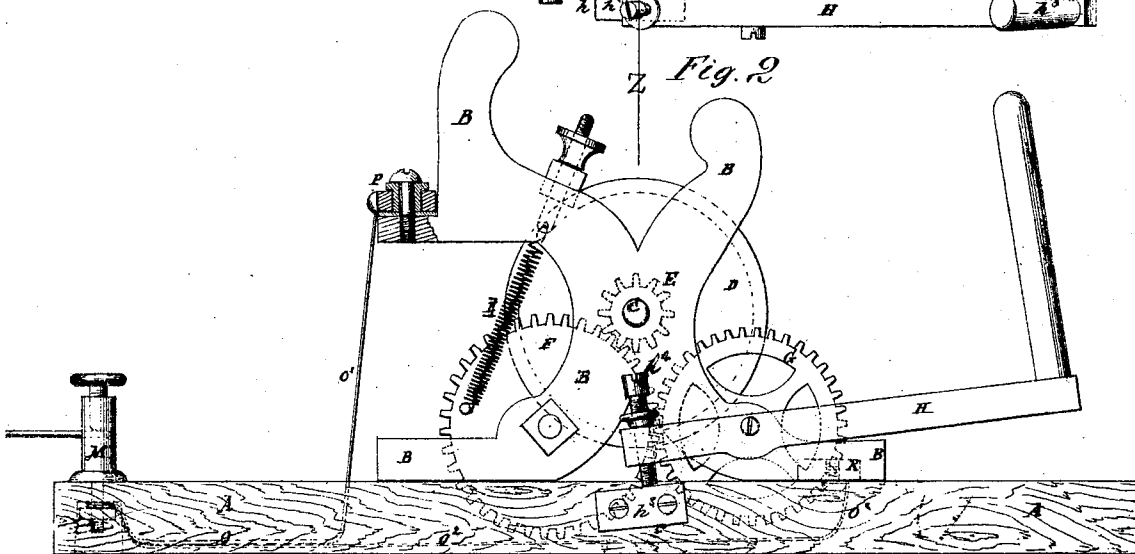


Fig. 2



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117771

4 Plates, Plate II

Isaac Hall. Telegraph App^s.

Fig. 3

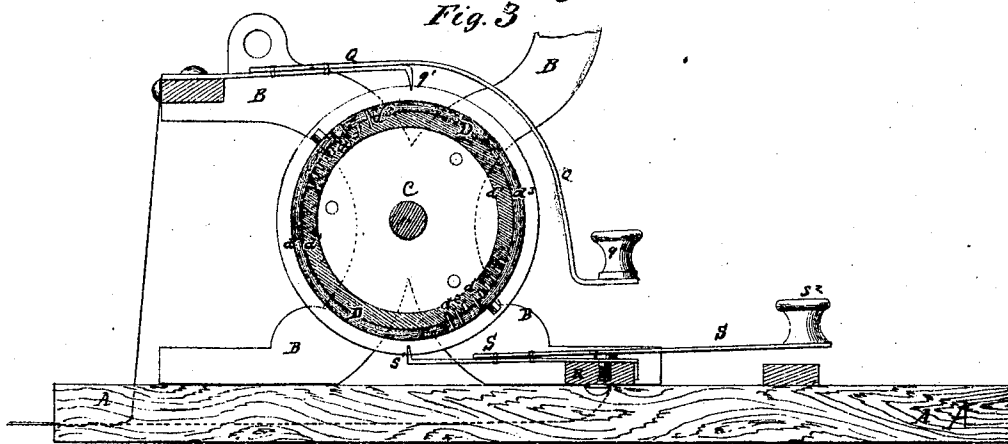
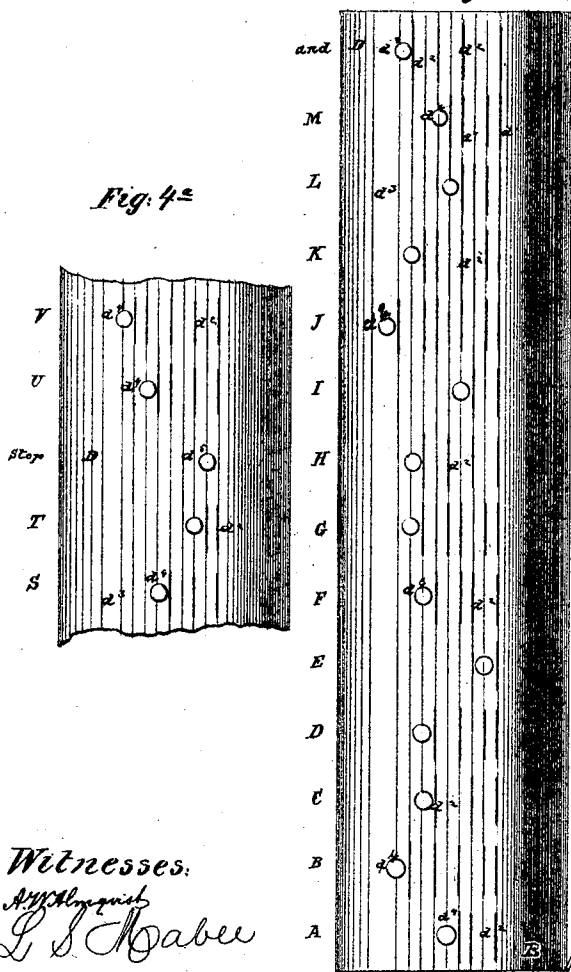


Fig. 4

Fig. 4^a



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Fig. 5

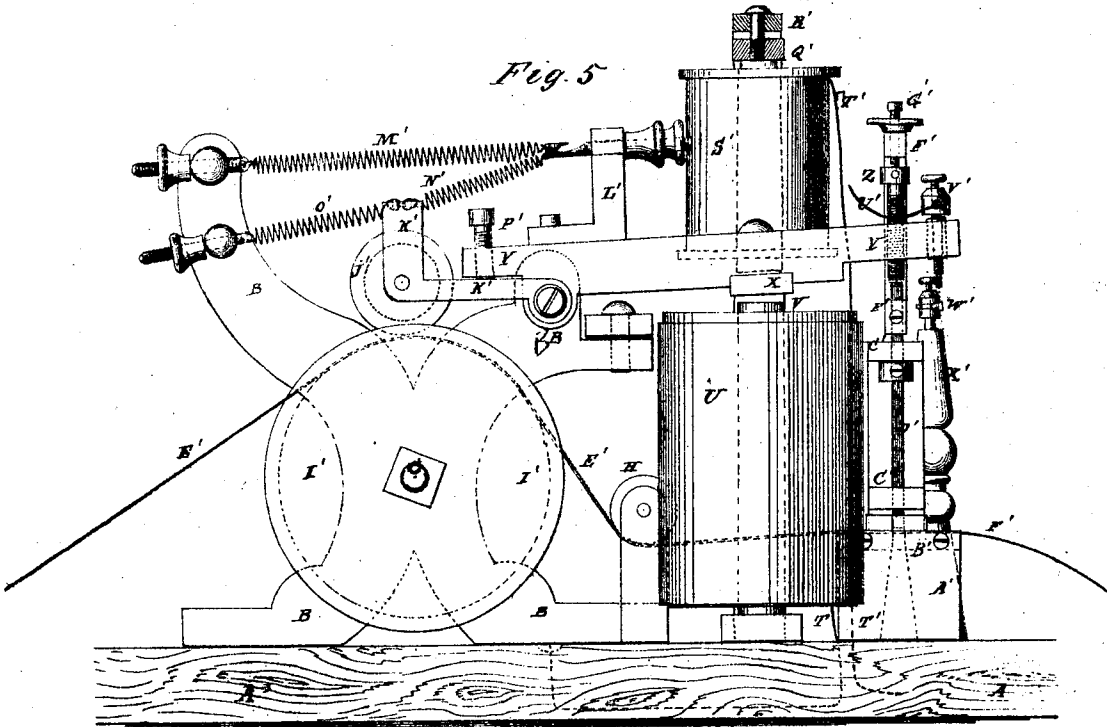
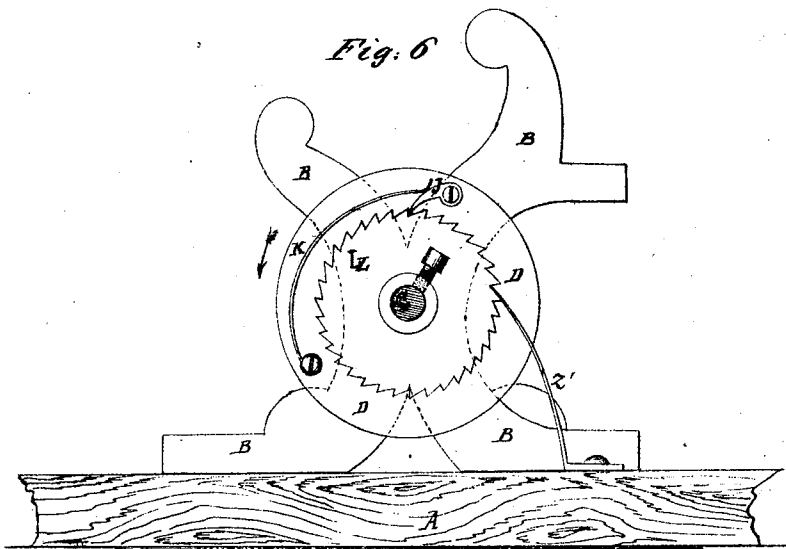


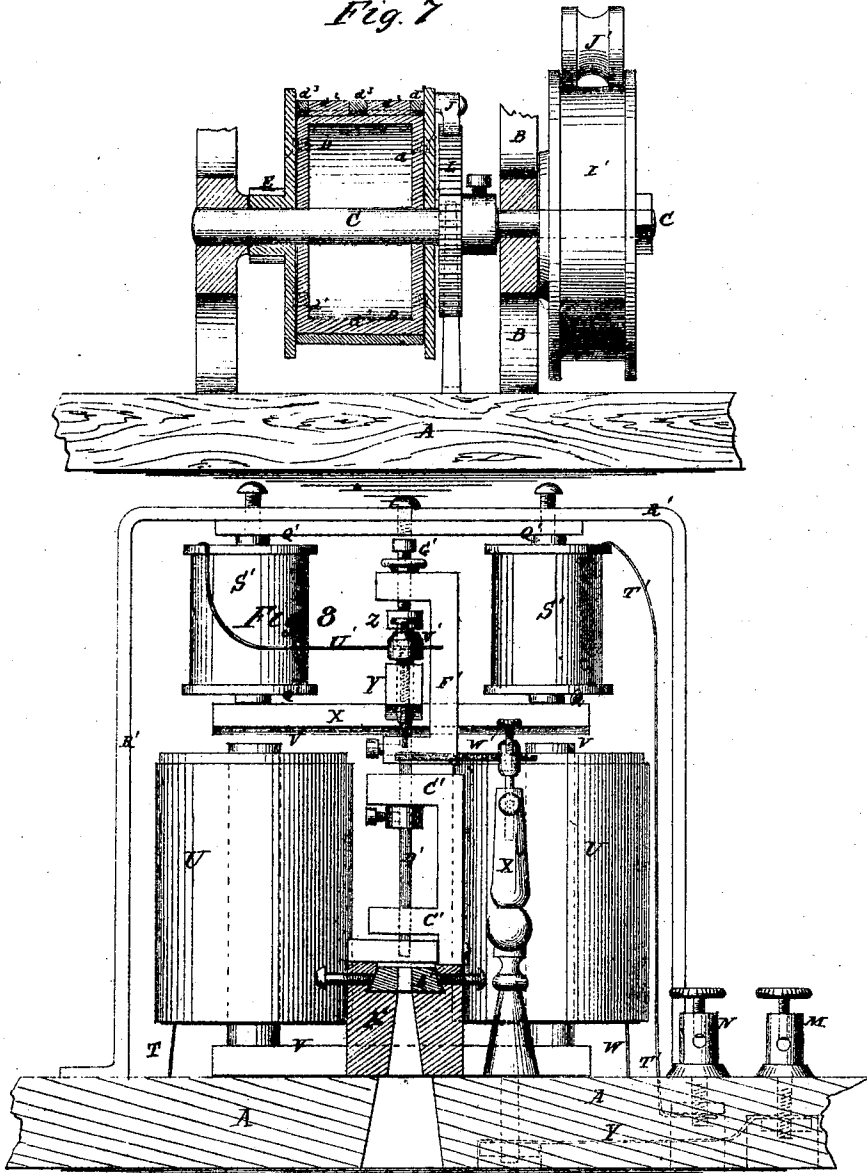
Fig: 6



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Fig. 7



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UNITED STATES PATENT OFFICE.

ISAAC HALL, OF NEW YORK, N. Y., ASSIGNOR TO HIMSELF AND GEORGE B. WALTER, OF SAME PLACE.

IMPROVEMENT IN TELEGRAPH APPARATUS.

Specification forming part of Letters Patent No. 117,771, dated August 8, 1871.

To all whom it may concern:

Be it known that I, ISAAC HALL, of the city of New York, in the county and State of New York, have invented a new and useful Improvement in Telegraph Apparatus; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawing forming part of this specification.

Figure 1, Sheet I, is a top view of my improved apparatus, the upper magnet being removed. Fig. 2, Sheet I, is a side view of the same. Fig. 3, Sheet II, is a detail vertical section of the same taken through the line *x x*, Fig. 1. Fig. 4, Sheet II, is a detail view of the roller. Fig. 4^a, Sheet II, is a detail view of the middle part of the reverse side of the roller. Fig. 5, Sheet III, is a view of the other side of the apparatus, part of the upper magnet being removed. Fig. 6, Sheet III, is a detail vertical section of the same taken through the line *y y*, Fig. 1. Fig. 7, Sheet IV, is a vertical detail section of the same taken through the line *z z*, Fig. 1. Fig. 8, Sheet IV, is an end view of the same, partly in section, to show the construction.

Similar letters of reference indicate corresponding parts.

My invention has for its object to furnish an improved telegraph apparatus, which shall be simple in construction, easily operated, and rapid and effective in operation, and which shall be so constructed that the current of electricity will only have to operate the punch, the other movements of the machine being effected by mechanical means; and it consists in the construction and combination of the various parts of the apparatus, as hereinafter more fully described.

A is the wooden bed-plate of the machine, to which the metallic frame-work is attached, and by which said frame-work is insulated. B is the metallic frame-work in bearings, in which revolve the journals of the shaft C. D is a roller or contact-drum, which revolves loosely upon the shaft C, and by means of which the circuit is closed and broken, to operate the punch to form the signs for the letters of the alphabet. The foundation of the roller D is a metallic tube, *d*¹, made with close metallic ends, through holes in the center of which the shaft C passes. The opposite sides of the interior tube *d*¹ have a num-

ber of longitudinal parallel slits or grooves formed in them, extending the entire length of the roller, and made at exactly the same distance apart. In these slits or grooves are placed and secured small pieces or strips, *d*², of platinum or other suitable metal, which are arranged in such a way as to operate the punch by closing and breaking the circuit in such a way as to form the alphabet; as, for instance, if the platinum pieces *d*² are placed in consecutive grooves the perforations made by the punch will overlap or meet each other, and thus form a dash, but if one or more grooves or slits intervene between the pieces or platinum a space will be left between the perforations made by the punch, thus forming a point, so that, by properly arranging the said platinum pieces in the said grooves or slits, the signs or letters of the "Morse" alphabet, or any other system of signs may be formed. The spaces between the platinum pieces *d*² are filled with rubber, *d*³, and vulcanized or filled with any non-conducting substance, forming a roller with an interior metallic tube, and with the outer edges of the platinum pieces *d*² flush with the outer surface of said roller. E is a gear or pinion-wheel formed upon or rigidly attached to the end of the roller D, so as to carry the said roller with it in its revolution. F is a gear-wheel, the journals of which work in bearings in the frame B, and the teeth of which mesh into the teeth of the gear-wheel E. The teeth of the gear-wheel F also mesh into the teeth of the gear-wheel G, the journal of which works in bearings in the frame B, and to the projecting end of said journal is securely and rigidly attached a lever, H, to the end of the long arm of which is attached, or upon it is formed, a hand-piece, *h*¹, for convenience in operating it. Through the end of the other or short arm of the lever H is passed a set-screw, *h*², to serve as a stop to limit the movement of the lever H by striking upon a plate or block, *h*³, attached to the bed-plate A or frame B. The set-screw *h*² is provided with a lock-nut, so that when properly adjusted it may be securely locked in place. By this construction, by depressing the end of the lever H the roller D will be partially revolved in one direction. When the pressure is removed from the lever H the roller D is carried back to its former position by the spring I, one end of which is secured to the side of the gear-wheel F near its outer edge, and the other

end of which is connected with the frame B by a screw and nut, so that its tension may be adjusted as may be required. To the end of the roller D, opposite the gearing E F G, is pivoted a pawl, J, which is held down by the spring K to engage with the teeth of the ratchet-wheel L, which is adjustably secured to the shaft C, so that, when the roller D is revolved forward, by operating the lever H the said roller may carry the shaft C with it; but when the roller D is carried back by the spring I the pawl J may slide over the teeth of the ratchet-wheel L without moving the said shaft C, the said ratchet-wheel being kept from being moved by the friction of the said pawl by the stop Z', as shown in Fig. 6.

The teeth of the ratchet-wheel are made of exactly the same number as the subdivisions or spaces of the roller D, and said ratchet-wheel and roller are so arranged that when the contact-pieces or points of the finger-levers may be in contact with one or another of the stops at the end of each letter the pawl J may have hold of a tooth of said ratchet-wheel ready to carry the shaft C forward as the next letter is being formed. M and N are the cups that receive the wires from the battery, from one of which, as M, a wire passes which is divided into two branches, one, o^1 , leading to the bar P, which is attached to the frame B, and which is insulated by rubber placed between it and the said frame, and by small rubber tubes with flanged upper ends placed in the screw-holes through which the screws pass that connect it to the said frame B, so that the said screws cannot come in contact with the said bar P. To the bar P is attached the upper row or series of contact-levers Q, which pass over the roller D, and have points or pieces of platinum or other suitable metal, q^1 , attached to them in such positions that when the said levers are depressed the said points q^1 may come in contact with the platinum-points d^2 of the roller D, closing and breaking the circuit as the said points d^2 are carried past the said points q^1 by the movement of the said roller D. The levers Q should have sufficient elasticity to raise them from the roller D as soon as the pressure is removed. The other branch o^2 of the wire O leads to the bar R, which is insulated by being attached to the wooden bed-plate A. S is the lower row or series of contact-levers, which levers are pivoted to the bar R attached to the bed-plate A, so that when the outer ends of said levers are depressed their inner ends may be raised to bring the points S^1 , formed upon or attached to their said inner ends, in contact with the lower set of platinum points or pieces d^2 of the rollers D. The levers S should have sufficient spring to take them away from the roller D when the pressure upon their outer ends may be removed. To the outer ends of the contact-levers Q and S are attached finger-keys $q^2 S^2$, which are made alternately high and low and long and short, for convenience in applying the fingers to said keys with rapidity and accuracy. To the roller D, at the end of each letter, are attached stops d^1 , against which the points $q^1 S^1$ strike, to prevent the onward movement of said roller when a letter is com-

pleted, and thus prevent irregular spaces from being made between the perforations of the paper. In the center of the roller D is formed an insulated stop, d^5 , to be used for stopping the movement of the roller D to form the spaces between the words. Each time one of the points q^1 or S^1 comes in contact with one of the points d^2 the circuit is closed, and the current passes from the roller D to the frame B, which is insulated by being attached to the wooden bed-plate A. From the frame B the current passes through the wire T to the coils U of the magnet V, from which it passes through the wire W to the cup N, and so on to the battery. Every time the circuit is closed the magnet V becomes magnetized and draws down the armature X. The armature X is securely attached to the lever Y, which is pivoted near its rear end to frame B. A' is the bed-plate of the punch, in a recess in the upper part of which is secured the die-plate B', by set-screws, as shown in Fig. 5, so that it may be adjusted as may be required. C' is a guide-bracket, through holes in which the punch D' works, and the base of which is attached to the top of the bed-plate A' above the die-plate B' in such a way as to leave a recess between the base of the said bracket and the said die-plate for the passage of the strip of paper E' to be perforated. The upper end of the punch D' is adjustably attached to the lower arm of the armed bar F' by means of a set-screw, so that it may be conveniently raised and lowered to adjust it as may be required. The downward movement of the punch D' is limited by the bar F' striking the bracket C', and its upward movement is limited by a collar adjustably secured to the punch D' below the upper arm of the bracket C' by means of a set-screw. Through the upper arm of the bar F', directly above the upper end of the punch D', is shown a screw, G', provided with a lock-nut, so that it may be securely locked in place when adjusted. Through the forward end of the lever Y is screwed a screw, Z, in such a position that when the end of said lever is raised the upper end of the said screw may come in contact with the lower end of the screw G' and may raise the bar F' and punch D' out of the die-plate and paper. As the forward end of the said lever Y is lowered the lower end of the screw Z comes in contact with the upper end of the punch D' and forces the punch down, perforating the paper. From the recess in the top of the die-plate A' the strip of paper E' passes beneath the small guide-roller H' pivoted to some suitable support attached to the bed-plate A of the machine. From the guide-roller H' the strip of paper E' passes over the feed-roller I', the face of which is grooved to keep the paper E' in place upon it. The paper E' is held down upon the feed-roller I' so as to be carried forward by said feed-roller by the tension-roller J', which is pivoted to the rear part of the bar or frame K', the forward end of which is pivoted to the pivoting-pin of the lever Y. To the lever Y, a little in front of its pivoting-point, is attached an upwardly-projecting arm, L', to the upper end of which is connected the forward end of the spring M', the other end of which is secured to a support

attached to or formed upon the frame B. To the upper end of the arm L' is also attached the forward end of the spring N', the rear end of which is secured to the part of the bar or frame K' that projects above the tension-roller J', to which bar or frame K' is also attached the forward end of the spring O', the rear end of which is secured to the frame B or to a support formed upon or attached to said frame B. The forward ends of the springs M' N' and the rear ends of the springs M' and O' are secured to their supports by screws and thumb-nuts, so that their tension may be conveniently adjusted, as may be required. Through the rear end of the lever Y is screwed a set-screw, P', the lower end of which projects from the lower side of said lever, so as, when the forward end of the said lever Y is raised to withdraw the punch from the paper, the forward end of the screw P' may come in contact with the bar or frame K' to force the tension-roller J' down with sufficient force to cause the feed-roller I' to carry the paper E' forward with it in its revolution. It will be observed that the lever Y is operated or raised to withdraw the punch from the paper by the combined force of the three springs M' N' O', and that the tendency of the spring N' is to raise the tension-roller J' from the feed-roller I', and the tendency of the spring O' is to draw said tension-roller J' down upon the said feed-roller I', so that the said tension-roller J' will be held down with a force equal to the amount by which the power of the spring O' exceeds that of the spring N'. This enables the relative tension of the springs N' O' to be so adjusted that when the current is closed and the punch is operating upon the paper E' the strength of the said paper will be sufficient to hold it stationary against the tendency of the feed-roller I' to carry the said paper with it in its forward movement; but when the current is broken and the lever Y rises the tension-roller J' will be forced down upon the paper E' and feed-roller I' with sufficient force to cause the said feed-roller I' to carry the said paper with it in its forward movement. To facilitate the withdrawal of the punch from the paper I use a second magnet, Q', which is adjustably secured to a bar or frame, R', insulated by having its ends attached to the wooden bed-plate A, and so arranged that the poles of the magnet Q may be directly over and close to the armature X. The magnet Q' is provided with a coil, S', in the ordinary manner, which coil is connected with the cup N or with the wire W' by means of the wire T'. The other end of the coil S' is connected by the wire U' with the adjustable screw-cup V', which passes through the forward end of lever Y and is insulated from said lever by rubber, so that the current of electricity from the coil S' cannot pass to the coil U and thus affect the lower magnet V. In the lower end of the adjustable screw V' is attached a platinum point, which, when the lever Y is drawn down by the action of the magnet V, comes in contact with a platinum point attached to the outer end of the arm W', the other end of which is adjustably attached to the upper end of the standard X', which is attached to the wooden bed-plate A, and the lower

end of which is connected with the cup N or with the wire O by the wire Y', completing the circuit.

By this construction, as the lever Y moves down from the action of the magnet V the platinum point of the screw V' comes in contact with the platinum point of the arm W', so that as soon as the current passing through the coils U is broken the magnet Q', acting in connection with the springs M' N' O', may raise the lever Y and withdraw the punch from the paper. The use of the magnet Q enables the springs M' N' O' to be made weaker, so that the magnet V in drawing down the lever Y to punch the paper does not have so much resistance to overcome, and consequently does not require to be so powerful.

I am aware of the patent granted to G. Little, November 2, 1869, and desire distinctly to disclaim any intention to embrace within the scope of my claim anything there shown and described.

The drum for making the contacts in my invention is seven inches long and less than two inches in diameter, (full working size,) and may be less than seven inches long. By this arrangement it is not necessary to have a finger-key and its corresponding contacts for each letter or sign; for, by depressing two or more finger-keys, other letters or signs and arbitrary characters are formed; as, for instance, by depressing the finger-keys A and N, the Morse character L is formed. Consequently, the finger-key L and others with their corresponding contacts may be omitted. The surface of the contact-drum is quite smooth, and the inserted contact-pieces d^2 are arranged on each semi-circumference. By this device I make the contact-drum one-half less in length than it would be if the contact-pieces d^2 were placed in a straight line. I also form the entire body of the contact-drum D of a conducting substance to receive the insulation. The contact-drum D is used for the same purpose as Little's segmental blocks. The drum D also imparts motion in its forward movement to the main shaft by means of a dog or click attached to one end and working with a ratchet. It will be observed that the circuit-closing drum D has a to-and-fro action, which is controlled by a lever and gearing arranged for that purpose. By this device the friction is reduced to a minimum. In Little's invention, on the other hand, the cylinder O, (made of non-conducting material, full working size,) will require to be nearly two feet long and three inches in diameter in consequence of the circuit-closing blocks and clamping-bands being placed in one line in grooves between ribs. The friction on the cylinder O by this device is very great, and increases as each segmental block and its corresponding clamping-band is added. To such an extent is this the case that it will be found impossible by this device to obtain the desired results. The punch in my device is not pivoted to the lever. The said lever works between adjustable points, in order that the punch may drop by its own weight and rest upon the paper to be perforated as soon as the magnet V acts to draw the lever down. By taking advantage of the momentum acquired in its descent, the punch being at the extreme end, the action of the lever Y is that of a hammer, (which its sound,

when working, resembles.) The lever Y in its descent increases the tension of the spring n , which is adjusted to react on the spring O which governs the tension-roller J, which is eased sufficiently to allow the feeding-roller I to slip while the punch is through the paper. The upper magnet Q for withdrawing the lever Y is smaller and wound with finer wire than the magnet V, to offer the most resistance to the passage of the current. The insulated connecting-point V should be so adjusted with regard to the contact-spring W that both magnets are in circuit nearly simultaneously, but owing to the difference in the resistance of their coils the magnet Q is ignored by the current until the primary circuit is broken by the forward motion of the contact-drum D. The contact-spring W' follows the insulated connecting-point on the return stroke to near its termination. By this means the maximum effect of the upper magnet Q is obtained. Little in his punching-device uses two armatures, one at each end of the lever, with the punch pivoted between, throwing the magnet into circuit by means of the switch, which does not admit of adjustment. Thus, it will be seen that the devices shown by Little are entirely different from those shown in my invention.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The metallic cylinder d^1 , slotted at equal intervals and in parallel lines on its periphery, having metallic strips d^2 , hard rubber (or non-conductor) d^3 , and stops d^4 d^5 , all arranged thereon, as and for the respective purposes specified.

2. The combination of the adjustable lever H,

spring I, and gearing E F G, or equivalent gearing, for imparting a reciprocating movement to the contact-drum or roller D, substantially as herein shown and described, and for the purpose set forth.

3. The combination of the spring-pawl J K, ratchet-wheel L, and stop Z' with the contact-roller or drum D and shaft C, for the purpose of operating the feed-roller I' from the said contact-roller D, substantially as herein shown and described.

4. The combination and arrangement of the springs M' N' O' with the lever Y, frame or bar K', tension-roller J', and set-screw P', substantially as herein shown and described, and for the purposes set forth.

5. The adjustable screw Z and armed bar I', whether provided with an adjustable screw, G', or not, in combination with the lever Y, guide-bracket C', and punch D', for the purpose of operating the punch by the movements of said lever Y, substantially as herein shown and described.

6. The magnet Q', applied through an insulated platinum-pointed screw-cup, V', and an oppositely-arranged platinum-pointed arm W', to assist in raising the lever Y, in the manner described.

7. The key-levers Q q^1 q^2 S s^1 s^2 , constructed and arranged in connection with each other and with the contact-roller D, substantially as herein shown and described, and for the purpose set forth.

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