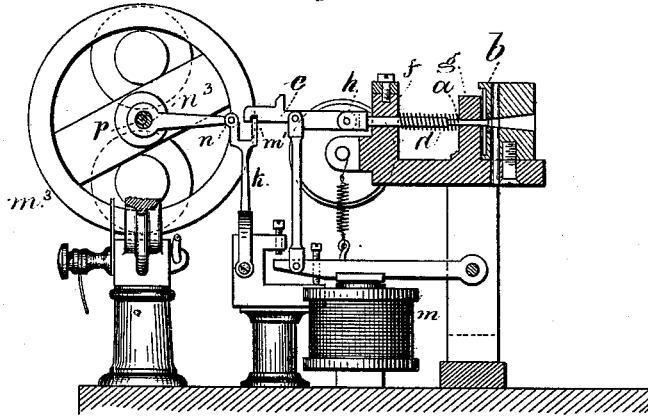
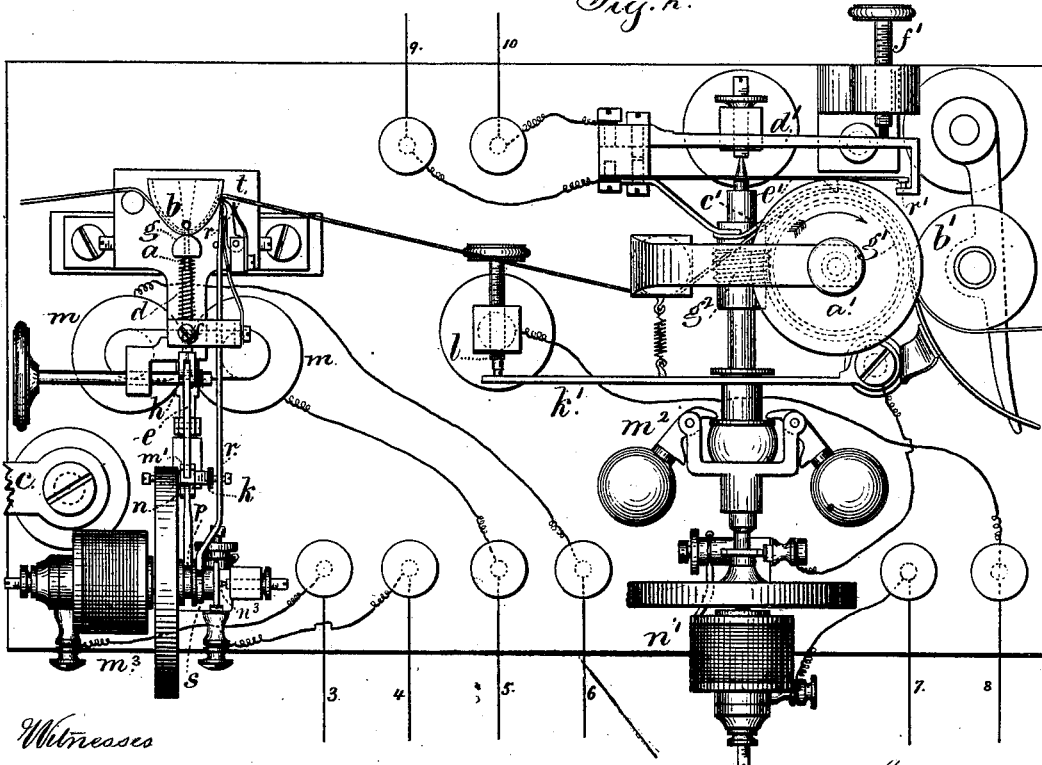


T. A. EDISON.  
 Automatic Telegraph Perforator and Transmitter.  
 No. 200,994.                      Patented March 5, 1878.

*Fig. 1.*



*Fig. 2.*



*Witnesses*

*Chas. A. Smith  
 Harold Ferrell*

*Inventor*

*Thomas A. Edison  
 per Lemuel W. Serrell atty.*

# UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF MENLO PARK, NEW JERSEY.

## IMPROVEMENT IN AUTOMATIC-TELEGRAPH PERFORATOR AND TRANSMITTER.

Specification forming part of Letters Patent No. **200,994**, dated March 5, 1878; application filed November 11, 1876.

*To all whom it may concern:*

Be it known that I, THOMAS A. EDISON, of Menlo Park, in the county of Middlesex and State of New Jersey, have invented an Improvement in Telegraphs, of which the following is a specification:

The object of this invention is to transmit Morse characters over a local circuit or telegraph-line by any of the usual methods, and record the same simultaneously and automatically by perforating a strip of paper, which strip, so perforated, serves to retransmit the same message over other circuits or lines.

By this improvement a record of the message can be made at the transmitting or receiving station, or at any intermediate station, by the perforated paper, without obstructing the operation of the line, and that strip can be used for subsequent automatic transmission.

I make use of a shaft revolved, preferably, by an electric engine, and operating a paper-feed and a punch, the feed taking place when the punch is out of the paper, and there is a coupler between the power and the punch for connecting or disconnecting the latter, which coupler is operated by an electro-magnet, so that the message, passing through the magnet, will be effective in operating the perforator, and the perforated strip serves as a record, or it can be used for retransmission.

The invention further consists in the mechanism for retransmitting the message from the perforated strip.

In the drawing, Figure 1 is a sectional elevation of the punching mechanism, and Fig. 2 is a plan of the complete apparatus.

*a* is the punch. *b* is the die between which the paper passes from the roll upon the arm *c*. *d* is the spiral spring which aids in withdrawing the punch from the paper. The bearings of the punch are *f* and *g*. *e* is a coupler, secured to the punch at *h*, and provided with a notch at its extreme end. The coupler is moved up and down by the lever of the magnet *m*.

*k* is a pivoted lever, provided with two prongs at its end, one of which, *m*<sup>1</sup>, catches in the notch on *e* when the lever of the magnet is attracted, thus connecting the coupler *e* to *m*<sup>1</sup>. The other prong of *k* is connected by the link

and joint *n* to the eccentric *p* upon the engine-shaft *n*<sup>2</sup>. *r* is the paper-feeding lever, also connected to the engine-shaft by an eccentric, *s*.

The eccentric *p* is set at one hundred and eighty degrees, or nearly so, to the eccentric *s*, so that the punch enters the paper while the feed-lever is drawing back, and the punch comes out of the paper just as the feed-lever commences to move the paper forward, thus producing an accurate timing of the punching and feeding devices.

The electric engine *m*<sup>3</sup>, for actuating the punch and paper-feed, is in the circuit 3 4 of a local battery.

The feed-lever *r* is provided with points, which engage with the paper and allow it to be carried forward. *t* is a click, which prevents the paper from receding when *r* is drawn back.

The operation is as follows: When the circuit in which the magnet *m* is placed is open, the coupler *e* is thrown upward, and the punch remains out of the paper, and receives no movement; but the paper-feed *r* continues to move the paper forward at a regular rate. If, now, the circuit in which *m* is placed is closed, the magnet becomes energized, its lever is attracted, and the coupler *e* is brought down upon the prong *m*<sup>1</sup>, locked to it, and immediately the punch reciprocates rapidly, passes through and out of the paper. The first movement punches a hole the same size as the punch, but thereafter, and so long as the magnet *m* is closed, punches only crescent-shaped pieces at each movement, as the paper-feed is only a fraction of the distance covered by the punch; hence an elongated slot or perforation is made, its length depending upon the length of time that *m* is energized. Immediately that the circuit containing *m* is broken, the coupler *e* is thrown out of contact with *m*<sup>1</sup>, the punch ceases to be reciprocated, while the lever *r* continues to feed the paper, thus forming the spaces.

As the engine-shaft *n*<sup>3</sup> makes several thousand revolutions per minute, the perforated characters can be formed with great rapidity.

The electro-magnet *m* is in a circuit, 5 6, to a distant station, in which circuit there is a

receiving-instrument, battery, and finger-key, and the message transmitted to said distant instrument corresponds to the message perforated in the strip of paper by the punch *a*. After the strip has been punched it is passed through the transmitting or translating machine, which consists of a drum, *a'*, provided with a slot around its whole circumference, and in its center.

*b'* is the roller for pressing the paper against the drum, so that it may be carried forward. *c'* is a forked spring, used for holding the paper against the drum, and also to gripe the end of the paper as its end is passed between the spring and the drum. *g'* is a pinion-wheel, engaging with a worm, *g''*, upon the shaft of the electric engine *n'*, and said engine is in a circuit, 7 8, of a local battery. *m''* is a governor, which, as the speed increases, causes the lever *l'* to be withdrawn from *l*, thus breaking the circuit in which the engine is placed.

By the use of the worm and pinion a very even rotation of the drum *a'* is attained, while allowing great rapidity of rotation of the electric engine, which is desirable, and by the use of the electric governor any required speed is easily attained. The circuit-breaking devices consist of a duplex spring, *e' d'*, and the wires 9 10, connecting with *e' d'*, form part of the circuit to a distant station, to which the message is to be retransmitted. *e'* is provided with a V-point somewhat smaller than the slot in the periphery of the drum *a*. This point is in line with the perforated characters, and when resting on the paper the extreme end of *e'*, which is tipped with platina, is separated from the point *r'* of *d'*; but when a perforation passes under the point on *e'*, the said point enters into the slot in the drum, bringing the end of *e'* in contact with *r*, closing the circuit, which is again broken the moment the paper intervenes between the point of *e'* and the drum. *f'* is a screw for adjusting the contact-points to or from the drum *a*.

I will mention that the electric engines might be displaced, both in the puncher and in the transmitter, by clock-work, or by tuning forks or reeds set in motion by electro-magnets—in the case of the puncher one prong serving to actuate the punch, while the other prong would actuate the paper-feed, and in the case of the transmitter the tuning-fork could, by a suitable toothed wheel and click, give practically a continuous rotation to the drum, the speed being regulated by movable weights on the prongs of the fork, or by double pressure-springs.

I will also mention that if the puncher is to be used merely for preparing the paper for transmission, the locking-coupler *e'* might be actuated by a movement derived from a Morse key, without the use of electricity; and where great speed is required in perforating, the shaft upon which the eccentrics are placed might be rotated by hand, a small pulley be-

ing secured to the shaft, which would be connected to a very large one by a belt or geared by toothed wheels, and the whole set in motion by hand or foot power.

I will also mention that an absolute lock like the lever *e* and prong *m'* is not absolutely requisite when considerable power is used to revolve the eccentrics, for if plenty of power is used, as with hand-power, the spiral spring *d* around the punch can be strengthened and made to draw the punch out without aid from the eccentric-lever, and the mere insertion of a wedge between the end of *m'* and a continuation of the punch *a* will serve to actuate the punch. Such wedge is free to be withdrawn at each revolution of the shaft carrying the eccentric, and there is but little movement; hence a very weak power will suffice to throw the wedge in and out.

I will also mention that the punch and paper-feeding mechanism may be reciprocated continuously, and the characters formed by using a movable die and paper-feeding wheel, both of which can be brought toward the punch and feed-click by an electro-magnet, or by hand. It is not even essential that the paper-feed click should impinge directly upon the paper, as the paper may be passed over a drum and the drum rotated by the feed-click engaging in the teeth of a ratchet-wheel upon the shaft of the same.

I will also mention that when it is required that reverse currents should be used, so as to enable the punching mechanism to be controlled by a polarized relay whose lever operates the magnet *m*, two punches may be used, one under the other, but separated, say, one-thirty-second of an inch, and the locking mechanism so arranged that when *m* is closed the top punch will enter the paper, and when open the eccentric will be locked to the other punch when it enters the paper, thus causing the spaces between the characters in the upper row to have perforations immediately below them in the second row. In this case the transmitting-drum is to be provided with two grooves and two contact-springs, one connected to the positive pole of a battery, while the other is connected to the negative pole of another battery, thus allowing the transmission of alternate currents. Even one battery could be used and the springs arranged to reverse the same.

I claim as my invention—

1. The punch and die *a b* and notched coupler *e*, in combination with the eccentric *p*, fork *k*, and electro-magnet *m*, substantially as set forth.

2. In a perforating apparatus, a continuously-revolving shaft and a step-by-step feed, operated thereby, in combination with a punch that is actuated by the shaft while the paper is quiescent, a coupler to connect the power and the punch, and an electro-magnet to move such coupler, substantially as set forth.

3. Punch and paper-feeding mechanism re-

ciprocated by the eccentrics  $p$  and  $s$ , when the same are arranged in such a position that the paper is only fed when the punch is clear of the die.

4. The transmitter consisting of a drum,  $a'$ , contact-points and springs  $e' d' r'$ , electric engine  $n^1$ , and governor  $m^2 k' l$ , all arranged and operated substantially as specified, and for the purposes set forth.

Signed by me this 30th day of October, A.  
D. 1876.

THOS. A. EDISON.

Witnesses:

GEO. T. PINCKNEY,  
HAROLD SERRELL.