

P. B. DELANY.
TELEGRAPHY.

No. 510,006.

Patented Dec. 5, 1893.

Fig. 1,

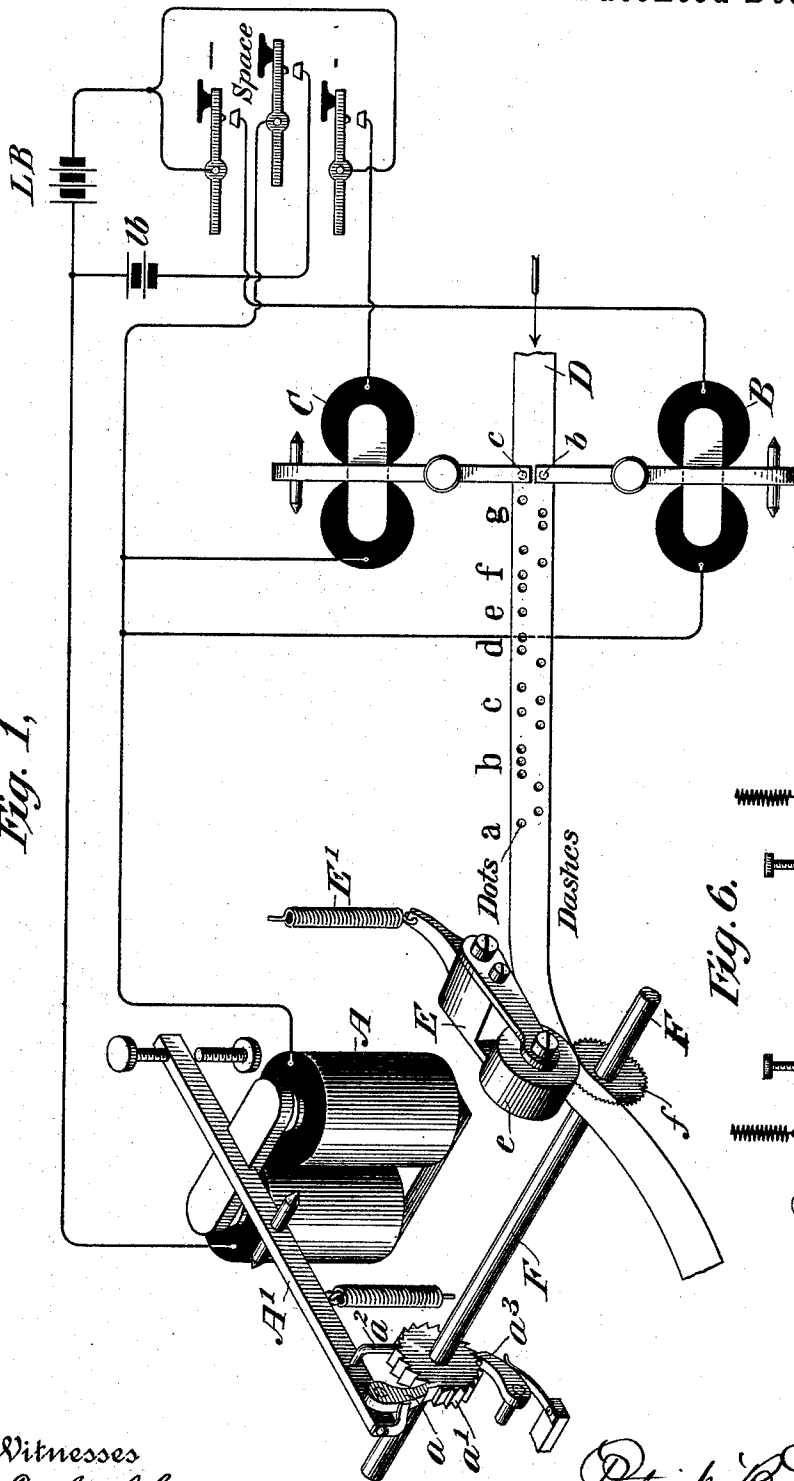
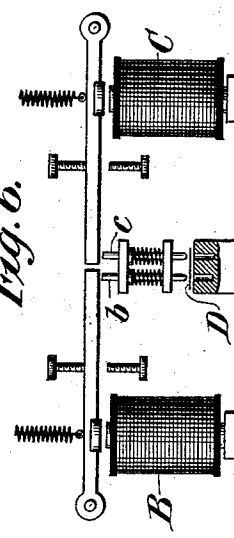


Fig. 5,



Fig. 6.



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Fig. 2, Patented Dec. 5, 1893.

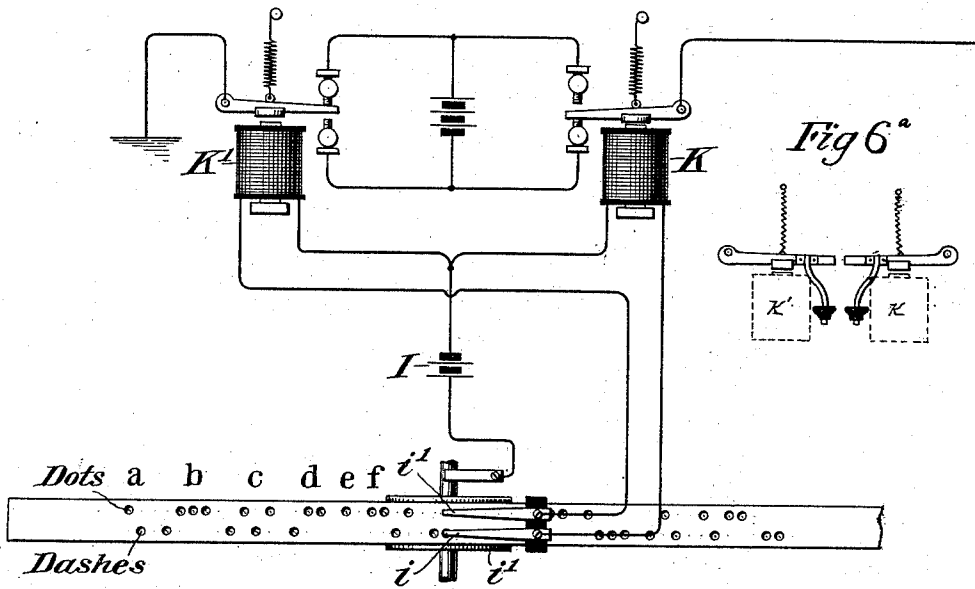


Fig. 3,

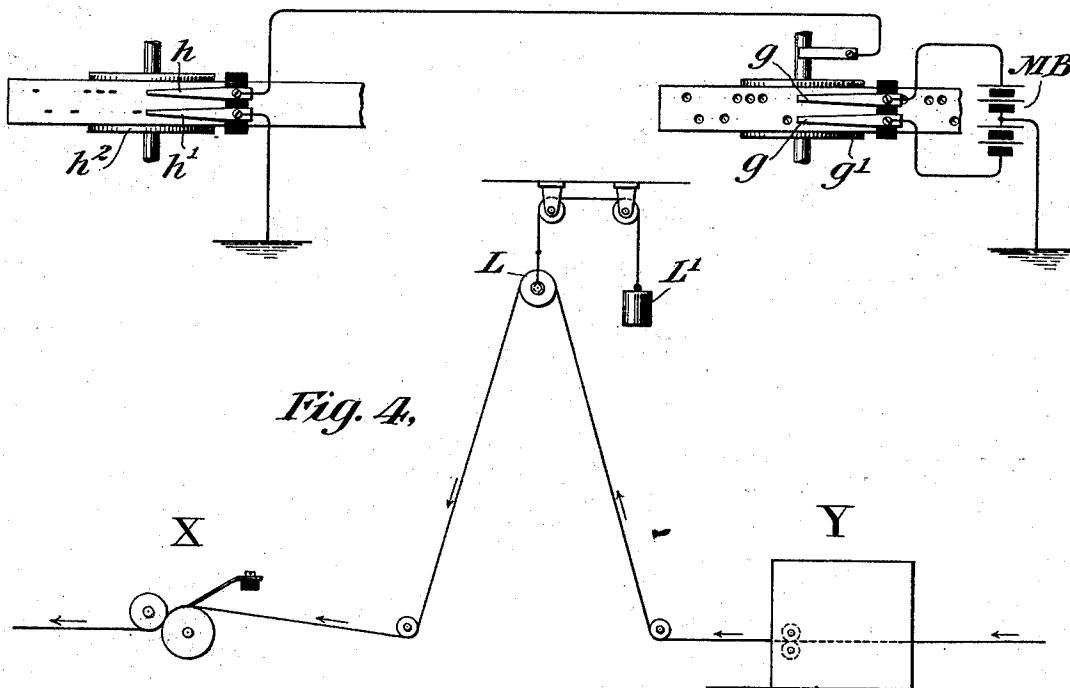


Fig. 4,

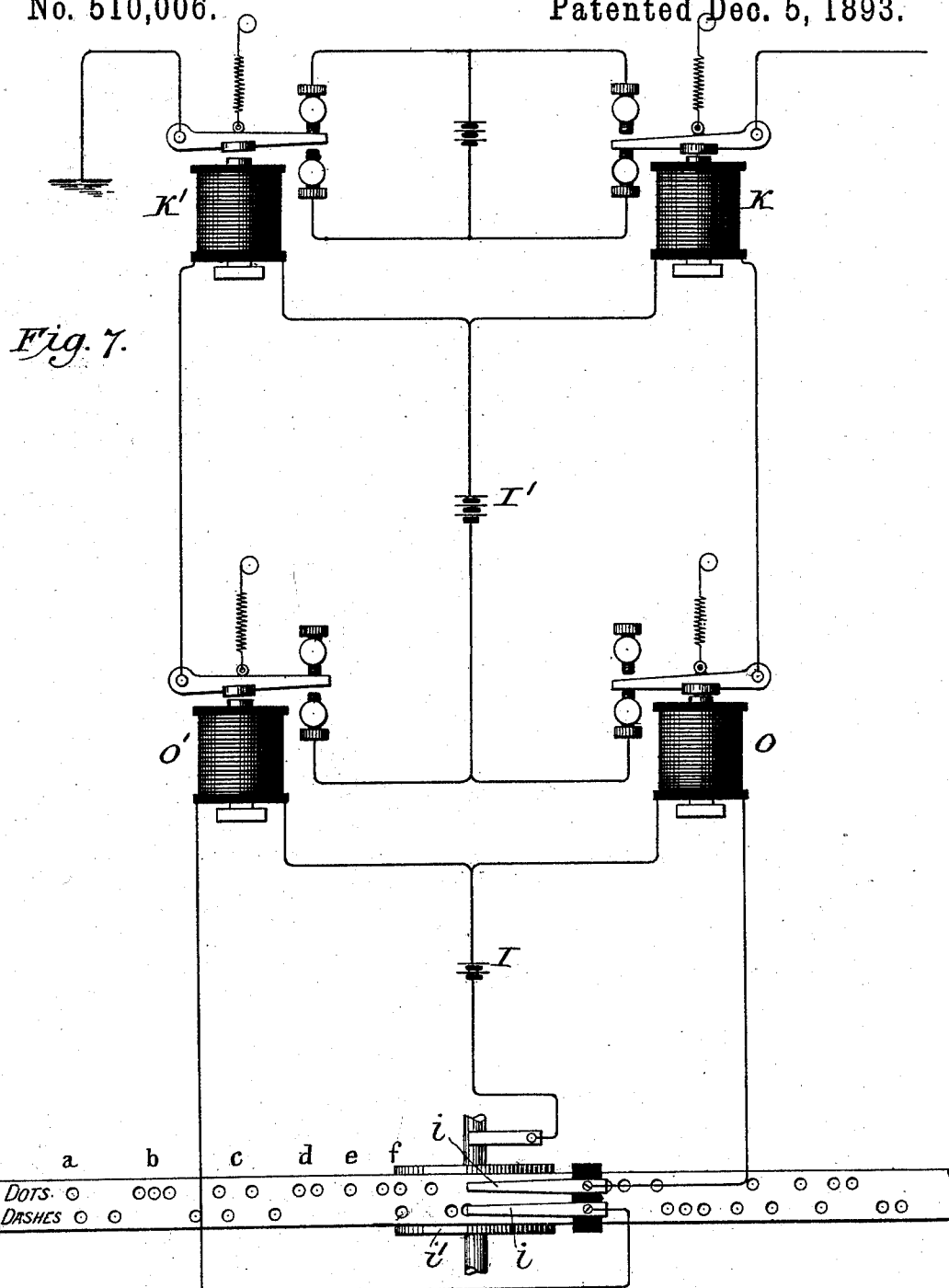
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UNITED STATES PATENT OFFICE.

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TELEGRAPHY.

SPECIFICATION forming part of Letters Patent No. 510,006, dated December 5, 1893.

Application filed July 22, 1893. Serial No. 481,171. (No model.)

To all whom it may concern:

Be it known that I, PATRICK B. DELANY, a citizen of the United States, residing at South Orange, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Telegraphy, of which the following is a specification.

The object of my invention is to provide a mechanical system to take the place of hand transmission over ocean cables and long and difficult land lines. I am aware that heretofore mechanical systems of transmission for ocean cables have been proposed, such systems being mainly adaptations of the well known Wheatstone automatic system. As in such cases, I also purpose effecting the automatic transmission by means of a perforated ribbon. In my system the ribbon is perforated as heretofore, in two lines on opposite sides of its longitudinal center, which however is unperforated and therein differs from the ribbons used with Wheatstone transmitters. All the perforations in one line represent dots, and all those in the other line dashes. The letters are made up by the proper combinations of such dot and dash perforations, preferably according to the continental code. The letters and words are uniformly spaced. I effect the perforation of the ribbon in a novel and efficient manner by means of electro-magnetically actuated punches controlled by keys, one key being used for dashes, another for dots and the third for spaces. The ribbon is automatically intermittently fed a uniform distance after each perforation, as required to give the proper spaces between letters and words. The ribbon thus prepared is passed through a transmitter, having contact devices that respectively complete two local circuits through the two rows of perforations, and the local circuits control electro-magnetic transmitters, one of which sends negative currents to line, which may indicate the dashes, and the other positive currents, which may indicate the dots. The electro-magnets and their armatures which effect this automatic transmission may be similar to ordinary sounders, and if desirable, to effect a greater delicacy and precision of action, I may interpose between their circuits and the contact devices controlled by the perforations in the ribbon, sensitive relays of relatively

higher resistance. The ribbon having been accurately prepared the succession of impulses representing the dots and dashes of the message will be thrown upon the line in proper order, and with mechanical precision, both as regards the duration of the impulses and the length of the spaces. If such transmission be through a sub-marine cable, it may be received upon a siphon recorder which will operate in precisely the same manner as if the impulses respectively representing dots and dashes had been transmitted into the cable by the use of two keys as is the ordinary practice at the present time. The duration of contact between the cable and the battery or earth may be regulated by adjustment of the transmitter magnet levers and the springs, so as to obtain with greater exactness the best conditions for fast signaling. If the above described system of transmission be practiced over land lines with chemical reception, the result is practically the same, the negative impulses representing the dashes being manifested or developed in one line on the receiving paper, and the positive impulses representing dots being manifested in another line. In either case it is desirable that the sending operator be able to cut in upon the mechanical transmission by the perforated strip to interpolate some communication, explanatory or otherwise, and to permit of this I may provide the armature lever of each of the magnets that act to throw the impulses upon the line, with an ordinary button so that it may be used as a transmitting key, the two buttons being arranged side by side so that they may be operated in the manner ordinarily practiced for manual transmission over sub-marine cables; or I may interpose ordinary keys in the local circuits of these magnets placed in normally open shunts around the contact devices controlled by the perforated transmitting ribbon. Of course in the event of such manual transmission the automatic transmitter devices should be stopped or could continue to run without interruption, but the ribbon then passing through them should be unperforated. My system is adapted to such an operation as will presently appear. In transmission over sub-marine cables, the limit to the speed of transmission, due to the retardation of the

cable, is such that the circuit may be completely occupied by a single operator, working manually, or the prepared ribbon may pass directly from the perforator to the transmitter. In transmission over long submarine cables, the speed owing to retardation is considerably below the ability of the operator, but notwithstanding the fact there are numerous delays incidental to direct manual transmission arising from illegible manuscript and interruptions of various kinds, which delays taken in the aggregate represent serious waste of time daily. With present automatic systems so far as is known to the applicant there are also serious delays consequent upon the accumulation of several messages upon a single reel, and intermittent breaks caused by changing of the reels supplying the transmitter. The business of a day is thus necessarily chopped up into many short stops rendering filing and subsequent identification laborious. All these delays and annoyances I propose to obviate by the introduction of a take-up mechanism between the perforating and transmitting instruments so that an operator may perforate in excess of the carrying capacity of the cable, and provide an accumulation or reservoir of matter for transmission thus eliminating from the transmission all the incidental delays above referred to, not a moment of the cable's carrying capacity need be lost and the entire business of a day may be run through in one continuous ribbon. This interposed mechanism may be of any suitable character to accomplish the purpose suggested, the primary feature of the invention being the possibility of accumulating between the two instruments a sufficient length of the prepared ribbon to allow the operator intervals of time during which he may suspend the manipulation of the perforator. In my improved system, it is therefore apparent that the mechanical transmission is similar in kind to that of hand transmission, except that it is more perfect and accurate and produces uniform results as regards reception, irrespective of the idiosyncrasies of the work of the operator. This is an important feature of submarine cable telegraphy where the peculiarities of a transmitting operator's manipulation have to be understood and allowed for in translating the message from the record on the receiving ribbon. It will be observed that in the system above outlined, there is no mechanism to be mechanically operated by the perforated ribbon and no mechanically operated contact devices controlled by arms or levers operated by the ribbon. The local contacts that control the circuits of the transmitting magnets are completed merely by contact fingers, under which the ribbon runs, falling or being pressed into the perforations and establishing contact of the proper duration with a contact surface beneath the ribbon. These contacts complete local circuits provided with ample battery power and in

which the instruments are so adjusted that the ultimate contact by which impulses from the main battery are sent into the cable is certain, firm and practically uniform as regards duration, force and character of contact.

The system is hereinafter more specifically described in connection with the accompanying drawings, in which—

Figure 1 is a diagrammatic view illustrating the organization by which the ribbon is perforated; Fig. 2 a similar view showing one arrangement for transmission; Fig. 3 a similar view showing an arrangement for transmission and chemical reception; Fig. 4 a like view indicating the perforator, the transmitter and the interposed mechanism by means of which an excess of prepared ribbon may be accumulated between the two instruments. Fig. 5 indicates a section of the ribbon upon which the matter transmitted has been recorded by an ordinary siphon recorder. This is a representation of an ordinary recorder receiving ribbon, the action of the recorder in receiving according to my system being the same as with the present system of manual transmission, except as regards greater accuracy of the received signals or characters. Fig. 6 is a side view, transverse to the ribbon, showing the punch magnets, punches and dies. Fig. 6^a shows the two transmitter magnets modified to serve as ordinary transmitting keys. Fig. 7 is a view similar to Fig. 2, except that the contacts through the perforations in the ribbon control local circuits that operate two relay magnets O O', whose armature levers control the transmitter magnets K K'.

The perforating devices for preparing the ribbon are shown clearly in Fig. 1. The keys for the dots and dashes are respectively marked by those characters, and are each connected with one side of a local battery L B. The opposite pole of the battery is connected through the coils of a feed magnet A. The circuit then branches, one branch passing through the magnet B and thence to the anvil of the dash key. The other branch passes through the magnet C and thence to the anvil of the dot key. The spacing key, which is marked "Space" is connected through the coils of the magnet A and thence to one side of a local battery *lb* the opposite pole of which is connected with the anvil of the key. These three key buttons are arranged in the form of a clover leaf so that the space key may be reached with equal facility from either of the character keys. Of course the current for this circuit might be taken from the battery L B, but I prefer to use a separate battery as illustrated. The armature lever of each magnet B C carries or actuates a perforating punch *c b* the two punches being arranged in a parallel line transverse to the ribbon D to be perforated. These punches work into or against corresponding dies and the paper ribbon passes between the punches and the dies.

Such a construction is of course obvious and well known, and detailed illustration is unnecessary. The ribbon travels in the direction indicated by the arrow from a roll suitably mounted, passes under the punches and between the feed wheel and roller *f e*.

f is preferably a thin wheel or disk and has a finely toothed or serrated edge, and is fast upon the shaft *F*. The roller *e* is carried by a swinging frame *E*, and depressed by a spring *E'* against the disk *f*. The armature lever *A'* of the feed-magnet *A* carries a pawl *a* that, when the lever is actuated by its spring, drives a ratchet wheel *a'* fast on the shaft *F*, and also a stop *a''* that prevents the wheel being moved in excess of the required distance by the impact of the pawl. A detent pawl *a'''* prevents back motion.

The operation of this part of my invention is as follows:—When either the dot or dash key is depressed the feed-magnet *A* is energized and also the punch magnet *B* or *C*, as the case may be. The corresponding punch is actuated to perforate the paper and when the key is raised the armature lever *A'* is thrown by its spring and the paper is automatically drawn forward the required distance to afford the proper space between the perforation just made and the succeeding perforation, indicating the next dot or dash of the letter. When the letter is completed, the space key may be depressed once to form the space between it and the following letter; and when the word is completed the space key may be depressed twice. Thus the space between letters is double the space between the elements of a letter and the space between words is exactly double the space between letters. The serrated wheel accurately draws the ribbon forward without any slip or lost motion. Obviously the perforations must occupy accurate relations to each other and all peculiarities of "style" of the operator are eliminated from the prepared ribbon. In the drawings the letters perforated in the ribbon are marked *a, b, c, &c.* The ribbon should be carried along straight in practice, the apparent curve shown being merely to permit more full illustration of the feeding mechanism. Of course the punches might be arranged to emboss the ribbon instead of perforating it. A ribbon thus prepared may be used for transmission and chemical reception as shown in Fig. 3, where *M B* is a split main battery grounded in the middle and having its opposite poles connected with contact fingers *g g*, between which and a contact drum *g'* the prepared ribbon is drawn. The line at this end is connected with the drum. At the receiving end it is connected with a contact finger *h* whose mate *h'* is grounded. The chemically prepared receiving ribbon runs between these fingers and a metallic drum *h''*. The circuit is closed wherever a finger *g* drops into a perforation and makes contact with the drum *g'*. The two pairs of fingers are springs and press always toward the drums.

This manner of reception is common and well known in automatic chemical telegraphs.

In Fig. 2 I have shown my system for submarine cable transmission. The perforated ribbon passes between a pair of contact fingers *i i* and a metal drum *i'* connected with one pole of a local battery *I*, the opposite pole of which is connected by branch circuits through the coils of two transmitter magnets *K K'* and thence to the respective contact fingers *i i*. Each time that a contact finger makes contact with the drum through a perforation in the lower row of perforations the magnet *K* is energized and a current of one polarity is sent to line, and produces the record of a dash at the receiving recorder or other instrument; and each time that the other finger enters a perforation in the upper row the magnet *K'* is energized and a current of opposite polarity is sent into the line to produce a dot record or signal at the receiver. The arrangement of main battery and contacts for producing this reversal or change of poles is an ordinary one. The impulses thus automatically sent into the line are sent in the same order and produce the same general effect, though a more uniform and accurate effect, as is produced by the manipulation of two keys in the ordinary way in cable telegraphy. A portion of a cable recorder strip with the letters *a, b, c, d, e*, indicated thereon is shown in Fig. 5. It will be perceived that by this arrangement I avoid the use of lever contact mechanism, the operation of which is effected through the medium of the perforations in the transmitting ribbon as in the well known Wheatstone system, and yet maintain a uniform character and duration of the main line contacts.

In Fig. 4, I have shown one way of accumulating the prepared ribbon between the perforating apparatus and the transmitter. *X* represents the transmitter and *Y* the perforator. As the prepared ribbon leaves the perforator it passes over a suspended pulley *L* connected to a cord that runs over one or more fixed pulleys and is connected to a counterbalance weight *L'*. The parts are so balanced that when the limit of the take-up is reached the paper, pulley and cord will almost counterbalance the weight *L'*, and preferably the weight of the cord *L* per unit of length is twice that of the perforated ribbon. The ribbon is drawn forward by the transmitter. With such an arrangement the perforating operator may prepare the ribbon in excess of the capacity of the transmitter for the purpose hereinbefore referred to. Should the operator have occasion to interpolate some instructions or communication he suspends the perforation and stops the transmitter. Then by the manipulation of the armature levers of the transmitter magnets *K, K'* as ordinary telegraph keys, he may transmit in the ordinary way now practiced.

To conveniently adapt the armature levers to be used as ordinary keys, they may be con-

structed and arranged as shown in Fig. 6. They are preferably placed side by side and a depending arm M attached to each lever is provided with an ordinary key button, the buttons being side by side and in proper relation to the base board.

From the foregoing it appears that this system has capacities and advantages not, so far as I am aware, heretofore attained.

Obviously the mere details of the apparatus may be varied in a variety of ways without departing from the principles and mode of operation of my invention.

In Fig. 7 I have shown an organization similar to that illustrated in Fig. 2, except that the local circuits completed by the contacts through the perforations in the ribbon control intermediate magnets or relays O O', the armature levers of which control the electric circuits having the source of energy I' that effect the operation of the transmitter magnets K K', as hereinbefore described. This is a desirable arrangement, since there is in such a system some liability of imperfect contact through the perforation in the ribbon, due to the presence of fibers of the paper or foreign matter, such as dust, &c. The intermediate magnets O O' may be so wound, and the power of the battery I so adapted to them that they are caused to attract their armature levers with power and precision, and thus effect a perfect working of the transmitter magnets K K'.

I claim as my invention—

1. The combination with the dot, dash and space keys, of the punches, their magnets, the feed magnet, its paper feeding or drawing devices, and the local circuits of said magnets controlled by the keys, substantially as set forth.

2. The combination of the dot, dash and space keys, the punches arranged in a line transverse to the ribbon, their actuating magnets, the feed magnet, and its paper drawing or feeding devices, two circuits, one for the dot and one for the dash key, each including the feed magnet and one of the punch magnets and controlled by its key, and a third circuit including the feed magnet and controlled by the space key, substantially as set forth.

3. The combination of the dot and dash

keys, the dot and dash punches arranged in a line transverse to the ribbon, an actuating magnet for each punch the circuits of said magnets respectively controlled by the corresponding key and means for feeding the ribbon step by step in unison with the manipulation of the keys, substantially as set forth.

4. The combination of the dot, dash and space keys, the dot and dash punches arranged in a line transverse to the ribbon, an actuating magnet for each punch, the space magnet, the circuits of said magnets respectively controlled by the corresponding key, and means for feeding the ribbon after the actuation of each of three keys, substantially as set forth.

5. The combination of the transmitter magnets, one for sending dot impulses and the other dash impulses into the line, two local circuits controlled by electrical contacts made through two lines of perforations in a transmitting ribbon, one representing dots and the other dashes, a relay in each of said local circuits, and two other local circuits controlled by the armature levers of said relays and respectively including the two transmitter magnets, substantially as set forth.

6. The combination of mechanism for preparing a ribbon for automatic transmission, an automatic transmitter, and interposed ribbon take-up devices, whereby the ribbon may pass direct from the preparing mechanism through or over the take-up devices to the transmitter, and a margin or excess of prepared ribbon accumulated under uniform tension between the transmitter and preparing mechanism, substantially as set forth.

7. The combination of an automatic transmitter having transmitter magnets such as K K', mechanism for perforating or preparing a ribbon for automatic transmission, and take-up devices for maintaining uniform tension on the ribbon between the transmitter and said preparing mechanism, substantially as set forth.

In testimony whereof I have hereunto subscribed my name.

PATRICK B. DELANY.

Witnesses:

FRANK S. OBER,
ALFRED W. VAN ZEE.