3 Sheets—Sheet 1.

T. M. FOOTE.

METRICAL-TELEGRAPH SYSTEM.

No. 191,130. Patented May 22, 1877.

Fig. 1.

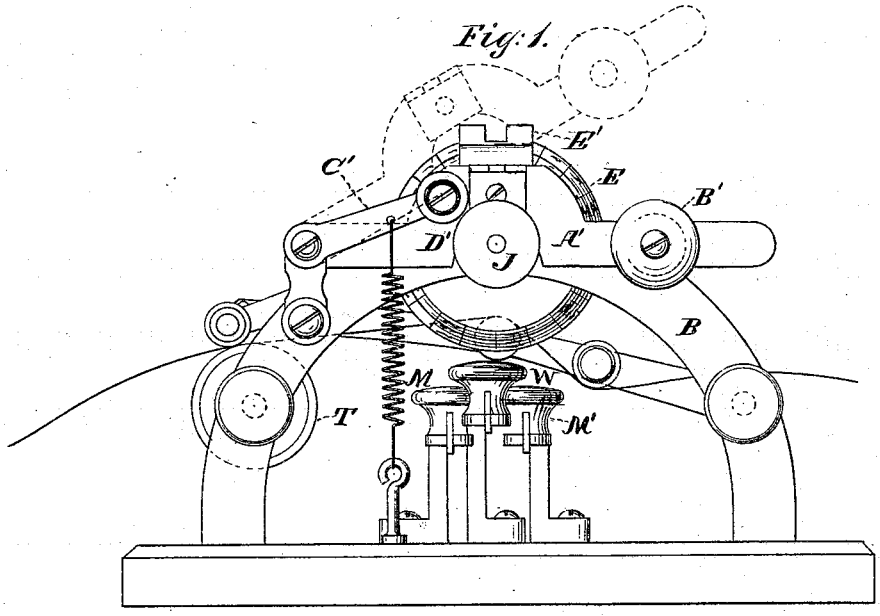
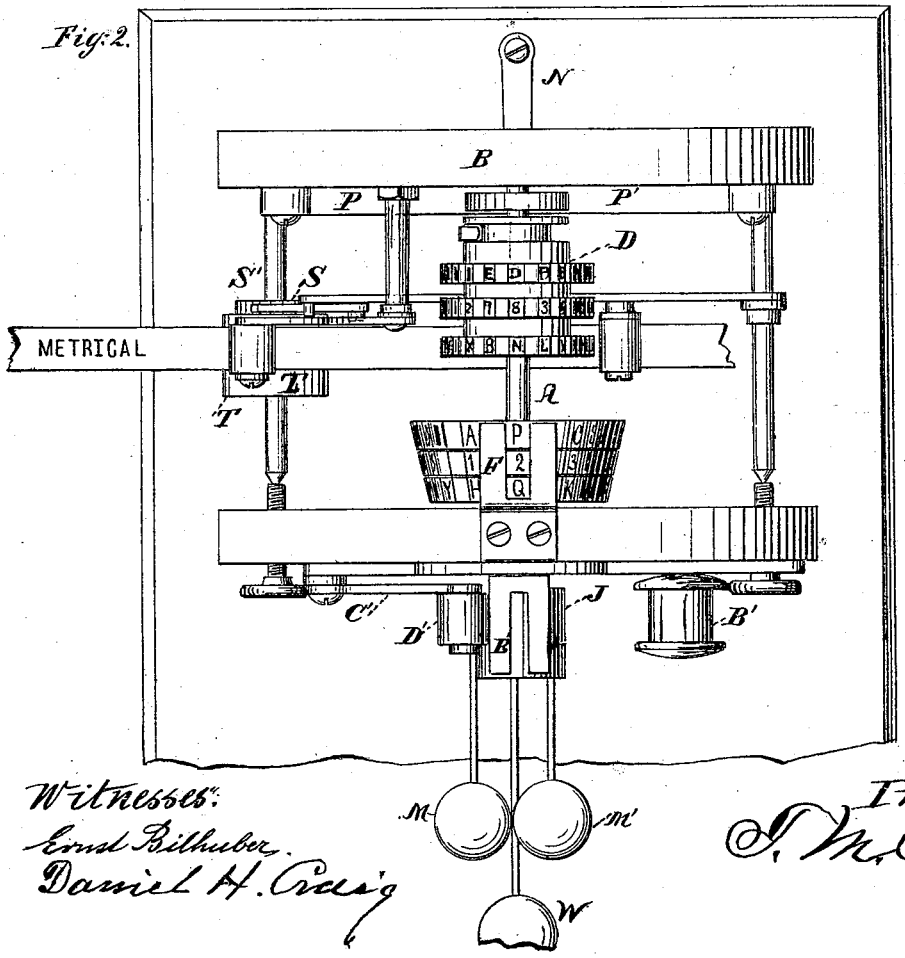


Fig. 2.



Witnesses:
Ernst Bilhuber.
Daniel H. Craig

Inventor.
T. M. Foote

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

3 Sheets—Sheet 2.

T. M. FOOTE.

METRICAL-TELEGRAPH SYSTEM.

No. 191,130. Patented May 22, 1877.

Fig: 3.

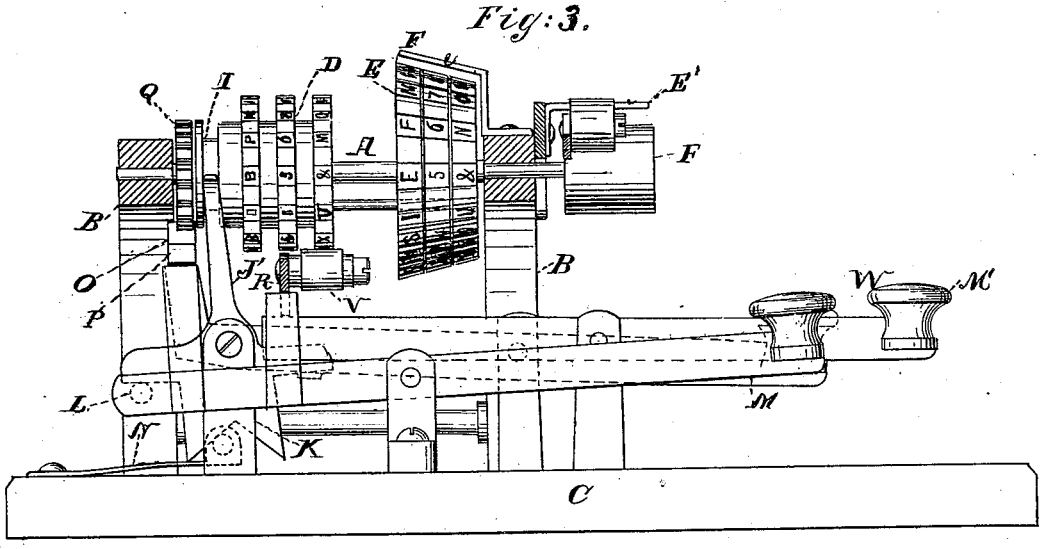


Fig. 13.

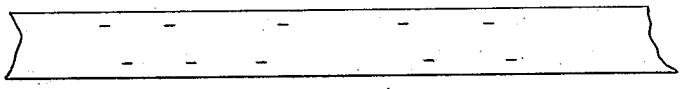


Fig: 4.

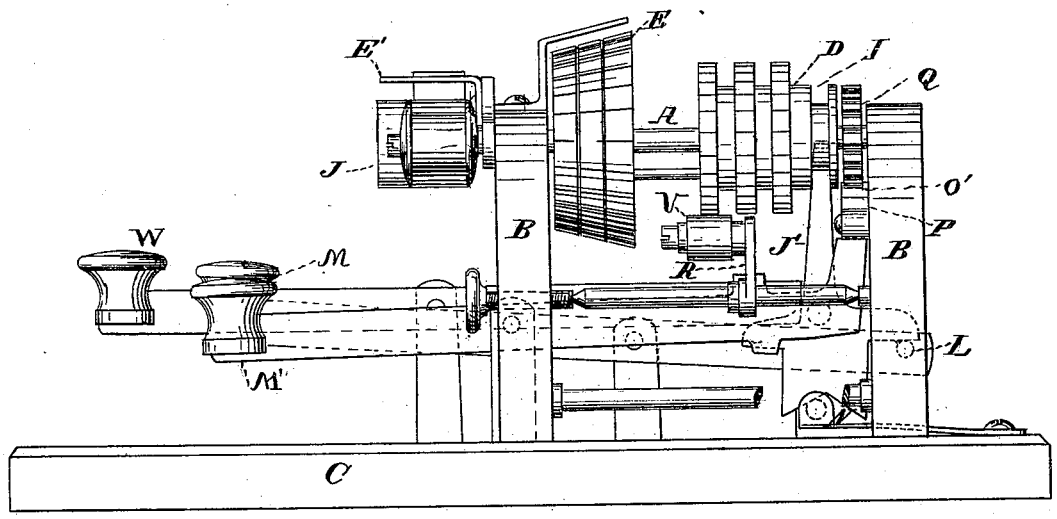
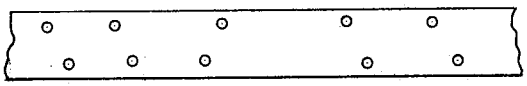


Fig 14.



Witnesses:
Ernst Bilhuber.
Daniel H Craig

Inventor
T. M. Foote

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

3 Sheets—Sheet 3.

T. M. FOOTE.

METRICAL-TELEGRAPH SYSTEM.

No. 191,130. Patented May 22, 1877.

Fig: 7.

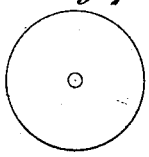


Fig: 5.

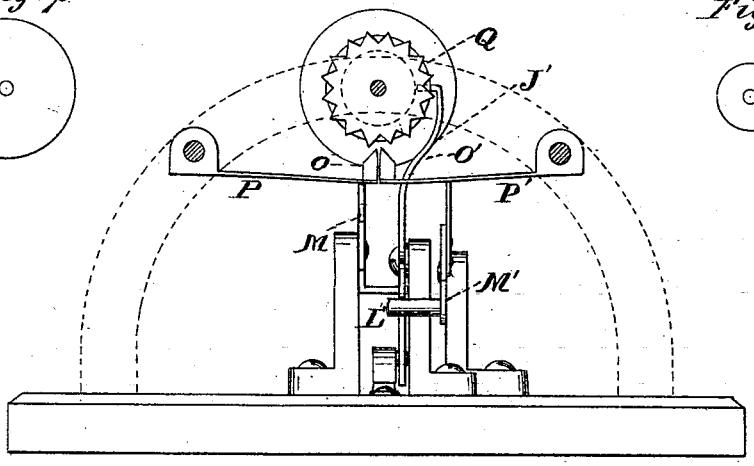


Fig: 6.

Fig: 8.

A	P	C	S	▮	E	F	M	T	▮	I	R	B	D	▮
H	Q	K	X	U	&	N	G	Z	J	W	O	L	V	Y

Fig: 9.

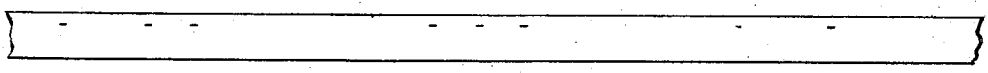


Fig: 10.

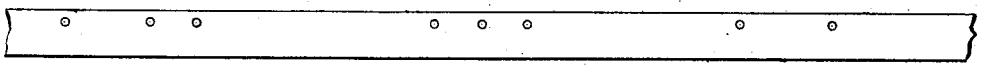
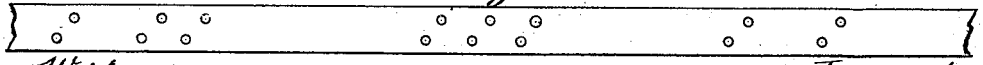


Fig: 11.

Fig 12.



Witnesses:

Ernst Bilhuber.

Daniel H Craig

Inventor.

T. M. Foote

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

THEODORE M. FOOTE, OF BROOKLYN, NEW YORK.

IMPROVEMENT IN METRICAL TELEGRAPH SYSTEM.

Specification forming part of Letters Patent No. **191,130**, dated May 22, 1877; application filed November 28, 1876.

To all whom it may concern:

Be it known that I, THEODORE M. FOOTE, of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Metrical Telegraph System, of which the following is a specification:

This invention relates to certain improvements in that system of chemical telegraphy in which the proper makes and breaks in the circuit to record the signals at the receiving-instrument are made at the transmitting-instrument, through the medium of a strip or fillet of perforated paper or other non-conducting material.

Previous to this invention in such system of telegraphy the Morse system of signals has been usually employed, the perforations in the paper representing the message varying in size, and so spaced and arranged as to form the dashes and dots in their proper relative positions upon the chemically-prepared paper at the receiving-instrument.

Serious objections, however, have been found attendant upon the use of the Morse system of signals, owing to the tendency of the dots and dashes running together, or the dots being elongated into dashes at the receiving-instrument, rendering the message unintelligible, and rendering this system of telegraphy very unsatisfactory on long lines, and materially limiting the speed with which the signals can be transmitted even upon short lines.

The object of my invention is designed to overcome these objections; and to this end I discard the Morse system of signals altogether, and employ a system of signals consisting wholly of all dots or all dashes, which are produced by perforations in a fillet or strip of paper, which is drawn uniformly through the transmitting-instrument, the perforations being arranged relatively and corresponding to a series of letters on the type wheel or wheels of a translating-instrument, by means of which the message recorded in dots or dashes on the strip of chemically-prepared paper can be translated into Roman or other letter characters, as more fully hereinafter set forth.

My invention consists, first, in an improved method of transmitting telegraphic messages by means of a perforated slip or fillet of paper, having the perforations made relatively to the letters on the type-wheel of a translating-instrument, in such manner that the dots or dashes recorded upon the chemically-prepared slip will be formed in proper relation to the characters on the type-wheel of said instrument, to indicate the proper letters to be printed upon the slip of paper which finally receives the message, as more fully hereinafter set forth; second, in the combination, with the type-wheel of the translating-instrument and the driving-drum of the same, of an indicating-wheel, marked with letters or characters on the type-wheel, all adapted to move together, for the purpose of indicating the proper letter or character to be printed, as more fully hereinafter set forth; third, in the combination, in a chemical telegraphic instrument, of two or more type-wheels, mounted on a common shaft, and a corresponding number of indicating-wheels or dials, the type-wheels being engraved with the letters of the alphabet and other signs and characters, and the indicating-wheels marked respectively with the letters corresponding to the same with the driving-drum of the apparatus, the whole arranged to operate in connection with the chemically-prepared slip which receives the signals from the transmitting-instrument, as more fully hereinafter set forth; fourth, in the combination, with one or more type-wheels with the characters of the alphabet and other characters engraved thereon, of one or more type-wheels with numerals and other characters engraved thereon, and a corresponding number of indicating-wheels or dials marked respectively with the characters and numerals of the type-wheels and the driving-drum of the translating-instrument, the whole arranged to be operated by the chemically-prepared slip which receives the signals from the transmitting-instrument, as more fully hereinafter described; fifth, in the combination, with the chemically-prepared slip upon which the signals are recorded, a driving-drum of a determinate size, and the type-wheels of a translating-instrument, of a printing-lever, and a key-lever for operating the same, for printing from said type-wheel the char-

acters indicated by the recorded signals on the prepared slip; sixth, in the combination, with the recorded slip, a driving-drum of a determinate size, and the type-wheels of a translating-instrument, of one or more key-levers for shifting the type-wheels; seventh, in the combination, with the interchangeable driving-drums, of a self-acting lever, carrying a friction-roller for pressing the paper to the driving-drum for the purpose of adapting the driving-drums of various sizes to be used in one instrument, as more fully hereinafter set forth; eighth, in the combination, with the indicating plate or plates and the driving-drum of the apparatus, of a device or devices for indicating the positions which the indicating-wheel and the type-wheels assume as the signals on the chemically-prepared strip are brought into position, as more fully hereinafter set forth; ninth, in the combination, with the driving-drum of a determinate size, the type-wheels of a translating-instrument, the printing-pad, and key-levers, of a lever and pawl for operating the drum which carries the strip of paper to be printed, as will more fully hereinafter appear.

In the drawings, Figure 1 represents a front elevation of the receiving-instrument which I employ in connection with my improved system. Fig. 2 represents a top view of the same. Fig. 3 represents an elevation of one side of the instrument; Fig. 4, an elevation of the opposite side of the same; Fig. 5, a back elevation of the instrument; Figs. 6 and 7, views of the driving-drum of the instrument; Fig. 8, a view of the printed slip; and Figs. 9, 10, 11, and 12 views of the perforated strips, showing different modes of perforating the same, and Figs. 13 and 14 modifications of the recorded and perforated slips of paper.

The letter A represents the type-wheel shaft, journaled in suitable upright supports B B, which are secured to a base, C, in any convenient manner. D represents the type-wheel, which may consist of a single disk, having the letters, characters, or figures engraved at equal intervals upon the same; but for convenience and rapidity of working I prefer to use two or more disks. In the present instance I have shown three disks or wheels, each divided into thirty parts on its periphery, the outer disks containing at alternate intervals the letters of the alphabet, and the intermediate disk the numerals necessary for recording the messages. The letter E represents an indicating-wheel mounted on the same shaft, consisting of a number of disks, corresponding to the number of disks in the type-wheel, and marked to correspond with the letters and character on the type-wheel disks, and F a guide, secured above the said indicating-disk, which serves, in connection with a similar guide above the driving-drum, (to be more fully hereinafter explained,) to indicate when the type-wheel is in position to print the proper letter.

The letters on the two type-wheels are, for convenience, arranged with special reference to each other, the letters most often used at the commencement of words being arranged on one wheel directly opposite those least used, which are arranged on the other. The intermediate wheel is marked with the numerals or ciphers in common use.

In the instrument as at present constructed, with the printing-pad arranged diametrically opposite the guide F, the letters and figures on the type-wheel are so arranged with respect to the corresponding letters and figures on the indicating-wheel that when a letter or figure on the indicating-wheel appears between the slot in the guide, the corresponding letter or figure on the type-wheel is directly over the printing-pad in position to be transferred to the paper slip upon which the message is printed upon depression of the respective printing-keys.

The shaft or journal A projects at the front of the apparatus, and is provided with a drum, J, which I denominate the driving-drum of the instrument, and to which motion is given by drawing manually or otherwise over the same the chemically-prepared slip of paper upon which the signals are received from the transmitting instrument.

The type-wheel D, when constructed with two or more disks, is capable of a longitudinal motion upon the shaft A, with which it turns, and is formed with an annular recess, I, at its rear, into which sets the upper end of a lever, J′, which is pivoted below to a standard, K, attached to the bed or base of the instrument, and is provided with two lateral arms, one projecting at each side, under which the projections L L′ on the key-levers M M′ engage, and by means of which the type-wheel can be shifted on its shaft either backward or forward in order to bring either type-disk in line with the printing-pad, the intermediate disk remaining normally over the same, and being kept in said position by means of a spring, N, which operates against the lower part of the lever J′ for the purpose. The letters O O′ represent duplicate pawls secured to the ends of the springs P P′ fastened to opposite sides of the rear standards, and adapted to be operated by the respective key-levers M M′, to be thrown into a ratchet-wheel, Q, secured to the type-wheel shaft A for the purpose of holding the type-wheel in position while the same is being printed from. Said levers also serve to operate the printing-lever R, pivoted to one side of the apparatus at one end, and provided with a pawl, S, at the other, which engages a ratchet-wheel, S′, secured to the paper-feed roller T, which carries the paper to be printed upon, for the purpose of rotating the same, so as to move the paper the proper distance for the printing of a new letter or figure after each impression. The printing-pad V is secured to said printing-lever R, which is operated to throw the said

pad against any type when in position by means of the key-levers W M M′, which extend to the front of the apparatus.

The letter A′ represents a lever pivoted at one end to one side of the front standard B, and extending over the type-wheel shaft, being provided at the other end with a guide-roller, B′, for the reception of the strip of chemically-prepared paper upon which the signals are received from the transmitting-instrument. To said lever is pivoted one end of a self-adjusting arm, C′, to the other end of which, directly over the driving-drum, is journaled a friction-roller, D′, which bears against said drum, so as to press the prepared paper against said drum as it is drawn over the same, causing the drum, its shaft, the type-wheel, and indicating-wheels to move as said paper is drawn along.

The transmitting and receiving instruments may be of the usual construction, and must run regularly or nearly isochronously; but, in order that they may run at different rates of speed, I provide the translating-instrument with a series interchangeable driving-drums of different diameters, to be employed on the type-wheel shaft of the translating-instrument.

In order to designate the particular driving-wheel to be used, the operator at the transmitting-instrument makes two special perforations at the beginning of each message. As these two perforations pass through the transmitting-instrument, two marks, dots, or dashes, as the case may be, are recorded on the chemically-prepared strip as it passes through the receiving-instrument, and these two chemically-recorded dots, which are termed the "translator's guide," indicate the distance from zero back to zero, or a complete revolution of the type-wheel, and thus show the relative speeds of transmitting and receiving instruments, and indicate to the operator of the translating-instrument the proper drum to be employed upon the type-wheel shaft of the same, the said shaft requiring a driving-drum, the circumference of which will be the same as the distance between the first two recorded dots, so that by drawing the chemically-prepared paper over the driving-drum the distance between the first two recorded dots will rotate it just one revolution, after which the succeeding recorded dots will come opposite the letter they represent, so that the translation of the recorded dots upon the chemically-prepared paper into Roman or other characters printed from a type-wheel is rendered practicable, as in the manner more fully hereinafter explained.

To the lever A′ is secured a guide, E′, which indicates, when the signals on the chemically-prepared paper are in proper position relatively to the corresponding letters on the type and indicating wheel for the letter represented by the signal to be printed.

I prefer to make the perforations in the strip of paper for the transmitting-instrument in two parallel rows, as indicated in Figs. 11 and 12, and employ the same with currents of opposite polarity, although they may be perforated in single rows, as indicated in Figs. 9 and 10, and a current of one polarity employed.

If found desirable, the perforations may be made as shown in Fig. 13. The recording will then be as shown in Fig. 14.

In this plan of recording the guide to the translation or copying into Roman letters will be the changes that occur from the upper to the lower line, and the reverse; and wherever such changes occur, the indicating-wheel will indicate what particular letter or character is to be printed, and upon which disk it is, as before.

In operation, the strips of paper for the transmitting-instrument, after being properly perforated with the message, are caused to be carried through said transmitting-instrument. As each perforation passes under the circuit-closer, a dot, dash, or mark is formed on the chemically-prepared slip at the receiving-instrument, which is traveling at the same rate of speed and uniformly with the paper of the transmitting-instrument, or at a known relative rate therewith, which is indicated by means of the special perforations in the paper which convey the proper signal to the receiving-instrument to enable the operator to select the proper-sized driving-drum to be placed in position on the type-wheel shaft of the translating-instrument, as before stated.

After the message is properly recorded upon the chemically-prepared paper in the receiving-instrument, the recorded slip is taken from the instrument, and the two special dots or dashes are noted, and the proper driving-drum selected and secured to the driving-shaft of the translating-instrument. The record-slip is then placed on the driving-drum under the friction-roller, which bears against it and under the guides attached to the lever A′. The paper is then drawn manually, or otherwise, over the driving-drum rotating the same and its shaft, which carries the type and indicating wheels. As the paper is drawn along the recorded dots or dashes appear below the slot of the guide over the driving-drum, and as each recorded dot or dash appears the paper is stopped, the indicating-wheel indicating the letter, figure, or character to be printed, and upon which wheel said letter, figure, or character is located. If upon the figure-wheel, as said wheel is normally in position over the printing-pad, the central key is depressed, making the proper impression. If upon either of the other wheels, the key to the right or left, as the case may be, is depressed, shifting the type-wheel, so as to bring the proper letter in position, at the same time operating the printing-pad to make the impression.

As an explanation, I would here remark that if the receiving on the chemical paper is thus — — —, first a letter on the lower wheel and then one on the upper or

farther wheel, and so on alternately, and if

— — —,

thus — — — — first a letter on the lower wheel and then one on the upper wheel is printed. Now, when the center-wheel is to be used, a special signal or letter occurs, we will say, twice—as, for instance, *y y*—which will indicate that the center-wheel is to be recorded from, and, when through with it, the same characters or letters will occur again.

By my invention, as only a single dot or dash is employed to represent a letter or character, it will be evident that the message may be transmitted with about one-fourth the number of impulses required by the Morse system, and that no tailing or obliteration of the recorded dot can possibly take place, as each impulse indicates with unerring certainty the proper letter which is to be printed in the ordinary alphabetical characters, and that, for this reason, the system can be applied to the working of land or ocean lines of any length, through which sufficient current can be transmitted to mark the chemically-prepared paper.

Although I have described my invention as especially adapted to be used, in connection with chemically-prepared paper, for recording the signals, it will, of course, be evident that my method can be used in connection with any other material or medium which will yield a distinct mark when submitted to the action of the flowing current.

What I claim, and desire to secure by Letters Patent, is—

1. The method of transmitting telegraphic messages by means of a perforated slip or fillet of paper, having perforations relatively to the letters on the type-wheel of a translating-instrument, in such manner that the dots or dashes recorded on the chemically-prepared slip will be found in proper relation to the characters on said type-wheel to indicate the proper letters to be printed upon the slip of paper which finally receives the message, as herein described.

2. The combination, in a telegraphic instrument, of two or more type-disks mounted upon a common shaft, and a corresponding number of indicating-wheels, each type-wheel being engraved with a portion of the letters of the alphabet, and the indicating-wheels marked, respectively, to correspond with the same, with the driving-drum of the instrument, the whole arranged to operate in connection with the chemically-prepared paper or other medium which receives the signals from the transmitting-instrument, substantially as described.

3. In combination with one or more type-wheels marked with the characters of the alphabet, one or more type-wheels marked with numerals, and a corresponding number of indicating-wheels, marked, respectively with characters and numerals to correspond, and a driving-drum, the whole arranged to operate in connection with the slip of paper or other medium which receives the signals from the transmitting-instrument, substantially as described.

4. The combination, with the type-wheels, of the translating-instrument and a corresponding number of indicating-wheels of different diameters, marked to correspond with the characters of the type-wheels, and a corresponding number of interchangeable driving-drums of different diameters, the whole arranged to be operated in connection with the prepared strip or other medium which receives the signals from the transmitting-instrument, substantially as described.

5. In combination with the chemically-prepared slip or other medium upon which the signals are recorded, a driving-drum of a determinate size, and the type-wheel of a translating-instrument, a printing-lever and a key-lever for operating the same, for printing from said type-wheel the characters indicated by the recording-signals on the prepared slip, substantially as described.

6. In combination with the recorded slip, a driving-drum of a determinate size, and the type-wheels of the translating-instrument, one or more key-levers for shifting the type-wheels, substantially as described.

7. In combination with the interchangeable driving-drums, a self-adjusting lever, carrying the drum for guiding the chemically-prepared paper, and a friction-roller for pressing the paper to the drum, for the purpose of adapting driving-drums of different sizes to be used with the same apparatus, substantially as described.

8. The combination, with the indicating wheel or wheels and the driving-drum of the apparatus, of suitable guides for indicating the positions which the indicating and type wheels assume when the chemically-prepared paper is arrested, with the record thereon appearing at the guides and the type-wheel in position to be printed upon, substantially as described.

9. The combination, with a driving-drum of a determinate size, the type-wheels of the translating-instrument, the printing-pad, and the key-levers, of a lever and pawl for operating the drum which carries the strip of paper to be printed, substantially as described.

10. In an apparatus for translating or copying telegraphic messages, the combination of the driving-roller, the indicating-wheel, and a type-wheel or wheels, to be operated in connection with a recorded slip and the key-levers for shifting the type-wheel and printing the letters of the message, substantially as described.

In testimony that I claim the foregoing I have hereunto set my hand in the presence of the subscribing witnesses.

THEODORE M. FOOTE.

Witnesses:

JAMES K. AYMAR,

CHAS. A. RANDALL.