July 21, 1931. J. W. LONG 1,815,786

PRINTING TELEGRAPH CONTROL CIRCUIT

Filed Dec. 31, 1928 2 Sheets-Sheet 1

Fig. 1.

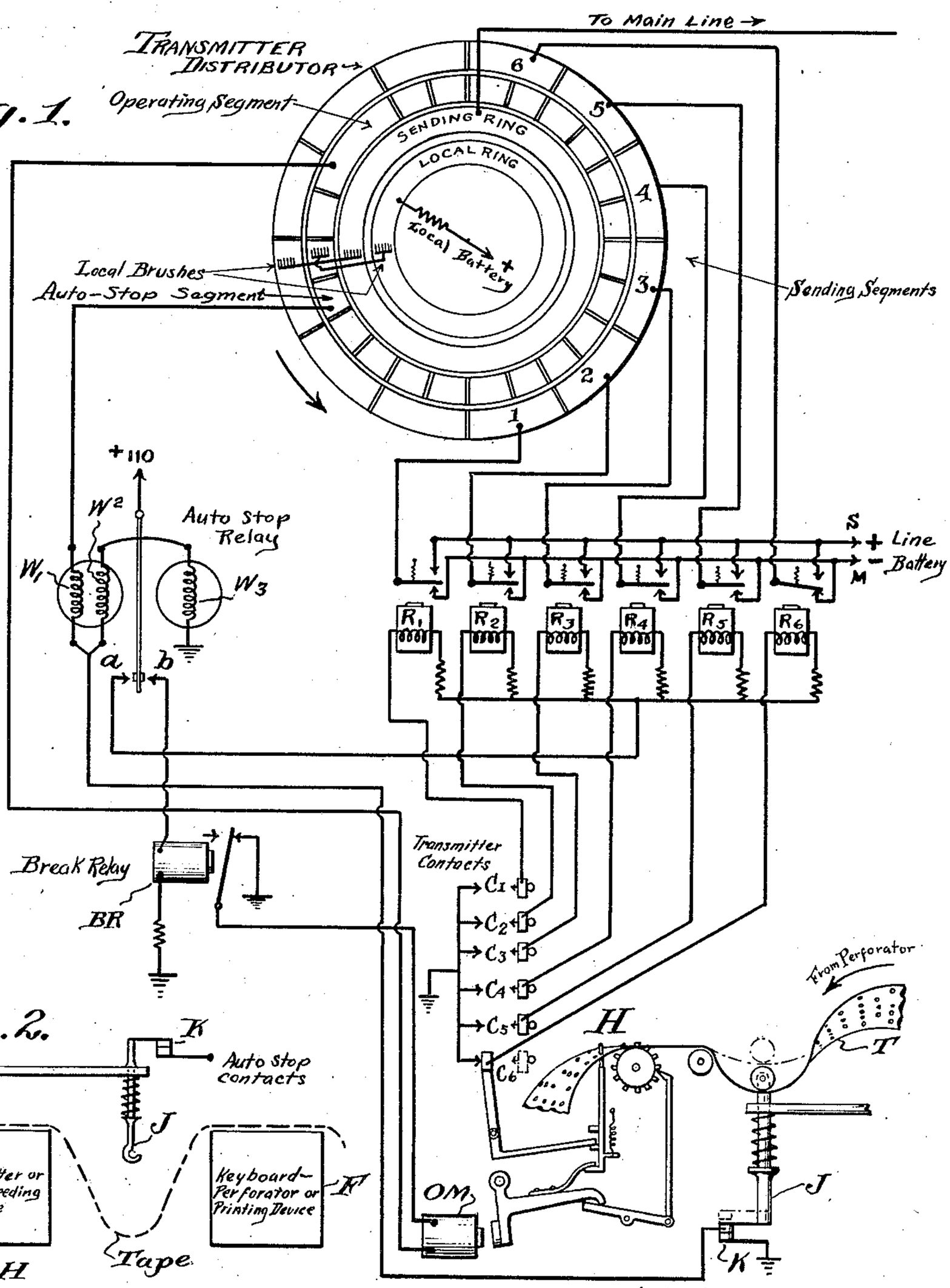

Fig. 2.

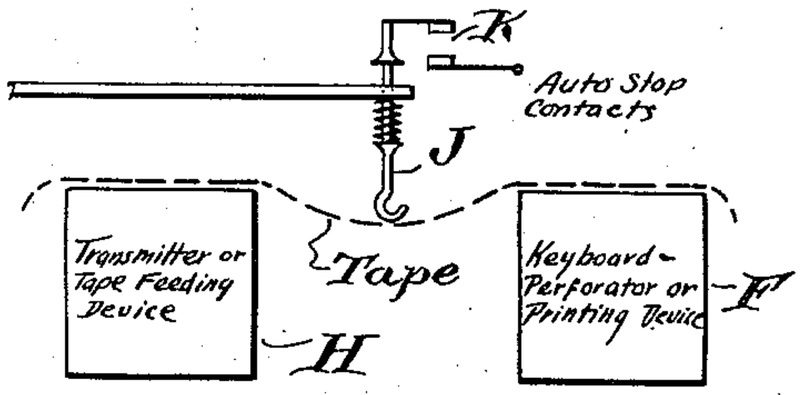

Fig. 3.

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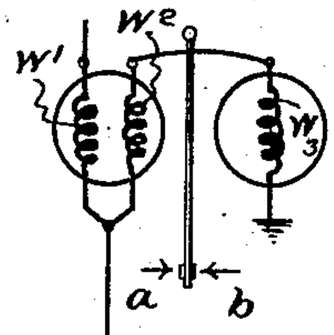


Fig. 4.

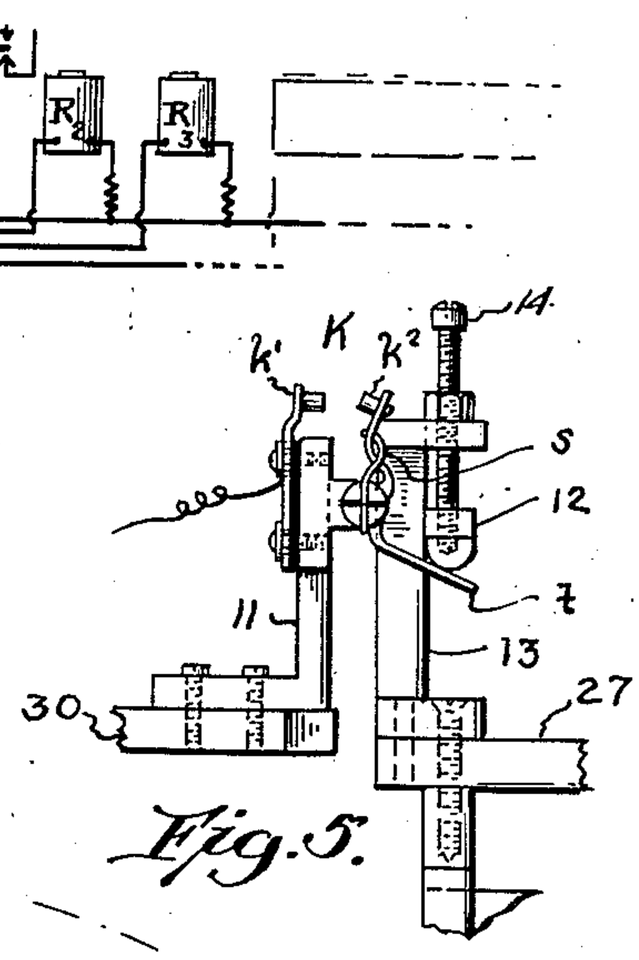
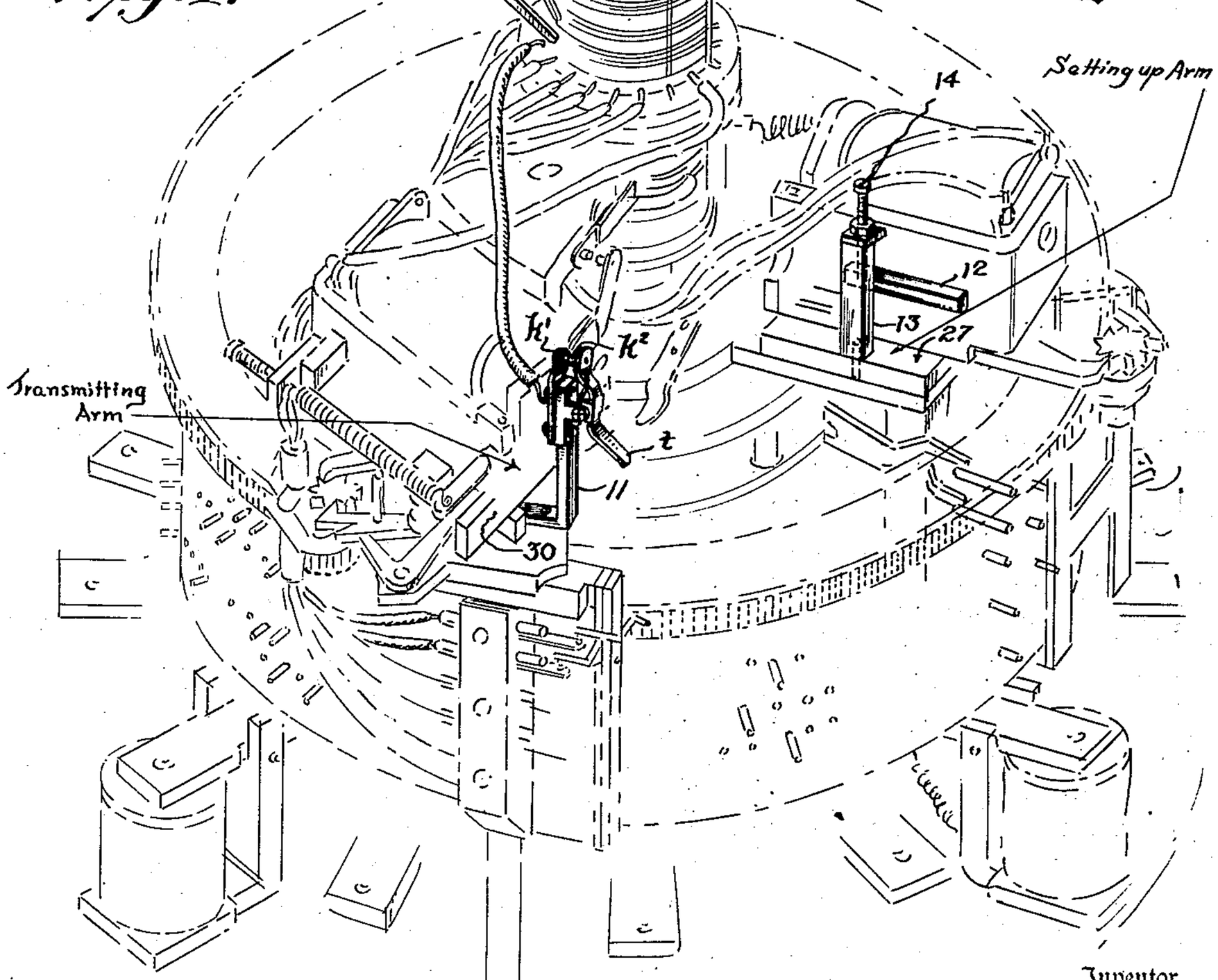


Fig. 5.



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UNITED STATES PATENT OFFICE

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PRINTING TELEGRAPH CONTROL CIRCUIT

Application filed December 31, 1928. Serial No. 329,639.

This invention relates to control circuits for printing telegraphs, and in particular to a control circuit for automatically stopping the transmitter of a printing telegraph system when the transmitter operation overtakes the operation of the signal storage devices.

The circuit of my invention may be applied to either a printing telegraph system employing a perforated tape or to a system in which the signals are stored in the form of drum pins in a storage transmitter.

An object of my invention is to devise a control circuit for causing the stepping or operating magnet to cease functioning and to cause a certain signal to be transmitted to the line while the auto-stop feature is effective.

A further object of my invention is to devise an auto-stop control circuit which is actuated by means of a separate segment on the distributor.

Another object of my invention is to devise an auto-stop control circuit in which the stepping magnet is controlled jointly by auto-stop contacts and by a polar relay controlled from the distributor.

The invention is illustrated in the accompanying drawings in which:

Figure 1 is a circuit diagram of my invention as applied to a tape transmitter;

Figures 2 and 3 are schematic diagrams illustrating the operation of the auto-stop contacts by the tape in a tape transmitter;

Figure 4 illustrates my invention as applied to a printing telegraph system employing a storage transmitter; and

Figure 5 illustrates the details of the auto-stop contact employed in Figure 4.

One system of electric circuits operated from auto-stop contacts is described in Houghtaling Patent No. 1,275,559 covering the multiplex telegraph system used by the Western Union Telegraph Company. Referring to Figures 2 and 3, this system comprises broadly a tape perforator F and a tape transmitter H with a metal arm J extending from the auto-stop contact unit K over the tape. When the tape loop rises and becomes taut between the perforator and the tape transmitter, it raises the rod J, and through the operation of a relay, causes the tape transmitter to stop feeding the tape.

The system of control described in the application is an improvement over the above mentioned multiplex method of controlling, and is capable of more general application. For example, the multiplex method is not applicable to control over transmission when a storage transmitter, such as described in U. S. Patent No. 1,576,167 to Wheeler and Dirkes is used. The control circuits of the present invention will apply not only to the multiplex system, but to systems where storage transmitters are used.

Referring to Figure 1, T represents a perforated tape supplied from a perforating keyboard to a tape transmitter of usual construction, the transmitting contacts of which are indicated by the characters C_1 to C_6 inclusive, corresponding to a 6-unit code. Operation of these contacts is controlled in accordance with the perforations carried by tape T. The tape is fed to the transmitter by a well known feeding device controlled by the operating magnet OM, which in turn, is controlled by a segment on the transmitting distributor shown at the top of the figure. For the sake of clearness of illustration, the details of the contact operating mechanism and feeding device have been illustrated for contact C_6 only. Transmitter contacts C_1 to C_6 control intermediate relays R_1, R_2, R_3, R_4, R_5, and R_6 respectively. The tongues of these relays are biased to their back contacts which are connected to plus or spacing battery. The front contacts are connected to minus or marking battery. The armatures of the relays are connected to separate segments 1 to 6 on the transmitting distributor. The distributor face plate is divided into two solid and two segmented rings. One segmented ring has 12 equal segments and is connected by revolving brushes to a solid ring which has connection to the transmission line. This pair of rings control the sending impulses transmitted to the line. The other segmented ring is connected by means of revolving brushes to the second solid ring which is connected to positive battery, and this pair of rings constitute local control rings for controlling the

actuation of the operating magnet OM in order to step the tape through the transmitter, or to control the transmitting arm on the drum in case of a storage transmitter, and for the purpose of controlling the auto-stop relay.

One winding W^1 of a polarized auto-stop relay is connected at one terminal to a segment on the local segment ring of the distributor, and the other terminal of the winding W^1 is connected to ground through the contacts K of the auto-stop contact device. Windings W^2 and W^3 of the auto-stop relay are connected in series with winding W^1 in a circuit extending from the distributor through the windings to ground. Windings W^1 and W^2 are on the same leg of the polarized relay, and are connected in opposed relation in the circuit including winding W^3. The armature of the auto-stop relay is connected to positive battery. Contact *a* of the auto-stop relay is connected to a conductor which supplies operating current to relays R_1 to R_6 inclusive in common. Contact *b* of auto-stop relay is connected through break-relay BR to ground through a suitable resistance. The energizing circuit for the operating magnet OM of the transmitter extends from a segment on the local distributor ring through the magnet, and through the back contact of break-relay BR to ground.

Operation of Figure 1 is as follows:

The arrangement shown in the diagram represents a two-channel multiplex distributor only one chanel being shown connected to transmitting segments 1 to 6 inclusive. With no signals being transmitted, transmitting contacts C_1 to C_6 are open, the tongues of the relays R_1 to R_6 lie against their back contacts, the tongue of the auto-stop relay lies against contact *a*, the tongue of break-relay BR lies against its back contact, and the auto-stop contacts K are closed. Assume that the "T" character combination is set up by the transmitter for transmission. Contacts C_1 to C_5 remain open and, therefore, intermediate relays R_1 to R_5 remain deenergized with their armatures on the spacing side. Transmitter contact C_6 is closed, thereby energizing intermediate relay R_6 which places marking battery on its armature. The brushes revolve in the direction as shown on the diagram, and when the sending brushes pass on to segment 1, a spacing pulse is transmitted to the main line; likewise, on segments 2, 3, 4 and 5, spacing pulses are transmitted, and the brush passing over No. 6 sending segment will transmit a marking pulse. Thus, a sequence of five spacing polarity impulses and one marking impulse is transmitted to the main line, which combination will cause the receiving mechanism to print the character "T".

Following shortly after the transmission of the sixth impulse the local brushes pass over the operating segment. The local battery, from the local ring through the brushes and the operating segment thence through the operating magnet to ground, causes the operating magnet OM to be energized and deenergized, which steps the tape through the transmitter in the case of the tape transmitter, or steps the transmitting arm in the case of the storing transmitter, which causes the next character selection to be set up by the transmitter contacts. The above cycle of operation is thus repeated.

In case the perforator stops operating, the tape T will not be able to advance into the tape transmitter, and the same signal combination will be applied to the sending segments of the distributor and repeated to the line at each revolution of the sending brushes. The auto-stop contacts K are provided for the purpose of stopping operation of the stepping mechanism of the transmitter and applying a certain signal combination to the sending segments of the distributor which will not actuate the receiving mechanism when the slack in the tape is taken up. The operation of the auto-stop contacts is illustrated in Figures 2 and 3. So long as the tape has a proper amount of slack, it passes beneath the arm J and the contacts K remain closed. However, if the transmitter H feeds the tape faster than the perforator supplies it, the tape becomes taut between the two mechanisms and comes in contact with the arm J, and in moving the arm upward the contacts K are opened. In Figure 1, a slightly modified form of the arm J is shown in which the tape is trained under a roller secured at the upper end of the arm, and the contacts K are carried at the lower end.

When the auto-stop contacts K are opened by operation of the tape, the circuit to ground from the common point of windings W^1 and W^2 is opened, but nothing happens until the local brush passes over the auto-stop segment on the local ring and completes a circuit from local battery through windings W^1, W^2 and W^3 of the auto-stop relay to ground. Since windings W^1 and W^2 are wound upon the same core in opposed relation, they neutralize each other, and winding W^3 will operate the tongue of the auto-stop relay from contact *a* to contact *b*. Operation of the auto-stop relay removes the common battery from the intermediate relay coil windings, thus causing their armatures to fall against their back contacts regardless of the code combination set-up in the transmitter contacts, and spacing battery is applied to all sending segments, to which combination the receiving printer instrument does not respond. Operation of the tongue of the auto-stop relay to contact *b* completes an energizing circuit for break-relay BR which operates to open the energizing circuit of operating magnet OM, thus preventing further operation of the stepping mechanism of the transmitter. The transmission will

remain idle so long as the tape remains taut, and a pulse will be transmitted through windings W^1, W^2 and W^3 of the auto-stop relay 9 by the local brush each time it passes over the auto-stop segment.

If more inteligence signals are to be transmitted, the operator actuates the keyboard device which stores up one or more characters, as may be the case and this relieves the tension on the auto-stop contacts and allows them to close. The circuits remain the same until the local brush passes over the auto-stop segment which completes the following circuit; local battery, resistance, auto-stop segment, winding W^1 of the auto-stop relay, and auto-stop contacts K to ground. The left pole of the auto-stop relay is given the greater magnetic strength, and the tongue is therefore pulled to its *a* contact. The common battery is restored to the windings of the intermediate relays, thus causing the same combination to be set up by their armatures as was set up by the transmitter contacts before the sending brush passes on to the first sending segment. The signals are thus transmitted to the main line as the sending brushes pass over the sending segments. The break-relay is deenergized and the operating circuit is restored, ready for functioning when the local brushes pass over the operating segment which will cause a new combination to be stepped into the transmitter device.

This control system may be used with any keyboard or perforator device where the characters are stored up and then transmitted by passing through a transmitting device.

This control system can be used in connection with the system disclosed in the Wheeler-Dirkes Patent 1,576,167 on storing transmitter where the characters are stored up by use of steel pins arranged in uniform vertical rows inserted in holes provided for them in a large metal drum. The auto-stop contact device is shown applied to this arrangement in Figure 4. The storing transmitter consists of a revolving arm 27 that sets up the characters in the drum pins, similar to the tape perforator. Following the setting-up arm is the transmitting arm 30 which carries the transmitter contacts. These arms move independently of each other, and when the setting-up arm approaches too near the transmitting arm, the auto-stop contacts are opened which operates the same circuits as previously described. The auto-stop contact is connected to the auto-stop relay through one of the usual collector rings at the top of the transmitter.

The details of the auto-stop contacts used in Figure 4 are illustrated in Figure 5. The contacts K comprise a stationary contact element K′ and a movable contact element K^2, both mounted on a standard 11 carried by the transmitting arm 30. The movable contact K^2 is normally held into engagement with contact K′ by means of a spring S. Movable contact K^2 is provided with a tail-piece *t* extending below and to the right of the pivot axis. The arrangement for opening the auto-stop contacts is carried by the setting-up arm 27 and comprises a standard 13 provided with a cross-bar 12 arranged to engage the tail-piece *t* of the movable contact K^2 when the transmitting arm approaches the setting-up arm. A screw 14 is provided for adjusting the height of the cross-bar 12. It is obvious that the stop-contacts may be carried by the setting-up arm and the bar 12 carried by the transmitting arm.

From the foregoing, it is apparent that the control system which I have devised may be used not only with any tape printing machine and tape feeding device where the operation of each instrument is independent of each other, but also may be used with the storage type transmitter.

In case of a tape transmitter, it will be noted that the signal tape or record is fed into the transmitter, whereas in the storage type transmitter the transmitting arm is moved with respect to the signal record or pin-drum. In both cases, there is relative movement of the signal record with respect to the transmitter, and the accompanying claims are intended to cover both types of operation. Also, the word "overtakes" as used in the claims is intended to apply to the case of the tape transmitter or the storage transmitter.

I claim:—

1. In a printing telegraph system, means for storing signal combinations, a transmitter including a distributor, means for feeding said storage means to said transmitter, limit contacts operated by said transmitter when the transmitting speed exceeds the feeding speed, and a relay for stopping the transmitter controlled jointly by said limit contacts and said distributor.

2. In a printing telegraph system, means for storing signal combinations, a transmitter operated by said signal storage means including means for setting up signal impulses, a distributor for transmitting said impulses, means for feeding said storage means to said transmitter, limit contacts operated by said transmitter when the transmitter operation overtakes the storage operation, and a relay controlled jointly by said distributor and said contacts to deenergize said setting-up means and maintain said feeding means deenergized.

3. In a printing telegraph system, a signal record, a transmitter operated by said record including a distributor, a stepping magnet operated by said distributor to feed the signal record to the transmitter, relay contacts in said stepping magnet circuit, limit contacts operated by said transmitter when the transmitter overtakes the record opera-

tion, and a relay circuit including said limit contacts and a segment on said distributor for opening the circuit to said stepping magnet when said limit contacts are operated.

4. A control circuit for a printing telegraph system including a stepping magnet and a distributor, in combination, an operating circuit for said magnet including a segment on said distributor, a relay for interrupting the operating circuit of said magnet, an energizing circuit for said relay including a separate segment on said distributor, and control circuits for said relay prepared on operation of said stop contacts.

5. In a printing telegraph system, a plurality of magnets for setting up signal impulses, a distributor for transmitting said impulses, an energizing circuit for said setting-up magnets including relay contacts a relay controlled by a segment on said distributor for opening said contacts, and a control circuit for said relay including auto-stop contacts for preventing the operation of said relay except on operation of said stop contacts.

6. In a printing telegraph system, in combination, a plurality of magnets for setting-up signal impulses, a distributor for transmitting said impulses, a stepping magnet, an energizing circuit for said stepping magnet controlled by a segment on said distributor including normally closed relay contacts, an energizing circuit for said setting-up magnets including normally closed relay contacts, a relay controlled by a segment on said distributor for opening said contacts in said energizing circuits, and a control circuit for said relay including auto-stop contacts for preventing the operation of said relay except on operation of said stop-contacts.

7. In a printing telegraph system, in combination, a plurality of magnets for setting-up signal impulses, a distributor for transmitting said impulses, a stepping magnet controlled jointly by a segment on said distributor and auto-stop contacts, for interrupting the energizing circuits of said setting-up magnets and said stepping magnet.

8. In a printing telegraph system, in combination, a plurality of magnets for setting-up signal impulses, a distributor for transmitting said impulses, a stepping magnet, an energizing circuit for said stepping magnet controlled by a segment on said distributor, an energizing circuit for said setting-up magnets, and a polar relay for controlling said energizing circuits, said polar relay having two windings on one pole and a single winding on the other, and energizing circuits for said polar relay extending from a segment on said distributor through said windings in series, with the two windings on one pole opposed to each other, and a connection from the point of said two windings through auto-stop contacts to ground.

9. In a printing telegraph system a signal record, a transmitter operated by said record including a distributor, means for feeding said signal record to the distributor for transmitting one cycle of operation thereto and means actuated by the distributor during the preceding cycle to predetermine whether the transmitting function shall operate in the following cycle.

10. In a printing telegraph system the combination of a distributor, a signal storage device, a transmitting device and means thereto for setting up a signal combination in the transmitter device and means for preventing said transmission of signals by use of a separate segment on said distributor in combination with limit contacts controlled by the number of prepared but untransmitted character combinations in the storage device.

In testimony whereof I affix my signature.

JAMES W. LONG.