

June 10, 1930.

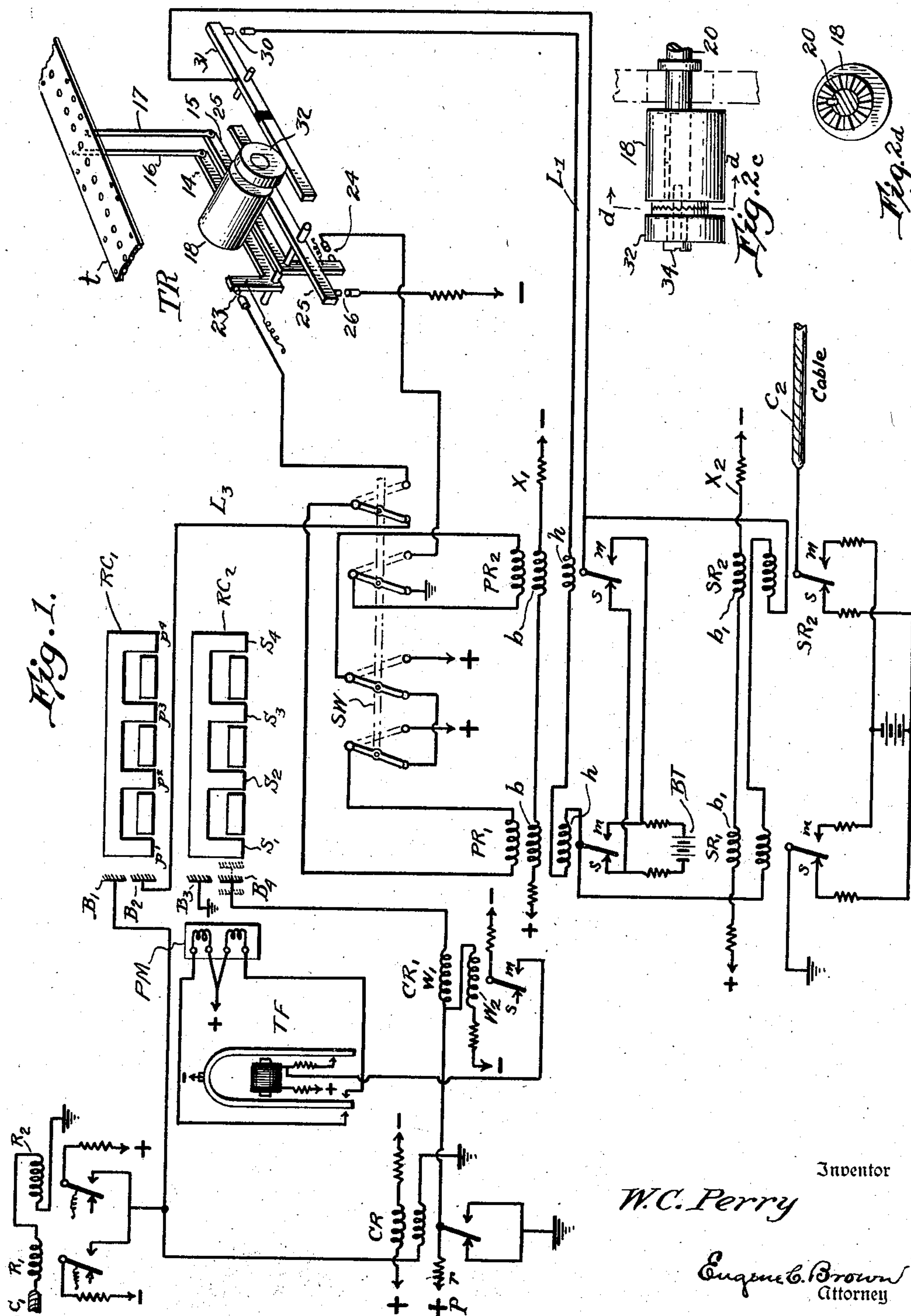
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COMBINATION TELEGRAPH TRANSMITTER AND REGENERATOR

Filed July 15, 1929

2 Sheets-Sheet 1



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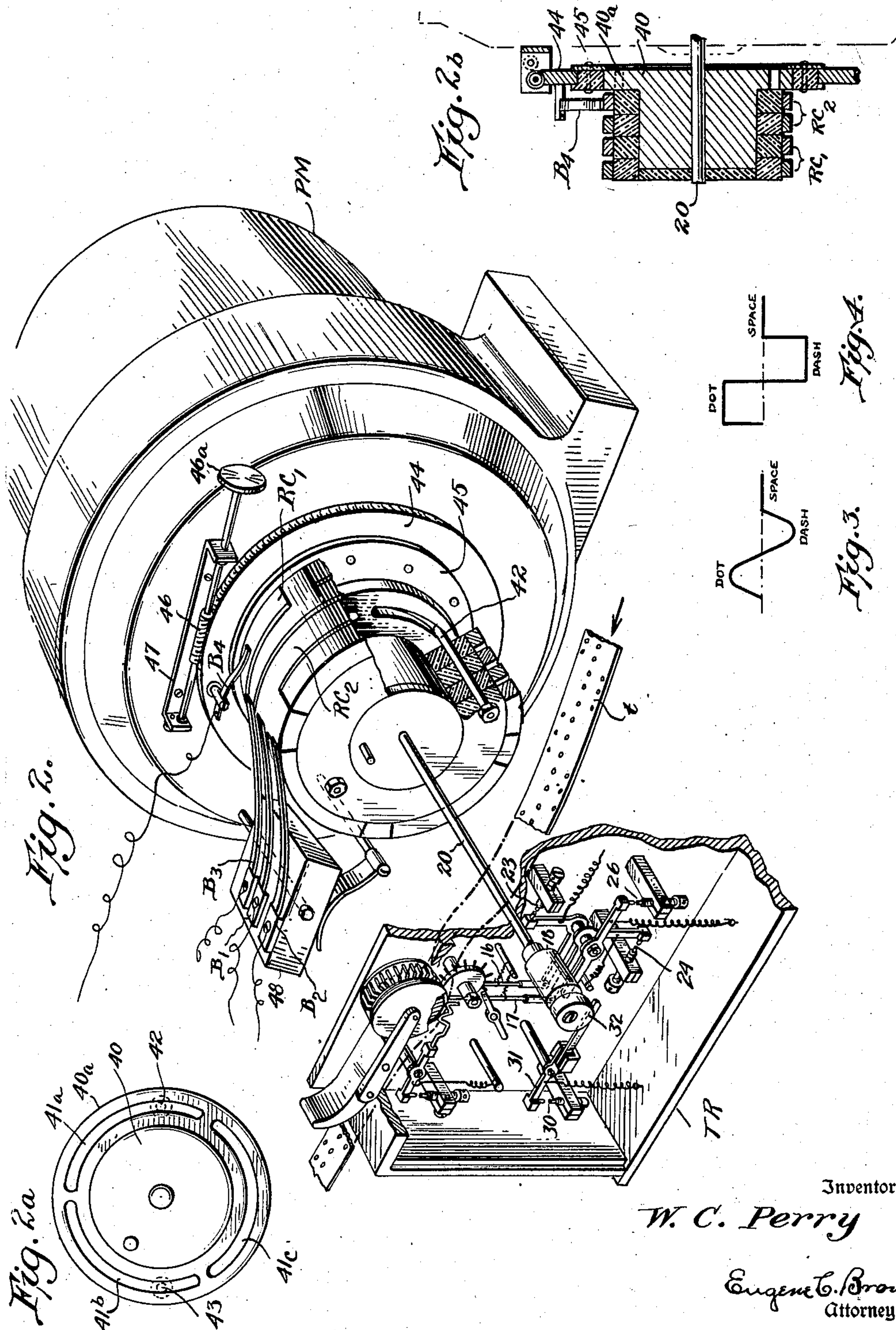
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2 Sheets-Sheet 2



UNITED STATES PATENT OFFICE

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COMBINATION TELEGRAPH TRANSMITTER AND REGENERATOR

Application filed July 15, 1929. Serial No. 378,441.

This invention relates to a telegraph system and apparatus in which a regenerative repeater may be used as a transmitting apparatus, whereby a repeating station may function as a terminal transmitting station, and the same piece of apparatus is used for either repeating or transmitting signals.

My invention is illustrated in the accompanying drawing in which:

Figure 1 is a schematic wiring diagram of the invention;

Figure 2 shows the structural arrangement of the combined tape transmitter, rotary commutators and phonic motor;

Figures 2^a, 2^b, 2^c and 2^d illustrate details of construction of Figure 2; and

Figures 3 and 4 are diagrams illustrating the operation of the invention.

Referring to Figure 1, R_1 and R_2 are respectively "dot" and "dash" relays connected to an incoming cable C_1 . The tongues of these relays are biased to the off-position, and are connected respectively to minus and plus battery. RC_1 and RC_2 are rotary commutator rings mounted upon a common shaft 20, of the phonic motor PM, which in turn is controlled by a tuning fork TF. The operating contacts of relays R_1 and R_2 are connected to commutator brush B_1 and to ground through a winding of correcting relay CR. PR_1 and PR_2 are pick-up relays, the operating windings of which are connected in series between commutator brush B_2 and ground, through a transfer switch SW. Commutator brush B_3 is connected to ground, and the commutator brush B_4 is connected to the tongue of correcting relay CR through a winding W_1 of correcting relay CR. Winding W_2 of correcting relay CR is connected from the tongue of relay CR to negative battery through a suitable resistance. The tongue of correcting relay CR is connected to negative battery, and the operating contact of this relay is connected to one terminal of the operating magnet of tuning fork TF. TR indicates a tape transmitter of the type disclosed in U. S. patent to Peterman 1,542,779 and includes a tape t with cooperating pins 16 and 17 attached to the end of levers 14 and 15 which carry re-

spectively the "dot" and "dash" contacts 23 and 24. 18 is a cam operated from the phonic motor PM in synchronism with the rotary commutators RC_1 and RC_2 , and is arranged to operate levers 14 and 15. A lever 25 is also arranged to be operated by cam 18 and carries "curbing" contacts 26. A pivoted lever 31 carrying contacts 30 is arranged to be operated by a separate locking cam element 32 carried on the same shaft with cam 18. This cam element may be adjusted with respect to cam 18 by loosening screw 34 (see Fig. 2^c) and shifting the cam 32 to any desired position and then tightening the screw. Contacts 23 and 24 are connected to terminals of switch SW in such manner that upon operation of the switch to the dotted line position, the contacts are included in series with the operating windings of pick-up relays PR_1 and PR_2 respectively and to positive battery. Contact 26 is connected to negative battery. Contacts 30 are included in holding circuit L_1 including holding windings h_1 , h_2 of relays PR_1 and PR_2 and battery BT. The tongues of pick-up relays PR_1 and PR_2 are connected in series with the operating windings of sending relays SR_1 and SR_2 . Pick-up relays PR_1 and PR_2 are biased to their spacing contacts by windings b_1 , b_2 in a biasing circuit X_1 , and sending relays SR_1 and SR_2 are likewise biased to the spacing contacts by windings b_1 , b_2 in the biasing circuit X_2 . The contacts of correcting relay CR are connected to ground, and the tongue is connected to positive battery P through a suitable resistance r .

Figure 2 shows the operating arrangement of the tape transmitter TR, and the rotary commutator on the shaft 20 of phonic motor PM.

Referring to Figure 2^b for the details of the commutator structure, the shaft 20 carries a hub 40 provided with a flange 40_a, which is provided with arcuate slots 41_a, 41_b, and 41_c (see Fig. 2^a), through which extend bolts 42 and 43 for clamping the commutator ring assembly to the hub 40. A ring gear 44 is rotatably mounted upon an annular seat 45 secured to the motor

frame concentric with the motor shaft, and a worm 46 journaled in a frame 47 on the motor housing meshes with the ring gear 44. Commutator brush B_4 is mounted upon ring gear 44. Commutator brushes B_1 , B_2 and B_3 are carried by a block of insulation 48 suitably supported from the motor frame. By turning the worm 46 by means of handle 46a, the brush B_4 may be shifted with respect to the brushes B_1 , B_2 and B_3 .

Operation of the invention is as follows:—

With the switch SW in the position shown by the solid lines in Figure 1, the signals received over cable C_1 operate relays R_1 and R_2 to impress corresponding signals on the pick-up relays PR_1 and PR_2 through the commutator segments P_1 , P_2 , P_3 and P_4 . The relays PR_1 and PR_2 , which are biased to their spacing contacts by the biasing circuit X_1 , operate to their marking contacts m whenever the local cable relays R_1 , R_2 operate. That is, the "dot" pick-up relay PR_1 operates when the "dot" local cable relay R_1 operates, and the "dash" pick-up relay PR_2 operates when the "dash" local relay R_2 operates. Thus, for the cable code character "A", (Figure 3) the "dot" local cable relay R_1 operates for the "dot" element of "A", and as the commutator brush B_2 passes segment P_1 the "dot" pick-up relay PR_1 operates and is locked through circuit L_1 including locking windings h , h and battery BT. The transmitter locking cam 32, which forms a part of the cable transmitter shown in Figure 2, is adjustable so that the signal may be locked up for its full length or for any degree of its length, which is known as "curbing". In this case the sloping wave form of "A" is regenerated into the rectangular wave shown in Figure 4. Then when the "dash" element of "A" arrives (Figure 3), the "dash" local cable relay R_2 operates, and as the brush B_2 passes segment P_2 , circuit L_2 is energized and the "dot" pick-up relay PR_1 operates to its spacing contact, and the "dash" pick-up relay PR_2 operates to its marking contact and locks through the circuit L_1 , and translates the curved "dash" element of "A" Figure 3 into the rectangular wave Figure 4.

Now the "space" of "A" arrives, and the "dot" and "dash" local cable relays are inoperative and circuit L_3 therefore is not energized. In this case the two pick-up relays PR_1 , PR_2 are operated to their spacing contacts s by bias circuit X_1 when locking contact 30 opens and transmit the space element of "A", Figure 3, as shown at Figure 4.

The signals from the relays PR_1 , PR_2 are transmitted into the sending relays SR_1 and SR_2 , and from these relays into the outgoing cable C_2 .

The regenerating feature as described so far, is the same as described in Peterman U. S. Patent No. 1,542,779, except that the

locking or "curbing" is done with the cam of the transmitter instead of with the segments between the pick-up segments of the receiving distributor.

Proper synchronism is maintained between the repeating apparatus and the distant rotary distributor or fork by means of correcting relays CR and CR_1 . The vibrating tuning fork TF controlling the operation of phonic motor PM is adjusted to vibrate slightly faster than the distant sending fork or distributor, and by operation of the correcting mechanism is corrected to run in exact synchronism with the distant transmitting apparatus. With the tongue of relay CR on either contact, relay CR_1 is short-circuited and no current flows through windings W_1 and W_2 . While the tongue of correcting relay CR is crossing its air gap, a current flows from positive battery P through correcting relay CR_1 . If winding W_1 of relay CR_1 be connected to ground through a segment of rotary commutator RC_2 , the relay CR_1 will operate to its spacing contact s since the current through winding W_1 overpowers the lesser current in winding W_2 . On the other hand, if the circuit through winding W_1 is not completed through a segment of rotary commutator RC_2 at the moment the tongue of relay CR is passing across its gap, the winding W_1 of relay CR_1 will not be energized, and the tongue of relay CR_1 will be operated to its marking contact by current flowing through winding W_2 . The slowing-down circuit thus completed from negative battery to the magnet of the fork, causes the fork to be suddenly arrested because of the increased field strength, and the fork is slowed down. Accordingly, if when relay CR operates, the circuit through winding W_1 is not completed through rotary commutator RC_2 , the relay CR_1 will be operated to its marking contact M and will slow down the fork. If when relay CR operates, the circuit through winding W_1 is completed, then relay CR_1 will be operated to its noncorrecting contact s . The phase or time of closing the circuit through winding W_1 may be controlled or adjusted by shifting the position of brush B_4 through the operation of worm 46 (see Fig. 2). By this means the operation of the relay may be properly phased with respect to the incoming signals.

In case it be desired to employ the regenerative repeater for the transmission of telegraph signals from the tape transmitter TR, the transfer switch SW is thrown to the dotted line position shown in Figure 1. With this circuit arrangement, the contacts 23 of the tape transmitter control the pick-up relay PR_1 and the "dash" contacts 24 control the pick-up relay PR_2 . The regenerative action of the repeater is the same as described above. The operation of

transmitter TR is maintained in synchronism with the synchronizing impulses transmitted over the incoming cable C_1 since the operating cam 18 of the transmitter is driven from the same shaft which drives rotary commutators RC_1 and RC_2 .

From the foregoing, it will be seen that I have devised a system in which a regenerative relay may be employed for repeating signals from one cable to another, or for transmitting signals from a tape transmitter at the relay station. It will also be seen that I have devised means for keeping the circuit in synchronism, that is, the whole circuit from terminal to terminal while the regenerator at a repeating station is being used for transmitting purposes. It will also be seen that by my system a repeating station may transmit at the same speed and with signals having the same type as the signals transmitted by a distant terminal station. This is due to the repeater transmitter being controlled by the distant station and, therefore, must transmit at exactly the same speed, and the curbing or locking cam of the transmitter is timed to curb or lock with the same timing as at the distant transmitter.

I claim:—

1. In a telegraph system, an incoming line, an outgoing line, means for repeating signals from the incoming line to the outgoing line including a rotary distributor and pick-up relays controlled by said distributor, a tape transmitter driven by said rotary distributor, and contacts controlled by said tape transmitter for controlling a regenerative circuit on said pick-up relays.

2. In a telegraph system, an incoming line, an outgoing line, means for repeating signals from the incoming line to the outgoing line including a rotary distributor and pick-up relays controlled by said distributor, a tape transmitter driven by said rotary distributor and connections between said pick-up relays and said transmitter for transmitting messages to said outgoing cable through said pick-up relays.

3. In a telegraph system, an incoming line, an outgoing line, means for repeating signals from the incoming line to the outgoing line including a rotary distributor and pick-up relays controlled thereby, means for driving said rotary distributor in synchronism with synchronizing signals transmitted over said incoming line, a tape transmitter driven by said synchronous driving means, and means for connecting said pick-up relays selectively to either the rotary distributor or the tape transmitter, whereby said relays may be employed for repeating messages between said lines or for transmitting from said tape transmitter to said outgoing line.

4. In a telegraph system, an incoming line,

an outgoing line, means for repeating signals from the incoming line to the outgoing line including a rotary distributor and pick-up relays controlled by said distributor, a tape transmitter driven by said rotary distributor, contacts controlled by said tape transmitter for controlling a regenerative circuit on said pick-up relays, and a transfer switch for connecting said pick-up relays for operation either by said rotary distributor or by said tape transmitter.

5. In a telegraph system, an incoming line, an outgoing line, means for repeating signals from the incoming line to the outgoing line including a rotary distributor and a pair of pick-up relays controlled thereby, means for driving said rotary distributor in synchronism with synchronizing signals transmitted over said incoming line, a tape transmitter driven by said synchronous driving means, and a transfer switch for selectively connecting the operating windings of said pair of pick-up relays in series to said rotary distributor or to the dot and dash contacts respectively of said tape transmitter.

6. In a telegraph system, an incoming line, an outgoing line, means for repeating signals from the incoming line to the outgoing line including a rotary distributor and a pair of pick-up relays controlled thereby, means for driving said rotary distributor in synchronism with synchronizing signals transmitted over said incoming line, a tape transmitter driven by said synchronous driving means, contacts controlled by said tape transmitter for controlling a regenerative circuit on said pick-up relays, and a transfer switch for selectively connecting the operating windings of said pair of pick-up relays in series to said rotary distributor or to the dot and dash contacts respectively of said tape transmitter.

In testimony whereof I affix my signature.

WILLIAM CHRISSIE PERRY.