

July 21, 1942.

H. O. RUGH

2,290,385

TAPE-PRINTING TELEGRAPH

Filed Aug. 27, 1940

3 Sheets-Sheet 1

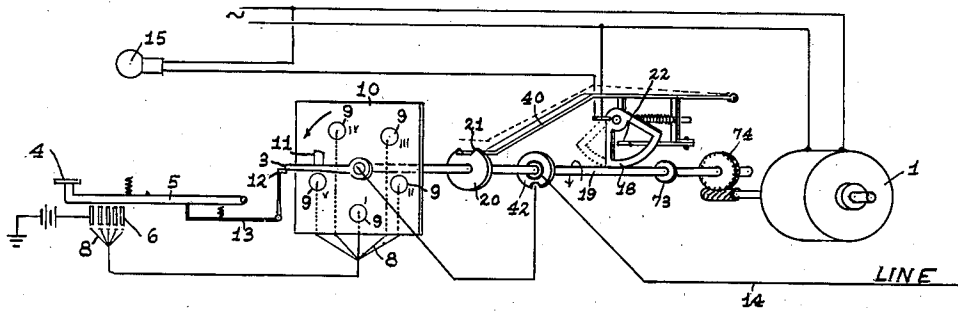


Fig. 1.

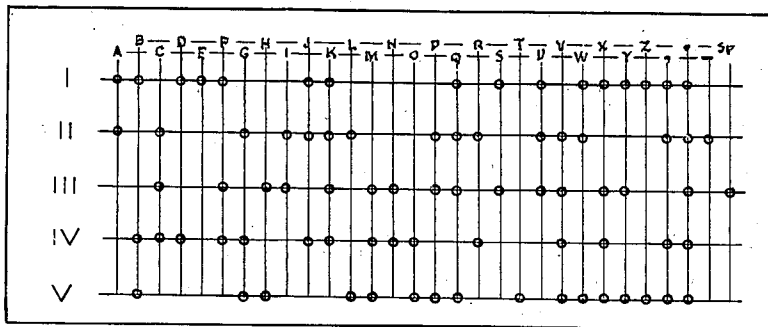
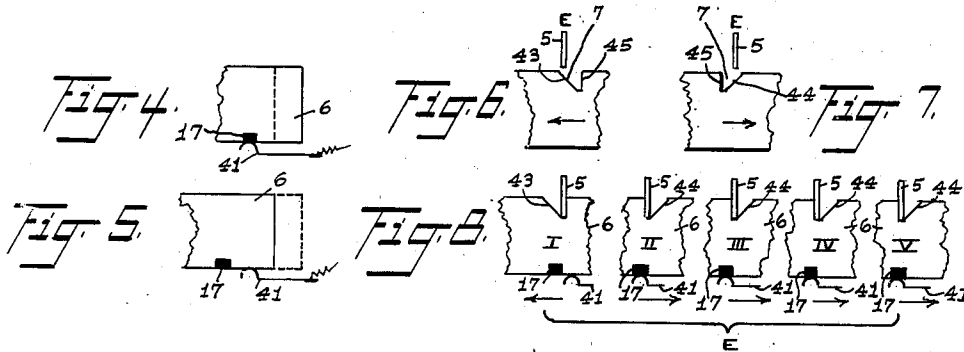
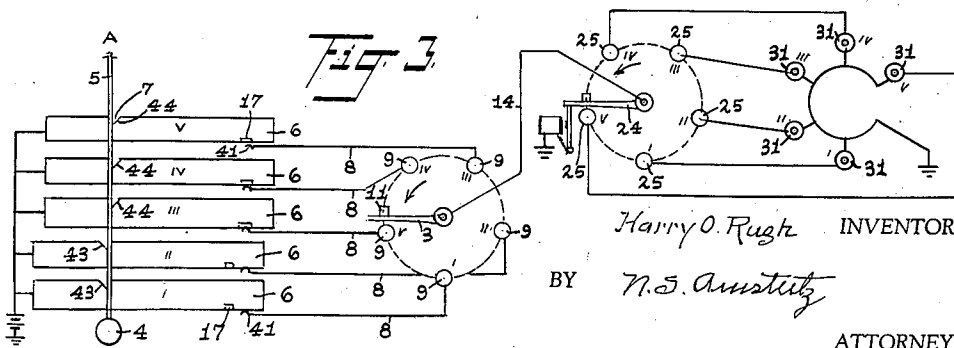


Fig. 2.



Harry O. Rugh INVENTOR.

BY N. S. Amstutz

ATTORNEY.

July 21, 1942.

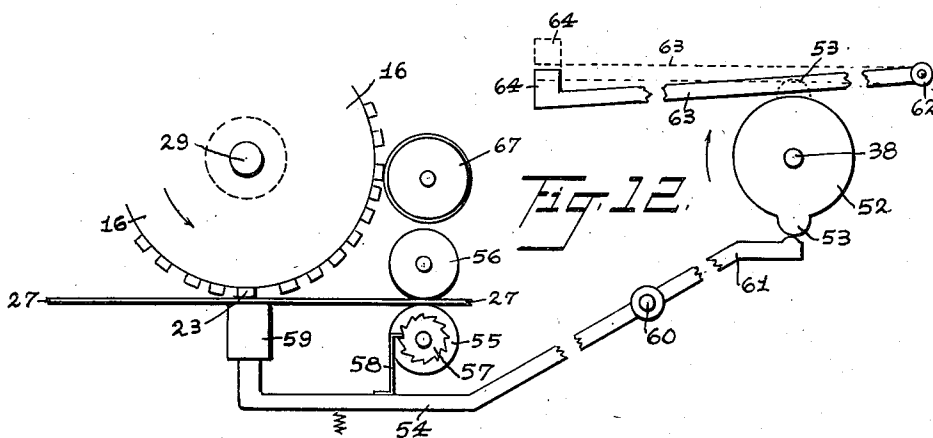
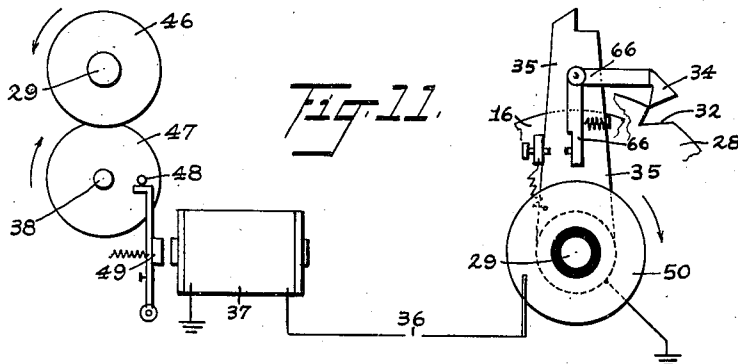
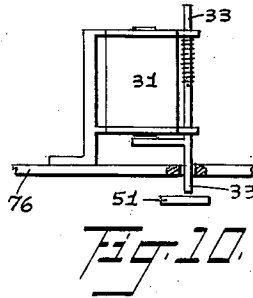
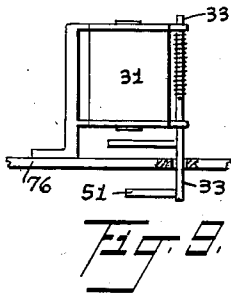
H. O. RUGH

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TAPE-PRINTING TELEGRAPH

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3 Sheets-Sheet 2



Harry O. Rugh INVENTOR.

BY *N. S. Amstutz*
ATTORNEY.

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H. O. RUGH

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TAPE-PRINTING TELEGRAPH

Filed Aug. 27, 1940

3 Sheets-Sheet 3

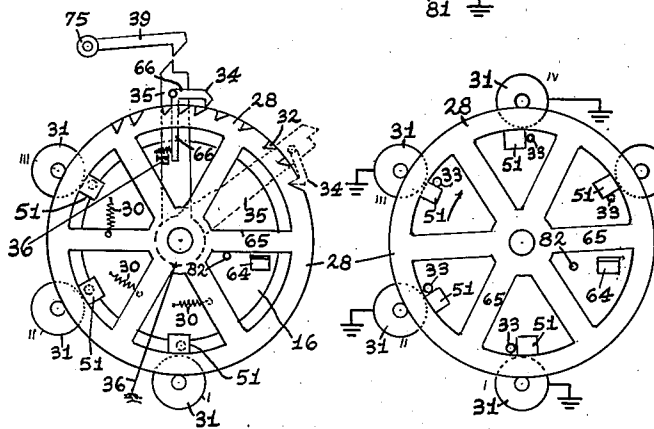
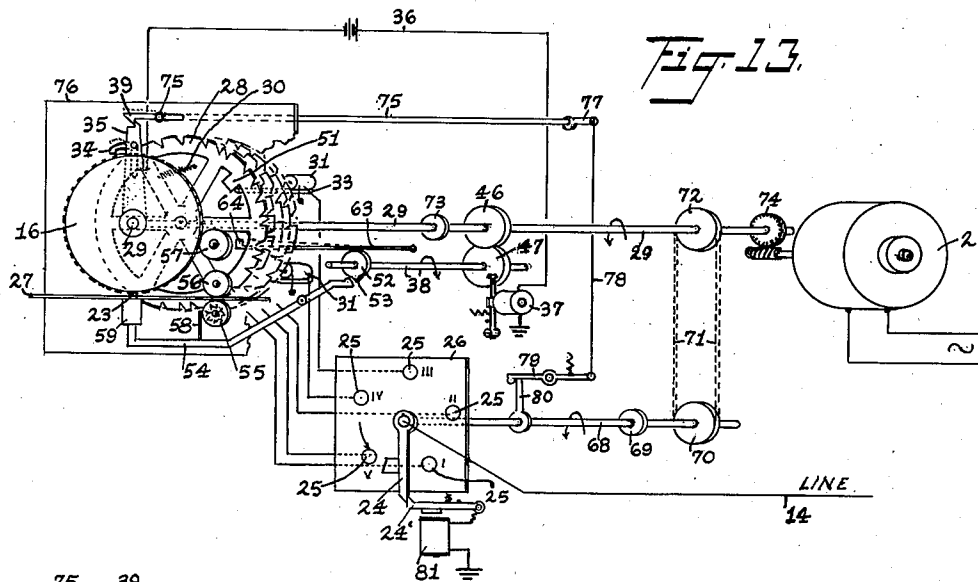


Fig. 14.

Fig. 15.

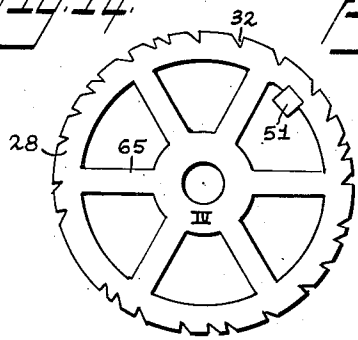


Fig. 16.

Fig. 17.

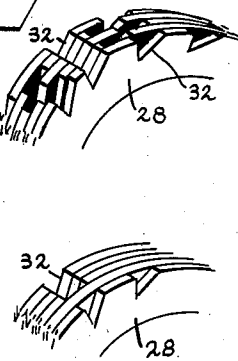


Fig. 17.

Harry O. Rugh INVENTOR.

BY N. S. Amstutz,

ATTORNEY.

UNITED STATES PATENT OFFICE

2,290,385

TAPE-PRINTING TELEGRAPH

Harry O. Rugh, Chicago, Ill., assignor to Bartlett
S. Marimon, trustee, Chicago, Ill.

Application August 27, 1940, Serial No. 354,427

3 Claims. (Cl. 178—34)

My invention relates to improvements in tape-printing telegraph and it consists of the special features recited in the annexed claims.

The purpose of my invention is to provide a printing telegraph system that uses a tape on which the received message is printed; that employs standard synchronous driving motors for the key operated sender and the type wheel receiver; that uses a group of selecting-bars beneath the letter keys that are connected to similarly numbered points on a distributor having a brush which is driven by the motor; that completes the entire operation of transmitting a single character within a single revolution of the brush; and that automatically controls the admissible speed of character repetition, both physically and optically.

In cooperation with the sender I provide a printer that may be connected to it by direct wire, over lighting circuit lines, or by radio; that has an intermittently operated printing wheel which is driven frictionally by its synchronous sixty cycle motor; that simultaneously operates a "distributor" brush which is a substantial duplicate of the sending brush; that provides a printing wheel, which is positioned for each character received through the cooperation of the distributor and a plurality of selecting relays moves one or more disks from a zero point so that they present notches on all the disks in register with each other; that by reason of such registering notches a projecting pin from a type wheel positioning arm will drop into the aligned notches wherever they may be, within the circumference of the disks; that at the same time the selected letter on the type wheel will be directly above the tape; that immediately after the selection of the letter has been made, corresponding to the code transmitted by the sender which has been interpreted by the brush of the receiving distributor and the action of the corresponding relays and the release of the code disks and the making of the impression, the tape is then fed forward and the code disks are restored to zero position for a new letter; that when these operations are completed the type wheel positioning arm is locked until a new release pulse comes from the sender to again repeat the operation for the same or any other characters; and that all of these functions occur within a single revolution of the distributor brushes.

With these and other ends in view I illustrate in the accompanying drawings such instances of adaptation as will disclose the broad underlying features of the invention without limiting myself

to the specific details shown thereon and described herein.

Fig. 1 is a schematic view in diagram form of the related parts of the sending station.

5 Fig. 2 is a tabular arrangement of the key lever in relation to the selecting bars positioned below the key levers.

Fig. 3 shows the diagrammatic circuit interrelation of a sending and receiving station.

10 Fig. 4 is a detached elevation of a selecting bar in insulated relation to a circuit.

Fig. 5 is a view similar to Fig. 4 but with the bar shifted to make an electrical contact.

15 Fig. 6 is a detached elevation of a selecting bar and a type bar adapted to move the former to the left similar to Fig. 5.

Fig. 7 is a view similar to Fig. 6 showing the type bar in relation to a saw-tooth notch adapted to move the bar to the right similar to Fig. 4.

20 Fig. 8 is a group of five selecting bar fragments grouped under the letter "E," they are numbered in roman numerals. The bar I with a key lever depressed has been moved to the left similar to Fig. 5. Bars II, III, IV, V show the type bar depressed the same as bar I these four bars have all been moved to the right so as to put them out of electrical contact.

25 Fig. 9 is a plan view of a relay showing its stop pin in front of a disk plate.

30 Fig. 10 is a view similar to Fig. 9 showing the plate released.

Fig. 11 is a diagrammatic view showing the release of the printing shaft and the related electrical connections to the type finding arm on the printing wheel.

35 Fig. 12 is a diagrammatic view showing the printing impressor, paper feed and the disk restoring means.

40 Fig. 13 is a schematic view, in diagrammatic form, showing the related parts of a receiving station.

Fig. 14 is a diagrammatic view of assembled disks and relays with the type selecting arm having its "letter finder" in a group of aligned notches.

45 Fig. 15 is a view similar to Fig. 14 showing a group of five relays and their releasing pins in front of stop plates secured on the notched disk. For simplicity the notches are not shown in this view.

50 Fig. 16 is a perspective view, showing the notches of five disks (I, II, III, IV, and V) in alignment with each other.

55 Fig. 17 is a view similar to Fig. 16 showing a

second disk (II) bridging the aligned notches of disks I, III, IV, and V.

Fig. 18 is an elevation of the disk IV with its related saw-tooth notches.

In practicing my invention I may use whatever equivalents of function or alternative parts that the exigencies of varying conditions may demand without departing from the broad scope of the invention.

The transmitter

I may use a sixty cycle motor 1 for sending key board impulses to a distance or any other type of synchronization to a receiving motor 2. At the sending end the motor, through a conventional speed reducer drives a commutating arm 3 with an attached brush that makes a single revolution for each letter cycle and then comes to a controlled stop.

There are the usual letter keys 4 attached to key levers 5 fulcrumed at one end. They are under conventional spring tension to hold them normally in a raised and inactive position, ready to be depressed by the operator.

Beneath, and at right angles to the key levers 5, there are five notched bars (I, II, III, IV, and V) 6. The notches 7 on the bars correspond to each letter key 4 according to a prearranged code shown on the drawing. The selecting bars 6 may be normally held under spring tension against a stop at one end. When any key 4 is struck, a key lever 5 is moved. The bar or bars corresponding to its code are pushed endwise by the downward movement of the key lever to close a related circuit to its commutator contact. On the release of the key the bars which were used are automatically restored endwise under spring tension or otherwise to their normal or zero position.

The bars 6 in modified form, Figs. 4-8 normally remain in a floating position fixed by the last movement of a key lever above them in contrast to the above described manipulation. Each bar on its under-edge may have inserted a narrow piece of insulating material 17 against which a delicately poised flat spring 41 may rest. When the bars are in their idle position the springs are on the insulating blocks. As soon as they are shifted endwise by the movement of a key the spring will pass off from the block and engage the metal of the bar to close a circuit. The key levers 5 engage saw-tooth notches 7 made on the upper edges of the bars.

When these notches are beveled upward to the left, as at 43 the downward movement of the type bar will slide a bar to the left and close the circuit. When notches are formed with the incline 44 leading upward to the right, such notches will cause the bars to be moved in the opposite direction so as to break the circuit. The vertical edge 45 of each notch 7 prevents a moved bar 6 from being shifted too far, hence without the use of any accessory means, the bars will remain in position ready to receive successive key lever movements. When a "period" of the key board is struck all the bars 6 (Fig. 3) are moved simultaneously so that each bar 6 closes the circuit from a suitable source of current to the same numbered contact (I-V) 9 on the stationary commutator 10 to be transferred consecutively to the line 14 through the movement of the rotating brush 11, that is, all of the contacts 9 will be engaged by the brush in each single revolution. The pulses sent to the receiving station will in actuating sequence through the corre-

spondingly numbered contacts (I-V) 25 in the receiving commutator 26 and the similarly numbered relays 31 release the first (I) of the disk 28, the second (II) one, the third (III) one, the fourth (IV) one, the fifth (V) one at almost instant operation. The grouped disks will present one saw-tooth notch 32 of each disk 28 in alignment with a similar notch of each of the other disks so that the "letter finding" projection pin 34 of the selecting or finding arm 35 drops into the aligned notches the position of the type wheel 16 will be opposite the tape 27 to be impressed upon it.

I have found it expedient to use the period at the beginning of every sentence or phrase because all of the coded bars (I-V) 6 will be positioned at the same starting point. Whatever combinations are made through the use of one or more bars and corresponding contacts on the commutators, 10 and 26, only those contacts will be alive that the specific coded pulses require and for the given letter selected the others will be dead. The sending and receiving machines may also be operated without using only "five" bars to produce a period, a dash, or any other arbitrarily selected character. The permutation of five different bars is 120 and there is ample room for other combinations to represent different symbols or characters. Should six bars be selected the possible combination would be 720. The tabulated code of Fig. 2 is partially conventional.

An inspection of Fig. 2 will show the tabulated bars (I-V) that are used for each letter of the alphabet including the comma, the period, the dash, and a space. Other combinations may be made, as desired, for numerals and other characters or symbols. In this instance the letter "A" uses bars I and II (6) corresponding to contacts I and II (9) of the commutators 10 and 26, relays I and II (31) and disks I and II (28). The letter "B" uses numbers I, IV, and V (6), "C" uses II, III, and IV (6). The letter "O" uses only two bars viz., IV and V (6). The space uses a single bar, III (6) etc., etc.

The depression of a key moves one or more notched selecting bars 6 according to a prearranged code corresponding to the key which has been depressed. A separate wire 8 is in separate electrical connection from each bar to the corresponding contacts 9 on a stationary commutator 10. The contacts are radially positioned in concentric order and the commutating brush 11, driven frictionally by the motor 1, sweeps across the contacts (I-V) 9 in rapid succession. At the end of each revolution it is held against rotation by a catch 12 that is released through the first movement of any one of the key levers by a trip 13.

The contacts 9 and motor 1 are connected to the transmitting line 14, or radio hook-up in any conventional manner. If a supply circuit is used as a source of current and simultaneously as a transmission line a battery is not required, but if a conventional telegraph line, or radio transmission is used then a battery source of current will be employed.

In order that the keys 4 may not be too rapidly depressed I provide a visual and physical control. This comprises a red glow lamp 15 that indicates the moment during which a key may be struck. The duration of this visible signal is under the control of the operator, within prescribed limits, to prevent the piling up of letter-

impressions of the receiving type-wheel 16 on the receiving tape 27.

This control includes a pivoted frictional segment 18 that rests, while in action, on the motor shaft 19. The rotation of the small diameter shaft slowly moves the large radius segment 18, clockwise against the action of a restoring spring, until a cam 20 on the shaft raises it out of mechanical contact with the shaft and closes the lamp circuit. This permits the segment 18 to return slowly under the action of the spring keeping the circuit closed until a pivoted supporting arm 40 drops it into a notch 21 cut into the periphery of the disk 20.

The first movements of the segment 18 closes the lamp circuit and the length of time the lamp will glow, during the return swing of the segment, is determined by an adjustable stop 22 which limits the time in which the segment will return to its starting point. This determines the permissible time constant for the key-board operations of each letter.

The rotary movement of a commutating brush 11 over the series of commutator contacts, (I—V) 9, is all performed within a single revolution of the driving shaft 19 remotely similar to the well known Baudot system of telegraphy. An outstanding difference, is found in my sending and receiving machines.

The receiving printer

This part of my system uses a duplicate driving motor 2 that is also frictionally connected to a duplicate commutating brush 24 which also sweeps over the insulated contacts, (I—V) 25, on a stationary commutator 26. These contacts are smaller than those similarly numbered at the sending end.

The receiving brush 24 is held against rotation by a catch 24' that is released through the first impulse which comes from the distant key board. When in motion the brush sweeps over its contacts in synchronism with the movement of the sending brush 11. Both brushes are in circuit with similarly numbered contacts (I—V) 10 and 25 at both stations at the same moment.

The receiving motor 2 has its shaft 29 connected to the type printing wheel 16 through friction disk 73 to shift the wheel circumferentially through the required angle to bring the desired letter 23, corresponding to the letter pulses (I—V) that are being sent, opposite the tape 27 in the impressing position.

The selection of a letter on the type wheel 16 that is to be printed is unique, in that, five separate notched disks (I—V) 28 are mounted movably on the receiving motor shaft 29 concentric with the type wheel and motor drive shaft. These disks 28 correspond in number to the five selecting bars 6 of the sending key board. They are normally held under rotary tension clockwise around the axis of the drive shaft 29 by spring 30 into zero position 82. Their maximum movement is not large. The disks are under the control of relay magnets (I—V) 31 which in turn are electrically connected to corresponding contacts, (I—V) 25 over which the receiving brush 24 passes, during each single revolution.

The disks 28 are notched at 32 on their circumferential edges according to the coded notches 7 of the selecting bars under the operating key levers 5 at the sending end. Each disk is moved clockwise by spring when it is released by its relay 31 a predetermined distance varying ac-

cording to the code impulses coming from the transmitter.

The disks 28 are variably notched. For a given letter, for instance the letter "A" disks I and II are moved, but disks III, IV and V are not moved, similarly selecting bars 6, numbered I and II are the only ones that are moved to make contacts I and II corresponding to disks 28, numbered I and II. Bars 6 numbered III, IV, and V are held away from their contacts 41. The bars are in a floating idle position and the correspondingly numbered disks 28 also remain in their idle position for the letter "A."

The notched disks 28, as stated, are normally held in their starting or zero position by separate delicate coil springs 30 attached to each disk (I—V) so as to move them from a common starting point when they are released by the relay or relays (I—V) 31. These relays in their action correspond to the letter code pulses received from the sending station. Just as soon as the relay stops 33, of a given combination are released the disks move into their new or "assembling" position to bring the coded notches 32 of the actuated disk or disks into alignment with corresponding coded notches 32 of inactive disks.

The moment that all the notches 32 of a group are in alignment a "letter finder" 34 of the selecting arm 35, under frictional drive 69, from the shaft 68, is released. It traverses anti-clockwise with the arm 35 and drops into the aligned notches 32 when it closes a circuit 36 to release the printing mechanism.

Before the printing wheel 16 is brought around to the proper position for a given character a stop plate 51 on a notched disk 28 is released by the pin 33 of its relay magnet 31. In Fig. 9 a pin 33 is shown against the front edge of a plate 51. In the adjoining Fig. 10 the pin has been withdrawn and the plate has moved in front of it by the action of its spring 30.

When the disks are moved anti-clockwise toward their zero position, against the tension of the springs 30, the stops 33 being spring pressed instantly move in front of the plates to hold them until they are again released. The character "found" on the printing wheel 16 is impressed on the tape 27 by the impresser 59 of the arm 54. The arm is pivoted at 60. It has an extension 61 which is acted upon by a projection 53 of the cam 52. This cam is on the single revolution shaft 38 that is turned from the pulley 46 on the main drive shaft 29. The pulley 46 coacts frictionally with a mutilated pulley 47 on the shaft 38. It restores the disks 28 to their starting position. This is accomplished by an arm 63 that is pivoted at 62. It has an upper extension 64 which engages the spokes 65 of the disks 28. The arm 63 rides on the cam 52 until the projection 53 raises it to restore the disks to their starting point.

The shaft 38 is released when the "letter finder" projection 34 drops into an aligned group of notches 32. This "finder" is attached to a bell crank 66 pivoted to the type finding arm 35. The bell crank is under spring tension to cause the "finder" 34 to drop into a group of aligned grooves 32 at the moment that the character on the printing wheel corresponding to the position of the group of aligned notches 32 is opposite the tape, to be impressed on it by the impresser 59.

The bell crank 66 connects the circuit 36, insulated disk 50, and the magnet 37, to ground. The other side of the circuit is grounded from

the metal parts in a conventional manner. The magnet 37 attracts the armature arm 49 from beneath the pin 48 on the mutilated pulley 47. This frees the shaft 38 so that the pulley 46, under extra friction, against 47 rotates the shaft 38.

The type wheel 16 is continually supplied by an ink roller 67. The tape 27 is intermittently fed by a lower wheel 55 and an upper wheel 56. The lower wheel may have a ratchet 57 that is engaged by a resilient hook ended spring or pawl 58, which, when the impresser 59 pushes the tape 27 against an inked character of the printing wheel 16 during the upward movement of the long end of the lever 54. The spring or pawl 58 idly moves into a new tooth of the ratchet 57. On the downward stroke of the arm the pawl pulls the ratchet 57 one tooth and moves the rollers 55 and 56 the proper distance to bring the tape 27 into a new position to receive the next type impression.

A shaft 68 actuates the brush 24. It is connected by friction disks 69 to a sprocket 70 which in turn is connected by a chain 71 to a sprocket 72 on a drive shaft 29. Between the pulleys 46 and the printing wheel 16 a friction disk 73 is also placed. A similar friction disk is on the shaft 19 at the sending end. Both shafts 19 and 29 are driven by a worm gear 74.

The type wheel positioning arm 35 is released by the catch 39 operating through a shaft 75 that passes through a support 76 which also supports the magnets 31. At the outer end of the shaft 75 a short arm 77 is secured. This is connected by a link 78 to a rock arm 79 pivoted at its center. This arm is actuated by a finger 80 attached to the shaft 68. The moment that the initial releasing impulse comes over the line 14, the brush 24, armature 24' and its magnet 81, the catch 39 is instantly raised so that the finding arm 35 of the printing wheel is free to move it and the attached wheel anti-clockwise to select a position for the next character that is to be printed. This movement of the arm 35 may be over any portion of the circumference of the printing wheel according to the position of the desired letter on the wheel.

Within each complete letter cycle the required coded disks (I—V) 28 are released one by one into position so that a notch 32 of one disk will be in register with a notch in every other disk then the selecting arm 35 is released so that its "letter finder" 34 will drop into the aligned notches. This alignment may take place at any portion of the circumference of the disks, corresponding to the position of the desired letter on the type wheel 16 which is to be brought around to the impressing position adjacent the tape 27. The moment the impression has been made the disks are freed to return to their starting position. The reverse movement of the disks will bring an un-notched portion of one or more disks across the previously aligned notches raises "finder" 34. The arm 35, is then free to complete its revolution and pass under the catch 39 where it is held, ready to repeat the cycle for the next incoming letter signals.

It is to be noted that whatever combination is selected of any of the five contacts, (I—V) 9 on the sending station commutator 10 at the sending station, the same numbered contacts (I—V) 25 on the commutator 26 of the receiving station and the corresponding relays (IV) 31 will always be in circuit at the same synchronized moment.

It will be obvious that the cooperating mecha-

nism, and the interrelation of circuits may be widely varied to sequentially produce all the co-operating functions in a unitary cycle of time as practical alternatives, without limiting myself to any specific means for accomplishing the desired result.

All of the various functions are very closely related, as a matter of fact, within a single revolution approximately $\frac{1}{250}$ minute of the commutating brushes a key is depressed, a time limit is set for a key repetition, a set of coded pulses is created during the key operation, the receiver is started, the transmitted pulses shift the code disks, the desired letter is found, the found letter is impressed on the tape, the tape is fed, the code disks are restored and both machines are stopped all within approximately one-fourth second of time, ready to have the cycle repeated.

If desired I may scramble a message by using a transposing plug between the selecting bar contacts and the sending commutator, which will shift the contacts three, four, and five of the letter "M" to contacts one, four and five, thus substituting the letter "B" for the letter "M" etc. By then pressing the "B" key actuating bars, four, and five are moved and the letter "M" will reappear, decoded. An almost unlimited number of scrambling combinations can be made to go through one, two, or three codings so that the first, second and third scramblings will be unintelligible to any one doing the transcribing but the last transcription will completely decode the message. This adaptation of my printing telegraph does not form a part of the present application.

What I claim is:

1. In type printing telegraphs, a receiving machine comprising a commutator having a plurality of contacts, a brush for consecutively engaging each contact in the course of a single revolution, a plurality of relays corresponding to the number of contacts of the commutator, a plurality of notched interpreting disks corresponding in number to the contacts, a plurality of releasing relay magnets corresponding in number to the contacts, a printing wheel, a frictional drive to the brush, a frictional drive to the printing wheel, a letter selecting finger connected to the printing wheel, means for moving the interpreting disks to a common point so as to bring all the related notches of all the disks into alignment, means on the letter selecting finger of the type wheel for engaging a group of aligned notches, and means for releasing the printing impressing device through the dropping into the aligned notches of the finger on the letter selecting arm of the printing wheel.

2. A tape-printing telegraph receiving machine comprising a relay control, a frictionally actuated type wheel, a relay control, a tape adjacent the type wheel, a shaft for said wheel, a plurality of disks on said shaft having variable spaced saw-toothed notches on their periphery, means for automatically shifting each disk on said shaft a variable distance under spring tension when released by said relay away from a zero position such shifting corresponding to a related letter on the type wheel, a pawl pivoted on said arm, a spring for actuating the pawl said arm being in frictional engagement with the type wheel and is intermittently movable therewith and adapted to traverse the pawl past the notches of the disks until a notch on one disk is in alignment with a notch of every other disk permitting the pawl to

drop into said aligned notches, thereby having moved the type wheel the required distance to bring the selected letter to an impression point, and means for impressing the selected letter on the adjacent tape.

3. In tape-printing telegraph machines a receiver comprising a plurality of disks, a plurality of separate and variably grouped notches on the disks, a shaft in common for all the disks, a print-

5 ing wheel in concentric relation to the shaft, a selector having concentric movement adjacent the periphery of the notched disks and the printing wheel, a printing impressing device operative adjacent the type wheel, and means for releasing the impressing device when a notch in one disk is in alignment with a similar notch in every other disk.

HARRY O. RUGH.