G. R. BENJAMIN.

AUTOMATIC TRANSMITTER.

APPLICATION FILED APR. 26, 1915.

1,298,440.

Patented Mar. 25, 1919.

2 SHEETS—SHEET 1.

Fig 1.

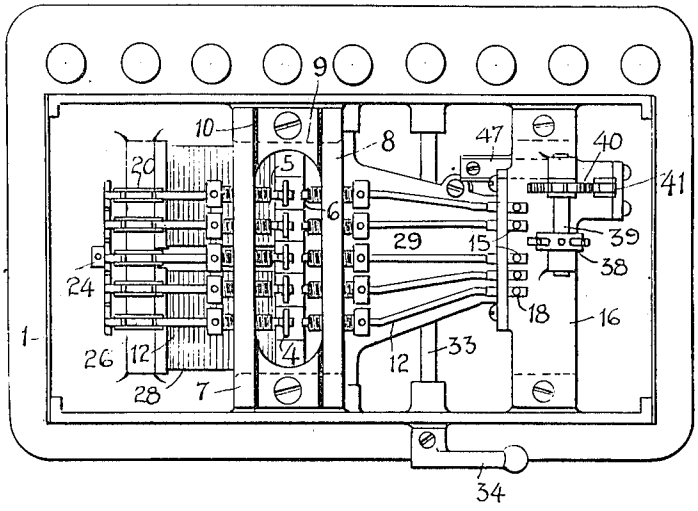
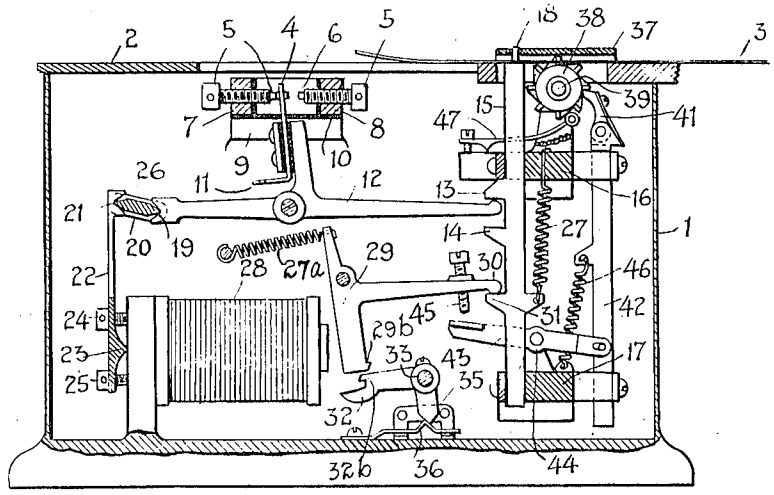


Fig 2.



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2 SHEETS—SHEET 2.

Fig 3.

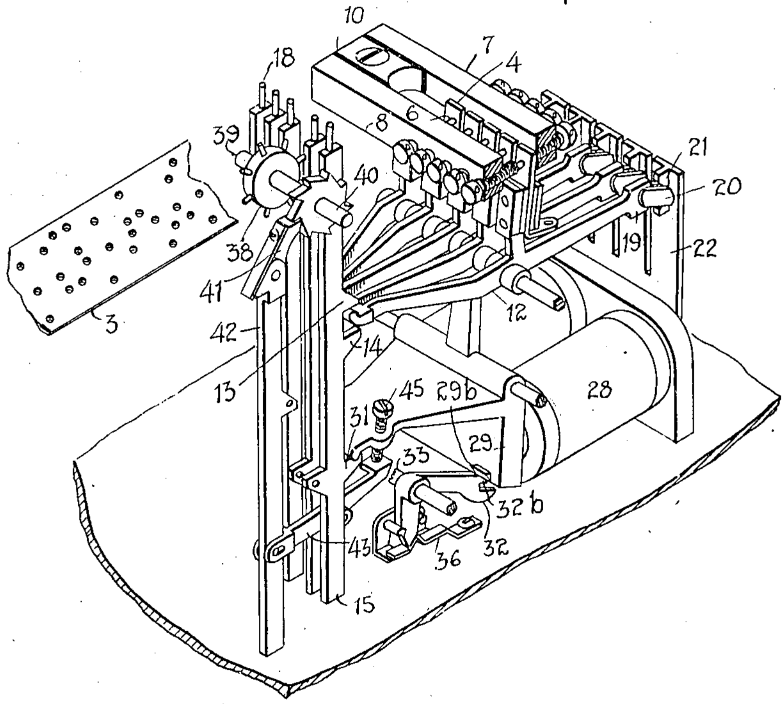
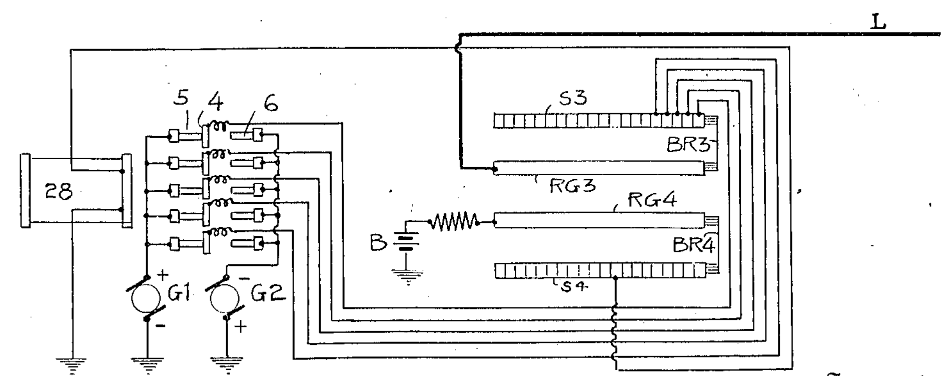


Fig 4.



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UNITED STATES PATENT OFFICE.

GEORGE R. BENJAMIN, OF JERSEY CITY, NEW JERSEY, ASSIGNOR TO THE WESTERN UNION TELEGRAPH COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

AUTOMATIC TRANSMITTER.

1,298,440. Specification of Letters Patent. Patented Mar. 25, 1919.

Application filed April 26, 1915. Serial No. 23,791.

To all whom it may concern:

Be it known that I, GEORGE R. BENJAMIN, a citizen of the United States of America, and a resident of Jersey City, in the county of Hudson and State of New Jersey, have invented a certain new and useful Automatic Transmitter, of which the following is a specification.

My invention relates to improvements in automatic transmitters, particularly transmitters controlled by a perforated tape; and the improved transmitter herein described is particularly intended as a telegraph transmitter, and for use in multiplex telegraph systems of the general so-called Baudot type, such for example as the system illustrated and described in the application of George M. Yorke and myself, filed January 5, 1915, Serial No. 654. However, the transmitter herein described is applicable to other systems, and to uses other than in telegraphy, and therefore I wish it to be understood that in terming my invention an automatic telegraph transmitter, I do not intend thereby to limit my invention to use in connection with telegraph systems, or to use in any particular connection; I have termed the invention an automatic telegraph transmitter, simply because that is the name which would ordinarily be given it by those skilled in the art. My invention consists in novel means whereby a perforated tape or like controlling device may control the closing and breaking of a plurality of contacts in accordance with a predetermined code; in means whereby firm contacts and rapid breaking and closing of contacts are assured; in means whereby the breaking and closing of contacts is controlled, not only by the said tape, but also by a magnet susceptible of distant control; in improved feed mechanism for the tape coöperating with the contact-operating mechanism; and in other features all as hereinafter described and more particularly pointed out in the appended claims.

The objects of my invention are to improve the construction of transmitters such as referred to; to adapt same for more rapid operation; to provide an efficient transmitter adapted for operation by tape wherein the rows of code perforations for the several characters or signals to be transmitted are each arranged transversely, with respect to the normal direction of feed of that tape; to insure firm contacts and rapid closing and breaking of such contacts; to provide improved means for the control of the contacts, not only by the perforated tape, but also by means adapted for distant control; to provide improved feed means adapted for coöperation with the contact making and breaking mechanism; and generally to make the transmitters simple, compact, free from liability to derangement, rapid in operation, and relatively inexpensive in construction.

I will now proceed to describe my invention with reference to the accompanying drawings, and will then point out the novel features in claims.

Figure 1 shows a top view of my improved transmitter, a certain guide plate, hereinafter referred to, having been removed;

Fig. 2 shows a vertical longitudinal section of the transmitter;

Fig. 3 shows the essential portions of the transmitter in perspective and more or less diagrammatically, the inclosing case and certain other portions of the transmitter having been removed.

Fig. 4 is a diagram showing electrical connections in connection with which the transmitter may be used.

My improved transmitter comprises a suitable case 1 having a base, as usual, and having a removable top plate 2, the latter adapted for passage over it of a perforated tape 3 (shown more clearly in Fig. 3), this tape being, in practice, perforated transversely according to the code characters or signals to be transmitted. In the particular code for which the transmitter shown is intended to be used, each character consists of five current impulses, of which some may be positive and others negative; therefore, the transmitter shown comprises five separate sets of contacts, each of such sets of contacts being arranged to produce current reversals; the transmitter being, therefore, a "pole changing" transmitter; but, as will be readily understood, the transmitter is equally adapted for operation by mere making and breaking a circuit, without current reversal.

Each of the said contacts comprises a contact tongue 4 and adjustable contact stops 5 and 6, each contact tongue being arranged to vibrate between its stop 5 and its stop 6.

The several stops 5 are mounted upon a supporting bridge 7, and the several stops 6 are mounted upon a supporting bridge 8,

these bridges being mounted upon lugs 9 projecting from the sides of the case 1, and insulated therefrom by insulation 10. In practice the bridge 7 is connected to a source of current supply of one polarity, and the bridge 8 is connected to a source of current supply of the opposite polarity, the several contact tongues 4 having connected to them conductors 11 leading (usually through a so-called distributer, as hereinafter described) to the line conductor.

Each contact tongue 4 is mounted upon a separate pivoted bell crank lever 12, one extremity of which engages one or another of lugs, 13 and 14, of a sliding feeler 15 mounted to slide up and down in suitable bearings of bridges 16 and 17 extending from one side of the case 1 to the other side thereof. These feelers 15 each carries at its upper end a pin 18 adapted to pass through perforations of the tape 3. The opposite extremity of each bell crank 12 has a socket 19 receiving one end of a double edged jockey 20, the other end of the jockey being seated in a similar recess 21 of a spring 22 having a fulcrum at 23 and provided with adjusting screws 24 and 25, whereby the pressure of said spring 22 may be adjusted. At the sides of each jockey 20 there are cheek plates 26, whereby the jockey is held in place.

A spring 27 is provided for each feeler 15, such spring tending to draw the feeler upward.

For depressing the feelers against the action of these springs 27, I provide a magnet 28 having a pivoted bell crank armature 29, one end 30 of this bell crank armature engaging a lug 31 formed on each of the feelers 15. It will be apparent that when the magnet 28 is energized and caused to attract its armature, all of the feelers 15 which are then in elevated position, are depressed. A retractile spring 27*a* is provided for the armature 29; but it is obvious that, even without said spring 27*a* the armature 29 would be retracted, upon deënergization of magnet 28, by the rise of any of feelers 15.

It is convenient at times to have available means for locking all of the feelers 15 down. To this end I provide a locking dog 32 on a shaft 33 mounted in bearings in the case 1 and having, exterior to the case, an operating handle 34. It will be apparent that, when the magnet 28 has been energized and has attracted its armature, the handle 34 can be used to throw up the dog 32 into engagement with the armature 29, thereupon locking the armature and so holding all of the feelers 15 down. The shaft 33 carries a V-edged arm 35 engaged by a V-shaped jockey spring 36, which spring tends to hold the locking dog 32, either in the engaged or in the disengaged position.

The armature 29 and the dog 32 are provided with coacting locking projections 29*b* and 32*b* respectively. When the dog 32 is thrown up as previously described, to lock the armature 29 in attracted position, these projections 29*b* and 32*b* interlock, preventing the dog 32 from being thrown down again except at a time when the magnet 28 is energized. This prevents the throwing down of the dog 32 at a wrong time, with possible resulting splitting of a signal.

Above the position for the tape 3 there is a guide plate 37, preferably perforated in line with the pins 18 of the feelers 15. This guide plate limits rise of the tape 3, under the action of those feelers 15 which do not happen to be in line with perforations of the tape.

For feeding the tape forward, I provide a sprocket wheel 38 having teeth adapted to enter a center row of perforations, or sprocket holes, in the tape; this sprocket wheel being mounted upon a shaft 39 on which is also mounted a ratchet wheel 40; which wheel is arranged to be advanced, step by step, by a spring-actuated pawl 41 mounted upon a sliding rod 42 to which is connected a link 43 pivoted at 44, the other end of this link being arranged to be engaged by an adjustable screw 45 carried by the armature 29. It will be apparent that each time the armature 29 is attracted by the magnet, and thereby caused to pull down any of the feelers 15 which are then in elevated position, the screw 45 will engage the proximate end of the link 43, thereby raising slide rod 42 and causing pawl 41 to advance the ratchet wheel 40 through the space of one tooth, and, thereby, to rotate sprocket wheel 38 through the space of one tooth. Upon the next deënergization of magnet 28, the slide rod 42 is drawn down by its spring 46, the pawl 41 being thereby caused to engage another tooth of the ratchet wheel 40. A spring pressed jockey 47 prevents reverse movement of the ratchet wheel 40 when the pawl 14 descends.

The operation of my improved transmitter is as follows:

Supposing the parts to be in the position shown in Fig. 2, and supposing magnet 28 to be energized and to attract its armature 29: the end 30 of this armature, engaging the lugs 31 of such of the feelers 15 as may then be in elevated position, will draw down such feelers, and immediately after said feelers have cleared the tape 3 the screw 45 will engage the link 43 and actuate the same, thereby raising the slide rod 42 and pawl 41, and so advancing the tape 3 through the space of one tooth; and at the same time the lugs 13 will engage the bell crank levers 12 of those contact tongues which may at the time be in the position shown in Fig. 2, thus moving the said contact tongues into engagement with their stops 6. During such motion of the bell

crank levers 12, as soon as the jockeys 20 have passed to the other side of the line of thrust of their respective springs 22, said springs, acting through the jockeys 20 upon the bell crank levers 12, will force the contact tongues 4 over against their stops 6, producing firm and steady contacts with such stops 6. When the magnet 28 is next deënergized, such of the feelers 15 as may be beneath perforations of the tape 3, will rise, their pins 18 passing through the corresponding perforations of the tape, and such feelers 15, in their upward movement, will raise the corresponding bell crank levers 12, breaking contact of the corresponding contact tongues 4 with corresponding stops 6; and as soon as the corresponding jockeys 20 have passed the line of effort of their corresponding springs 22, said springs 22 will force the corresponding tongues 4 over into contact with the corresponding stops 5, producing firm and steady contacts with those contact stops 5. At the same time, slide rod 42 and pawl 41 will descend into engagement with a further tooth of the ratchet wheel 40.

In Fig. 4 I have illustrated diagrammatically connections of my transmitter with the distributer of a multiplex telegraph system, such for example, as that of the Yorke-Benjamin application Serial No. 654, above referred to. S3, RG3, RG4 and S4 are commutator rings (shown as developed) of a distributer, and BR3 and BR4 are brushes. Rings S3 and S4 are segmented. Contact stops 5 of the transmitter are shown connected to a generator G1, and contact stops 6 are shown connected to a generator G2, opposite poles of the two generators being connected to the said stops. The contact tongues 4 are shown connected to suitable segments of distributer ring S3, while ring RG3 is shown connected to line. The battery B is shown connected to ring RG4, and one of the segments of ring S4 is shown connected to the magnet 28; such segment being one which is not opposite the segments of ring S3 to which the contact tongues 4 are connected. It will be apparent that after the several contact tongues 4 have been connected, through rings S3 and RG3, to the line, successively, magnet 28 will be energized from battery B through rings RG4 and S4, and thereby the transmitter will be "cleared" as previously described. The magnet will be energized for an instant only, and during this instant the tape 3 (see Fig. 3) will be fed forward another space, so that when the magnet is next deënergized, another series of contacts will be set up in the transmitter, as determined by the perforations of the tape, so that in the next passage of the distributer brushes over the rings, a further signal will be sent. according to the particular combination of contacts set up, followed by a further clearing of the transmitter; and so on.

I am aware of the well known Wheatstone transmitter, wherein two feelers operating a single set of contact points, are controlled by a perforated tape having two rows of perforations, the holes of the two rows being opposite each other, or being staggered relatively, according as a dot or a dash is to be transmitted; I am also aware of another transmitter wherein, for a single code character, there are a plurality of perforations in a single longitudinal row on the tape, *i. e.*, the perforations in the tape are arranged one after the other in the direction of feed of the tape; the transmitter comprising a plurality of feelers, arranged in a similar longitudinal row, and each controlling a contact of the transmitter. But the Wheatstone transmitter is not adapted to "set-up" a series of contacts for a complete code character, and to hold those contacts "set-up" until such code character has been transmitted complete; and the other transmitter referred to requires too great a length of tape to be fed forward for each character, owing to the perforations for each character being arranged longitudinally of the tape. In the transmitter herein illustrated and described, since the perforations are arranged transversely of the tape, and since the feelers are correspondingly arranged transversely, only a very short length of tape is occupied by any particular code character.

I am also aware that in various printing telegraph systems, type setting machines, etc., tapes perforated transversely have been employed, but in such cases the contacts have usually been made directly through the perforations of the tape; a method which has not been found practicable for such high a speed operation as that for which the transmitter herein described is intended. The arrangement herein described, wherein sliding feeler rods are arranged transversely with respect to the tape, and have extremities movable through perforations in the tape, such feeler rods controlling individual contacts, which contacts, however, are held closed or opened, as the case may be, by spring actuated jockeys, independent of the feelers themselves, has proved to be particularly advantageous for high speed operation, and to give contact periods of maximum duration, with great solidity of contacts.

What I claim is:

1. A telegraph transmitter comprising in combination intermittently operating tape feeding means adapted to feed longitudinally a transversely perforated tape, a series of feelers arranged transversely with respect to the direction of feed of such tape and adapted to move rectilinearly through per-

forations of that tape, means tending to move said feelers toward and through the tape, restoring means for withdrawing from engagement with the tape feelers already in engagement therewith, means for synchronizing the tape feed with the operation of said feelers, and contact means, one for each such feeler, each such contact means having two positions, one or the other of which will be occupied according to the position of its corresponding feeler, and means, independent of the feelers, arranged to hold such contact means in the positions to which they may be adjusted by the feelers, such holding means adapted to yield to motion of the contact means produced by said feelers.

2. A telegraph transmitter comprising in combination intermittently operating tape feeding means adapted to feed longitudinally a transversely perforated tape, a series of feelers arranged transversely with respect to the direction of feed of such tape and adapted to move rectilinearly through perforations of that tape, individual spring means for each feeler tending to move said feelers toward and through the tape, restoring means for withdrawing from engagement with the tape feelers already in engagement therewith, means for synchronizing the tape feed with the operation of said feelers, and contact means, one for each such feeler, each such contact means having two positions, one or the other of which will be occupied according to the position of its corresponding feeler, and means, independent of the feelers, arranged to hold such contact means in the positions to which they may be adjusted by the feelers, such holding means adapted to yield to motion of the contact means produced by said feelers.

3. A telegraph transmitter comprising in combination tape feeding means adapted to feed longitudinally a transversely perforated tape, a series of feelers arranged transversely with respect to the direction of feed of such tape and adapted to move rectilinearly through perforations of that tape, means tending to move said feelers toward and through the tape, a restoring magnet and means operated thereby for withdrawing from engagement with the tape feelers already in engagement therewith, means for synchronizing the tape feed with the operation of said feelers, and contact means, one for each such feeler, each such contact means having two positions, one or the other of which will be occupied according to the position of its corresponding feeler, and means, independent of the feelers, arranged to hold such contact means in the positions to which they may be adjusted by the feelers, such holding means adapted to yield to motion of the contact means produced by said feelers.

4. A telegraph transmitter comprising in combination intermittently operating tape feeding means adapted to feed longitudinally a transversely perforated tape, a series of feelers arranged transversely with respect to the direction of feed of such tape and adapted to move rectilinearly through perforations of that tape, means tending to move said feelers toward and through the tape, restoring means for withdrawing from engagement with the tape feelers already in engagement therewith, means for synchronizing the tape feed with the operation of said feelers, and contact means, one for each such feeler, each such contact means having two positions, one or the other of which will be occupied according to the position of its corresponding feeler, and spring actuated jockeys, one for each such contact means, arranged to hold that contact means in either of two positions to which it may be adjusted by its corresponding feeler, such jockeys adapted to yield to motion of the contact means produced by said feelers.

5. A telegraph transmitter comprising in combination tape feeding means adapted to feed longitudinally a transversely perforated tape, a series of feelers arranged transversely with respect to the direction of feed of such tape and adapted to move rectilinearly through perforations of that tape, means tending to move said feelers toward and through the tape, a restoring magnet and means operated thereby for withdrawing from engagement with the tape feelers already in engagement therewith, and contact means, one for each such feeler, each such contact means having two positions, one or the other of which will be occupied according to the position of its corresponding feeler, and means, independent of the feelers, arranged to hold such contact means in the positions to which they may be adjusted by the feelers, such holding means adapted to yield to motion of the contact means produced by said feelers, said feeding means arranged also to be operated by said magnet.

6. A telegraph transmitter comprising in combination tape feeding means adapted to feed longitudinally a transversely perforated tape, a series of feelers arranged on one side of the position of such tape and arranged transversely with respect to the direction of feed of such tape, and adapted to move rectilinearly through perforations of that tape, means tending to move said feelers toward and through the tape, restoring means for withdrawing from engagement with the tape feelers already in engagement therewith, contact means, one for each such feeler, and each comprising a pivoted lever, each feeler having a recess with which the corresponding pivoted lever engages, whereby motion of the feelers causes motion of the corresponding contact levers, and means, inde-

pendent of the feelers, arranged to hold such contact levers in the positions to which they may be adjusted by the feelers, such holding means adapted to yield to motion of the contact levers produced by said feelers.

7. A telegraph transmitter comprising in combination tape feeding means, a series of feelers, adapted to move through perforations of that tape, means tending to move said feelers toward and through the tape, restoring means comprising a magnet and an armature therefor, for withdrawing from engagement with the tape feelers already in engagement therewith, contact means, one for each such feeler, operated by movements of that feeler, and a locking member for said armature adapted to lock same in attracted position, said armature and locking member having engaging means preventing unlocking of the armature except when that armature is in attracted position.

8. A telegraph transmitter comprising in combination a plurality of levers, pivoted at an intermediate point and each having a contact-carrying projection, a plurality of tape-controlled feelers each engaging one of said levers at one end thereof and thereby adapted for influencing such lever, and means, independent of the feelers, arranged to hold such levers in the positions to which they may be adjusted by said feelers, such holding means adapted to yield to motion of the contact means produced by said feelers.

9. A telegraph transmitter comprising in combination a plurality of levers, pivoted at an intermediate point and each having a contact-carrying projection, a plurality of tape-controlled feelers each engaging one of said levers at one end thereof and thereby adapted for influencing such lever, means, independent of the feelers, arranged to hold such levers in the positions to which they may be adjusted by said feelers, such holding means adapted to yield to motion of the contact means produced by said feelers, a restoring magnet and means operated thereby for withdrawing the feelers and thereby actuating such contact levers.

10. A telegraph transmitter comprising in combination a plurality of levers, pivoted at an intermediate point and each having a contact-carrying projection, a plurality of tape-controlled feelers each engaging one of said levers at one end thereof and thereby adapted for influencing such lever, and spring-actuated jockeys engaging the other ends of said levers, and adapted to hold such levers in positions to which they may be adjusted by the feelers, but to yield to motion of the said levers produced by said feelers.

11. A telegraph transmitter comprising in combination a plurality of levers, pivoted at an intermediate point and each having a contact-projection, a plurality of tape-controlled members each engaging one of said levers at one end thereof, and thereby adapted for influencing such lever, each such lever having a socketed end, a jockey spring for each such lever opposite such socketed end, and a jockey member for each lever intermediate such spring and such socketed end and seated in the socketed end of such lever.

12. A telegraph transmitter comprising in combination a plurality of levers, pivoted at an intermediate point and each having a contact-projection, a plurality of tape-controlled members each engaging one of said levers at one end thereof, and thereby adapted for influencing such levers, each such lever having a socketed end, a jockey spring for each such lever opposite such socketed end, and itself having a socket, and a jockey member for each lever intermediate such spring and such socketed end and seated in the sockets of said lever and spring.

13. A telegraph transmitter comprising in combination a plurality of pivoted levers each carrying a contact member, a plurality of tape-controlled members mounted for substantially rectilinear movement and having a recess into which one end of the corresponding lever fits, whereby each such tape-controlled member may move its lever in both directions, means tending to move said tape-controlled members in one direction, and restoring means adapted to move said tape-controlling members in the opposite direction.

14. A telegraph transmitter comprising in combination a plurality of pivoted levers each carrying a contact member, a plurality of tape-controlled members mounted for substantially rectilinear movement and having a recess into which one end of the corresponding lever fits, whereby each such tape-controlled member may move its lever in both directions, means tending to move said tape-controlled members in one direction, and restoring means adapted to move said tape-controlled members in the opposite direction and comprising a magnet and an armature therefor, said armature having an extension engaging loosely the said tape-controlled members.

15. In an automatic impulse transmitter, the combination of opposed contact points insulated from one another and adapted for connection to sources of current supply of opposite potential, and a pivoted contact arm movable from one of said contact points to the other, and having two extensions, each at an angle to said arm, actuating means acting upon one of said extensions, and elastic pressure means acting upon the other of such extensions and tending to hold said contact arm in contact with whichever of said contact points said contact lever is in contact at the moment.

16. In an automatic impulse transmitter, a movable contact arm, adapted to move from either to the other of two positions, and having two extensions, each at an angle to said arm, means for arresting said contact arm in either of such positions, actuating means engaging one extension of such arm and adapted to move it from either of such positions to the other, and means acting upon the other extension of said arm and tending to hold it in either position which it may occupy at the moment.

17. In an automatic impulse transmitter, a movable contact arm, adapted to move from either to the other of two positions, and having two extensions, each at an angle to said arm, means for arresting said contact arm in either of such positions, actuating means engaging one extension of such arm and adapted to move it from either of such positions to the other, and elastic means acting upon the other extension of said arm and tending to hold it in either position which it may occupy at the moment.

18. An automatic impulse transmitter comprising in combination a plurality of current reversing devices and controlling means therefor comprising a plurality of longitudinally slidable members adapted to be controlled as to position by a perforated tape, elastic pressure means for pressing said members against the tape, means for retracting said members from the tape simultaneously, said means arranged to release said members subsequently, tape feed means, means for synchronizing the operation of said tape feed means with the retraction and release of said members, said members arranged to operate said current reversing devices in both directions, and means, independent of said members, arranged to hold said current reversing devices in the positions in which they may be adjusted by said members, such holding means arranged to yield to motion of the current reversing devices produced by said members.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

GEORGE R. BENJAMIN.

Witnesses:

WALTER A. HOUGHTALING,

PAUL H. FRANK.