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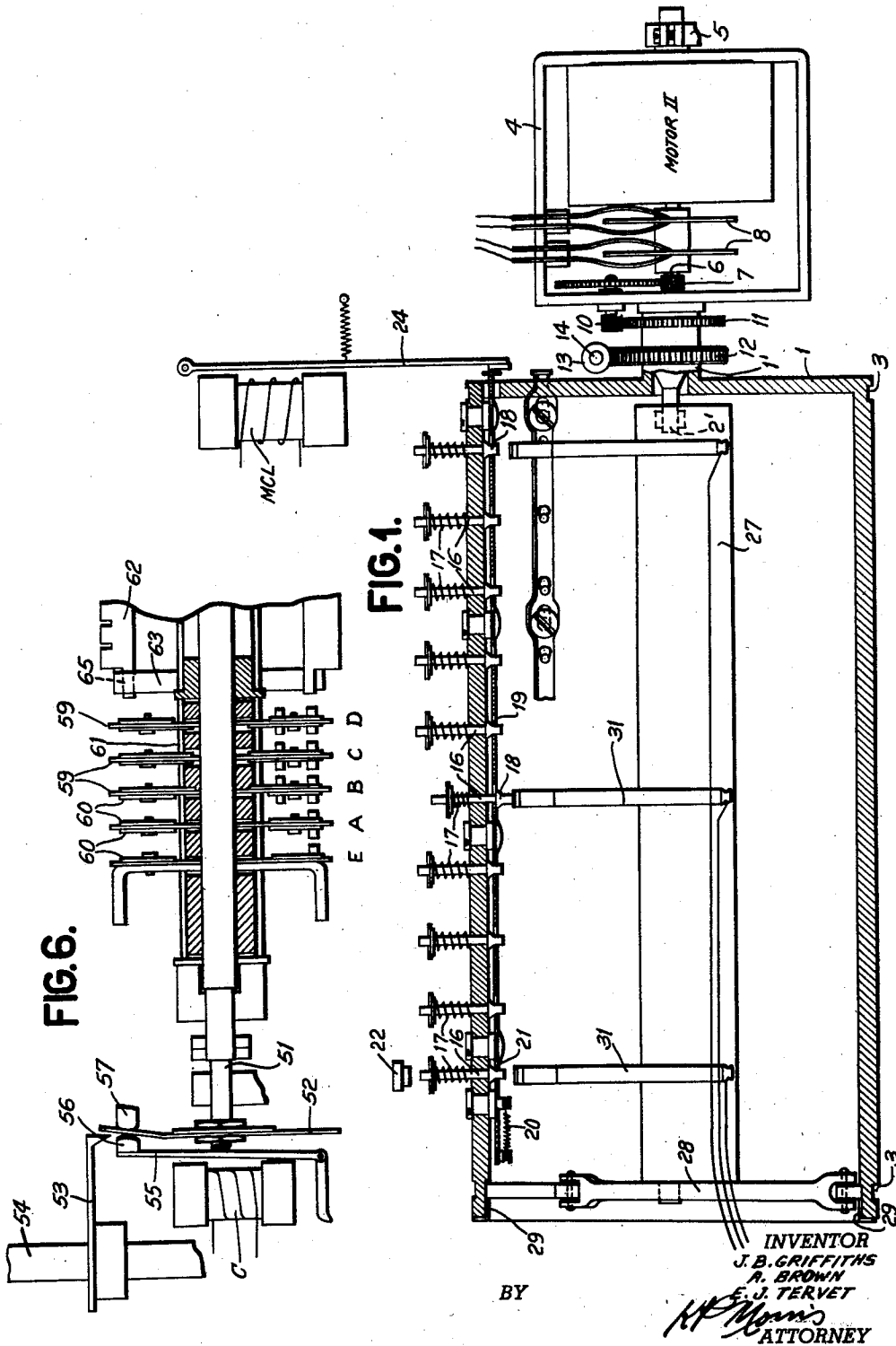
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2,298,939

TRAIN DESCRIBER AND PLATFORM INDICATOR

Filed June 9, 1939

4 Sheets-Sheet 1



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FIG.3.

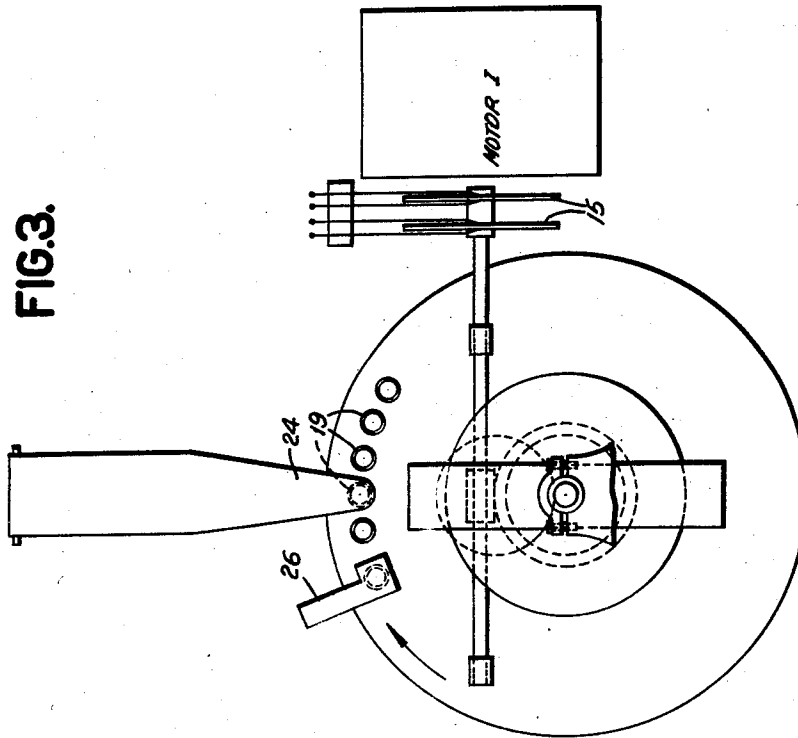
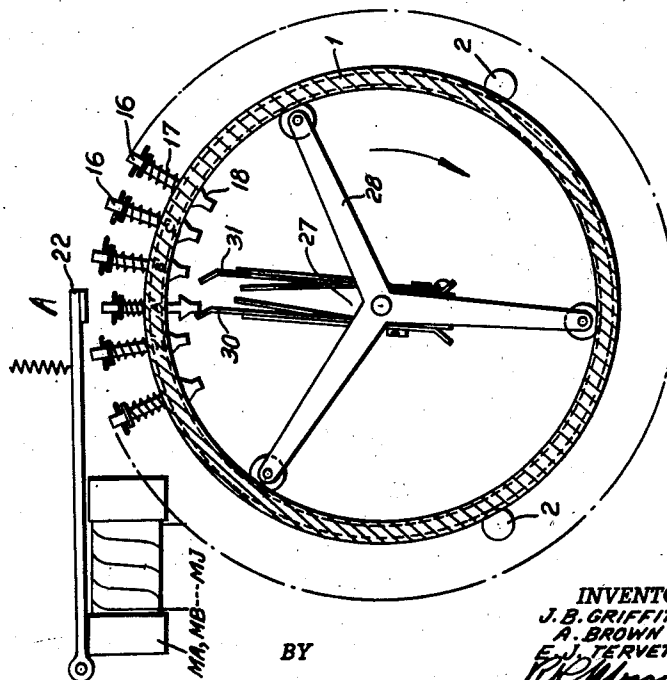


FIG.2.



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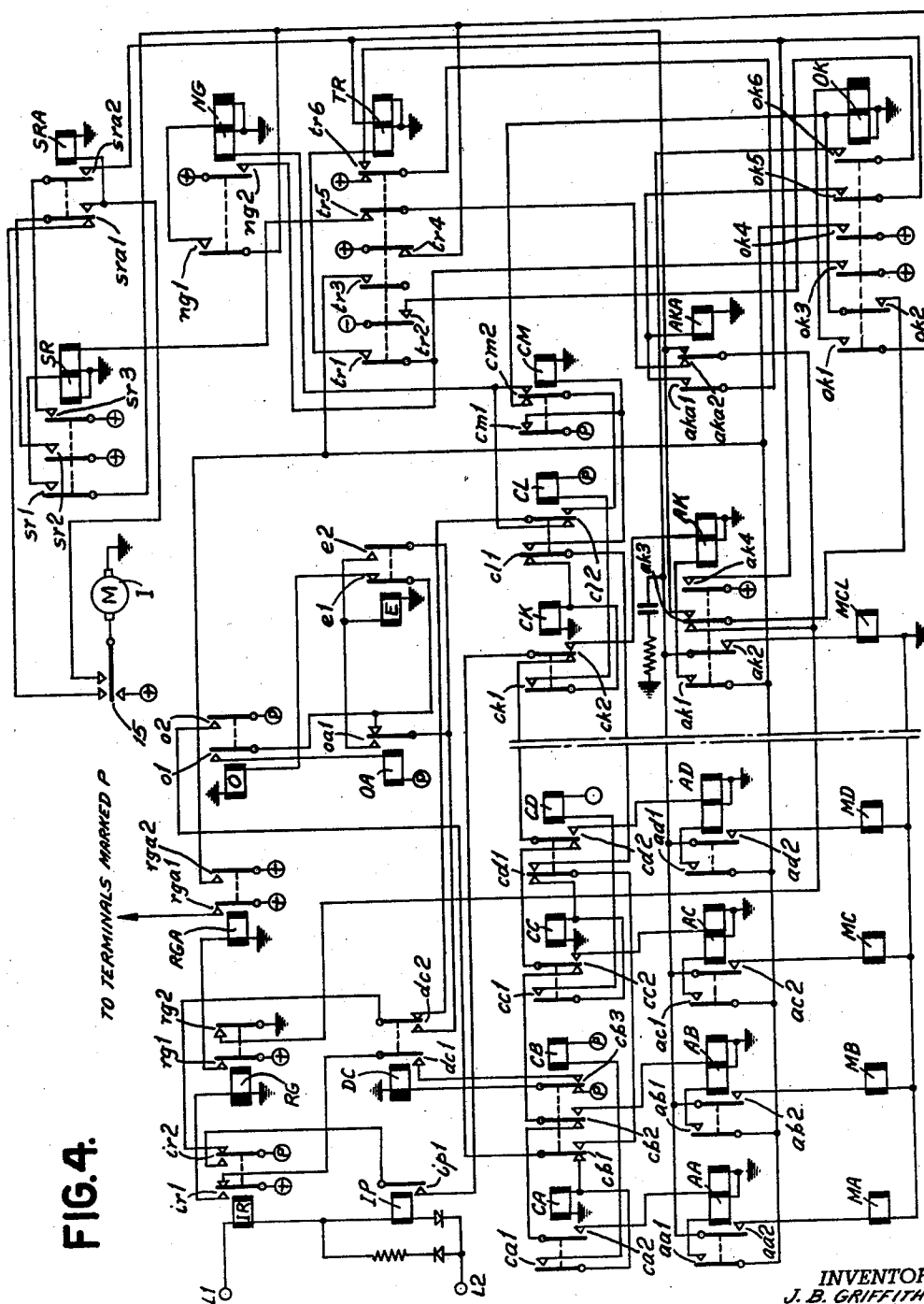
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FIG. 4.



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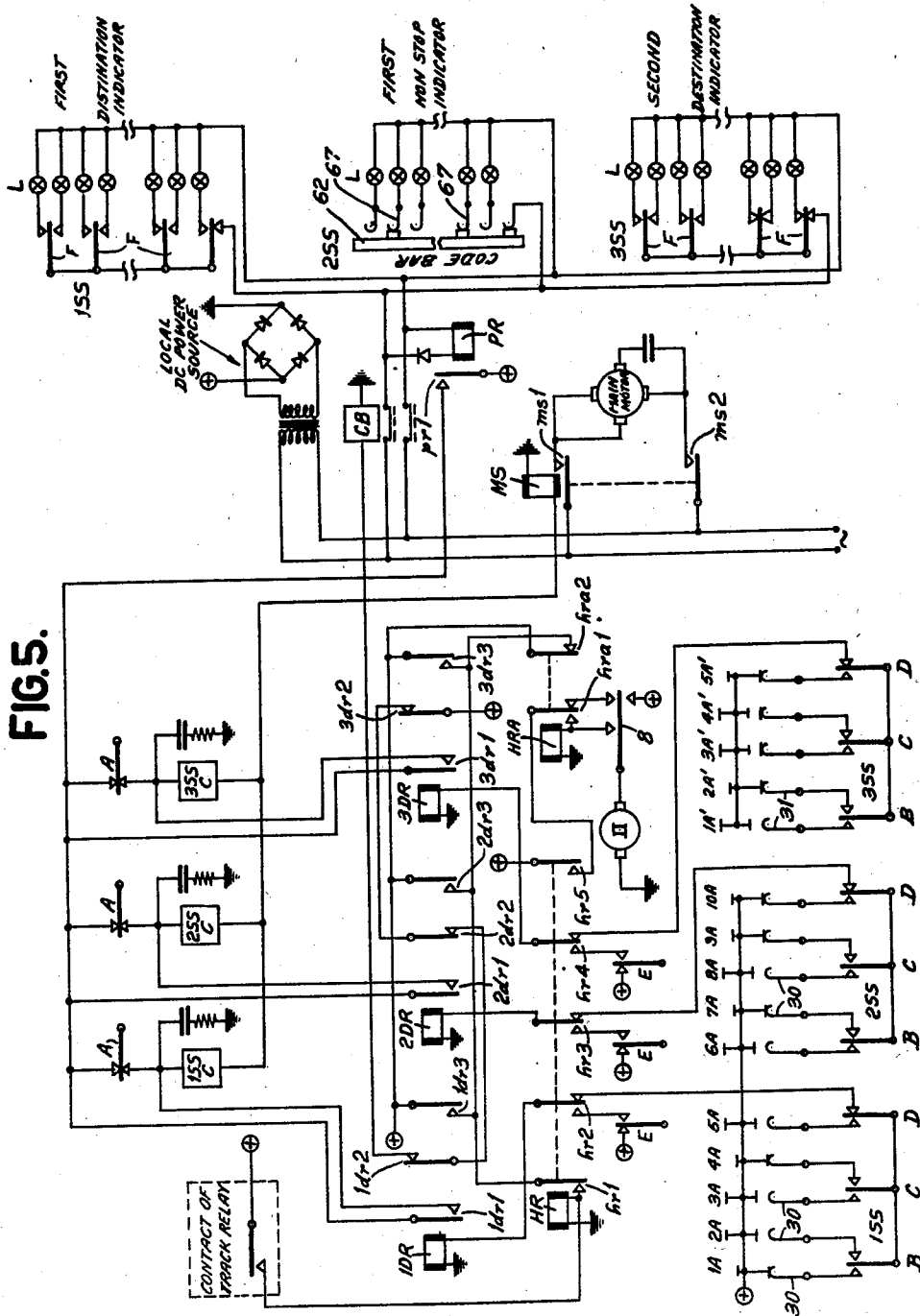
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TRAIN DESCRIBER AND PLATFORM INDICATOR

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4 Sheets-Sheet 4



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2,298,939

TRAIN DESCRIBER AND PLATFORM INDICATOR

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Application June 9, 1939, Serial No. 278,380
In Great Britain June 9, 1938

1 Claim. (Cl. 177—353)

This invention relates to equipment for storing in succession pieces of information, which will hereinafter be referred to for convenience as "descriptions"; such equipment being known in connection with train describers and platform indicators used in railway systems.

In accordance with this invention a device for storing descriptions comprises a cylinder carrying a number of sets of radially movable code-pins, the pins of a set being selectively actuated to store a description.

In accordance with a further feature of the invention, a device for storing descriptions represented by a combination of what may for convenience be denominated "active" and "passive" code-elements, for example positive and negative electrical impulses, the total of code elements in a description being always the same, comprises storage-elements arranged in a plurality of similar sets, with one storage-element in the set particular to each code-element in the code, each set being arranged to receive one description by the selective actuation of the storage-elements in accordance with the descriptive combination, and to store the received description by a mechanical locking of the elements after actuation.

One of the advantages of the invention is that by making the pins or storage-elements mechanically locking, stored descriptions will not be lost by a momentary failure of power supply. Another advantage is that the number of descriptions stored can vary, in other words the positioning of a detector device to read one or more of the descriptions stored can be independent of the positions of the sets of pins or elements.

In a railway train describer, one portion of the code, for example the first five impulses, could refer to the required "destination", the reversal of the polarity of a selected combination of electrical impulses providing the necessary distinction between a relatively large number of destinations. Similarly, the second portion of the code might also consist of five impulses, the reversing of selected combinations of which would give the necessary selection of non-stopping particulars.

Any line fault which occasioned the loss of one or more impulses or the addition of stray impulses, would produce an error in the total number of impulses in the code: in the case of platform signs, the receipt of a faulty code could be arranged to leave a blank space on the indicator, and in the case of signal cabin receivers, the receipt of a false code could, if desired, provide an alarm for the receiving signalman. In cases

where there is a number of receivers in parallel, a fault on one receiver will not interfere with the transmission of a description to other receivers, but under no circumstances will a faulty code transmission display a wrong description, either to the public or to a succeeding signalman.

The indicator display may be carried out by a motor-driven rotary switch or sequence switch. The use of sequence switches provides reliably spaced code impulses without reliance on relay timing or ratchet driven mechanism, and in addition the contact between sequence switch cams and brushes permits the use of relatively heavy contact pressures, the self-cleaning action of the rotating cams providing excellent contact surfaces.

A cancellation facility may be provided by means of which a cancel code can be transmitted to all receivers which will delete both the destination and the non-stop portions of the last description received and permit a new description to be inserted in its place. This facility is valuable, since it is probable that a signalman having transmitted a description in error, will realize his error when he is about to set up the next description.

It should be noted that the use of combinations of a relatively small number of code impulses and storage pins, very considerably reduces the size of the storage unit. For example, descriptions consisting of a selection of twenty-five destinations and fifteen codes of non-stop particulars, could, by this method, be transmitted and stored in a nine-element code as opposed to the forty which would be required if each "destination" and "non-stop" were allocated a unique impulse.

When the description reaches a display position, i. e. first or second description stored, the combination of code pins may be utilized to position two sequence switches. One of these switches has cams of the standard type cut to control the illumination of the desired destination on the platform sign to signalman's indicator. The other sequence switch controlling the display of non-stop particulars, may be equipped with easily detachable selector bars to provide a completely flexible selection of non-stopping particulars, together with the interchange of receiver units between stations. These selector bars take the form of metal inserts which can be supplied already sectionalized so that it is the work of a few minutes for a lineman to cut selector bars to correspond with the selection of non-stopping particulars required at any station and to insert the bars in the corresponding grooves in

the sequence switch. Thus it will be seen that when a sequence switch is driven to a pre-determined position in accordance with the code received, the cutting of the chosen selector bar will effect the display of the requisite non-stopping particulars.

In order that invention may be clearly understood, a description will be given of one embodiment, reference being made for this purpose to the accompanying drawings in which:

Figure 1 is a side view in section of a mechanical description storage device.

Figure 2 is a left-hand-end view;

Figure 3 is a right-hand-end view;

Figure 4 shows a circuit diagram of the receiving side of the equipment;

Figure 5 shows a circuit diagram of the indicator-change side;

Figure 6 shows in section the driving mechanism of a sequence switch.

Mechanical storage unit

The mechanical storage unit is shown in Figs. 1 to 3, and takes the form of a cylinder carrying a number of angularly-spaced parallel sets of radially-movable code pins, and a detector within the cylinder. A combination of pins of a set can be operated to store a code received, the operated code pins being mechanically locked in position until they have subsequently been detected to control the description displayed. The cylinder is moved round through one step, that is through the angular distance between two adjacent sets of pins, each time a description is to be received, and in so stepping takes the detector with it. The detector on the other hand moves one step in the opposite direction each time the display is to be changed, this stepping being effected either manually, or automatically in response to the operation of a track relay by the outgoing train.

The cylinder 1 is mounted on a horizontal axis, supported by bearing rollers 2 running in circumferential grooves 3 on the outside of the cylinder. At one end the cylinder 1 is formed with a sleeve portion 1' which constitutes a journal for a stub axle 2' fixedly mounted on a drum 4, this drum being supported also in a bearing block 5 at its other end.

Within the drum 4 is housed an electric motor and its step-down gearing, the two being indicated in the drawings under reference motor II. The motor shaft 6 carries a pinion 7 and also off-normal cam discs 8 by means of which the motor II when once started up is caused to give one complete revolution to its shaft 6 and then come to a stop. The pinion 7 is in constant mesh with a gear 9 rotatably mounted on a shaft extending through a bearing in the end wall of the drum 4, and to this shaft is secured a pinion 10 meshing with a gear 11 fixed on the sleeve 1' of the cylinder 1. The gear-combinations 7-9, and 10-11, each have a step-down ratio of 1-to-6, so that when the motor II is set into motion to give one complete revolution of the shaft 6 there occurs a relative movement between the drum 4 and the cylinder 1 of one-thirty-sixth of a revolution, or ten degrees.

The sleeve at the end of the cylinder also carries fixedly a worm-wheel 12 meshing with a worm 13 which is fixed on a shaft 14 driven from a motor I through a step-down gearing, and, by the provision of the off-normal cams 15, Fig. 5, referred to below, made to execute one complete revolution whenever the motor I is started up.

The gear-ratio between the worm 13 and worm-wheel 12 is one-to-thirty-six; hence whenever the motor I is started up the cylinder 1 is stepped round through ten degrees, and, assuming that the motor II is not then running, the drum 4 is carried with it.

The code-pins 16 are arranged in sets of ten, each set corresponding to a train-description and being arranged in a straight line parallel with the cylinder axis with the individual pins passing radially through the cylinder wall. The sets are spaced from one another by an angular distance of ten degrees so that there are thirty-six sets in all. Each pin 16 is urged outwardly by means of a spring 17, and is stopped by means of a shoulder on a conical portion 18 of the pin itself. Beneath each set of pins and running the whole length of the cylinder is a latching bar 19 which is constantly urged towards the right by means of a spring 20. Key-hole slots 21 in this bar allow the conical heads 18 of the pins to pass through only when the bar is in its leftward position. The action of depressing any one pin, or any two or more pins simultaneously, forces the bar to the left until the pins are fully depressed, when the bar springs back to the right again and the pins are retained in the operated position.

For operating that set of pins which at any moment is in the description-receiving position, shown at A' in Fig. 2, there is provided a set of ten strikers 22 each of which is operated when its associated magnet MA, MB, . . . MJ is energised, and in operating strikes the underlying pin 16 to press it inwardly until it latches. Also, for the purpose of releasing all the latched pins of the set last operated, this in response to a special cancel signal, there is provided a cancel striker 24 and operating magnet MCL adjacent the end of the latching bar 19.

For releasing the pins of an obsolete description before the cylinder has gone full circle, a fixed ramp 26, Fig. 3, is provided just in advance of the description-receiving position to engage the ends of the bars 19. This is necessary where two or more descriptions can be read simultaneously as will be understood from what follows.

The detector device is arranged inside the cylinder and comprises a beam 27, Fig. 1, which is supported at one end by a spider 28 riding on the interior of the cylinder, and at the other end by its slotted engagement with the stub axle 2' already referred to which projects from the drum 4. The detector can thus be removed and inserted very easily once the holding ring 29 on the end of the cylinder has been removed. Fixed on the beam 27 is a series of spring-contacts 30, each contact being disposed beneath one of the pins 16 so that it will be operated when that pin is depressed. This series reads the train description of the first train due; similar series for later trains may also be provided, and Fig. 2 shows a series 31 spaced ten degrees behind the first.

The functioning of the apparatus is as follows:

Let it be assumed that a description has just been set up, the circuit for doing so being described further on. This description will be stored on the set of pins indicated at A' in Fig. 2, certain of which have been depressed and held by the latch bar 19. This set A' will remain in the description-receiving position as shown until the next description is about to be received, so that at any time up till then the operator at the distant transmitter can cancel the description trans-

mitted should he find that he has made a mistake. Of course it would be possible to have the cancel mechanism 24 set back one step, and to have the stepping of the cylinder follow immediately upon setting-up; but such an arrangement would deprive the transmitting signal-man of the opportunity of sending a new train description, for storage in that same set, after the first has been cancelled.

Now let it be supposed that a second train description is about to be received. The circuit arrangements for receiving the description will be discussed in detail with respect to Fig. 4; it is sufficient for present purposes to say that the first action is the starting up of motor I. The motor I causes shaft 14 to execute one complete rotation, stepping the cylinder 1 round through ten degrees in an anti-clockwise direction as seen in Fig. 2. If the motor II is inoperative at this time, the drum 4 will move in unison with the cylinder, and will carry with it the detector mechanism 27—30—31. Thus the contacts 30 will continue in engagement with the pin-set A' in the new position, formerly occupied by set Z', ten degrees to the left of the vertical, and the pin-set B' together with the contacts 31 will be in description-receiving position. When the complete description has been received on the appropriate relays and has been found satisfactory, certain of the magnets MA, MB, . . . etc., selected according to the code, will be operated simultaneously, depressing the corresponding pins 16, these latching. The contact set 31 will then be selectively operated, to give a display or transmission of the description pertaining to the second train due.

Should the operator at the distant transmitter then find that he has made an error, he can send the special cancel signal, which will energise magnet MCL to operate striker 24 and release the hold of bar 19 on the pins. This will not only itself cause no stepping of the cylinder, but will prevent, by circuit arrangements described below, such a stepping before the next description is sent, so that the pin-set B' remains in position to receive such fresh description.

Now let it be assumed that the train A' has passed out from the station so that the description has to be removed from the indicator board and the train-description B' has to be brought into the position "Next train due." Either manually or automatically the motor II is set into operation, giving one complete rotation to the shaft 6. This causes the drum 4 and the associated detector mechanism to rotate through ten degrees in the clockwise direction of Fig. 2, bringing contacts 30 into engagement with pin-set B', and contacts 31 with pin-set C'.

This condition, namely one description only in store with a detector mechanism capable of reading two descriptions, shows the need for the fixed ramp 26, since in its absence the contacts 31 intended to read "Second train due" would be reading the obsolete description of the thirty-sixth earlier train. However, the arrangement may be such that the description is not displayed when it is in the receiving position but only after it has been stepped away, this would have the advantage of preventing displays from being given while they are still open to cancellation, but would not be satisfactory where there might be only one train at a time in the system.

It will be appreciated that although for explanatory purposes the motors I and II have been regarded as running only one at a time, in fact

it is quite possible for both to be running together, motor I turning both cylinder and detector anti-clockwise, and motor II turning the detector clockwise with respect to the cylinder, so that its movement in space is neutralised.

It will also be noted that the extent of movement of the detector is never more than one complete revolution; as a consequence of this the leads from the contacts 30 and 31 can be of a simple kind, there is no necessity for brushes and like equipment necessary with continuously rotating members.

Incoming circuit arrangement

The operation of the mechanical equipment just described is dependent upon the use of a suitable circuit arrangement, and such an arrangement will now be described with reference to Fig. 4.

In this circuit and also in the circuit of Fig. 5 the relays are designated by capital letters, the relay tongues are numbered consecutively and are designated in the specification by lower case letters corresponding to the reference characters indicating the particular relay and a numeral indicating the tongue member.

The signals from the distant transmitter come in over the pair of wires L1, L2, and consist of a constant number of impulses, thirteen in this case, made up of a long preliminary pulse, ten code impulses, a twelfth impulse, and a long final pulse. The preliminary pulse is for preparatory or starting purposes and is always negative; the ten code impulses may be negative or positive, the train-descriptive information being conveyed by the combination of negative and positive impulses; the twelfth impulse is negative during ordinary descriptive transmissions, but is reversed in polarity for the purpose of cancelling the last description set up; while the final long pulse, always negative, causes actuation of the strikers 22 (Fig. 2) of which the magnets are also shown at MA, MB, etc. in Fig. 4.

Every impulse, positive or negative, energises the relay IR, but only the reversed or positive impulses energise relay IP also. The first long pulse, the ten code impulses, and the cancel impulse energise in succession the twelve relays CA, CB, . . . , CL; and of these the first eleven prepare successively the circuits for the eleven relays AA, AB, . . . , AK, so that these will be operated if the next impulse is positive. A received impulse train consisting of the correct number of impulses will, at the end of the first twelve impulses, leave relay CL operated and relay CM unoperated, thus allowing operation of slow to release relay OK on the thirteenth pulse, to cause firstly energisation of the stepping relay SR and secondly energisation of striker relay TR. If too few impulses have been received, so that CL is unoperated, or too many, so that CM is operated, the fault relay NG is operated to move the drum a step, but no striking of the pins. The cancel signal, given by a reversal of the polarity of the twelfth impulse, operates the relay AK which is one of the series AA, AB, etc.

Considering this circuit now in detail, when the first long pulse is received, this pulse always being negative, relays IR, slow-to-release relay RG and RGA are successively operated by closure of contacts *ir1* and *rg1* respectively and relay RGA applies at its contacts *rga1* general battery feed P to the system.

This causes slow-to-release relay DC to ener-

gize from the back contact *cb3*. At the end of the preliminary pulse relay IR is released and completes a circuit from source P for the operation of relay 0, via back contact *ir2*, front contact *dc2*, back contact *oa1*, back contact *e1* to the winding of relay 0. At *o1* of relay 0, a circuit is closed through the winding of relay OA to source P, but this relay is not immediately operated because it is shunted by the circuit previously described from source P through back contacts *ir2*, etc., through the winding of 0; however on receipt of the first of the ten code impulses, whether positive or negative, relay IR is operated, and the circuit to relay 0 is broken at *ir2* which opens the shunt across OA causing the immediate operation thereof before contacts *o1* break, the circuit being from P, windings OA contact *o1*, back contact *e1* winding of 0 to ground.

With the operation of relay OA, a circuit is prepared for relay E by the closing of tongue *oa1* with its front contact and when the first code impulse ends, and relay IR is deenergized, the back contacts *ir2* are again closed, energizing relay E over a circuit from P, *ir2*, front *dc2*, front *oa1*, winding of relay E to ground. Relays 0 and OA are released by the opening of contacts *e1* which opens the circuit to winding 0, causing contacts *o1* to open the circuit from OA. Tongue *e2* is in parallel with *oa1* and maintains the locking circuit through E when *oa1* moves to its back contact.

At the beginning of the second code impulse, relay E is released by the operation of IR which causes tongue *ir2* to break with its back contact, while at the end of this same impulse, relay 0 is again energized as it was at the end of the long starting pulse.

Thus, relay 0 is energized at the end of one impulse, released at the end of the next, energized at the end of the next, and so on, being finally released at the end of the twelfth pulse.

Consider now the effect of the successive operations of relay 0 upon the relay series CA—CL. On its first operation, a circuit is closed to operate relay CA thus closing contacts *ca1* and *ca2*. The circuit may be traced as follows. Source P, contacts *o2*, back contacts *cb1*, winding CA to ground. When *ca1* closes, a circuit is completed from P through winding of CB, contacts *ca1* winding of CA to ground. Winding CB is shunted by the circuit from P, via *o2* back contacts *cb1*, and CB energizes only when this shunt is broken by the first release of relay 0, opening contacts *o2*, thereupon both CA and CB lock in series by means of the circuit just described.

Similarly, on the second operation of relay 0, the relay CC is energized via a circuit from P, *o2*, front *cb1* back *cd1* winding of CC to ground causing operation of contacts *cc1* and *cc2*. The closing of *cc1* establishes a circuit from P, winding of relay CD, contacts *cc1* winding of CC to ground. As in the case of relay CB, relay CD is shunted by a circuit from P, *o2*, front *cb1*, back *cd1*, until the termination of the impulse whereupon 0 is deenergized, contacts *oa* open breaking the shunt circuit and CD and CC lock up in series through contacts *cc1*.

In the same manner, at the end of each of the first twelve incoming impulses, one of the relays CA—CL is energized, until eventually all twelve will be locked in.

With the successive operations of relays CA, CB, CC, etc., the relays AA, AB, AC, etc. are

selected one at a time by the contacts *ca2* *cb2*, *cc2*, etc. to be energized if the next incoming impulse is positive. Thus relay CA, operated at the end of the long preliminary pulse, closes its contacts *ca2* leading to the terminal of one winding of relay AA. If the first code-impulse is negative there will be no effect upon relay AA since relay IP responds only to positive impulses, and the contacts *ip1* thereof will be open, cutting off the potential from the operating circuit of these relays; but if it is positive, then *ip1* will be closed and a circuit will be completed from P, front contacts *ir2*, *ip1*, back contacts *ck2* . . . *cb2*, front contacts *ca2* winding AA to ground and relay AA will be operated, and locked in by a circuit from positive potential, contacts *rga2*, *aa1*, second winding of AA to ground. Irrespective of the polarity of the next impulse, the closing of contacts *cb2* at the end of the impulse, will connect a winding of relay AB in place of AA to the operating circuit just described, so this in its turn will be operated and locked in if the second code-impulse is positive.

It may be noted here that as a result of the operation and locking of one of the relays CA, CB, etc., relay DC is made to lock over a circuit from positive potential, back contact *ir1*, front contact *dc1*, front contact *cb3*, winding of DC to ground. DC is a slow to release relay, and holds for the time of a short impulse, despite the opening of back contacts *ir1*.

At the end of the last of the eleven short impulses, relay 0 releases causing the operation of relay CL in the same manner as described above in connection with relay CB.

The next and last pulse to be received is a long one, which will hold relay IR over long enough so that relay DC is released at *ir1*. In consequence, the operating circuit to relay 0 is broken at front contacts *dc2*, and instead a circuit is prepared for the operation of relay OK, which follows at the end of the pulse when IR releases. The circuit is traced as follows: P, back contacts *ir2*, *dc2*, front contacts *cl2*, back contacts *cm2*, one winding of relay OK to ground.

Relay OK locks in by a circuit from a source of positive potential, back contact and tongue *tr4*, front contact *ok1*, second winding of OK to ground.

At *ok2* a circuit is closed to the stepping relay SR, as follows: P back contacts *ir2*, *dc2*; front, *cl2*; back, *cm2*; front *ok2*; back *ak3*; back *aka2*; back *tr5*; winding SR to ground, which operates SR closing contacts *sr1* and *sr2* causing motor I to be started to perform its prescribed movement via a circuit from a source of positive potential, front contacts *sr2*, back contacts *sra1*, off normal cams 15, to motor I.

Relay SR locks in by a circuit from positive potential, back contact *tr4*, contact *sr1*, second winding of SR to ground.

When motor I has completed its movement previously described, relay SRA is energized from a contact on off-normal cam 15, and locks in by means of a circuit from *sr2*, front contact *sra1*, winding SRA to ground, closing a circuit to relay TR from a positive source of potential, via *sr3*, *sra2*, one winding of TR to ground, operating TR and closing a circuit from a negative source of potential, contacts *tr2*, *ok6*, to the tongues *aa2*, *ab2*, . . . *ak2*, and thence through the windings of any of the selected striker magnets MA . . . MD, or MCL to ground, causing the operation thereof.

Relay TR in operating, opens at *tr4* the lock-

ing circuits to relays OK and SR, releasing these relays, and opening at *sr2* the locking circuit of SRA, which releases and opens it contacts *sra2* releasing relay TR. Thus the receiving circuit will be restored to normal to await the transmission of the next train description.

As already described, a train description that has been set up is not stepped onward until this is necessary for the reception of a further description. If now the transmitting signalman desires to cancel the last description set up, he sends the cancel signal, which consists as before of a long pulse, eleven short impulses, and a long final pulse, all being negative except the last short impulse. The operation of the relays CA, CB, . . . , CL will be as already described, but of the relays AA, AB, . . . , AK, only AK will be operated, preparing the circuit at *ak2* for the cancel magnet MCL. At *ak3* the operating circuit to the relay SR is broken, and the final long pulse is passed direct to the striker relay TR, causing cancellation without previous stepping. The circuit may be traced as follows: From negative potential *tr2*, *ok6*, *ak2*, cancel magnet MCL to ground. In addition the relay AKA is operated, by a circuit from positive potential *ak4*, *ok5*, winding AKA to ground. The operation of AKA breaks the circuit at *aka2* via *tr5* to stepping relay SR thus preventing the operation of this relay and motor I to avoid the appearance of blanks on the indicator and the impulse, instead, at front contact *aka2* goes to a winding of TR, which operates, and locks in, and releases by the circuits described above. Once operated, AKA locks in by a circuit from positive potential, tongue and back contact *tr6*, *aka1* front contact, winding AKA to ground. AKA remains locked up until TR is operated in the subsequent train description.

Faulty code

If a code is received which consists of too few impulses, so that CL is inoperative, or too many, so that CM is operated, the long final pulse is transferred from the OK relay to the NG relay at *cm2*. The relays SR and TR then operate in the way already described, but the operation of relay TR fails to cause the striker magnets MA, MB, . . . to operate owing to the fact that contacts *ok6* are open which cuts off the operating battery from *tr2*.

Detector circuit arrangement

Reference will now be made to Fig. 5 for a description of the circuit associated with the detector part of Figs. 1-3 and including the display indicators.

The ten code-elements, stored by means of the ten pins constituting a set, are divided into two groups of five each, one group for describing the train-destination, and the other group for the non-stop stations.

The five wipers 30 (Fig. 2) which give the destination description are associated with a first sequence switch 1SS (Fig. 5), while the five wipers concerned with the non-stop data are associated with a second sequence switch 2SS. A third sequence switch 3SS is used for the destination description of the second train due, i. e. in association with the first five wipers of the second contact set 31 (Fig. 2). It has not been thought necessary for purposes of description to provide for this second train due, a non-stop indication, but of course this could easily be

given, as could data concerning other trains after the second.

The sequence switches SS, of which the mechanical details will become apparent from the description of Fig. 6 below, are of a well-known kind, having a single shaft carrying five cam discs A, B, C, D and E. Such sequence switches are well known in the automatic telephone and railway signalling arts, and their various arrangements for cam and contact circuits are well known, and since the structural details of the sequence switches form no part of the present invention, they will only be referred to briefly, for the purposes of explanation. In each sequence switch three cams B, C and D are associated with the wipers terminating the leads from the contacts 30 shown diagrammatically in Fig. 5 and are cut so that an electrical circuit is established for certain positions of the shaft; the right-hand wiper of cam D is constantly in engagement, and leads to a drive relay DR which so long as it is energised causes the sequence switch shaft to rotate. Thus if one of the cams, say cam B, is cut so that on its left-hand side it makes circuit during the first half-revolution of the switch shaft, and on its right-hand side makes circuit during the first and third quarters, then the following possibilities exist for setting the switch: if pin No. 2A is down the switch shaft will advance through one-quarter revolution; if pin No. 1A is down the advancement will be through one-half; and with both pins down it will be three-quarters. This principle can be extended to the other cams so that with a switch as shown thirty-one angular positions of the shaft are provided for, apart from the home position. The cam disc E is one which makes contact in all positions other than the home position and thus serves to return the switch to normal when the homing relay contacts *hr2* are changed over. The cam disc A is for the purpose of setting the switch accurately and precisely in the position to which it is displayed by the depression of a certain combination of pins 16. The operation of a sequence-switch driving-relay 1DR, 2DR, etc. closes at *1dr1*, *2dr1*, etc. a circuit for the corresponding magnetic clutch, 1SS/C, 2SS/C, etc. and for the motor-start relay MS. The main motor Fig. 5, common to all the sequence switches, is made to run so long as any of the DR relays are operated, and is clutched to any of the sequence switch shafts so long as the corresponding clutch magnet C is energised. Contacts *1dr1*, *2dr1*, *3dr1* are fed from a source of positive potential and back contact of relay PR the winding of which is connected through a rectifier across the leads from an alternating current source which operates a series of selectable lamps. The contacts of a circuit breaker CB are in series with the source of alternating current and relay PR. When CB is energized by a circuit from positive potential, back contacts *3dr2*, *2dr2*, *1dr2*, winding CB to ground the circuit breaker contacts are closed, the selected lamps are illuminated and relay PR is operated holding its tongue away from its back contact, thus opening the battery circuit to the wipers of cams A and the respective contacts *1dr1*, *2dr1*, *3dr1*, preventing the operation of the corresponding clutches. This arrangement serves to prevent illumination of the display board while the sequence switches are in motion.

It will be understood that thirty-one permutations are possible with each of the three groups of five pins, and with the cam arrangement de-

scribed, any of the sequence switches may be rotated selectively to any of thirty-one positions. In accordance with well known practice, rotary contact members other than those above described may be provided which engage either singly or in combination with stationary contacts, provided according to circuit requirements in the various positions of the switches.

The circuit arrangement now about to be described shows one form of an indicating arrangement.

The illumination of the appropriate lamps on an indicator is given by a further set of cams F' on the shaft of the sequence switch. A circuit is established through any one of their wipers at any one setting of the switch and causes one of the lamps L to be lit up.

As regards switches 1SS and 3SS, these cams are cut the same for all stations since all stations will need to give the same display in response to the same incoming code: but with the non-stop indicator associated with sequence switch 2SS this will not be so, the meaning of a received code indicating non-stop will be different from station to station, consequently the cams F' of switch 1 are replaced by code bars in switch 2 having contacts suiting the requirements of the respective stations.

The circuit shown in Fig. 5 includes means for automatically changing the setting of the indicator boards when the "first train due" has come and gone. The passage of the train away from the station or signal box causes the contacts of a track relay to close, energising the homing relay HR, which locks over *hra2*. At *hr2*, *hr3* and *hr4*, circuits are closed for relays 1DR, 2DR, 3DR, to restore the three sequence switches to normal, whilst at *hr5* feed is supplied through the contact of off-normal cam of to the motor II, so that this motor will start up, and being started will give one complete revolution to its shaft 6. This results, as already described with reference to Figs. 1 to 3, in a stepping round of the detector mechanism in the clockwise direction of Fig. 2. Just before the end of the prescribed one revolution, the cam 8 closes a circuit to the relay HRA, which opens the normal locking circuit to relay HR at *hra2*. Accordingly, when all three switches SS have reached their home positions, the circuits over cams E to the driving relays DR will be opened, releasing relay DR, then HR, and HRA. By this time the contacts 30 and 31 will each be engaged by a fresh set of pins 16, and when the contacts *hr2*, *hr3*, *hr4* again make to the cams B, C and D, the sequence switches will be started up again, from their home positions as is essential, to give a new display.

Sequence switch mechanism

Figure 6 shows the general construction of a sequence switch driving mechanism.

The shaft 51 of the sequence switch has at one end a gear 52 which is flexible, and which, when allowed to assume its normal, planar condition engages with a crown-wheel 53 on the shaft 54 of the main motor shown in Fig. 5.

When the sequence switch is at rest the flexible gear is warped under the pressure of a spring (not shown) acting upon an armature 55 carrying a rubber buffer 56 which co-operates with a similar fixed buffer 57 to brake the movement of the switch shaft, stopping it immediately the

clutch has been released. The flexible gear 52 is freed, to clutch the switch shaft 51 to the driving shaft 54, when the clutch magnet C is energized.

Fixed on the switch shaft 51 are the five cam discs A, . . . E; each consisting of an insulating carrier 59 and a pair of conducting facings 60 each pair being permanently connected together, as by conducting rivets passing through the carrier. In addition the adjacent facings of the cams B, C and D are extended inwards to engage spacing bushes 61, so that the six facings are in permanent connection with one another.

The remainder of the selecting cams F on shaft 51 cooperate with stationary contacts in the usual manner, or an alternative arrangement may be used in which radially placed code bars 62, Figures 5 and 6, may be used, having projecting teeth which when the bar assembly is rotated engage stationary contact members, according to well known practice and thereby close selected circuits. This latter arrangement makes substitutions in existing display circuits easy, because the display bars may be changed readily. With this arrangement, when any one bar is brought into reading position by the displacement of the sequence switch it engages with a set of contacts 67, Fig. 5, which are selectively operated according to their meeting a tooth or a gap, thus causing the appropriate indication to be displayed.

What is claimed is:

A system responsive to received code signals wherein each code signal comprises a first long impulse followed in succession by a plurality of code impulses and a cancel impulse, a group of relays arranged to be operated in succession by said first impulse and said code impulses, a rotary drum, a plurality of axially disposed rows of displaceable pins on said drum, the pins in each row corresponding in number to the number of code impulses of each signal, a second group of relays arranged to be energized only on receipt of code impulses of a predetermined polarity over circuits prepared by the operation of the first group of relays, a plurality of striker magnets each controlled by a circuit prepared by the operation of a relay of said second group of relays, armatures for said striking magnets having a striking part, said striking parts each being disposed over a pin in one of the rows on said drum whereby actuation of a striker will displace the corresponding pin, a detector comprising a row of contacts disposed on a rotary support inside of said drum, indicator control circuits operated by said contacts, means for advancing said support a step at a time in reference to said drum so that the contacts thereon will be operated when brought into engagement with the displaced pins of a row, means responsive to a code signal to advance said drum a step so that a new row of pins is positioned under said strikers to be displaced according to the code impulses of said signal, a common locking means for each row of pins on a drum, means responsive to a special code signal including a cancel impulse for tripping said locking means and thereby releasing the set of pins last actuated, and means responsive to said special code signal for preventing the operation of said means to advance said drum.

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