E. TYER.

APPARATUS FOR CONTROLLING THE TRAFFIC ON SINGLE LINE RAILWAYS.

APPLICATION FILED OCT. 10, 1910.

1,024,233.

Patented Apr. 23, 1912.

4 SHEETS—SHEET 1.

Fig. 4.

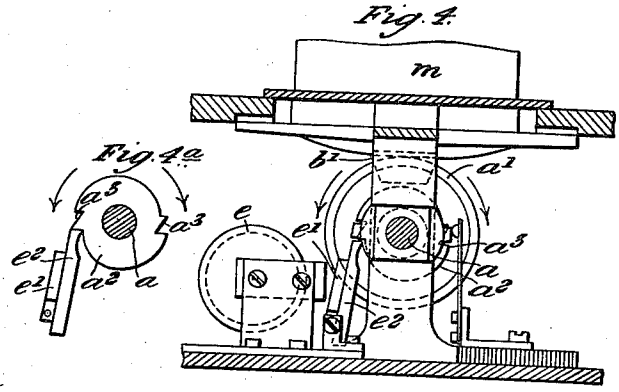

Fig. 2a

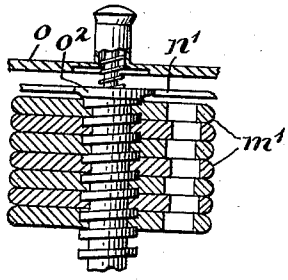

Fig. 1.

WITNESSES

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Fig. 2.

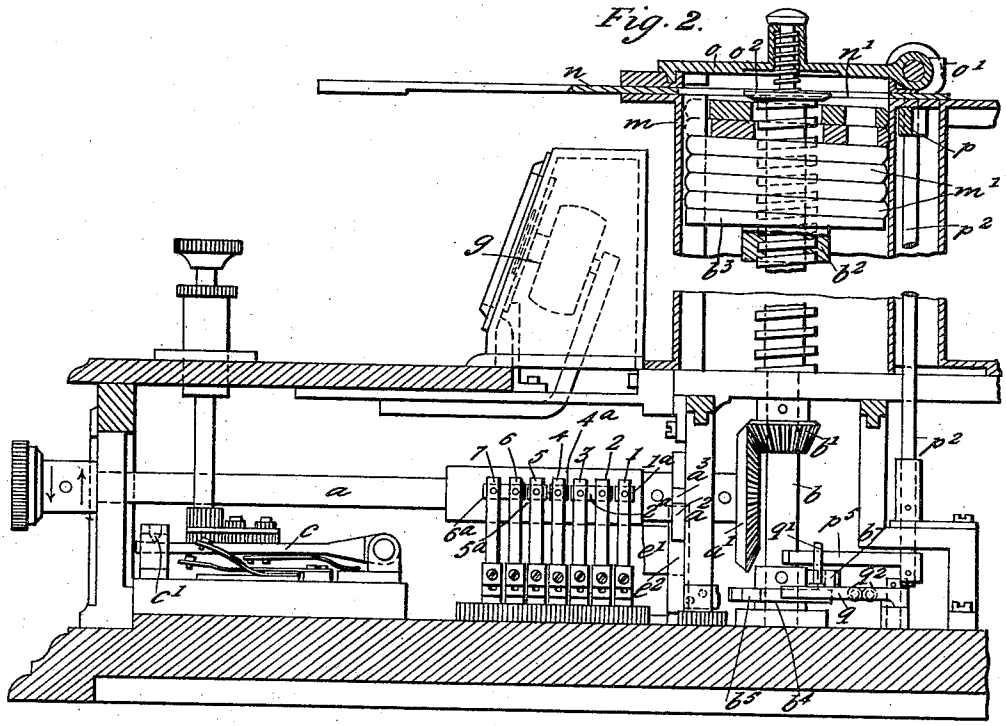
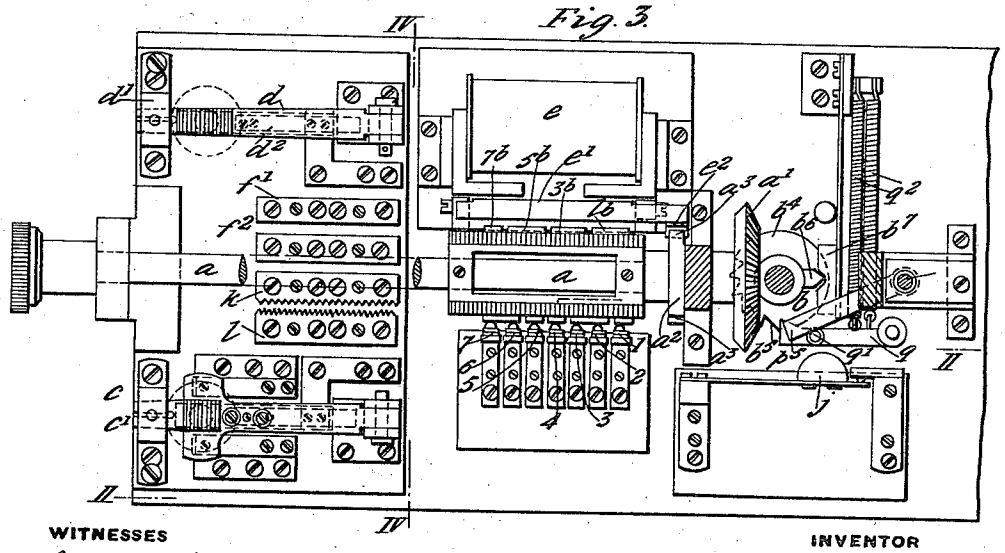


Fig. 3.



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4 SHEETS—SHEET 3.

Fig. 5.

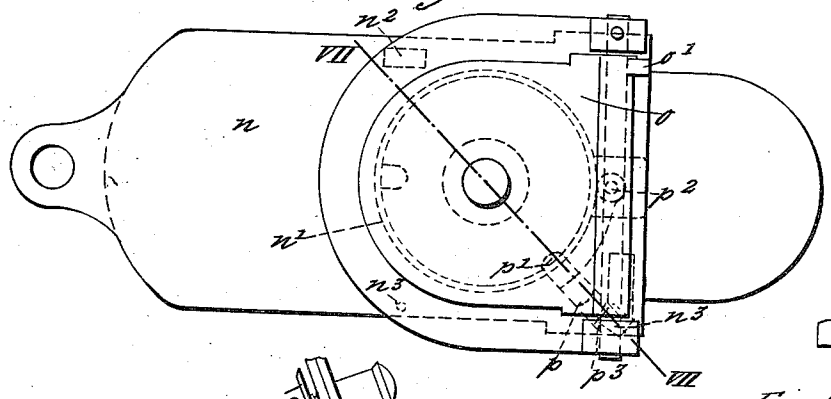


Fig. 6.

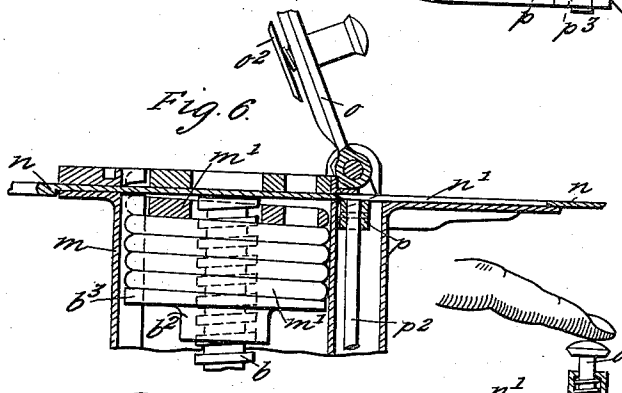


Fig. 9.

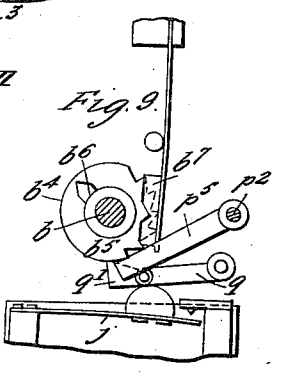


Fig. 7.

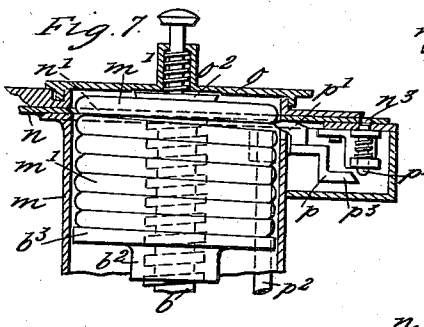


Fig. 8.

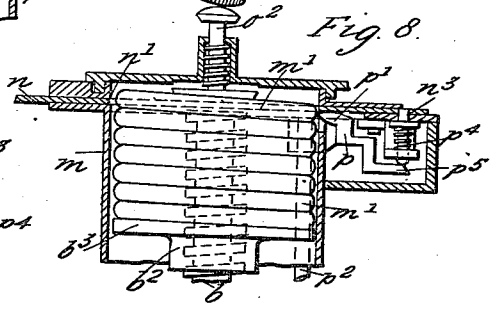


Fig. 10.

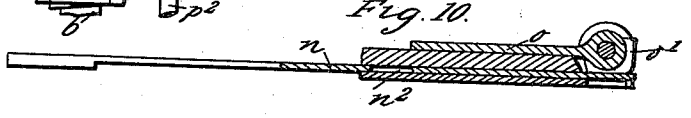
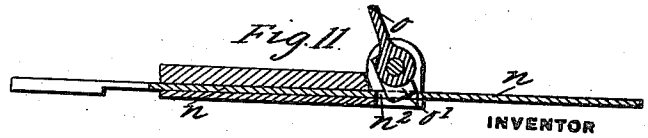


Fig. 11.



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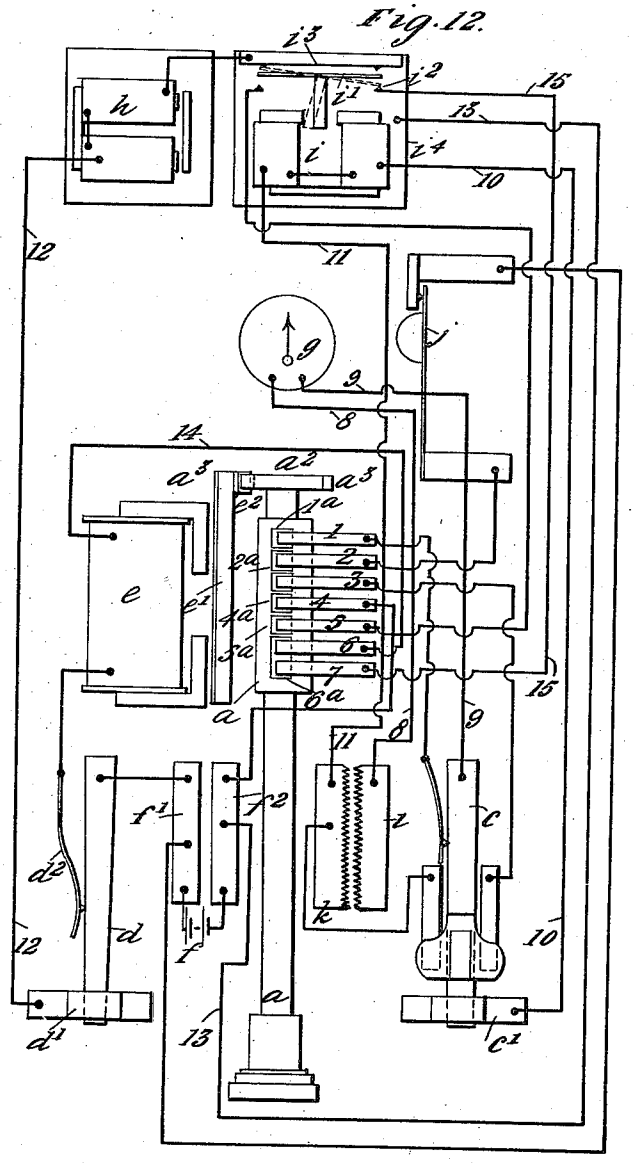
4 SHEETS—SHEET 4.

Fig. 12.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR CONTROLLING THE TRAFFIC ON SINGLE-LINE RAILWAYS.

1,024,233. Specification of Letters Patent. Patented Apr. 23, 1912.

Application filed October 10, 1910. Serial No. 586,166.

To all whom it may concern:

Be it known that I, EDWARD TYER, a subject of the King of Great Britain, residing at Ashwin street, Dalston, in the county of London, England, electrical engineer, have invented certain new and useful Improvements in Apparatus for Controlling the Traffic on Single-Line Railways, of which the following is a specification.

I have described in previous patent specifications various constructions of apparatus for insuring safety on single lines of railway by controlling electrically the issue of tablets which are carried by the trains in passing over the various sections of the line. Such an electrically controlled tablet apparatus is described, for example, in British Patent Specification No. 1904 of 1891, and the improved construction of tablet apparatus which constitutes the present invention is, generally speaking, very similar in character and operation to the apparatus described in the aforesaid specification.

The chief features of novelty comprised in the new and improved construction relate to the means for storing, withdrawing and replacing the tablets and to the safety device for preventing tampering with the apparatus. Thus, the tablets are stored in a cylindrical magazine which may be either vertical or horizontal and are moved as a column so as to bring them into position for the withdrawal of a tablet by means of the rotation of a screw-threaded spindle which is geared with the commutator spindle in such manner that half a turn of the latter (which reverses the commutator) causes the tablet spindle to be rotated through a complete turn, the pitch of the thread of the tablet spindle being equal to the thickness of a tablet. The tablets may have their center holes screw-threaded to fit the spindle by means of which they are shifted, or they may be shifted by means of a guided nut on the screw-thread.

In the preferred construction the tablets are carried one above the other in a vertical magazine and are supported on a platform integral with a nut mounted on a vertical screw-threaded spindle running through the central holes of the tablets, the usual slots in the edges of the tablets and a corresponding slot in the platform coöperating with a vertical guide to constrain the tablets to move vertically without rotation when the spindle is turned. If the central holes of the tablets are screw-threaded to fit the spindle, the platform and nut may be dispensed with.

In the accompanying drawings, Figure 1 is a perspective view of one form of tablet instrument having a vertical magazine, embodying my present invention; Fig. 2 is a longitudinal vertical section on the line II—II of Fig. 3; Fig. 2^a is a detailed sectional view of a portion of Fig. 2 showing a modified form of tablets; Fig. 3 is a plan view with the top and tablet reservoir removed; Fig. 4 is a section on the line IV—IV of Fig. 3; Fig. 4^a is a detail showing the electromagnetic locking device; Fig. 5 is a plan of tablet slide and reservoir; Fig. 6 is a longitudinal vertical section of the portion thereof with the slide in and lid raised; Fig. 7 is a section on the line VII—VII of Fig. 5, showing the position of the parts when the tablet is inserted; Fig. 8 is a similar view showing the position of the same parts when the tablet is pushed home to displace the lever with which it coöperates; Fig. 9 is a detail view of the tablet spindle lock and the switch controlled thereby; Figs. 10 and 11 are longitudinal sections illustrating the interlocking connections of the slide and lid; and Fig. 12 is a diagrammatic view showing the electric circuits.

Referring first mainly to Fig. 12, *a* denotes the commutator spindle, *b* the tablet spindle, *c* the bell key for sending currents to line, *d* the switch controlling the unlocking electromagnet *e*; *e'* the magnet armature, *f* the local battery, *f'* the positive terminal, f^2 the zinc terminal, *g* the galvanometer, *h* the bell, *i* the polarized relay, *j* a switch controlled by the locking device of the tablet spindle *b*. *l* the line terminal, and *k* the earth terminal. The spring brushes of the commutator are denoted by the numerals 1, 2, 3, 4, 5, 6, 7 and the associated contacts 1^a, 2^a, 4^a, 5^a, 6^a on one side of the commutator, and 1^b, 3^b, 5^b and 7^b on the reverse side of the commutator.

Referring now to the other figures of the drawing, the tablet spindle b is geared with the commutator spindle a, through bevel gear a', b' having a ratio of two to one. Mounted on the screw-threaded spindle b is a nut b^2, as shown in Fig. 2, which is surmounted by a platform b^3, the upper surface of which is inclined toward the rear of the tablet magazine m, so that the tablets m' will rest one upon the other in a correspondingly inclined position. Alternatively, as shown in Fig. 2^a the tablets m' may have their center holes screw threaded to fit the spindle b and be then shifted by the spindle. In this case the screw threads of the tablet would be arranged so that when in engagement with the spindle they will assume the desired inclination.

The inlet end of the magazine, which, in the case of a vertical magazine, is the upper end, is closed by a slide n, which in one position has an aperture n' in register with the column of tablets, and in the other operative position has a solid part over the tablets. As the last tablet inserted in the magazine is the first to be withdrawn, the upper tablet of the column is always close against the slide which closes the magazine. Above the slide is a hinged lid o, having a recess in its under side adapted to accommodate a tablet, and this lid is so correlated with the tablet slide that it can only be raised for the withdrawal or insertion of a tablet when the slide is pushed into the closed position, as in Fig. 6, so as to cover completely the remaining tablets in the magazine and also a lever p, hereinafter described, which controls the rotation of the tablet and commutator spindles in one direction, thereby preventing tampering with the tablets or lever. The slide n, which is guided longitudinally on the top of the magazine, has an aperture n' of sufficient diameter to allow the tablets to pass therethrough and the front edge of this aperture is chamfered, as shown, for the reason already explained. A second hole or slot n^2 is provided in the slide in such a position that when the latter is thrust home to the rear this slot will register with a stud or projection o' on the lid o. In all other positions of the slide, this stud o' abuts against a solid part of the slide, thereby preventing the lid being raised, while in the rearward position, this stud is enabled to enter the slot n^2 in the slide and the lid to be raised so as to withdraw or replace a tablet.

Assuming normal condition of the tablet instrument, and that a releasing current is received from the distant end of the section, this current entering at line terminal l traverses lead 8, galvanometer g, lead 9, key c, bridge contact c', lead 10, relay i, lead 11 to earth k. With the commutator in the position shown, the relay armature is deflected by the line current to the left, bringing the tongue i' against the contact i^2, thereby establishing a circuit from the local battery f, through terminal f', key d, bridge contact d', lead 12, bell h, bar i^3 on relay, tongue i', base plate i of relay, lead 13, to zinc terminal f^2, this current causing the bell to ring.

On depressing key d, a circuit is established from local battery f, through terminal f', key d, spring d^2, magnet coil e, lead 14, spring brush 6, contact 6^a, spring brush 7, lead 15, relay contact i^2, tongue i', base plate i^4, lead 13 to zinc terminal f^2. The magnet e being energized by this current, armature e' is attracted, unlocking the commutator a, so that it can be rotated counter-clockwise through half a turn. The rotation of the spindle a disconnects all circuits at the spring brushes of the commutator, and also incidentally the sending circuit of the local battery is broken at spring switch j by means of the locking pawl of the tablet spindle, hereafter described. The rotation of the commutator spindle in this direction through half a turn rotates the tablet spindle through a complete turn in the direction for feeding the column of tablets into the delivery position, and consequently, if the slide is in the proper position, the top tablet will be raised through the aperture in the slide into the recess under the cover. On pushing the slide inward, the front edge of the aperture passes under the tablet so that the latter is exposed above the slide when the lid is raised for its withdrawal.

Fig. 7 shows the position of the parts which coöperate with the tablets when a tablet has been placed on the top of the magazine and the slide pulled out so as to allow the tablet to drop through the aperture in the slide. In this position, the rear edge of the inserted tablet rests on the nose p' of a crank lever p, which is carried at the end of a vertical rod p^2, suitably journaled in fixed parts of the apparatus or casing. Carried by the crank lever p is an arm p^3, the end of which engages a spring-pressed pin or plunger p^4 and is suitably chamfered so that when the crank lever p is moved outward, the pin p^4 is simultaneously thrust upward through a hole n^3 in the slide, thereby locking the slide when the crank lever p is displaced outwardly. There are two of these holes n^3 in the slide, one being in register with the pin p^4 when the slide is pulled out and the other when the slide is pushed home.

Assuming the magazine to be in the position shown in Fig. 7, the operator depresses a plunger o^2, fitted in the lid and thereby forces the top tablet m' past the nose p' of the lever p, displacing the lever laterally and, of course, rocking the vertical rod p^2

in its bearings. The lateral displacement of the crank lever p brings the end of the arm p^3 into engagement with the spring-pressed pin p^4, forcing the end of the pin into the hole n^3 in the rear part of the slide n, thereby locking the slide, as shown in Fig. 8.

At the lower end of the vertical rod p^2 there is a projecting arm p^5 (Fig. 2) which engages a pin q' projecting upwardly from a locking pawl q which is normally spring-pressed into engagement with ratchet teeth b^5 cut in the edge of a disk b^4 which is keyed on the lower end of the tablet spindle b. The lateral displacement of the crank lever p through its engagement with the top tablet, causes the locking pawl q to disengage from the ratchet and thereby enables the operator to turn the commutator spindle a in the clockwise direction, that is to say, in the direction in which the column of tablets m' is lowered in the magazine. As the crank lever p is returned to its normal position by means of suitably applied springs, as for example, the return spring or springs q^2 of the locking pawl q, when the center of the edge of the disk has passed the nose of the lever, and as this occurs before the tablet spindle b has been turned through its full range, that is, one revolution; the ratchet teeth b^5 extend only over part of the edge of the disk b^4, the remainder of the disk being left full so that the pawl q will ride on the full part of the disk when the crank lever p is released by the passage of the tablet and will drop only into engagement with the ratchet teeth when a full turn has been completed. This provision applies, of course, when the tablet spindle b is being rotated in a direction in which the operative sides of the ratchet teeth are moved toward the nose of the pawl and does not apply when the tablet spindle is being rotated in the opposite direction since, in this case, the pawl merely slips over the teeth. Projecting from the boss of the disk b^4 is a V-shaped stud b^6 adapted to engage in a correspondingly shaped recess in a spring-pressed block b^7, the stud b^6 and coöperating notch acting as a locating pawl determining the correct normal position of the spindle b. The movement of the pawl q is arranged also to effect the interruption of the circuit to line at the switch j, as indicated more particularly in Fig. 9 of the drawings.

Near one end of the commutator spindle a is a disk a^2 having teeth a^3 cut therein at opposite ends of a diameter which teeth cooperate with a locking pawl e^2 carried by the armature e' of the electromagnet e to arrest the rotation of the commutator spindle a on each half turn, the locking pawl e^2 being retracted to allow the commutator spindle a to be rotated counter-clockwise by the energizing of the magnet e, consequently on the depression of the key d by the operator, after a releasing current has been received from the distant station. The two sets of contacts at opposite ends of the diameter of the commutator are so arranged that the spring brushes 1, 2, 3, 4, 5, 6, 7 rest on one or the other of these sets of contacts when the commutator spindle is in one or the other of its normally locked positions. The interconnection of the contacts on the commutator is shown in Figs. 3 and 12, but as the arrangement of the commutator and the manner in which its operation controls the electric circuits are no part of the present invention, but, on the contrary, are well known, it is unnecessary to describe this part of the apparatus at any length.

The operation of the apparatus is as follows: Assuming the condition of the traffic on a section of the line to be such as to require the withdrawal of a tablet from the instrument at the entering end of the section, on the receipt of a releasing current from the distant end, the local relay armature is deflected into a position in which a circuit is established from the local battery on the switch key being depressed by the operator, the establishment of a current in this circuit energizing the electromagnet whereby the commutator spindle is unlocked, so that it can be turned in that direction which rotates the tablet spindle in the direction required for the withdrawal of a tablet. Assuming the direction of rotation of the commutator spindle to be counter-clockwise, half a turn of the spindle in this direction breaks the local battery circuits and reverses the polarity of the battery connections to line and commutates the connections between the relay and the electromagnet. The consequent rotation of the tablet spindle through one complete turn raises the column of tablets so that the upper tablet is pushed through the aperture in the slide into the recess under the lid to such an extent that, on pushing the slide inward the beveled front edge of the aperture passes under the tablet, so that on completion of the inward movement of the slide, the top tablet rests on the solid part of the slide which cuts off the remainder of the tablets. In this position, the hole or slot in the slide comes into register with the stud or projection from the hinge of the lid, which normally abuts against the solid part of the slide, and thereby allows the lid to be lifted and the exposed tablet to be withdrawn. On the column of tablets being raised by the rotation of the tablet spindle, the top tablet encounters the lever p, the displacement of which causes the spring-pressed pin or plunger p^4 to be directed into the hole of the slide so as to lock the latter and thereby prevent the slide being moved until the tablet has been raised to the proper position for withdrawal, in which position

it has moved clear of the lever and the locking pin has been withdrawn by its spring from engagement with the slide. If another tablet has to be withdrawn, it is obvious that the commutator spindle can not be rotated by the operator until the tablet slide has been pulled out, since the top tablet of the column would be pressing against the solid part of the slide.

To insert a tablet the slide, if not already in position, must be pushed in so as to allow the lid to be raised and the tablet to be inserted in the appropriate position. The slide is then pulled out, allowing the tablet to drop through the aperture, but the rear edge of the tablet is arrested by the nose of the spring-pressed lever above referred to, so that it can not drop completely into the position on the top of the column of tablets. The operator by pressing the knob of the plunger o^2 fitted in the lid forces the edge of the tablet past the lever, thereby displacing it laterally and simultaneously locking the slide by the means already described, which remains locked until the edge of the tablet clears the nose of the lever. The lateral displacement of the lever involves the partial rotation of the vertical rod p^2 on which it is fixed and the consequent unlocking of the tablet spindle by means of the arm p^5 projecting from the rod which withdraws the pawl q from engagement with the ratchet disk b^4 on the tablet spindle. The commutator spindle can now be turned in the clockwise direction, and consequently, the column of tablets will be lowered in the magazine. To enable the commutator spindle to be given half a turn and the tablet spindle a complete turn, the teeth of the locking ratchet only extend around part of the circumference of the ratchet disk, so that when the edge of the inserted tablet falls below the lever with which it coöperates, the pawl will not reëngage the ratchet teeth but will rest on the full part of the disk until the due rotation has been effected. Movement of the locking pawl or its actuating mechanism is also arranged to operate a switch so that the local battery circuit is broken during the period in which the top tablet is in operative engagement with the lever on the vertical rod, and this condition, of course, applies whether the tablets are being raised or lowered in the magazine.

Since the spring-pressed lever which controls the tablet spindle lock and the other devices already described in connection with it, must not be accessible when the lid of the magazine is opened, it is disposed below the level of the slide and is covered by the latter when pushed in, as shown in Figs. 6 and 7. It follows from this that, in order to insure due clearance for the return of the lever to its normal or inoperative position, the tablets if of the usual pattern, have to be inclined downward toward the rear of the magazine, as already explained. Otherwise, the tablets must be made of a special pattern, for example, they may have a central boss of such depth as to leave sufficient clearance between the edges of the tablets to allow the return of the lever to its normal position.

It is to be understood that many modifications may be made in the apparatus above described, without departing from the present invention, as for example, the apparatus may be arranged to be actuated by the operator turning the tablet spindle instead of the commutator spindle. Also, as already mentioned, the tablet magazine and spindle may be arranged horizontally, the tablets being either screw-threaded to fit the screw-threaded spindle or not, as the case may be. If they are not screw-threaded, they would usually be strung on a plain fixed rod or bar passing through their central aperture, a screwed spindle suitably geared with the commutator spindle being fitted with a traversing nut which engages in rear of the row of tablets. In this case also, in returning a tablet the operator has to press on the returned tablet by means of a suitable device so as to push the whole row of tablets backward as the spindle is rotated.

Having thus described my invention and the best means I know of carrying the same into practical effect, I claim:

1. In electrically controlled apparatus for working traffic on the tablet system on single line railways, in combination with local electric circuits, a magazine adapted to hold a series of tablets side by side in row and means for shifting the tablets as a column within the magazine a distance equal to the thickness of a tablet, said means comprising a rotatable commutator spindle adapted to control the local electric circuit, a rotatably mounted member correlated with the tablets within the magazine and a connection between the commutator spindle and rotatable member operating to turn the latter and cause the tablets to move as a column the desired distance when the commutator spindle is given half a turn to commutate the connections in the local circuits.

2. In electrically controlled apparatus for working traffic on the tablet system on single line railways, in combination with local electric circuits, a series of tablets each having a central aperture which is screw-threaded, a magazine adapted to hold the tablets side by side and means for shifting the tablets as a column within the magazine a distance equal to the thickness of a tablet, said means comprising a rotatable commutator spindle adapted to control the local electric circuits, a rotatable screwed spindle having threads of a pitch equal to

the thickness of a tablet and adapted to turn in the apertures of the tablets and gearing connecting the commutator spindle and the screw-threaded spindle and operating to impart a complete turn to the latter to shift the tablets as a column the desired distance when the commutator spindle is given a half turn to commutate the connections in the local circuits.

3. In electrically controlled apparatus for working traffic on the tablet system on single line railways, in combination with local electric circuits, a magazine adapted to hold a series of tablets side by side in a row and means for shifting the tablets as a column within the magazine a distance equal to the thickness of a tablet, said means comprising a rotatable commutator spindle adapted to control the local electric circuits, a rotatably mounted screw-threaded spindle having threads of a pitch equal to the thickness of a tablet, a guided traversing nut mounted on the screw-threaded spindle and engaging the rear of the row of tablets, and gearing connecting the two spindles and operating to impart a complete turn to the screw-threaded spindle and thereby shift the guided nut and the tablets as a column a distance equal to the thickness of a tablet when the commutator spindle is given a half turn to commutate the connections in the local circuits.

4. In electrically controlled apparatus for working traffic on the tablet system on single line railways, in combination with local electric circuits, a series of tablets each having a central aperture, a vertical cylindrical casing adapted to hold the tablets superposed one on the other and means for shifting the tablets as a column within the magazine a distance equal to the thickness of a tablet, said means comprising a rotatable commutator spindle adapted to control the local circuits, a vertical screw-threaded spindle extending through the central apertures of the tablets and having threads of a pitch equal to the thickness of a tablet, a guided traversing nut mounted on the screw-threaded spindle and engaging the rear of the row of tablets, and gearing connecting the said two spindles and operating to impart a complete turn to the screw-threaded spindle and thereby shift the guided nut and the tablets as a column a distance equal to the thickness of a tablet when the commutator spindle is given a half turn to commutate the connections in the local circuits.

5. In electrically controlled apparatus for working traffic on the tablet system on single line railways, in combination with local electric circuits, a series of tablets each having a central aperture, a vertical cylindrical casing adapted to hold the tablets superposed one on the other and means for shifting the tablets as a column within the magazine a distance equal to the thickness of a tablet, said means comprising a rotatable commutator spindle adapted to control the local circuits, a vertical screw-threaded spindle extending through the central apertures of the tablets and having threads of a pitch equal to the thickness of a tablet, a guided traversing nut mounted on the screw-threaded spindle, a platform having an inclined upper surface, surmounting the nut and adapted to support the superposed tablets in a correspondingly inclined position for the purpose described and gearing connecting the said two spindles and operating to impart a complete turn to the screw-threaded spindle and thereby shift the guided nut and the tablets as a column a distance equal to the thickness of a tablet when the commutator spindle is given a half turn to commutate the connections in the local circuits.

6. In apparatus for controlling the traffic of single line railways on the tablet system and in which the tablets are moved as a column for the purpose of withdrawing or inserting a tablet, the combination of a magazine adapted to hold a row of tablets side by side, a tablet slide movably mounted on the end of the magazine, said slide having both an aperture adapted to register in one operative position of the slide with the row of tablets and also a solid part adapted to register in a second operative position of the slide with said row of tablets, a lid hinged to the magazine above the said slide, and means operating to prevent the raising of the lid when the said aperture is in register with the row of tablets.

7. In apparatus for controlling the traffic of single line railways on the tablet system and in which the tablets are moved as a column for the purpose of withdrawing or inserting a tablet, the combination of a magazine adapted to hold a row of tablets side by side, a tablet slide movably mounted on the end of the magazine, said slide having both an aperture adapted to register in one operative position of the slide with the row of tablets and also a solid part adapted to register in a second operative position of the slide, with said row of tablets, said slide having in addition a recess, a lid hinged to the magazine above the said slide and having a projection adapted normally to abut against the solid part of the slide and to register with the said recess when the solid part of the slide registers with the row of tablets.

8. In apparatus for controlling the traffic of single line railways on the tablet system, the combination of a magazine adapted to receive a series of tablets side by side, a rotatably mounted spindle and means oper-

ated thereby adapted to move the tablets as a column, a device normally operating to lock the spindle against rotation in one direction and adapted to be displaced by a tablet, pressed by an operator into the inlet of the magazine to unlock the spindle and permit its rotation in the said direction.

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

EDWARD TYER.

Witnesses:
WALTER J. SKERTEN,
JOSEPH MILLARD.