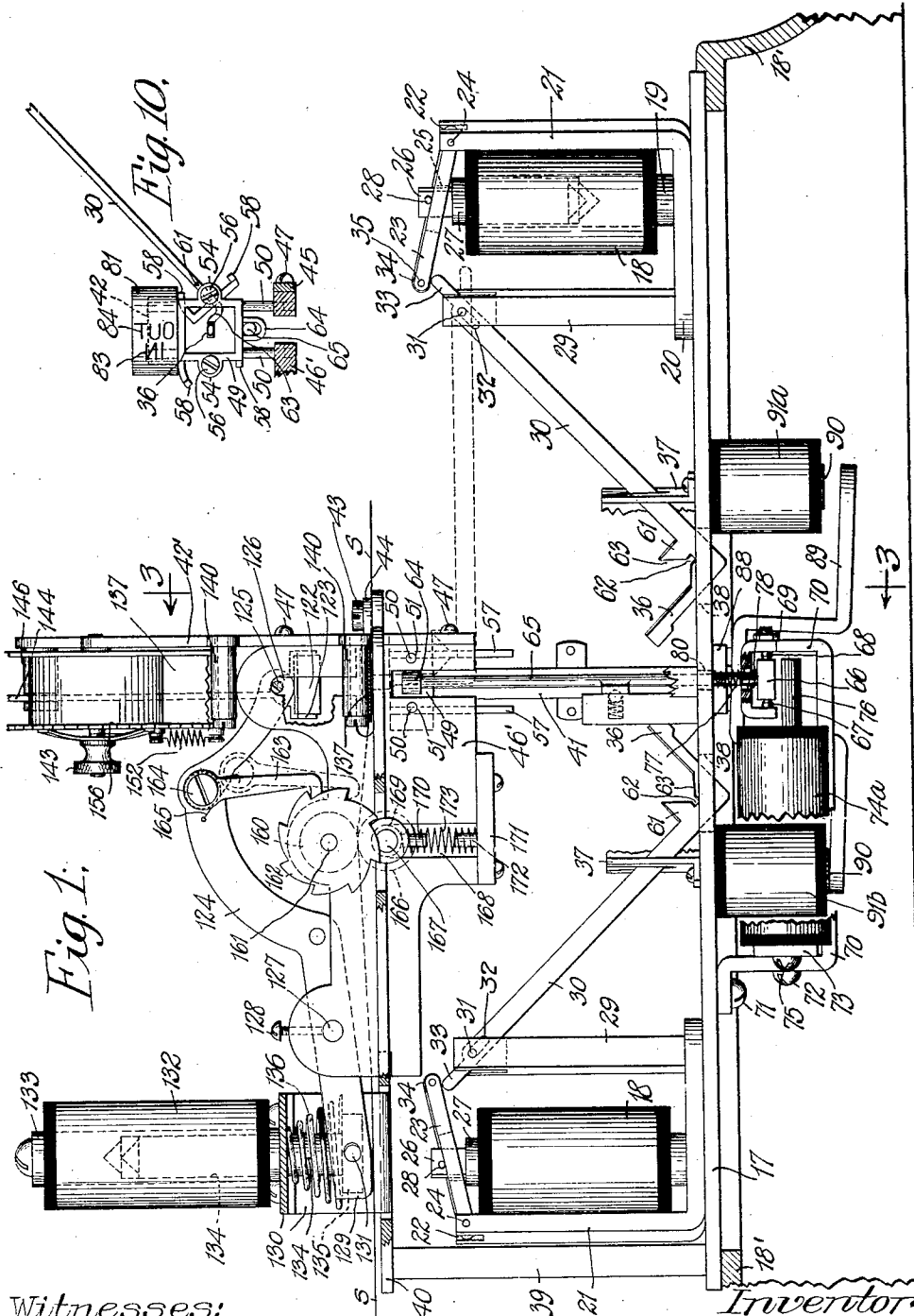


A. L. SOHM.
 ELECTRICAL RECORDING APPARATUS.
 APPLICATION FILED JAN. 20, 1911.

1,132,884.

Patented Mar. 23, 1915.

6 SHEETS-SHEET 1.



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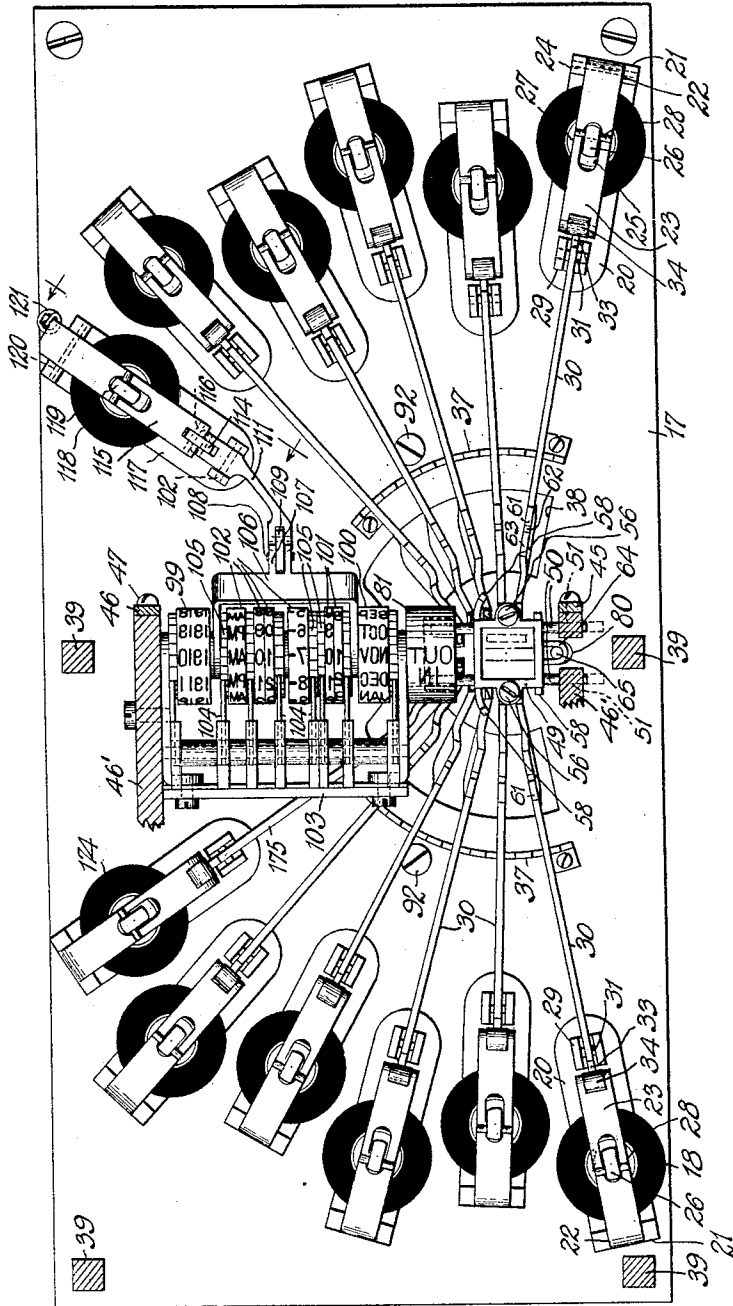
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6 SHEETS-SHEET 2.

Fig. 2.



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6 SHEETS-SHEET 3.

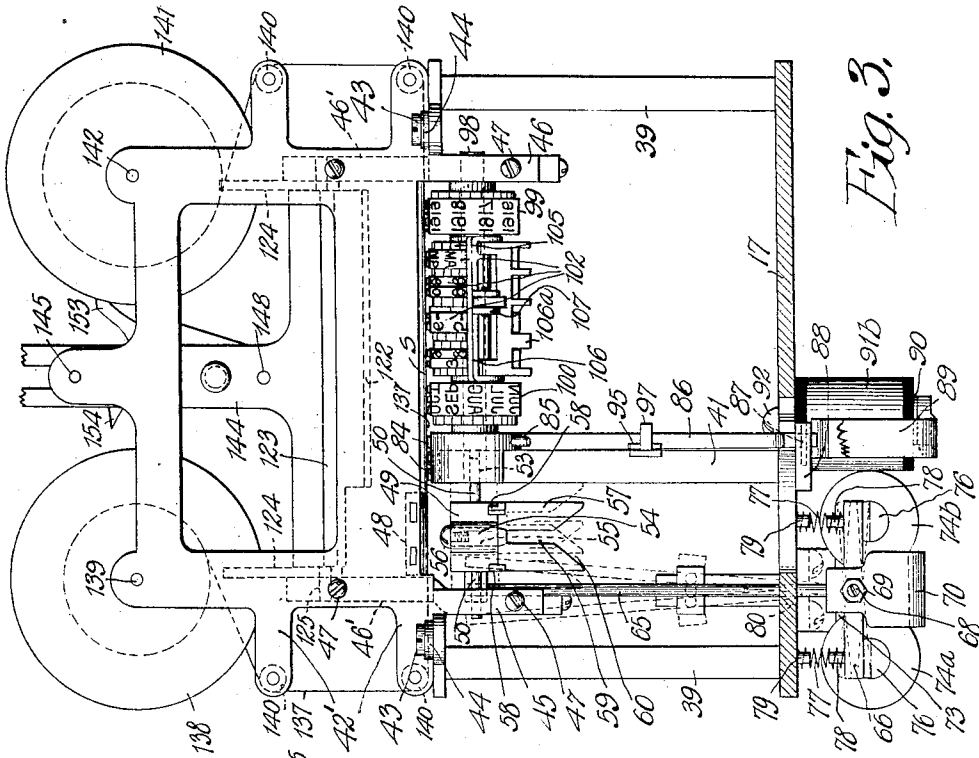


Fig. 3.

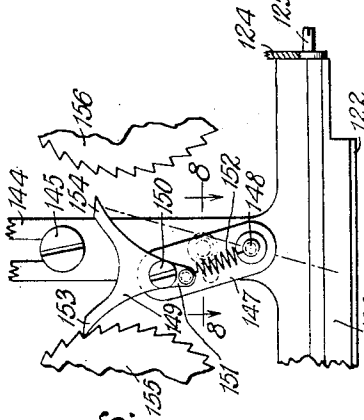


Fig. 6.

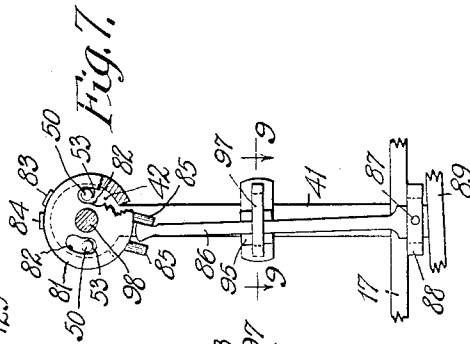


Fig. 7.

Fig. 8.



Fig. 9.

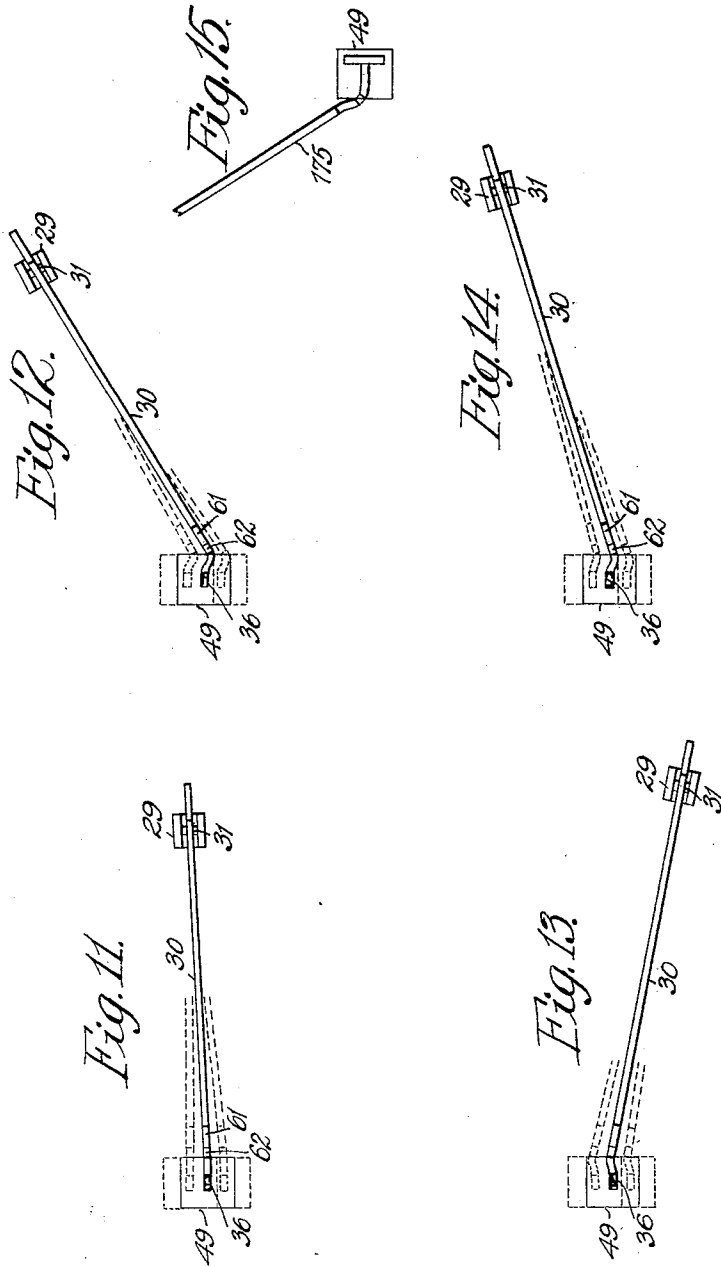
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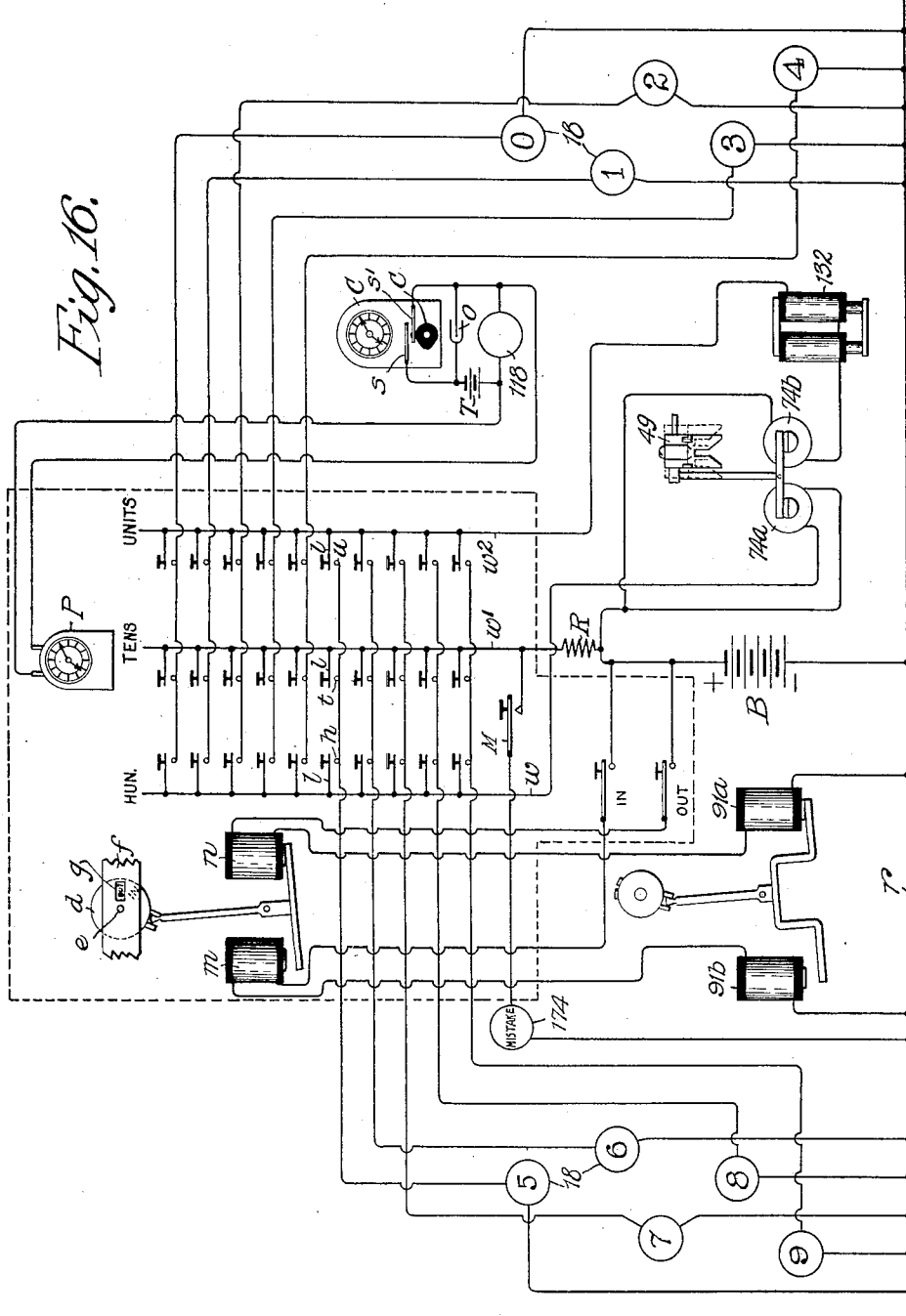
1,132,884.

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UNITED STATES PATENT OFFICE.

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ELECTRICAL RECORDING APPARATUS.

1,132,884.

Specification of Letters Patent.

Patented Mar. 23, 1915.

Application filed January 20, 1911. Serial No. 603,621.

To all whom it may concern:

Be it known that I, ALFRED L. SOHM, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a certain new and useful Improvement in Electrical Recording Apparatus, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to electrical recording apparatus and, more particularly, is concerned with that kind of apparatus which makes a record of the time of day simultaneously with other circumstances and events which are to be permanently noted.

The object of my invention is to provide a generally improved mechanical and electrical arrangement which is more simple than the structures of the prior art and by means of which more reliable operation than has heretofore been possible will be obtained.

Specifically, my invention as a whole has to do with the so-called "in and out" registers which are used in large industrial establishments where many workmen are employed. In places of this kind it is desirable to make a record of the time which each employee spends on behalf of his employers so that his wages for any definite period, such as a week or month, can be exactly computed. In accordance with this demand, these "in and out" devices have been provided and it is the practice for each employee to make a registration by means of the device each time he enters and leaves the place of business. This registration identifies each particular employee and is accompanied by the registration of the time of day. In some instances, the registration is further supplemented by a positive notation as to whether the employee is entering or leaving the premises. The registrations of the kind just pointed out are all placed upon a record slip or sheet and it is quite the universal practice to provide such a sheet for each working day. At night the record sheet is removed from the machine and the bookkeeper has before him a complete record of the time of each employee which must be paid for. Some devices operate mechanically and some electrically

and some involve the elements of both. This, then, is the art to which my invention relates.

The device of my invention is operated electrically and this is consistent with the important feature thereof that the operating board or "entrance plate," as I term it, may be disposed at the workmen's entrance to an industrial establishment, while the register mechanism, *per se*, may be disposed in the office or some place convenient to the person in charge of the record sheet. It is important that as the record sheet passes through the machine, the entries are made upon it in regular physical order, that is, the registrations in order upon the sheet are chronologically consecutive. This is a distinct advantage since, when a number of registrations are made so close together that the time notation is the same on all, it will indicate which was made first and which last and will often be effective in settling disputes as to improper registration.

The operating board or entrance plate comprises a number of switches for controlling circuits which include electromagnets for operating the printing mechanism, as will be described. These electromagnets are properly mounted upon a frame and each of them carries a type bar which is properly associated with a platen. These type bars each contain a digit and a person, in making a registration, operates the proper switches on the entrance plate so that a certain number assigned to him will be printed upon the record sheet. At the same time, other printing mechanism is automatically set into operation and the time of day is printed upon the record, opposite the number just referred to. This last named registration is brought about by means of type wheels containing sufficient notations and connected with each other by suitable carry-over mechanism and operated by an electromagnet which itself is controlled by a master clock as will be described. There is also associated with this registration a positive notation as to whether the person making the registration is coming or going and means is provided on the entrance plate for controlling the shifting of the printing member for this notation if it is necessary to do so, the entrance plate being provided with means for indicating its position. As a precaution, the entrance plate is also pro-

vided with a "mistake button" and if a person finds that he has improperly registered his number he can remedy the mistake by pressing this button and energizing an electromagnet which controls a special type bar for blotting out the erroneous record. He can then proceed to make his registration in the proper way.

In the device of my invention there are but ten electromagnets for printing the digits, the type bars having the characters from 0 to 9 respectively, and it will appear that each type bar is adapted to print a figure in the hundreds, tens, and units columns. I provide means for effectively guiding the type bar of the energized electromagnet into the proper place so that it will print in the proper column depending upon the switch of the operating board which was depressed.

Other features of the improvement will become apparent as this description proceeds and I shall define what I consider to be my invention in the claims which are appended hereto.

My invention is embodied in the device illustrated in the accompanying drawings, in which,

Figure 1 is a side elevational view thereof, parts being broken away and shown in section to more clearly illustrate the construction; Fig. 2 is a plan view thereof, the top of the structure being removed; Fig. 3 is a cross-sectional view taken approximately on the plane of the line 3—3 of Fig. 1 and looking in the direction indicated by the arrows; Fig. 4 is a full plan view of one side of the device; Fig. 5 is an elevational view of the electromagnet for operating the time printing wheel; Fig. 6 is an isolated elevational view of the pawl mechanism for operating the printing ribbon; Fig. 7 is an isolated elevational view of the mechanism for changing the "in and out" indication; Fig. 8 is a cross-sectional view taken on the plane of the line 8—8 of Fig. 6 and looking in the direction indicated by the arrows; Fig. 9 is a cross-sectional view taken on the plane of the line 9—9 of Fig. 7 and looking in the direction indicated by the arrows; Fig. 10 is an isolated plan view of the means for guiding the type bars; Figs. 11, 12, 13 and 14 are more or less diagrammatic views of the guiding mechanism; Fig. 15 is a view illustrating the nature of the type bar controlled by the "mistake button;" and Fig. 16 is a diagrammatic view showing the circuit connections.

Like reference characters are applied to the same parts throughout the various figures.

Referring first to the structural embodiment of my invention, it will be seen that the various operating parts are all mounted upon a base plate 17 which is set in a supporting base 18'. The printing electromag-

nets which have hereinbefore been referred to are mounted vertically upon the base plate 17 in a suitable staggered arrangement as best shown in Fig. 2. These electromagnets are indicated at 18, 18. They are all constructed substantially alike, except for the length and exact form of the type arm, as will be described, and in describing the structure of one of them I am giving a sufficient description of all. These electromagnets are of the solenoid type and the winding 18 is mounted upon the stationary part 19 of the core. This core 19 is mounted upon the foot 20 of an L-shaped bracket 21, and the upper end of this bracket is bifurcated as indicated at 22 for the reception of an armature arm 23 which is pivoted thereto at 24. This armature arm 23 is slotted as indicated at 25 and an extension 26 from the movable core armature 27 passes through the slot 25 as clearly illustrated. The extension 26 is provided with a cross pin 28 which rests upon the top of the armature arm 23 so that the core armature 27 will hang loosely within the winding 18 and will be subject to the magnetic influence set up thereby. Extending upwardly from the end of the foot 20 is a post 29 and the upper end of this post is bifurcated for the reception of the type bar 30. A cross pin 31 in the post 29 passes through an elongated opening 32 in the type bar 30 and in this way the type bar is pivotally mounted upon the post 29 subject to the play of the pin 31 in the slot 32. The type bar is provided with a tail 33 which passes on to a point under the end of the armature arm 23 so that a roller 34 pivoted at 35 in the bifurcated end of such arm may rest upon the tail as best illustrated in Fig. 1. The lower end of the type bar 30 is provided with a toe 36, which carries the printing character, and other parts which will be described later as taking part in the guiding operation which as I have indicated, is of importance. The bar 30, near its lower end, takes into the space between two teeth of a comb 37, when it is in normal position. The teeth of this comb are pointed so that the spaces between them will be flared and the comb as a whole therefore acts as a positioning device to insist upon the return of the type bars to their proper normal positions. Since they are loosely mounted, as before described, such positioning means is desirable. The base plate 17 is provided with a circular slot 38 into which the heel of the type bar may drop so that space may be saved and so that there will be no interference between the type bars when one of them is brought upwardly by the action of the electromagnetic mechanism associated therewith. As before stated, there are ten of these type bars and associated electromagnets. The toe 36 of each of the type bars is provided with a printing character and the

digits from 0 to 9 are provided in this way. The object of the loose mounting of the type bar will be described presently.

On one side of the base plate 17 four upwardly extending posts 39, 39 are provided for the purpose of supporting a shelf 40 above the printing electromagnets. This shelf carries the time printing mechanism, the ribbon mechanism, the paper advancing mechanism, and the "in and out" printing mechanism. Possibly it would simplify this description to say at the start that the printing line is approximately coincident with the line extending between the two right hand posts 39, 39 (Fig. 2). Extending upwardly from the base plate 17 between the right hand posts 39, 39 (Fig. 2) is a post 41 (Figs. 3 and 7) which has a circular head 42 at the top thereof for a purpose hereinafter set forth. At the right hand side of the shelf 40 (Fig. 1) a vertical frame plate 42' is mounted in place by means of screws 43, 43 passing through horizontal lugs 44, 44, extending therefrom, into the shelf. This frame plate has the downwardly extending supports 45 and 46. The shelf 40 is, broadly, U-shaped, while the frame plate 42' extends across the open end of the U. On the inside of the U, on each side, a side plate 46' is mounted, this plate being held in place mainly by means of screws 47, 47 passing through the frame plate 42' and into the end thereof. Secured in the inside angle between the plate 42' and the left hand side plate 46' (Fig. 3) is a small stationary platen 48, this platen thus coming upon the "printing line" which has hereinbefore been referred to between the left hand side plate 46' and the post 41. Below the small stationary platen 48 a guide box 49 is arranged to move from side to side. This guide box, as best shown in Figs. 2 and 10, is in the form of a small rectangular horizontally disposed frame from each side of which two pins 50, 50 extend. The pins on one side are slidably mounted in openings 51 in the left hand side plate 46' while the pins on the other side are slidably mounted in openings 53 in the head 42 on the post 41, hereinbefore referred to. The distance between the left hand side plate 46' and the head 42 is considerably greater than the width of the guide box 49 and, as will appear evident from Figs. 2, 3 and 10, this guide box is free to move from side to side, always under the platen 48. On each of the other sides of the guide box 49, or rather on each end thereof, is a boss 54 which is provided with a central vertical opening in which a pin 55, held in place by a cap screw 56, is pivotally mounted. At its lower end this pin carries the guide wing 57 which is thus free to oscillate and which cooperates with certain parts of the type bar 30 in a manner to be described. The wing on one

side is substantially like that on the other and the movement of these wings is limited by means of the lugs 58, 58 extending upwardly therefrom and arranged to encounter the outside of the guide box as clearly illustrated in Fig. 10. Each wing 57 is slotted centrally and vertically as illustrated at 59 and the slot thus provided is sufficient in size for the reception of the type bar 30. At the bottom of the wing the slot 59 is flared as illustrated at 60 and the oblique surfaces thus provided are effective in guiding the type bar up into the restricted portion of the slot. Each type bar is provided, in the angle between the main portion and the toe, with a lug 61 which is slotted centrally at 62 and flared at 63 quite in the manner as has been described relative to the wing. This lug on the type bar is positioned so that it will come up approximately into the zone of the wing and, the two sets of oblique surfaces cooperating, the type bar will respond to the wing, and the wing will respond to the type bar, until the small notch or slot 62 of the type bar is brought practically exactly into line with the axis of the pin upon which the wing is carried and thus into a definite position. Since the type bar is loosely mounted upon its pivot it may be moved back and forth and, since there is considerable play between the type bar and the sides of the slot in the post in which it is mounted, as shown in Fig. 2, it may be moved from side to side to a considerable extent. The guiding wing is capable of oscillation and it may thus be brought into any position required by the mounting of the type bars. The wing on one side of the guide box is used in connection with the five type bars on that side while the other wing is used in connection with the five type bars on the other side. When any one of the electromagnets 18 is energized, in a manner to be described, the core armature 27 is pulled downwardly and, with it, the armature arm 23. The roller 34 rolling upon the tail 33 of the type bar, the tail end of the type bar will be lowered and the other end suddenly raised. In whichever position the associated guide wing 57 is found, one of the oblique surfaces 60 thereof will be engaged by one of the oblique surfaces 63 of the actuated type bar and, the two surfaces cooperating, the type bar will be brought up into the restricted portion of the slot 59. When the type bar nears the end of its stroke, one of the surfaces 63 will engage with that part of the wing at the upper end of the slot and the type bar will be moved one way or the other until the notch 62 is brought into positive position in line with the axis of the pin upon which the wing is mounted. The parts are so constructed that when the notch 62 does come into line with the axis of the pin 55, the toe 36 will occupy

just the right position within the rectangular guide box and the character on the toe will also be in just the right position. It is thus seen that, once guided by the wing 57, the type bar is always brought into such position that the character carried thereby will always occupy the same position in the guide box, and each type piece will occupy the same position that every other type piece does.

The guide box 49 is normally in a position midway between the left hand side plate 46' and the post 41, as illustrated in Figs. 2 and 3. When in this position the type prints in the tens column and it is clear that if the box is moved to one side or to the other the type can be made to print in the units or hundreds column, as desired. The latitude of the flared part of the slot 59 is such that in whichever position the guide frame 49 is brought, one or the other of the oblique surfaces 60 will be engaged by the actuated type bar and the guiding action, as has been described, will take place.

The means for shifting the guide frame 49 one way or the other from its normal position will now be described and in this connection Figs. 1, 2, 3 and 10 will be particularly referred to. From the drawings it will be seen that the outer side of the guide frame 49 is provided with an eye lug 64 into which a rod 65, extending upwardly from an oscillating armature 66, passes. This armature is centrally mounted upon the bearing pins 67 and 68, the latter being adjustable and held in place by a set nut 69, in the magnet frame 70 which is secured to the under side of the base plate 17 by means of a screw 71. A screw 72 secures a cross plate 73 to the magnet frame 70 and to this cross plate a pair of magnets 74^a, 74^b are secured by means of screws 75 on opposite sides of the magnet frame 70, as shown in Fig. 3. The cores 76, 76 of the electromagnets 74^a, 74^b extend considerably beyond the end thereof and, at their ends, are semi-cylindrical in form so that the armature 66 may be placed above them subject to the attraction of one or the other. The horizontal position of the armature 66 is the normal one and this position is maintained by means of a pair of coiled springs 77, 77 which extend between posts 78, 78 on the armature and posts 79, 79 on the under side of the base plate 17. These springs are so adjusted as to exert substantially the same influence on both sides of the armature and the result is that either can be assisted by the attraction of the associated electromagnet. The manner in which these electromagnets are energized will be pointed out when Fig. 16 is taken up for description. When the armature 66 is in its normal position the rod 65 holds the guide

frame 49 in its normal or central position, that is, the position shown in Figs. 2 and 3. The opening 80 in the base plate, through which the rod 65 extends, is of sufficient size to permit of the swinging of the rod with the swinging of the armature and the rod has sufficient play in the eye lug 64 so that the oscillatory movement thereof may be transformed into the translatory movement of the guide frame. When the electromagnet 74^a is energized the guide frame 49 will be brought over to the left (Fig. 3) and a type bar actuated at that time will be guided up into position to print a figure in the hundreds column. When the guide frame 49 is in its normal position an actuated type bar will be guided up to print a figure in the tens column; and when the electromagnet 74^b is energized an actuated type bar will be guided up to print a figure in the units column. In each instance the type has the small stationary platen 48 for a backing. In Figs. 11 to 14 inclusive the manner in which the type bars are guided up into the different positions is clearly illustrated and the object of the loose mounting of the type bar 30 in the post 29 is clearly evident. In each instance the normal position is shown in full lines while the other positions are shown in dotted lines. Several different type bars are shown so that it may readily appear how each of them may be properly guided into place even though they must needs approach the guide box from different directions due to the distribution of the respective electromagnets upon the base plate 17.

The manner in which the "in" and "out" notations are made will now be described, reference being had especially to Figs. 1, 3, 7 and 9. The head 42, of the post 41, which has hereinbefore been described as of circular form, is partly surrounded by a shell 81 which is cut out sufficiently at the point where the head joins the post so that it may swing from side to side as is clearly evident from Fig. 7. This shell, where it covers the back of the head 42, is provided with small circular slots 82, 82 through which the pins 50, 50 may extend, if necessary, when the guide box 49 is brought over to the units position. The shell 81 has upon its periphery the type characters 83 and 84 for the "in" and "out" notations, respectively. The vertical diameter of this circular shell intersects the "printing line" which has hereinbefore been referred to and it follows that the line of type which is brought into the uppermost position will be the one that is printed. The manner in which this printing takes place will be described later. The back of the shell 81 is completely circular and is provided at the bottom with two downwardly extending pins 85, 85 between which extends the end of a lever 86 pivoted

at 87 to a block 88 secured to the under side of the base plate 17, this base plate having a suitable slot through which the lever may extend. An armature 89 is secured to the lower end of the lever 86, below the pivot therefor, and the ends of this armature are under the ends of the cores 90, 90 of electromagnets 91^a and 91^b which are secured to the under side of the base plate 17 by means of screws 92, 92. It will now be seen that this is an oscillating armature which may be drawn into one or the other of two positions by energization of the proper electromagnet. When the electromagnet 91^b is energized the lever 86 is drawn into the position shown in Fig. 7 and the shell 81 is brought into the position in which the "out" notation is made. When the electromagnet 91^a is energized the lever is brought into the reverse position and the notation "in" is made. In order that the action may be positive and that one or the other set of characters may be accurately brought into line, means is provided for positively determining the extreme positions of the lever 86. This means is shown particularly in Figs. 7 and 9 and consists of a ball 93 confined in a pocket in the base 41 against the tension of a small coiled spring 94. The lever 86 has an enlarged part at 95 which has two sockets 96, 96 in one or the other of which this ball is adapted to be held by means of the coiled spring. When the lever is at one limit of its movement the ball rests in one socket and when the lever is at the other limit it rests in the other socket. A bridge 97 limits the movement of the lever.

A shaft 98 extends between the head 42 on the post 41 and the right hand side plate 46' (Fig. 3). The axis of this shaft lies in the vertical plane of the "printing line" and the various type wheels for printing the year, the month, the day of the month, and the time of day, are mounted upon this shaft. This arrangement is clearly shown in Figs. 2 and 3 where the year wheel is shown at 99, the month wheel at 100, the day wheels at 101, and the time wheels at 102, 102. The particular construction here employed forms no part of my present invention and I shall therefore refer to the elements of that particular construction merely broadly. A framework 103 is mounted in place in some suitable manner through the medium of the shaft and the right hand side plate 46' and this framework carries a number of spring pawl sets 104, 104 which engage with suitable ratchets 105, 105, on the shaft 98 in order to prevent under and over throw. The year wheel 99 and the month wheel 100 are adapted to be set manually while the other wheels are operated electrically in a manner to be described presently. These other wheels are interconnected in a suitable manner and, in

the present instance, are adapted to show the time at minute intervals. When twelve hours have passed the indication will change from "a. m." to "p. m." or vice versa and when twenty-four hours have passed the day will be changed. These interconnected parts are operated by an oscillating yoke 106 which is mounted upon the shaft and which itself is actuated by the mechanism shown in Figs. 2 and 5. The yoke 106 is provided with a bifurcated lug 107 to which is pivoted at 108 a link 109 which hangs downwardly and is connected by means of a loose pivot 110 with a rocking lever 111. This rocking lever is pivoted at 112 and, by means of a loose pivot 113, a link 114 is connected therewith, this link passing upwardly and being connected with an armature arm 115 by means of a loose pivot 116. The remainder of this construction is quite like that of one of the printing electromagnets. An L-shaped supporting member 117 is provided and an electromagnetic coil 118 is mounted upon this member. A core 119 hangs from the armature arm 115, which is pivoted at 120 to the member 117, all as described with reference to the printing electromagnets. In this case however the armature arm 115 is extended beyond the pivot and a coiled spring 121 connects the tail of this armature arm with the base plate 17 and tends to draw it downwardly. When the electromagnet 118 is energized, in a manner to be described, it advances the yoke 106, which carries suitable pawls 106^a, a sufficient distance so that these pawls may be advanced to catch upon succeeding teeth on the ratchets with which they are associated. When the energization ceases the spring 121 is free to operate and the time wheels are rotated by the action of the spring. This is different from the action of the printing electromagnets where the work is done by the energization, the weight of the parts merely serving to restore them to their normal positions.

The platen for the "in and out" wheel and the time wheels is illustrated at 122. This platen of course lies in the vertical plane of the "printing line" and is adapted to be lowered when the impression is to be made. This platen is adapted to occupy that part of the "printing line" not already occupied by the stationary platen 48. The platen 122 is carried in a box 123 which is carried upon an oscillating frame 124 by means of trunnions 125, 125. Each of these trunnions extends into a slot 126 in the respective side plate 46' and the proper movement of the platen is thus assured. The frame 124 is mounted upon a pivot rod 127 held in place in the side plates 46', 46' by means of the set screws 128, 128. The frame 124 has a tail part 129 which passes under a bridge 130 mounted upon the shelf 40. A

rod 131 passes across the sides of this tail part and is loosely connected therewith as indicated in Fig. 1. Mounted upon the bridge 130 is a pair of electromagnets 132, 132, the cores of which are joined by a yoke 133. These cores have a hollow portion for the reception of a solenoid armature 134 which passes downwardly through the bridge and is connected with the rod 131 through the medium of a head 135, a coiled spring 136 being disposed between the head and the under side of the bridge so as to hold the armature in its lower position. Since the tail of the frame 124 is thus held downwardly, the platen 122 is normally held in its raised position, that is, the position shown in Fig. 1. The manner in which the electromagnets 132, 132 are energized will be described later. Suffice it so say for the present, that their energization results in the drop of the platen and the printing of the "in" or "out" indication, the date, and the time.

The inking is secured by means of a ribbon 137 which passes between the platen and the type. One end of the ribbon is secured to and is rolled upon a spool 138, pivoted at 139 in the frame 42', and passes over suitably mounted idlers 140, 140, across the printing line, over other idlers 140, and back to the other spool, 141, pivoted at 142 to the frame piece 42, upon which it is rolled and to which the end is attached. The spools 138 and 141 are held in place by means of thumb screws 143 so as to facilitate convenient removal. The mechanism for securing the progression of the ribbon is illustrated in detail in Figs. 6 and 8. The platen box 123 which is operated up and down by means of the electromagnets 132 has, extending upwardly therefrom, a strap 144 which is guided relative to the frame 42' by means of a screw 145 passing through an elongated slot therein and into a boss 146 on said frame. Near the point where the strap 144 joins the box 123, as best shown in Fig. 6, a small lever 147 is pivoted at 148. This lever is provided at the top with a double-acting dog 149 pivoted thereto at 150 and having a tail 151 between which and the pivot 148 a spring 152 is disposed. The dog 149 is provided with two pawl teeth 153 and 154 which are adapted for association with ratchets 155 and 156 respectively, secured to the spools 141 and 138 respectively. The lever 147 is adapted to occupy two different operative positions. In one of said positions the pawl tooth 153 is in place for cooperation with the ratchet 155 while the other tooth remains inoperative. When the lever 147 is thrown over to its other position the pawl tooth 154 is brought into position for cooperation with the ratchet 156 and the tooth 153 is rendered inoperative. The lever 147 is adapted to be held in either

of its positions by means of the mechanism illustrated in Fig. 8. This mechanism comprises a ball 157 which is confined in a pocket, stamped in the strap 144, against the tension of a coiled spring 158. The lever 147 is provided with two sockets 159, 159 and the ball 157 is adapted to rest in one or the other of these sockets, depending upon the position of the lever 147. As the strap 144 reciprocates in response to the movement of the frame 124 under the influence of the electromagnet 132 the active pawl tooth 153 or 154, whichever the case may be, operates to advance the associated ratchet and to pull the ribbon in this way. As before stated, the ribbon is fastened at its ends to the respective spools. When the ribbon has reached the limit of its travel the pawl tooth 153, on its return stroke, the stroke when it should advance the ratchet, cannot move it because the ribbon cannot be drawn any farther. The coiled spring 136 which returns the frame 124 to its normal position, is a stout spring and the holding action of the spring 158 and the ball 157 is overcome. The lever 147, by reason of the engagement of the tooth with the ratchet, is thrown over into the other position. Summarizing this action and referring to Fig. 6, it will be seen that when the ratchet 155 can no longer be turned in a counterclockwise direction because the ribbon, attached at its other end to the spool 138, has reached the limit of its movement, the upward movement of the strap 144 under the influence of the spring 136 will cause the dog 149 to turn in a counterclockwise direction about the pivot 150. This will remove the right hand socket 159 from the ball and the lever will finally be brought into its alternate position with the left hand socket 159 receiving the ball 157. The spring 152 maintains the dog 149 in proper relation relative to the lever 147. I have indicated the alternate position of the dog mechanism by the dot-and-dash line. Then the tooth 153 becomes the inactive pawl and the tooth 154 becomes the active pawl for cooperation with the ratchet 156. In the further operation of the machine the ribbon runs in the reverse direction, from the spool 141 to the spool 138, until it has reached the limit of its travel. Then the reverse action, as has been described, takes place, and this cycle is repeated as often as is necessary.

The strip of paper upon which the records are made passes lengthwise of the machine between the ribbon 137 and the platen. The paper is in the form of a strip and may be fed from a suitable roller and drawn through the machine in a manner to be described. After leaving the machine it may be torn off at suitable intervals so that it may conveniently be used for computation purposes. The mechanism for causing the

travel of the paper is as follows: Mounted between the side plates 46', 46' just to the left of the printing mechanism (Figs. 1 and 4), is a roller 160, this roller having trunnions 161, 161 passing through the side plates. On each of these trunnions, beyond the side plates, is a ratchet wheel 162 which is adapted to be engaged by a dog 163 pivoted at 164 to the oscillating frame 124, a spring 165 being provided to hold this dog in engagement with the ratchet. The throw of the oscillating frame 124 is such as to secure the movement of the dog through a distance slightly more than the length of one of the teeth of the ratchet, and the teeth of the ratchet are of such length that the periodic movement of a strip of paper rolling on the roller 160 will be ample to move the printed line on the strip entirely out of the range of the so-called "printing line". The roller 160 has associated therewith a second roller 166 which is mounted upon trunnions 167, 167 mounted in slots 168, 168 in the side plates 46', 46'. Each trunnion is provided with a collar 169 in which it bears, the collar itself being the part which bears in the corresponding side plate. The collar 169 has the downwardly extending pin 170 and the block 171 secured to the under side of the side plate 46' is provided with an upwardly extending pin 172, and between these two pins, in the slot 168, a coiled spring 173 is disposed. These springs 173, 173 holding the roller 166 in contact with the roller 160 and the paper strip *s* is fed between these rollers. As the oscillating frame 124 actuates, the ratchet 162 is advanced and the paper is carried on through the machine.

I provide means whereby, in case a person making registrations makes a mistake, such registration can be blotted out, and this is done by the energization of a distinct electromagnetic mechanism which I term the "mistake magnet". This magnet is precisely like the printing magnets in construction and inherent operation and, like those magnets, is mounted upon the base plate 17, as indicated at 174. Since the construction and operation of this magnet is just like the others which have been described so fully I shall refrain from giving a detailed description of it. Suffice it to say that, as shown in Fig. 15, the type bar of this electromagnet is provided with a character in the simple form of a bar long enough to extend across the three columns of the number column. This type bar 175 however is made of such length that the character thereon occupies an advanced position in the guide box, that is, it is adapted to be stricken over the last printed line after the paper strip has been advanced one step by the ratchet 162. This is clearly shown in Fig. 15. The zone of the printing line, in the guide box

49, is shown in dot-and-dash lines in Fig. 2 and the position which the character of the mistake type bar assumes is indicated in dotted lines. The distance which each actuation of the ratchet 162 advances the sheet is approximately equal to the distance between the center lines of these diagrammatic representations.

I shall now refer to Fig. 16 and describe the operation of my system. The parts carried by or with the "entrance plate" are enclosed in the dotted line in this figure. The other parts, except the master clock and its associated parts, and the battery, are parts of the machine which have been described in detail. The battery can be disposed anywhere and so can the master clock with its directly controlled elements. The circuit wires of course can be of any length. The circles with the numbers 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9 indicate the various printing magnets 18. The entrance plate is provided with three series of ten switches each, one series constituting the hundreds column, the second constituting the tens column, and the third constituting the units column. Each of these switches is adapted to close a circuit through the main battery B and one of the printing magnets 18. The circuit of each of the printing magnets is adapted to be closed by three switches, one in each column. It will suffice to give a detailed explanation of the circuit of one printing magnet since the same applies to all. It will be seen for instance that one terminal of printing magnet No. 5 is connected with the common return wire *r* which leads to the negative pole of the battery B, while the other terminal of this printing magnet is connected with three contacts *h*, *t* and *u*. The contact *h* is adapted to be engaged by the switch lever *l* of the hundreds wire *w*, the contact *t* is adapted to be engaged by the switch lever *l* of the tens wire *w*¹ and the contact *u* is adapted to be engaged by the switch lever *l* of the units wire *w*². The tens wire *w*¹ is connected with the positive pole of the battery through the resistance R. The units wire *w*² is connected with the positive pole of the battery through the electromagnets 132 which, for convenience, I shall term the "impression" magnets, and the unit magnet 74^b which has heretofore been described. The hundreds wire *w* is connected with the positive pole of the battery through the hundreds magnet 74^a which has hereinbefore been referred to. When it is desired to print "5" in the hundreds column the switch lever *l* of the hundreds column is depressed to close the circuit through the hundreds magnet 74^a, through the battery B and through the printing magnet No. 5. The energization of the magnet 74^a will bring the guide box 49 over into the hundreds position, as has been described, and the energization of the

printing magnet No. 5 will cause the type bar No. 5 to be actuated and, as has been described, this type bar will be guided by the wing 57 up into the hundreds position.

5 When it is desired to print a "5" in the tens column the lever *l* in the tens column is operated and the circuit is closed through the printing magnet No. 5, the battery B, and the resistance R. The resistance R is provided since the current which is used is of

10 sufficient strength to operate one of the printing magnets, one of the shifting magnets 74^a or 74^b, and the impression magnets 132, simultaneously, and since in the instance of the tens impression these last

15 named magnets are not used, the entire current will otherwise be confined to the printing magnet alone. As has been described, the normal position of the guide box 49 is the tens position and when it is desired to

20 print a figure in the tens column it is unnecessary therefore that this guide box be moved. The type bar will be guided properly into the tens column. When it is desired to print a "5" in the units column the

25 switch *l* of the units column is operated and the circuit is closed through the impression magnets 132, the units magnet 74^b, the battery B and the printing magnet No. 5. The energization of the electromagnet 74^b brings

30 the guide box 49 over into the units position, as has been described, and the energization of the printing magnet No. 5 causes the actuation of the associated type bar which is then guided up into the units position. The

35 energization of the impression magnets 132 causes the operation of the frame 124, and brings the platen 122 down upon the type wheels. When the unit button *l* is released

40 the magnets 132 are deenergized and the return of the oscillating frame 124, under the influence of the coiled spring 136, advances the paper and advances the ribbon, all as has been described. Thus, it is seen that the

45 day and time and the "in" and "out" indication is printed automatically when the unit number is printed. The entrance plate is also provided with a switch marked "in" and a switch marked "out" and these

50 switches control the circuits through the electromagnets 91^b and 91^a, respectively. It will appear that it is not always necessary to operate these switches. If a person desiring to make a registration finds that the

55 "in and out" wheel is already in the proper position he need pay no attention to these switches and may proceed at once to record his number. In order that such a person may be advised of the position of the "in and out" wheel I provide an indicator on

60 the entrance plate such as diagrammatically shown in the figure under consideration. The disk *d* pivoted at *e* is provided at different points near its periphery with the indications "out" and "in." This disk is

65

disposed behind the bar *f* which has a window *g* through which either one of the notations referred to may be exposed. This disk *d* is adapted to be operated in unison with the "in and out" wheel by means of

70 the magnets *m* and *n*. The electromagnet *n* is in series with the electromagnet 91^a and with the "out" button and the battery, and it is clear that when this button is depressed both electromagnets will be energized and,

75 unless the wheel and the disk are already in that position, the "out" characters will be brought into the printing line and the "out" indication will be made at the entrance

80 plate. The analogous operation takes place in the case of the magnets *m* and 91^b which are similarly related and controlled. The mistake magnet, which has been described, is indicated at 174, this magnet being connected through the switch M on the entrance

85 plate and through the resistance R with the battery B. When, after making a registration, a person discovers that he has made a mistake, he presses the button M and the mistake magnet 174 is energized. The type

90 bar associated with this magnet is then brought up into the guide box, the character being brought into the "advanced" position, as has been described, and the erroneous record is stricken out. Merely the assigned

95 number is stricken out, of course, but this is sufficient to indicate to the inspector that the entry is to be disregarded. The person then crossing out his erroneous registration can proceed to make the proper one.

100 The master clock is indicated at C and the insulating cam *c* is adapted to make one revolution per minute. A change in this period is immaterial. The cam *c* operates to make intermittent engagement between the

105 contact springs *s* and *s'* and the circuit which these springs control includes the local battery T and the time printing magnet 118 which has hereinbefore been referred to. A condenser may be connected across the

110 springs *s* and *s'* to cut down the sparking. A secondary clock P may also be controlled by contacts *s* and *s'* and may be disposed upon the entrance plate.

115 I have deemed it wise to describe the operation of the various parts of my machine and system as the description of the structure went along and I consider it unnecessary therefore to append a detailed summarization of the operation. Suffice it to

120 say that when a person, to whom the number 374, for instance, is assigned, desires to make an entry, he approaches the entrance plate and looks to see if the "in and out" indication is proper. If it is not he presses

125 either the "in" or "out" button to make it so. He then presses and releases the fourth button from the top in the hundreds column and the figure "3" is printed on the record sheet. He then presses and releases the

130

eighth button from the top in the tens column and the figure "7" is printed on the record, after the figure "3." He then presses the fifth button from the top in the units column and the figure "4" is printed on the record, after the figure "7." At the same time the movable platen comes down and prints the date and the time as indicated by the register wheels, this time being the same as indicated by the master clock and the secondary clock. Upon releasing this last button the inking ribbon is advanced and the paper is also advanced. If, by mistake, the person presses the fourth button from the top in the units column instead of the fifth button from the top, he, upon discovering the mistake, immediately presses the mistake button, and the record is canceled. He then proceeds to make an entirely new registration. The record is as follows:

374 IN JAN 5 8 43 AM 1911

I claim as new and desire to secure by Letters Patent:

1. In a recording device, in combination, an actuating single type bar, means for guiding said type bar, and means laterally for shifting said guiding means to print the character in different positions.

2. In a recording device, in combination, a loosely mounted oscillating single type bar, means for guiding said type bar, and means laterally for shifting said guiding means to print the character in different positions.

3. In a recording device, in combination, an actuating type bar, means for guiding said type bar, and means for shifting said guiding means both ways from a neutral printing position.

4. In a recording device, in combination, a type bar, electrical means for operating said type bar, means for guiding said type bar, electrical means for shifting said guiding means and means for simultaneously controlling said electrical means.

5. In a recording device, in combination, a type bar, electrical means for operating said type bar, means for guiding said type bar, electrical means for shifting said guiding means, and a switch for closing the circuits through both of said electrical means simultaneously.

6. In a recording device, a plurality of actuating type bars swinging toward the printing zone from different directions, and a member having a flaring slot therein for receiving said type bars and guiding them into the printing position, said member being capable of oscillation about the axis of said slot.

7. In a recording device, a plurality of actuating type bars swinging toward the printing zone from different directions, and a flared receptacle for receiving said type bars and guiding them into the printing position.

8. In a recording device, a plurality of actuating single type bars swinging toward the printing zone from different directions, and a flared receptacle for receiving parts of said type bars and guiding them into laterally different printing positions.

9. In a recording device, a plurality of loosely mounted actuating single type bars swinging toward the printing zone from different directions, and a flared receptacle for receiving said type bars and guiding them into laterally different printing positions.

10. In a recording device, a plurality of actuating single type bars swinging toward the printing zone from different directions, a flared receptacle for receiving said type bars and guiding them into the printing position, and means for laterally shifting said receptacle.

11. In a recording device, a type wheel, with two lines of characters, a pair of magnets, an oscillating armature under the alternate control of said magnets, and mechanical connection between said armature and said wheel whereby either set of characters may be brought into the printing line.

12. In a recording device, date and time printing means, an "in and out" printing means, and a plurality of individual digit printing means, and electromagnetic means for operating all of said printing means.

13. In a recording device, date and time printing wheels, a time-controlled electromagnet for advancing said wheels, an "in and out" printing member, manually-controlled electromagnetic means for operating said "in and out" printing member, a plurality of digits type bars, an operating electromagnet for each type bar, and means for selecting the operation of any of said last-named electromagnets.

14. In a recording device, date and time printing wheels, a time-controlled electromagnet for advancing said wheels, an "in and out" printing member, manually-controlled electromagnetic means for operating said "in and out" printing member, a plurality of digits type bars, an operating electromagnet for each type bar, and means for selecting the operation of any of said last-named electromagnets to print a number, "in" or "out", and the time and date in a line on a strip of paper.

15. In a recording device, date and time printing wheels, a time-controlled electromagnet for advancing said wheels, an "in and out" printing member, manually-controlled electromagnetic means for operating said "in and out" printing member, a plurality of digits type bars, an operating electromagnet for each type bar, means for selecting the operation of any of said last-named electromagnets, means for passing a strip of paper over the printing line of the

printing parts, a platen over the paper, and means for passing an inking ribbon under said paper on the printing line.

5 16. In a recording device, date and time printing wheels, a time-controlled electro-
magnet for advancing said wheels, an "in
and out" printing member, manually-con-
trolled electromagnetic means for operating
10 said "in and out" printing member, a plu-
rality of digits type bars, an operating elec-
tromagnet for each type bar, means for se-
lecting the operation of any of said last-
named electromagnets, means for passing a
15 strip of paper over the printing line of the
printing parts, a platen over the paper,
means for passing an inking ribbon under
said paper on the printing line, and electro-
magnetic means for operating said paper-
20 passing means and said ribbon-passing
means.

17. In a recording system, a set of time
wheels, time-controlled means for periodi-
cally advancing said time wheels, an "in
and out" printing member, electromagnetic

means for controlling said member, a 25
switchboard having switches for controlling
said electromagnetic means, electromagnetic
indicating mechanism on said switchboard
operating in unison with said electromag-
netic means, a plurality of individual type 30
bars for printing digits, electromagnetic
means for operating said type bars, electro-
magnetically controlled guiding means for
guiding the type bars into different posi-
tions, switches on said switchboard for se- 35
lecting any type bar electromagnet and any
position of said guiding means, and electro-
magnetic means for passing a strip of paper
and an inking ribbon in connection with the
printing mechanism. 40

In witness whereof, I hereunto subscribe
my name this 16th day of January, A. D.
1911.

ALFRED L. SOHM.

Witnesses:

ARTHUR H. BOETTCHER,
ALBERT G. McCALEB.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,
Washington, D. C."