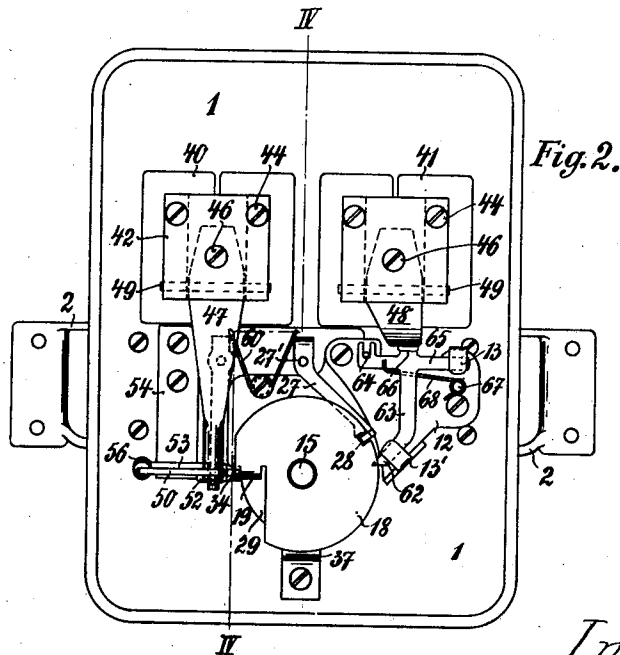
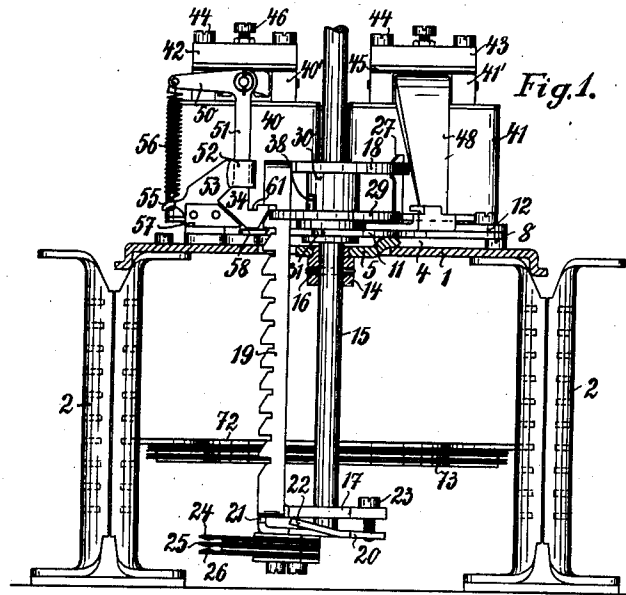


B. SETTEGAST.
 SELECTOR FOR AUTOMATIC TELEPHONE EXCHANGES.
 APPLICATION FILED MAY 23, 1910.

1,015,644.

Patented Jan. 23, 1912.

3 SHEETS—SHEET 1.

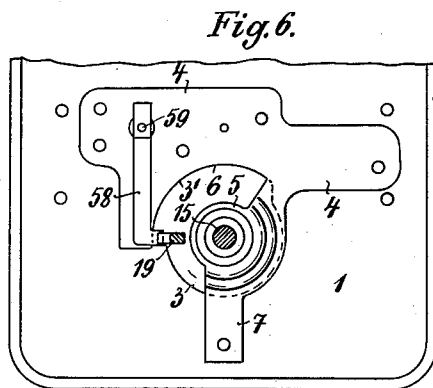
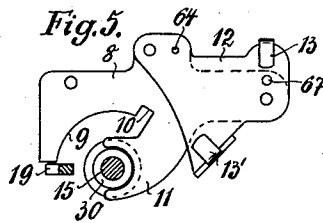
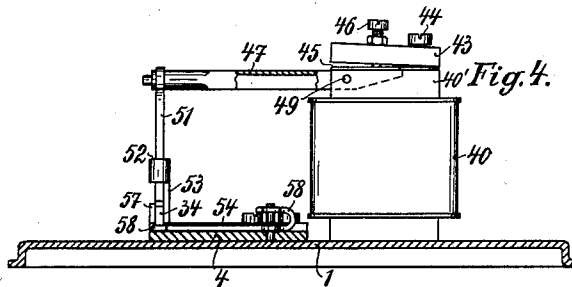
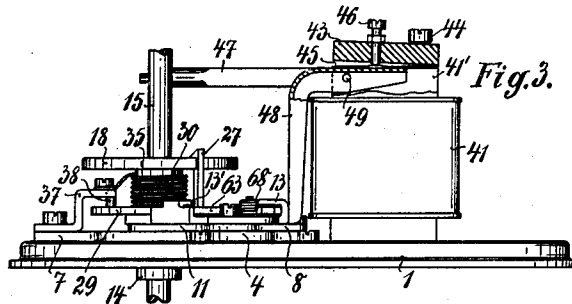


Witnesses,
 M. Heffling
 D. Burdine

Inventor,
 Bernhard Settegast,
 by B. Singer,
 Atty.

1,015,644.

3 SHEETS—SHEET 2.



Witnesses,
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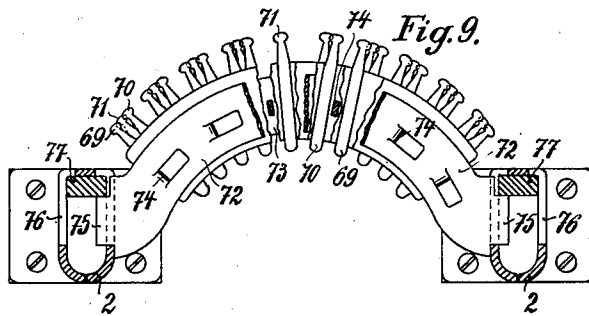
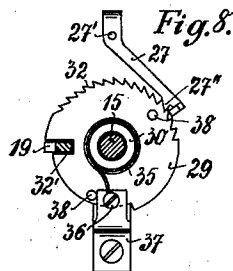
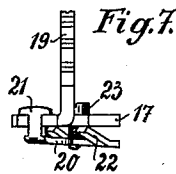
Inventor,
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by B. Singer
Att'y.

B. SETTEGAST.
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3 SHEETS—SHEET 3.



Witnesses,
 M. Heffling
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UNITED STATES PATENT OFFICE.

BERNHARD SETTEGAST, OF KARLSHORST, NEAR BERLIN, GERMANY, ASSIGNOR TO
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SELECTOR FOR AUTOMATIC TELEPHONE-EXCHANGES.

1,015,644.

Specification of Letters Patent.

Patented Jan. 23, 1912.

Application filed May 23, 1910. Serial No. 562,924.

To all whom it may concern:

Be it known that I, BERNHARD SETTEGAST, engineer, citizen of Germany, residing at Karlsruhst, near Berlin, Germany, have invented new and useful Improvements in Selectors for Automatic Telephone-Exchanges, of which the following is a specification.

This invention relates to a selector for automatic telephone exchanges. Such selectors are used as is well known to automatically effect the connection between two subscribers' stations of a telephone network. In the known Strowger system each selector has a moving member consisting of a switch cylinder having usually three contact arms through two of which the speaking currents flow while the third serves as a testing contact. The switch cylinder is raised through the requisite number of steps by a lifting magnet and then turned by a turning magnet.

The switch cylinder was made hitherto as a double cylinder in the ordinary sense of the word, one cylinder having usually ten, circumferential grooves, and the second cylinder fixed to the first having ten longitudinal grooves extending parallel to the axis. After completion of the conversation the switch cylinder was turned to the end of its path whereupon it fell downward and was turned back to its position of rest by a spring which had been put under tension. Such a switch cylinder has a great weight and consequently necessitates a large amount of energy for raising and turning it; moreover in falling it gives a heavy shock to the members which carry it. These defects are avoided according to the present invention by the use of a very much lighter form of the moving member. The switch cylinder is replaced by a simple toothed bar which has two perforated disks attached to it arranged to slide longitudinally and to turn on a fixed shaft. The contact arms formed as springs are mounted on this moving member in such a way that their position can be readily adjusted as is required with the desired accuracy. The falling of the raised switch cylinder of the Strowger system was prevented by a catch when in the working position this catch engaging in one of the circular grooves; in the new selector a fixed plate serves this purpose. The toothed bar therefore need only be made as broad as is

necessary to insure the proper engagement of the lifting catch. The lifting and turning magnets according to the present invention are also made as far as possible of the same form. They are so arranged that they will exert the greatest possible force with the least possible expenditure of current. For this purpose the actual armature is made separate from the arm which it serves to move, and the engaging point between them is in the middle point of the magnetic field. Further, both the raising magnet and the turning magnet have only one spring each which serves the double purpose of returning the armature and its arm to the normal position, and of returning also the lifting or turning catch.

In the Strowger system there is a special set of fixed contacts provided for each contact arm of the switch cylinder over which the contact arms pass; that is to say, the A-conductor, the B-conductor which both lead to the subscriber, and the testing conductor which only leads to the office, are connected to separate contact sets. If a fault occurs in any one line or if a line is to be cut off the necessary operations have to be carried out in all three contact sets of the selector. In place of this the contacts of the A-, B- and corresponding testing-conductors are arranged together in the new selector. For example a set of contacts is formed by ten such groups of three contacts each. The sets of contacts are so arranged in multiple sets of ten for example in the standards of the selector that they are easily accessible from the rear and can also be removed and exchanged in a very simple manner.

In the selector about to be described in detail by way of example care is taken that as far as possible all parts can be made by purely mechanical processes of stamping, pressing, bending and the like, so that no subsequent finishing work by hand is needed which would greatly add to the expense. The construction is also such that the parts of the selector can be made easily and that they shall be simple to build up, while the separate parts shall be capable of being readily replaced or interchanged.

One form of construction of the new selector is shown in the accompanying drawings, in which—

Figure 1 is a front view; Fig. 2, a plan; Fig. 3, a side view of the upper part seen

from the right, partly in section; Fig. 4, a section on the line IV—IV of Fig. 2 seen from the right; Figs. 5 and 6 show in each case two plates lying on the base plate or one on another; Figs. 7 and 8 show details hereinafter explained; Fig. 9 is another detail view showing a set of contacts.

The base plate 1 (Figs. 1, 2 and 6) is carried by the stands 2 hereinafter described, these latter being suitably fixed to a bracket of a frame or the like (not shown in the drawing). The base plate is flat except for the downwardly bent edges, and has an aperture in it of roughly circular shape, as seen in Fig. 6. The edge of the hole is indicated by the numerals 3 and 3¹ and forms part of a smaller circle for about $\frac{5}{8}$ of its circumference, and of a larger circle for about $\frac{3}{8}$ of its circumference. A second plate 4 (Figs. 1, 3, 4 and 6) is attached to the base plate 1, the middle portion 5 of the plate 4 being depressed so as to lie in the hole and in the plane of the base plate 1. At the left side of this part 5 the plate 4 is cut away, as shown at 6, in a circular form, corresponding with the edge 3¹ of the hole in the base plate 1, and also for about $\frac{3}{8}$ of a circle. A tongue 7 extends forwardly from the part 5 of the plate 4, and lies upon the top of the base plate 1. On the plate 1 lies a third flat plate 8 (Figs. 1, 3 and 5) formed with a curved slot 9 also extending for about $\frac{3}{8}$ of a circle and having a notch 10 at its right end. The edge of the slot 9 forms a circular arc which is of smaller radius than the part 3¹ of the hole in the base plate 1. The plate 8 is further formed with a fork 11 and carries a fourth plate 12 (Figs. 1 and 5) having two hook-shaped upwardly bent lugs 13 and 13¹.

In the depressed middle part 5 of the plate 4 is fitted a collar 14 (Fig. 1) in which a vertical shaft 15 is fixed by a pin 16 or the like. The shaft 15 can thus neither turn nor move longitudinally, but on it two disks 17, 18, are arranged both to slide and to turn, these disks being connected by a toothed bar 19. Both the disks 17, 18, and the bar 19 are preferably made from a single piece of sheet metal which is first stamped out with the required outlines and then bent to shape; both disks 17, 18, have circular holes to slide over the shaft 15. Beneath the disk 17 is fixed a plate 20 (Figs. 1 and 7) having a T-shaped lug 21 at one side which engages in a slot in the disk 17, and also two other upwardly bent pieces 22 which rest against the disk from below. A screw 23 passing through a hole in the disk and a threaded hole in the plate 20, holds the plate in conjunction with the lug 21 so as to fasten it to the disk. The bent pieces 22 form to some extent resting and turning points for the plate 20; as the screw is tightened the right side (Fig. 1) of the plate

20 is pulled up while the left side is held fast by the head of the lug 21, causing the projections 22 to bend as springs.

Contact springs 24, 25, 26 (Fig. 1), insulated one from another and from their support, are attached below to the plate 20; the number of contact springs used may be different of course according to the telephone system employed at any particular station.

These contact springs have flexible leads (not shown) connected to them, which leads are preferably carried at their other ends to a set of eyelets or terminals (also not shown) on the base plate 1. The contact springs 24, 25 and 26 can be accurately adjusted by tightening or loosening the screw 23 so as to raise them or lower them when required by causing the plate 20 to turn slightly as before explained.

The disks 17, 18, with the rod 19, can move longitudinally of the shaft 15, as already stated, but owing to the edge 9 of the slot in the plate 8, this longitudinal movement can only take place in the two positions in which the toothed rod 19 is either in the notch between the end of the part 3 of the hole in the base plate 1 and the end of the part 9 of the plate 8, or is in the notch 10 of the plate 8. The edge 9 always engages in one of the notches of the bar 19 as soon as this latter is turned. The turning of the disks 17, 18, with the bar 19 is only possible after they have been raised at least one tooth space, because this movement is necessary to raise the disk 18 sufficiently to free it from a catch 27 pivoted at 27¹, and engaging in a notch 28 in the disk.

The toothed bar 19 with the disks 17, 18 and the contact springs 24, 25, 26 is first turned, as hereinafter explained, through one or more steps to bring these into the working position in which they make the telephone connections, and after completion of the conversation the bar is further turned until it comes into the notch 10, whereupon it falls through this notch to its lowest position again. As soon as the bar 19 is raised by one step, the disk 18 is above the catch 27 which then no longer engages in the notch 28; the toothed bar 19 can be turned now or after further upward steps, and the tooth of said bar which is then just over the edge 9 of the plate 8 will rest on the top of the plate around this edge during the turning movement, thus preventing the bar 19 from falling down at once owing to its weight. The bar is no longer supported by the plate however, when the notch 10 is reached, so that in this position it falls down.

On the shaft 15 below the disk 18 is arranged another disk 29 (Figs. 1 and 8), whose hub 30 turns freely around the shaft. The hub 30 below the disk 29 is grooved at 31 and is engaged by the fork 11 of the plate 8 (Fig. 6). The hub 30 extends also

above the disk 29 and serves as a rest for the disk 18, the bar 19, disk 17 and the contact spring device thereon in the position of rest (Fig. 1), so that the fork 11 also supports all these parts and further takes up the shock when they fall owing to the bar 19 coming into the notch 10. The shock is thus damped because the fork 11 acts as a spring to some extent. The disk 29 (Fig. 8) is toothed at 32 for about $\frac{3}{4}$ of its circumference, and also has a notch 32¹ in which the bar 19 lies; when the disk 29 is turned therefore as described hereinafter, it carries the bar 19 around with it. A spring 35 is coiled around the hub 30, and fixed thereto at one end. The other end of the spring is held by a stud 36 carried by an arm 37, which in turn is held rigidly upon the part 7 of the plate 4. The spring is put in tension when the disk 29 is turned right-handedly. As soon as the bar 19 has fallen through the notch 10, the spring 35 releases itself and turns the bar 19 toward the left, bringing it back to the starting position (Fig. 1). Two pins 38 serve to limit the turning movements of the disk 29, by abutting at the right or left against the arm 37.

The movements of the toothed bar 19 with the disks and contact springs connected thereto have been described above, and it now remains to state how these parts are raised and turned. Both movements are effected by means of electro-magnets 40 and 41 (Figs. 1 to 4), 40 being the lifting magnet, and 41 the turning magnet. The iron frames 40¹ and 41¹ of the two magnets are both similarly formed; they consist of U-shaped pieces of iron directly attached to the base plate 1 and provided with windings on both arms. The armatures 42 and 43 of the two magnets are also both of the same form; they consist of iron plates through slots in each of which pass two headed screws 44 engaging in the iron cores 40 and 41. These screws allow the armatures 42, 43, to swing freely to the desired extent while holding them upon the iron cores. Between the faces of the cores and the armatures are placed sheets 45 of non-magnetic material; these prevent the armatures from touching and clinging to the cores. Adjusting screws 46 passing through the armatures and through holes in the sheets 45 regulate the stroke or movement of the armatures. The lower ends of the adjusting screws rest on arms 47, 48, each of which is revolvably supported on a pin 49, and is formed of sheet metal bent into a U-shape. The apparatus works with a strength which is very near to the theoretically greatest strength obtainable from the electro-magnetic device, owing to the fact that the respective armatures 42, 43, are separated from the arms 47, 48, which they operate, while the latter are acted upon by the pressure of the screws 46 which are

approximately in the middle of the armatures 42, 43, and therefore in the middle of the magnetic fields.

The arm 47 operated by the raising magnet 40 (Figs. 1, 2 and 4) is carried directly outward, and has an elbow lever 50, 51, pivoted at its end. The lower end of the arm 51 is formed as the catch 34 which operates upon the teeth of the bar 19 (Fig. 1). The arm 51 is guided in a loop 52 formed in the vertical plate 53 which latter is attached to the base plate 1 by means of a plate 54. The plate 53 is also formed with a projection 55 which serves as the attachment for one end of a tension spring 56 whose other end engages with the outer end of the arm 50. The plate 53 also has a wedge-shaped piece 57 upon it, on the inclined face of which can slide the similarly formed inclined rear face of the lifting catch 34. Beneath this latter is arranged a locking catch 58 which is mounted to turn in a horizontal plane about a pin 59 on the plate 4 on which it rests. The locking catch 58 is pressed by means of a spring 60 (Fig. 2) acting on the tail piece of said catch, so as to engage in the notches of the bar 19 and to prevent this latter from falling.

If the armature 42 of the raising magnet 40 is drawn down, it causes the end of the arm 47 which carries the lever 50, 51, to rise, whereupon the catch 34 lifts the toothed bar 19 one step, while the spring 56 is stretched. A notch 61 is formed in the catch 34 which is caught by means of the loop 52 as the catch rises in order to insure the correct action of the catch. The locking catch 58 snaps over the next tooth of the bar 19 when this latter is raised, and engages in the next notch under the tooth. If now the excitation of the lifting magnet 40 ceases, the spring 56 releases itself moving back the arm 47, and the armature 42, and at the same time returning the elbow lever 50, 51, with the catch 34 to the position of rest shown in Figs. 1 and 4. The teeth of the bar 19, and the face of the catch 34, and of the locking catch 58 are all sloped so that the catches can easily slip past the teeth of the bar. The engagement of the lifting catch 34 in the next tooth space of the bar 19 is insured by the sliding of the inclined rear face of the catch on the sloping edge of the piece 57. The divisions of the toothed bar—that is to say the distance between the adjacent teeth—is purposely made somewhat greater than the stroke of the lifting catch 34. By this means the jumping of the toothed bar through more than one tooth space is prevented because the stroke of the lifting catch is not sufficient alone for raising the bar one step, but the lifting has to be completed to the required extent by the inertia imparted to

the toothed bar and the members attached thereto.

The forward end of the arm 48 of the turning magnet 41 is bent downward at an angle (Figs. 1 to 3), and serves to turn the pawl 62. The pawl 62 is formed upon a T-shaped piece 63 which turns around a pin 64 fixed on the plate 12 on which the pawl piece rests. The arm 65 of the T-piece 63 and the pawl member 62 itself are guided in their movements by the lugs 13 and 13¹ (Figs. 2 and 5) already referred to. The pin 64 does not engage in a hole but in a slot in the T-piece 63. The lower end of the arm 48 rests against a projection 66 on the T-piece 63. The pawl 62 engages with the teeth 32 already mentioned on the disk 29, by the turning of which latter the toothed bar 19 is moved around by means of the notch 32¹ (Fig. 8). The return movement of the disk 29 is prevented by means of the catch 27 already referred to which has a tooth 27¹¹ which also engages with the teeth 32. The spring 60 which acts upon the locking catch 58 also presses against the catch 27 in a similar manner (Fig. 2). The front end of the catch 27 is bent upward as already described and serves as stated to engage in a notch 28 in the disk 18, and to prevent this latter from turning until the toothed bar 19 has been raised at least one step. A spring 68 mounted on a pin 67 on the plate 12 presses upon the T-piece 63 and thus holds back the pawl 62.

When the armature 43 of the turning magnet 41 is drawn down, the lower end of the arm 48 is moved to the left (Fig. 3), and thus turns the pawl piece 63 (Fig. 2) to the right around the pin 64 as a turning point, by which means the spring 68 is tensioned. The pawl 62 engages with the disk 29 and turns this latter together with the bar 19 in a right-handed direction, while the tooth 27¹¹ of the catch 27 simply slides over the next tooth of the set of teeth 32. If the excitation of the turning magnet 41 now ceases, the spring 68 is released, and it moves back both the T-piece 63 with the pawl 62, and the arm 48 with the armature 43 into the position of rest shown in Figs. 2 and 3. The springs 56 and 68 therefore have each two functions namely, the returning of the lifting and turning members 34 and 62, and also the returning of the arms 47 and 48 with the armatures 42 and 43.

After the toothed bar 19 has fallen through the notch 10 of the plate 8 (Fig. 5) the spring 35 must be released as already stated in order to return the disk 29 and the bar 19 with the parts connected thereto, by a lefthand turning movement, to the position of rest (Fig. 1). This movement would be prevented, however, by the tooth 27¹¹ of the catch 27 because it would engage in the teeth 32 of the disk 29. The

catch 27 must therefore be moved back. This is effected by means of the disk 18 which on falling comes against the inclined head of the catch 27 and moves this aside. The spring 35 is therefore free to release itself and then returns the disk 29 and the bar 19 with the disks 17, 18, to the position of rest, whereupon the head of the catch 27 snaps into the notch 28 of the disk 18, which allows the tooth 27¹¹ to again engage with the teeth 32 of the disk 29.

The lifting and turning of the bar 19 and of the contact springs 24, 25, 26, connected therewith, having been fully described, it now remains only to explain the arrangement of the sets of contacts with which the contact springs coöperate. These sets of contacts (Figs. 1 and 9) only one of which is indicated in Fig. 1, consist for example of ten groups each of three contacts 69, 70, 71. Each contact (Fig. 9) consists of a strip with the usual soldering eyelet at its outer end, while the inner end of each strip projects inward a little beyond the plates 72, 73, about to be described, and is adapted to be engaged by the end of one of the contact springs 24, 25, 26. The contact pieces 69, 70, 71, are separated from one another and from the supporting plates 72, 73, by means of intermediate layers of insulating material. The supporting plates 72, 73, are held together either by rivets, or better by means of lugs 74 stamped out of one plate and passed through corresponding slots in the other plate and then bent over at their ends. The lower plate 73 is only made so long as is necessary for holding the contacts 69, 70, 71, but the ends of the upper plate 72 are formed as lugs 75 which are thrust from the rear into slots 76 in the standards 2, (Fig. 9). These standards consist of stamped sheet metal shaped as tubes with extended foot-pieces at each end. When the required number—say ten—of the plates 72 carrying the sets of contacts have been inserted in the standards, bars 77 are thrust into the hollow standards from above, thus locking the plates 72 in position, as seen in Fig. 9. The standards 2 are so arranged that they will each take the lugs 75 of the contact sets of two adjacent selectors.

As is evident from the preceding description and the drawings, all the parts of the new selector are so formed that they can be made entirely by machinery, that is to say, they need no subsequent finishing by hand. They all consist of stamped and, in some cases, bent sheet material which can be made at the same time with the necessary holes for receiving the various screws, pins and the like. In consequence of this, the new selector is not only very easily made, but costs very little.

I claim:

1. In a selector for automatic telephone

exchanges, a spindle, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disks, means for moving said toothed bar and said disks longitudinally of said spindle, means for turning said disks and toothed bar on said spindle, and contacts connected with the lowermost of said disks.

2. In a selector for automatic telephone exchanges, a spindle, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disks, lifting means for said toothed bar and said disks, a lifting magnet and an armature therefor for actuating said lifting means, means for turning said disks and toothed bar on said spindle, and contacts connected with the lowermost of said disks.

3. In a selector for automatic telephone exchanges, a spindle, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disks, a catch for engaging said toothed bar, a lifting magnet and an armature therefor, intermediate mechanism between said catch and said armature whereby said catch may be lifted and said toothed bar and said disks may be moved longitudinally of said spindle, means for turning said disks and toothed bar on said spindle, and contacts connected with the lowermost of said disks.

4. In a selector for automatic telephone exchanges, a spindle, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disks, means for moving said toothed bar and said disks longitudinally of said spindle, a turning magnet and an armature therefor, intermediate mechanism between said armature and said toothed bar for turning said disks and said toothed bar on said spindle, and contacts connected with the lowermost of said disks.

5. In a selector for automatic telephone exchanges, a spindle, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disks, means for moving said toothed bar and said disks longitudinally of said spindle, a turning magnet and an armature therefor, a member mounted on said spindle engaging said toothed bar, mechanism actuated by said armature for turning said member and said toothed bar on said spindle, and contacts connected with the lowermost of said disks.

6. In a selector for automatic telephone exchanges, a spindle, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disks, a lifting magnet and an armature therefor, a catch engaging said toothed bar, intermediate mechanism between said catch and said armature whereby the catch may be operated and said toothed bar and said disks

may be moved longitudinally of said spindle, a turning magnet and an armature therefor, a member mounted on said spindle engaging said toothed bar, mechanism actuated by said armature for turning said member and said toothed bar on said spindle, and contacts connected with the lowermost of said disks.

7. In a selector for automatic telephone exchanges, a spindle, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disks, means for moving said toothed bar and said disks longitudinally of said spindle, a third disk mounted on said spindle having teeth on its periphery, means on said disk for engaging said toothed bar, a pawl arranged to engage said teeth on said disk, means for actuating said pawl whereby said toothed bar and said disks may be turned on said spindle, and contacts connected with the lowermost of said disks.

8. In a selector for automatic telephone exchanges, a spindle, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disks, means for moving said toothed bar and said disks longitudinally of said spindle, a third disk mounted on said spindle having teeth on its periphery, means on said disk for engaging said toothed bar, a pawl arranged to engage said teeth on said disk, a turning magnet and an armature therefor, a lever connected with said pawl and actuated by the movement of said armature whereby said pawl may be actuated and said toothed bar and disks may be turned on said spindle, and contacts connected with the lowermost of said disks.

9. In a selector for automatic telephone exchanges, a spindle, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disks, means for moving said toothed bar and said disks longitudinally of said spindle, a third disk mounted on said spindle having teeth on its periphery, said disk being provided with a slot for engaging said toothed bar, a pawl arranged to engage said teeth on said disk, a turning magnet and an armature therefor, a lever connected with said pawl and actuated by the movement of said armature whereby said pawl may be actuated and said toothed bar and disks may be turned on said spindle, means for preventing the rotation of said toothed disk in a contrary direction, and contacts connected with the lowermost of said disks.

10. In a selector for automatic telephone exchanges, a spindle, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disks, means for moving said toothed bar and said disks longitudinally of said spindle, a third disk mounted on said spindle having teeth

on its periphery, said disk being provided with a slot for engaging said toothed bar, a pawl arranged to engage said teeth on said disk, a turning magnet and an armature therefor, a lever connected with said pawl and actuated by the movement of said armature whereby said pawl may be actuated and said toothed bar and disks may be turned on said spindle, means for preventing the rotation of said toothed disk in a contrary direction, means for preventing the turning of the uppermost of said disks until said toothed bar has been raised, and contacts connected with the lowermost of said disks.

11. In a selector for automatic telephone exchanges, a spindle, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disks, means for moving said toothed bar and said disks longitudinally of said spindle, means for turning said disks and toothed bar on said spindle, means for preventing the turning of the uppermost of said disks until said toothed bar has been raised, and contacts connected with the lowermost of said disks.

12. In a selector for automatic telephone exchanges, a spindle, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disks, means for moving said toothed bar and said disks longitudinally of said spindle, means for turning said disks and toothed bar on said spindle, means for allowing said toothed bar to drop to its normal position after having been turned, and contacts connected with the lowermost of said disks.

13. In a selector for automatic telephone exchanges, a spindle, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disks, means for moving said toothed bar and said disks longitudinally of said spindle, means for turning said disks and toothed bar on said spindle, means for preventing the turning of the uppermost of said disks until said toothed bar has been raised, means for allowing said toothed bar to drop to its normal position after having been turned, and contacts connected with the lowermost of said disks.

14. In a selector for automatic telephone exchanges, a spindle, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disks, means for moving said toothed bar and said disks longitudinally of said spindle, a third disk mounted on said spindle having means for engaging said toothed bar, means for rotating said last named disk and with it said toothed bar and said two first named disks, means for preventing the rotation of said third disk in a contrary direction, means for allowing said toothed bar to drop to its normal position after having been turned, and contacts connected with the lowermost of said disks.

15. In a selector for automatic telephone exchanges, a spindle, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disks, means for moving said toothed bar and said disks longitudinally of said spindle, a third disk mounted on said spindle having means for engaging said toothed bar, means for rotating said last named disk and with it said toothed bar and said two first named disks, means for preventing the rotation of said third disk in a contrary direction, means for allowing said toothed bar to drop to its normal position after having been turned, and contacts connected with the lowermost of said disks.

16. In a selector for automatic telephone exchanges, a spindle, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disks, means for moving said toothed bar and said disks longitudinally of said spindle, a third disk mounted on said spindle having means for engaging said toothed bar, means for rotating said last named disk and with it said toothed bar and said two first named disks, means for preventing the rotation of said third disk in a contrary direction, means for preventing the turning of the uppermost of said disks until said toothed bar has been raised, and contacts connected with the lowermost of said disks.

17. In a selector for automatic telephone exchanges, a spindle, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disks, means for moving said toothed bar and said disks longitudinally of said spindle, a third disk mounted on said spindle having means for engaging said toothed bar, means for rotating said last named disk and with it said toothed bar and said two first named disks, means for preventing the rotation of said third disk in a contrary direction, means for preventing the turning of the uppermost of said disks until said toothed bar has been raised, means for allowing said toothed bar to drop to its normal position after having been turned, and contacts connected with the lowermost of said disks.

18. In a selector for automatic telephone exchanges, a spindle, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disks, means for moving said toothed bar and said disks longitudinally of said spindle, a third disk mounted on said spindle having means for engaging said toothed bar, means for rotating said last named disk and with it said toothed bar and said two first named disks, means for preventing the rotation of said third disk in a contrary direction, means for preventing the turning of the uppermost of said disks until said toothed bar has been raised, means for allowing said

means for adjusting said two last named disks with relation to each other, and contacts mounted on the lowermost of said disks and movable with said toothed bar.

23. In a selector for automatic telephone exchanges, a spindle, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disks, means for moving said toothed bar and said disks longitudinally of said spindle, means for turning said disks and toothed bar on said spindle, means for preventing the turning of said disks until said toothed bar has been raised, means for allowing said toothed bar to drop to its normal position after having been turned, means for turning said disks and toothed bar in a contrary direction and back to their normal position after said toothed bar has dropped to its normal lowermost position, and contacts connected with the lowermost of said disks.

24. In a selector for automatic telephone exchanges, a spindle, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disks, means for moving said toothed bar and said disks longitudinally of said spindle, means for turning said disks and toothed bar on said spindle, means for preventing the turning of said disks until said toothed bar has been raised, means for allowing said toothed bar to drop to its normal position after having been turned, means for turning said disks and toothed bar in a contrary direction and back to their normal position after said toothed bar has dropped to its normal lowermost position, a disk arranged beneath the lowermost of said two first named disks, means for adjusting said two disks with relation to each other, and contacts mounted on the lowermost of said disks.

25. In a selector for automatic telephone exchanges, a spindle, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disks, means for moving said toothed bar and said disks longitudinally of said spindle, means for turning said disks and toothed bar on said spindle, means for preventing the turning of said disks until said toothed bar has been raised, means for allowing said toothed bar to drop to its normal position after having been turned, means for preventing the rotation of said disks in a contrary direction before they are allowed to assume their lowermost position, a disk arranged beneath the lowermost of said two first named disks, means for adjusting said two disks relatively to each other, and contacts mounted on the lowermost of said disks.

26. In a selector for automatic telephone exchanges, a spindle, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disks, means for moving said toothed bar and said

disks longitudinally of said spindle, means for turning said disks and toothed bar on said spindle, a third disk arranged beneath the lowermost of said two first named disks, an upstanding lug connected with said third disk and engaging the lowermost of said two first named disks, means located on the opposite side of said two disks to the side on which said lug is disposed for adjusting the position of the two disks with relation to each other, and contacts mounted on the lowermost of said disks.

27. In a selector for automatic telephone exchanges, a spindle, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disks, means for moving said toothed bar and said disks longitudinally of said spindle, means for turning said disks and toothed bar on said spindle, a third disk arranged beneath the lowermost of said two first named disks, an upstanding lug arranged on the edge of said third disk and adapted to engage the lowermost of said two first named disks, a screw passing through said two disks on a side opposite to that on which said lug is disposed whereby the position of the two disks may be adjusted with relation to each other, and contacts mounted on the lowermost of said disks.

28. In a selector for automatic telephone exchanges, a spindle, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disk, a lifting magnet and an armature therefor, a catch adapted to engage said toothed bar, said catch having an inclined face, intermediate mechanism between said catch and said armature whereby said catch may be operated and said toothed bar may be moved longitudinally of said spindle, a block having an inclined face on which the inclined face of said catch slides, means for turning said disks and toothed bar on said spindle, and contacts connected with the lowermost of said disks.

29. In a selector for automatic telephone exchanges, a spindle, a pair of disks suitably spaced apart and moving on said spindle, a toothed bar connecting said disks, a lifting magnet and an armature therefor, a lever actuated by the movement of said armature, an elbow lever pivoted on said last named lever, a catch on the lower end of said elbow lever for engaging said toothed bar, means for returning said levers to their normal position after the excitation of said magnet has ceased, means for turning said disks and toothed bar on said spindle, and contacts connected with the lowermost of said disks.

30. In a selector for automatic telephone exchanges, a spindle, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disks, a

lifting magnet and an armature therefor, a lever actuated by the movement of said armature, an elbow lever pivoted on said last named lever, a catch on the lower end of said elbow lever for engaging said toothed bar, said catch having an inclined face, a block also having an inclined face on which the inclined face of said catch slides into engagement with said toothed bar, a spring acting on said elbow lever to return the same to its normal position after the excitation of said magnet has ceased, means for turning said disks and toothed bar on said spindle, and contacts connected with the lowermost of said disks.

31. In a selector for automatic telephone exchanges, a spindle, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disks, a lifting magnet and an armature therefor, a lever actuated by the movement of said armature, an elbow lever pivoted on said last named lever, a catch on the lower end of said elbow lever for engaging said toothed bar, means for returning said levers to their normal position after the excitation of said magnet has ceased, means for turning said disks and toothed bar on said spindle, a catch having an upturned end engaging the uppermost of said disks for holding said disks against rotation until said toothed bar and disk have been raised, means for allowing the return to their normal position of said disks and said toothed bar controlled by the movement of said catch, and contacts connected with the lowermost of said disks.

32. In a selector for automatic telephone exchanges, a spindle, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disks, means for moving said toothed bar and said disks longitudinally of said spindle, a third disk mounted on said spindle engaging said toothed bar said disk being provided on its periphery with teeth, a pawl engaging said teeth, means for actuating said pawl, a catch having an upturned end engaging the uppermost of said two first named disks for preventing the rotation of said disk until said disk and toothed bar have been raised, means controlled by the movement of said catch for returning said disks to their normal position after said disks and toothed bar have been allowed to drop to their lowermost normal position, and contacts connected with the lowermost of said disks.

33. In a selector for automatic telephone exchanges, a spindle, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disks, means for moving said toothed bar and said disks longitudinally of said spindle, a third disk mounted on said spindle having means for the engagement of said toothed bar, said disk being provided on its periphery with

teeth, a pawl engaging said teeth, means for actuating said pawl, the uppermost of said two first named disks being provided on its periphery with a slot, a spring controlled catch engaging in said slot and holding said disk from rotation until said disk and toothed bar have been raised, said catch being provided with an inclined face adapted to bear against the edge of the uppermost of the two first named disks whereby said catch will be moved when the disk descends, a tooth on said catch engaging the teeth on said third disk for normally preventing rotation of said disk in a contrary direction, means for rotating said third disk in a contrary direction when said tooth on said catch has been withdrawn from engagement with the teeth on said third disk, and contacts connected with the lowermost of said disks.

34. In a selector for automatic telephone exchanges, a spindle, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disks, means for moving said toothed bar and said disks longitudinally of said spindle, a third disk mounted on said spindle having means for the engagement of said toothed bar, said third disk being provided on its periphery with teeth, a turning magnet and an armature therefor, a pawl engaging said teeth on said third disk, a lever operated by the movement of said armature and connected with said pawl, means for preventing the turning of the uppermost of said disks until said toothed bar has been raised, means controlled by the movement of said last named means for allowing said third disk to turn in a contrary direction whereby said two first named disks and said toothed bar may be returned to their normal position, and contacts connected with the lowermost of said disks.

35. In a selector for automatic telephone exchanges, a spindle, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disks, means for moving said toothed bar and said disks longitudinally of said spindle, a third disk mounted on said spindle having means for the engagement of said toothed bar, said third disk being provided on its periphery with teeth, a pawl engaging said teeth on said disk, a turning magnet and an armature therefor, a lever operated by the movement of said armature and connected with said pawl, the uppermost of said two first named disks being provided on its periphery with a slot, a spring controlled catch engaging in said slot for holding said disk against rotation until said disks and toothed bar have been raised, said catch being provided on its upper end with an inclined surface and also being provided with a tooth engaging the teeth of said third disk for holding said disk against rotation in a contrary

direction, a spring acting on said third disk for returning the same and said two first named disks and said toothed bar to their normal position when the teeth on said third disk having been freed from said tooth on said catch upon the engagement of said inclined surface of said catch with the uppermost of said disks, and contacts connected with the lowermost of said disks.

36. In a selector for automatic telephone exchanges, a spindle, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disks, a lifting magnet and an armature therefor, a lever actuated by the movement of said armature, an elbow lever pivoted on said last named lever, a catch on the lower end of said elbow lever for engaging said toothed bar, means for returning said levers to their normal position after the excitation of said magnet has ceased, a third disk mounted on said spindle having means for the engagement of said toothed bar, said third disk being provided on its periphery with teeth, a turning magnet and an armature therefor, a pawl engaging said teeth on said third disk, a lever operated by the movement of said armature and connected with said pawl, means for preventing the turning of the uppermost of said disks until said toothed bar has been raised, means controlled by the movement of said last named means for allowing said third disk to turn in a contrary direction whereby said two first named disks and said toothed bar may be returned to their normal position, and contacts connected with the lowermost of said disks.

37. In a selector for automatic telephone exchanges, a spindle, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disks, a lifting magnet and an armature therefor, a lever actuated by the movement of said armature, an elbow lever pivoted on said last named lever, a catch on the lower end of said elbow lever for engaging said toothed bar, means for returning said levers to their normal position after the excitation of said magnet has ceased, a third disk mounted on said spindle having means for the engagement of said toothed bar, said third disk being provided on its periphery with teeth, a pawl engaging said teeth on said disk, a turning magnet and an armature therefor, a lever operated by the movement of said armature and connected with said pawl, the uppermost of said two first named disks being provided on its periphery with a slot, a spring controlled catch engaging in said slot for holding said disk against rotation until said disks and toothed bar have been raised, said catch being provided on its upper end with an inclined surface and also being provided with

a tooth engaging the teeth of said third disk for holding said disk against rotation in a contrary direction, a spring acting on said third disk for returning the same and said two first named disks and said toothed bar to their normal position when the teeth on said third disk have been freed from said tooth on said catch upon the engagement of said inclined surface of said catch with the uppermost of said disks, and contacts connected with the lowermost of said disks.

38. In a selector for automatic telephone exchanges, a spindle, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connected with said disks, a lifting magnet and an armature therefor, a lever operated by the movement of said armature, means for adjusting the position of the end of said lever with reference to said armature, a catch for engaging said toothed bar for raising the same, a lever connecting said catch and said first named lever, a third disk mounted on said spindle, a turning magnet and an armature therefor, means controlled by the movement of said armature for rotating said third disk, whereby said two first named disks and said toothed bar may be turned on said spindle, means for allowing said toothed bar to drop to its normal lowermost position after having been turned, means for turning said disks and said toothed bar to their normal position after having been lowered, and contacts connected with the lowermost of said disks.

39. In a selector for automatic telephone exchanges, a spindle, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disks, a lifting magnet and an armature therefor, a turning magnet and an armature therefor, a pair of levers operated by the movement of said armatures, means for adjusting the position of the ends of said levers with reference to said armatures, means operated by said lifting magnet for raising said toothed bar and said disks, means operated by said turning magnet for turning said disks and toothed bar on said spindle, means for preventing the turning of said disks until said toothed bar and said disks have been raised, and contacts connected with the lowermost of said disks.

40. In a selector for automatic telephone exchanges, a base plate said base plate being provided with a circular aperture, a second plate secured to said base plate said second plate having a depressed portion fitting in said aperture but leaving a portion of said aperture open, a spindle passing through said aperture and said depressed portion of said second plate, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disks and passing through the open portion of

the aperture in said base plate, means for moving said toothed bar and said disks longitudinally of said spindle, means for turning said disks and toothed bar on said spindle, means for preventing the turning of the uppermost of said disks until said toothed bar has been raised, and contacts connected with the lowermost of said disks.

41. In a selector for automatic telephone exchanges, a base plate having an aperture formed therein, a second plate mounted on said base plate having a depressed portion adapted to fit in said aperture but leaving a portion of said aperture open, a third plate arranged over said second plate provided with a curved slot having a curved edge shaped like a portion of the edge of said aperture but having a lesser radius of curvature, a spindle passing through the depressed portion of said second plate and through said third plate, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disks and passing through said aperture, said third plate being provided with an additional slotted portion through which said toothed bar may drop, said toothed bar being prevented from longitudinal movement except when in its initial position and when in said last named slot by the edge of the first named slot of said third plate engaging a tooth of said toothed bar, means for moving said toothed bar and said disks longitudinally of said spindle, means for turning said disks and toothed bar on said spindle, and contacts connected with the lowermost of said disks.

42. In a selector for automatic telephone exchanges, a base plate having an aperture formed therein, a second plate mounted on said base plate having a depressed portion adapted to fit in said aperture but leaving a portion of said aperture open, a third plate arranged over said second plate provided with a curved slot having a curved edge shaped like a portion of the edge of said aperture but having a lesser radius of curvature, a spindle passing through the depressed portion of said second plate and through said third plate, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disks and passing through said aperture, said third plate being provided with an additional slotted portion through which said toothed bar may drop, said toothed bar being prevented from longitudinal movement except when in its initial position and when in said last named slot by the edge of the first named slot of said third plate engaging a tooth of said toothed bar, means for moving said toothed bar and said disks longitudinally of said spindle, a third disk mounted on said spindle, said disk being provided with a slot at its periphery for engaging

said toothed bar, said third disk being further provided with teeth on a portion of its periphery, a pawl engaging said teeth of said third disk, means for actuating said pawl, means for preventing the rotation of the uppermost of said two first named disks until said toothed bar has been raised, means for turning said disks and said toothed bar in a contrary direction after said two first named disks and said toothed bar have been allowed to drop, where the same are returned to their normal position, and contacts connected with the lowermost of said disks.

43. In a selector for automatic telephone exchanges, a base plate having an aperture formed therein, a second plate mounted on said base plate having a depressed portion adapted to fit in said aperture but leaving a portion of said aperture open, a third plate arranged over said second plate provided with a curved slot having a curved edge shaped like a portion of the edge of said aperture but having a lesser radius of curvature, a spindle passing through the depressed portion of said second plate and said third plate, a fourth plate arranged on a portion of said third plate said fourth plate being provided with two bent-over lugs, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disks and passing through said aperture, said third plate being provided with an additional slotted portion through which said toothed bar may drop, said toothed bar being prevented from longitudinal movement except when in its initial position and when in said last named slot by the edge of the first named slot of said third plate engaging a tooth of said toothed bar, means for moving said toothed bar and said disks longitudinally of said spindle, a third disk mounted on said spindle, said disk being provided with a slot at its periphery for engaging said toothed bar, said third disk being further provided with teeth on a portion of its periphery, a pawl engaging said teeth of said third disk, said pawl being connected with a T-shaped lever, said pawl working under one of said bent-over lugs and one arm of said T-shaped lever working under the other of said lugs, a turning magnet and an armature therefor, a lever operated by the movement of said armature and connected with said T-shaped lever to operate the same, the uppermost of said two first named disks being provided with a slot in its periphery, a catch engaging in said slot to prevent rotation of said disk until said toothed bar and said two

first named disks have been raised, said catch being provided with a tooth which engages the teeth of said third disk for holding said disk against rotation in a contrary direction, means for rotating said disk in a contrary direction when the tooth of said catch has been disengaged from the teeth of said third disk and after said two first named disks and said toothed bar have assumed their lowermost normal position, and contacts connected with the lowermost of said disks.

44. In a selector for automatic telephone exchanges, a base plate having an aperture formed therein, a second plate mounted on said base plate having a depressed portion adapted to fit in said aperture but leaving a portion of said aperture open, a third plate arranged over said second plate provided with a curved slot having a curved edge shaped like a portion of the edge of said aperture but having a lesser radius of curvature, a spindle passing through the depressed portion of said second plate and said third plate, a pair of disks suitably spaced apart and movable on said spindle, a toothed bar connecting said disks and passing through said aperture, said third plate being provided with an additional slotted portion through which said toothed bar may drop, said toothed bar being prevented from longitudinal movement except when in its initial position and when in said last named slot by the edge of the first named slot of said third plate engaging a tooth of said toothed bar, a catch adapted to engage said toothed bar, said catch being provided with an inclined edge, a block also having an inclined edge on which said catch slides into engagement with said toothed bar, a locking catch disposed below said first named catch and adapted to engage the teeth of said toothed bar, a spring acting on said locking catch, a lever connected with said first named catch, a lifting magnet and an armature therefor, a lever operated by the movement of said armature connected with said first named lever, a spring for returning said levers to their normal position after excitation of said magnet has ceased, means for turning said disks and toothed bar on said spindle, and contacts connected with the lowermost of said disks.

In testimony whereof I affix my signature in presence of two witnesses.

BERNHARD SETTEGAST.

Witnesses:

WOLDEMAR HAUPT,
HENRY HASPER.