No. 896,832. PATENTED AUG. 25, 1908.

J. A. HULIT.

SELECTIVE CALL APPARATUS.

APPLICATION FILED OCT. 30, 1905.

2 SHEETS—SHEET 1.

Fig. 2

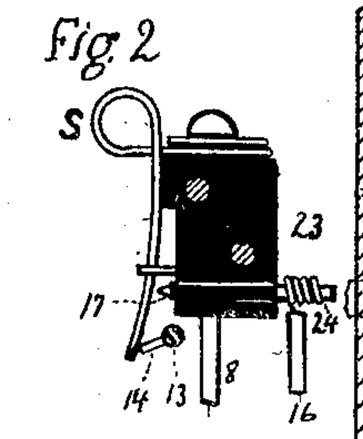

Fig. 1

Fig. 3

Fig. 4

Witnesses
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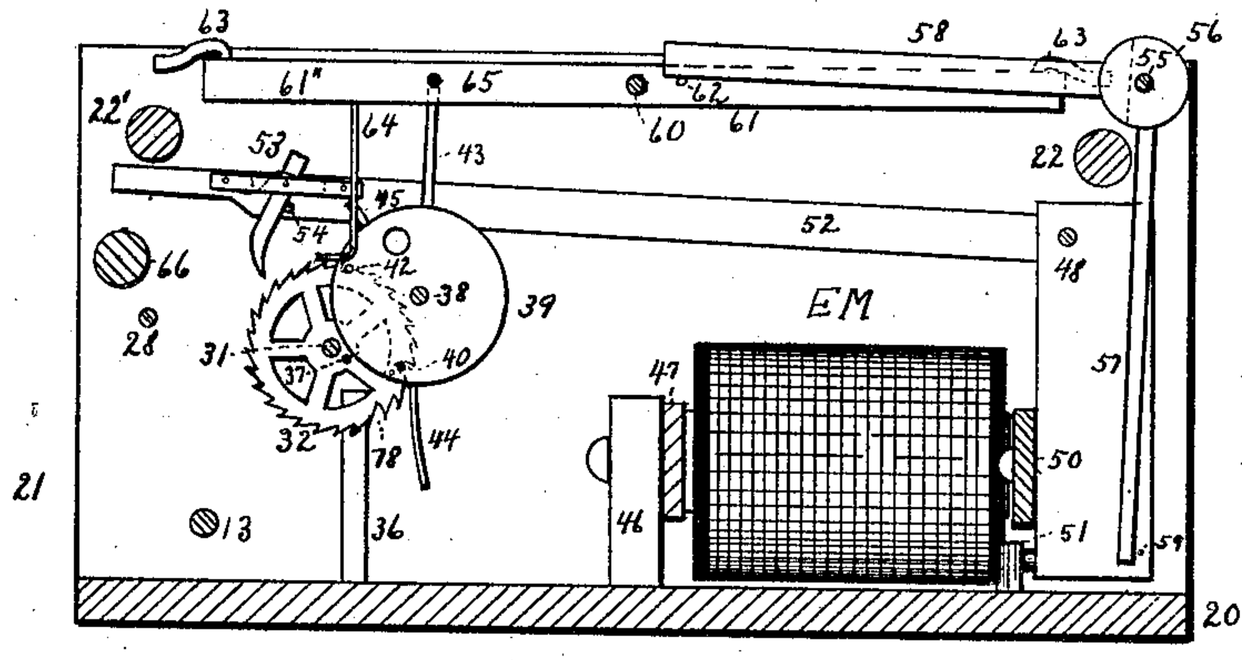

Fig. 5

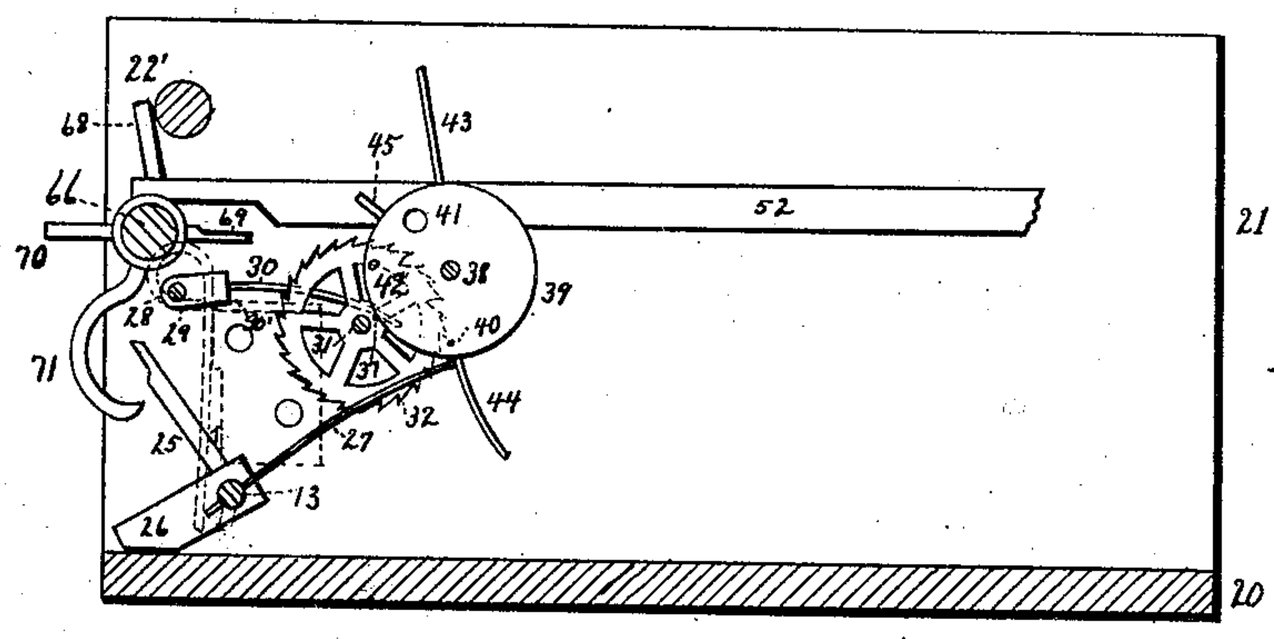

Fig. 6

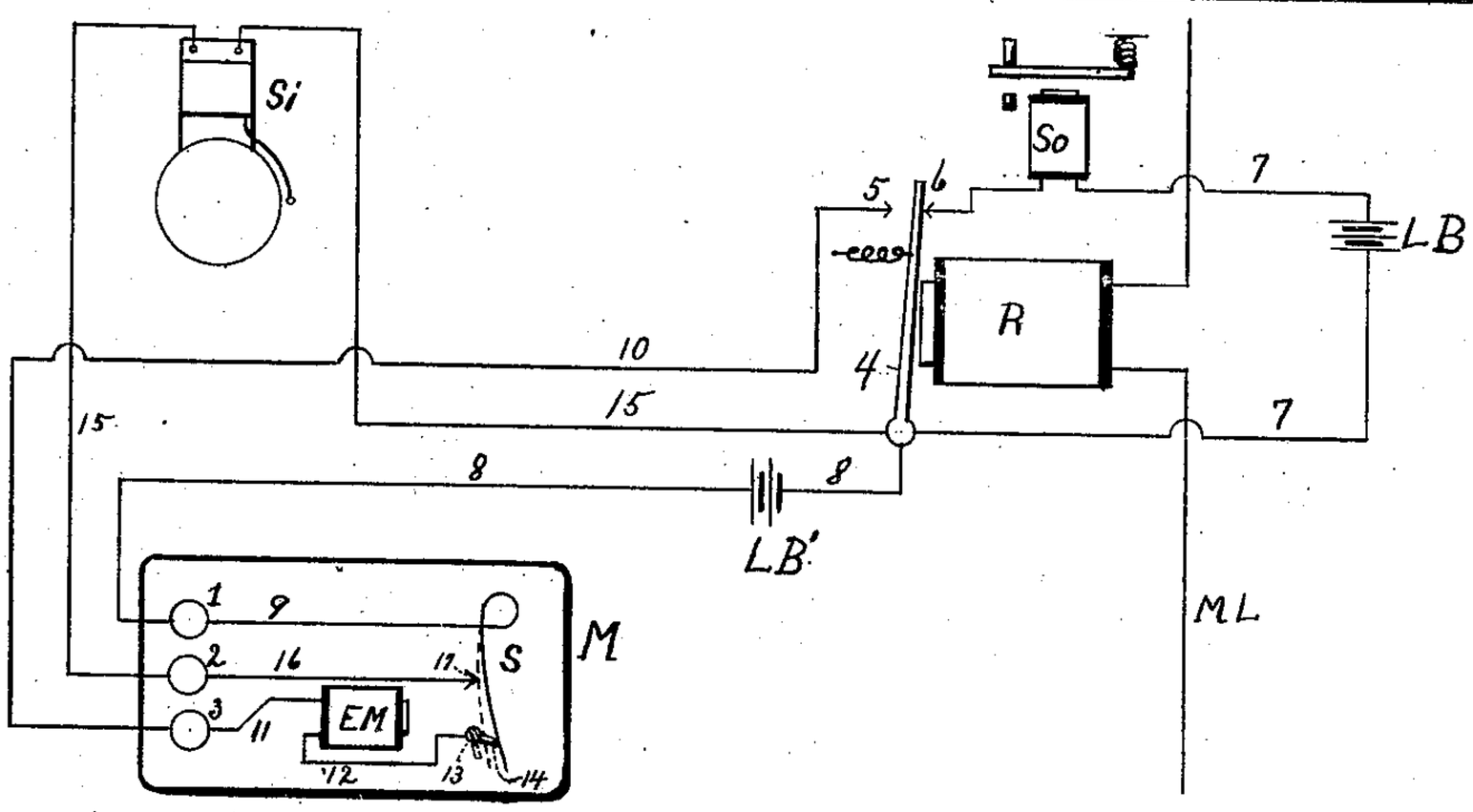

Fig. 7

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UNITED STATES PATENT OFFICE.

JOHN A. HULIT, OF TOPEKA, KANSAS.

SELECTIVE CALL APPARATUS.

No. 896,832. Specification of Letters Patent. Patented Aug. 25, 1908.

Application filed October 30, 1905. Serial No. 284,933.

To all whom it may concern:

Be it known that I, JOHN A. HULIT, a citizen of the United States of America, residing at Topeka, in the county of Shawnee and State of Kansas, have invented new and useful Improvements in Selective Call Apparatus, of which the following is a specification.

The invention relates to devices whereby any one or group of stations may be called or signaled without calling or signaling other stations on the same line, useful on telegraph lines, party line telephone systems, and elsewhere.

Patents have already been granted to me covering broadly some of the features shown herein, to-wit: Patent No. 795,836, dated August 1, 1905, and Patent No. 850,837, dated April 16, 1907 for selective call apparatus.

Objects of the present invention are: to improve generally upon devices of the general nature above described; to simplify and reduce the number of parts; to reduce the friction to a minimum; to provide a simple and efficient switch; to provide a simple and efficient manual restoring device; to provide a simple and efficient controlling device for the holding pawl; to provide a self-controlled holding pawl; to improve upon the balance bar and holding pawl as shown in the patent last above referred to, in this, to-wit: that where in the said patent, I have shown mechanism whereby the holding pawl is sustained away from the ratchet until the balance bar has made its full stroke, and whereas the holding pawl was then thrown into engagement with the ratchet by reason of the balance bar making its full stroke, in the present invention, I provide a holding pawl so arranged that the action of the parts in propelling the ratchet forward has the effect of throwing the holding pawl out of engagement with the ratchet, causing it to move slowly and return to engagement therewith after an appreciable interval only, thus making the action of the holding pawl to this extent independent of the action of the balance bar.

Further objects will appear hereinafter.

The invention consists of the parts, improvements, and combinations pointed out and claimed herein.

In the drawings accompanying and forming part of this specification, and in the description thereof, I illustrate the invention in its preferred form, and show the best mode of applying the principles thereof; but it is to be understood that the invention itself is not confined to the drawings and the description of the drawings, that it may be applied to other uses, and that parts and combinations thereof as separately claimed may be used in connection with other devices of like general nature, and that I contemplate changes in form, proportions, material, arrangement, and the transposition of parts and the substitution of equivalent members without departing from the spirit of the invention.

In the drawings, I have shown the invention applied to a telegraph line, the machine proper being included in a circuit controlled by the back contact of the relay armature; whereby on a normally open main line circuit the local selective call circuit is normally closed.

Figure 1 is an elevation view of the mechanism within the machine case, the near frame plate being removed, the ratchet retracting spring being also removed, and the case and some of the parts being shown in section; this view being taken approximately on a plane of the line 1′—1′ of Fig. 3. Fig. 2 is a supplement to Fig. 1, being a view, through the line 2′—2′ of Fig. 3, of the block of insulation on which is mounted the two-point switch, and which is attached to the other side of the frame plate shown in Fig. 1. Fig. 3 is a plan view of the mechanism, the case being shown in section and the base and case being also broken away in places. In Figs. 1, 2, and 3 all the parts are shown in their normal positions, that is, the main line is supposed to be open and the local circuit is supposed to be closed energizing the electromagnet. Fig. 4 shows the positions of the propelling and retaining devices as well as the selective devices when the local circuit is open. Fig. 5 represents the same parts when the local circuit is closed and is the same so far as the parts are shown in Fig. 5, as Fig. 1, except that in Fig. 5 the selective feature has been brought into play so as to prevent the return of the ratchet notwithstanding the operation of the devices which would otherwise have that effect as shown in Fig. 1. Fig. 6 is drawn to show the action when the ratchet has been progressed far

enough to throw the switch to close the signal circuit and open the selective machine circuit. Fig. 7 shows in diagram the local wiring.

Like letters and numerals of reference indicate like or corresponding parts throughout the several views.

Referring first to the local wiring, Fig. 7: ML is the main line passing through relay R whose armature 4 is provided with front and back contacts 6 and 5 respectively. The sounder So is included, in the usual manner, in the sounder circuit 7 with its battery LB, and controlled by the front contact. The selective calling machine and the signaling device are connected up as follows: The selective machine circuit runs from back contact 5 by wire 10 to binding post 3, through wire 11, electromagnet EM, wire 12, shaft 13, arm 14, switch S, wire 9, binding post 1, wire 8 and battery LB′, armature 4 to back contact; this circuit is normally closed at 4—5 when the main line is open, although in the diagram the main line is shown as closed. The bell or signal circuit runs from the contact 17 through wire 16, binding post 2, wire 15 and bell Si, wire 8 and LB′, binding post 1, wire 9, and switch S; this circuit is normally open between contact 17 and switch S. Thus within the machine proper, the machine circuit is normally closed and the signal circuit is normally open, so that the operation of the armature 4 alternately energized and demagnetized the electromagnet EM. This electromagnet does not however, directly operate the switch S or the shaft 13 or arm 14. But, by the mechanism hereinafter explained, it will operate the shaft and arm only upon the making of certain combinations. When the proper combination has been made, the shaft 13 will be turned so as to disconnect the arm 14 from the switch S and permit the switch S to come into contact with the contact 17; thereby opening the machine circuit and closing the signal circuit, within the machine. Obviously, when applied to a telegraph line, the mechanism must be such that ordinary Morse signals will not have the effect of shifting the switch, and that when two or more are used on the same circuit, each will have a combination by which it can be operated individually.

The foregoing circuit arrangement is only given as the preferred one; I do not confine myself to the use of the invention herein disclosed with this or any other particular arrangement of circuits.

Referring now to the details of the selective switch-shifting apparatus proper: On a metallic base 18 is a surbase 19 of wood to which are secured the binding posts 1, 2, 3, the inclosing case 76, and the frame base-plate 20 to which are secured rigidly the upright frame plates 21, 21, between which most of the parts of the mechanism are mounted. The frame-plates are rigidly secured together and properly spaced apart by means of the three separators or stay-rods 22, 22′, 22″, as well as by being secured to the base-plate 20.

A block of insulating material 23 is secured to the outside of one of the frame plates 21; and a metal rod 24 is extended therethrough and provided with a platinum point 17 (see Fig. 2). The spring or switch tongue S is properly fastened to the top of the block 23 and tends naturally to engage the point 17, but is normally held out of engagement therewith by the arm 14 of shaft 13 which shaft is mounted between the two frame plates with the one end extended out under the switch S. Secured to the shaft 13, within the frame plates, are the upright rod 25, the weight 26, and the forwardly extending rod 27. On a shaft 28, also pivoted between the frame plates, is a piece 29 which is extended forward by a rod 30 secured thereto, a shoulder or notch being formed where the rod 30 is secured to the piece 29, as at 30′, which shoulder is adapted to be engaged by the upright rod 25 and thereby hold the switch S out of engagement with the point 17 against the tension of said spring S and against the weight of the part 26 whose function it is to free the arm 14 from the switch S and permit it to engage 17 when the rod 25 is freed from shoulder 30′ by the raising of the rod 30. This action is shown in Fig. 6, which, in connection with the diagram in Fig. 7, explains how the selective machine circuit is opened and the signal circuit is closed, within the machine, to effect the ringing of the bell or the making of the desired signal whatever it may be.

To raise the rod 30: A shaft 31 is pivoted between the uprights and has secured thereto a ratchet wheel 32 and a quite fine spring 33, one end of which is fastened to the shaft and the other to a stud 34 projecting from the plate 21. The ratchet also has a pin 35, and a buffer 36 extends in the path of the pin; and the spring 33 tends naturally to hold the ratchet with the pin 35 against the buffer 36; in other words the spring tends to force the ratchet in the direction opposite to the direction in which it is propelled by the push pawl. The ratchet wheel also carries another pin 37 which engages with the rod 30, and the parts are so adjusted in this particular machine that when the ratchet has been progressed a distance of eight notches from its position with 35 against 36, the pin 37 will raise 30 and release 25 from shoulder 30′, to effect the shifting of the switches as heretofore explained. Fig. 6 shows the ratchet progressed eight teeth or notches. Still another shaft 38 is pivoted between the upright frame plates, and on this shaft is secured a disk 39 provided with a pin 40 adapted to engage the

notches of the ratchet and act as a detent or holding pawl therefor, another pin 42 extending laterally therefrom, and the rods 43 and 44 extending approximately radially therefrom. In constructing this element, I prefer to set the shaft 38 in the exact center of the disk, and then drill out a hole 41, whereby the balance is such that the disk tends naturally to bring the pin 40 into engagement with the ratchet, because of the extra weight on the right-hand side (as viewed in Figs. 1, 4, 5, 6) of the disk. The disk should be adjusted so that when moved, it will move rather slowly or sluggishly, as will be explained hereinafter. The pins 35, 37, and 40 extend from the rear side of the ratchet and disk respectively, for which reason I have shown them in the drawings by full black dots.

To a standard 46 arising from the base-plate 20 is secured the heel-plate 47 of the electromagnet EM. On a rod 48, also pivoted between the uprights 21, 21, is secured a bar or lever 49 carrying the armature 50 for the electromagnet. A butting post 51 prevents the armature from contacting with the magnet cores. Also secured to the lever 49 so as to be integral therewith is the main propelling lever 52, which forms an L-shaped lever in connection with 49. To the other end of the main propelling lever is secured the push pawl 53, a stop pin 54 limiting its action one way, and a very fine hair spring, or gravity, tending to keep it in engagement with the stop-pin. When the magnets are energized the end of the lever 52 is against the stay-rod 22′ (as in Figs. 1 and 5); when demagnetized, the lever rests on the shaft 66 (as in Figs. 4 and 6). This range of action and the adjustments are such that when the main propelling lever falls from 22′ to 66, the push pawl engages the ratchet and progresses it one notch or tooth. Also pivoted between the uprights is a shaft 55 on which is secured a socket piece 56 to which are secured the two arms 57 and 58. Rod 57 extends downwardly in the rear of the pin 59 which extends laterally from the side of 49; and the rod 58 extends rearwardly (to the left in the drawings) so as to rest on a pin 62 when not held up from same by reason of the action of 59 against 57. Also pivoted between the uprights is a shaft 60 on which is mounted the balance bar or throw-off 61, which is so adjusted that the rear end 61″ is heavier than the other end 61′. However, it is so nearly counterbalanced that when free to travel from the position shown in Fig. 4 (with the heavier end up), it will move somewhat slowly or sluggishly. Its range of action is between the stay-rod 22 and stay-rod 22′, the extension rods 63, 63, engaging said stay-rods as buffers. The pin 62 is carried by the balance bar 61. The balance bar also carries the trip rod 64 which is adapted to engage the rod 42 in the disk 40 and thereby throw the pin 40 out of engagement with the ratchet, when the balance bar is permitted to make its full stroke down in accordance with its natural tendency, and when it rests in this position, the trip rod 64 holds the holding pawl or detention pin out of engagement with the ratchet, which, of course, as far as the holding pawl or detention pin is concerned, will permit the retractile spring 33 to return the ratchet to its initial position. The element 56, 57, 58 is an auxiliary or intermediate lever or balance bar, between the main propelling lever and the main balance bar, and is so weighted with relation to the main balance bar that when free to fall of its own weight, it will raise the heavier end of the main balance bar by reason of its engagement on the pin 62; but this action is also preferably slow, so that there will be no hard blow or jar. Balance bar 60 also has a pin 65 extending from the rear side thereof adapted to engage the rod 43 whenever the detention pin 40 engages with a deep notch 78 of the ratchet wheel, but not to engage sai rod 43 unless the said pin 40 does fall into a deep notch. When the detention pin engages a deep notch and throws the rod 43 under the pin 65, the balance bar 60 is thereby held in elevated position (this being shown in Fig. 5) with the trip rod 64 free from the pin 42; so that although the balance bar would otherwise fall and throw off the holding pawl or detention pin, in this case it would not throw it off. This constitutes the selective feature of the series of machines on the same line.

This machine is designed especially to be placed on a telegraph line; and so it is to be so constructed and adjusted as to be not responsive to the ordinary dots and dashes made in transmitting the usual Morse characters, which is to be borne in mind. Special attention is to be given to the main balance bar and to the disk 39, which with the detention pin 40 constitutes a holding pawl for the ratchet, which holding pawl is adapted to move ponderously, or sluggishly, or slowly, as the action may be variously termed. When the electromagnet is demagnetized, as by closing the main line circuit, the main lever 52 falls and brings pawl 53 into engagement with the ratchet and progresses the ratchet one notch. On being released from the magnet, the bar 49 carries pin 59 away from rod 57, thereby permitting the weight of the rod 58 to rest on pin 62, thereby depressing the lighter end 61′ of the main balance bar and raising the heavier end, which immediately releases pin 42 from trip rod 64 permitting the detention pin to engage in a notch; but by reason of the ratchet being progressed the back of the next tooth en-

gages the pin 40 and throws the disk around by reason of the cam-like engagement. Preferably the parts are so adjusted that this action will throw the disk around approximately until the stop pin 45 engages with the shaft 31. If now, the main line be opened again before the disk has returned to engagement with the ratchet, then the ratchet will be returned to initial position by reason of the spring 33. If, on the other hand, the main line be kept closed long enough to permit the disk to make the complete oscillation to and fro and into engagement again with the ratchet, then upon opening the main line and thereby raising the main lever and propelling pawl, the ratchet will be retained at its progressed stage by said detention pin. I prefer to adjust the parts so that the dash which is required is somewhat longer than the dashes usually made in the Morse code, so that the making of even those dashes will have the effect of returning the ratchet, just the same as a dot. If now, a long dash having been made as described, the line be kept open a considerable length of time, as in a long space, the rod 58 being raised to permit the main balance bar to fall in accordance with its natural tendency, it will engage pin 42 by tripper 64, thereby throwing off the holding pawl and permitting the ratchet to return to initial position. But if, on the other hand, the ratchet having been progressed one notch by a long dash as described, a short space be made by commencing the next dash quickly, or by leaving the main line open only momentarily, in such case, before the balance bar will have time to fall its whole distance to throw off the holding pawl, it will be returned to its normal position by reason of the rod 58 falling on the pin 62. And I prefer to adjust the parts so that the space between the succeeding dashes must be quite short in order to catch the main balance bar before it throws off the holding pawl. From this it will be seen that the characters which will operate the machine are long dashes made closely together; and that a short dash, or a dot, or a long space will have the effect of returning the ratchet to initial position; and as the Morse code is made up principally of dots, short dashes, and spaces also of considerable length, it will be clear that this machine may be safely placed on a telegraph line with the assurance that ordinary characters will never progress the ratchet sufficiently to effect the shifting of the switches. It is also clear now that eight long dashes made closely together will operate the machine and effect the shifting of the switches. After the first notch, the pin 40 will be engaged more certainly and uniformly by the backs of the teeth, so that the lengths of the dashes required will be quite uniform.

Reference has been made to "deep" notches. It will be noted that all the teeth or notches engaged by the holding pawl are of uniform depth, except the third and sixth notches, 78, 78, which are of a different depth, namely, they are deep notches. These two depths of notches control the action of the rod 43 with relation to the pin 65 in this way: When the pin 40 engages in a shallow notch or one of usual depth, pin 65 will not strike rod 43 and the main balance bar will be permitted to fall to throw off the holding pawl on the making of a long space. But when the pin 40 engages in a deep notch, rod 43 will be thrown farther to the right so that it comes directly under pin 65; and thus if a long space be made when the holding pawl engages a deep notch, the balance bar will not throw off the holding pawl, for the reason that the balance bar is then held suspended, as shown in Fig. 5. Therefore, in the machine shown, the making of long spaces after the third and sixth long dashes will not have the effect of returning this particular ratchet, although it would return another ratchet whose second and fourth notches were deep ones. On the other hand, if I send the combination 224 (two dashes, space, two dashes, space, four dashes), I would operate the last-named machine without operating the first named. And if I make eight straight dashes, I will ring both bells. Again if I have two machines adjusted to eight dashes, one with the second and fifth notches deep, and the other with the third and fifth notches deep, it will be clear that the combination 53 would ring both bells, although that combination would not affect the two machines first mentioned. The method of permutation here illustrated is fully discussed and explained in my said patents, although in the first patent the permutation is effected by pins instead of deep notches, and in the second patent the permutation is effected by the deep notches, as in this invention; and I do not therefore deem it proper to further comment upon that feature further here.

To manually restore the parts to their initial and normal position after once the switches have been shifted, I provide the following: To a shaft 66 also pivoted between the uprights, I secure a rod 69 extending underneath the main propelling lever 52, a rod 68 engaging stay-rod 22′ as a buffer, a rod 71 adapted to engage rod 25 when released from 30′, and a tail or handle 70. A spring 67 tends to keep the parts in position shown in Fig. 1 with buffer 68 against 22′. After the rod 25 has been released, however, so that the parts are in position shown in Fig. 6, by depressing rod 70, the rod 69 raises the main propelling lever 52, and the rod 71 restores the rod 25 and with it the shaft 13 and the parts secured thereto, to

their normal positions. Upon shifting the switch, rod 27 has been raised to engage rod 44 and hold the holding pawl out of engagement with the ratchet, although the ratchet is held in its progressed stage by the propelling pawl. But upon operating the restoring device, the rod 27 remains longer in engagement with the rod 44 than the push pawl remains in contact with the ratchet; which permits the ratchet to be returned to initial position instantly upon being released from the push pawl in the act of restoring the machine after the call has been made. When inclosed in a case as in 76, I provide a rod 72 from which extends the rod 74 and to the outer end of which is secured a knob 75, whereby the machine will be restored to normal and initial position simply by turning the knob. Preferably, I drill a hole of the desired size through each end of the case, then insert the rod 72, then secure the rod 74 thereto so as to be close to one end, then insert a plug 73 and fasten on the knob 75. I prefer to make the case of brass nicely polished, and the plug 73 being of the same material is scarcely noticeable; all of which tends to make a neat and positively dust-proof case.

The connections from the binding posts are shown in Fig. 3 in dotted outline. Binding post 3 connects by wire 11 with the electromagnet, whence the wire 12 is connected with the metallic frame and through the frame with the shaft 13 mounted therein. Binding post 2 connects by wire 16 with rod 24 and point 17. And binding post 1 connects by wire 9 with switch S. These connections are all as shown in the diagram.

The shafts 55, 60, 31, 38, and 28 are preferably mounted between cup screw bearings. The separators 22 and 22′ are removed from Fig. 3 in order to disclose the parts thereunder. The manner of constructing the holding pawl in the shape of a disk is a matter of preference merely, since in this way I can easily secure the proper adjustment and can also easily locate and fasten the several rods and pins thereto.

What I claim is:

1. The combination of a ratchet, a propelling pawl therefor, a pivoted oscillating holding pawl adapted to be disengaged from the ratchet by the ratchet and to be returnable slowly thereto by its own force, a throw-off, a trip support for the throw-off, and means cooperating with the ratchet and selectively arranged for bringing the trip support into play and thus preventing the throw-off from disengaging the holding pawl.

2. The combination of an electromagnet, a main propelling lever with a push pawl controlled thereby, a switch-shifting ratchet, a slowly moving holding pawl adapted to be returnable to the ratchet slowly, a balance bar actuated by the main lever and adapted to throw off the holding pawl, and devices coöperating with the ratchet and selectively arranged for preventing the balance bar from throwing off the holding pawl.

3. The combination of an electromagnet, a main propelling lever with a push pawl controlled thereby, a balance bar, a ratchet adapted to shift a switch, a slowly moving pivoted oscillating holding pawl adapted to be disengaged from the ratchet by the balance bar and by the ratchet, and a trip support for the balance bar to sustain it away from the holding pawl with means coöperating with the ratchet and selectively arranged for preventing the balance bar from throwing off the holding pawl.

4. The combination of an electromagnet, a main propelling lever adapted to progress a ratchet, a switch-shifting ratchet, a slowly moving pivoted oscillating holding pawl, a balance bar tending naturally to throw off the holding pawl and actuated in the other way by the main lever, a trip support for the balance bar, and devices coöperating with the ratchet and selectively arranged for bringing the trip support into play.

5. The combination of an electromagnet, a main propelling lever adapted to progress the ratchet, a switch-shifting ratchet, a slowly moving holding pawl adapted to be thrown from the ratchet when the ratchet is progressed and to be returnable thereto slowly by its own force, a balance bar tending naturally to throw off the holding pawl and actuated in the other direction by the main lever, a trip support to sustain the balance bar away from the holding pawl and means coöperating with the ratchet and selectively arranged for controlling the trip support.

6. The combination of a ratchet, a propelling pawl, a holding pawl adapted to be disengaged from the ratchet when the ratchet is progressed and to move slowly so as to be returned to the ratchet only after an interval of time, a throw-off, a trip-support for the throw-off, and means coöperating with the ratchet and selectively arranged for bringing the trip-support into play and preventing the throw-off from disengaging the holding pawl.

7. The combination of an electromagnet, a main propelling lever with a propelling pawl, a switch-shifting ratchet, a pivoted oscillating holding pawl, a throw-off for the holding pawl actuated by the main propelling lever, a trip-support for the throw-off associated with the holding pawl, and means selectively arranged on the ratchet for controlling the action of the trip-support with relation to the throw-off.

8. The combination, in a machine of the kind described, of a ratchet, a propelling

pawl, a holding pawl, a throw-off for the holding pawl, and a trip-support for the throw-off associated with the holding pawl, the teeth of the ratchet being of different depths, and the action of the trip-support with relation to the throw-off being controlled by the depth of the teeth.

In testimony whereof I have hereunto signed my name in the presence of subscribing witnesses.

JOHN A. HULIT.

Witnesses:
Z. T. FISHER,
C. J. ROSEN.