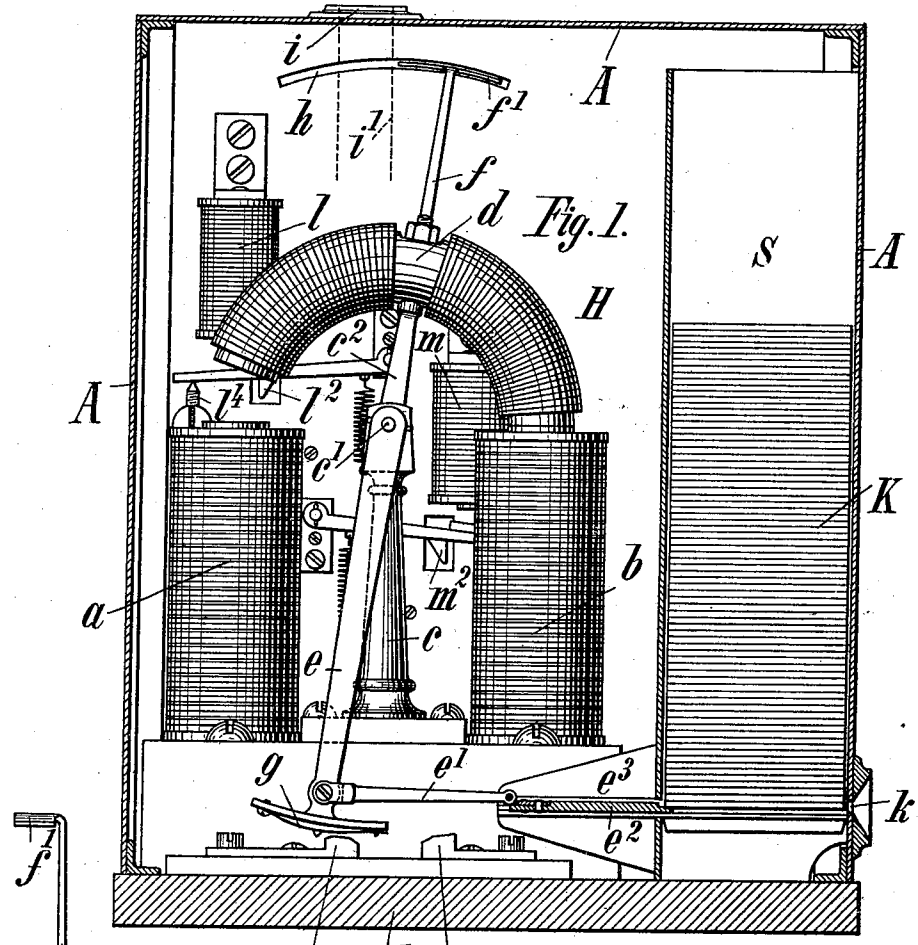
No. 627,736. Patented June 27, 1899.

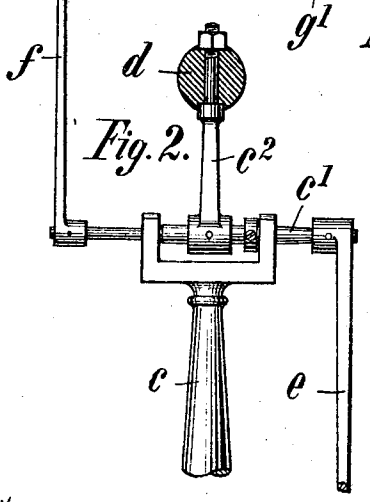
J. H. F. KRULL.

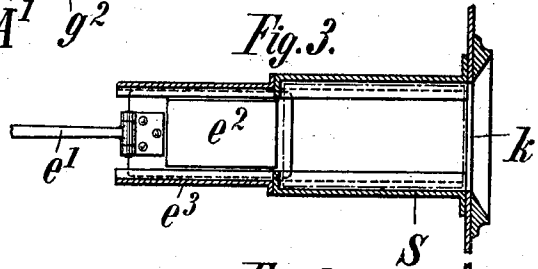
ELECTRIC COIN FREED APPARATUS.

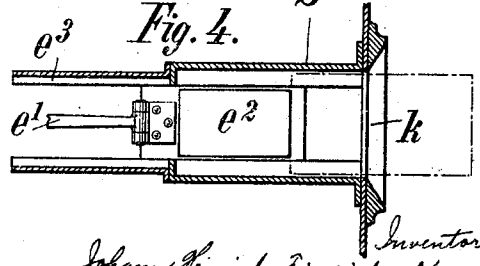
(Application filed Jan. 17, 1899.)

(No Model.) 3 Sheets—Sheet 1.









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ELECTRIC COIN FREED APPARATUS.

(Application filed Jan. 17, 1899.)

(No Model.) 3 Sheets—Sheet 2.

Fig. 5.

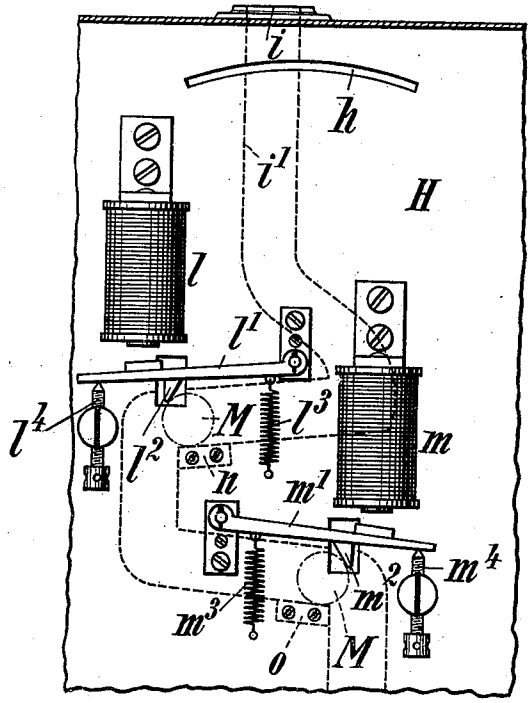
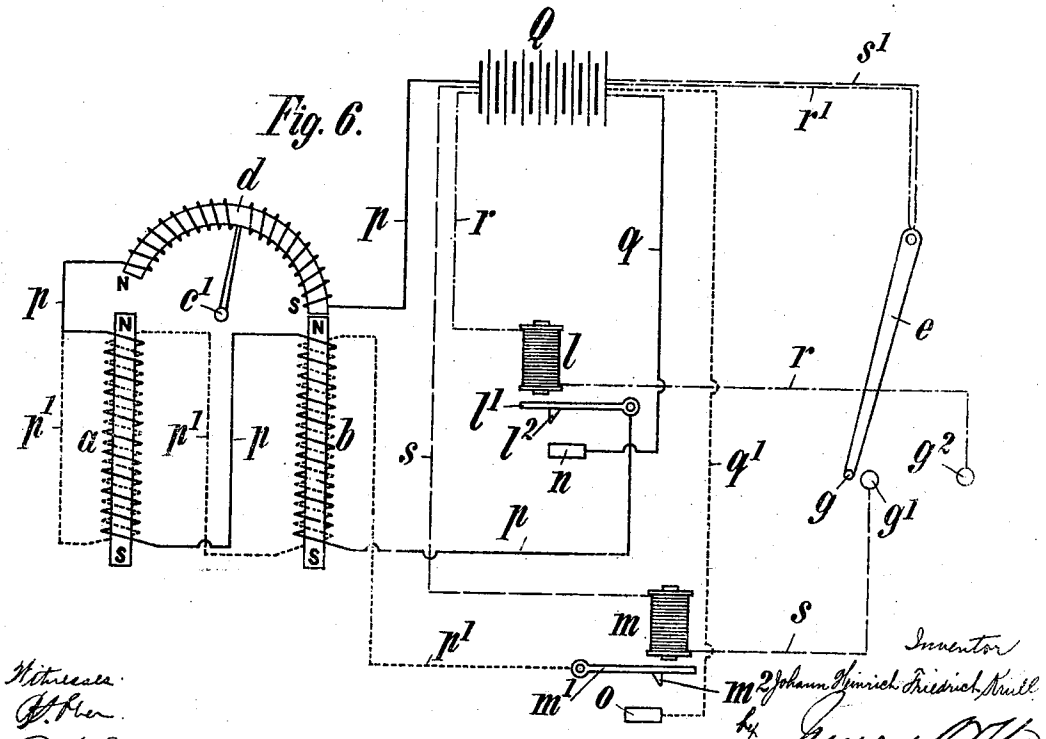


Fig. 6.



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(No Model.) 3 Sheets—Sheet 3.

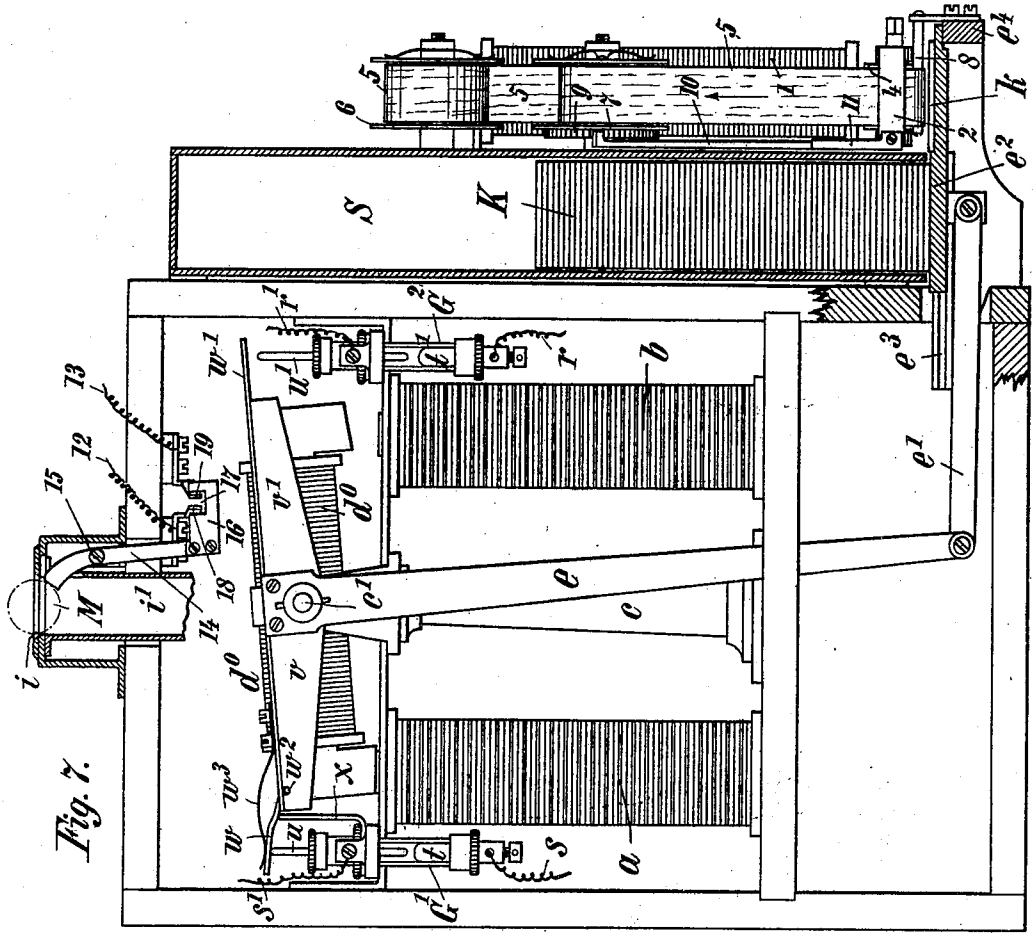


Fig. 7.

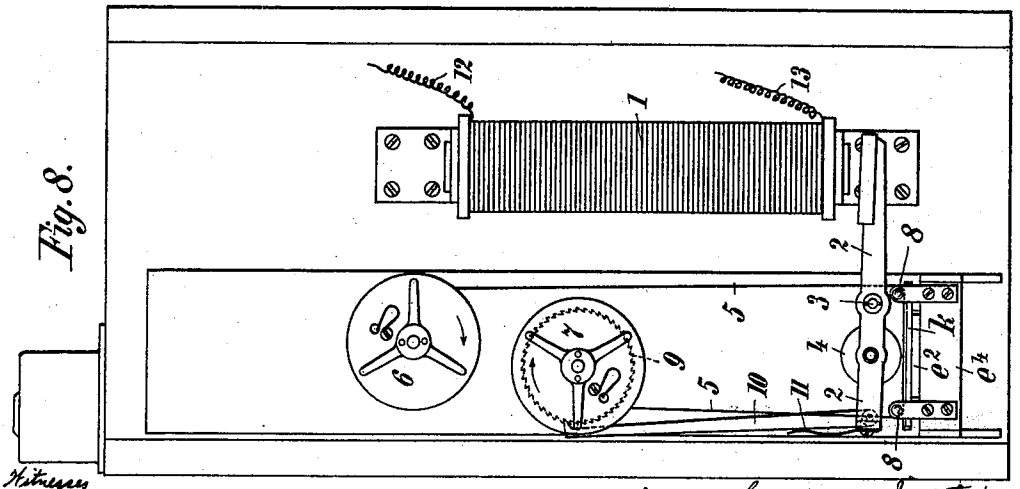


Fig. 8.

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UNITED STATES PATENT OFFICE.

JOHANN HEINRICH FRIEDRICH KRULL, OF HAMBURG, GERMANY.

ELECTRIC COIN-FREED APPARATUS.

SPECIFICATION forming part of Letters Patent No. 627,736, dated June 27, 1899.

Application filed January 17, 1899. Serial No. 702,439. (No model.)

To all whom it may concern:

Be it known that I, JOHANN HEINRICH FRIEDRICH KRULL, a subject of the German Emperor, and a resident of Hamburg, in the German Empire, have invented certain new and useful Improvements in Electric Coin-Freed Apparatus, of which the following is a specification.

This invention relates to an electrically-actuated coin-freed apparatus in which the delivery of the article to be sold takes place owing to the oscillatory motion of an armature pivotally mounted within the influence of two electromagnets, the electric circuit being completed in such a manner that the electric current flows through the armature invariably in one and the same direction and through the electromagnets also, but in each direction alternately for the purpose of alternately attracting and repelling the armature. This reversal of the position of the armature takes place according as the coin introduced into the apparatus in its passage through the same closes first one and then the other of the two paths for the current, which are arranged upon or around the said electromagnets in opposite directions. The poles of the armature therefore invariably maintain the same position, whereas the electromagnets alternate their poles while the apparatus is operating in such a manner that the electromagnets have the same pole in the ends lying in the same directions—that is to say, the upper and lower ends—and in consequence of the alternate closing and breaking of the two paths for the current their polarity alternates always at the same time and in the same sense. Owing to this alternation of the electromagnet-poles while the armature-poles remain unaltered the movement or oscillation of the armature is produced, while when the apparatus is not in use—that is to say, when no current is passing through the same—the remanent magnetism insures that the armature shall bear firmly against one of the electromagnet-cores, and consequently that the apparatus shall be in readiness for immediate use. The regulation—that is to say, the closing and breaking of the circuits surrounding the electromagnets formed by means of the introduction of the coin—takes place by means of two electric relays inserted in suitable accessory or auxiliary circuits. The making and breaking of the accessory circuits and the actuation of the relays is effected by means of a suitable contact-making device, which is likewise actuated by the oscillation of the armature.

In the accompanying drawings an electrical automatic railway or similar ticket-delivery apparatus arranged in accordance with this invention is illustrated by way of example.

Figure 1 is a vertical section through the apparatus. Fig. 2 illustrates the suspension of the armature. Figs. 3 and 4 are detail views of the slide for delivering the object sold, which is operated by the armature. Fig. 5 illustrates a portion of the apparatus as shown in Fig. 1, the electromagnets, the armature, and its suspension being omitted in order that the arrangement of the relays may be more clearly shown. Fig. 6 is a diagrammatic representation of the apparatus, showing more especially the electrical connections. Fig. 7 shows a somewhat modified form of the delivering apparatus, being provided at the same time with a suitable stamping apparatus. Fig. 8 is a right-hand end view of the apparatus as shown in Fig. 7.

Similar letters and numerals refer to similar parts throughout the several figures.

In a suitable casing A the two electromagnets a and b, having between them a post c, are arranged. At the upper portion of this post is arranged a spindle c', which carries an arm c^2, provided with an arc-shaped armature d, capable of oscillating between the two electromagnets a and b, so that it is in contact either with the electromagnet a or with the electromagnet b. Upon one end of the spindle c' is provided a lever e, to which a suitably-shaped slide e^2 is attached by means of an intermediate link e'. This slide works in a suitable guide e^3 in such a manner that in its displacement from the position illustrated in Fig. 3 to that shown in Fig. 4 it pushes the undermost ticket of a pile of tickets K, arranged in a box S, out through the opening k of the apparatus. The lower extremity of the lever e is furnished with a spring contact-maker g, which is capable, by means of two contact-pieces g' and g^2, arranged upon the bottom A′ of the apparatus, of closing the circuit at predetermined times, as is hereinafter explained. Upon the other extremity of the spindle c' is arranged an arm f, which carries a plate f', entering a slot h in the partition H. This plate f' serves, after the position of the armature has been reversed,

to block the admission opening i or passage i, for the coin, so that while the slide e^2 is delivering a ticket which has been paid for a fresh coin cannot enter the passage i'.

Upon the partition H, Fig. 5, are arranged two relays, consisting of the electromagnets l and m and the armature-levers l' and m' thereto belonging. These latter are furnished with projections l^2 and m^2, which extend into the passage i' through suitable slots in the partition H—that is to say, into the path of the coin M. The armature-levers, which are pressed down by springs l^3 m^3, rest upon contact-screws l^4 m^4. A coin M falling in the passage i' is therefore first of all arrested by the projection l^2, so that it rests upon a plate n and forms an electrical connection between the parts l^2 and n, the object of which will be hereinafter explained. If the armature-lever is lifted by its electromagnet l, the circuit is broken and the released coin is able to proceed along the passage i' until it is again stopped by the projection m^2, so as to again form the circuit by connecting the armature-lever m' and a second contact-plate o. Interruption of the current again takes place by the rise of the armature-lever m', whereupon the released coin is able to fall into a suitable receptacle. (Not shown in the drawings.)

The electrical connection and arrangement of the various parts are clearly shown in Fig. 6. The wire p, coming from the source of electricity—for instance, a battery Q—first passes around the armature d. It then passes downward and around the cores of the electromagnets a and b, and finally connects with the armature-lever l'. Between the armature d and the electromagnets a b there branches off from the wire p a wire p', which is wound around the cores of the electromagnets a and b in the opposite direction and passes to the armature-lever m'. From the other pole of the source of electricity a conductor q proceeds to the contact-piece n and a conductor q' to the contact-piece o. In addition to this two wires r and s lead from the source of electricity Q, pass around the electromagnets l m, and proceed to the contact-pieces g^2 g', respectively. Corresponding conductors r' and s' (which in practice are replaced by a single wire) connect the other side of the source of electricity with the lever e, carrying the contact-spring g.

The operation of the apparatus is as follows: A coin M introduced into the admission-slot i first of all forms an electrical connection between the lever l' and the plate n. The circuit p q is thereby closed, thus producing by means of the excitation of the electromagnets a and b an alternation in the poles of the electromagnet-cores, so that the remanent north polarity of or at the upper portion of the cores is changed into south polarity. The south magnetism now present in the upper ends of the electromagnet-cores causes the armature d, the polarity of which does not change owing to the fact that the current always passes through it in one and the same direction, to oscillate toward the left hand and upon the electromagnet a. Owing to the oscillatory motion of the armature d the blocking-slide f' moves under the admission-aperture i, while the lever e swings to the right hand and by means of the slide e^2 linked thereto pushes the ticket to be delivered through the delivery-aperture k, the contact-spring g sliding beyond the contact-piece g'. When the lever e has reached the end of its travel in the right-hand direction, it comes into contact with the contact-piece g^2, and thereby closes the auxiliary circuit r r' for the electromagnet l. Through the influence of the electromagnet l the armature-lever l' is raised for the purpose of breaking the circuit p q, and thus releasing the coin M. This coin on being released proceeds along the passage i' and, retained between the armature-lever m' and the plate o, closes the circuit p p' q'. The current thus caused to flow around the electromagnets in the opposite direction to that in which it previously passed again produces a change of polarity in the electromagnets, and the north magnetism now present in the upper ends of the electromagnet-cores produces a backward swing of the armature d toward the right hand onto the electromagnet b. Owing to this reversal of the positions of the armature d and lever e, respectively, the auxiliary circuit r r' is interrupted, the stop f' moves back and opens the passage i', and at the same time the delivery-slide e^2 is drawn back toward the left hand by means of the oscillation of the lever e in the same direction. Upon its passage toward the left hand the lever, for example, sliding upon the contact-piece g' closes the second auxiliary circuit s s', which excites the electromagnet m with the object of attracting the armature-lever m'. Owing to the rise of the armature-lever m' the circuit p p' q' is again interrupted and the coin released, leaving it free to traverse the remainder of the passage i' and fall into the coin-receptacle. Shortly before the lever e reaches the end of its oscillation—*i. e.*, its left-hand end position—the spring g slides off the contact-piece g', thereby again interrupting the auxiliary circuit s s'. When the armature d has attained the extremity of its right-hand travel and the lever e the extremity of its left-hand travel, Figs. 1 and 6, the whole of the circuits in the apparatus are interrupted or opened. The electric current is thus present in the apparatus only during the time in which the coin introduced into it is closing the circuits, and consequently the electromagnet-cores a b and the armature d are only magnetized for this short period. As, however, it is necessary that the apparatus should always be in a condition for immediate use, Fig. 1—that is to say, the armature d must always rest firmly against the right-hand electromagnet b during the time the apparatus is not operating, admitting of no movements or oscillations of the armature d

as a result of shaking or other shocks—the armature should be made of steel, so that the remanent magnetism may hold the armature d firmly against the core of the electromagnet b also when no current is passing through the apparatus.

For the purpose of stamping the tickets or the like as they are delivered a suitable stamping apparatus may be connected with the delivery apparatus in any appropriate manner and may also be electrically operated, if so desired.

In Figs. 7 and 8 I have shown an electrically-operated stamping apparatus in connection with the delivery apparatus, the latter showing some modifications. In this delivery apparatus the arrangement is such that the armature d^0, somewhat modified in its shape or form, does not rest against or upon the electromagnet b during the time the apparatus is not operating, but upon the electromagnet a. The contact-plates g' g^2 for the auxiliary circuits of the electric relays, Figs. 1 and 6, are replaced in this case by suitable mercury contact devices G' and G², the construction of which is well known and which essentially consists of mercury-columns t and t', with which are connected the wires s and r, respectively, and of yielding or spring-actuated contact-pins u and u', with which are in electrical connection the wires s' and r', respectively. By bringing the contact-pins u and u' in contact with their mercury-columns t or t' the corresponding auxiliary circuits s s' and r r' will be closed. The alternate closing of the contact devices G' G² is effected by the oscillating movement of the armature d^0 or its shaft c', respectively. For this purpose there are attached to the rocking shaft c' or the lever e, respectively, two arms v v', preferably made of one piece. These arms v v' are provided with projecting parts w and w', which when the armature d^0 oscillates impinge upon the contact-pins u u', thereby causing the latter against the pressure of their springs to dip alternately into the mercury-columns and to close the corresponding auxiliary circuits. The projecting part w is hinged at w^2 to the arm v and is under the influence of a spring w^3, which latter is stronger than the spring acting upon the contact-pin u, so that the lever w is able to press or move the contact-pin u downward as soon as the lever w strikes or acts upon the said contact-pin u. Shortly before the armature d^0 reaches its left-hand end position or position of rest, Fig. 7, the projecting part w strikes against a stop x, which causes the former to turn upward into the position shown in Fig. 7 and to release the contact-pin. The thus freed contact-pin is then raised by its spring in order to break the circuit s s' for the purpose already explained. The stamping apparatus is composed of an electromagnet 1, attached to the casing A, and of an armature-lever 2, pivoted at 3 also to the said casing or to the ticket-box S, connected therewith. The lever 2 carries the roller or block 4, having upon its surface the letters, numbers, or like figures to be impressed in or stamped on the tickets to be delivered. The ticket k to be delivered first is held underneath the letter-block 4 by means of the suitably-shaped slide e^2, the free edge of which rests upon a cross-piece e^4, provided between the guide-pieces e^3 of the slide e^2, Fig. 7. Between the stamping-block 4 and the slide e^2 or the ticket k, supported by it, may be provided a color band or strip 5. This color-strip, leading from the roller 6 to the roller 7, is passed over suitable guide-rollers 8 8. Attached to the roller 7 is a ratchet-wheel 9, with which works a pawl 10, pivoted to the lever 2 and acted upon by a spring 11. By means of the said ratchet device, operated by the oscillations of the stamping-lever 2, the color-strip 5 is gradually wound upon the roller 7—that is to say, it is fed along by steps underneath the stamping-block, so that the latter when pressed down onto the ticket to make the required stamping will act always on fresh parts of the said color-strip. The electromagnet 1, operating the armature-lever 2, may be placed in any suitable circuit 12 13. The closing of this circuit 12 13 may be effected by the insertion of a coin M into the coin-slot i or coin-passage i'. In Fig. 7 I have shown such switch device by way of example. 14 is a double-armed lever capable of being turned on its pivot 15. The upper end or arm of the lever 14 projects into the passage i'—*i. e.*, into the path of the coin—while the other or lower arm carries a block or plate 16, having a recess or notch 17, into which enter the spring-contact tongues 18 19, as shown by Fig. 7. The contact-tongues 18 19 are connected with the wires 12 and 13, respectively.

The operation of the modified apparatus, Figs. 7 and 8, is as follows: By the introduction of a coin M into the passage i the lever 14 is reversed, whereby the tongue 19 is drawn toward the tongue 18 in order to close the circuit 12 13 and to excite the electromagnet 1. Owing to this excitation the lever 2 is attracted and stamps, by means of its downwardly-pressed block or roller 4 and the color-strip 5, respectively, the ticket k, properly held and supported by the slide e^2. After the coin inserted has passed the lever 14 the switch device 19 18 16 14 automatically breaks or opens the circuit 12 13, whereupon the released armature-lever 2 effects in well-known manner by means of its pawl 10 a forward rotation of the ratchet-roller 7 9 and a forward feeding of the color band or strip 5. As soon as the circuit p q, Fig. 6, is closed by the coin proceeding along the passage the polarity of the electromagnets a b is altered and the armature d^0 caused to oscillate toward the right and upon the electromagnet b in the same but reversed manner, as already described when explaining the action of the apparatus shown in Fig. 1. In consequence

of the oscillation of the armature d^0 the lever e, and with it the slide e^2, swings to the left hand, whereby the stamped ticket k, resting upon the said slide e^2, is stripped off by the lowermost ticket of the pile K and thus caused to fall down through the opening between the guides e^3 and cross-piece e^4. The backward swing of the armature d^0, effected by another change of the polarity in the electromagnets $a\ b$, (as fully explained above,) causes the lever e to swing to the right hand and to push or carry forward by means of its slide e^2 another ticket k of the pile K, which ticket is retained in the position shown in Fig. 7 until another coin is inserted in the coin-slot in order to operate anew the stamping device and the delivery apparatus proper.

Having fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In apparatus such as described, a carrier for the object to be delivered, a pair of electromagnets having coils wound in opposite directions, an oscillating armature having its coil wound in one direction, said armature operating said carrier, a main electric circuit including the armature-coil and one of the coils of each of the electromagnets, circuit-closing devices, comprising a fixed and a movable contact interposed in said circuit, a branch from said main circuit including the second coil of each electromagnet, and circuit-closing devices comprising likewise a movable and a fixed contact interposed in said branch circuit; of a coin-guide for guiding a coin first to the main-circuit contacts, then to the branch-circuit contacts to successively close said circuits through said coin, and means operated by the aforesaid armature for obstructing the coin-guideway in advance of the main-circuit contacts, for the purpose set forth.

2. In apparatus such as described, a carrier for the object to be delivered, a pair of electromagnets having coils wound in opposite directions, an oscillating armature having its coil wound in one direction, said armature operating said carrier, a main electric circuit including the armature-coil and one of the coils of each of said electromagnets, circuit-closing devices comprising a fixed and a movable contact interposed in said circuit, a branch from the latter circuit including the second coil of each of the electromagnets, and circuit-closing devices likewise comprising a movable and a fixed contact interposed in said branch circuit; in combination with a coin-guide for guiding a coin first to the contacts in the main circuit, then to the contacts in the branch circuit to close said circuits successively through the coin, a stop on the movable contact of each pair of such operating to prevent the coin from moving out of contact therewith, and means controlled by the oscillations of the armature for successively displacing the movable contacts and thereby releasing the coin, for the purpose set forth.

3. In apparatus such as described, a carrier for the object to be delivered, a pair of electromagnets having coils wound in opposite directions, an oscillating armature having its coil wound in one direction, said armature operating said carrier, a main electric circuit including the armature-coil and one of the coils of each of the electromagnets, circuit-closing devices comprising a fixed and a movable contact interposed in said circuit, a branch from the latter circuit including the second coil of each of the electromagnets, and circuit-closing devices likewise comprising a movable and a fixed contact interposed in said branch circuit; in combination with a coin-guide for guiding a coin first to the contacts in the main circuit, then to the contacts in the branch circuit to close said circuits successively through the coin, a stop on the movable contact of each pair of such operating to prevent the coin from moving out of contact therewith, an electromagnet for each of the aforesaid movable contacts, auxiliary circuits including said electromagnets, and a circuit-closer controlled by the movements of the armature to first close the auxiliary circuit through the electromagnet for the movable contact in the main circuit after said circuit has been closed, and then close the circuit through the electromagnet for the movable contact in the branch circuit after said circuit has been closed, substantially as and for the purpose set forth.

4. In apparatus such as described, a carrier for the object to be delivered, electrically-controlled appliances for operating said carrier, a suitable electric circuit including said appliances, circuit-closing devices comprising a fixed and a movable contact interposed in said circuit, and a coin-guide for guiding a coin to said contacts; of electrically-operated stamping devices, a suitable electric circuit including said devices, a circuit-closer comprising a fixed contact and a coöperating movable contact interposed in said circuit, said movable contact in the path of a coin moving along the aforesaid coin-guideway, whereby the last-named movable contact is moved to its fixed contact to close such circuit, for the purpose set forth.

5. In apparatus such as described, a carrier for the object to be delivered, electrically-controlled appliances for operating said carrier, a suitable electric circuit including said appliances, circuit-closing devices comprising a fixed and a movable contact interposed in said circuit, and a coin-guide for guiding a coin to said contacts; of stamping devices for stamping the article on the carrier, consisting of an electromagnet, a two-armed rock-lever armature carrying a stamp on one of its arms, an electric circuit including said electromagnet, a circuit-closer consisting of a fixed and a movable contact normally held apart, said movable contact in the path of a coin moving along the aforesaid coin-guide, whereby said movable contact is moved to the fixed

contact to close the electric circuit, substantially as and for the purpose set forth.

6. In apparatus such as described, a carrier for the object to be delivered, electrically-controlled appliances for operating said carrier, a suitable electric circuit including said appliances, circuit-closing devices comprising a fixed and a movable contact interposed in said circuit, and a coin-guide for guiding a coin to said contacts; of stamping devices for stamping the article on the carrier, consisting of an electromagnet, a two-armed rock-lever armature carrying a stamp on one of its arms, an electric circuit including said electromagnet, a circuit-closer consisting of a fixed and a movable contact normally held apart, said movable contact in the path of a coin moving along the aforesaid coin-guide, whereby said movable contact is moved to the fixed contact to close the electric circuit, and an ink-ribbon having motion over the printing-face of the stamp, and ribbon-feeding devices operated by the aforesaid armature-lever to feed the ribbon along at each closure of the electric circuit, substantially as and for the purpose set forth.

7. In apparatus such as described, a carrier for the object to be delivered, a rock-shaft connected with said carrier to reciprocate the same, a radial arm on said shaft, a segmental armature secured to said arm and having its coil wound in one direction, a pair of electromagnets having coils wound in opposite directions, a main electric circuit including the armature-coil and one of the coils of each electromagnet, circuit-closing devices comprising a fixed and a movable contact interposed in said main circuit, a branch from the latter circuit including the second coil of each of the aforesaid electromagnets, and circuit-closing devices comprising likewise a fixed and a movable contact interposed in said branch circuit; in combination with a coin-guide for guiding a coin first to the contacts in the main circuit, then to the contacts in the branch circuit and therethrough close said circuits successively, for the purpose set forth.

8. In apparatus such as described, a carrier for the object to be delivered, a rock-shaft connected with said carrier to reciprocate the same, a radial arm on said shaft, a segmental armature secured to said arm, the coil of which armature is wound in one direction, a pair of electromagnets having coils wound in opposite directions, a main electric circuit including the armature-coil and one of the coils of each electromagnet, circuit-closing devices comprising a fixed and a movable contact interposed in said main circuit, a branch from said main circuit including the other coil of each of said electromagnets, and circuit-closing devices comprising likewise a fixed and a movable contact interposed in said branch circuit; in combination with a coin-guide for guiding a coin first to the main-circuit contacts, then to the branch-circuit contacts, and therethrough close said circuits successively, and a second radial arm on the aforesaid rock-shaft provided with a projection adapted to obstruct the coin-guideway in advance of the main-circuit contacts when the aforesaid shaft is rocked in one direction by the closure of said circuit, for the purpose set forth.

9. In apparatus such as described, a carrier for the object to be delivered, a rock-shaft connected with said carrier to reciprocate the same, means for feeding the objects to the carrier one at a time when said carrier is moved in one direction, a radial arm on the rock-shaft, a segmental armature secured to said arm and having its coil wound in one direction, a pair of electromagnets having coils wound in opposite directions, a main electric circuit including the armature-coil and one of the coils of each electromagnet, circuit-closing devices comprising a fixed and a movable contact interposed in said main circuit, a branch from the latter circuit including the second coil of each of the aforesaid electromagnets, and circuit-closing devices comprising likewise a fixed and a movable contact interposed in each branch circuit; in combination with a coin-guide for guiding a coin first to the contacts in the main circuit, then to the contacts in the branch circuit and therethrough close said circuits successively, for the purpose set forth.

10. In apparatus such as described, a carrier for the object to be delivered, a rock-shaft connected with said carrier to reciprocate the same, a radial arm on said shaft, a segmental armature secured to said arm and having its coil wound in one direction, a pair of electromagnets having coils wound in opposite directions, a main electric circuit, including the armature-coil and one of the coils of each electromagnet, circuit-closing devices comprising a fixed and a movable contact interposed in said circuit, a branch from the main circuit including the other coil of each of said electromagnets, circuit-closing devices comprising likewise a fixed and a movable contact interposed in said branch circuit, a coin-guide for guiding a coin first to the main-circuit contacts, then to the branch-circuit contacts to successively close said circuits through such coin, and stop devices operating to prevent the coin from moving clear of the aforementioned contacts; of an electromagnet for each of the described movable contacts, auxiliary circuits including said electromagnets, and circuit-closing devices comprising a contact in each of said circuits and a contact-lever coöperating therewith, said lever secured to the aforementioned rock-shaft and rocking synchronously with the armature on said shaft, for the purpose set forth.

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