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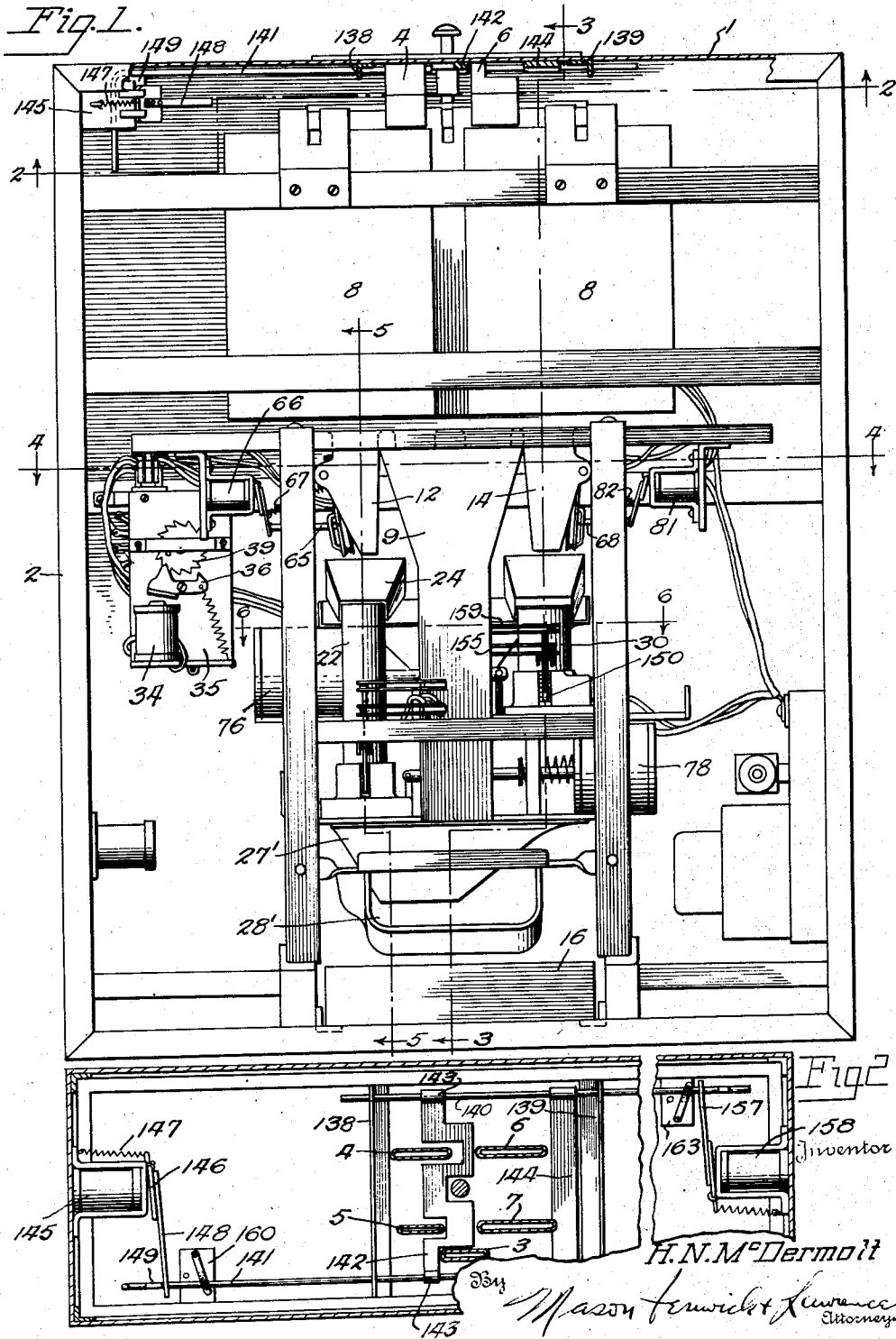
H. N. McDERMOTT

2,271,397

COIN-CONTROLLED CHANGE-MAKING VENDING APPARATUS

Filed July 29, 1941

5 Sheets-Sheet 1



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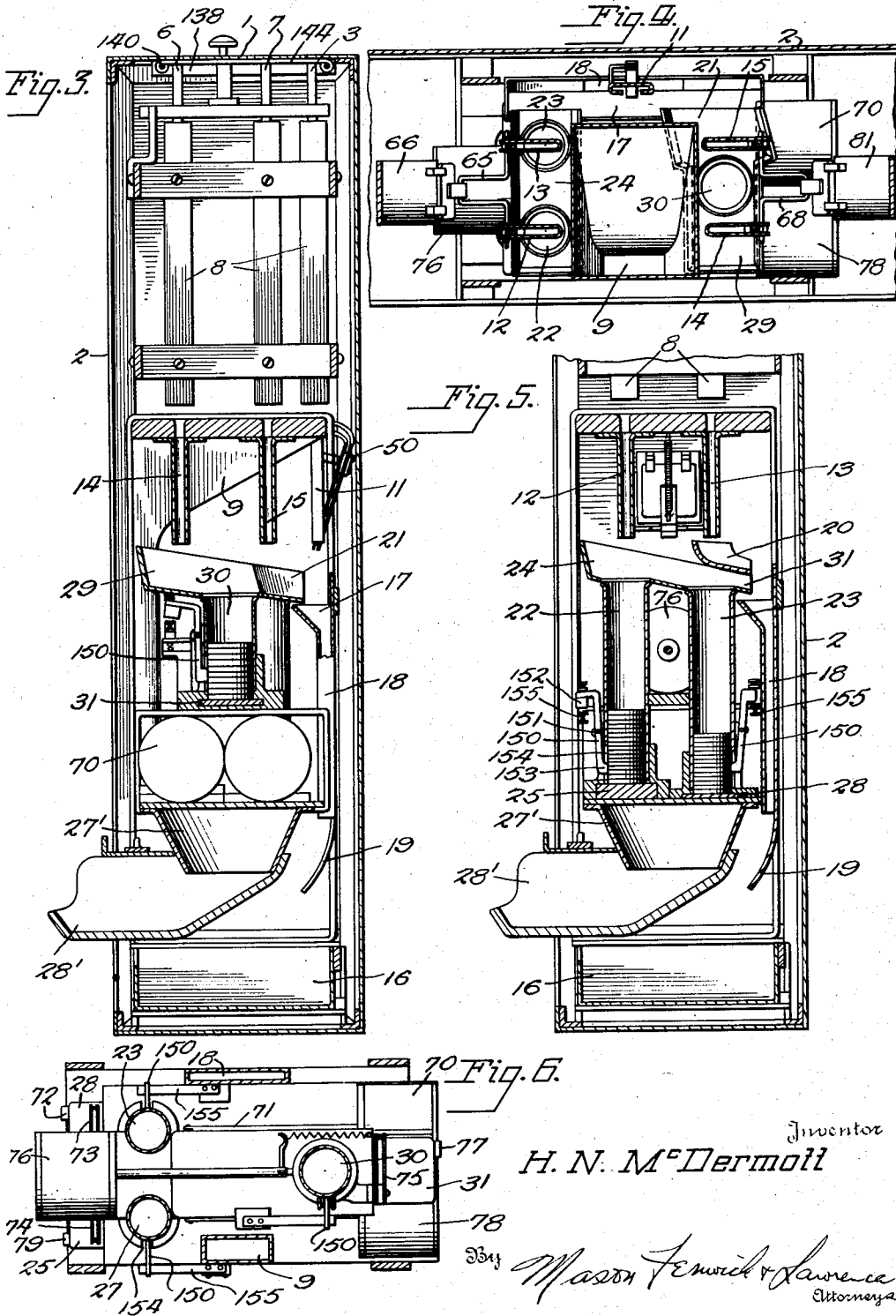
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COIN-CONTROLLED CHANGE-MAKING VENDING APPARATUS

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5 Sheets-Sheet 2



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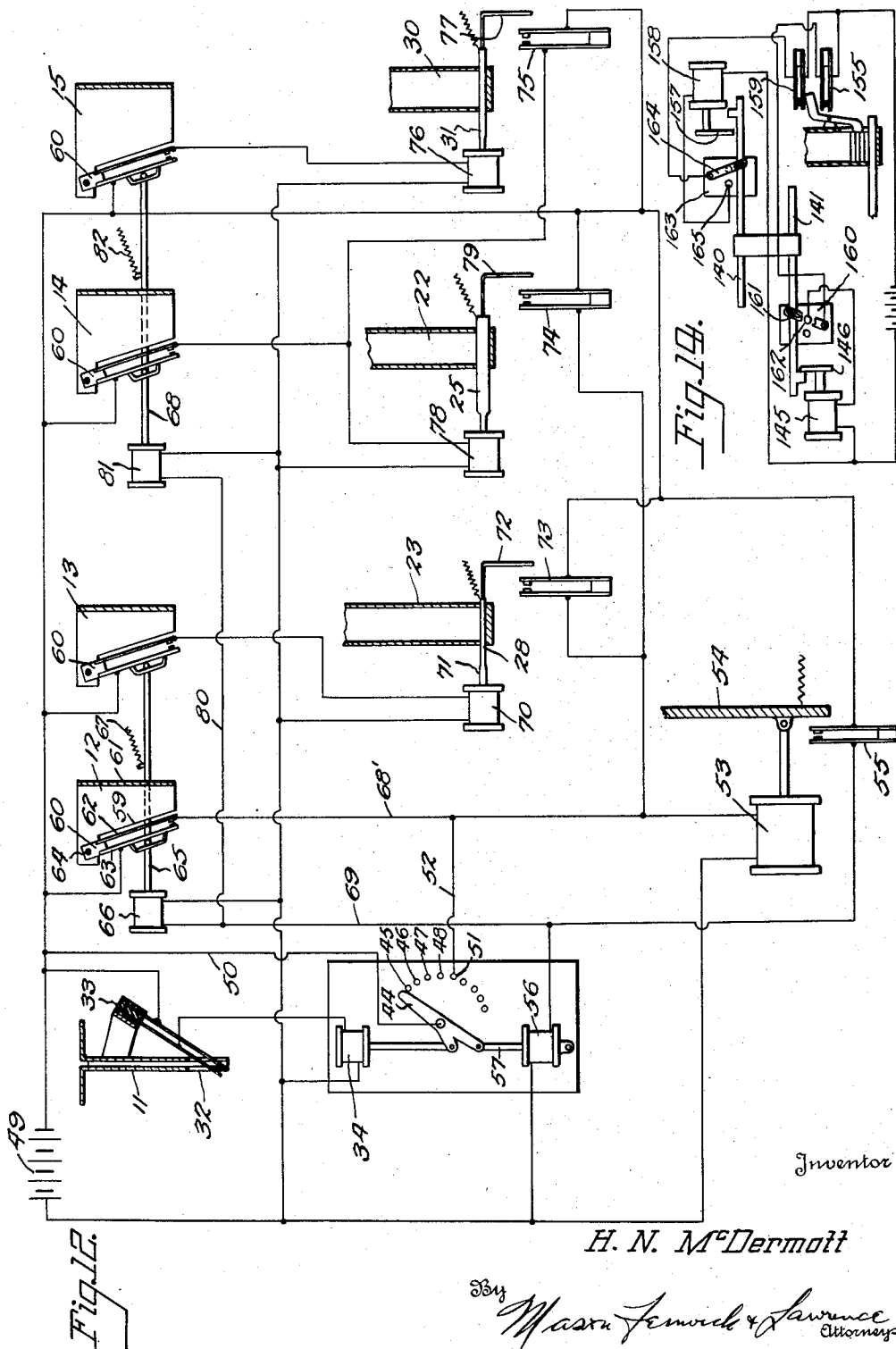
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COIN-CONTROLLED CHANGE-MAKING VENDING APPARATUS

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5 Sheets-Sheet 4



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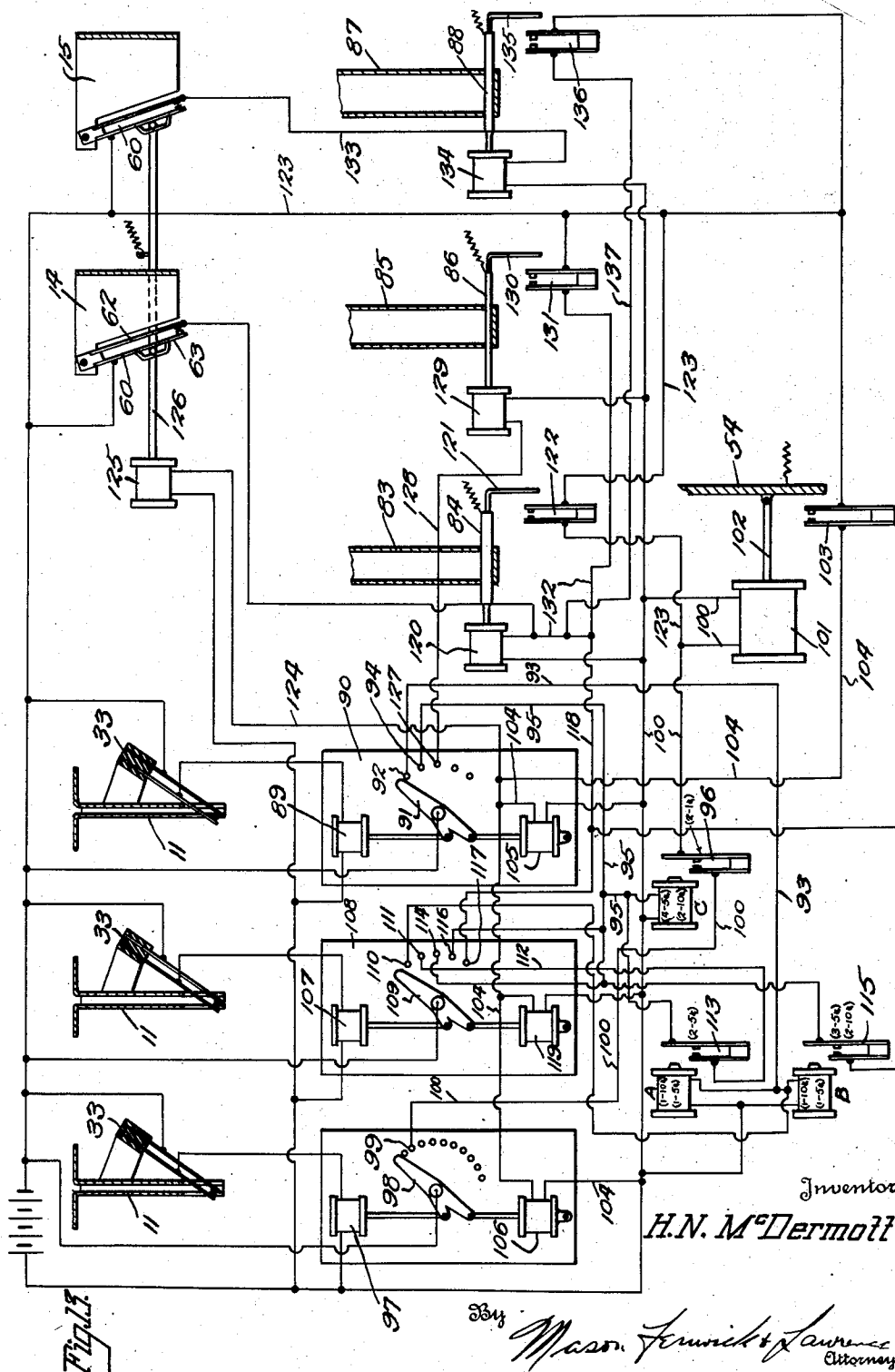
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COIN-CONTROLLED CHANGE-MAKING VENDING APPARATUS

Filed July 29, 1941

5 Sheets-Sheet 5



UNITED STATES PATENT OFFICE

2,271,397

COIN-CONTROLLED CHANGE-MAKING
VENDING APPARATUS

Howard N. McDermott, Hendersonville, N. C., assignor of twenty-five per cent to Jerome B. Sellers, twenty-five per cent to Carl C. Banks, and fifty per cent to Lucy S. McDermott, all of Hendersonville, N. C.

Application July 29, 1941, Serial No. 404,550

11 Claims. (Cl. 194—10)

This invention is a coin-controlled change-making vending apparatus.

The general object of the invention is to provide a machine adapted to be operatively connected to any type of vending apparatus and designed for the insertion of a coin or combination of coins of value equal to or in excess of the price of the vended commodity, which upon the insertion of such coin or coins actuates a vending device to deliver the commodity, and if the value of the inserted coin or coins is more than the price of the commodity, releases the exact change.

Another object of the invention is the provision of a change-making machine embodying the principles of the subject invention but characterized by the absence of vendor device actuation, and set to release change in the exact aggregate value of the inserted coin or coins.

Other objects of the invention will appear as a preferred and practical embodiment of the invention proceeds.

In the drawings which accompany and form a part of the following specification, and throughout the several figures of which the same characters of reference have been employed to designate identical parts:

Figure 1 is a front elevation of the vending and change-making machine;

Figure 2 is a horizontal section taken along the line 2—2 of Figure 1, looking up;

Figure 3 is a vertical section taken along the line 3—3 of Figure 1;

Figure 4 is a horizontal section taken along the line 4—4 of Figure 1;

Figure 5 is a vertical section taken along the line 5—5 of Figure 1;

Figure 6 is a horizontal section taken along the line 6—6 of Figure 1;

Figure 7 is a vertical section through the coin chute, coin tube and 4 nickel pay-off slide;

Figure 8 is a vertical elevation of one side of the accumulator;

Figure 9 is a vertical elevation of the opposite side;

Figure 10 is a vertical end elevation of the accumulator;

Figure 11 is a perspective view of the coin chute switch employed in connection with the accumulator;

Figure 12 is an electric diagram of the operative instrumentalities for a 5¢ commodity;

Figure 13 is a similar diagram for a 22¢ commodity; and

Figure 14 is a diagrammatic lay-out of the instrumentalities and circuits involved in the closing of the coin slots automatically upon the depletion of coin in the coin pay-off tubes.

Referring now in detail to the drawings, and particularly first to Figures 1 to 12, inclusive, which by way of illustration depict a machine

for vending and making change for a five cent article, the purchaser has the choice of inserting either five pennies, one nickel, one dime, one quarter or one half dollar. Therefore, the top of the cabinet 2 which houses the mechanism of the apparatus has five money slots 3, 4, 5, 6, and 7, best shown in Figure 2, sized to take coins of these respective denominations.

Upon insertion, the coins pass through slug detectors 8, one for each coin slot, which are of conventional construction, and therefore, shown only diagrammatically. Slugs are ejected by the slug detectors in known manner and drop through the central passage 9 into the change receptacle 28, where they are kept segregated from the good money.

From the slug detectors 8, the coins pass into tapered coin chutes 11, 12, 13, 14, 15, one for each denomination, and sized accordingly. In these chutes the coins perform the function of closing switches controlling electrical circuits which operate the change-making mechanism where change is to be made, and which actuate the vending mechanism.

Since four pennies must pass through the penny chute 11, Figure 3, without closing the vending device actuating circuit, which is closed by the fifth penny, while one coin only passes into each of the other chutes 12, 13, 14 and 15, the switch construction in the penny chute is different from the switch construction of the other chutes, and for the other chutes it is similar or identical, as will presently appear.

Pennies, dimes and half dollars are never paid out; pennies, because change for a five cent item is always in multiples of five; dimes, because they are too thin to assure accuracy in the pay-out; and half dollars, because they represent the capacity limit of the machine as illustrated, and the maximum change paid out will be 45¢.

Therefore, when pennies, dimes and half dollars discharge from the representative chutes 11, 13, and 15, they fall directly into the money drawer 16 in the bottom of the cabinet.

Figures 3 and 4 show that the penny chute 11 overlies the flared mouth 17 of a passage 18, discharging into the money drawer by way of the deflector 19.

In Figure 5, the dime chute 13 is shown discharging into an inclined pan 20, which also empties into the flared mouth of the passage 18. Figure 3 shows that the half dollar chute 15 overlies an inclined pan 21 which discharges into the passage 18.

Paid out change is therefore limited to coins of the nickel and quarter denominations, and coin tubes are therefore provided for accumulating the nickels and quarters discharging from the respective nickel and quarter chutes 12 and 14. Inasmuch as one nickel is paid out for an in-

serted dime, and four nickels for an inserted quarter, it is preferred to have two nickel coin tubes, one for paying out a group of four nickels, and the other a single nickel. In Figure 5, the nickel chute 12 is shown in relation to a pair of nickel coin tubes 22 and 23, the upper ends of which communicate with a nickel pan 24. The nickel chute 12 is directly over the nickel coin tube 22. At the bottom of this tube is a four nickel pay-off slide 25 having a hole 26 of the same diameter as the interior of the nickel coin tube 22, and of the thickness of four nickels, so that when the four nickel pay-off slide moves out of registry with the nickel coin tube 22 it cuts off four nickels from the bottom of the stack of nickels accumulated in said coin tube. When the four nickel pay-off slide moves to the position shown in Figure 7, the hole 26 comes in registry with the discharge aperture 27, the four nickels therein contained discharging through said aperture, through the funnel 27' shown in Figures 3 and 5 into the change receptacle 28' which opens outwardly on the front of the cabinet and from which the purchaser picks up his change.

When the nickel coin tube 22 has become filled, any further nickels discharging from the chute 12 overflow into the inclined pan 24 and into the nickel coin tube 23, the bottom of which communicates with a hole in the single nickel pay-off slide 28 which is of the thickness of a single nickel and which, therefore, cuts off one nickel from the bottom of the stack in the nickel coin tube 23, discharging the same through the funnel 27 and into the change receptacle 28'.

Referring now to the quarter chute 14 shown in Figure 3, this discharges into an inclined pan 29, the bottom of which communicates with the top of the quarter coin tube 30 and being of the thickness of a single quarter whereby when it moves out of registry with the quarter coin tube it cuts a single quarter from the bottom of the stack of quarters in said coin tube and discharges it through the funnel 27 and into the change receptacle 28'.

When both nickel coin tubes 22 and 23 are full, any excess nickels falling into the pan 24 discharge from the open lower end 31 of said pan into the passage 18 and down into the money drawer 16. Any excess quarters falling into the pan 29 until the quarter coin tube 30 is full, slide into the pan 21 and drop through the passage 18 into the money drawer.

The electrical instrumentalities and circuits therefor by means of which the functions of the machine are performed are shown, in part structurally and in part diagrammatically, in Figure 12, which represents a machine for vending a five cent article of merchandise. The penny chute 11 has an opening 32 in its lower end, through which projects the blades of a normally open switch 33. These blades intersect the passage through said switch and are so delicate that they turn aside under the weight of a penny, permitting the latter to be discharged from said chute without detention. When a penny first strikes the switch, it brings the switch contacts together, closing a circuit through the solenoid 34 of an accumulator. The accumulator is shown in detail in Figures 8, 9 and 10, and will now be described. It consists of a frame 35, on which is suitably mounted the solenoid 34. The armature of said solenoid is a pivoted escapement 36, the teeth 37 and 38 of which control the step by step movement of an

escapement wheel 39 fixed to a shaft 40. The escapement wheel is biased to move in a counter-clockwise direction, as viewed in Figure 8, by a coil spring 41 fixedly anchored to the frame at one end and winding partially around the hub 42 of the escapement wheel, being anchored at its opposite end to the latter. The teeth of the escapement wheel have an abrupt shoulder facing in the unwinding direction, and a sloping shoulder facing in the winding direction of said wheel. Normally, when the solenoid 34 is de-energized, the escapement is kept pressed against the escapement wheel, to prevent unwinding of the latter, by means of a spring 43. Each time the switch 33 is closed by the passage of a penny through the penny chute, the solenoid 34 is energized to cause the escapement to permit the unwinding movement of the escapement wheel and shaft 40 the distance of one step, that is, one tooth of the escapement wheel. On the opposite end of the shaft 40 is an arm 44 which at each unwinding step of the escapement wheel advances successively to engage the contacts 45, 46, 47 and 48.

The arm 44 is in circuit with the battery or other electrical source 49 through a wire 50, but in the five cent vending machine the contacts 45, 46, 47, 48 are blind contacts, that is to say, they are not connected to any circuit, so that nothing happens upon the successive insertion of the first four pennies, excepting that the arm 44 moves successively along the series of contacts 45 to 53. When the fifth penny is inserted, the arm 44 moves to the contact 51, which as shown is connected by the wire 52 through the solenoid 53 and back to the electrical source. The solenoid 53, when energized, moves a lever or equivalent device 54 which operates the vending device, causing it to discharge the purchased article. In the same movement by which the lever 54 actuates the vending device, it also closes a relay switch 55 which closes a circuit through the solenoid 56, the armature 57 of which is pivotally connected to the arm 44 and returns the arm to its original repose position, breaking the circuit through the solenoid 53 and permitting the release movement of the lever 54 which actuates the vending device. Obviously, no change is given, since the five pennies necessary to actuate the vending device are the exact price of the vended article. If the purchaser inserts less than five pennies and no more, no circuit is closed except the momentary closure of the solenoid 34 circuit for the passage of each penny, and no article is vended. If more than five pennies, but less than ten are successively inserted, an article would be vended for the insertion of the fifth penny, but inserted pennies beyond that number will simply fall into the money drawer. If ten pennies are inserted, one article will be vended for the fifth penny and a second article for the tenth penny.

It will be noted that the solenoid 56 is pivotally mounted to the frame at the point 58, so that it is not necessary to provide any lost motion at the pivotal connection between the armature 57 and the arm 44.

The same type of accumulator can be used for articles of different price. For example, for a three cent article the wire 52 would be connected to the contacts 47. However, for any article other than a five cent article the change pay-off circuits would be different from those shown in Figure 12, which are peculiarly adapted for making change for a five cent article.

Now, referring to the nickel, dime, quarter and half dollar chutes 12, 13, 14 and 15, respectively, inasmuch as these operate through the insertion of a single coin, they are all alike. Each, for example, has an open side 59 confronted by a switch 60, the blades of which converge toward the opposite or closed side 61 of the switch. The blade 62 of the switch 60 which lies adjacent the open side of the chute is sufficiently delicate to be pressed into contact with the companion blade 63, through the weight of the inserted coin, but the blade 63 is so stiff that it does not yield to the weight of the coin but detains the coin in the chute until released. The switch 60 is pivotally mounted at the point 64 and is held in normal coin-retaining position by the armature 65 of a release solenoid 66, said armature as shown, serving for a plurality of switches and being biased into coin-retaining position by means of the springs 67. As shown, the nickel and dime chutes are controlled by the same armature 65 and the switches 60 of both chutes are simultaneously actuated by said armature. The same relationship exists between the armature 68 which releases the coins from the quarter and half dollar chutes 14 and 15.

Now, advertent to the nickel chute 12, it is obvious that there will be no change pay-off in connection with this chute. A nickel is inserted in the chute which presses the switch blade 62 against the switch blade 63, closing a circuit from the source and by way of the wire 68' through the solenoid 53 which actuates the lever 54 of the vending device. An article will be vended and the switch 55 closed by the movement of the lever 54, closing a release circuit which passes by way of the wire 69 through the release solenoid 66, energizing it and drawing back the armature 65, which in turn draws back the pivoted switch 60, permitting the nickel to be discharged from the chute 12. As has been already explained in reference to Figure 5, when the nickel drops from chute 12, it falls into the four nickel pay-off tube 23, and if both of the nickel pay-off tubes are full, it discharges from the pan 24 down the passage 18 into the money drawer.

Now, referring to the dime chute 13, it is obvious that a nickel will be paid out in change. The insertion of a dime closes the switch 60, the dime being temporarily retained in the chute. The closed circuit energizes the solenoid 70, the armature 71 of which is connected to the one nickel pay-off slide 28, causing said slide to draw one nickel from the bottom of the stack in the one nickel pay-off tube and to drop the nickel through the funnel 27 into the change receptacle 28'. The pay-off slide 28 carries a projection 72 which, moving with said slide, closes a switch 73, energizing the release solenoid 53, which actuates the vending device lever 54, which in turn closes the release switch 55, energizing the release solenoid 66, drawing back the armature 65, rocking the switch 60, releasing the dime which falls into the money drawer, permitting the switch 60 to open, breaking the circuit through the solenoid 70 so that the one nickel pay-off slide returns to its normal position with its nickel hole in registry beneath the stack of coins in the one nickel pay-off tube. The return of the pay-off slide 28 opens the switch 73, breaking the circuit through the solenoid 53, returning the vending device lever 54 to normal position, opening the switch 55, de-energizing the solenoid 66 and causing the arma-

ture 65 to move to the right under the urge of the spring 67, restores the switch 60 to its normal position, as shown.

The principle of the invention is that the change is first discharged before the vending device is actuated, so that the purchaser cannot be heard to say that he received the article but did not get the change.

The circuits associated with the quarter chute 13 are similar in arrangement and mode of operation to those appurtenant to the dime chute 13, but the circuits controlled by the insertion of a half dollar are somewhat different because the change from a half dollar must be paid out from two pay-offs, the quarter and the four nickel pay-offs.

Referring now to the half dollar chute 15, the insertion of the coin closes the switch 60 associated with said chute, closing the circuit through the solenoid 76, which operates the quarter pay-off slide 31. When this pay-off slide moves, discharging a quarter into the change receptacle 28' it at the same time closes the switch 75 by means of the projection 77, carried by said slide. The switch 75, when actuated, closes a circuit through the solenoid 78 of the four nickel pay-off slide 25, moving the latter to discharge four nickels into the change receptacle 28' and at the same time keeping the projection 79 carried by said slide to close the switch 74, closing a circuit through the solenoid 53, which operates the vending device lever 54. When the switch 55 is closed by the movement of the lever 54, it closes a circuit through the wires 69 and 80 to the solenoid 81, which draws the armature 68 leftward against the tension of the spring 82, rocking both of the switch 60 associated respectively with the quarter and half dollar chute, releasing the coin in the half dollar chute which gravitates to the money drawer 16. The effacement of this coin opens the switch 60 of the half dollar chute, de-energizing solenoid 76, causing the return of the quarter pay-off slide 31 to normal position, the withdrawal of the projection 77 from the switch 75, opening the latter, breaking the circuit through the solenoid 78, permitting the return of the four nickel pay-off slide to normal position and the withdrawal of the projection 79 from the switch 74, opening the latter and breaking the circuit through the solenoid 53, which actuates the vending device lever 54. This lever then returns to normal position, permitting the switch 55 to open.

Thus, the operation of the machine has been particularly described for all combinations of currency which would normally be used in a machine of half dollar capacity for vending a five cent item.

In Figure 13 the coin-controlled change-making and vending device operating apparatus of the subject invention is shown adapted for an article of merchandise priced 22¢, in which the following combinations of coins may be inserted by the purchaser:

- Two dimes and two pennies.
- Four nickels and two pennies.
- One dime, two nickels, and two pennies.
- Five nickels.
- One dime and three nickels.
- Two dimes and one nickel.
- Three dimes.
- One quarter.
- One half dollar.

The first three combinations each add to the

exact price of the commodity and so there will be no change pay-off.

For five nickels inserted, or one dime and three nickels, or two dimes and one nickel, or one quarter, there is a three cent pay-off for each. For three dimes inserted there is a nickel pay-off, plus three pennies, and for a half dollar inserted there is a change pay-off of one quarter, one nickel and three pennies.

It will be observed that for any of the combinations the change pay-offs are either three penny, one nickel, or one quarter items, and consequently, a pay-off coin tube is required for each of these denominations but not for the dimes or half dollars, which are never paid out of the machine, but fall directly into the money drawer. Figure 13 shows the three cent coin tube 83 with the three cent pay-off slide 84 having a thickness of three pennies, the one nickel coin tube 85 having the pay-off slide 86 equal to the thickness of a single nickel and the quarter coin tube 87 having the quarter pay-off slide 88.

It will be noted from the above tabulation of possible combinations of inserted coins that a plurality of pennies, a plurality of nickels or a plurality of dimes figures in one or more of the combinations but that no more than one quarter or one half dollar is ever inserted. Wherever more than one coin of the same denomination is inserted, a coin chute and accumulator is used similar to the penny chute and accumulator employed in the five cent item machine. Consequently, coin chutes of this type are provided for the penny, nickel and dime slots, said coin chutes and the switches appurtenant thereto being designated by the respective reference characters 11 and 33. As only one quarter or one half dollar is ever inserted in payment for a twenty-two cent item, the coin chutes for the quarter and half dollar slots are similar to the quarter and half dollar coin chutes shown in Figure 12 and are designated accordingly with the respective reference characters 14 and 15 and the associated switches by the reference character 60.

The circuit sequences will now be traced, referring to the simpler combinations of inserted coins in which there is no change pay-off:

Two dimes and two pennies

The purchaser inserts the first dime in the dime chute 11, which falls through into the money drawer, closing the switch 33 in transit. This closes a circuit through the solenoid 89 of the accumulator 90, moving the arm 91 from its zero position, as shown, to the first contact 92. This closes a circuit through the arm 91, contact 92, wire 93 through both solenoids A and B and back to the current source. Parenthetically, it may be here stated that there are a number of combinations of inserted coins in which a dime figures, and when the purchaser inserts one dime the machine cannot foretell what the succeeding inserted coins will be, and therefore, must activate such circuits and instrumentalities as may be useful in any one of the combinations in which a dime plays a part. In this particular combination it is not useful that the solenoids A and B shall be activated, and consequently, as will now appear, the circuits through said solenoids will be broken upon the insertion of the second dime. When the second dime is inserted it drops through the dime chute 11, again closing the switch 33, again energizing the sole-

noid 89 and moving the arm 91 from the first contact 92 to the second contact 94. This breaks the circuit through the solenoids A and B and closes a circuit through the arm 91, contact 94, wire 95, through relay C to the current source. Relay C, being energized, pulls the contacts of the switch 96 together, but there is as yet no current passing through the circuit of said switch.

The purchaser next inserts the first penny in the penny chute 11, which in passing there-through closes the penny switch 33, energizing the solenoid 97 of the penny accumulator, moving the arm 98 from its zero position to the first contact which is a dead contact, since where pennies form part of the combination of inserted coins, two pennies are always inserted. The purchaser then inserts the second penny, which again closes the switch 33, energizing solenoid 97, moving the arm 98 to the second contact 99. This closes a circuit through the wire 100, through the closed contacts of the switch 96 through the vender solenoid 101 actuating the armature 102 of said solenoid and rocking the vending device lever 54 which actuates the vending device.

It does not make any difference whether the purchaser first inserts the pennies or the dimes. We have traced the sequences where the dimes are inserted first. In case the pennies are first inserted, current will be supplied to the circuit through the wire 100, but the contacts of the switch 96 will be open. When the dimes are inserted, the solenoid C will be actuated, drawing together the contacts of the charged switch 96.

In the course of its vending device actuating movement, the lever 54 strikes the release switch 103, closing it and closing a circuit through the wire 104, the solenoid 105 which returns the arm 91 of the dimes accumulator to zero position and the solenoid 106 which restores the arm 98 of the penny accumulator to zero position. The return of the arm 98 to zero position breaks the circuit through the switch 96 and the vendor solenoid 101, permitting the lever 54 to return to its normal repose position.

Four nickels and two pennies

The purchaser inserts the first nickel in the nickel slot, which passes through the nickel chute 11 to the nickel coin tube 85. In passing through the nickel chute 11, it closes the switch 33, energizing the solenoid 107 of the nickel accumulator 108, moving the arm 109 from zero position to the first contact 110, closing a circuit through the solenoid B. This is not a useful circuit in this particular combination. The second nickel inserted again closes the switch 33, moving the arm 109 to the second contact 111, breaking the circuit to the solenoid B and closing a circuit through the wire 112 to the switch 113, the contacts of which are at present open. This also is not a useful circuit in the present combination. The third nickel inserted again closes the switch 33, moving the arm 109 to the third contact 114, breaking the circuit to the switch 113 and closing a circuit to the switch 115, the contacts of which are open. The fourth nickel inserted, again closes the switch 33, moving the arm 109 to the fourth contact 116, breaking the last mentioned circuit and closing a circuit through the solenoid C. This solenoid, energized, draws the contacts of the penny switch 96 together, but there is no current in the penny circuit. The pur-

chaser then inserts two pennies in succession in the penny chute 11, which moves the arm 98 over to contact 99, closing the circuit through the closed penny switch, energizing the vendor solenoid 101 and operating the vending device lever 54. The release circuits closed by the actuation of the release switch 103 by the lever 54 are the same as described in connection with two dimes and two pennies, including the energization of the nickel release solenoid 119, which restores the arm 109 of the nickel accumulator to its zero position.

One dime, two nickels and two pennies

The purchaser inserts a single dime which passes through the dime chute 11, closing the switch 33, energizing the solenoid 89 of the dime accumulator, moving the arm 91 to the contact 92, closing the circuit through the wire 93 to the solenoids A and B. This is a useful circuit in this combination. The purchaser then inserts two nickels successively in the nickel slot. Each, passing through the nickel chute 11 closes the switch 33 energizing the solenoid 107, the second energization of which places the arm 109 on the contact 111, closing a circuit to the switch 113. The contacts of this switch were already closed through the energization of the solenoid A, so that current passes through said switch, energizing the solenoid C, closing the penny switch. The purchaser then inserts two pennies which passing through the penny chute impart successive closures to the penny chute switch 33, placing the arm 98 upon the contact 99, closing a circuit through the closed penny switch 96 and operating the vendor solenoid 101. The release circuit activated by the movement of the lever 54 is the same as previously described, involving the energization of each of the release solenoids 106, 119, and 105, restoring the arms of all of the accumulators to their zero positions, and by breaking the penny circuit through the switch 96, de-energizes the vendor solenoid 101, restoring the lever 54 to its repose state.

Now, referring to the combinations which have a pay-off:

Five nickels

The fifth nickel passing through the nickel chute 11 energizes the solenoid 107 to put the nickel accumulator arm 109 on the fifth contact 117, closing a circuit through the wire 118 to the solenoid 120 of the three cent pay-off slide 84, actuating said slide to cut off three pennies from the bottom of the stack in the coin tube 83 and to discharge them into the change receptacle 28'. In this movement of the pay-off slide 84 the projection 121 carried thereby closes the switch 122, closing a circuit through the wire 123 and the wire 100 through the vendor solenoid 101 actuating the vending device lever 54. Closure of the release switch 103 by the lever 54 energizes the solenoid 119, restoring the arm 109 to zero position, breaking the circuit through the solenoid 120 and permitting the return of the three penny pay-off slide 84 to normal position, opening the switch 122 and de-energizing the vendor solenoid 101, permitting the return of the lever 54 to its normal repose state.

One dime and three nickels

The dime passing through the chute 11 closes the switch 33, moving the arm 91 to contact 92, closing a circuit which energizes both solenoids A and B. The passage of the three nickels

through the nickel chute 11 closes the switch 33 three times, moving the arm 109 to the contact 114, closing a circuit through the switch 115 whose contacts were brought together by the energization of the solenoid B. This circuit energizes the solenoid 120, operating the three penny pay-off slide 84 to discharge three pennies into the change receptacle 28'. Movement of the three penny pay-off slide 84 closes the switch 122, energizing the vendor solenoid 101 and operating the vending device lever 54. The release circuit closed through the switch 103 by the movement of the lever 54 against said switch energizes the release solenoids 105 and 119 of the respective dime and nickel accumulators, restoring the respective arms 91 and 109 to their zero position, breaking the circuit through the solenoid 120 of the three penny pay-off slide, restoring the latter to its normal position and permitting the switch 122 to open, which de-energizes the vendor solenoid 101, releasing the lever 54 and opening the switch 103.

Two dimes and one nickel

Two dimes passing through the dime chute 11 actuate the switch 33 to place the arm 91 on the contact 94, closing a circuit to the switch 115 whose contacts are as yet open. The insertion of the nickel in the nickel slot and its passage through the nickel chute 11 actuates the switch 33 to place the arm 109 on the first contact 110 of the nickel accumulator, closing a circuit through the solenoid B which draws the contacts of the switch 115 together, closing a circuit through the solenoid 120 of the three penny pay-off, operating the three penny pay-off slide, which in turn causes energization of the vendor solenoid 101 and operation of the vending device lever 54. The release sequences are similar to those previously described.

One quarter

An inserted quarter drops into the quarter chute 14, its weight bringing the blade 62 of the switch 60 into contact with the blade 63. The quarter is retained in the chute 14. The circuit closed by the switch 60 energizes the solenoid 120 of the three penny pay-off slide, actuating the latter and discharging three cents change into the change receptacle. Movement of the three penny pay-off slide 84 closes the switch 122 through the instrumentality of the projection 121 carried by the three penny pay-off slide, closing a circuit through the vendor solenoid 101, operating the vending device lever 54, which in turn closes the release switch 103, the latter by way of the wires 104 and 124, closing a circuit through the switch release solenoid 125, operating the armature 126 to rock the switch 60 about its pivot, releasing the quarter into tube 87, and if this tube is already full the released quarter overflows said quarter tube, dropping into the money drawer. Release of the quarter opens the contacts of said switch, de-energizing the solenoid 120, permitting the three penny pay-off slide 84 to return to its normal position, and permitting the switch 122 to open, which de-energizes the vendor solenoid 101, causing the lever 54 to return to its repose position, opening the release switch 103. The breaking of the circuit controlled by the release switch de-energizes the solenoid 125, permitting the armature 126 to move to the right, as viewed in Figure 13, restoring the pivoted switch 60 to its normal repose position.

Three dimes

When three dimes are deposited, the third actuation of the switch 33 of the dimes chute 11 places the arm 91 on the contact 127, closing a circuit through the wire 128, which energizes the solenoid 129 of the nickel pay-off slide 86, operating the latter to discharge a single nickel into the change receptacle 28'. The projection 130 carried by the nickel pay-off slide 86 closes the switch 131, thereby closing a circuit through the wire 132, which energizes the solenoid 120 of the three penny pay-off slide 84, operating this slide to discharge three pennies into the change receptacle. The movement of the three penny pay-off slide 84 causes the projection 121 to close the switch 122, energizing the vendor solenoid 101 and operating the lever 54 which actuates the vending device. The release circuit closed by the switch 103, when the latter is actuated by the lever 54, restores the arm 91 to its zero position, breaking the circuit through the solenoid 129 of the nickel pay-off slide 86, permitting the return movement of said slide, withdrawing the projection 130 from the switch 131, causing the latter to open, breaking the circuit through the solenoid 120 of the three penny pay-off slide 84, permitting the latter to return to its repose position in which the projection 121 withdraws from the switch 122, letting the latter open, breaking the circuit through the vendor solenoid 101, permitting the lever 54 to move to its repose position out of contact with the switch 103, opening the latter and breaking the release circuit.

One half dollar

When a fifty cent piece is deposited it lands in the half dollar chute 15, closing the switch 60 associated with said chute, closing a circuit through the wire 133, energizing the solenoid 134 of the quarter pay-off slide 88, actuating the latter to drop a quarter into the change receptacle. In this movement of the quarter pay-off slide 88, the projection 135 carried thereby closes the switch 136, which completes a circuit through the wires 137 and 132 to the solenoid 120 of the three penny pay-off slide 84, actuating the latter to drop three pennies into the change receptacle 28'. Movement of the three penny pay-off slide 84 causes the switch 122 to close, energizing the vendor solenoid 101 to operate the lever 54 of the vending device. The closure of the switch 103 by the lever 54 completes a circuit through the solenoid 125, actuating the armature 126 to rock the switch 60 of the chute 15, releasing the half dollar which drops into the money drawer and the release of which opens the switch 60. The opening of said switch breaks the circuit through the solenoid 134, permitting return of the quarter pay-off slide 88 to normal position, thereby opening the switch 136 which breaks the circuit to the solenoid 120 of the three penny pay-off slide 84, permitting the return of said slide to normal position, thereby opening the switch 122, which de-energizes the vendor solenoid 101, permitting the movement of the lever 54 to normal position and thereby opening the switch 103 which de-energizes the solenoid 125, permitting the armature 126 to move to the right, restoring the switch 60 of the half dollar chute to its normal position, as shown.

Referring once again to the five cent item machine, shown in Figures 1 to 12, inclusive, and particularly to Figures 1, 2, 3, and 5, provision is made for closing certain of the coin slots automatically

when the coins in any of the coin pay-off tubes become depleted to the extent that changes cannot be made.

Figures 1 and 3 show a pair of angle irons 138 and 139 suitably secured to the under side of the top of the cabinet 1 on opposite sides of the coin slots 3, 4, 5 6 and 7. The depending flanges of said angle irons are provided with perforations affording slideways for the parallel rods 140 and 141. Fixed to the rods is a sinuous plate 142 having eyes 143 fixedly surrounding the rod 140 and secured thereto. Said plate is operatively related to the penny, dime and nickel slots. A plate 144 is likewise fixed both to the rods 141 and 140, said plate being operatively related to the half dollar and quarter slots. Said plates are so shaped that when the rod 141 is moved toward the left, as viewed in Figure 2, the plate 142 obscures a portion of the dime slot, while the plate 144 obscures a portion of the quarter and half dollar slots so that coins cannot be inserted in the slots so restricted. The plate 142 is so shaped and positioned that in the range of its movement it does not obscure either the penny or nickel slot. This is so because even if there is no change in the pay-off tubes a purchaser by inserting five pennies in the penny slot, or a single nickel in the nickel slot, can obtain delivery of the five cent commodity. The rod 140 is operated through a solenoid 145 having an armature 146 normally biased away from said solenoid by a spring 147. The armature 146 has an extension 148 engageable with a projection 149 on the rod 141. When the solenoid 145 is energized, responsive to depletion of coins in a change pay-off tube, the attraction of the armature 146 causes the extension 148 to contact the projection 149 and move the rod 141 leftward, moving the plates 142 and 144 into slot occluding position. On the opposite side the rod 140 is operated by an armature 157 of a solenoid 158 energized when coins are replenished in the pay-off coin tubes following depletion, which pulls the plates 142 and 144 in the opposite direction to reopen the coin slots. The solenoids 145 and 158 are automatically activated by the coin responsive means associated with each of the coin tubes and shown in Figures 3 and 5. Said means, as shown, are identical, each consisting of a lever 150 pivoted at an intermediate point 151 overbalanced by a weight 152, so that its lower end 153 projects inwardly through a slot 154 in the coin tube intersecting the bore of said coin tube. When enough coins are in the tube to make change for the vended item, the coins keep the lower end 53 of the lever pressed outwardly against the urge of the weight 152. Normally open switches 155 and 159 are in operative proximity to the weight 152, so that when the coins in the tube are depleted to the extent that they permit the incursion of the lower end 153 into the bore of the coin tube, the weight 152 depresses the upper limb of the switch 155, bringing the contacts together and energizing the solenoid 145. When the contents of the coin tube have been replenished to the extent that the lower end of the lever 150 is forced outwardly, the contacts of the switch 155 open, de-energizing the solenoid 145. At the same time the weighted outer end of the lever 150 is forced upwardly, bringing together the contacts of the switch 159, energizing the solenoid 158 whose armature pulls the rod 140 and with it the plates 142 and 144 into unobstructive position with respect to the coin slots.

It will be apparent to one skilled in the art

that whenever the respective switches 155 or 159 remain closed which would be, in the case of the former, during the period of coin depletion, and in the case of the latter while there are coins in the coin tubes, that the current would continuously traverse the winding of the respective solenoids, overheating them, with the chance of burning them out. To prevent this, the armature of each solenoid is associated with a switch in the circuit of said solenoid, which switches are moved to open the respective circuits by said solenoids in performing their plate moving function.

Referring to Figure 14, it will be observed that the circuit which energizes the solenoid 145 includes a switch 160 having an arm 161 engaging the contact 162 for closing said circuit when the armature 146 is in its release position. Likewise, a switch 163 has an arm 164 adapted to engage a contact 165 but being out of engagement with said contact when the switch 160 is closed. In the positions of parts shown in Figure 14 in which the switch 159 is closed and the slot occluding plates have been moved to release position through the energization of solenoid 158, the circuit through said solenoid is broken through the immediate opening of the switch 164. By the same movement of the rods 140 and 141 the switch 160 has closed, preparing the circuit through the solenoid 145 to be energized upon the closure of the switch 155. In short, the switches 160 and 163 each constitutes a second gap in the respective circuits in which the switches 155 and 159 constitute primary gaps, the secondary gap being open while the primary gap is closed.

It will be obvious that the machine can be adjusted to vend and pay off change for any priced commodity, simply by selecting the proper pay-off coin tubes and change pay-off slides of appropriate thickness therefor, and by providing an accumulator operating coin chute and switch for each coin slot wherein a plurality of coins of the same denominations may be inserted for any of the coin combinations which can be employed in covering the price of the article to be vend.

The machine of the subject invention is not a vending device, but is primarily a change-making apparatus with facilities, the lever 54, adapting it to be applied to the actuation of a vending device of any type and priced commodity.

The lever 54, as has been explained, has another function than that of vendor operation, inasmuch as by its actuation of the switch 55 in Figures 12 and switch 103 in Figure 13, it releases the parts and restores the circuits to their original position and state following the sequences of operation set in motion by the insertion of a coin or coins.

The apparatus is therefore a complete operative device in the absence of an associated vendor, adapted to function as a change-making machine simply by selecting such type of coin chutes and the arrangement of pay-off units, as will make change for a zero priced commodity.

While I have in the above description disclosed what I believe to be a preferred and practical embodiment of the invention, it will be understood to those skilled in the art that the specific details of construction and arrangement of parts as shown and described are by way of example and not to be construed as determining the scope of the invention which is set out in the appended claims.

What I claim as my invention is:

1. Coin-controlled vendor actuating and change-making apparatus responding to the insertion of a plurality of coins of aggregate value equal to or exceeding the price of the vended commodity and in which the change delivered is equal to the value of the inserted coins less the price of the commodity, and in which a number of combinations of inserted coins are eligible including single coins of different denominations each greater than the price of the commodity, and one or more groups of coins, the coins of a group being of the same denomination, said apparatus having a coin slot for each denomination of coin present in the several combinations, coin chute units one for each slot, said units being of different types, one type for the slots receiving a plurality of coins of the same denomination, the other for the slots which receive a single coin, each plural coin unit comprising a chute allowing continuous through passage of the coins, a switch in the path of the coins operated independently by each coin in passage, and a multi-contact relay switch, each multi-contact switch comprising a series of contacts, a switch arm movable step by step into successive engagement with said contacts, an operating solenoid for each switch arm in circuit with the corresponding chute switch for advancing the switch arm a one-contact step for each closing of said switch, a vendor actuating member, an operating solenoid therefor, a change pay-off device, a solenoid for operating said pay-off device, a plurality of groups of circuit closing instrumentalities, each group consisting of a switch and a solenoid for closing said switch, the switch of the first group being in circuit with the solenoid of the vendor actuating member and with a contact of one of the multi-contact switches, the solenoid of said group being in one or more alternative circuits including a contact or contacts of respectively, one or more of the multi-contact switches, the circuits of said switch and solenoid of said group including such multi-switch contacts as are closed by the insertion of coins into two of the coin slots, equal in value to the price of the vended commodity, whereby a circuit is closed through the solenoid of the vendor operating member without involving the actuation of the pay-off device, the switch of the second group being in circuit with the solenoid of the first group, and the solenoid of the second group being in alternative circuits which include such contacts of a plurality of the multi-contact switches as are respectively closed by coins of different denominations whose aggregate value is the same as the aggregate value of the coins which activate any of the alternate circuits which directly include the solenoid of the first group, whereby the circuit is closed through the solenoid of the vendor operating member by the insertion of coins in three of the coin slots, of aggregate value equal to the price of the commodity, the switch of the third group being in circuit with the solenoid of the pay-off device, and with contacts of certain of the multi-contact switches, and the solenoid of said third group being in one or more alternative circuits including a contact or contacts of one or more of the multi-contact switches, the circuits of the switch and solenoid of the third group including such multi-switch contacts as are closed by the insertion of coins in the plural coin slots having an aggregate value in excess of the price of the commodity whereby the pay-off device is actuated, and a switch in circuit

with the solenoid of the vendor operating member closed by said pay-off device responsive to its change dispensing movement, the single coin slot units comprising one or a series of chutes, in which a coin or coins is detained and a switch associated with each chute, closed by said coin or coins during its period of detention, the chute switch of the first unit of said series being in circuit with the solenoid of said pay-off device, other solenoid actuated pay-off devices in said series each actuated by a single coin detained in any of the respective coin slots and each pay-off device when actuated closing a circuit through a solenoid or the solenoids of the pay-off devices of lower denominations in said series, including the first pay-off device whose movement closes the circuit which actuates the vendor operating member.

2. Coin-controlled vendor actuating and change-making apparatus as claimed in claim 1, including a solenoid for each multi-contact relay switch operatively connected to the movable arm thereof for restoring said arm to zero position when energized, and a release switch actuated by said vendor operating member, said solenoids being in circuit with said release switch.

3. Coin-controlled vendor actuating and change-making apparatus as claimed in claim 1, in which the switches associated with the single coin chutes constitute the coin-detaining means, said switches being pivotally mounted to swing as a whole, a solenoid having an armature connected to said switches, said armature being spring-biased to hold said switches in coin-detaining position, said switches each having a blade-carried contact moved into switch closing position by the weight of a coin in the chute, a release switch actuated by said vendor operating member in circuits with the solenoids of said single coin chute switches for energizing said solenoids upon actuation of said vendor operating member to swing said switches to coin-releasing position, thereby opening said switches, said circuit being broken by the opening of said release switch upon the return of the vendor operating member to its normal inactive position, thereby permitting return of the single coin chute switches to normal open coin-detaining position.

4. Coin-controlled vendor actuating and change-making apparatus responding to the insertion of a plurality of coins of aggregate value equal to or exceeding the price of the vended commodity and in which the change delivered is equal to the value of the inserted coins less the price of the commodity, a cabinet, coin slots at the top of said cabinet sized for different denominations of coin, coin tubes in coin receptive position with respect to such slots receiving coins of denominations which figure in the change pay-off, a money compartment in the lower part of said cabinet in position to directly receive coins of denominations which are not involved in the change pay-off, also the overflow coins from the coin tubes at least one of said coin tubes having a slot in its lower portion, and a switch having an element biased to extend through said slot into said coin tube, but excluded from said tube by the presence of coins therein, said switch being closed when said element is so extended, a slot occluding member for slots receiving coins of denominations involved in the change pay-off, a solenoid for operating said member, in circuit with said switch for blocking said slots upon depletion of change pay-off coins in said coin tube.

5. Coin-controlled vendor actuating and change-making apparatus responding to the insertion of a plurality of coins of aggregate value equal to or exceeding the price of the vended commodity and in which the change delivered is equal to the value of the inserted coins less the price of the commodity, and in which a number of combinations of inserted coins are eligible including single coins of different denominations each greater than the price of the commodity, and one or more groups of coins, the coins of a group being of the same denomination, said apparatus having a coin slot for each denomination of coin present in the several combinations sized for the several denominations, coin tubes in coin receptive relation to each of the slots which are sized for denominations figuring in the change pay-off, and in the case where the denomination is such that the unit of pay-off may be alternatively one or a plurality of coins of that denomination, a plurality of coin tubes in receptive relation to that slot, one filled by overflow from the other, change pay-off slides beneath each coin tube having coin holes registering with said coin tubes and of the thickness of the change pay-off unit from the respective tubes, means actuated by the insertion of a coin or coins of value exceeding the price of the vended commodity for actuating one or more of said slides to displace the latter to transfer the proper pay-off unit or units to a discharge point, a change receptacle into which the change pay-off coins are delivered, a vendor operating element actuated responsive to the movement of a change pay-off slide, and a money receiver receiving coins from slots having no coin tubes and overflow coins from said coin tubes.

6. Coin-controlled vendor actuating and change-making apparatus responding to the insertion of a plurality of coins of aggregate value equal to or exceeding the price of the vended commodity and in which the change delivered is equal to the value of the inserted coins less the price of the commodity, and in which a number of combinations of inserted coins are eligible including single coins of different denominations each greater than the price of the commodity, and one or more groups of coins, the coins of a group being of the same denomination, said apparatus having a coin slot for each denomination of coin present in the several combinations, coin chute units for each slot, said units being of different types, one type for the slots receiving a plurality of coins of the same denomination, the other for the slots which receive a single coin, each plural coin unit comprising a chute allowing continuous through passage of the coins, a switch in the path of the coins operated independently by each coin in passage, and a multi-contact relay switch comprising a frame, a series of contacts on said frame adapted to be connected into circuits effecting the vending and change pay-off functions of the apparatus, a shaft, a ratchet wheel on said shaft, a spring for rotating said shaft in one direction, an escapement meshing with said ratchet wheel to impart a step by step rotation to said shaft under the urge of said spring, a solenoid in circuit with the corresponding chute switch for operating said escapement, a switch arm on said shaft making step by step engagement with the contacts of said series, and a solenoid operated arm on said shaft for restoring said switch arm to zero position with respect to said series of contacts.

7. Coin-controlled vendor actuating and change-making apparatus responding to the insertion of a plurality of coins of aggregate value equal to or exceeding the price of the vended commodity and in which the change delivered is equal to the value of the inserted coins less the price of the commodity, and in which a number of combinations of inserted coins are eligible including single coins of different denominations each greater than the price of the commodity, and one or more groups of coins, the coins of a group being of the same denomination, said apparatus having a coin slot for each denomination of coin present in the several combinations, coin chute units one for each slot, said units being of different types, one type for the slots receiving a plurality of coins of the same denomination, the other for the slots which receive a single coin, each plural coin unit comprising a chute allowing continuous through passage of the coins, a switch in the path of the coins operated independently by each coin in passage, and a multi-contact relay switch, each multi-contact switch comprising a frame, a series of contacts carried by said frame adapted to be connected into circuits effecting the vending and change pay-off functions of the apparatus, a shaft, a ratchet wheel on said shaft, a spring for rotating said shaft in one direction, an escapement meshing with said ratchet wheel to impart a step by step rotation of said shaft under the urge of said spring, a solenoid in circuit with the corresponding chute switch for operating said escapement, a switch arm on said shaft making step by step engagement with the contacts of said series, change pay-off means actuated by a circuit established through engagement of said switch arm with a contact of said series, a vendor operating member actuated coin-selectively by said pay-off means or directly through said multi-contact relay switch, a release arm on said shaft, a release solenoid for actuating said release arm for restoring said switch arm to zero position with respect to said series of contacts, and a release circuit including said release solenoid and a normally open switch engaged by said vendor operating mechanism when actuated.

8. Coin-controlled vendor actuating and change-making apparatus responding to the insertion of a plurality of coins of aggregate value to or exceeding the price of the vended commodity and in which the change delivered is equal to the value of the inserted coins less the price of the commodity, and in which a number of combinations of inserted coins are eligible including single coins of different denominations and a plurality of coins of a single denomination, said machine having a coin slot for each denomination of coin present in the several combinations, coin chute units one for each slot, each unit including a coin chute in coin receiving relation to its slot, said units being of different type, one type for the single coin slots, the other, for the coin slots which receive a plurality of coins of the same denomination, each plural coin chute allowing continuous through passage of the coins, a switch for said chute operated independently by each coin in passage, a multi-contact relay switch having an arm engageable successively step by step with each of a series of contacts, one step for each actuation of said chute switch, a solenoid actuated vendor operating member in a circuit closed when the arm of the relay switch engages that contact reached responsive to the insertion of the final coin of like denomination into said plural coin chute,

each single coin unit comprising a chute in which the coin is detained, and an associated switch closed by said coin during its period of detention, a vendor operating member, with actuating solenoid therefor, said solenoid being in circuits closed responsive to the coin actuation of the respective chute switches, change pay-off coin tubes in coin receptive relation to certain coin chutes, solenoid actuated change pay-offs operatively associated with the respective coin tubes, whose solenoids are in circuit with the respective chute switches, said vendor operating member being directly operated by the switch or switches of the chute or chutes receiving the exact price of the commodity, there being a gap in each vendor operating member solenoid circuit associated with the chute switches controlling pay-offs, closed by the change paying movements of the respective pay-offs.

9. Coin-controlled vendor actuating and change-making apparatus comprising a change pay-off device including an operating solenoid therefor, a coin actuated switch in circuit with said solenoid, a vendor operating member including an operating solenoid, a switch in circuit with said last named solenoid and operated by said pay-off device, when actuated, for energizing said last named solenoid thereby actuating said vendor operating member.

10. Coin-controlled change-making apparatus responding to the insertion of a plurality of coins of different denomination in which a number of combinations of inserted coins are eligible, including single coins of different denominations and/or a plurality of coins of a single denomination, said apparatus having a coin slot for each denomination, coin chute units one for each slot, said units being of different type, one type for such slots as receive a plurality of coins of the same denomination, the other for such slots as receive a single coin, each plural coin unit comprising a chute allowing continuous through passage of the coins, a switch in the path of the coins operated independently by each coin in passage, and a multi-contact relay switch, each multi-contact switch comprising a series of contacts, a switch arm movable step by step into successive engagement with said contacts, an operating solenoid for each switch arm in circuit with the corresponding chute switch for advancing the switch arm a one-contact step for each closing of said switch, a release solenoid operatively connected to said arm for restoring it to zero position, said single coin units each comprising a chute associated with a respective single coin slot and a pivoted switch in said chute normally positioned to detain a coin in said chute until said switch is moved out of the path of said coin, said switch having a movable blade yielding under weight of a coin for closing said switch, a solenoid having an armature operatively connected to said switch to draw them into coin release position when energized, a spring for biasing said armature to move said switches into coin detaining position, coin tubes in coin receptive position with respect to those chutes whose denominations figure in the change, pay-off slides associated with said coin tubes, a solenoid for each pay-off slide moving it into change delivering position when energized, said solenoids being in circuit with said pivoted switches, a lever, an operating solenoid therefor, said solenoid being in parallel circuits with said multi-contact switch and with switches closed by the movements of said pay-off slides, a circuit including the release

solenoid of said multi-contact switch, the solenoids of said pivoted switches, and the solenoids of said pay-off slides, and a switch closed by said lever when its operating solenoid is energized, and means biasing said lever to permit said last named switch to open when the operating solenoid of said lever is de-energized, restoring said multi-contact switch to zero position, permitting said pivoted switches to return to coin-detaining position, and permitting said pay-off slides to return to their positions of repose beneath said coin tubes.

11. Coin-controlled change-making apparatus comprising a cabinet having a plurality of slots sized to receive coins of different denominations, coin collecting change pay-off tubes in coin receiving position with respect to slots of denominations which figure in the pay-off, the lower portions of said coin tubes being provided with slots, an oscillatable lever for each slot having a portion biased to extend through said slot when the coin tube is empty, but being displaced from

said slot by the presence of coins therein, a plate mounted beneath the slots in said cabinet movable in opposite directions, respectively to obstruct certain of said slots when the coins in one of said coin tubes are depleted, and to reopen said slots when coins in said tube are replenished, alternately energizable solenoids having armatures connected to said plate for moving it in opposite directions, switches on opposite sides of that end of said lever opposite to the portion which intrudes within the slot in said coin tube, said switches being in circuit with the respective solenoids and an electric source, and being alternately closed by the oscillation of said lever to alternately energize said solenoids, and a switch in the circuit of each solenoid opened by the movement of the armature of said solenoid upon the energization of said solenoid, one of said last named switches being open while the other is closed.

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