April 14, 1936. R. D. COLLINS ET AL 2,037,157

PAY TELEPHONE STATION

Original Filed Nov. 30, 1931 6 Sheets-Sheet 1

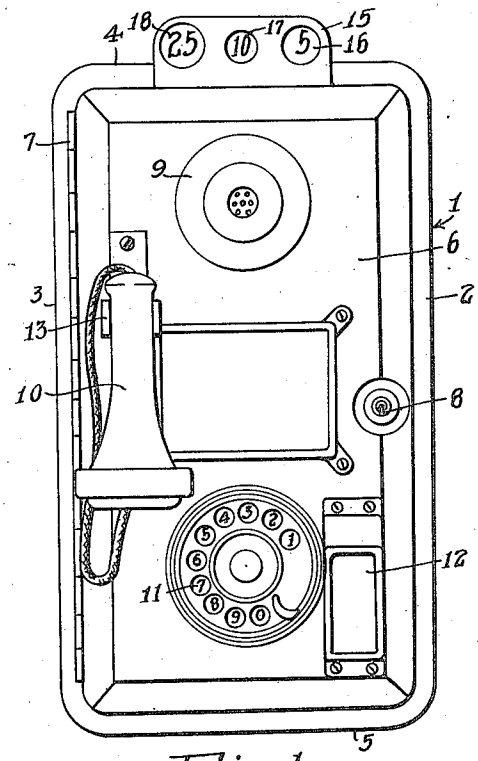

Fig. 1

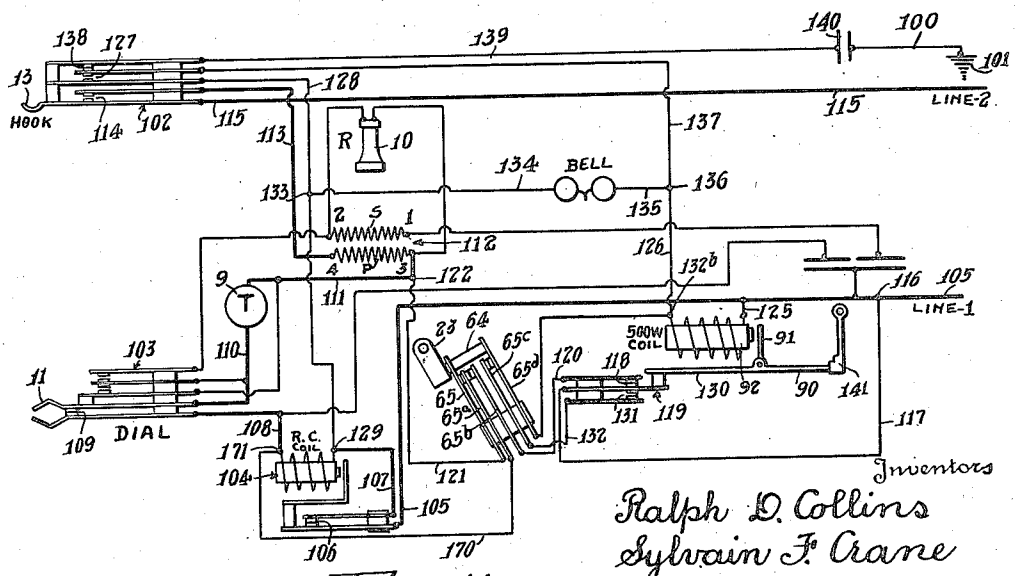

Fig. 11

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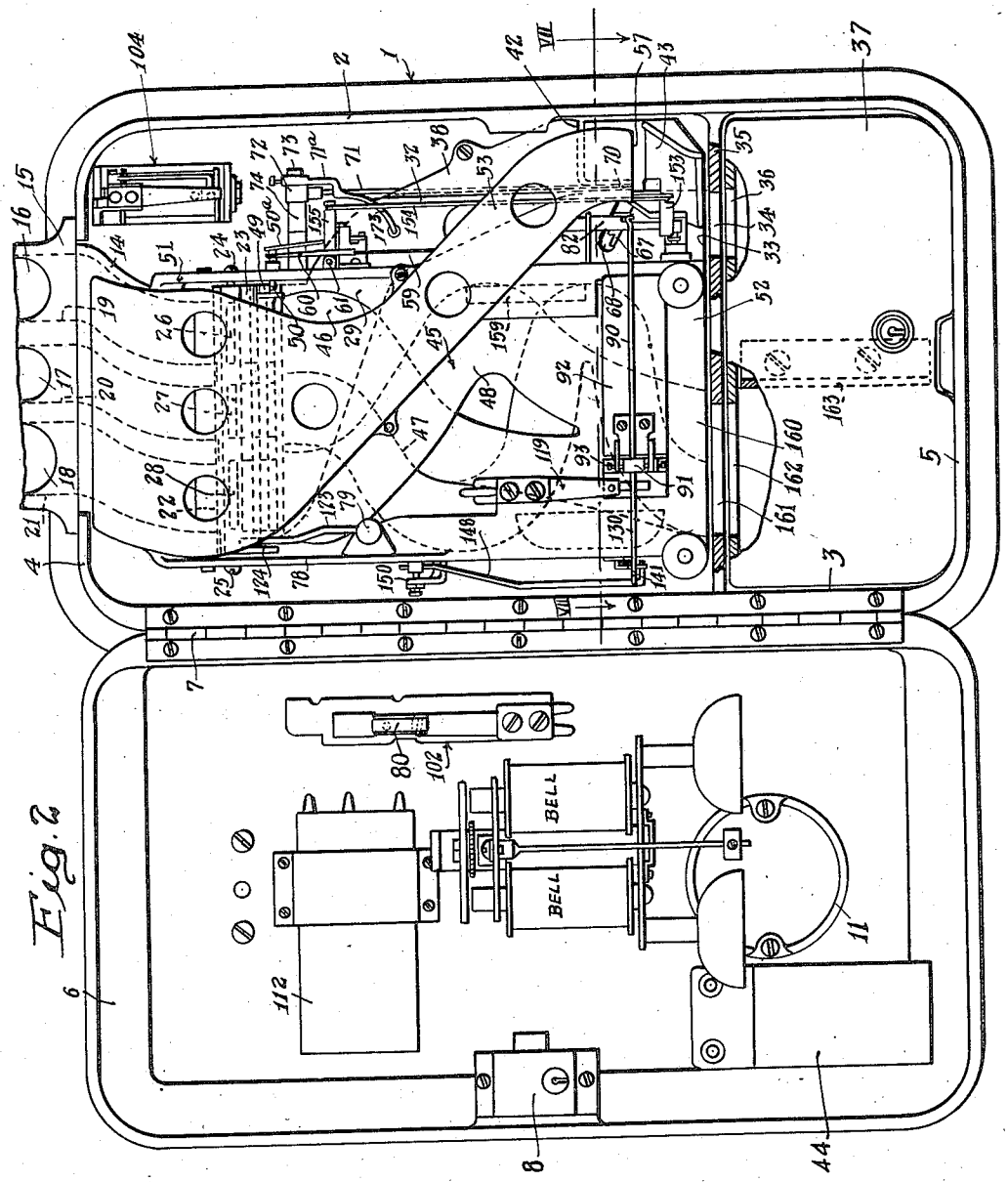

Fig. 2

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PAY TELEPHONE STATION

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Fig. 3

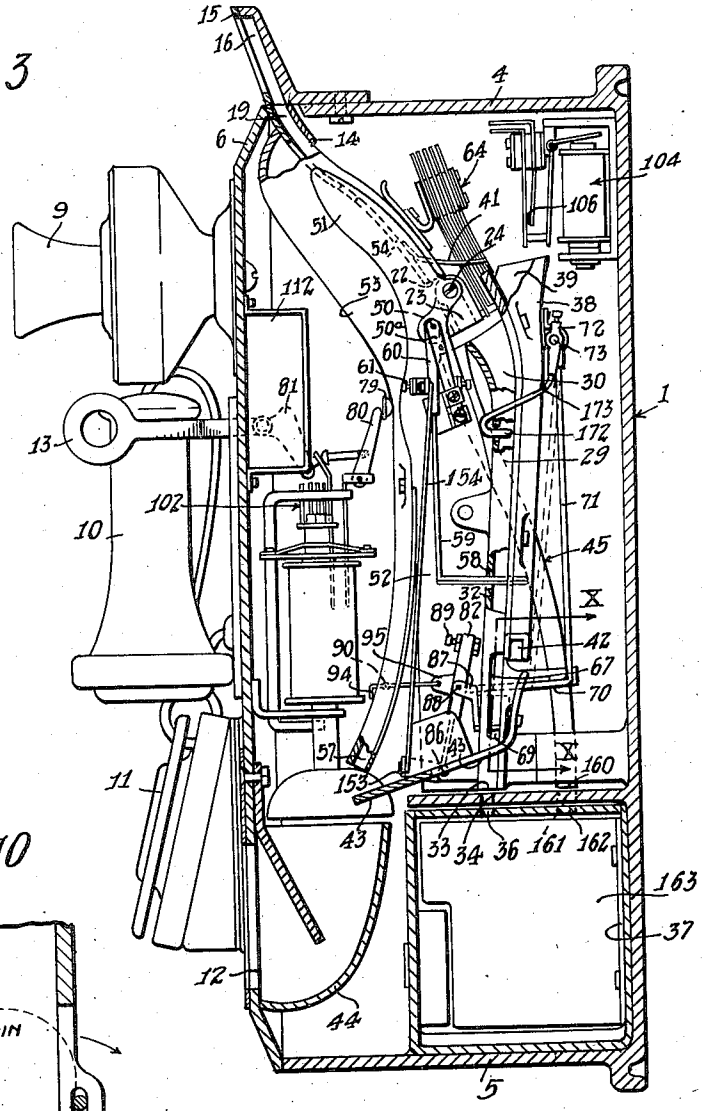
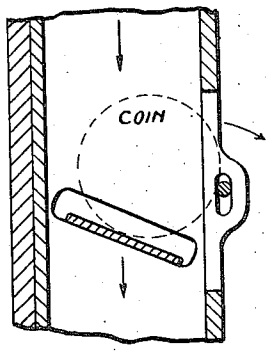


Fig. 10



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PAY TELEPHONE STATION

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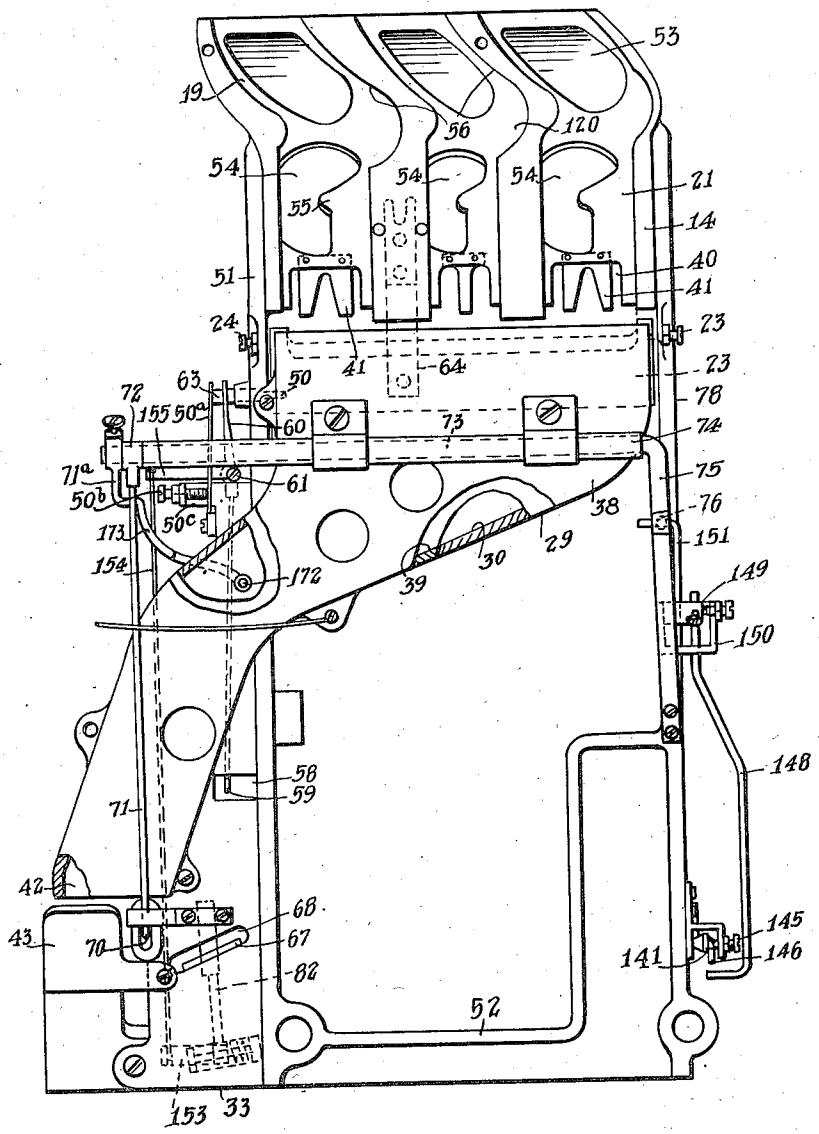
Fig. 4



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PAY TELEPHONE STATION

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Fig. 5

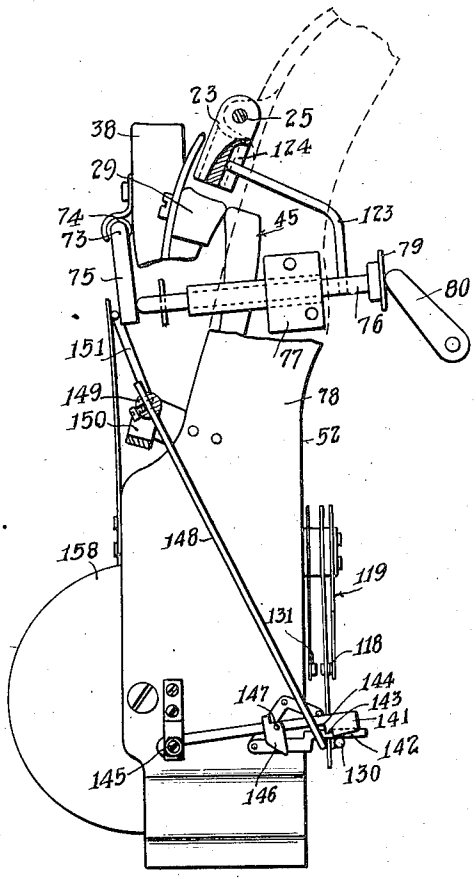

Fig. 6

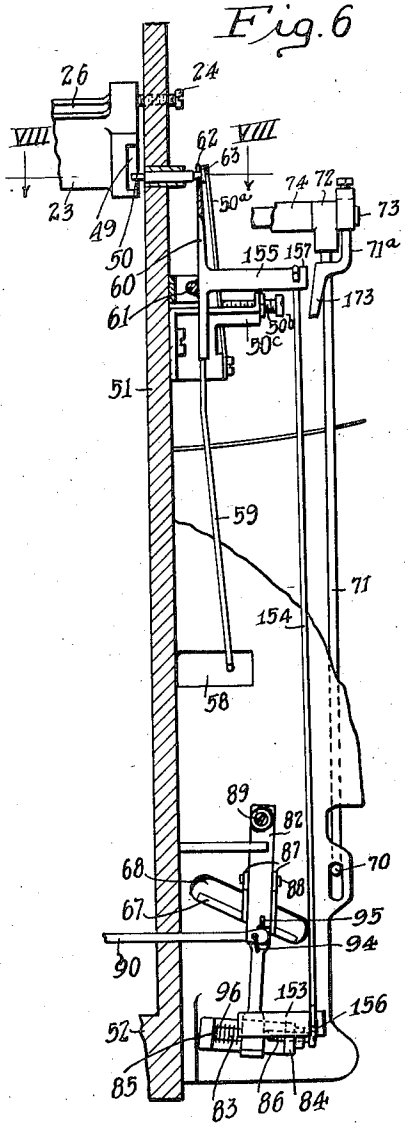

Fig. 8

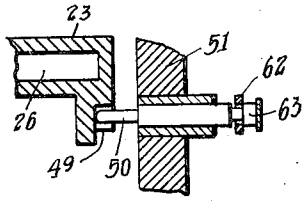

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Fig. 7

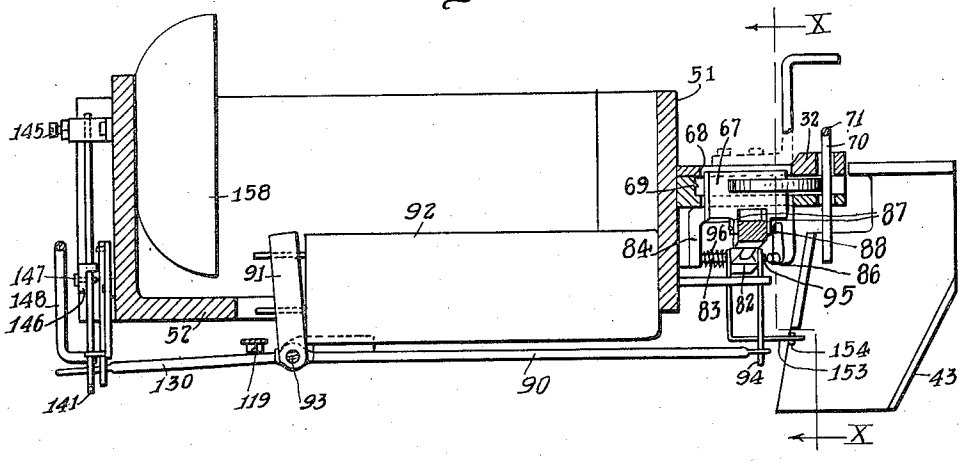
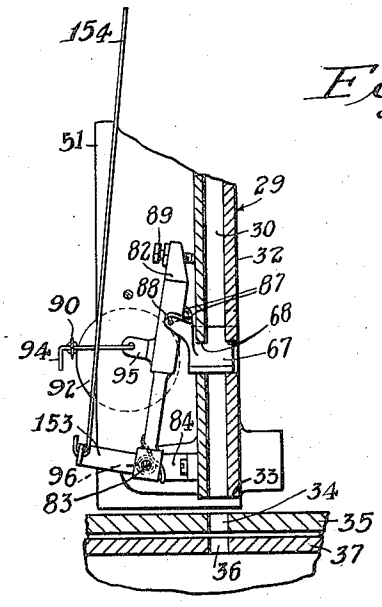


Fig. 9



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Patented Apr. 14, 1936 2,037,157

UNITED STATES PATENT OFFICE

2,037,157

PAY TELEPHONE STATION

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Original application November 30, 1931, Serial No. 578,060. Divided and this application August 18, 1934, Serial No. 740,466

8 Claims. (Cl. 179—6.3)

Our invention relates to pay telephone stations and has particular reference to a pay telephone station adapted for the automatic station-selecting telephones. In connection with pay station telephones, several problems are presented in connection with the automatic station-selecting telephones which are not presented in the systems using manual station-selecting systems, in which a telephone exchange operator selects the called station and has control over the calling station to either collect or refund the coin, depending upon whether or not the call is completed.

For example, the dial selecting or automatic station-selecting phones must be rendered operative by the initial coin to permit the dialing or selecting of the desired called station, and must be adapted to return the coin in the event that the station called is busy or fails to answer, while, at the same time, the station must be adapted to collect the coin in the event of completion of the call.

On the other hand, such stations must be adapted to permit conversation upon an incoming call, that is, when another station on the system is calling the pay station. Thus, the telephone station must be adapted to receive incoming calls without the necessity of depositing a coin therein, while it must be adapted to prevent outgoing calls without the deposit of the coin.

Automatic station selective systems adapted to accomplish the results set forth in the preceding paragraph, have been devised; for example, systems such as are shown and described in our copending applications Serial Numbers 512,620 and 554,190.

This application is a division of our copending application Serial No. 578,060, filed November 30, 1931.

However, in the present system, it is frequently possible for the calling party to strike a sharp blow on the housing of the telephone station and thereby release the coin to permit it to be refunded, even though the called station has been effectively connected.

It is an object of our invention to provide a pay telephone station in which the outgoing calls may be accomplished only upon the deposit of a coin, but which will permit incoming calls to be effectively connected without the necessity of depositing a coin, and which cannot be actuated by a blow on the housing to refund a coin if the connections are effectively made to talk to a called station.

Another object of our invention is to provide a pay telephone station which is provided with locking means, preventing conversing and/or dialing, in the case of outgoing calls, but which will permit conversing in the event of an incoming call, by means of a device which operates only responsive to the combined ringing of the station and the act or acts of answering the ring.

Another object of our invention is to provide a pay telephone station in which outgoing calls may be effectively made upon the deposit of a minimum charge denomination coin, but which also may be made by the deposit of other coins of greater denomination.

Another object of the invention is to provide a pay telephone station in which communication with a long distance exchange, information, or other telephone system service or business office, may be accomplished by the deposit of any one of a number of different denomination coins; thus making it unnecessary for the calling party to have the exact minimum charge denomination coin in order to put through calls of this character.

Another object of the invention is to provide means for holding such initially deposited coins in abeyance in the station, ready to be refunded upon the completion of such nonchargeable calls.

Another object of our invention is to provide a pay telephone station in which spurious coins, either undersized or underweight coins, will be segregated from correct weight or size coins, and which will prevent effective operation of the station by such spurious coins.

Other objects of our invention will be apparent from a study of the following specifications, read in connection with the accompanying drawings, wherein

Fig. 1 is a front elevational view of a pay telephone station constructed in accordance with our invention;

Fig. 2 is a front elevational view of a telephone station illustrated in Fig. 1, showing the cover open and exposing the coin collecting and refunding apparatus;

Fig. 3 is a vertical sectional view taken along the line III—III of Fig. 1, illustrating the coin collecting and refunding apparatus associated with the talking and listening and dialing apparatus;

Fig. 4 is a detail rear elevational view of the coin collecting and refunding apparatus shown in Fig. 2;

Fig. 5 is a detail side elevational view of a portion of the coin collecting apparatus illustrating

the operation of portions of the device by the receiver hook;

Fig. 6 is a fragmentary elevational view of a portion of the coin collecting and refunding devices, illustrating the basket tripping apparatus and the coin holding and releasing device;

Fig. 7 is a detail horizontal sectional view taken along line VII—VII, Fig. 2, showing the magnet and coin collection device in assembled relation;

Fig. 8 is a detail sectional view taken along line VIII—VIII of Fig. 6, illustrating the basket tripping device;

Fig. 9 is a fragmentary sectional view taken along line IX—IX of Fig. 7;

Fig. 10 is a fragmentary sectional view taken along line X—X of Fig. 3; and

Fig. 11 is a diagrammatic view showing the wiring employed in connecting our pay telephone station to the supply lines from a central station.

Referring to the drawings, we have illustrated in Fig. 1 a pay telephone station comprising a box-like housing 1 having side walls 2 and 3, a top wall 4, a bottom wall 5, and having a cover 6 hingedly secured to the side wall 3, as by means of a hinge 7. A lock 8 is preferably provided for maintaining the cover in closed position when the pay telephone station is installed. The telephone station includes a transmitter 9, a receiver 10, and a dial selecting device 11, all of which apparatus is preferably mounted upon the cover 6 of the housing 1 so as to permit all of this apparatus to swing out of the way when the door or cover 6 is opened. A coin return slot or opening 12 is provided through the front cover 6 for the purpose of permitting a person using the telephone to remove coins which are refunded by reason of failure to obtain the service for which coins may be deposited.

It will be observed that the receiver 10 is normally supported upon a receiver hook 13 which, like the transmitter dial selector, etc., is mounted for pivotal movement upon the front cover 6 of the housing 1.

By referring particularly to Figs. 2 and 3, it will be observed that a coin collecting and refunding mechanism is provided upon the interior of the housing 1, such mechanism including a coin guide 14 terminating at its upper end in a coin gauge 15 constituting a plurality of circular entrance openings 16, 17, and 18, each of which is designed to accurately fit the particular denomination coin to be inserted therein.

For example, the circular opening 16 is preferably of such diameter as will just admit a minimum denomination coin, such as a nickel, while the opening 17 fits a larger denomination coin, such as a dime, and the opening 18 fits a still larger denomination coin, such as a quarter. The coin guide 14 is provided with a slot leading from each of the circular openings 16, 17, and 18, these slots being designated by the reference characters 19 (associated with the nickel gauge 16), slot 20, (associated with the dime gauge 17), and a slot 21 (associated with the quarter gauge 18). The coin guide 14 terminates at a point 22 immediately above a transfer basket 23 mounted upon transverse trunnions 24 and 25 so as to have a slight forward and rearward motion above its pivot. The basket 23 is illustrated as being provided with a plurality of slots 26, 27, and 28, the upper ends of which are aligned, respectively, with the lower end of the nickel slot 19, the dime slot 20 and the quarter slot 21 in the coin guide 14 so that any coins which are deposited in the coin gauges 16, 17 and 18 will pass downwardly through the coin guide and into the respective slots of the basket 23.

Immediately below the transfer basket 23, we have illustrated an initial-call coin slot 29 which, as is more clearly illustrated in Fig. 4, extends entirely across the rear of the coin guide 14 and has a single slot 30 therein coextensive with all of the slots 26, 27, and 28 and therefore is adapted to receive coins from any one of these slots in the basket 23.

The initial call coin slot 29 is illustrated as extending downwardly and laterally with respect to the coin guide 14 to lead any coins deposited therein to the right-hand side of the housing 1 to a vertically extending coin chute 32 which terminates at 33 immediately above a slot 34 formed in a forwardly extending partition 35, which slot is in turn aligned with a similar slot 36 constituting an entrance passage into a coin receptacle or box 37 secured to the interior of the housing 1 in any suitable manner.

Immediately to the rear of the initial-call coin slot 29 we have illustrated a spurious coin chute 38 which, like the coin slot 29, has an opening 39 therethrough coextensive with the slots 19, 20, and 21 and is adapted to receive any light weight coin which may be deposited in these slots as by cutting away a portion of the coin guide 14 immediately to the rear of these slots, as is indicated in Fig. 4 at 40 and securing a relatively thin spring structure 41 to the forward side of the slots (19, 20 or 21), capable of exerting sufficient force to overcome the weight of a coin of any lesser weight than the proper coin for which the slot is adapted. For example, the spring structure 41, associated with the quarter slot 21, should be designed to be readily flexed by a coin having the weight of a substantially thin quarter, but should not be flexed by any coin or other article which is deposited in the slot having a lighter weight. Thus any coin of lighter weight would be directed by the spring to the rear of the basket 23 and thence into the opening 39 in the spurious or light weight coin slot 38.

By referring particularly to Fig. 4, it will be observed that the slot 39 extends downwardly and laterally of the housing 1 to terminate in an opening 42 immediately above a refund chute 43 which constitutes a slideway extending forwardly of the housing 1 into a position immediately above a refund box 44 secured to and forming a part of the front cover 6 of the telephone station. Thus light weight coins will be segregated from the coin collection devices and be immediately returned to the user without entering the coin collection mechanism and thereby preventing the effective operation of the telephone station by such light weight coins.

Since our telephone station is designed to be employed for either local calls or long distance calls, it is essential that the coin collection mechanism shall be adapted to receive deposits of toll for long distance coins, and for this reason we have illustrated the usual coin maze 45 ordinarily employed in pay telephone stations, such coin maze being well known in the art as comprising a nickel coin chute 46, a dime coin chute 47, and a quarter coin chute 48 each of which chutes extends, respectively, from immediately below the slot in the coin guide associated with the respective denomination coin. That is, the nickel chute 46 is disposed immediately below the nickel slot 19, the dime chute 47 is disposed immediately below the dime chute 20 and the quarter

chute 48 is disposed immediately below the quarter slot 21.

However, by referring to Fig. 3, it will be observed that the upper ends of each of the chutes 46, 47 and 48 is disposed slightly to the front of the transfer basket 23 so that coins which are deposited in the chutes 19, 20, and 21 cannot enter the coin maze 45 unless the transfer basket 23 is in its forward position instead of the rearward position, as is illustrated in Fig. 3.

By referring particularly to Figs. 2 and 8, it will be observed that the right-hand end of the transfer basket 23 is provided with a transverse depression 49 therein for the purpose of engaging a pin 50 which is slidably mounted in the vertical strut 51 forming one side of a suitable supporting frame 52, by which all of the coin collection and refunding devices are mounted within the housing 1.

By referring particularly to Fig. 8, it will be observed that the normal position of the pin 50 is such as to engage the forward side of the depression 49 and thus hold the basket 23 in the rearward position, such as is illustrated in Fig. 3, but may be withdrawn to permit the basket 23 to descend by gravity to its forward position with its slots aligned with the long distance coin collection maze 45. Thus it will be observed that the normal position of the transfer basket 23 is such as to direct all proper denomination coins deposited in any of the slots 19, 20, and 21 into the initial coin call chute, while the transfer basket may be actuated as hereinafter described to its forward position to permit any coins which are deposited in the slots 19, 20, and 21 to pass into such long distance collection maze.

Referring again to Fig. 3, it will be observed that a still further coin chute 53 is provided mounted in front of the coin guide 14. This coin chute is adapted to refund undersized coins or spurious coins which may be deposited in the slots 19, 20, and 21.

By referring to Fig. 4, it will be observed that the front wall of each of the chutes 19, 20, and 21 is provided with an arcuate opening 54 which extends through a considerable portion of the width of the slot with which it is associated. However, the lower portion of the opening 54 extends but slightly beyond the center line of the slot and a projection 55 is left extending transversely of the slot so as to engage beyond the center of any proper denomination coin and guide the same past the opening 54. However, an undersized coin, that is, one of smaller denomination than the correct coin for the slot, will, by reason of the twist 56 placed in the slot 19, be directed to the opposite side of the slot from which the projection 55 extends, and thus the projection 55 will not engage such coin beyond its center point and the coin will fall out of the slot 19. In like manner, slugs or tokens having a central opening therethrough will not be supported by the projection 55 but will fall outwardly from the opening 54 and thus pass into the spurious coin chute 53.

The coin chute 53 terminates at 57 immediately above the refund box or receptacle 44, so that spurious coins which are undersized will be returned immediately to the user without entering the coin collection devices and thus prevent effective operation of the telephone station by such spurious coins.

Referring again to Figs. 2, 3, and 4, it will be observed that the initial-call coin slot has an opening 58 extending through both the front and rear walls of the slot into which projects one end of a rod or wire 59 constituting one arm of a lever 60 pivoted to the strut 51 of the frame 52, as is indicated at 61. The lever 60 extends beyond the pivot and is bifurcated at 62 to engage a head 63 formed upon the pin 50, so that a coin passing through the call-coin slot 32 will engage the rod or wire 59 and move the pin 50 outwardly with respect to the basket 23, thus releasing the basket to permit it to move to its forward position. This operation insures that the initial-call coin which is deposited will pass into the initial-call coin chute or slot, while further coins which may be deposited will be directed into the long distance collection maze 45. The pin 50 may be biased inwardly by a spring 50*a* adjustable by means of a set screw 50*b* secured to a bracket 50*c* mounted upon the frame 52.

It will be observed that a switch 64 is mounted upon the rear of the coin guide 14 in such position that the switch arms or contacts 65 and 65*a* of this switch are normally held in contacting position by the engagement of the rear surface of the basket 23 with the switch 64 when the basket is in its rearward position. This position of the basket will also hold contacts 65*a* and 65*b* in contacting position while contacts 65*c* and 65*d* will be held in open circuit position ready to close when the basket 23 moves forward. The function of the contacts will be further described hereinafter. As will be hereinafter described, the switch 64 is connected in the circuit of the talking or dialing mechanism so as to prevent effective calling from the pay station until a coin has been deposited to secure the opening of the switch 64. After a coin has passed the rod or wire 59 it continues to descend through the initial-coin collection chute 30 to come to rest upon a coin holder 67 which comprises a substantially shelf-like plate of metal extending transversely through a slot 68 penetrating both the front and rear walls of the chute or slot 30. Thus the initially deposited coin prepares the station for calling another station, the long distance operator, or any other local call condition.

By referring particularly to Fig. 3, it will be observed that the initial-call coin chute 30 is provided with an opening 69 in its side wall to permit egress of coins from above the shelf-like coin holder 67 and permit them to pass to the refund chute 43 and thence to the refund receptacle 44. The slot or opening 69 is normally bifurcated by means of a pin 70 constituting the end of a rod or bar 71 which is rotatably mounted at its upper end 72 to a bar 73 pivotally mounted in a suitable bearing, such as a tube 74, for rotation about a horizontal axis at the rear of the collection mechanism. The rod 71 is connected for movement with the bar 73 by means of a dog 71*a*. The opposite end 75 of the bar 73 is illustrated as being bent downwardly into a position to engage the inner end of a rod 76, (see Fig. 5), which is mounted for horizontal reciprocation in a bearing 77 attached to the strut 78 forming the left-hand side of the frame 52.

It will be observed that the forward end of the rod 76 terminates in a button 79 adapted to be engaged by a lever 80 pivotally secured to the front cover 6 of the station and arranged to be actuated by the inner end 81 of the receiver hook 13. Thus, whenever the receiver 10 is on its hook 13, the lever 80 will be pressed inwardly to press the rod 76 rearwardly and cause the bar 73 to be moved to its rearward position, thus removing the pin 70 from its obstructing position in front of the

refund opening 69 of the initial call coin chute. However, whenever the receiver is lifted from its hook 13, as is the ordinary procedure when a person is attempting to make a call from the station, the lever 80 will be permitted to move forwardly which will result in the movement of the bar 73 to its forward position and cause the exertion of the pin 70 into obstructing position in front of the refund opening. Thus the initially deposited coin will be held in abeyance by the combined efforts of the coin holder and the pin 70 until the call is completed, or the receiver is returned to the hook upon failure to complete the call. It will be apparent that upon the return of the receiver to the hook, the coin which has been held in the chute 30 will now be permitted to pass through the refund opening 69 and thence to the refund receptacle 44, thus insuring the return of a deposited coin whenever the call cannot be completed for any reason, such as failure of the calling station to respond or the calling station being busy.

It will be observed that the initial coin which is required to obtain the initial call connections, need not necessarily be the minimum local call denomination call coin or nickel, but the station may be effectively operated to obtain a local connection by means of the deposit of any one of the three denomination coins for which the station is adapted. This is particularly desirable in connection with calling long distance operators, since it is not necessary that the exact minimum charge shall be deposited, but any of the three coins, nickel, dime or quarter, may be employed to obtain the initial connection with the long distance operator.

In order to obtain the proper collection of the coin, in the event that the call is completed, mechanism is provided for withdrawing the shelf-like coin holder 67 to permit the coin to pass downwardly beyond the coin holder and thus pass through the terminal 33 of the chute 30 and into the collection receptacle 37. This mechanism comprises mounting the shelf-like coin holder 67 upon a lever 82, the lower end of which is provided with a bearing 83 pivotally secured to a bracket 84 as by means of inserting one end 85 of a suitable opening in one leg of the bracket and passing a trunnion pin 86 through the other leg of the bracket and into a suitable opening (not shown) in the bearing 83. Thus the lever 82 may be rotated about its pivot to draw the shelf-like coin holder 67 out of obstructing position in the chute 30.

Preferably the coin holder 67 is pivotally secured to the lever 82 as by means of providing a pair of outwardly extending ears 87 upon the coin holder 67 and securing the coin holder to the lever by means of a transverse pin 88 passing through the ears and the lever. If desired, an adjusting screw 89 may be provided upon the upper end of the lever 82 to limit the rearward movement of the lever and thus limit the inward movement of the coin holder 67.

The lever 82 is arranged to be moved above its pivot by means of a rod 90 secured to and operated by the armature 91 of a relay 92.

By referring particularly to Fig. 7, it will be observed that the relay 92 constitutes an elongated coil of relatively small diameter secured in any suitable manner within the frame 52 and preferably having its longitudinal axis extending transversely across the front of the frame 52. The armature 91 is illustrated as being pivoted at 93 so that energization of the coil of the relay 92 will draw the armature 91 toward the coil while at the same time the lever 90 will be moved outwardly. The end of the rod 90 is illustrated as being connected by means of a link 94 to a forwardly extending ear 95 formed upon the lever 82 so that outward movement of the rod 90 will cause a forward movement of the lever 82 and thus withdraw the coin holder 67. If desired, a spring 96 may be provided around the bearing 83 to normally bias the lever 81 to its rearward or inner position to thus insure that the coin holder 67 will normally be in position to engage coins passing through the slot 30.

As hereinafter described, the relay 92 is arranged to be operated as the result of the transmission of reverse current over the line to which our pay telephone may be connected when the called station responds to the call. Thus whenever a call is completed, the relay 92 is operated to withdraw the coin holder 67 and insure collection of the coin. Moreover, the time at which it will be collected is at the instant the called station responds, so that there will be no opportunity for a person to converse over our pay station and then recollect the coin at the end of the call.

The remainder of the apparatus disclosed will best be understood with reference to a series of assumed operation of our pay telephone station:

Assuming that a person desires to make a local telephone call from our station, such person may lift the telephone receiver 10 from its hook 13. However, at this time the talking or dialing apparatus of the telephone is preferably out of operative condition to prevent effective calling or talking over the telephone until a coin has been deposited. This may be accomplished by interconnecting circuits of the telephone pay station, as is indicated in Fig. 11, wherein a pair of line conductors line—1 and line—2 are represented as being the two line conductors extending from the central station to which the telephone may be connected.

A ground connection is also provided for the pay telephone station, as by way of conductor 100, to a ground indicated at 101. A hook switch 102 is illustrated as being of the usual type employed in connection with telephone stations to be actuated from a normal position, such as that illustrated in Fig. 11, when the receiver is on the hook, to its opposite position when the receiver is removed therefrom. A dial switch 103 is illustrated as being operated by the dial selecting mechanism 11.

A reverse current relay 104 is provided as comprising the usual type of reverse current relay which will be operated only by current flowing in one direction, thus permitting effective operation of this relay only when an incoming call connection is made, or when a called station responds to the call. Under the assumed combination, the receiver had been lifted from the hook and thus moved the switch 102 from the position illustrated in Fig. 11, thus establishing a circuit extending from line—1 through conductor 105, the contacts 106 of the reverse current relay 104, conductor 107, the coil of reverse current relay 104 to the conductor 108, the contacts 109 of the dial switch 103, (which at this time will be closed since the dial has not as yet been operated), thence through the conductor 110, transmitter 9, conductor 111, the primary coil P of a transformer 112, conductor 113, the contacts 114 of the hook switch 102 (now closed), and then by way of conductor 115 to line—2.

By reason of this connection, the normal dial tone will be emanated from the receiver 10, indi-

cating that the telephone is in condition for operation. However, it will be observed that a shunt circuit is provided which shunts out the transmitter T' and the dial switches 103, preventing effective operation of the dial and preventing effective talking over the line until the shunt circuit is opened. This shunt circuit is illustrated as extending from line—1 by way of conductor 105 to a junction point 116 and thence by way of conductor 117 to the normally closed contacts 118 of a switch 119 controlled by the relay 92 employed for collection of coins in the initial call coin chute. Thence the shunt circuit extends by way of conductor 120 to the normally closed contacts 65b and 65 of the basket switch 64, which is arranged to be normally held in closed position whenever the basket 23 is in its rearward position ready to direct coins into the initial call coin collection chute 30. Thence the circuit extends by way of conductor 121 to a junction point 122 on conductor 111. Thus current is effectively prevented from passing through the reverse current relay 104, the dial switch 103 and the transmitter 9 until a coin is deposited.

Assuming that the person desiring to make the local call now deposits a coin in one of the coin gauges 16, 17 or 18, such coin will pass down through the coin slot 19, 20 or 21, respectively, and thence into the initial-coin collection chute 29, passing downwardly therein until such coin engages the rod or wire 59 and moves the same laterally in the slot 32 to withdraw the pin 50 and permit the basket 23 to move to its forward position. Movement of the basket 23 opens the contacts 65 and 65b of switch 64, thus removing the shunt which has been holding the dial and transmitter circuits out of effective operation. Hence as soon as a coin is deposited the telephone station may effectively be operated to select the particular called station to which the party desires to talk.

However, during the operation of the dialing mechanism the coin which has been deposited will be held in abeyance upon the coin holder 67 and since the receiver is off its hook, the pin 70 will be in position across the refund opening of the initial-call coin chute 30 and thus the coin will not be permitted to pass either to the collection receptacle 37 or to the refund receptacle 44.

Assuming that the called station fails to respond for any reason, the person using the telephone may hang up the receiver. In doing so the receiver hook 13 will be operated to move the bar 73 to its rearward position, thus removing the pin 70 from the refund opening of the initial-call coin chute and permitting the coin, which has been held in abeyance, to pass out to the refund receptacle 44 where it may be retrieved by the party making the initial call.

By referring particularly to Fig. 5, it will be observed that the rod 76, which is operated by the receiver hook to move the bar or rod 73 to its rearward position, also carries an upwardly and rearwardly extending pin 123 which engages in a slot 124 in the forward side of the basket 23 so that whenever the receiver is returned to the hook 13, the basket will be mechanically moved to its normal rearward position, such as is illustrated in Figures 5 and 3, reclosing the contacts 65 and 66 of the basket switch 65b, thus conditioning the telephone for a subsequent operation by any other person who desires to make a call. Thus, it will be observed that the only way in which a coin can be refunded to the calling party is by operating the receiver hook 13 and the consequence of this operation is to restore the telephone circuits to normal condition, requiring a new deposit of a coin in order to permit further calls to be made.

However, assuming that the called station does respond, such response will be accompanied by the transmission of reverse current over the line line—1, line—2. That is, the current which passes over the line will be in the reverse direction from that which has been previously flowing the line, as is the usual practice in pay telephone station practice at the present time. Such reverse current will cause actuation of the reverse current relay 104 since the circuit for this relay is now effectively a part of the circuit between line—1 and line—2.

Tracing this circuit, the reverse current will flow through line conductor line—2 by way of conductor 115, the now closed contacts 114 of the hook switch 102, conductor 113, the primary P of transformer 112, conductor 111 of transmitter 9, dial switch contacts 109 (now closed since dialing has been completed), conductor 108, relay 104, conductor 107, contacts of reverse current relay 106, and conductor 105 to line conductor line—1. It will be remembered that at this time the basket switch 64 will be in open circuit condition, and thus the shunt across the circuit just described will be open.

Referring particularly to Fig. 11, it will be observed that the coil 92 is normally connected in shunt circuit relation with the contacts 106 of reverse current relay 104; that is, the circuit for the relay 92 extends from conductor 105 by way of conductor 125 to coil 92, conductor 126, contacts 127 of hook switch 102, (now closed since the receiver is off the hook), conductor 128 to junction point 129 on conductor 107, and thence by way of conductor 107, contacts 106 of reverse current relay 104 and conductor 105 to line conductor line—1. Thus until contacts 106 of the reverse current relay 104 are opened, no current can flow through the coil 92. However, as soon as reverse current flows over the line and reverse current relay 104 is thus operated to open its contacts 106, current will be supplied to the coil of relay 92 to cause this relay to actuate its armature 91.

The effect of the operation of the armature 91 is to move the rod 90 forwardly to thus draw the lever 82 forwardly, removing the coin holder 67 from its obstructing position in the initial-call collection chute 32 and thus permit the coin which has been held upon the shelf or holder to pass downwardly through the openings 34 and 36 into the coin collection receptacle 37.

Thus it will be observed that as soon as the called station responds, the coin required for such call is collected immediately.

It will also be observed that the actuation of the lever 82 to withdraw the coin holder 67 will, by reason of the pivotal connection of the coin holder with the lever, draw the coin holder directly through a straight path, thus the only resistance to the withdrawal of the coin holder is that friction which is created by the weight of the coin bearing the coin holder 67 against the bottom of the slot in which it operates. Moreover, by reason of the pivotal connection of the coin holder 67 any rebound or jarring which may occur as a result of the coin dropping upon the holder, will be absorbed by the coin holder and will not be directly transmitted to the lever 82, thus effectively preventing a false return of the

lever 82 to collect the coin until the lever 82 is actuated by the operation of relay 92.

Again referring to Fig. 11, it will be observed that as soon as the coil 92 operates to move its armature 91 an extension 130 on the armature will engage the switch 119 mounted upon the frame 52 (see Fig. 2), to cause the opening of contacts 118 and the closing of contacts 131 of this switch. The closing of contacts 131 will complete a shunt circuit around the coil 92 to remove the resistance of this coil from the talking and listening circuits, thereby increasing the amount of current which is permitted to flow in the talking and listening circuits. This shunt circuit is illustrated as extending from line conductor line—1 by way of conductor 105 to junction point 116 and thence by way of conductor 117, contacts 131 of switch 119, conductor 132, junction point 132b which constitutes the other terminal of coil 92 and thus provides a metallic path of low resistance around the coil 92. However, it will be noted that a circuit has now been established for the reverse current relay 104 which is independent of contact 106 of this relay, this circuit extending from line—1 through conductor 117 and through the contacts 131 of switch 119, the contacts 65c and 65d of the basket switch to junction point 132b and thence by way of conductor 126, contacts 127 of hook switch 102, and conductor 128 to the coil of relay 104, conductor 108 and thence through the dial and transmitter and primary transformer 112 and contacts 114 of hook switch 102 and conductor 115 to line conductor line—2. However, as soon as the call is completed and the calling party restores the receiver 10 to its hook 13, the operation of the hook switch 102 will open the talking and listening circuits, while at the same time the basket 23 will be moved back to its normal rearward position reclosing the basket switch 64 and thus restoring the circuits to normal and ready for another call.

Next assuming that the party desiring to use the telephone wishes to make a long distance call, the receiver 10 will be lifted from the hook 13, as hereinbefore described, but again it will be necessary for the person to deposit a coin before connection can be had with the long distance operator. The deposit of the initial-call coin in any of the slots 19, 20 or 21, will be followed by the operation of the rod 59 to release the basket 23, as hereinbefore described, while the initially deposited coin will pass into the coin chute 30 to be held in abeyance therein by the coin holder 67 and the pin 70 in exactly the same manner as previously described for making a local call. However, it will be observed that since the basket 23 is released from its rearward position it is now in its forward position aligned with the long distance collection maze 45.

The long distance operator, upon responding, will receive the number of the called station and has a choice of either of two operations; namely, first, she may request the calling party to hang up the receiver and wait until she rings, or, second, she may request him to hold the line until the connection with the called station has been obtained. Assuming that she requires the calling party to restore the receiver to the hook, the pin 70 will be withdrawn, as hereinbefore described, and the initial-call coin will be refunded in exactly the same manner as hereinbefore set forth.

Assuming that the long distance operator obtains the connection with the called station, she may then ring out pay telephone station by sending ringing current over line—1 and ground, as is the usual practice in central station telephone operation. The ringing circuit extends from line conductor line—1, through conductor 105, reverse current relay switch 106, conductor 107 to junction 129, and thence by way of conductor 128 to junction 133, thence by way of conductor 134 to the bell coils indicated by the legend "Bell", conductor 135 to junction 136, thence by way of conductor 137, normally closed contacts 138 of hook switch 102, (now closed since the receiver is on the hook), and thence by way of conductor 139, ringing condenser 140 and conductor 100 to ground at 101.

Since the long distance operator is calling our pay telephone station, it is necessary that the telephone station should be placed in condition for talking without the necessity of a re-deposit of a coin in the initial-call coin collection chute, and for this reason we have provided an auxiliary circuit parallel with the bell circuit to cause the operation of the relay 92. This parallel circuit extends from line conductor line—1 through conductor 105, conductor 125, coil 92, conductor 126 to junction 136 and thence to ground by way of conductor 137, as was previously described for the bell circuit. Hence coil 92 will receive a portion of the ringing current and will actuate its armature 91.

By referring particularly to Figs. 2 and 5, it will be observed that the extension 130 on the armature 91 extends beyond the switch 119 to a position immediately below a lever 141. The lower face of the lever 141 is provided with a stepped recess comprising a normal lower level 142, an intermediate level 143, and an uppermost level 144. The lever 141 is illustrated as being pivoted at 145 to the strut 78 of the frame 52 so as to permit the lever to have a vertical movement. The lever 141 is also illustrated as having a cam 146 pivoted thereto at 147 to engage a rod or wire 148 rigidly secured to a shaft 149 which is in turn pivoted in a bracket 150 secured to a strut 78. A second rod 151, also rigidly connected to the shaft 149, extends upwardly to a position immediately in the rear of the downturned end 75 of the rod or bar 73. Hence whenever the telephone receiver is on its hook the lever 80 will press the rod or bar 73 to its rearward position and by reason of the engagement of the rod 151 therewith, the rod 148 will be pressed outwardly to a position limiting the inward movement of the extension 130 on the armature 91.

It will be observed, however, that the limit of movement of the extension 130 is such as to permit the extension to move inwardly past the lower level 142 to the intermediate level 143 of the lever 141. Thus energization of the relay 92 will cause the extension 130 to be moved inwardly to a first position, where it engages in the notch formed between the levels 142 and 143 on the lever 141.

From an inspection of Fig. 5, it will be observed that this amount of movement which is permitted the extension 130, will be sufficient to move the contacts of the switch 119 to such position as will open the contacts 118, but will not be sufficient to close the contacts 131.

It will be remembered that in the tracing of the normal circuits of the telephone station, the circuit which prevented effective operation of the talking or dialing mechanisms included contacts 118 of the switch 119 so that the disabling of the talking and selecting circuits is removed from

either of the following two operations; first, the deposit of a coin which moves the basket 23 and opens the basket switch 64; or, second, the operation of the relay 92 which opens the contacts 118 of switch 119. Hence the initial ringing of the telephone prepares the talking circuits so that the telephone is conditioned for talking by the actuation of the ringing device of our telephone station.

When the person desiring the long distance call responds to the ring by lifting the receiver from its hook, the rod 148 will be permitted to swing rearwardly to no longer obstruct the movement of the extension 130, and since the long distance operator is calling our station, she may place reverse current upon the line to operate the reverse current relay 104 to cause further energization of the coil 92 in the manner described with reference to the response of any called station.

Thus the relay 92 will be actuated to operate its armature 91 and the extension 130 thereof will further operate the switch 119 to close contacts 131, thereby effectively removing the resistance of the coil 92 over the talking circuit and permitting conversation over the telephone unobstructed by such additional resistance upon the line.

Since the connection is ready for the long distance call, it is now necessary that the long distance operator should inform the calling party as to the amount of toll which must be deposited and the coin collection apparatus must be arranged so as to permit the deposited coins to pass directly into the long distance coin maze 45. This is accomplished by means of an interconnection between the actuation of the relay 92 and the operation of the basket releasing pin 50.

By referring particularly to Figs. 2 and 3, it will be observed that any actuation of the relay 92 will be accompanied by an outward movement of the rod 99 attached to the armature 91 of the relay. This operation will cause outward movement of the lever 82 to withdraw the coin holder 67, as was previously described herein with reference to a local call. However, it will be observed that the lever 82 is provided upon its lower end with an extension arm 153 which will be moved downwardly as the lever 82 is moved outwardly under the influence of the rod 99. The extension 153 is connected by means of a rod or wire 154 to an outstanding lever 155 connected to the lever 60. This connection is effected by means of forming a relatively elongated slot 156 in the extension 153 to engage the hooked end of the wire 154, while a similar elongated slot 157 is provided in the lever arm 155 to engage a hooked end formed upon the opposite end of the wire 154. Thus whenever the relay 92 is actuated, as in the case of the long distance operator calling our pay station, the responsive movement of the rod 99 will cause a downward movement of the arm 155 on the lever 60 and thus will cause the lever 60 to be operated in the same manner as though a coin had been deposited in the initial-call coin slot and operated the rod or wire 59.

However, it will be observed that by reason of the elongated slot and hook connection between the wire 154 and the extension 153 and arm 155, the operation of the lever 60 will not cause movement of the lever 82, and thus though the lever 60 may be moved under the influence of the lever 60 on the initial coin chute, it will not cause the lever 82 to remove the coin holder. Thus there is provided two distinct methods of moving the transfer basket 23, namely by the deposit of the coin, and by the actuation of relay 92 by an incoming call. Likewise, there are two distinct functions of the relay 92, namely, that of causing collection of coins for an outgoing call, and that of operating the transfer basket in response to an incoming call.

The operation of the lever 60 will withdraw the pin 50 from its holding position with reference to the basket 23, and the basket will therefore be moved to its forward position ready to direct coins into the coin maze 45. Hence the calling party may now deposit the required nickels, dimes or quarters necessary to make up the total toll charge for the particular call which he is making.

It will be understood by those skilled in the art that the deposit of the coins in the nickel slot will cause them to pass through the nickel slot 46 and thence to be directed against a suitable audible signal 158, and coins deposited in the dime slot will pass through the dime slot 47 to be directed against the audible signal 158 twice during its passage through the maze; while quarters deposited will pass down through the quarter slot 48 to be directed against a different tone audible signal 159. All of the coins, after they have actuated the audible signals, will be directed to the lower end 160 of the coin maze and thence pass through an opening 161 in the partition 35 and through a suitable opening 162 in the coin collection receptacle 37.

As was described and claimed in our copending applications, Serial No. 554,190, filed July 31, 1931, and Serial No. 573,060, filed November 30, 1931, the coin receptacle 37 may be divided into two compartments by means of a partition 163 so as to segregate the local collections which pass through the openings 34 and 36 from the toll or long distance collections which pass through the openings 161 and 162.

On the other hand, assuming that the long distance operator, upon receiving the number of the station desired by the calling party, requests the calling party to hold the line, the obtaining of the long distance call will be made in the usual manner and prior to connection with the called station, the long distance operator may request the deposit of the necessary toll charges. Under these conditions, it will be observed that the basket 23 will have been moved to its forward position in response to the deposit of the initial-call coin so that the basket is in the correct position to direct the toll charges into the toll long distance collection maze 45. However, the initial coin which was deposited to obtain connection with the long distance operator will be held in abeyance in the initial coin collection chute until the end of the call. At this time the calling party will hang up the receiver, thereby removing the pin 70 from the refund opening in the coin chute, and permit the initially deposited coin to be refunded to the person using the telephone.

It will be observed that when such connection is made, the long distance operator does not send reverse current over the line to our telephone pay station, and hence the relay 92 is not operated, and therefore there will be no removal of the coin holder 67 during the entire time the long distance call is taking place.

Assuming now that some other station desires to call our pay telephone station, this is accomplished in the usual manner by the actuation of the central station selectors to make connection with our pay telephone station. As was described with reference to the calling back by the long distance operator, the ringing circuit being established to our pay telephone station will cause actuation of the ringer or bell of our station and by

reason of the shunt circuit to the relay 92 this relay will be actuated to move the extension 130 to the first notch of lever 141, thus preparing the telephone for the response to the call. When the receiver 10 is lifted from the hook 13, in response to such ring, the current from the calling station will be reversed current operating reverse current relay 104 and further operating relay 92 to remove the resistance of relay 92 from the talking circuit and permit unobstructed response to the calling station without necessitating the deposit of a coin in our station.

The purpose of providing the double notch in lever 141 to cause the operation of the switch 119 to follow two distinct and consecutive steps, is to insure that an incoming call will be effective to connect our telephone station for talking to the calling party, while the mere response of a station which is called from our pay station will not be effective to condition the circuit for talking.

Thus while our station is effectively operated for talking for an incoming call, it will be impossible for a calling party at our station to obtain connection with the called station and yet obtain a refund of the coin which he deposited for such call. This purpose is more readily apparent from a study of the two conditions.

Upon attempting to make an outgoing call, the party at our station will lift the receiver from the hook and deposit his coin, thus opening the shunt around the talking and dialing circuits, permitting him to operate the selectors necessary to ring the called station. By merely holding the receiver off the hook, the circuits which have been established by the deposit of the coin will remain effective when the reverse current comes over the line in response to the answering by the called station, and in addition the reverse current will cause the collection of the coin. However, should the calling party at our station attempt to obtain a refund of his coin after the ringing connection is made with the called station and before the answering by that station, our station will become immediately disabled for talking, even though the called station answers. In other words, the only way in which the reverse current coming in from another station can effectively operate our telephone is when the call is accompanied by two distinct operations, namely, first, the ringing of our station, and, second, the supplying of reverse current to our station from the outside calling station.

This operation will be best understood from an inspection of Fig. 11, in which it will be observed that the circuit to the reverse current relay 104 is normally shunted by the circuit which includes the contacts 118 of switch 119, and the contacts 65*a* and 65*b* of the basket switch 64. In other words, this shunt circuit excludes not only the transmitter and the dial circuits from effective connection with the line line—1, line—2, but also effectively prevents the operation of the reverse current relay, as well. Thus while an incoming call which includes the double operation of the ringing of our telephone station and the responding by our telephone station, will succeed in removing the shunt circuit from our telephone station, by the initial operation of relay 92 by the ringing current, while the receiver is still upon the hook, thus causing the opening of switch 118, an attempt on the part of a person using our telephone to obtain a refund of his coin and still talk with the station he has called, will not be effective.

Assuming that a party at our telephone station has deposited his coin and is dialing the number of the station to which he desires to be connected, and that connection is successfully established with the called station, the deposit of the coin has opened the shunt circuit at the basket switch 64.

Now assuming that while the called station is ringing, the party at our station hangs up the receiver or momentarily operates the receiver hook to cause the removal of the pin 70, to refund the deposited coin, such false operation is accompanied by two distinct effects, namely, the basket 23 is pressed back to its original position by means of the rods 76 and 123, while at the same time the accompanying forward movement of the rod or wire 148 will cause the end of that wire to ride under the cam 146 and lift the lever 141, while at the same time the outward movement of the rod 148 will engage the extension 130 on the armature 91 of relay 92 and will press against the extension 130 on the armature 91 of the relay 92 and will insure that this armature is in its normal nonoperated condition. This will insure that the switch contacts 118 of switch 119 are closed so that the rearward movement of the basket 23 will close switch 64 and re-establish the shunt circuit, taking the transmitter, the dial, and the reverse current relay out of effective circuit operation. Thus as the called station responds and sends reverse current over the line to our pay station, such reverse current is not permitted to enter the reverse current relay 104 and therefore the relay 92 is not operated and the shunt across the talking circuit remains across this circuit and effectively prevents conversation.

In other words, the false operation of our telephone in attempting to obtain both the refund of the coin and connection with the called station, is rendered futile and the attempt is defeated.

As hereinbefore described, another station calling our station will render our station effective for talking without the necessity of depositing the coin in our station. However, the necessity for providing devices rendering our telephone effective for talking upon the completion of connections for the incoming call opens the possibility that after our station has been rung, but no one at our station has responded, a subsequent user of our telephone could obtain a call without depositing a coin for such service. That is, the fact that the relay 92 is actuated by the ringing current coming in from another station, opens a portion of the normal shunt circuit around the talking circuits and leaves this shunt circuit open unless the subsequent operation of lifting the receiver at our station is performed. This, it will be observed, follows from the catching of the extension 90 of the armature 91 in the first notch of lever 141 which will only be released upon the lifting of the receiver and restoration of the receiver to its hook.

However, the possibility of this false operation or this possibility of obtaining free service is obviated in our system by providing a secondary shunt circuit around the transmitting and listening apparatus which can be controlled only by the basket switch.

By referring particularly to Fig. 11, while the normal shunt circuit around the transmitter, dial and receiver circuits passes in series relation through the contacts 118 of switch 119 and through contacts 65*a* and 65*b* of the basket switch 64, a secondary shunt circuit also extends around the transmitter, dial and receiver circuits independent of the switch contacts 118. This

circuit may be traced from junction point 122 on the receiver transmitter circuit through conductor 121, contacts 65 and 65a of the basket switch 64, and through conductor 170 to a junction 171 on conductor 108 from the opposite side of the circuit to the transmitter and dial.

Therefore, unless the basket switch is operated, the talking and dial circuits of our telephone remain inoperative. It therefore follows that unless the receiver is lifted from our telephone in response to an incoming call, the reverse current necessary to operate the reverse current relay and to cause the complete operation of relay 92 to trip the basket switch, will not occur, and the dial and transmitter circuits will remain shunted. However, as soon as the receiver is lifted from the hook the reverse current will operate the reverse current relay and will cause a tripping of the basket switch, as hereinbefore described, for the operation of an incoming call. Hence, though the incoming ringing current is permitted to operate the switch 118, this operation will not serve to render the station effective unless, and until, the receiver is lifted from the hook while the calling station remains connected with our pay telephone station.

While we have described the paths of the initial call coin which is deposited as passing immediately to the initial call coin collection chute to be refunded upon the restoration of the receiver, or to be collected upon the completion of the call, it frequently occurs that a person using the station deposits the coin prior to the lifting of the receiver from the hook. While, with the system hereinbefore described, such initial deposit of coin would immediately refund the coin, it frequently occurs that a person does not observe that the coin has been refunded and thereafter, upon lifting the receiver and failing to obtain the desired connection, reports the telephone as out-of-order. This may be obviated by the employment of an auxiliary pin 172 forming the end of a rod 173 which is in turn connected to the link 71a which interconnects the receiver actuated rod 73 and the wire 71 so that whenever the receiver is on the hook the pin 172 extends into the initial-call coin slot and holds the prematurely deposited coin in abeyance until the receiver is lifted. Thereupon, the coin so held, may descend through the chute and operate the devices as was described herein for the normal calling operation.

To sum up, it will be apparent that we have provided a pay telephone station in which outgoing calls may be accomplished for either local service or for long distance service, and in which the deposit of any of the denomination coins for which the telephone is adapted may be deposited to obtain the initial connection or call. That, further, the telephone station is so arranged that an incoming call can effectively operate the circuits of our telephone to condition our telephone to receive incoming calls, while at the same time an outgoing call is rendered ineffective by an attempt to obtain the call without the consequent collection of the necessary charge for the call.

It will be further apparent that the arrangement of the coin-collecting and refunding devices is such that the station cannot be rendered effectively operative by means of jarring, striking, or otherwise tampering with the station, and, further, that coins will be automatically collected or refunded depending upon whether or not successful completion of the calls can be obtained.

While we have shown and described the preferred embodiment of our invention, we do not desire to be limited to any of the details shown or described herein, except as defined in the appended claims.

We claim:

1. In a pay telephone station for local and long distance service, coin collection and refunding devices including a plurality of coin deposit slots each adapted to receive coins of denomination different from that of the remainder, an initial-call coin chute and a long distance call coin chute, transfer means interposed between said slots and said chute for selectively diverting coins into either of said chutes, means normally rendering the talking circuits of said station ineffective, means normally operating said transfer means to direct coins to said initial-call coin chute, and means in said initial-call coin chute operable by the deposit of a coin in any of said slots for rendering said talking circuits effective and for moving said transfer means to divert further coins to said long distance coin chute.

2. In a pay telephone station, a coin collection chute having a collection opening and a refund opening, a coin holder comprising a lever movable toward and away from said chute, obstructing means entering said chute, and means pivotally mounting said obstructing means upon said lever.

3. In a pay telephone station, a coin collection chute having a collection opening and a refund opening, a coin holder comprising a lever movable toward and away from said chute, obstructing means entering said chute and pivotally secured to said lever, and means operable by supply of reverse current to said station for actuating said lever to remove said obstructing means from said chute.

4. In a pay telephone station, a coin collection chute having a collection opening and a refund opening, a coin holder comprising a lever movable toward and away from said chute, an obstruction pivotally secured to said lever and entering said chute, means in said chute operable by the passage of a coin therethrough for rendering said station effective for operation, means interconnecting said coin actuated means and said lever to operate said coin actuated means by movement of said lever but to permit actuation of said coin actuated means without moving said lever.

5. In a pay telephone station, coin collection and refunding apparatus including a coin guide having a plurality of slots therein each adapted to receive coins different from that of the remainder, an initial-call coin chute positioned below said coin guide to receive coins deposited therein, a light weight coin diverting means in each of said slots for diverting light weight coins therefrom before entry into said initial-call coin chute, and a refund chute positioned adjacent said coin guide to receive said diverted coins and to pass them out of said station.

6. In a pay telephone station, coin collection and refunding apparatus, including a plurality of coin slots each adapted to receive coins of a denomination different from that of the remainder, an initial-call coin chute disposed below said coin guide to receive coins therefrom, spurious coin diverting means positioned in said slots for diverting spurious coins therefrom prior to entry into said initial-call coin chute, and a refund chute positioned adjacent said slots to receive said

diverted coins and to pass them from out of the station.

7. In a pay telephone station, a coin guide including a plurality of slots each adapted to receive coins of a denomination different from the remainder, an initial-call coin chute positioned below said coin guide to receive coins from said slots, spurious coin diverting means including means for detecting undersized or irregularly shaped coins positioned in said slots to divert such coins therefrom prior to entry into said initial-call coin chute, and a refund chute positioned adjacent said coin guide to receive such diverted coins and to pass them out of the station.

8. In a pay telephone station, a coin collection chute, having a collection opening and a refund opening, a coin holder in said chute for arresting a coin passing through said chute prior to its arrival at the collection opening and refund opening, said coin holder including a plate extending into said coin chute at right angles to the direction of movement of coins in said chute, and means for mounting said plate for movement into and out of said chute by a non-pivotal sliding motion whereby impact of coins on said plate will be prevented from moving said plate out of said chute.

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