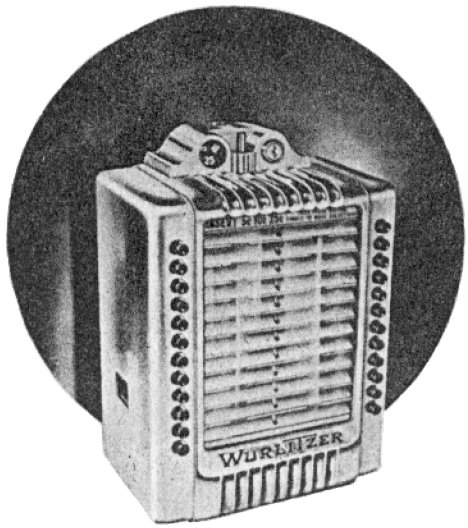
SERVICE INSTRUCTIONS

AND

PARTS CATALOG

for

WALL BOX MODEL 3020
IMPULSE STEPPER MODEL 219
IMPULSE TRANSMITTER MODEL 215
IMPULSE RECEIVER MODEL 216



COMMERCIAL PHONOGRAPH DIVISION
The RUDOLPH WURLITZER COMPANY
NORTH TONAWANDA, NEW YORK

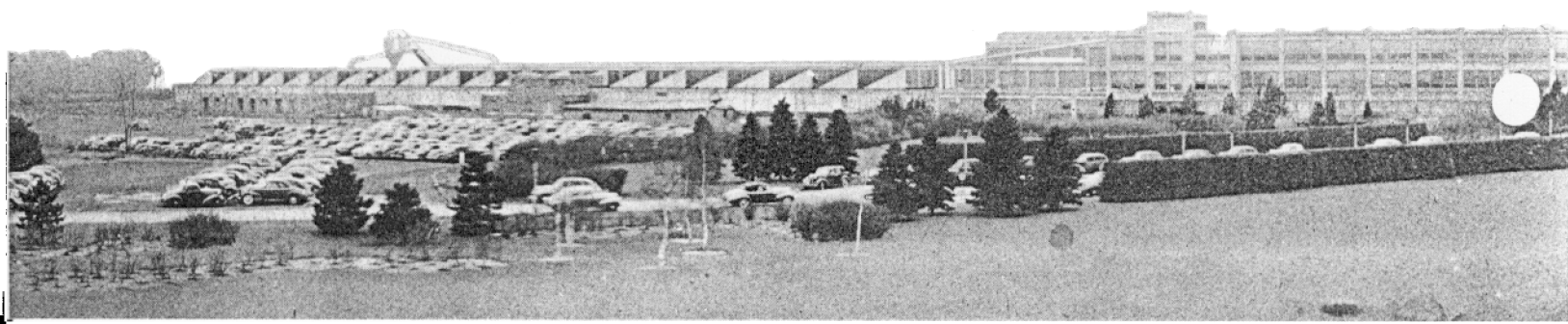
DEDICATION

This manual is dedicated to Wurlitzer Factory-Approved Music Merchants and their Servicemen, through whose cooperation and continued loyalty the unparalleled public and location owner acceptance of Wurlitzer equipment has been maintained.

Be assured that the same high standards which have done so much to solidify Wurlitzer's position in the music world, will be continued as Wurlitzer Extends Its Leadership.

It is our sincere desire that this Manual will materially assist you in gaining and holding locations by prompt, complete and efficient service.

The Rudolph Wurlitzer Company
North Tonawanda, N. Y.



INTRODUCTION

The instructions contained in this Manual have been prepared by the Wurlitzer Service Department to assist the Serviceman in becoming familiar with the Models 3020 Wallbox, 219 Impulse Stepper, 215 Impulse Transmitter and 216 Impulse Receiver. They are presented for your convenience and reference in the firm belief that a better understanding of the working principles and required maintenance of the wallbox will result in increased operating profits and more satisfactory performance of your equipment.

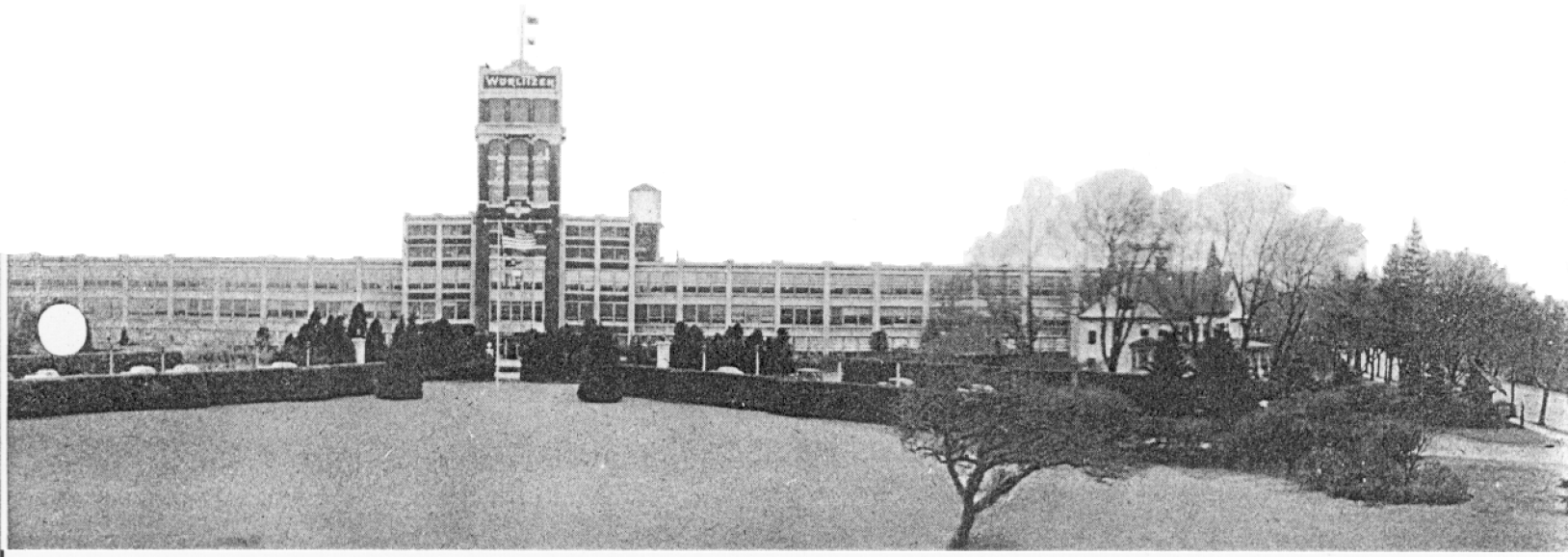
All details of the broad subject of service cannot possibly be covered in this Manual. The Wurlitzer Service Department will be glad to assist you with any special problems, through Field Representatives, Distributors or the Wurlitzer Factory.

If you will submit problems, advice and suggested remedies, you will enable us to improve our service to you through our periodic "Service Slants" bulletins and through the medium of this Manual.

Remember, your ideas will help others . . . and their ideas will help you.

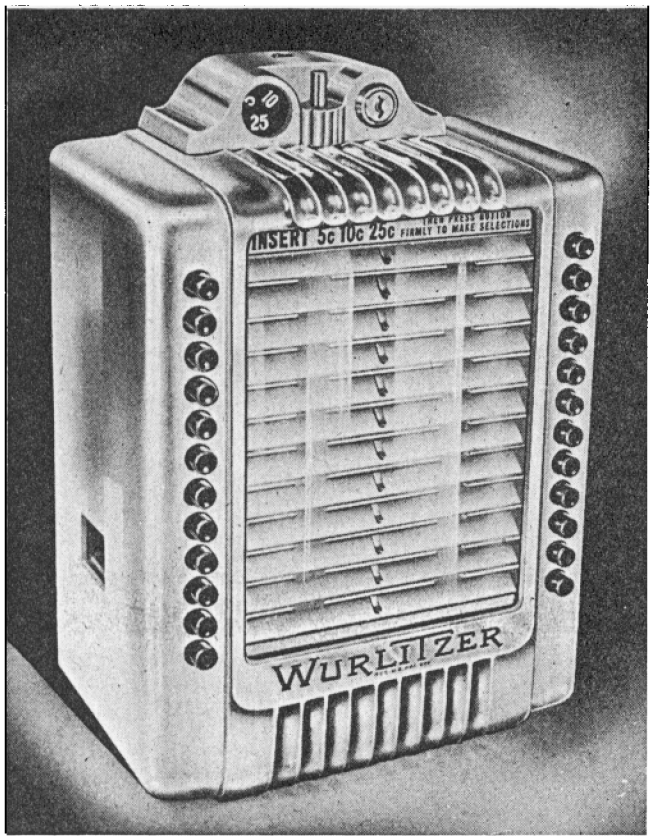
Your comments to:

Milton A. Bartels
General Service Manager
The Rudolph Wurlitzer Company
North Tonawanda, N. Y.



CONTENTS

LIST OF ILLUSTRATIONS



MODEL 3020

Streamlined, Highly Polished, all metal . . . Picks up and reflects surrounding lights, giving added Eye-appeal . . . Quickly converted from Three Wire to Wireless by merely plugging in a Model 215 Transmitter and a Line Cord.

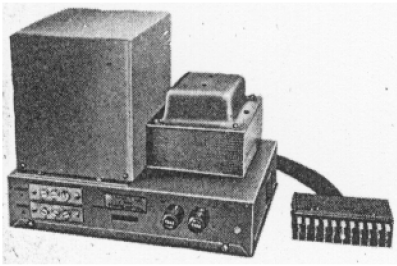
SPECIFICATIONS

13-1/4" High—5-3/4" Deep—9" Wide—Packed 28-1/2 lbs.

Single drop slot for 5, 10 and 25¢ coins to standard type slug rejector assembly. Credits banked on accumulator in wall box through positive motor-driven coin register.

Three Wire System requires no connection to power line. May be converted to wireless or two wire system.

115 volt, 60 cycle A.C.



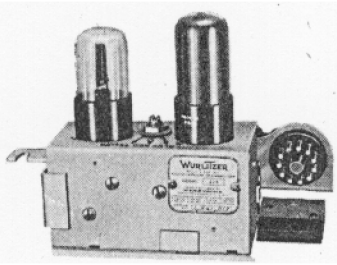
IMPULSE STEPPER MODEL 219

7-1/2" High — 7-1/4" Deep — 9-1/2" Wide—Packed 20 lbs.

Selenium Rectifier used in place of tubes assures long trouble free life and operating stability.

Single cable and multi-wire connector carries circuits to Junction Box.

Fuses and terminal strip for Wallbox line accessible at front door of phonograph.

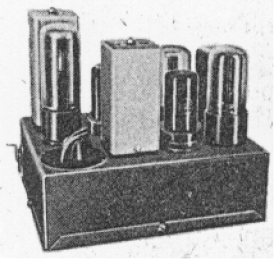


IMPULSE TRANSMITTER MODEL 215

2-3/4" High—2-1/4" Deep—7" Wide —Packed 1-1/2 lbs.

A plug-in unit; no adjustment required as frequency is fixed through use of crystal controlled circuit. Various frequencies available to fulfill local requirements.

A 6V6GT and 6X5GT tube used. One Transmitter required for each Wireless Wallbox. May be ordered separately.



IMPULSE RECEIVER MODEL 216

6" High—5-1/4" Deep—6-1/2" Wide —Packed 4-1/2 lbs.

A 6SK7, 6SQ7, 6SN7GT and 5Y3GT/G tube used in each receiver. A 6U5/6G5 tube installed for tuning, may be moved from one unit to another.

All circuit connections made by plugging the Impulse Receiver into the Impulse Stepper.

SERVICE INSTRUCTIONS

SECTION I

GENERAL DESCRIPTION

CYCLE OF OPERATION FOR WIRELESS WALLBOX

INTRODUCTORY

The Wurlitzer Wireless Remote Control System provides for transmission of pulses over 60 cycle wiring circuits from wallboxes to the phonograph.

The source of the signals is a transmitter in the wallbox which sends out radio frequency pulses. The device which responds to these signals or pulses is the radio impulse receiver, located in the phonograph. The receiver actuates the stepper, which in turn sets up the circuit required for obtaining the desired selection on the phonograph.

Generally, external wiring is not required with the Wireless Remote Control System; wallboxes are simply plugged into the electric wiring outlets and the receiver is plugged into the stepper in the phonograph.

CYCLE OF COIN REGISTRATION

The coin disc contact arm in its *at rest* position, sets up a circuit for the 5¢ or 10¢ or 25¢ coin switch and the coin relay. When a coin is inserted it passes through the slug rejector and falls against the coin switch. The coin switch closes, thus closing the coin relay. (See Figures 1, 2 and 3.) This relay interlocks through contacts 1 and 2 until near the end of the revolution when the release switch opens it. When the coin relay closes the motor is started through contacts 3 and 4, the register circuit is completed through contacts 7 and 8 and the selector circuit is isolated through contacts 5 and 6. When the coin relay is energized, contacts 5 and 6 break the selection circuit while the coins are being registered.

The coins are held on the coin switch by the coin gate, as the coin disc contact rotates in a clockwise direction from the *at rest* position. The coin switch, which is still closed, is disconnected from the coin relay circuit (Segment A of coin disc) and connected into the accumulator coil circuit (Segment B of coin

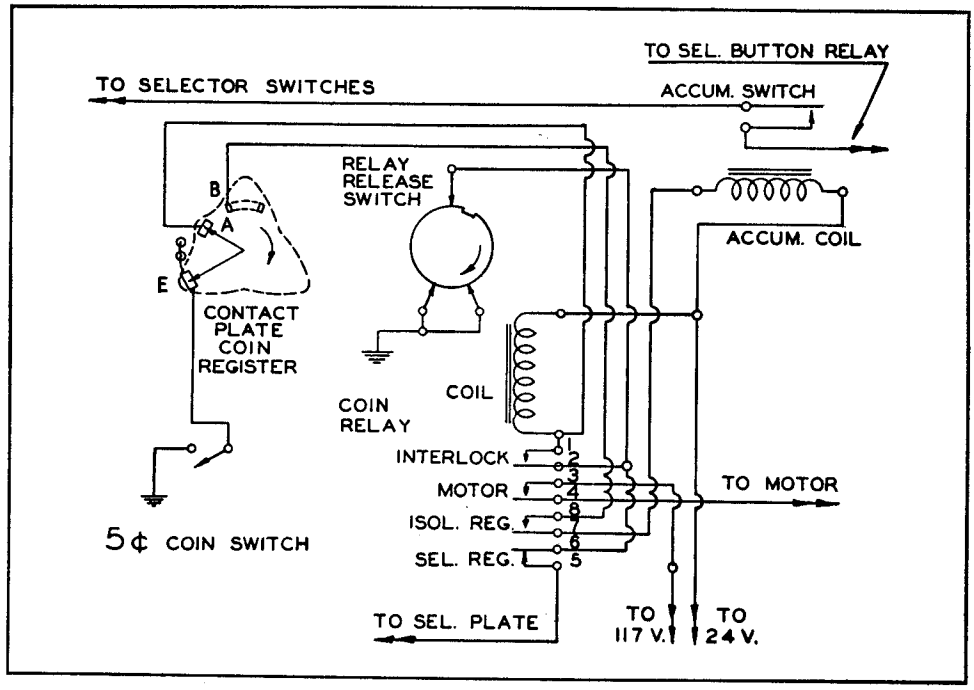


Figure 1—Five Cent Coin Registration Schematic

disc). If a quarter is inserted, six 24 volt A.C. pulses are sent to the accumulator coil moving the ratchet wheel six teeth. (See Figure 3.) If a dime is inserted, three 24 volt A.C. pulses are sent moving the ratchet wheel three teeth. (See Figure 2.) If a nickel is inserted, two 24 volt A.C. pulses are sent moving the ratchet wheel two teeth. (See Figure 1.) After the money is registered, the coin gate opens through the action of a cam controlled by the motor. This allows the coin to drop into the cash box, thereby opening the coin switch. Further action of the cam is immediately in effect to actuate the cancel lever, canceling the ratchet wheel one tooth. This leaves five registrations if a quarter has been inserted, two registrations if a dime has been inserted, or one registration if a nickel has been inserted. Near the end of the cycle the release switch rotates to its open segment, releasing the coin relay. The full cycle switch keeps the motor running until the open segment is reached, thus stopping the motor. When the motor stops, the contact arm is *at rest* on contacts H and F of the contact disc. (See Figure 4.)

After a nickel, dime or quarter has been registered on the ratchet wheel, the accumulator switch is closed. The contact arm, *at rest* on disc contacts H and F, completes the circuit through the accumulator switch to energize the selection button relay coil. This relay remains energized until released by the release switch, at the time it reaches the open segment. The wallbox is now ready for a selection.

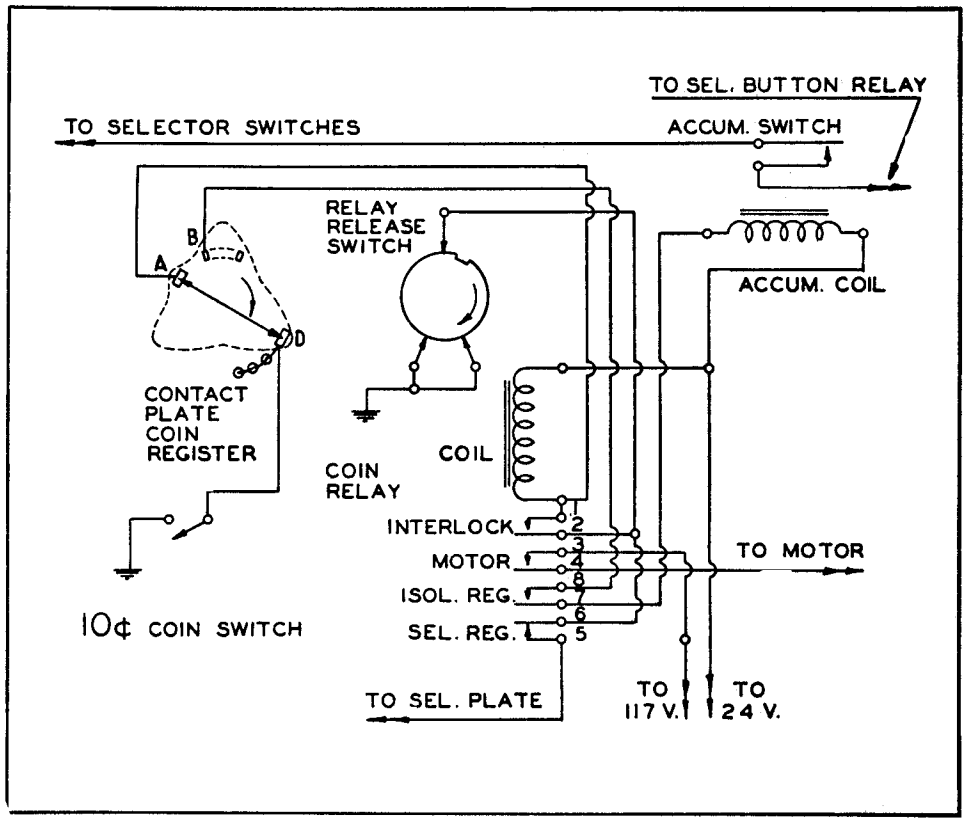


Figure 2—Ten Cent Coin Registration Schematic

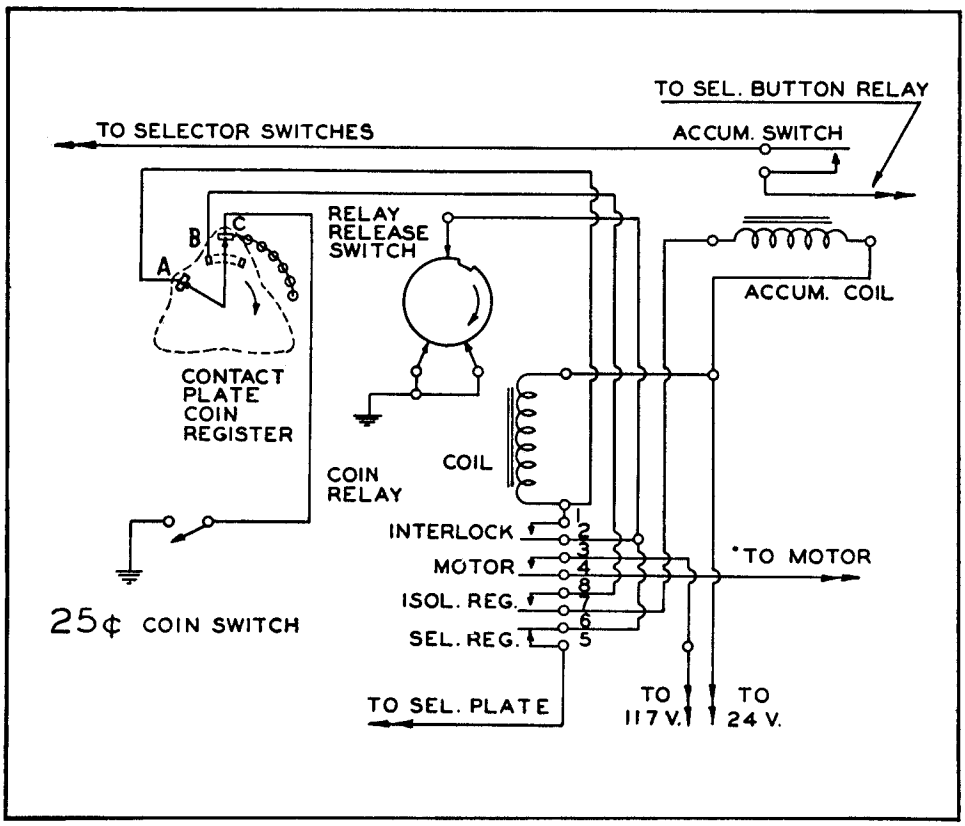


Figure 3—Twenty-Five Cent Coin Registration Schematic

CYCLE OF SELECTION

After a coin has been inserted and registered, the wallbox is ready for a selection. When any one of the 24 selector buttons is depressed, the following cycle takes place:

The coin relay remains open, keeping the selector circuit closed through its normally closed contacts 5 and 6. (See Figures 4, 5, and 6.) The motor is started by the 117 volt contacts on any one of the selector button switches which are in series with contacts 3 and 4 of the selector button relay and in parallel with the full cycle switch. The selector buttons are latched mechanically through cam action, powered by the motor. The selector contact arm rotates to complete the cathode circuit of the transmitter through contacts I and G. This generates a long R.F. pulse or signal which is transmitted over the 117 volt power lines to the phonograph. This pulse, or signal, comes out of the junction box through terminals 32 and 33, of the 33 connector stepper socket, into the stepper and out through the 12 prong socket terminals 6 and 12 to the receiver 12 prong plug terminals 6 and 12, which are the receiver R.F. Input terminals. The signal is then amplified and passes through the receiver, thereby actuating the receiver relay. The contacts of the receiver relay complete the circuit to terminals 5 and 8 of the 12 prong receiver plug and through terminals 5 and 8 of the 12 prong stepper socket, the circuit is completed to energize the stepper coil. This first long R.F. pulse closes the stepper coil thereby advancing the stepper contact arm one step. It also completes the circuit through its contacts 1 and 2 to the coil of the timing relay which closes. The closing of the timing relay and its contacts 1 and 2 completes a circuit to close the release latch relay. Additional R.F. pulses picked up by the receiver advance the stepper contact arm to the desired point of selection.

As the motor completes its cycle, cam action cancels one registration on the ratchet wheel and also releases the selector button latch bar permitting the selected button to return to a normal position through spring loading.

OPERATION OF MODEL 215 IMPULSE TRANSMITTER

The Model 215 Impulse Transmitter consists of a 6V6GT/G oscillator tube, a 6X5GT/G rectifier tube and other associated components. (See Figure 4.) The oscillator frequency is controlled by a quartz crystal in the 6V6GT/G grid circuit. The 6V6GT/G plate circuit is tuned to the crystal frequency at the factory. This tuning, generally, should not be molested in the field. The oscillator is keyed in the cathode circuit by means of the rotating contact arm as it rides over the contact strips.

The secondary or output coil, coupled to the oscillator coil connects to the A.C. line when a selection is being made, through the .1 MFD C-8 condenser and the frequency change switch. The C-8 condenser prevents 60 cycle current from affecting the output coil but does not impede the radio frequency signal being transmitted.

Transmitters are shipped from the factory equipped with a red crystal unit and with the three-position switch turned to "RED". Blue and yellow crystals are available from the Service Department, but should be used only when it becomes necessary to change frequency on one of two locations close together to avoid interference. The three crystal units (red, blue and yellow) provide three operating frequencies. When blue or yellow crystals are used, the transmitter switch must be turned to the corresponding color position.

The transmitters are carefully peaked or tuned, working into a proper load at the factory. In general, it is advisable not to attempt to improve on the factory adjustment on location, because it is possible to upset the peaking enough to prevent the crystal from oscillating during normal wallbox keying. Repeaking of the transmitter can best be done in the Distributor's or Operator's Service Department, which is equipped with suitable test apparatus.

OPERATION OF MODEL 216 IMPULSE RECEIVER

The Model 216 Impulse Receiver installed in the phonograph, gets its filament and "B" power from the stepper into which its plugs. The tube complement includes a 6SK7 amplifier, a 6SQ7 detector and D.C. amplifier, a 5Y3GT rectifier and a 6SN7GT for operating the relay. An additional tube, a 6U5/6G5, is used for tuning the receiver. This may be purchased from your Distributor.

Signals from the wallboxes are amplified by the 6SK7 tube and are then rectified by the diodes of the 6SQ7 tube. (See Figure 6). Each diode of the 6SQ7 tube is connected to a separate secondary winding of the second R.F. transformer. One diode circuit supplies a lengthened pulse of negative potential for the 6SK7 grid, which makes the receiver less sensitive to extraneous noise between pulses. The other diode circuit supplies a signal pulse, also of negative polarity to the 6SQ7 grid, causing the triode section to become *non-conducting*. With no signal, the triode section conducts, causing the 6SQ7 plate and 6SN7 grids to become more negative than the 6SN7 cathode, so that the 6SN7 draws no plate current.

The triode section of the 6SQ7 and the paralleled sections of the 6SN7 form a direct coupled D.C. amplifier. With no signal coming in, the 6SQ7 triode conducts and the 6SN7 is cut-off. When signals are received, each pulse causes a negative voltage to appear on the 6SQ7 grid and drives it to cut-off, i.e., it does not draw plate current. The potential of the 6SQ7 plate and 6SN7 grids immediately rises to that of the 6SN7 cathodes and the 6SN7 conducts, thereby

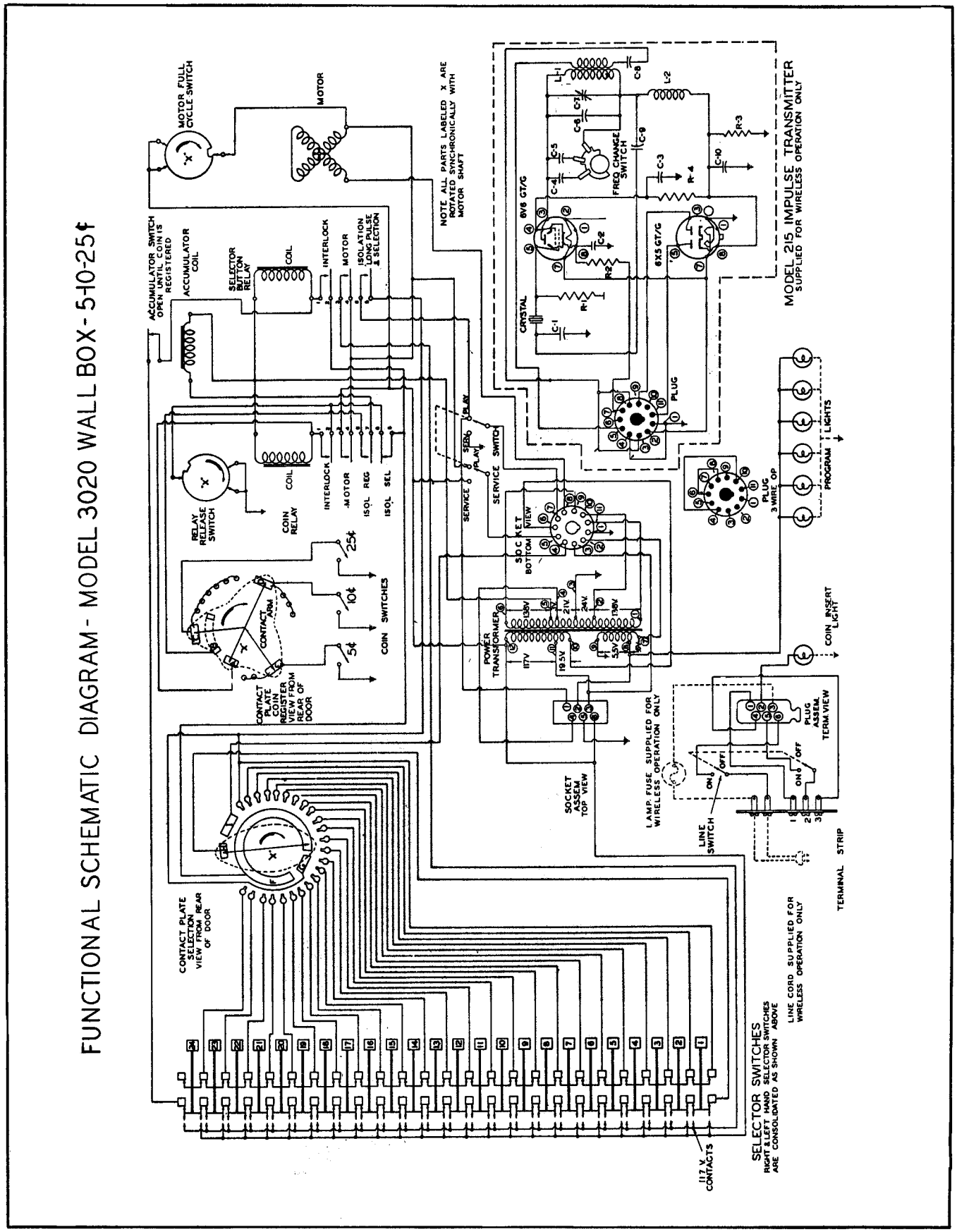
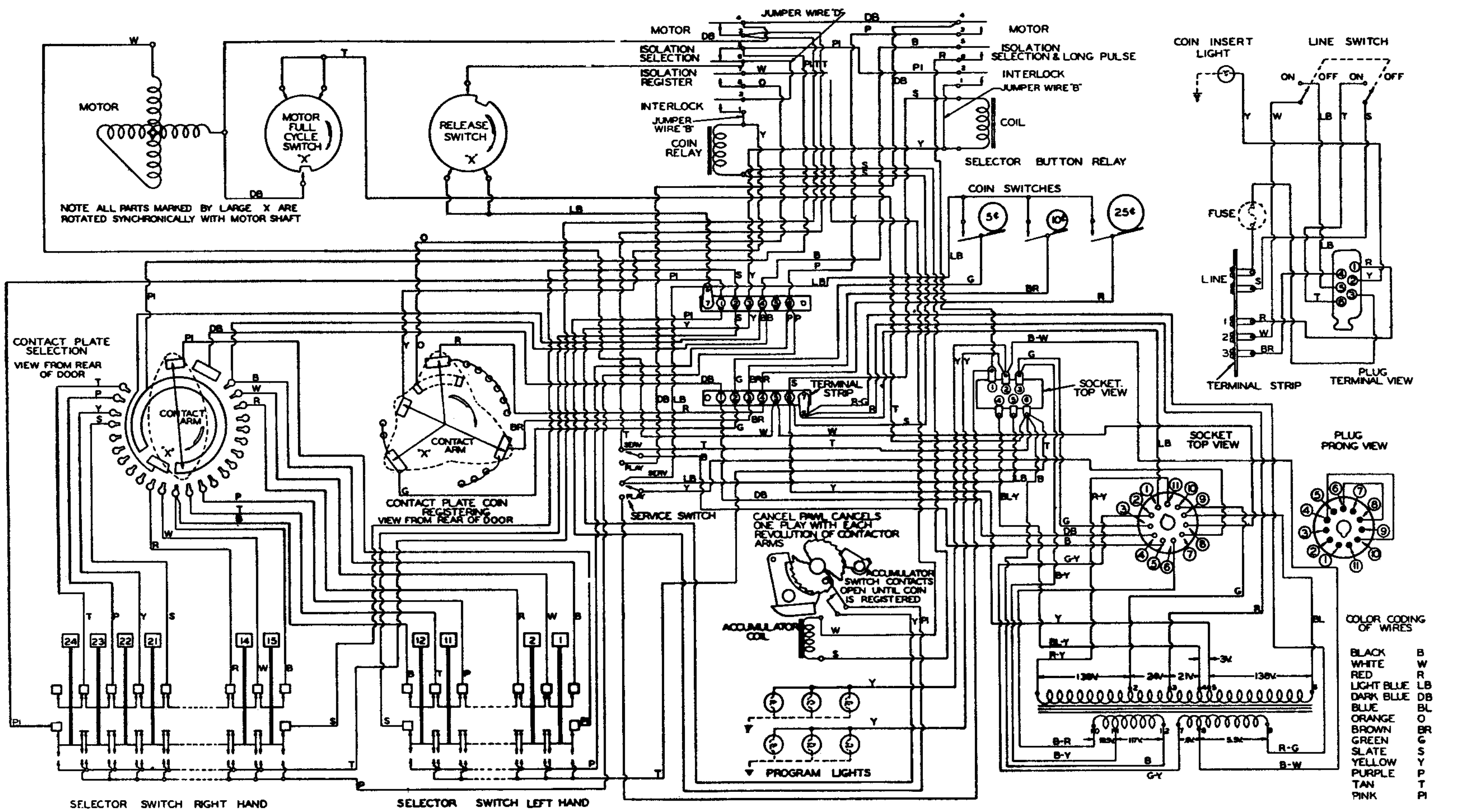


Figure 4—Functional Schematic—Model 3020 Wallbox, With Model 215 Transmitter

WIRING DIAGRAM - MODEL 3020 WALL BOX - 3 WIRE - 5-10-25¢-24V-60CY



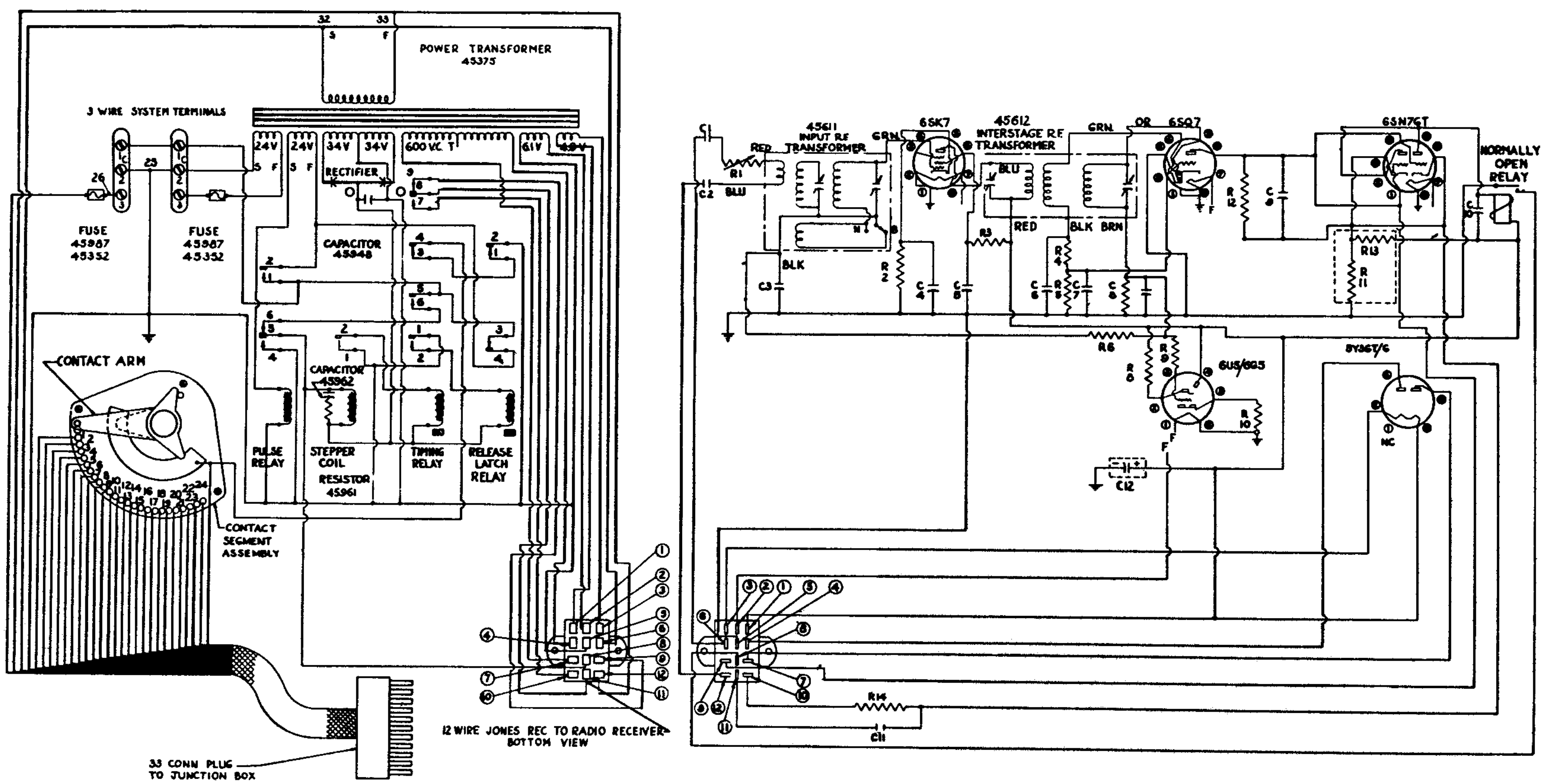
NOTE WIRING CIRCUIT FOR SEL BUTTONS NOS. 3-10 INC & 16-20 INC. NOT SHOWN ON DRAWING IS SAME AS FOR SEL BUTTONS NOS. 21-23 INC.

NOTE THIS SCHEMATIC DIAGRAM IS DRAWN SO THAT EACH INDIVIDUAL WIRE IN WALL BOX IS REPRESENTED BY A LINE.

PART	NAME	PART	NAME	PART	NAME	PART	NAME	PART	NAME	PART	NAME
										46135	JUMPER WIRE A
45017	SELECTOR SWITCH R H	45531	SOLDERING LUG 2 REQ	45671	SWITCH ASSEM-MOTOR & RELAY	38492	SOCKET 11 PRONG	46047	COIN SWITCH CABLE	46137	JUMPER WIRE G
45018	SELECTOR SWITCH L H	45986	LIGHT SOCKET 5 REQ	45830	CONTACT PLATE COIN REG.	46081	SOCKET ASSEM 6 PRONG	46002	CABLE - BASE WIRING	97873	JUMPER WIRE B 3 REQ
45764	LINE SWITCH	45970	LIGHT SOCKET	45833	CONTACT PLATE SELECTOR	46050	PLUG ASSEM 11 PRONG	46001	11 PRONG SOCKET CABLE	46136	JUMPER WIRE C
45765	SERVICE SWITCH	45985	PROGRAM LIGHT BULB 6 REQ	45827	CONTACT ARM ASSEM SEL	46054	PLUG ASSEM 6 PRONG	45999	SEL. BUTTON RELAY CABLE	97872	JUMPER WIRE D
45389	COIN SWITCH	37987	COIN INSERT LIGHT BULB	45903	CONTACT ARM ASSEM COIN REG			46000	MAGAZINE SW CABLE	46138	JUMPER WIRE E 2 REQ
45767	FUSE HOLDER	45484	COIN RELAY	45790	ACCUMULATOR SWITCH	45996	SELECTOR CABLE 1	46003	COIN REG CABLE	46145	JUMPER WIRE F
45766	TERMINAL STRIP	45483	SELECTOR BUTTON RELAY	45663	ACCUMULATOR COIL	45997	SELECTOR CABLE 2			99077	SLEEVING D
45978	TERMINAL STRIP 2 REQ	45371	MOTOR	45517	POWER TRANSFORMER	46046	SELECTOR CABLE 3	98685	SLEEVING B 2 REQ	99076	SLEEVING E

Figure 5—Model 3020 Wallbox Schematic

SCHEMATIC MODEL 219 IMPULSE STEPPER & MODEL 216 RADIO IMPULSE RECEIVER



ITEM	PART	DESCRIPTION	REMARKS
IMPULSE STEPPER	45199		
RECTIFIER	45388	0.5 AMP	34 VOLTS DC
RELEASE LATCH RELAY	45354	230 OHMS	34 VOLTS DC
TIMING RELAY	45355	230 OHMS	34 VOLTS DC
STEPPER COIL	45411	105 OHMS	34 VOLTS DC
PULSE RELAY	45353	124 OHMS	48V 60 CPS
RESISTOR	45961	510 OHMS	1/2 WATT
CAPACITOR	45948	80 MFD	100 WV
CAPACITOR	45962	0.5 MFD	400 WV
FUSE	45987	32 AMP	FUSETRON
FUSEPOST	45352		
TRANSFORMER	45375		120V 60 CPS
CONTACT SEGMENT	41672		

ITEM	PART	VALUE	REMARKS
	45779	RADIO IMPULSE RECEIVER	
R1	45626	50000 OHMS	SENSITIVITY CONT
R2	38554	300 OHMS	±5 % 1/3 WATT
R3	45950	56000 OHMS	±10 % 1 WATT
R4	45801	47000 OHMS	±10 % 1/3 WATT
R5	36323	270000 OHMS	±10 % 1/3 WATT
R6	28383	1 MEGOHM	±10 % 1/3 WATT
R7	36323	270000 OHM	±10 % 1/3 WATT
R8	28383	1 MEGOHM	±10 % 1/3 WATT
R9	28383	1 MEGOHMS	±10 % 1/3 WATT
R10	38554	300 OHMS	± 5 % 1/3 WATT
R11	45802	3600 OHMS	± 5 % 5 WATT
R12	45917	470000 OHMS	±10 % 1/3 WATT
R13	45803	16000 OHMS	± 5 % 8 WATT
R14	36441	22000 OHMS	±10 % 1/3 WATT

ITEM	PART	VALUE	REMARKS
		CAPACITORS	
C1	38748	.1 MFD	±10% 400WV
C2	38746	.1 MFD	±10% 400WV
C3	45797	.1 MFD	±10% 400WV
C4	24325	.1 MFD	±10% 200WV
C5	45797	.1 MFD	±10% 400WV
C6	35930	.0005 MFD	±10% 600WV
C7	35930	.0005 MFD	±10% 600WV
C8	35930	.0005 MFD	±10% 600WV
C9	35930	.0005 MFD	±10% 600WV
C10	22320	.3 MFD	±20%-10% 400WV
C11	31150	.05 MFD	±10% 200WV
C12	45798	20 MFD	450WV

ITEM	PART	DESCRIPTION	REMARKS
	45611	INPUT	RF TRANSFORMER
	45612	INTERSTAGE	RF TRANSFORMER
	45617	RELAY	4500 OHMS

AVERAGE VOLTAGE MEASUREMENTS	
FROM TUBE TO CHASSIS	
6SK7 6 PLATE TO GROUND 250 VOLTS DC	
6SK7 6 SCREEN TO GROUND 130 VOLTS DC	
6SK7 5 CATHODE TO GROUND 4.3 VOLTS 10V SCALE	
6SN7 2&5 PLATE TO GROUND 250 VOLTS DC	
6SN7 3&6 CATHODE TO GROUND 80 VOLTS 100V SCALE	
6SQ7 6 PLATE TO GROUND 1.1 VOLTS 10V SCALE	
CAPACITORS	
C4 TO GRND 4.3V	C5 TO GRND 130V
C6 TO GRND 0	C8 TO GRND 0
C12 TO GRND 250V	
RESISTORS 100V SCALE	
R11 TO GRND 50 VOLTS	

ALL MEASUREMENTS TO BE MADE WITH LINE AT 117 VOLTS 60 CYCLE USING 1000 OHMS PER VOLT VOLTMETER- FOR VOLTAGES OVER 50 USE 500 VOLT SCALE VOLTAGES TO BE MEASURED AT ZERO INPUT

Figure 6—Model 219 Impulse Stepper and Model 216 Impulse Receiver Schematic

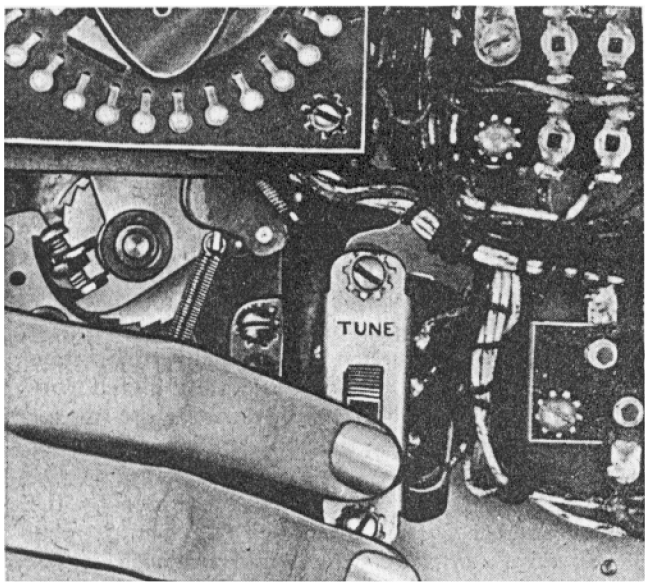


Figure 7—Wallbox Tuning Switch in "TUNE" Position

closing the relay in the receiver and causing the stepper to operate, as described in Operation of Model 219 Impulse Stepper.

The impulse receivers are tuned at the factory for the red frequency. In case retuning is necessary when a receiver is installed on location, it may be done by inserting a 6U5/6G5 tuning eye tube and getting a steady signal from any wallbox. To obtain a steady signal, open the wallbox door and throw the switch to the "TUNE" position. (See Figure 7.) The sensitivity control should be turned clockwise to begin tuning and backed-off counter-clockwise as the receiver is brought more into tune. The tuning procedure is to adjust the four trimmers on the R.F. transformers to obtain closing of the tuning eye. Flip the receiver No. 1 transformer switch to the "N" position. (See Figure 8.) As the eye closes, turn the sensitivity control counter-clockwise to open the eye and to allow more peaking with the trimmers. Continue backing off on the sensitivity control setting and tuning with the trimmers until the best peaking is obtained. Then throw the receiver No. 1 transformer switch back to the "B" position.

NOTE

It is important to remember that merely getting the tuning eye to close does not mean that the receiver is tuned. The receiver can be considered tuned only when the eye is open very slightly and further adjustment of the four trimmers will not cause it to close farther.

In general, it is desirable to keep the sensitivity control as far counter-clockwise as possible while still getting operation from all wallboxes with all the lights and other loads of the location turned on. This will allow the receiver to be less sensitive to extraneous noises on the A.C. line and will also minimize interfering signals from nearby locations. The sensitivity control should be turned counter-clockwise until some one wallbox *just fails* to operate the receiver; the control should then be turned clockwise about 10 divisions from the setting at which the first failure occurred. For example, assume that at 30 divisions a wallbox failure was noted; 30 plus 10 equals 40 divisions, at which setting we may expect to get operation and also less noise than if we were to put the control at 85 or 100 divisions. Sometimes it may be possible to set the sensitivity control full counter-clockwise and obtain satisfactory performance. This setting will give least interference from other locations and may frequently permit operation where higher settings would require a shift of frequency. Also, a low setting of the sensitivity control greatly reduces the effect of extraneous transients.

OPERATION OF MODEL 219 IMPULSE STEPPER

INTRODUCTORY

The Model 219 Impulse Stepper is designed to operate by itself on three wire operation. By adding a Model 216 Impulse Receiver it is used on wireless operation. Its purpose is to pick up impulses either by direct wire or through radio frequency over the 115 volt power line, depending on the type of remote control selectors used. Each impulse received by the stepper is mechanically registered by the stepper arm, the number of impulses received determining the selection.

CYCLE OF OPERATION

The impulse stepper will not operate unless first

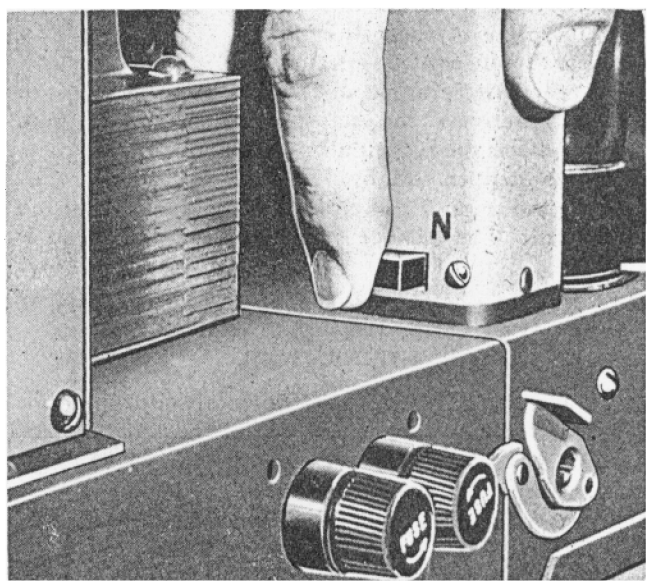


Figure 8—Receiver No. 1 Transformer Switch in "N" Position

set up to receive selection pulses. Using a three wire operation, the long A.C. pulse closes the A.C. pulse relay. This action closes contacts 4 and 5 of the pulse relay and opens contacts 5 and 6. (See Figures 6 or 12.) Contacts 4 and 5 complete the circuit to energize the stepper coil. Contacts 5 and 6, being open when the relay is energized, isolates the D.C. selenium rectifier power supply from the A.C. pulse received. These two currents superimposed may cause damage to the rectifier. The purpose of contacts 1 and 2 of the pulse relay is to keep the coil energized for the full duration of the A.C. pulse, as the actuation of the release latch relay opens its contacts 3 and 4 to disconnect the A.C. pulse relay. The stepper is now set up to allow a three wire remote selector to operate the stepper coil from the D.C. power supply. The selector now becomes a D.C. interrupter switch.

In using a wireless remote selector, the long R.F. pulse is picked up by the impulse receiver, amplified by the 6SK7 R.F. amplifier and then rectified by a diode of the 6SQ7 which supplies a signal of negative polarity to the grid of the 6SQ7 triode section. This causes the 6SQ7 to stop drawing current, causing the potential of the 6SN7 grids to rise. The C-11 condenser, across the 6SN7 grids and cathodes, acts as a protector against extraneous noises because the charging of this condenser slows the potential rise on the grids of the 6SN7. When this condenser receives its full charge, the potential has risen to such a point that the plates of the 6SN7 will draw sufficient current to energize the radio pulsing relay. The contacts of the radio pulsing relay, when closed, energize the stepper coil. The protective C-11 condenser of the impulse receiver is isolated from the grid circuit of the 6SN7 by the normally closed contacts 8 and 9 of the timing relay and becomes fully discharged through contacts 7 and 8 of the timing relay. The stepper is now receptive to short R.F. pulses delivered from a wireless remote control selector.

As previously pointed out, the A.C. pulse relay, in closing, energizes the stepper coil by three wire operation and the radio pulsing relay, in closing, energizes the stepper coil by "Wireless operation", thus holding the stepper coil closed for the duration of the long pulse. The balance of the cycle of operation is identical for three wire or wireless as follows:

Contacts 1 and 2 actuated by the stepper arm complete the circuit to energize the timing relay coil. When the timing relay closes, it closes its contacts 1 and 2 and 5 and 6 and opens its contacts 3 and 4 which isolate the selector magnet registering circuits. Its contacts 1 and 2 complete the circuit to energize the release latch relay. Its contacts 3 and 4 (normally closed) complete the registering circuit through contacts 1 and 2 of the release latch relay, to a selector magnet in the phonograph when the timing relay is released. Contacts 5 and 6 of the timing relay complete the D.C. circuit through normally closed contacts 5 and 6 of the pulse relay, to energize the stepper coil. This circuit being interrupted by the selector contact switch in the wallbox. The number of impulses received by the stepper is determined by the selected number at the wallbox. The timing relay and the release latch relay are equipped with copper slugs. These slugs have a definite action on the relays. They are large shorted turns on the poles of the magnets of the relays. When the relay coils are energized, the slugs store up energy. This energy is discharged slowly which delays the releasing of the armature from the pole piece. The timing relay and the release latch relay have approximately the same slugs. They are provided to hold the relays closed between pulses. The timing relay is energized by pulses delivered through contacts 1 and 2 of the stepper coil while the release latch relay is energized constantly through contacts 1 and 2 of the timing relay as long as the timing relay is closed. After pulses cease, the dissipation of energy in the slugs of the timing relay takes place. This means the timing relay opens first, closing its contacts 3 and 4 which through contacts 1 and 2 of the release latch relay give a positive impulse to a selector magnet in the phonograph and completes the circuit registering a play on the electric counter. At this time, the slugs in the release latch relay have dissipated their energy allowing the relay to open to release the stepper contact arm pawl and at the same time, opens its contacts 1 and 2 to break the common circuit to the selector magnet in the phonograph. The stepper arm is then restored to a rest or starting pos tion through spring loading.

CYCLE OF OPERATION FOR THREE WIRE WALLBOX

INTRODUCTORY

The Wurlitzer Three Wire Remote Control System provides for transmission of pulses through a three wire cable connected directly to the Model 219 Impulse Stepper in the phonograph. The cable also conducts power to the wallbox; no other wiring is required.

The power for the first long pulse is obtained from the wallbox transformer 24 volt secondary winding and the stepper transformer 24 volt phase winding. Additional pulses are obtained through D.C. power delivered from the selenium rectifier in the stepper. The pulses actuate the impulse stepper directly, stepping the stepper arm to the desired selection.

CYCLE OF COIN REGISTRATION

The coin disc contact arm in its *at rest* position, sets up a circuit for the 5¢ or 10¢ or 25¢ coin switch and the coin relay. When a coin is inserted it passes through the slug rejector and falls against the coin switch. The coin switch closes, thus closing the coin

relay. (See Figures 9, 10 and 11.) This relay interlocks through contacts 1 and 2 until near the end of the revolution when the release switch opens it. When the coin relay closes the motor is started through contacts 3 and 4, the register circuit is completed through contacts 7 and 8 and the selector circuit is isolated through contacts 5 and 6. When the coin relay is energized, contacts 5 and 6 break the selection circuit while the coins are being registered.

The coins are held on the coin switch by the coin gate, as the coin disc contact rotates in a clockwise direction from the *at rest* position. The coin switch, which is still closed, is disconnected from the coin relay circuit (Segment A of coin disc) and connected into the accumulator coil

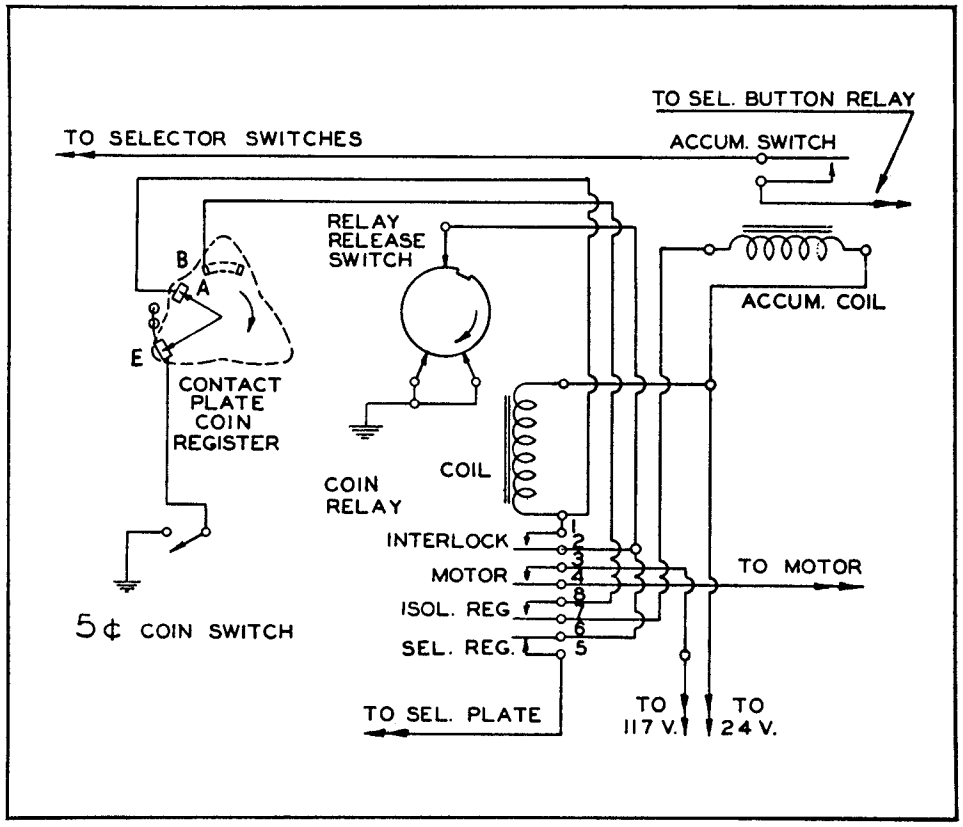


Figure 9—Five Cent Coin Registration Schematic

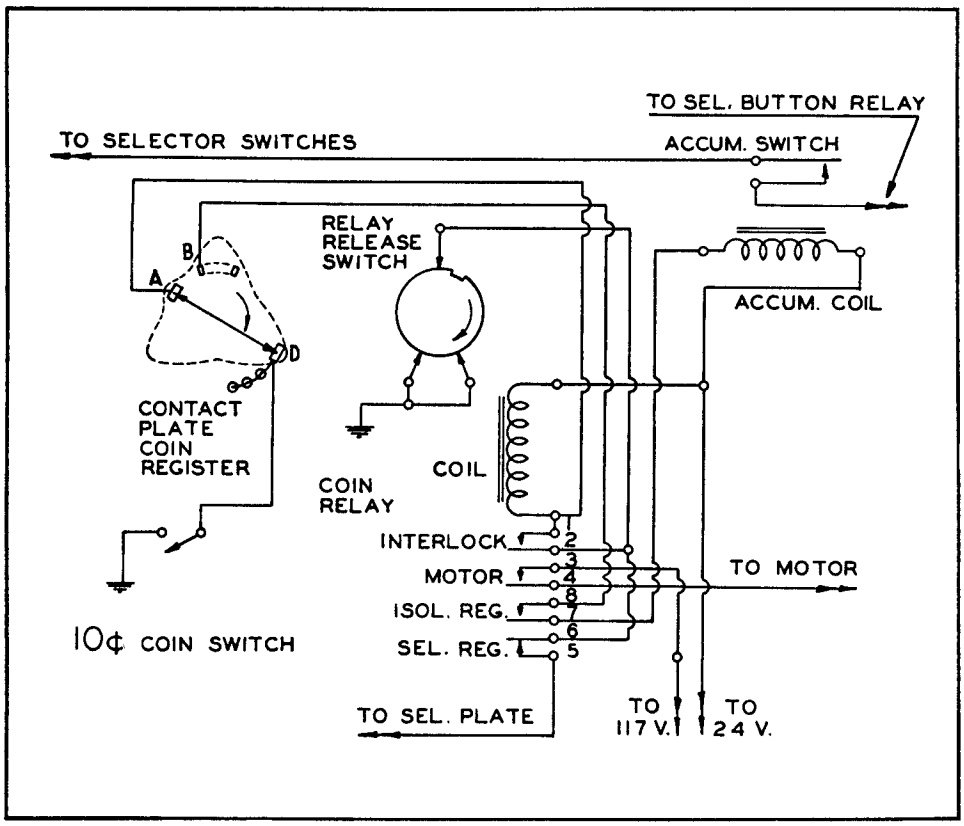


Figure 10—Ten Cent Coin Registration Schematic

circuit (Segment B of coin disc.) If a quarter is inserted, six 24 volt A.C. pulses are sent to the accumulator coil moving the ratchet wheel six teeth. (See Figure 11.) If a dime is inserted, three 24 volt A.C. pulses are sent moving the ratchet wheel three teeth. (See Figure 10.) If a nickel is inserted, two 24 volt A.C. pulses are sent moving the ratchet wheel two teeth. (See Figure 9.) After the money is registered, the coin gate opens through the action of a cam controlled by the motor. This allows the coin to drop into the cash box, thereby opening the coin switch. Further action of the cam actuates the cancel lever, canceling the ratchet wheel one tooth. This leaves five registrations if a quarter has been inserted, two registrations if a dime has been

inserted, or one registration if a nickel has been inserted. Near the end of the cycle, the release switch rotates to its open segment, releasing the coin relay. The full cycle switch keeps the motor running until the open segment is reached, thus stopping the motor. When the motor stops, the contact arm is *at rest* on contacts H and F of the contact disc.

After a nickel, dime or quarter has been registered on the ratchet wheel, the accumulator switch is closed. The contact arm, *at rest* on disc contacts H and F, completes the circuit through the accumulator switch to energize the selection button relay coil. This relay remains energized until released by the release switch, at the time it reaches the open segment. The wallbox is now ready for a selection to be made.

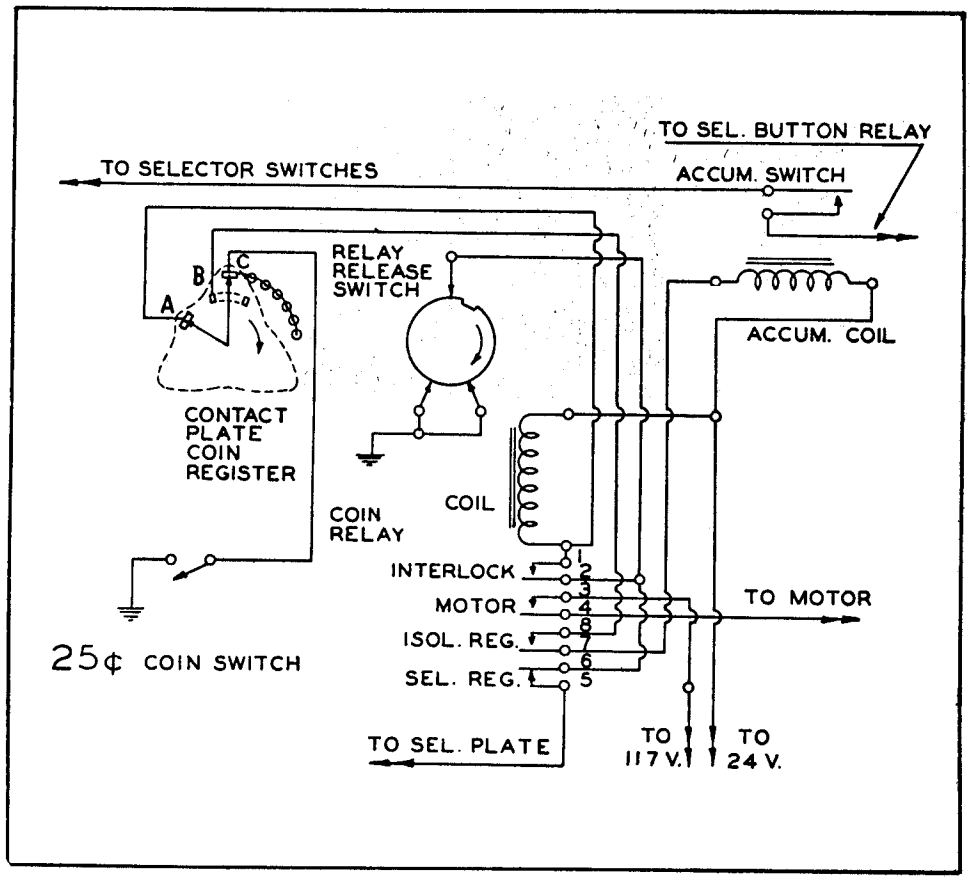


Figure 11—Twenty-Five Cent Coin Registration Schematic

* * * *

CYCLE OF SELECTION

After a coin has been inserted and registered, the wallbox is ready for a selection. When any one of the 24 selector buttons is depressed, the following cycle takes place.

The coin relay remains open, keeping the selector circuit closed through normally closed contacts 5 and 6. (See Figure 5.) The motor is started by the 117 volt contacts on any one of the selector switches which are in series with contacts 3 and 4 of the selector button relay and in parallel with the full cycle switch. The selector buttons are latched mechanically through cam action powered by the motor. The selector contact arm rotates to complete the long pulse circuit through contacts I and G on the selection plate and through the 24 volt secondary of the wallbox transformer. This long pulse closes the pulse relay in the impulse stepper. (See Figure 12.) This action closes contacts 4 and 5 of the pulse relay, completing the circuit to actuate the stepper coil which is powered by D.C. from the selenium rectifier in the stepper. This advances the stepper arm one position The action of the stepper ratchet closes the stepper switch contacts 1 and 2 completing the D.C. circuit to actuate the timing relay. This action closes contacts 1 and 2 of the timing relay which completes the D.C. circuit to energize the release latch relay.

After the wallbox selector contact arm has delivered the long A.C. pulse and the stepper relays are energized, the selector contact arm begins its action as an impulse switch to actuate the stepper coil. Current is now being supplied over wires 1 and 2 of the three wire cable to the wallbox from the selenium rectifier in the stepper. For each impulse made by the selector contact arm, the stepper arm is advanced one position. When the selector arm in the wallbox reaches the desired selection, the remaining contacts, if any, on the selector plate are open and no further impulses can be made. The stepper arm stops and is held on the desired contact of the stepper switch by the release latch relay. Since no more impulses can be delivered beyond the desired selection point, the timing relay is de-energized and opens. While the timing relay is open and the release latch relay is closed, a circuit is completed to the desired selection magnet through contacts 3 and 4 on timing relay and contacts 1 and 2 of release latch relay. The release latch relay then releases and permits the stepper arm to return to the *at rest* position by spring loading.

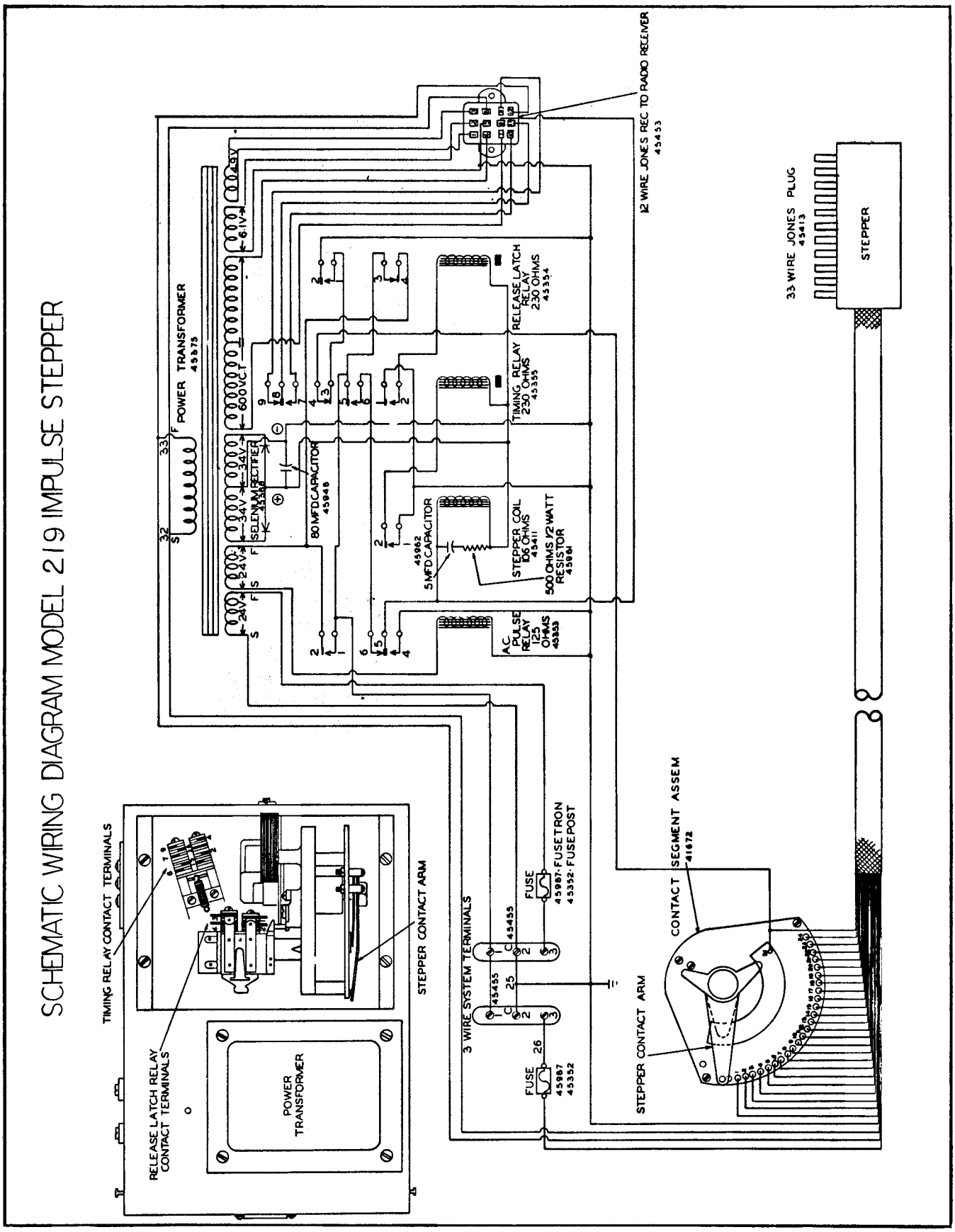


Figure 12—Model 219 Impulse Stepper Schematic

COIN SELECTOR MECHANISM

The 5, 10 and 25 cent coin selector is built into a single unit, all coins having a common entrance. The coin immediately encounters a weighing device which rejects light slugs and determines the path for 5, 10 and 25 cent coins to pass through the mechanism (See Figure 13.) A wire stop takes out any slugs having a hole in the center, such as washers. The sizing gauge eliminates thick slugs. Steel slugs are ejected by the action of a wiping blade moved by the linkage from the reject button at the coin entrance. The coins are guided through, against or past gauges as determined by their speed and are controlled by the action of the magnetic field on them.

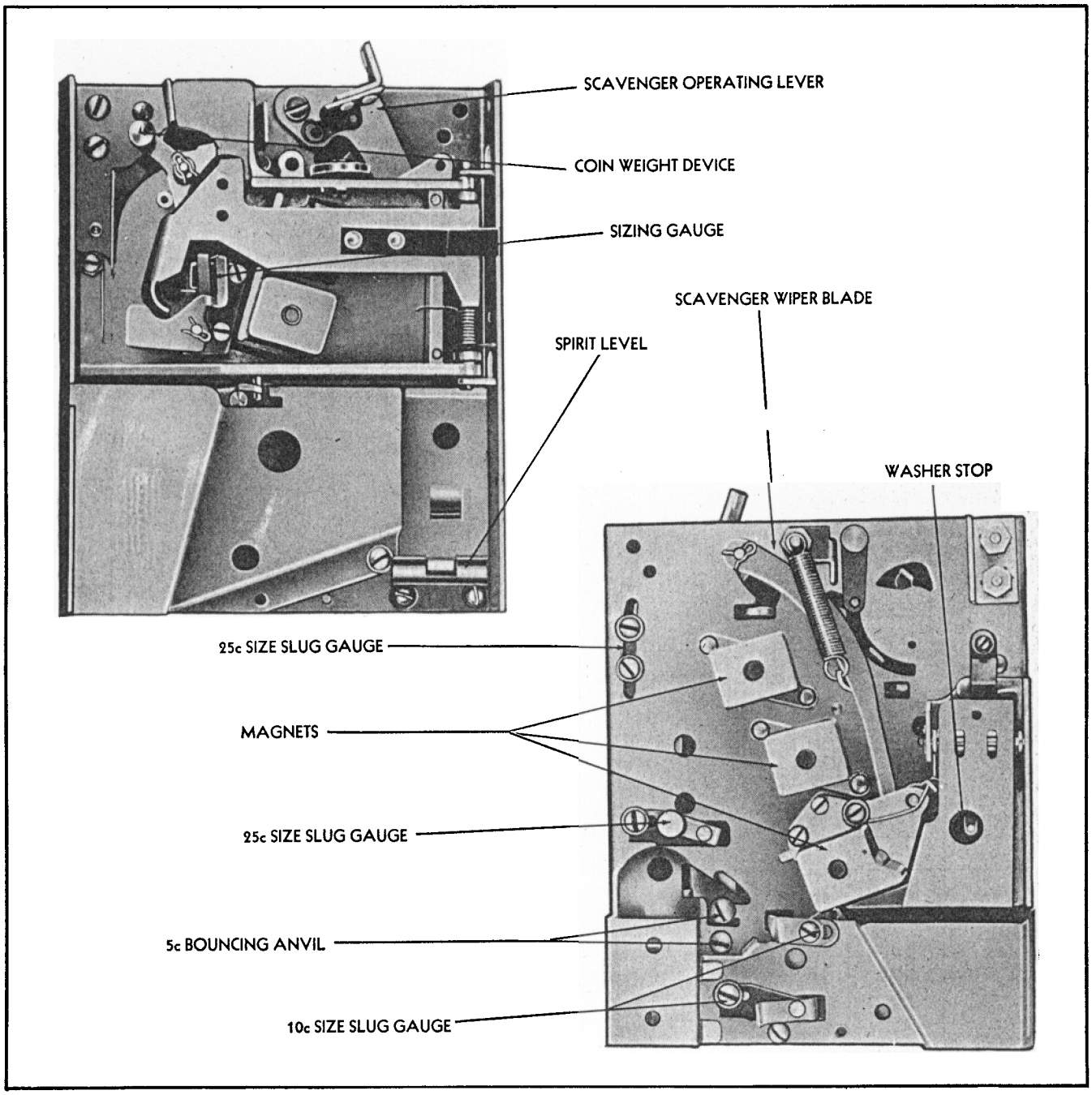


Figure 13—Coin Selector Mechanism

SECTION II
INSTALLATION

THREE WIRE INSTALLATION

1. Unlock and remove the cover of the wallbox.
2. Remove the program holder.
3. Unlatch and swing open the inside door.
4. Remove the 6 prong plug connecting the inner door mechanism to the mounting base.
5. Lift the inner door assembly from the pin hinges and lay it face down on the selector buttons (carefully).
6. Insert the grommet with the proper hole size to accommodate the size wire used. Two sizes of grommets are supplied.
7. Mount the wallbox base to wall in a level position, with suitable sized mounting screws. Use two top screws and one bottom. There are two knockouts at points where wires may enter the box. Ascertain which point is most desirable and knock out a plug accordingly.
8. Extend cable from terminals 1, 2 and 3 on wallbox to 1, 2 and 3, respectively, on stepper.
9. Two sets of terminals, or two circuits, are provided on stepper. Wire boxes in parallel, up to five boxes on a single circuit, from the stepper.
10. No fuse or line cord is needed for three wire operation. Power is supplied from the phonograph.
11. Test each wallbox for proper selection.
12. If more than 8 wallboxes are required in a location, add a Model 222 Booster Transformer. This will handle an additional 4 wallboxes.

TWO WIRE INSTALLATION

Use Kit No. 43, Part No. 46285, to convert Model 3020 Wallbox for Two Wire Operation.

1. Mount base as described in Steps 1 thru 7 above.
2. Install suitable grommet, Part No. 45687 or 45682.
3. Install line cord, Part No. 46224, to terminals marked line. The plug must be properly polarized. If wallbox fails to operate reverse plug. Install cable clips, Part No. 45253, to properly anchor line cord.
4. Install 1 Amp Fuse, Part No. 29532.
5. Insert 11 Prong Plug, Part No. 46421.
6. Connect 2 wire cable from terminals 1 and 2 in the wallbox to terminals 1 and 2 on the stepper.

WIRELESS INSTALLATION

The Model 3020 Wallbox is also used for wireless operation. All wallboxes and the phonograph must operate from a common power supply and on the same frequency. They are each plugged into a 60 cycle outlet.

1. Requires a Model 215 Impulse Transmitter for each wallbox.
2. Requires a Model 216 Impulse Receiver to be installed in the phonograph.
3. Install the Model 216 Impulse Receiver in the phonograph by plugging it into end of stepper and securing the latches.
4. Mount the wallbox base as described in Three Wire Installation, Steps 1 thru 7.
5. Install a 1 Amp. fuse and connect the line cord to the terminals marked "Line," a fuse and cord is furnished with each transmitter.
6. Remove the 11 prong plug located below the coin selector mechanism.
7. Plug in the Model 215 Impulse Transmitter and insert and secure the knurled thumb screw.
8. Check the frequency switch, located between the tubes on the transmitter. It should be set to the color corresponding to the crystal color. (Red)

TUNING OF MODEL 216 IMPULSE RECEIVER

1. Insert a 6U5/6G5 tuning eye tube in the 6U5 socket of the receiver.
2. Select one of the wallboxes in the system and turn the main switch "On" to furnish power to the transmitter.
3. Remove the wallbox cover and open the inner door.
4. Throw the tuning switch to "Tune" position. (Up position) (See Figure 7.) The wallbox is now transmitting a steady signal to the receiver.
5. Turn the sensitivity control on the receiver in the phonograph, clockwise to its farthest point. (Point 100)
6. Set the switch on the No. 1 transformer of the receiver to the "N" position. (See Figure 8.)
7. Adjust the four trimmers to cause the eye to close.
8. Turn the sensitivity control 10, 15 or more points on the dial in a counter-clockwise direction to again open the eye.
9. Adjust the four trimmers to again close the eye.
10. Continue backing-off on the sensitivity control and adjusting the trimmers until the best peaking is obtained. The farther counter-clockwise the sensitivity control, the less sensitive the receiver will be to extraneous noises and interfering signals on the A. C. power line. (See Operation of Model 216 Impulse Receiver, pages 3 and 7.)
11. Set the switch on the No. 1 transformer to "B" position.

Note

It is important to remember that merely getting the tuning eye to close does not mean the receiver is tuned. The receiver can be considered tuned only when the eye is open very slightly and further adjustment of the four trimmers will not cause it to close farther.

CHANGING FREQUENCY OF MODEL 215 IMPULSE TRANSMITTER

Should it be necessary to change the frequency on a wireless wallbox system, due to inter-location interference, it is only necessary to change the crystals in the transmitters of each wallbox on the system (Blue or yellow crystals supplied by your Distributor) and to retune the receiver by adjusting the receiver trimmers as outlined afore to the frequency of the new crystals installed.

In changing from red to blue or yellow, turn the sensitivity control *clockwise.* Back-off slightly on all receiver trimmer screws, counter-clockwise, in sequence and in equal amounts and repeat until the eye begins to close; then proceed to align as described afore. In case it is desired to change from yellow to blue or from blue to red, the receiver trimmer screws should then be turned in the clockwise direction in equal amounts until the eye begins to close, after which the alignment procedure should be followed.

If a yellow crystal is used, turn the frequency switch on transmitter to the position marked "Yellow." If a blue crystal is used, turn frequency switch to position marked "Blue." (See Figure 14.)

USE OF BRIDGING CONDENSER NO. 39851

When the power lines consist of three wires, one of which is grounded and the others have a potential of 110 volts to ground, or when outlets on a location are separated by one or two watt-hour meters it is usually advisable to have a qualified electrician install a bridging condenser to provide an easy path for the wireless signals. Otherwise, it may not be possible to operate the wireless selector on the opposite sides of the lines or the watt-hour meters.

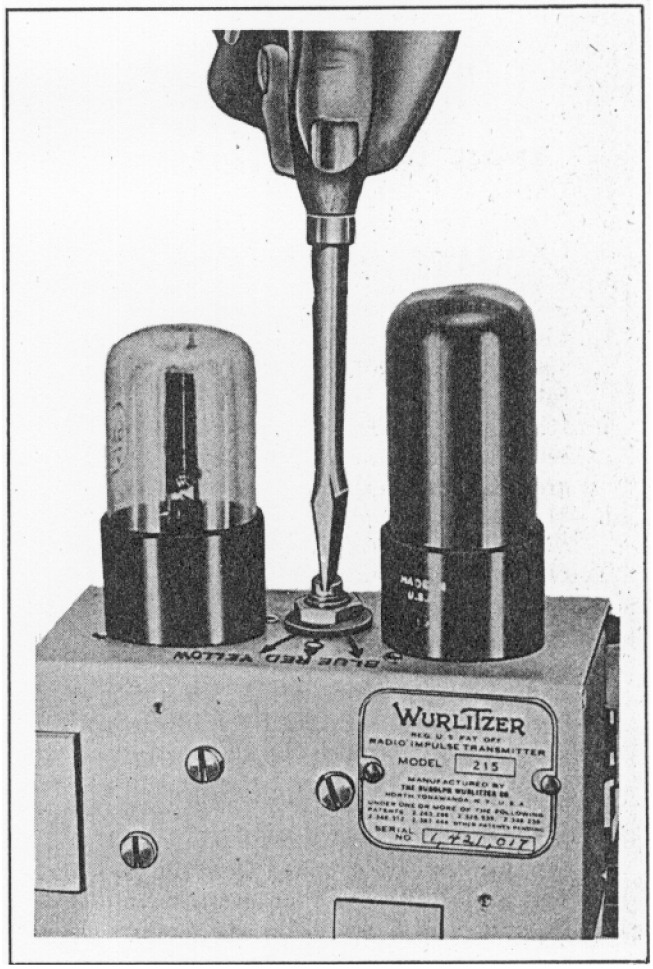


Figure 14—Setting Frequency Switch

Figures 15 and 16 show Bridging Condenser No. 39851 in place on these two types of installations.

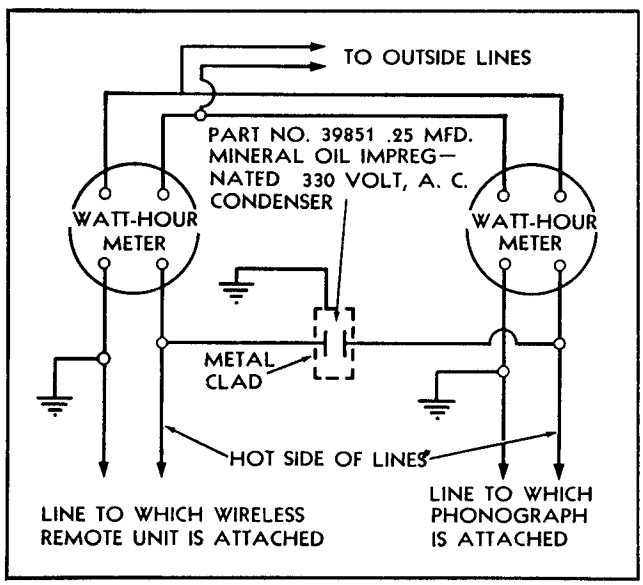


Figure 15—Installation of Wireless System on Power Lines Separated by Individual Watt-Hour Meters

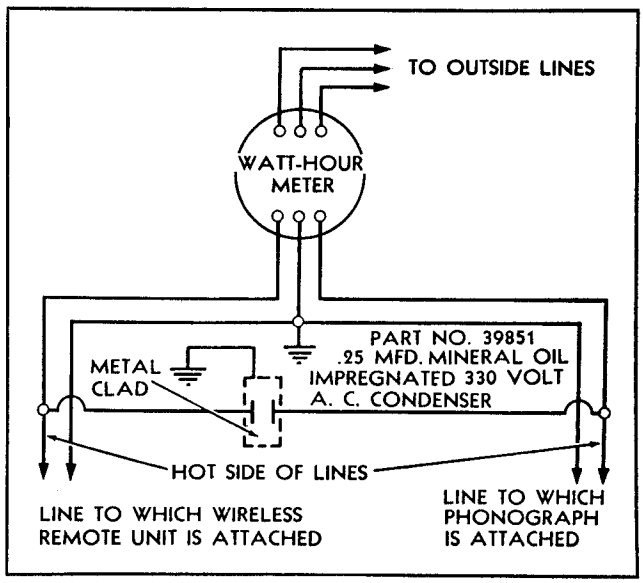


Figure 16—Installation of Wireless System on Power Lines Using Three Wires

SECTION III
ADJUSTMENTS

MODEL 3020 WALLBOX

COIN SELECTOR MECHANISM ADJUSTMENT

If 25 cent size brass, lead, zinc or german silver slugs are accepted, move the adjustment down. If it is moved too far, quarters will be rejected. See the top left corner of Figure 17. To control the rejection of 25 cent size copper slugs, adjust the lower gauge indicated in Figure 17. Move it in or out; if it is moved too far out, however, quarters will also be rejected.

The upper of the two 10 cent gauges controls the rejection of the 10 cent size brass, lead, zinc or german silver slugs. If slugs of this type are being accepted, move the gauge in. If it is moved too far in, however, dimes will be rejected. For copper slugs of the 10 cent size, adjust the lower gauge out to reject. If it is moved too far, dimes will be rejected.

No adjustment is necessary for the 5 cent coins. If nickels are rejected, clean all parts of the mechanism thoroughly with alcohol, gasoline, or carbon tetrachloride; wipe all parts dry. It should not be necessary to remove the magnets. However, if they are taken off, extreme care should be exercised so that each is put back in its original position.

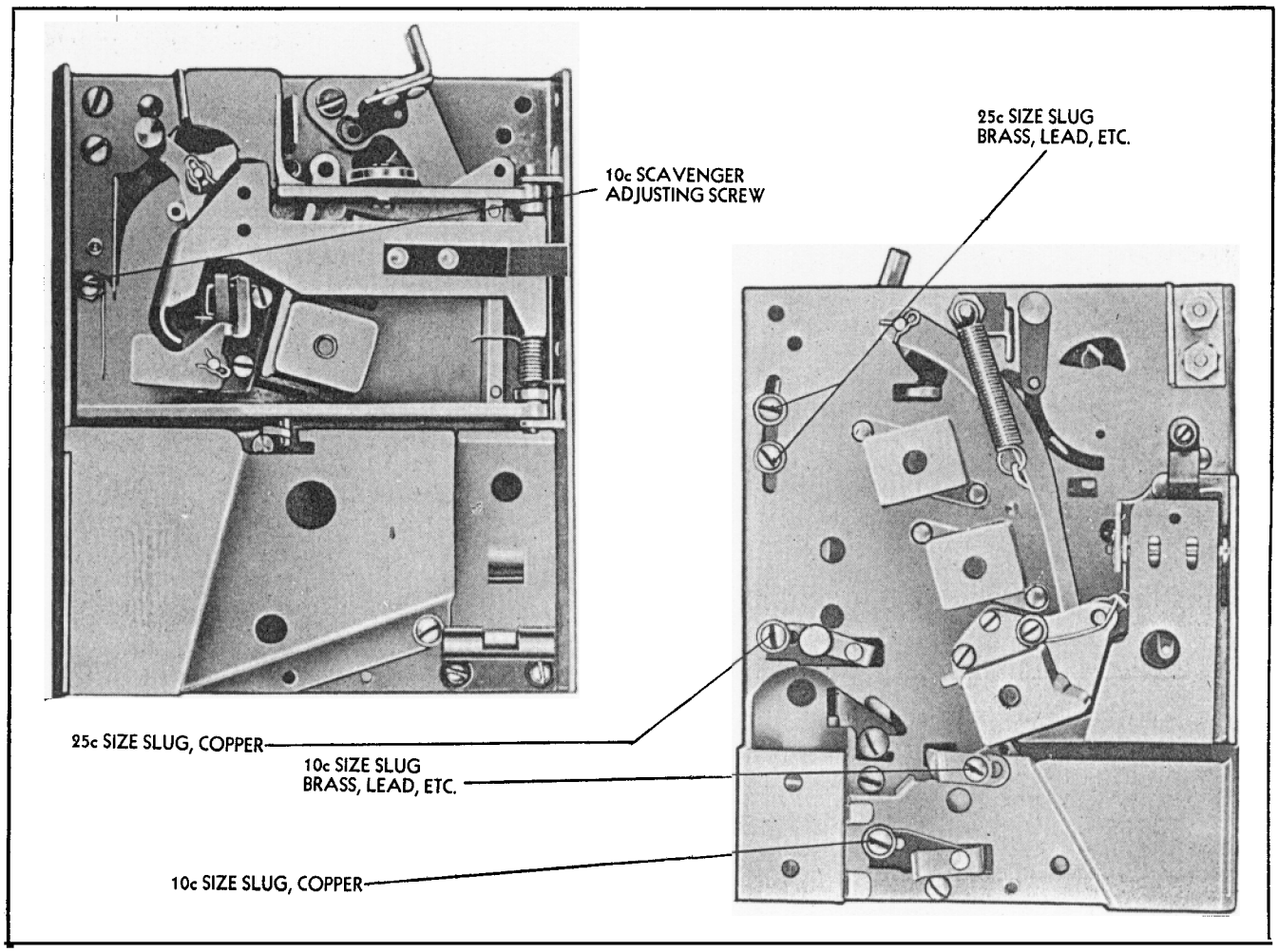


Figure 17–Coin Selector Mechanism Adjustment

COIN GATE ADJUSTMENT

The coin gate is adjusted with the motor in the cut-off position. Loosen the set screws in the hub of the coin gate. (See Figure 18.) Insert a screw driver in the slot in the end of the coin gate shaft and turn counter-clockwise to take up lost motion in the actuating levers. Position the coin gate to obtain a .003-inch clearance between the gate and the coin selector mechanism. While holding the gate at this point, tighten one set screw. Make certain that the slots in the lower end of the coin gate line up with the coin exits in the slug rejector before tightening the second set screw. The 10¢ coin exit is most critical in this respect. Make sure that the gate will hold the 10¢ coin and release it properly when the motor is energized.

COIN SWITCH ADJUSTMENT

NOTE

Be certain that the coin gate is in proper adjustment before adjusting the coin switches or coin lever stops.

With the motor in a cut-off position, adjust the coin lever stops, by bending, to retain the coins properly between the coin gate and coin lever. (See Figure 19.) When a coin passes through the slug rejector and forces a coin lever against the stop, the coin switch contacts must be closed. When adjusting the coin switch contacts, care should be taken to procure a wiping action of the blades to keep the contacts clean.

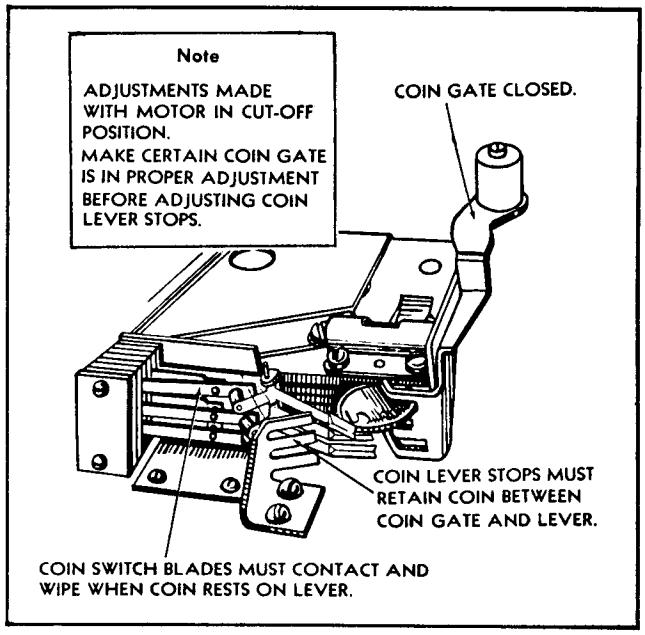


Figure 19—Coin Switch Adjustment

Following adjustment always actuate the motor to make certain that all denominations of coins will drop free when the coin gate is opened.

SELECTOR SWITCH LOCKING BAR ADJUSTMENT

Adjustment of the selector switch locking bars is made with the motor in the cut-off position. Loosen

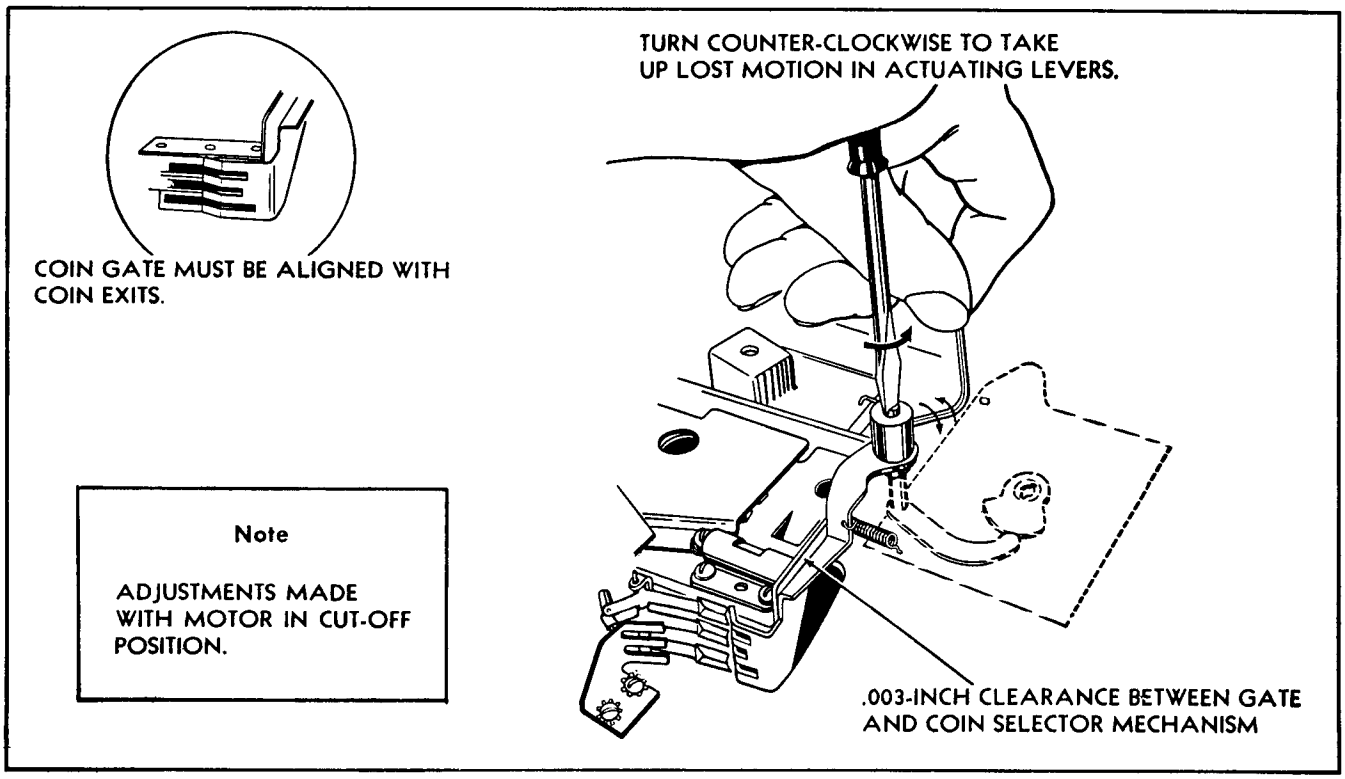


Figure 18—Coin Gate Adjustment

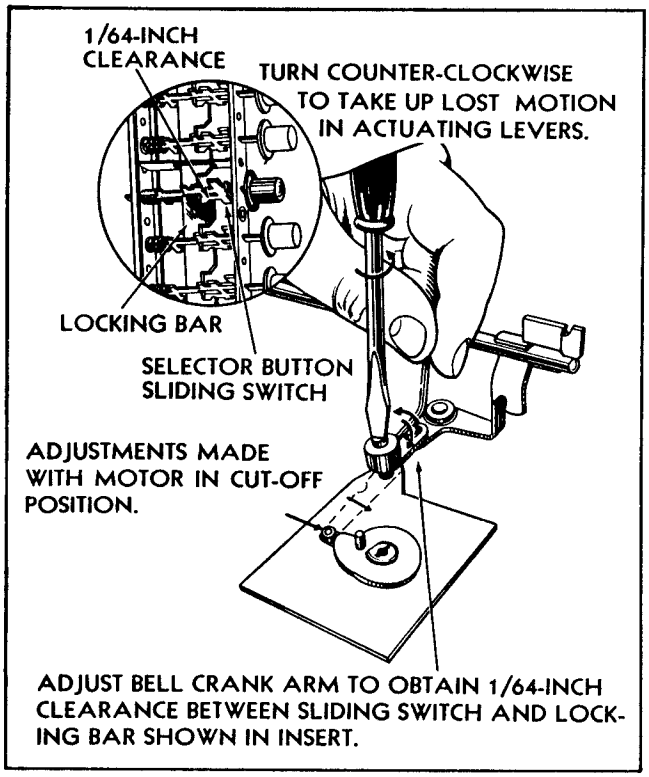


Figure 20—Selector Switch Locking Bar Adjustment

the set screws on the hub of the bell crank arm. (See Figure 20.) Insert a screw driver in the slot in the end of the bell crank shaft and turn counter-clockwise to take up lost motion in the linkage. While holding the shaft in this position, rotate the bell crank arm on the shaft to provide a 1/64-inch clearance between the sliding selector button switch and the locking bar, shown in the insert in Figure 20. While holding the shaft and the bell crank arm in this position, tighten the set screws.

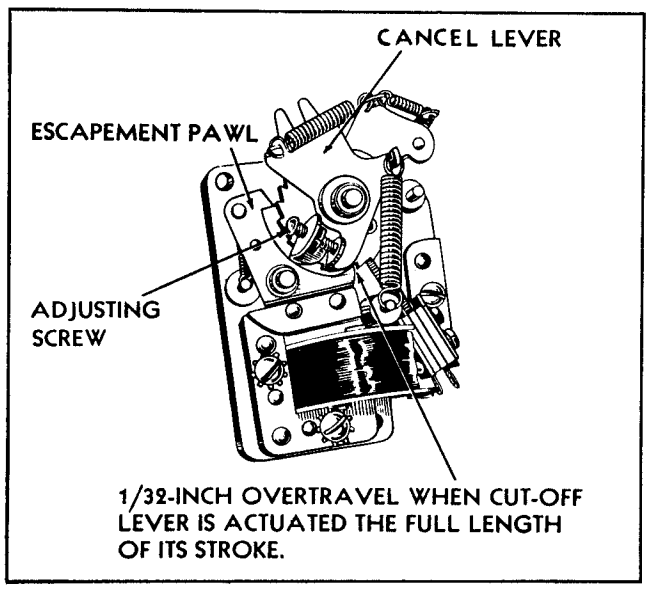


Figure 21—Accumulator Adjustment

ACCUMULATOR ADJUSTMENT

Before adjusting the accumulator, cancel all registered trips from the wheel and turn the main line switch on the wallbox to the "off" position. Trip one play onto the accumulator wheel manually. (See Figure 21.) Rotate the selector contactor arm manually to actuate the cancel lever of the accumulator to its maximum throw. Position the adjusting screw to provide 1/32-inch overtravel of the ratchet wheel. This will give 1/32-inch clearance between the tooth of the wheel and the point of the escapement pawl. When the desired adjustment is obtained, tighten the lock nut on the adjusting screw.

SELECTOR BUTTON RELAY ADJUSTMENT

NOTE

In setting relay contact blades, a special blade setter should be used. They may be purchased from your Distributor. When adjusting the contact blades, always adjust at the point nearest the insulated piece.

The selector button relay contains 3 pairs of normally opened contacts. With the armature held against the pole piece, set the short contact blades to such a position that they are deflected from .010 to .0 15-inches by the long blades. When the relay is in a normally open position the long switch blades, extending through the armature bakelite plate, should be tensioned slightly against the upper side of the slot in the bakelite plate.

NOTE

Do not change the tension of the armature spring.

COIN RELAY ADJUSTMENT

The coin relay contains 4 pairs of contacts. (See Figure 22.) Contacts 1 and 2, 3 and 4 and 7 and 8 are normally open. Contacts 5 and 6 are normally

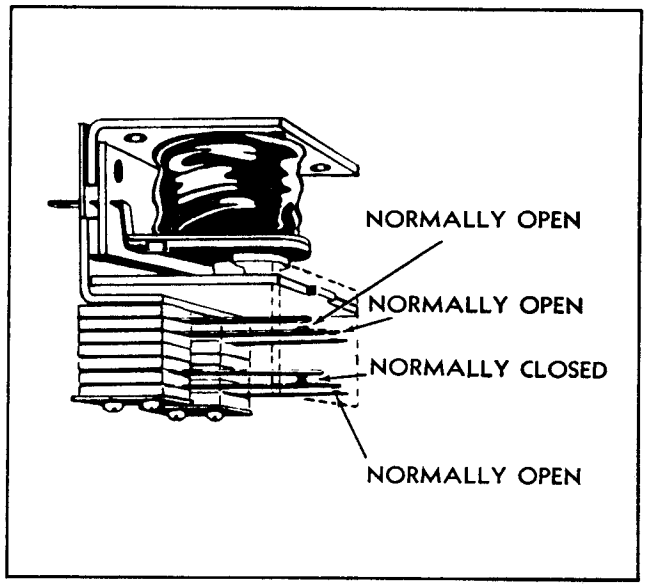


Figure 22—Coin Relay

closed. With the armature held against the pole piece, set the short contact blades of the normally open contacts to such a position that they are deflected by the long contact blades from .010 to .015-inches. Normally closed contacts 5 and 6 should now be open and upon releasing the armature they should be set so that the short blade (contact 5) is deflected by the long blade (contact 6) approximately .010 to .015-inches.

When the relay is in a normally open position the long switch blades extending through the armature bakelite plate should be slightly tensioned against the upper side of the slot in the bakelite plate.

NOTE

Do not change the tension of the armature spring.

* * * *

MODEL 219 IMPULSE STEPPER

STEPPER CONTACTOR ARM ADJUSTMENT

Adjust the stepper contactor arm by turning the eccentric cam stop to position the contact on the stepper arm long blade to be exactly on the first contact of the segment disc. (See Figure 23.) The stepper arm long blade should not have more than 14 grams and not less than 10 grams pressure. The short blade of the contactor arm should not have more than 18 grams and not less than 14 grams pressure.

STEPPER OPERATING ARM ADJUSTMENT

NOTE

Do not attempt to adjust the stepper operating arm without first checking the adjustment of the stepper contactor arm as mentioned above.

When properly adjusted, the eccentric cam stops A and B, shown in Figure 24, regulate the stroke of the operating arm to prevent stepping more than one step per impulse. Adjust cam stop A to permit the ratchet pawl to engage the proper first tooth on the quadrant gear. Adjust cam stop B to limit the stroke of the operating arm, and ratchet pawl, so that the contactor arm advances only one step through the action of the quadrant gear. When the operating arm is held against the cam stop B, there should be 1/64-inch clearance between the point of the quadrant gear tooth and the point of the ratchet holding pawl.

STEPPER SWITCH ADJUSTMENT

The blades of the stepper switch are normally open. (See Figure 25.) The long blade should at all times bear against the fibre insulator on the operating arm. When the switch is open, the short blade should bear against the center locating blade. At the time the ratchet pawl begins to engage the tooth in the quadrant gear, the long switch blade should begin to deflect the short blade. It is very important that a good wiping action be provided to prevent burning or pitting of the points.

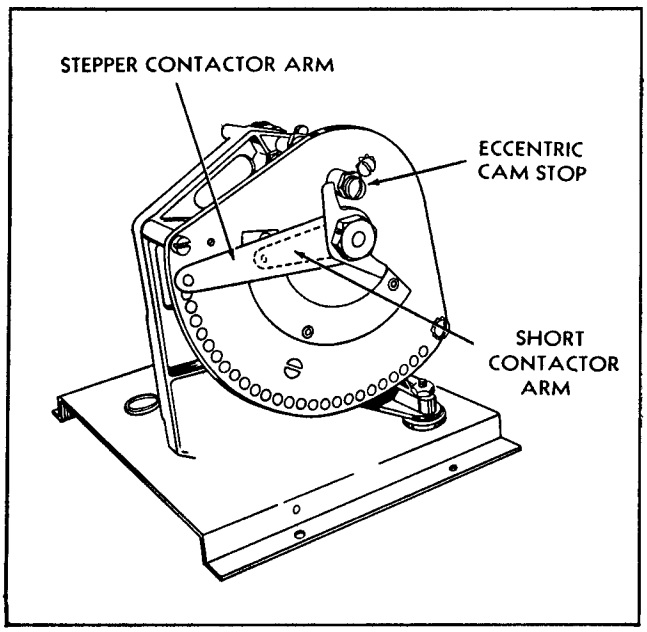


Figure 23 –Stepper Contactor Arm Adjustment

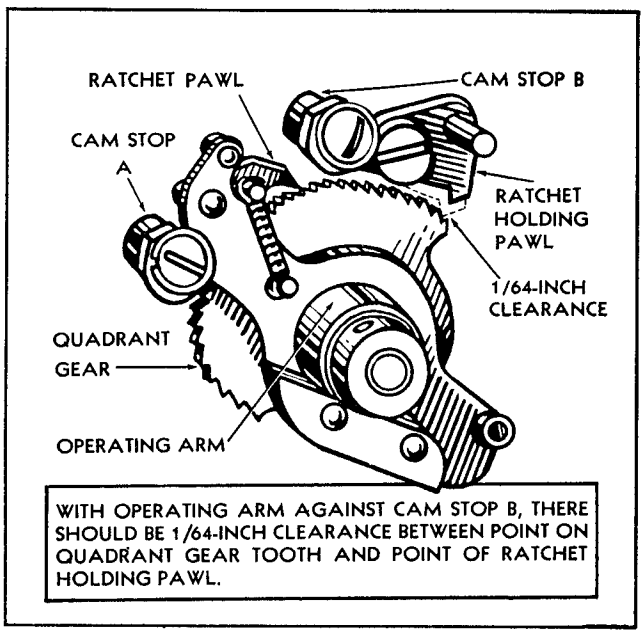


Figure 24 –Stepper Operating Arm Adjustment

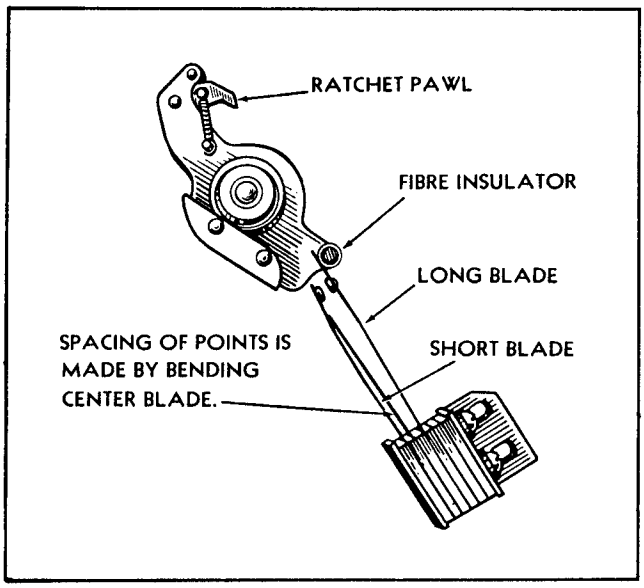


Figure 25—Stepper Switch Adjustment

RELEASE LATCH RELAY ADJUSTMENT

The release latch relay is mounted to an adjustable bracket. Proper adjustment of the relay and bracket permits proper action of the latch pawl, which latches the quadrant gear.

To adjust the relay and bracket, hold the relay armature against the coil pole piece. The flat spring mounted on the armature, bearing against the pin on the ratchet pawl, should lock the point of the pawl into a tooth of the quadrant gear. When the point of the pawl reaches the bottom of the tooth in the quadrant gear, the flat spring on the armature should be deflected slightly. When proper adjustment is obtained, tighten the screws holding the mounting bracket to the base assembly.

NOTE

For additional information on the release latch relay adjustment refer to Figure 26 below.

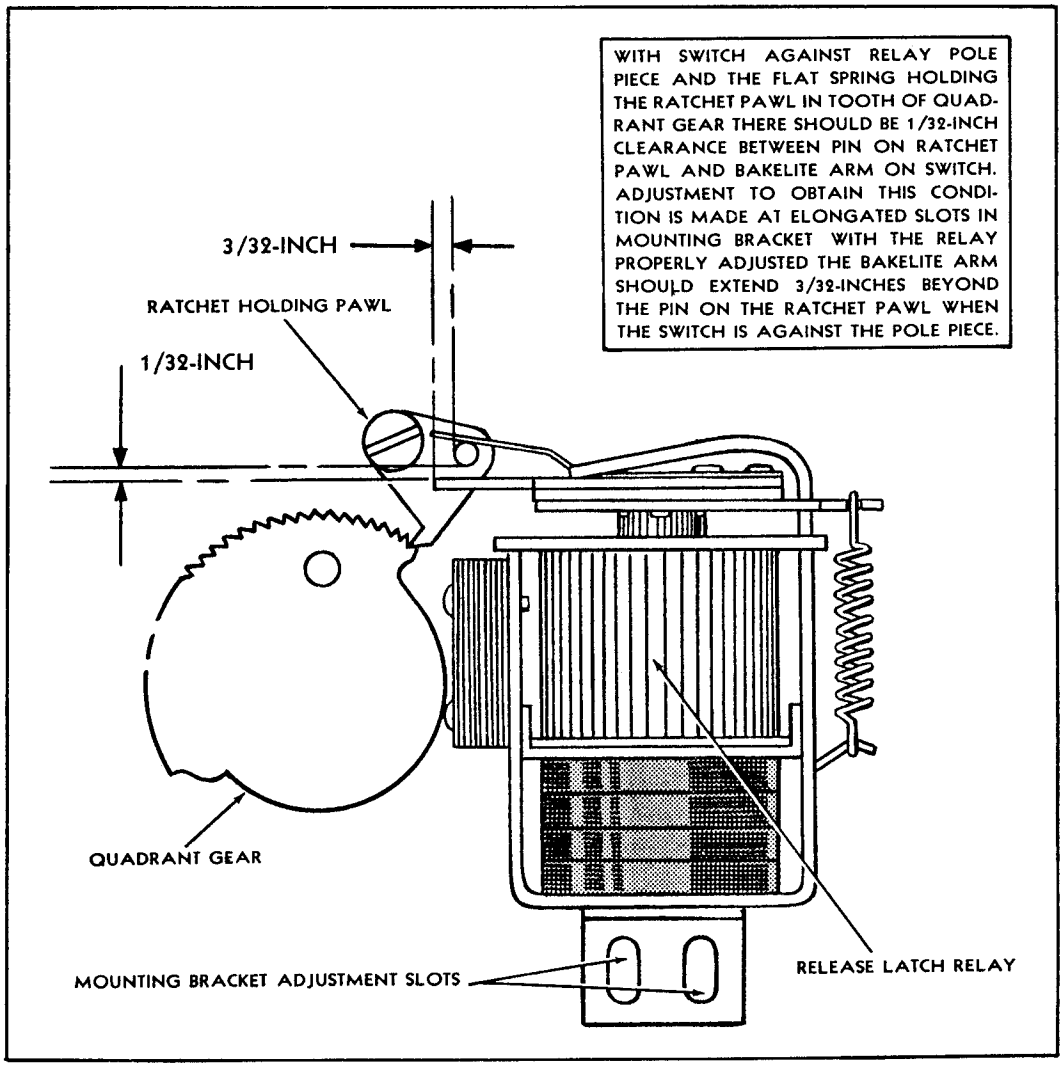


Figure 26—Release Latch Relay Adjustment

SECTION IV
MAINTENANCE

LUBRICATION

WALLBOX

Oil the locking bar shaft assembly, actuating lever, actuating lever pin, connecting arm shaft, coin gate shaft, accumulator wheel shaft, escapement pawl shaft, motor armature shaft and motor main shaft with SAE No. 10 acid free and wax free oil. (See Figure 28.) Lubricate the motor gears and the levers, cams and plate, shown in Figure 28, with Lubriplate No. 105.

IMPULSE STEPPER

Lubricate the ratchet shaft bearing and operating arm bearing with SAE No. 10 acid free and wax free oil. (See Figure 27.)

CLEANING

CONTACT POINTS

All electrical contacts in the wallbox are of solid silver construction. To clean, use carbon tetrachloride and a dry cloth. Do not use abrasive materials for cleaning. The contact points on the impulse stepper should be cleaned in the same manner.

COIN SELECTOR MECHANISM

Never oil the coin selector mechanism. Wipe it clean with a dry cloth. Abrasives may be used if necessary.

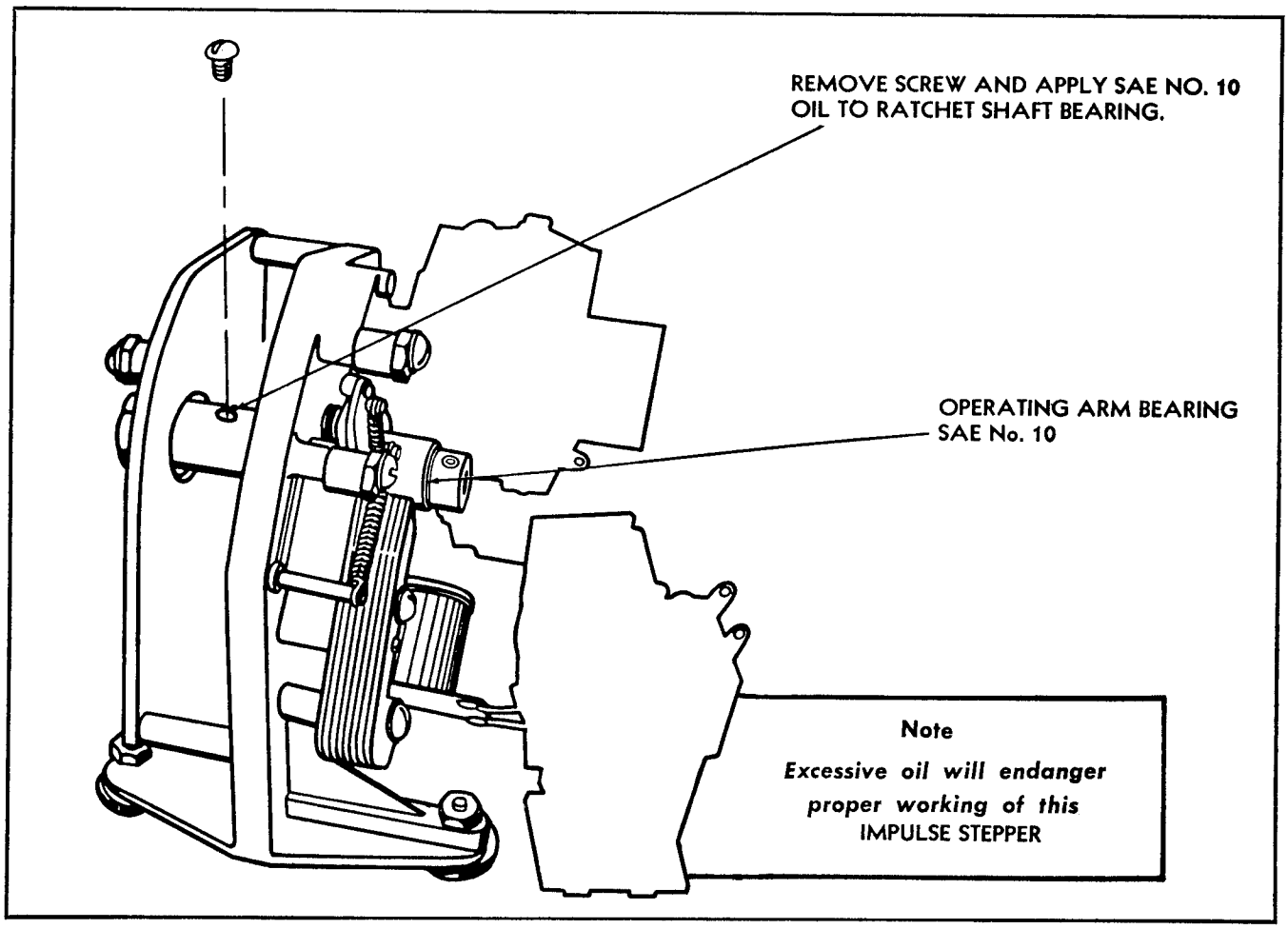
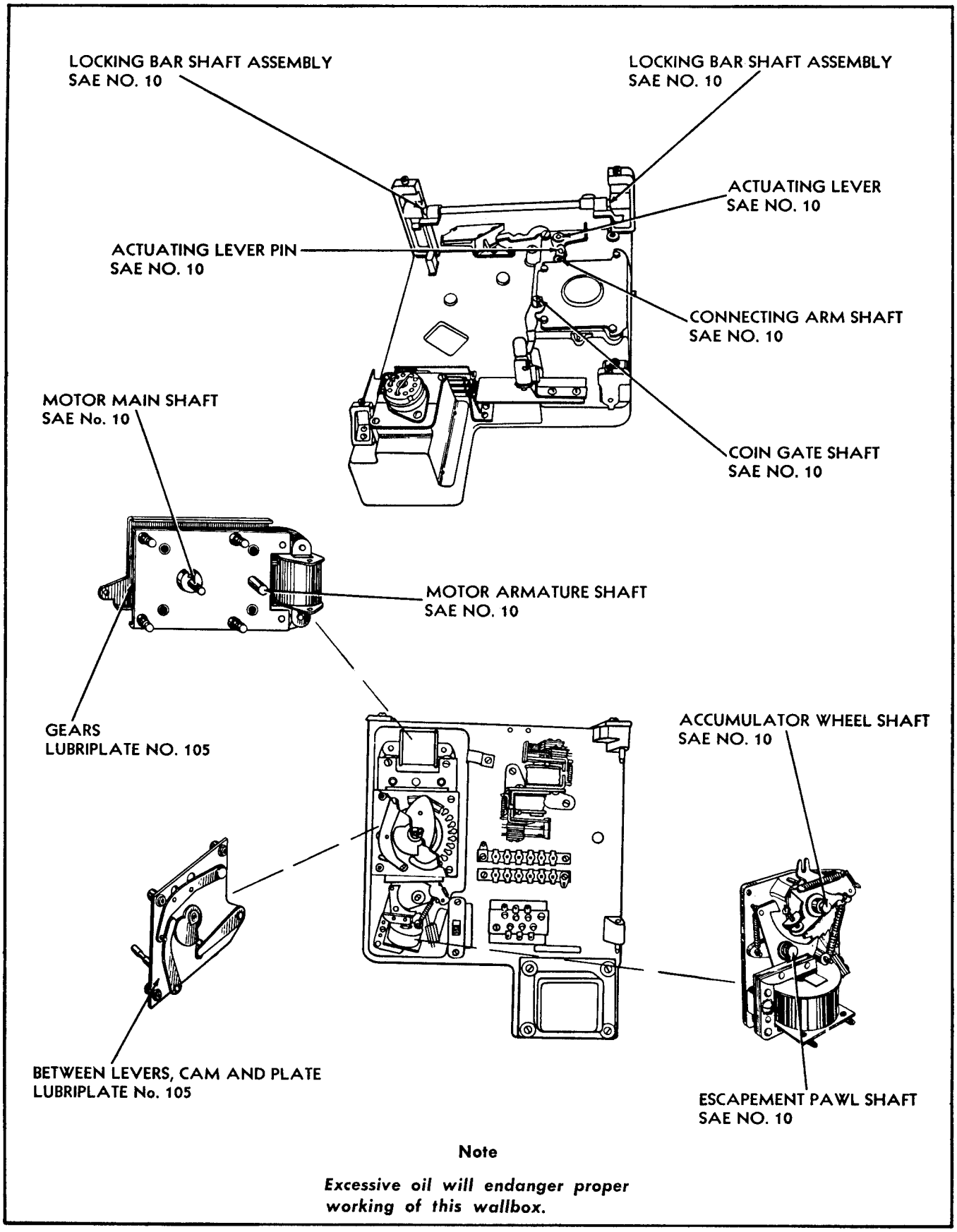


Figure 27—Model 219 Impulse Stepper Lubrication



Note

Excessive oil will endanger proper working of this wallbox.

Figure **28***—Model 3020 Wallbox Lubrication*

PARTS CATALOG

CONTENTS

ALPHABETICAL LIST OF ILLUSTRATIONS

PARTS  CATALOG

INTRODUCTION

This catalog has been compiled to simplify the ordering of parts for the Models 3020 Wallbox, 219 Impulse Stepper, 215 Impulse Transmitter and 216 Impulse Receiver. Its primary purpose is to give the name and part number of each part and to clearly indicate them assembled in their position.

To accomplish this, *Exploded Views* have been used entirely. Assemblies have been "pulled apart" in such a manner that each item is illustrated independently without losing its identity in relation to the complete assembly.

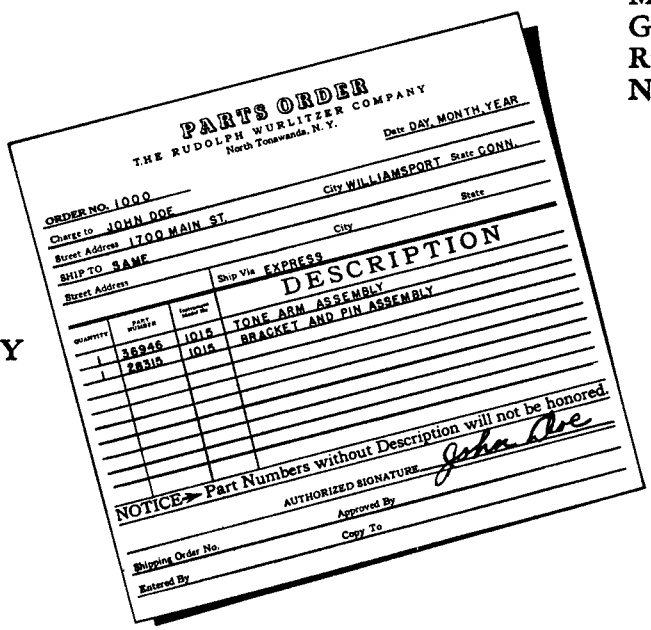
The catalog is arranged in Sections as indicated in the table of contents. This is done to group all related assemblies. The Alphabetical List of Illustrations directly below the table of contents is provided to aid in locating parts.

To find the number of a part, determine its function in the main assembly of which it is a sub-assembly. Locate the figure on which this main assembly is illustrated by referring to the Alphabetical List of Illustrations. If the part is not shown on the figure it is not obtainable and must be procured by purchasing the assembly. Parts of rivet and weld assemblies have not been listed as such parts are not obtainable. When ordering, make sure that the part number which you select includes the entire assembly that you need. It may be necessary to order two or more parts to complete the assembly that you require.

After determining the proper part name and number, fill out the parts orders *correctly* and *completely*. This will avoid delay caused by misunderstood orders and permit prompt and efficient service.

Milton A. Bartels
General Service Manager
Rudolph Wurlitzer Company
North Tonawanda, New York

FILL IN PARTS ORDERS PROPERLY



PARTS ORDER
THE RUDOLPH WURLITZER COMPANY
North Tonawanda, N. Y.

Date DAY, MONTH, YEAR

ORDER NO. 1000
Charge to JOHN DOE
Street Address 1700 MAIN ST. City WILLIAMSPORT State CONN.
SHIP TO SAME
Street Address City State
Ship Via EXPRESS

QUANTITY	PART NUMBER	INSTRUMENT MODEL NO.	DESCRIPTION
			ASSEMBLY
1	36946	1015	TONE ARM ASSEMBLY
1	28315	1015	BRACKET AND PIN ASSEMBLY

NOTICE→ Part Numbers without Description will not be honored.
AUTHORIZED SIGNATURE John Doe
Approved By
Shipping Order No.
Copy To
Entered By

BE SURE TO INCLUDE:

1. Part Number
2. Instrument Model Number
3. Part Name
4. Quantity
5. Authorized Signature

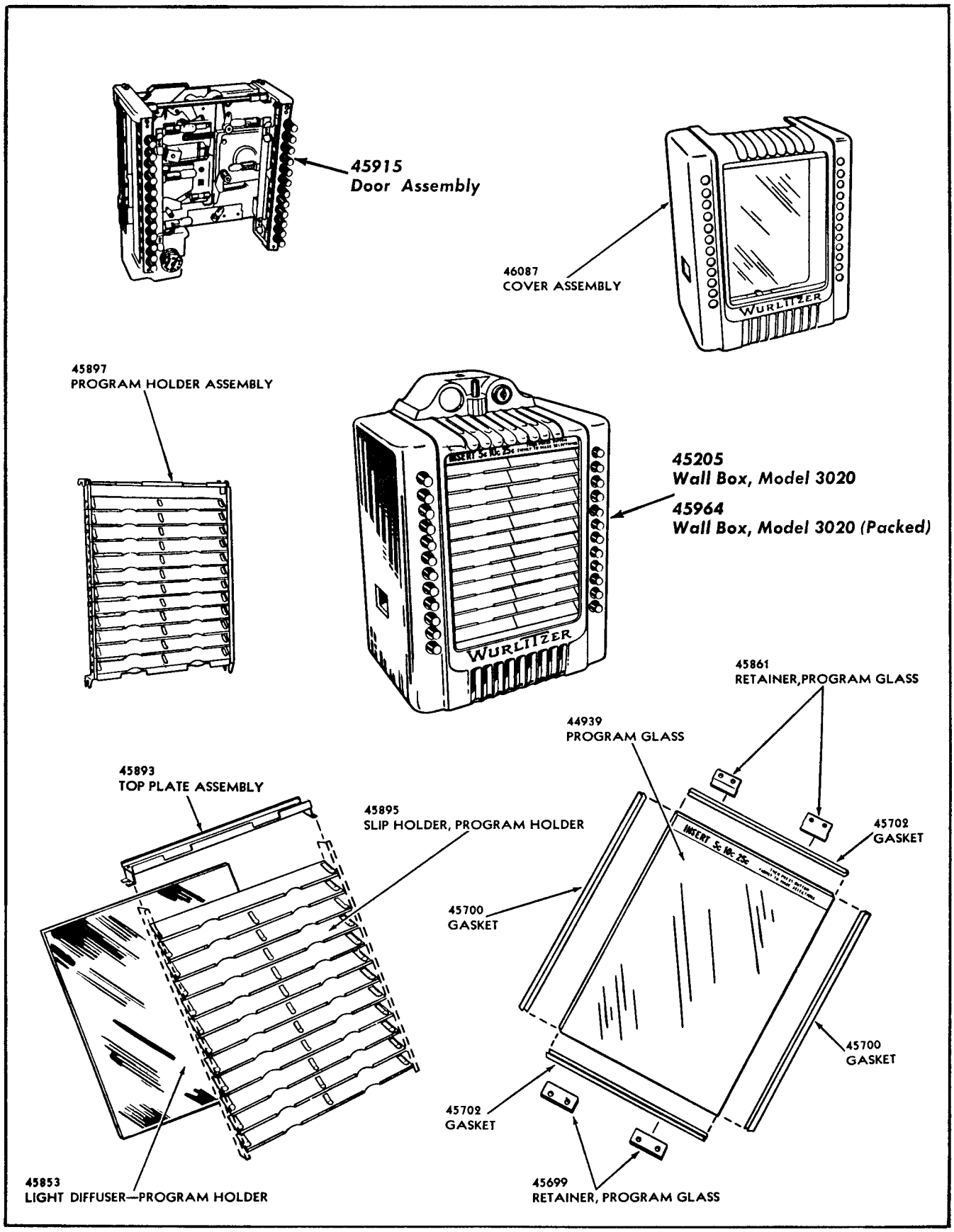


Figure 1—Wallbox, Cover and Program Holder

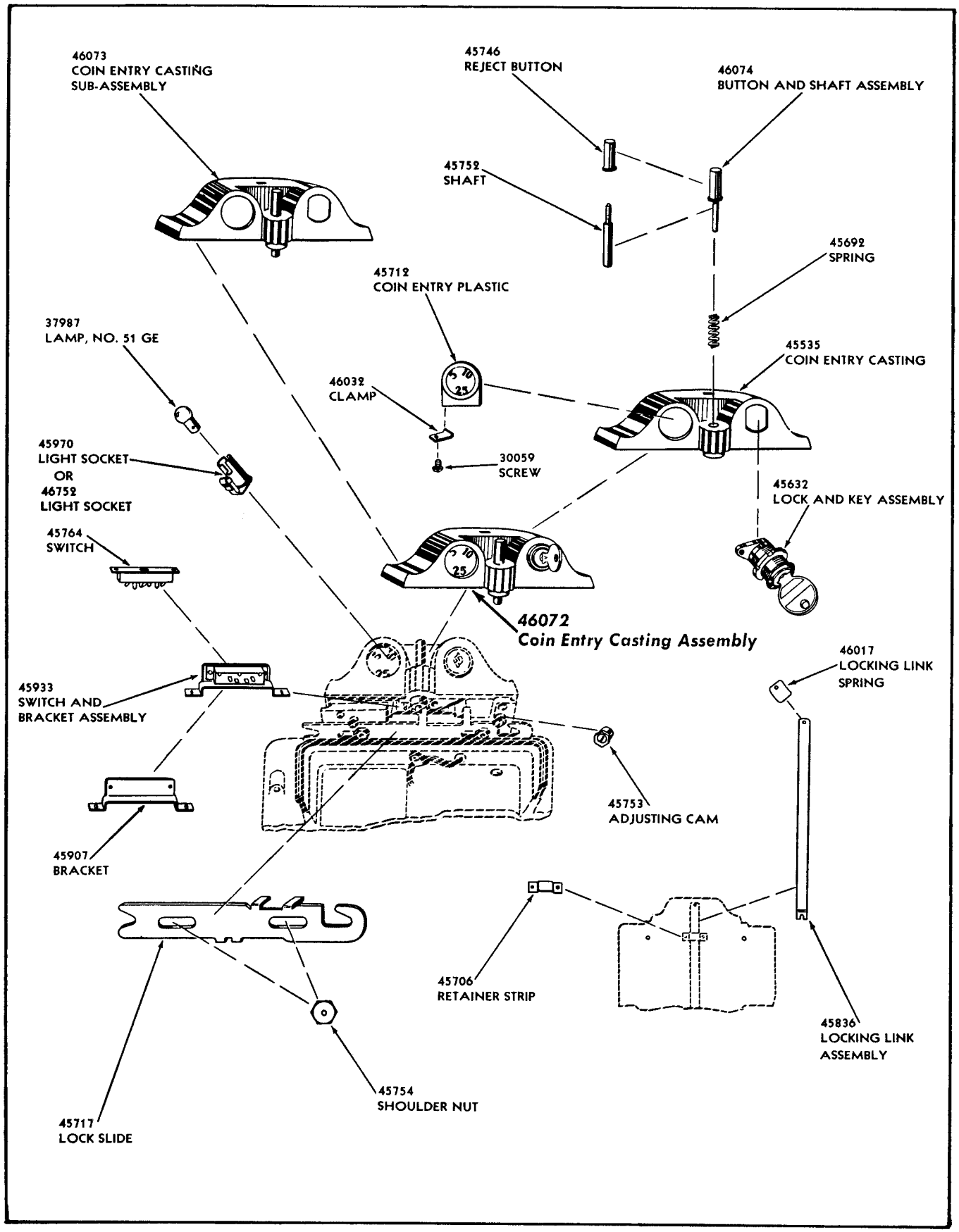


Figure 2—Wallbox Coin Entry and Locking Assembly

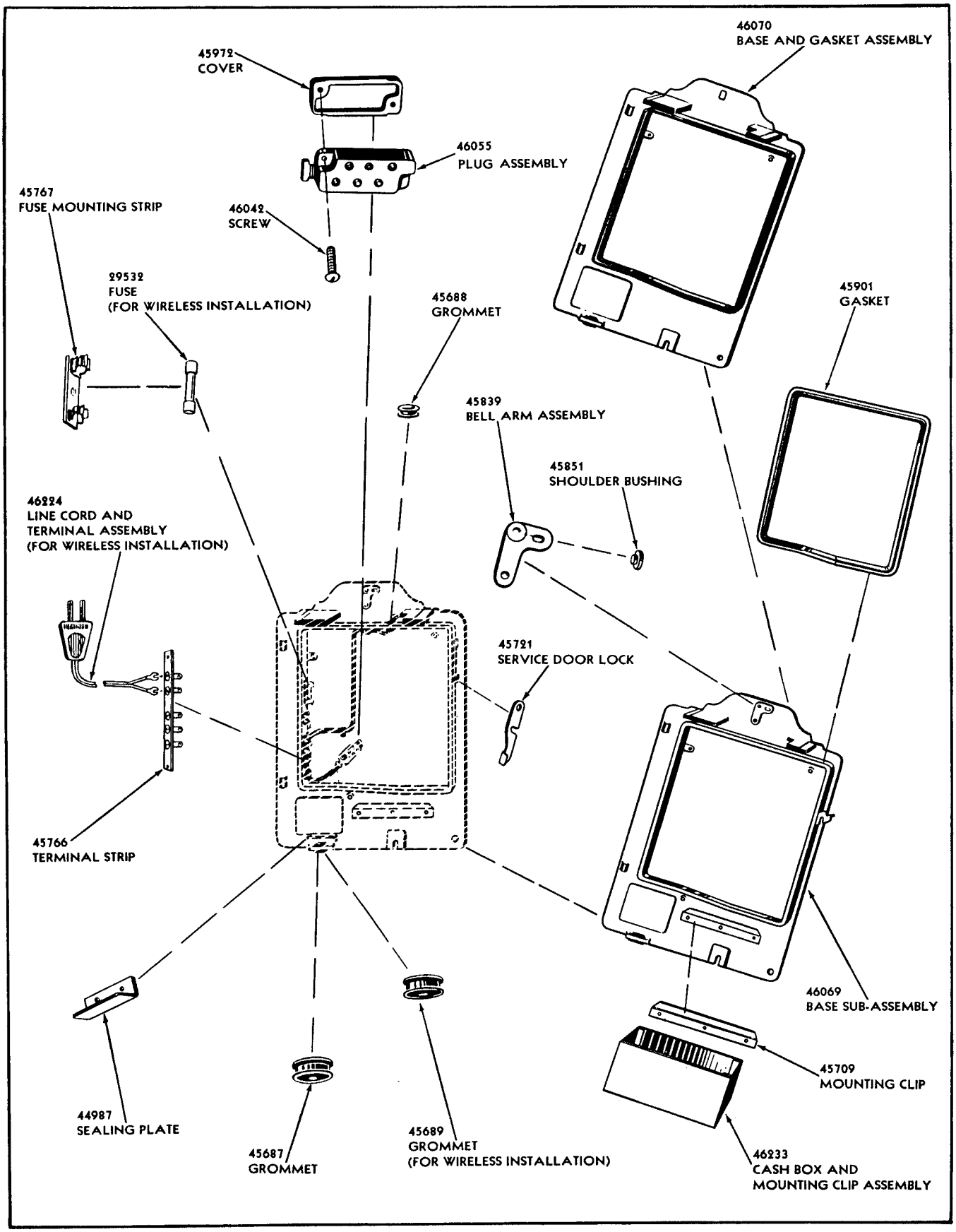


Figure 3—Wallbox Base and Sub-Assemblies

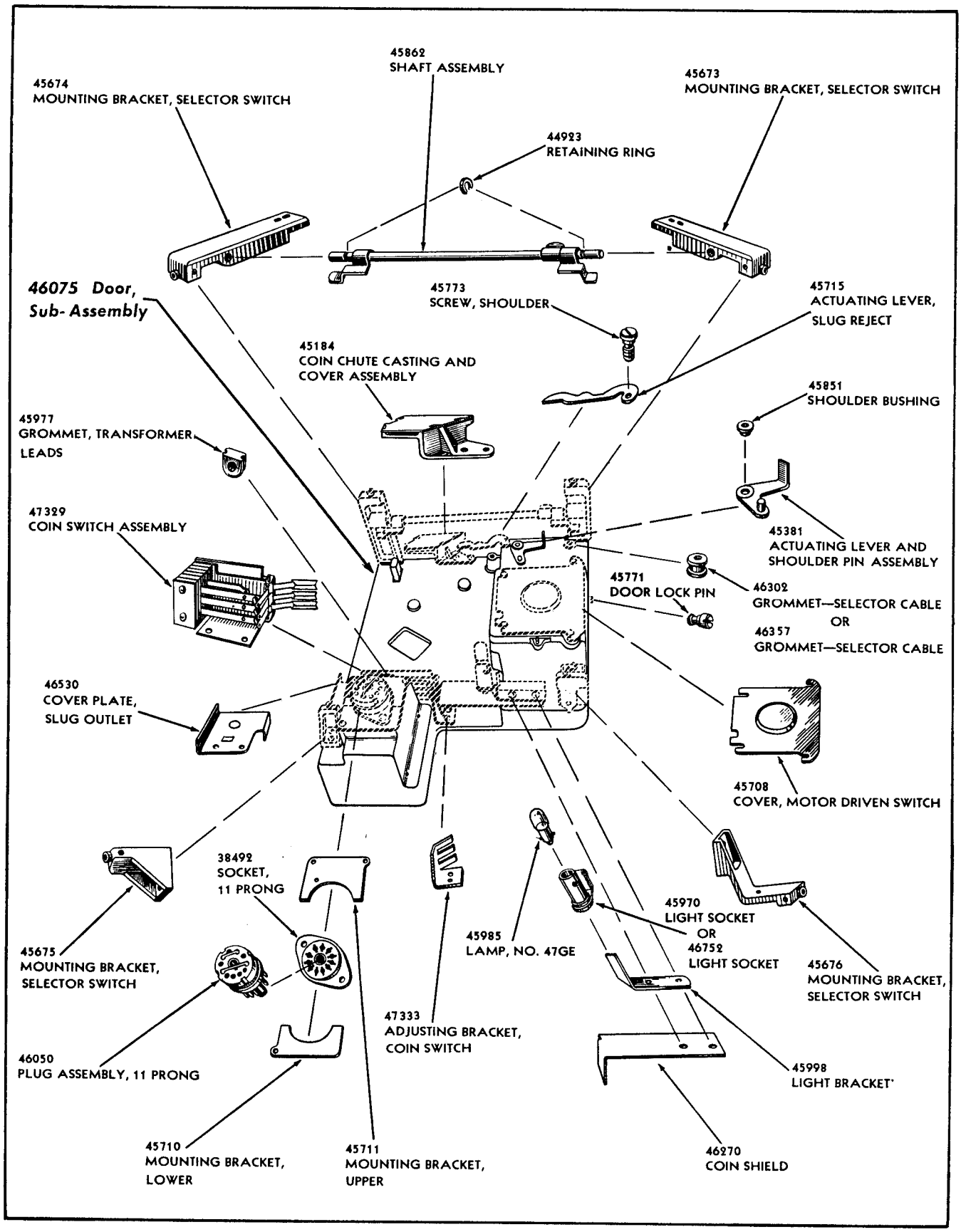


Figure 4—Wallbox Inner Door, Front Sub-Assemblies

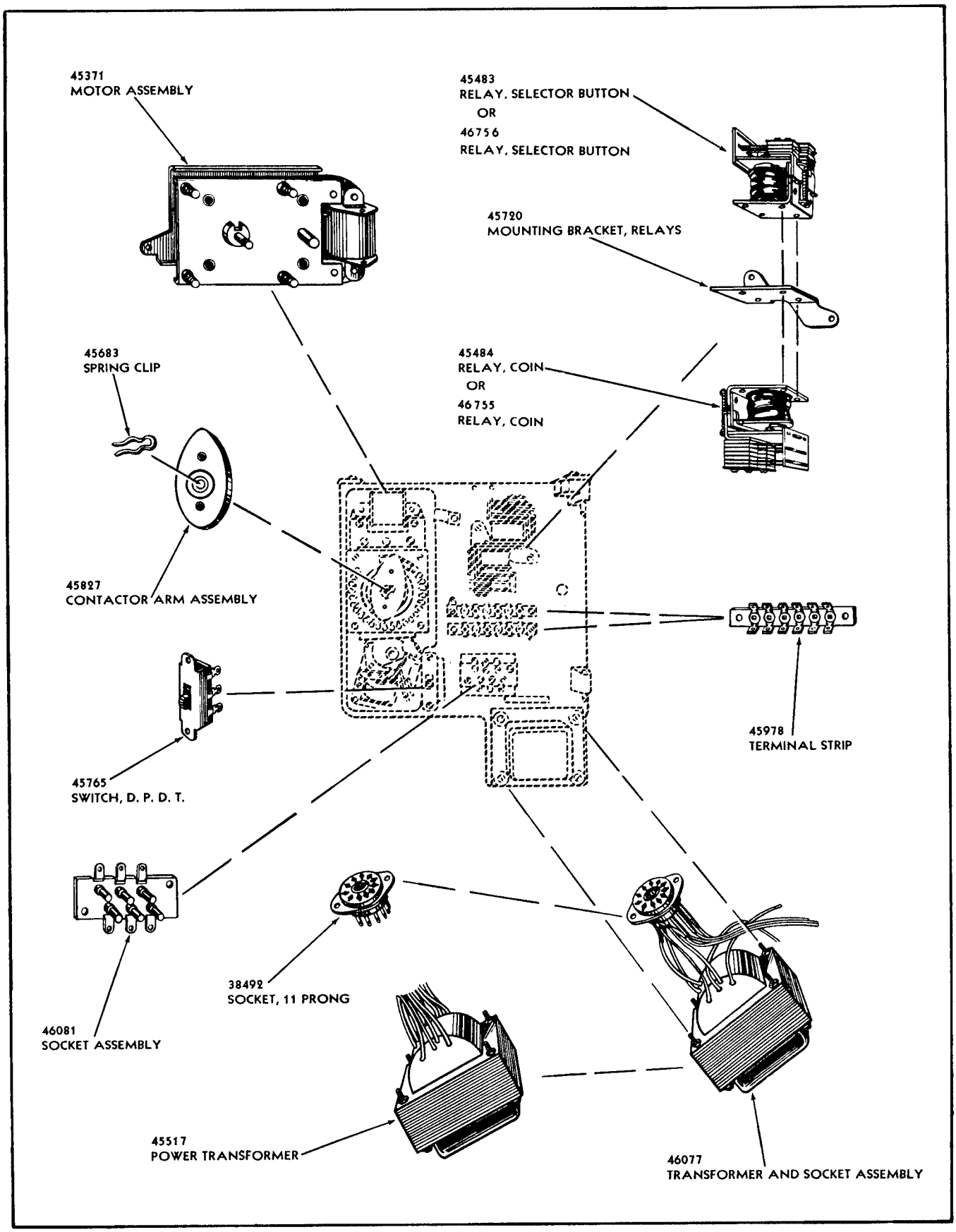


Figure 5—Wallbox Inner Door, Rear Sub-Assemblies

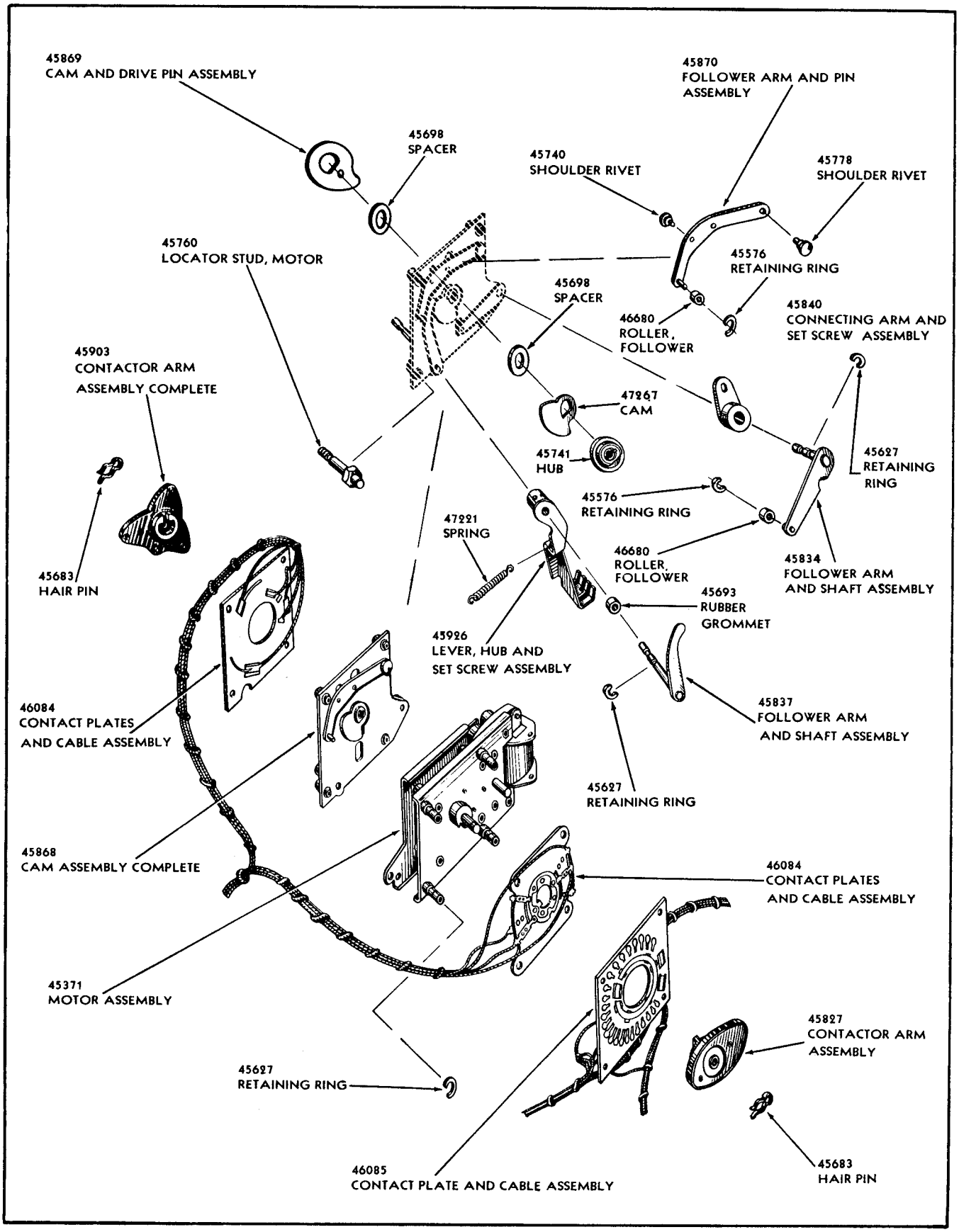


Figure 6—Wallbox Motor and Contact Assembly

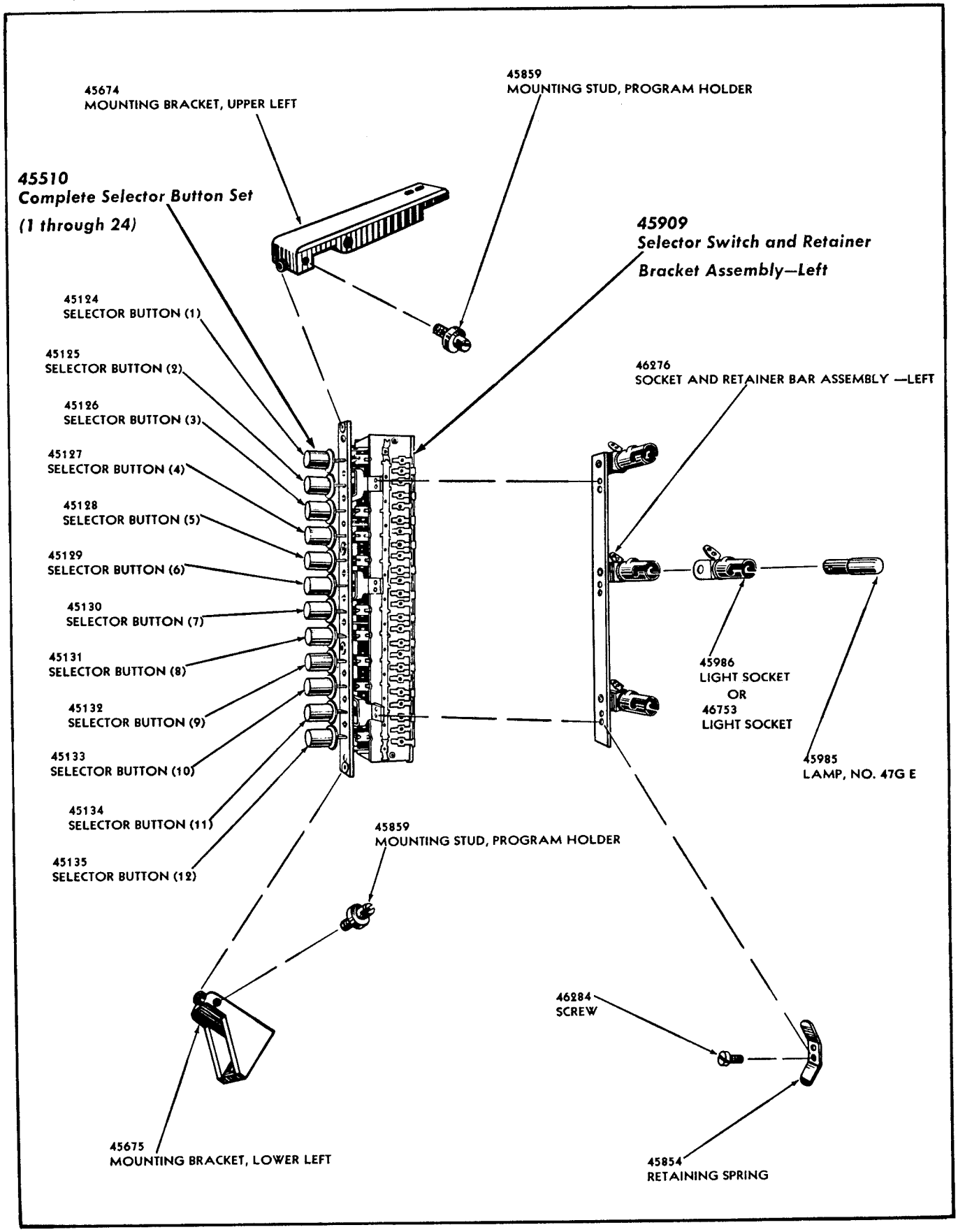


Figure 7—Wallbox Selector Switch Assembly—Left

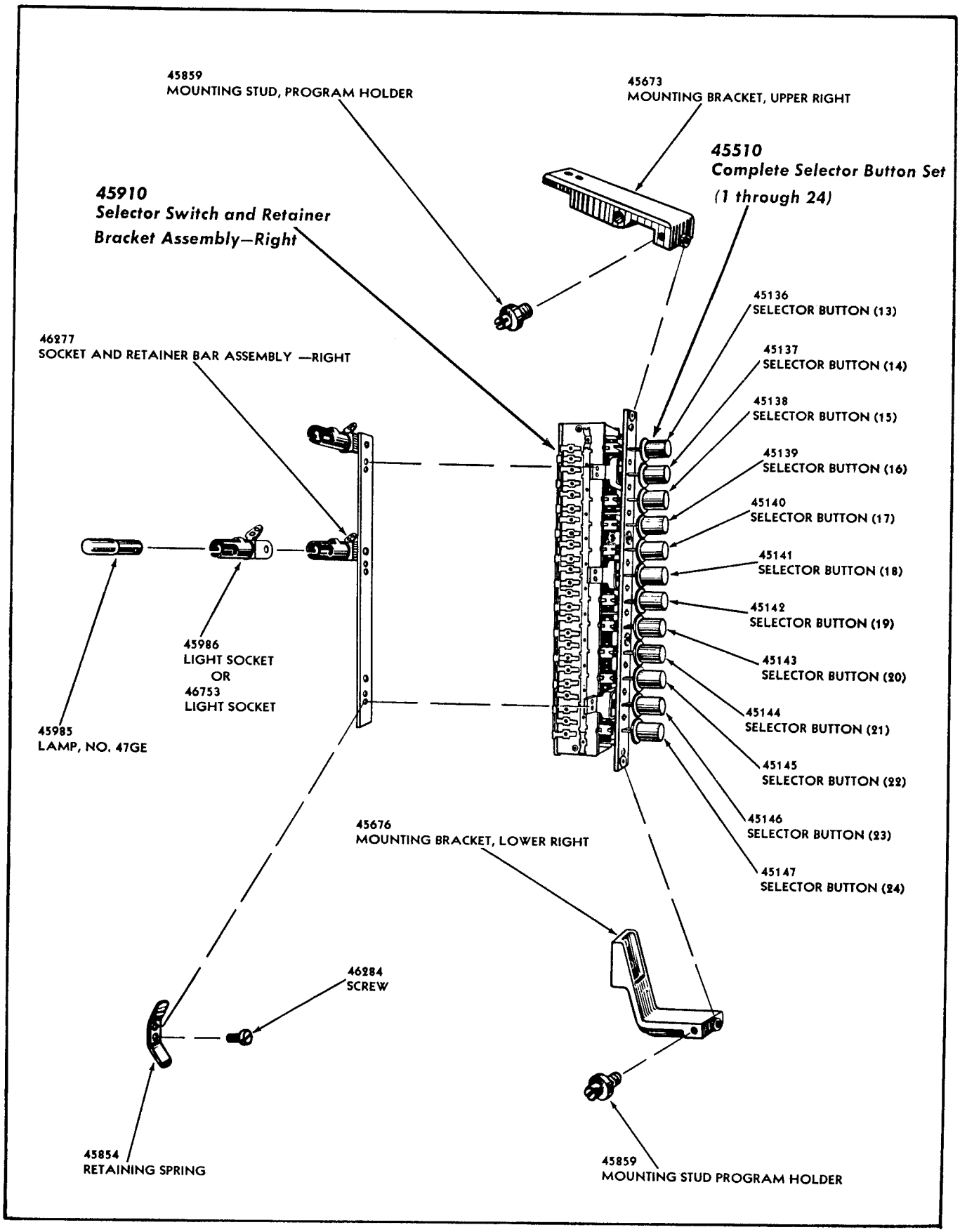


Figure 8—Wallbox Selector Switch Assembly—Right

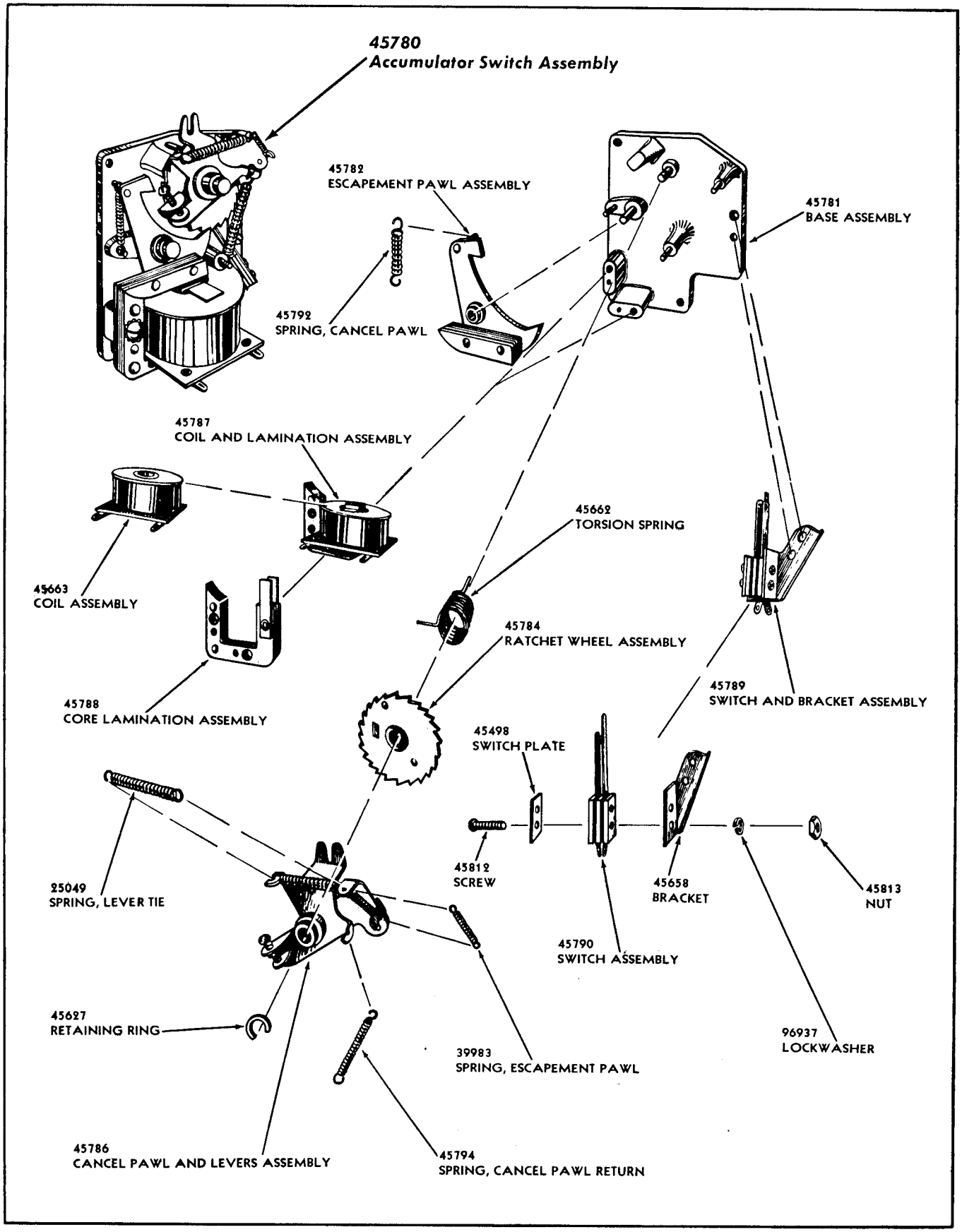


Figure 9—Wallbox Accumulator Switch Assembly

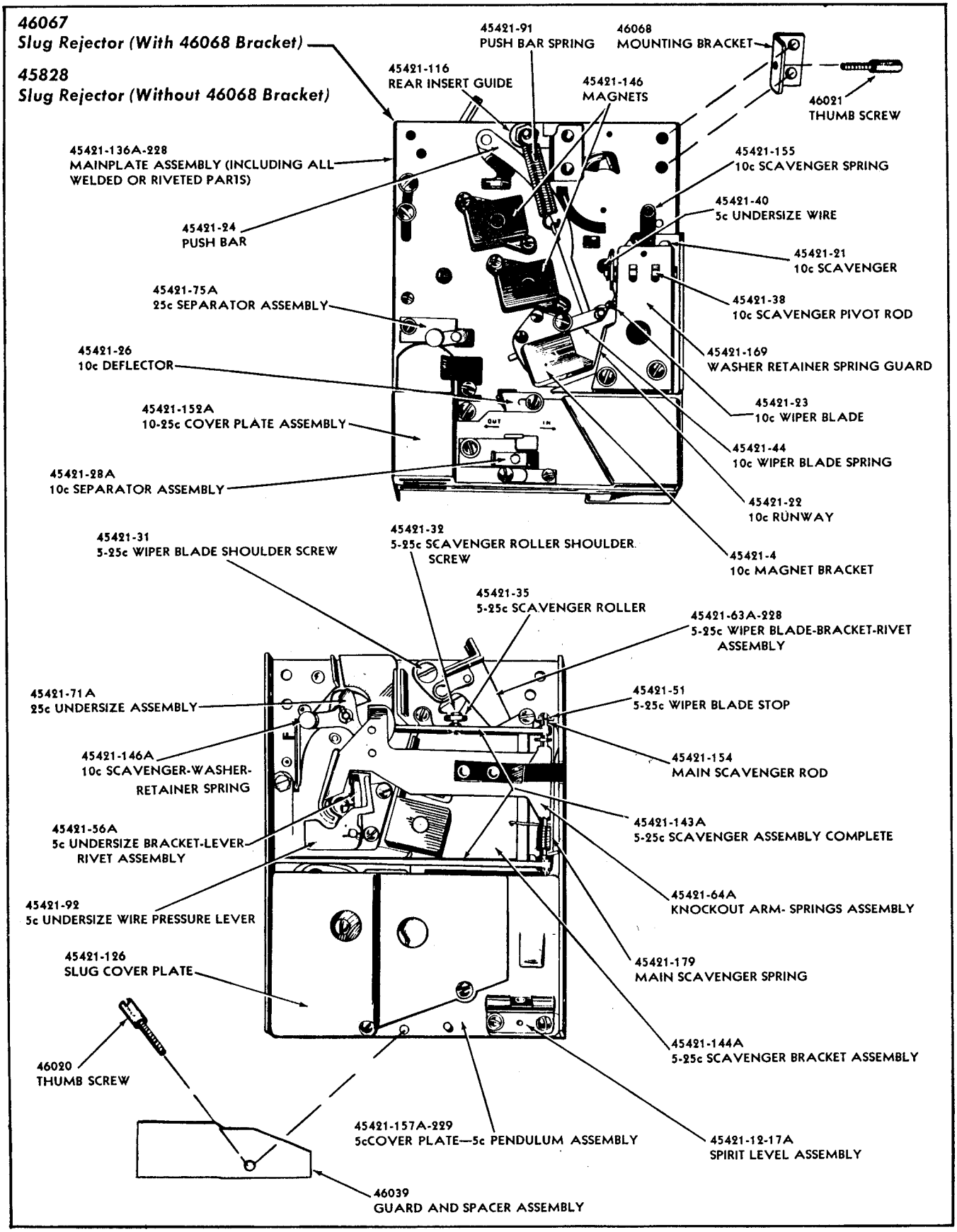


Figure 10—Wallbox Coin Selector Mechanism

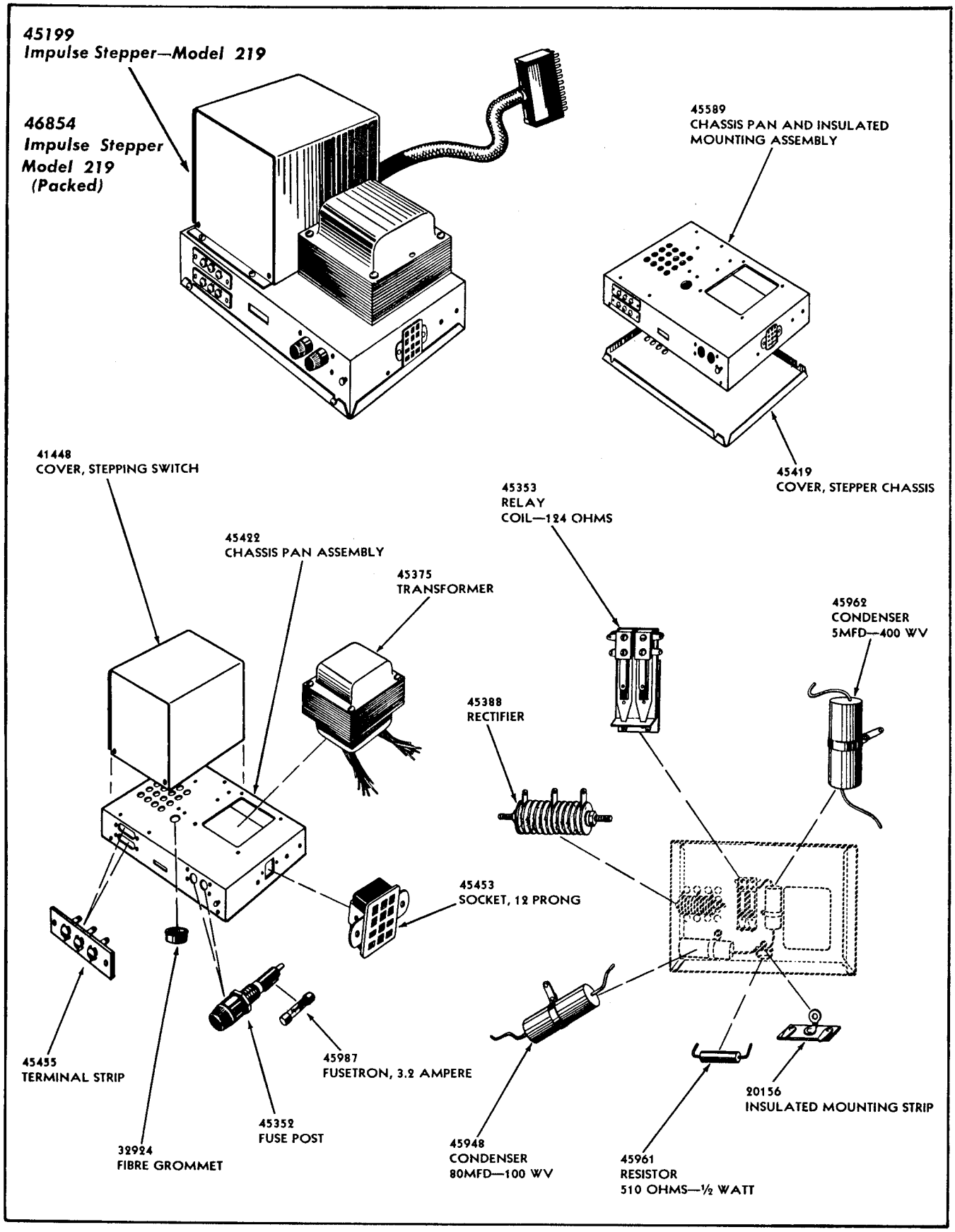


Figure 11—Impulse Stepper, Model 219

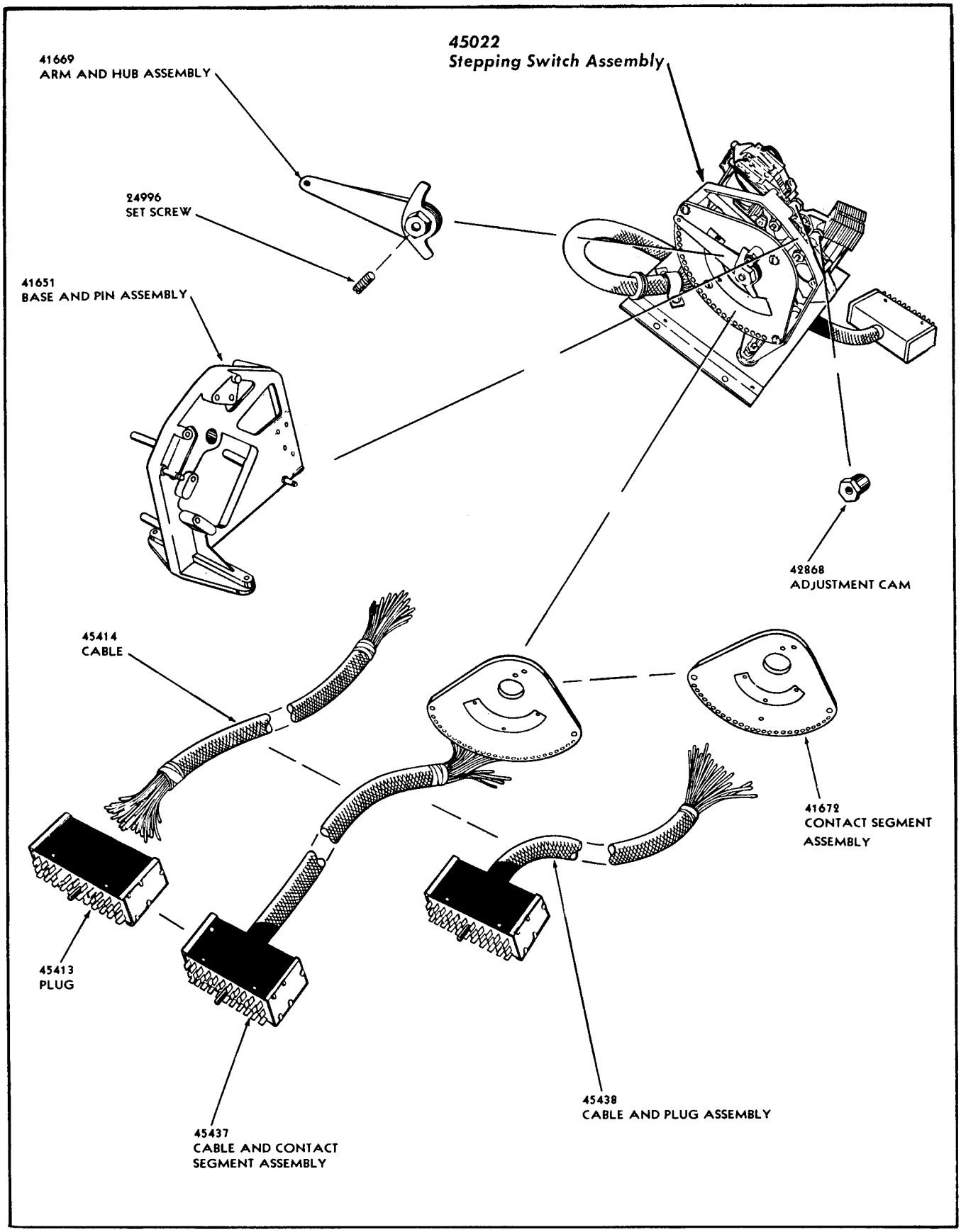


Figure 12—Stepping Switch Assembly
Sheet 1 of 2 Sheets

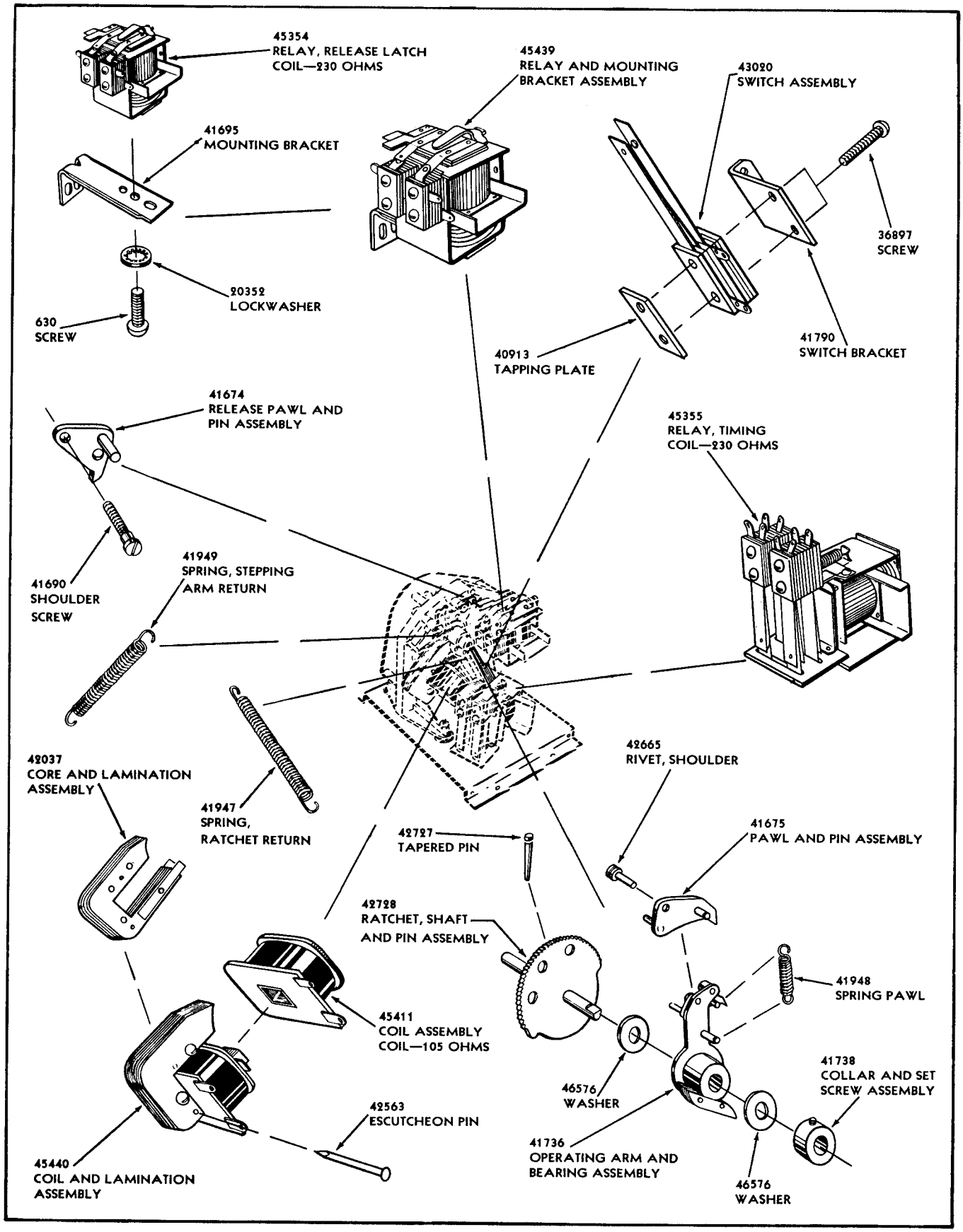


Figure 12—Stepping Switch Assembly
Sheet 2 of 2 Sheets

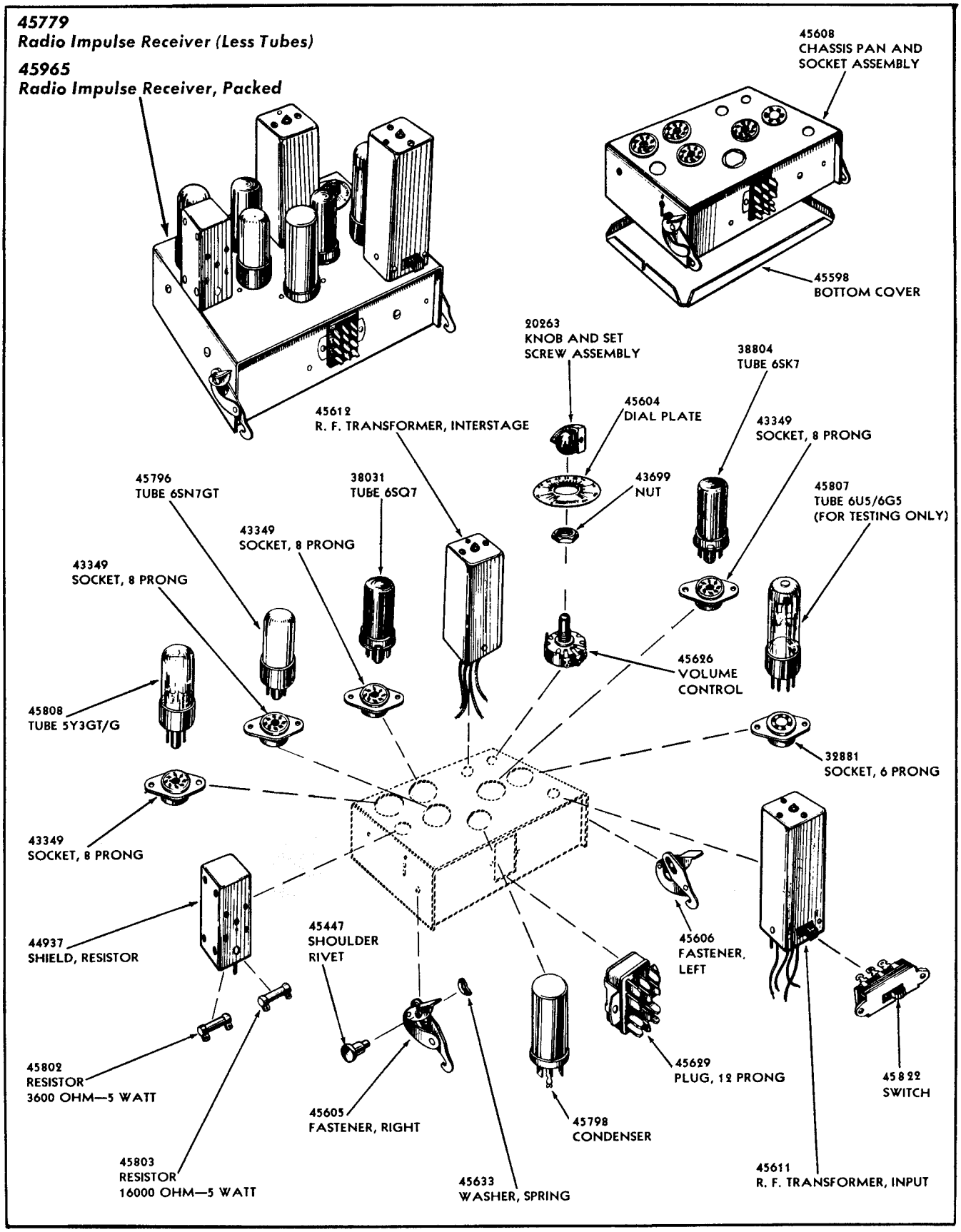


Figure 13—Impulse Receiver, Model 216
Sheet 1 of 2 Sheets

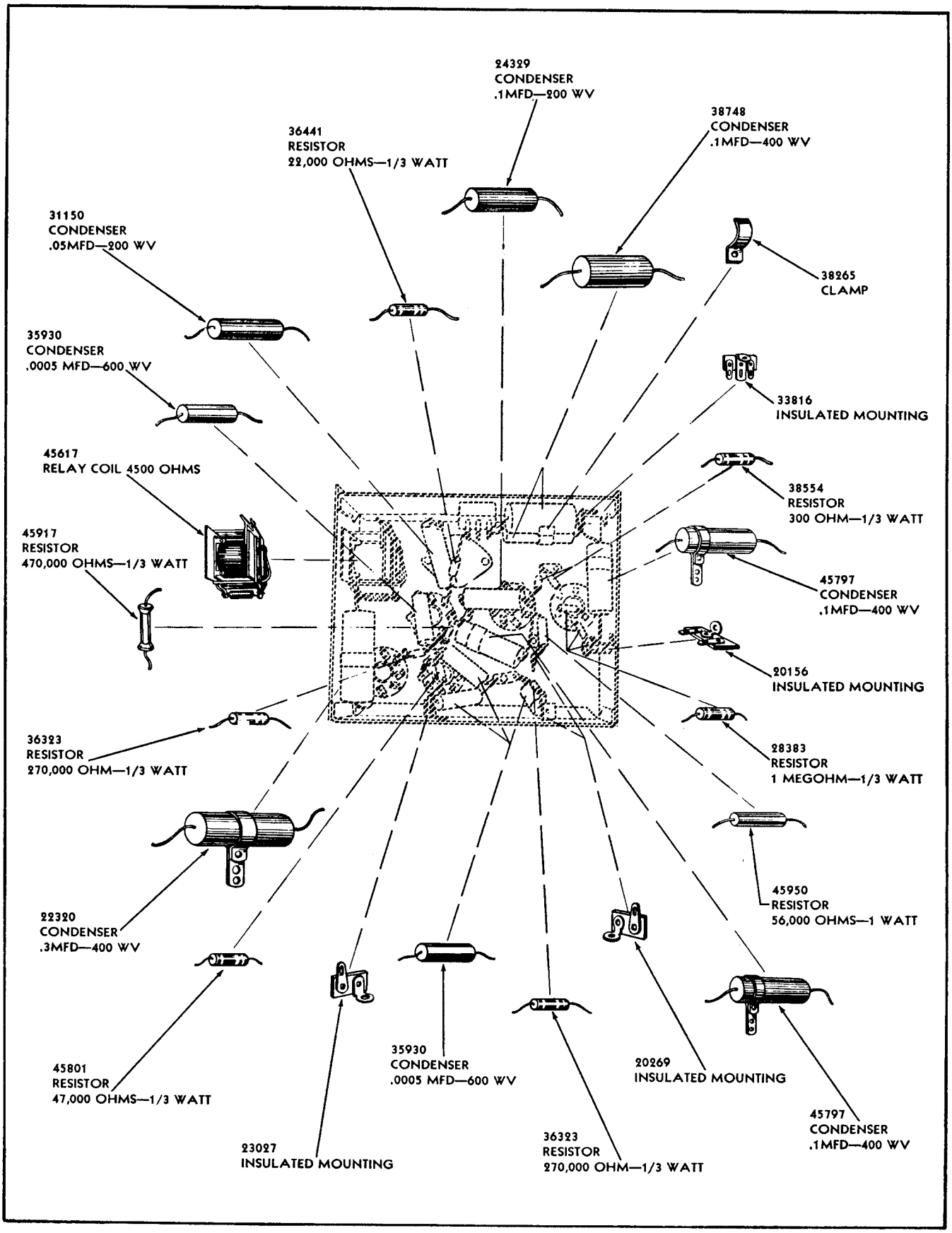


Figure 13—Impulse Receiver, Model 216
Sheet 2 of 2 Sheets

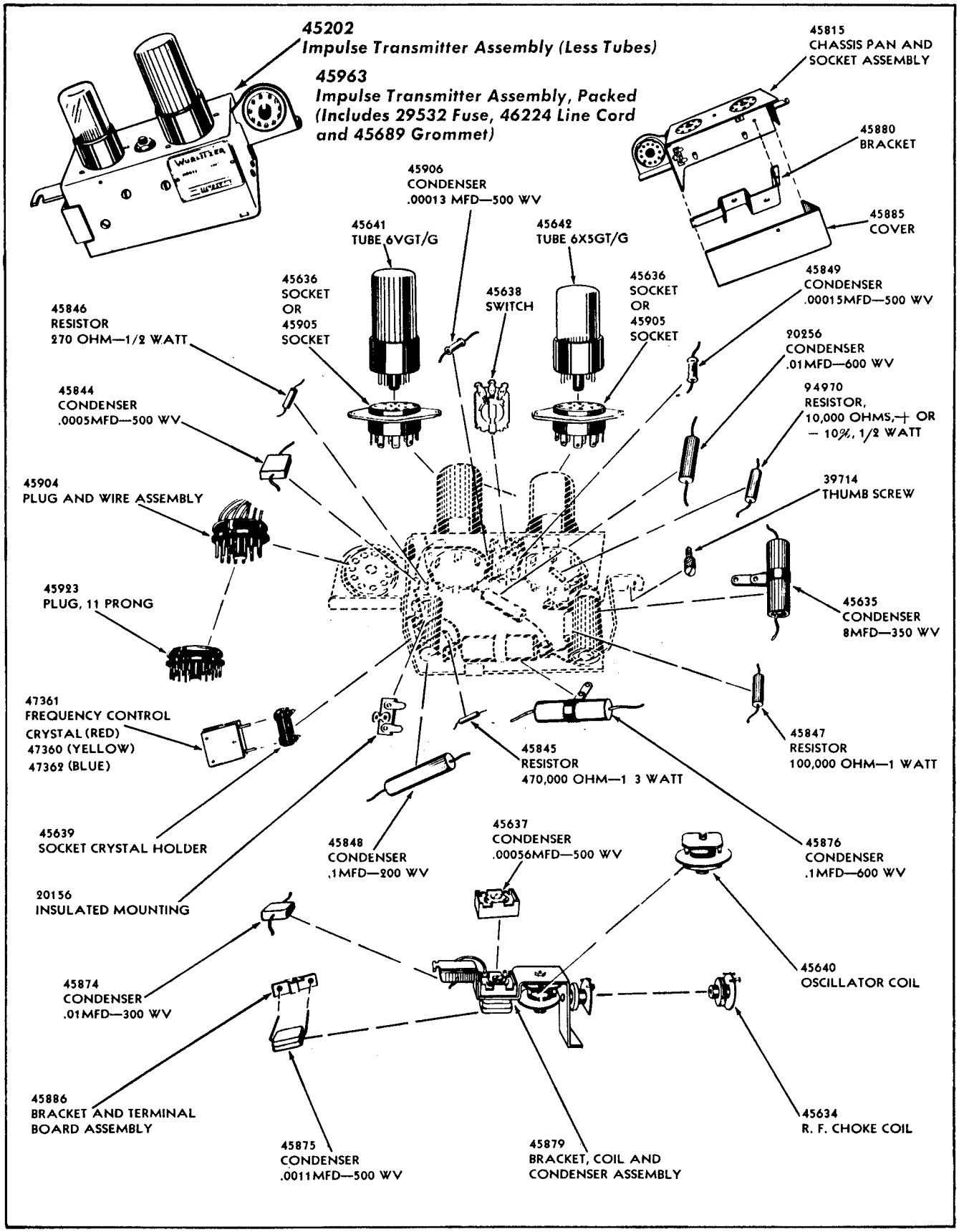


Figure 14—Impulse Transmitter, Model 215

SECTION V
NUMERICAL PARTS LIST

Part No.	*Description*
630	Screw, R.H. Machine, #8-32 x 3/8 long
20156	Insulated Mounting
20256	Condenser, Tubular, .01 MFD., +or−20%, 600 W.V.
20263	Knob and Set Screw Assembly
20269	Insulated Mounting
20352	Lockwasher, #8 Internal
22320	Condenser, Tubular, 0.3 MFD., +20−10%, 400 V.D.C.
23027	Insulated Mounting
24329	Condenser, Tubular, 0.1 MFD., +or−10%, 200 W.V.
24996	Screw, H.H. Set, 6-32 x 3/16 long
25049	Spring, Lever Tie
28383	Resistor, 1 Megohm, +or−10%, 1/3 Watt
29532	Fuse, 1.0 Amp
30059	Screw, R.H. Machine, #2-56 x 1/8 long
31150	Condenser, Tubular 0.05 MFD., +or−10%, 200 W.V.
32881	Socket, 6 Prong Electronic Piano
32924	Bushing, Fibre
33816	Insulated Mounting
35930	Condenser, Tubular, .0005 MFD., +or−10%, 600 W.V.
36323	Resistor, 270,000 Ohms, +or−10%, 1/3 Watt
36441	Resistor, 22,000 Ohms, +or−10%, 1/3 Watt
36897	Screw, R.H. Machine, #5-40 x 5/8 long
37987	Bulb, Selector
38031	Tube, 6SQ7
38265	Clip, Cable
38492	Socket, 11 Prong, Wall Box
38554	Resistor, 300 Ohms, +or−5%, 1/3 Watt
38748	Condenser, Tubular .1 MFD., +or−10%, 400 W.V.
38804	Tube, 6SK7
39714	Thumb Screw
39983	Pawl, Operating Electric Selector
40913	Tapping Plate
41448	Cover, Stepper
41651	Base and Pin Assembly, Stepper
41669	Arm and Hub Assembly, Contact
41672	Contact Segment Assembly
41674	Pawl and Pin Assembly, Release
41675	Pawl and Pin Assembly
41690	Screw, Shoulder, #6-32 x 31/32 long
41695	Bracket, Relay Mounting
41736	Operating Arm and Bearing Assembly
41738	Collar and Set Screw Assembly
41790	Bracket, Switch
41947	Spring, Stepping Ratchet Return
41948	Spring, Stepping Pawl
41949	Spring, Stepping Arm Return
42037	Lamination Assembly, Coil Core
42563	Escutcheon Pin, #16 x 5/8 long
42665	Rivet, Shoulder, Pawl
42727	Pin, Taper Special #000000 x 1/2 long (with groove)
42728	Ratchet, Shaft and Pin Assembly
42868	Adjustment Cam
43020	Switch Assembly
43349	Socket, 8 Prong
43699	Nut, Palnut type 9NI 3/8-32 thread
44923	Ring, Retaining, Roller Arm Assembly
44937	Shield, Resistor
44939	Glass, Program
44987	Plate, Sealing, Lower Grommet Hole
45022	Stepping Switch Assembly
45124	Selector Button (1)
45125	Selector Button (2)
45126	Selector Button (3)
45127	Selector Button (4)
45128	Selector Button (5)
45129	Selector Button (6)
45130	Selector Button (7)
45131	Selector Button (8)
45132	Selector Button (9)
45133	Selector Button (10)
45134	Selector Button (11)
45135	Selector Button (12)
45136	Selector Button (13)
45137	Selector Button (14)
45138	Selector Button (15)
45139	Selector Button (16)
45140	Selector Button (17)
45141	Selector Button (18)
45142	Selector Button (19)
45143	Selector Button (20)
45144	Selector Button (21)
45145	Selector Button (22)
45146	Selector Button (23)
45147	Selector Button (24)
45184	Casting and Cover Assembly, Coin Chute
45199	Impulse Stepper, Model 219 (See 46854)
45202	Impulse Transmitter, Model 215 (See 45963)
45205	Wallbox, Model 3020 (See 45964)

Part No.	Description
45352	Fuse Post
45353	Relay, Pulse, Stepper
45354	Relay, Release Latch, Stepping Switch
45355	Relay, Timing, Stepping Switch
45371	Motor Assembly, 3020 Wallbox
45375	Power Transformer, Impulse Stepper
45381	Actuating Lever and Shoulder Pin Assembly
45388	Rectifier, Selenium, Full Wave, Center Tap
45411	Coil Assembly, Stepping Switch
45413	Plug, 33 Prong
45414	Cable, 33 Wire, Stepping Switch
45419	Cover, Stepper Chassis
45422	Chassis Pan Assembly, Impulse Stepper
45437	Cable and Contact Segment Assembly
45453	Socket, 12 Hole, Impulse Stepper
45438	Cable and Plug Assembly
45439	Relay and Mounting Bracket Assembly
45440	Coil and Lamination Assembly
45453	Socket, 12 Prong
45455	Terminal Strip, Impulse Stepper
45483	Relay, Selector Button, Wallbox
45484	Relay, Coin and Isolation, Wallbox
45510	Selector Buttons, Complete Set 1 to 24 (Includes #45124 to #45147) Service Only
45517	Transformer, Power
45535	Casting, Coin Entry
45576	Ring, Retaining
45589	Chassis Pan and Insulated Mounting Assembly, Impulse Stepper
45598	Bottom Cover
45604	Dial Plate
45605	Fastener, Right Hand
45606	Fastener, Left Hand
45608	Chassis Pan and Socket Assembly
45611	R.F. Transformer, "Input"
45612	R.F. Transformer
45617	Relay, Radio
45626	Control, Sensitivity, 50,000 Ohms, Left Hand Taper
45627	Ring, Retaining
45629	Plug, 12 Prong
45632	Lock and Key Assembly
45633	Washer, Spring, 5/32 I.D. x 5/16 O.D. x .010 thick
45634	R.F. Choke
45635	Condenser, Electrolytic, 8.0 MFD., +100−10%, 350 W.V.
45636	Socket, Octal (MIP)
45637	Condenser, Mica Padder, 110 to 560 MMF., 600 V.R.M.S.
45638	Switch, Rotor Single Pole, 3 Position
45639	Socket, Crystal
45640	Coil, Oscillator
45641	Tube, 6V6GT/G
45642	Tube, 6X5GT/G
45662	Spring, Torsion, Cancel Wheel, Accumulator Switch
45663	Coil Assembly, Accumulator Switch
45673	Bracket, Mounting, Upper R.H. Switch
45674	Bracket, Mounting, Upper L.H. Switch
45675	Bracket, Mounting, Lower L.H. Switch
45676	Bracket, Mounting, Lower R.H. Switch
45683	Clip, Spring, Motor Shaft
45687	Grommet, Rubber
45688	Grommet, Rubber
45689	Grommet, Rubber
45692	Spring, Slug Reject Button
45693	Grommet, Rubber
45698	Washer, Spacer, .502 I.D. x 11/16 O.D. x .010 thick
45699	Clamp, Retainer, Program Glass
45700	Gasket, Window
45702	Gasket, Window
45706	Strip, Retainer, Lock Link
45708	Cover, Door Casting
45709	Clip, Mounting, Cash Box
45710	Bracket, Mounting, Right
45711	Bracket, Mounting, Left
45712	Coin Entry Plastic
45715	Actuating Lever, Slug Reject
45717	Cover, Lock Slide
45720	Bracket, Mounting
45721	Lock, Service Door
45740	Rivet, Shoulder, Accumulator Switch Cam Follower Arm
45741	Hub, Cam Assembly
45746	Reject Button
45752	Shaft, Slug Rejector Button
45753	Cam, Adjusting
45754	Nut, Shoulder
45760	Stud, Locator, Motor
45764	Switch, Line (D.P.S.T.)
45765	Switch (D.P.D.T.)
45766	Strip, Terminal, Base
45767	Mounting Strip, Fuse
45771	Pin, Door Lock
45772	Screw, Cover Lock
45773	Screw, Shoulder, Slug Rejector Actuating Lever
45778	Rivet, Shoulder
45779	Impulse Receiver, Model 216 (See 45965)
45780	Accumulator Switch
45781	Base Assembly, Accumulator Switch
45782	Escapement Pawl Assembly, Accumulator Switch
45784	Ratchet Wheel Assembly, Accumulator Switch
45786	Cancel Pawl and Levers Assembly, Accumulator Switch
45787	Coil and Lamination Assembly
45788	Core Lamination Assembly
45789	Switch and Bracket Assembly
45790	Switch, Accumulator Switch
45792	Spring, Cancel Pawl, Accumulator Switch
45794	Spring, Return, Accumulator Switch
45796	Tube, 6SN7GT
45797	Condenser, 0.1 MFD, +or−20%, 400 V.D.C.

Part No.	*Description*
45798	Condenser, Electrolytic, 20 MFD., 450 Volts
45801	Resistor, 51,000 Ohms+or−10%, 1/3 Watt
45802	Resistor, Wire Wound 3,600 Ohms+or−3%, 5 Watt
45803	Resistor, Wire Wound 16,000 Ohms+or−5%, 5 Watt
45807	Tube, 6U5/6G5 (Service Only)
45808	Tube, 5Y3GT/G
45812	Screw, R.H. Machine, #3-48 x 3/8 long
45813	Nut, Hex #3-48
45815	Chassis Pan and Socket Assembly
45827	Contact Arm Assembly Complete
45828	Slug Rejector (Without Bracket 46068)
45834	Follower Arm and Shaft Assembly
45836	Locking Link Assembly
45837	Follower Arm and Shaft Assembly
45839	Bell Arm Assembly, Locking Link Cover
45840	Connecting Arm and Set Screw Assembly
45844	Condenser, Mica, .0005 MFD, +or−5%, 500V
45845	Resistor, 470,000 Ohms, +or−10%, 1/3 Watt
45846	Resistor, 270,000 Ohms, +or−10%, 1/2 Watt
45847	Resistor, 100,000 Ohms, +or−10%, 1 Watt
45848	Condenser, Paper-Fixed, 1 MFD.,+or−10%, 200 V.D.C.
45849	Condenser, Ceramic, 150 MMF., +or−2%, N750 Temperature Coefficient
45851	Bushing, Shoulder
45853	Light Diffuser, Program Holder
45854	Retaining Spring
45859	Mounting Stud, Program Holder
45861	Retainer, Program Glass
45862	Shaft Assembly
45868	Cam Assembly Complete
45869	Cam and Drive Pin Assembly
45870	Follower Arm and Follower Assembly
45874	Condenser, Mica-Fixed, .01 MFD.,+or−10%, 300 W.V.
45875	Condenser, Silver-Mica, .0011 MFD.,+or−5%, 500 W.V.
45876	Condenser, Oil Filled Paper, .1 MFD.,+or−5%, 600 W.V.
45879	Bracket, Coil and Capacitor Assembly
45880	Bracket, Transmitter Parts
45881	Bracket and Terminal Board Assembly
45885	Cover, Transmitter
45894	Top Plate Assembly
45895	Slip Holder, Program Holder
45897	Program Holder Assembly
45901	Gasket, Sealing
45903	Contact Arm Assembly Complete
45904	Plug and Wire Assembly
45905	Socket, Octal Wafer
45906	Condenser, Ceramic, 130 MMF.,+or−2%, N750 Temperature Coefficient
45907	Bracket, Switch Mounting
45909	Selector Switch and Retainer Bracket Assembly, (L.H.)
45910	Selector Switch and Retainer Bracket Assembly, (R.H.)
45915	Door Assembly
45917	Resistor, 470,000 Ohms, +or−10%, 1/3 Watt
45923	Power Plug, 11 Prong
45926	Lever, Hub and Set Screw Assembly
45933	Switch and Bracket Assembly
45948	Condenser, Electrolytic, 80 MFD.,+100 or−10%, 100 W.V.
45950	Resistor, 56,000 Ohms, +or−10%, 1 Watt
45961	Resistor, 510 Ohms, +or−5%, 1/2 Watt
45962	Condenser, Tubular Paper, .5 MFD.,+or−20%, 400 W.V.
45963	Impulse Transmitter, Model 215, Packed
45964	Wall Box, Model 3020, Packed
45965	Impulse Receiver, Model 216, Packed
45970	Light Socket, Program Holder and Coin Entry
45972	Cover, Plug, Base Wiring
45977	Grommet, Transformer Leads
45978	Terminal Strip
45985	Lamp, Program, 6.3 Volt
45986	Light Socket, Selector Dial
45987	Fusetron, 3.2 Ampere
45998	Light Bracket, Lower Right
46017	Spring, Locking Link
46020	Screw, Thumb, Slug Rejector Mounting
46021	Screw, Thumb, Slug Rejector Mounting
46032	Clamp, Coin Entry Plastic
46039	Guard and Spacer Assembly
46042	Screw, Plasticscreen #4-24 x 378, Self Tapping
46050	Plug Assembly, 11 Prong
46055	Plug Assembly
46067	Slug Rejector and Mounting Bracket Assembly
46068	Mounting Bracket, Slug Rejector
46069	Base, Sub Assembly
46070	Base and Gasket Assembly
46072	Coin Entry Casting Assembly
46073	Coin Entry Casting Sub Assembly
46074	Button and Shaft Assembly
46075	Door, Sub Assembly, Wallbox
46077	Transformer and Socket Assembly
46081	Socket Assembly
46084	Contact Plates and Cable Assembly
46085	Contact Plate and Cable Assembly
46087	Cover Assembly, Wallbox 3020
46224	Line Cord and Terminal Assembly
46233	Cash Box and Mounting Clip Assembly
46270	Coin Shield
46276	Socket and Retainer, Bar Assembly (L.H.)
46277	Socket and Retainer Bar Assembly (R.H.)
46279	Rivet, Shoulder
46284	Screw, Fillister Head Machine, #2-56x1/8 long
46302	Grommet
46367	Grommet
46530	Cover Plate, Slug Outlet
46576	Washer, Stepper, .195 I.D. x ½ O.D. x .0159 thick

46680 Roller, Follower
46752 Light Socket
46753 Light Socket
46755 Relay, Coin
46756 Relay, Selector Button
46854 Impulse Stepper, Model 219, Packed
47221 Spring, Coin Mechanism
47267 Cam
47329 Coin Switch Assembly
47333 Bracket, Adjusting
47360 Crystal, Frequency Control Unit—Yellow. 241KC (Service Only)
47361 Crystal, Frequency Control Unit—Red, 221KC
47362 Crystal, Frequency Control Unit—Blue, 231KC (Service Only)
94970 Resistor, 10,000 Ohms, +or−10%, ½ Watt
96937 Lockwasher, #3 Kantlink

MASTER RESISTOR CHART

COLOR CODE

OHMS RESISTANCE	COLOR CODE			OHMS RESISTANCE	COLOR CODE			OHMS RESISTANCE	COLOR CODE		
	A	B	C		A	B	C		A	B	C
10	BROWN	BLACK	BLACK	1,000	BROWN	BLACK	RED	100,000	BROWN	BLACK	YELLOW
11	BROWN	BROWN	BLACK	1,100	BROWN	BROWN	RED	110,000	BROWN	BROWN	YELLOW
12	BROWN	RED	BLACK	1,200	BROWN	RED	RED	120,000	BROWN	RED	YELLOW
13	BROWN	ORANGE	BLACK	1,300	BROWN	ORANGE	RED	130,000	BROWN	ORANGE	YELLOW
15	BROWN	GREEN	BLACK	1,500	BROWN	GREEN	RED	150,000	BROWN	GREEN	YELLOW
16	BROWN	BLUE	BLACK	1,600	BROWN	BLUE	RED	160,000	BROWN	BLUE	YELLOW
18	BROWN	GRAY	BLACK	1,800	BROWN	GRAY	RED	180,000	BROWN	GRAY	YELLOW
20	RED	BLACK	BLACK	2,000	RED	BLACK	RED	200,000	RED	BLACK	YELLOW
22	RED	RED	BLACK	2,200	RED	RED	RED	220,000	RED	RED	YELLOW
24	RED	YELLOW	BLACK	2,400	RED	YELLOW	RED	240,000	RED	YELLOW	YELLOW
27	RED	VIOLET	BLACK	2,700	RED	VIOLET	RED	270,000	RED	VIOLET	YELLOW
30	ORANGE	BLACK	BLACK	3,000	ORANGE	BLACK	RED	300,000	ORANGE	BLACK	YELLOW
33	ORANGE	ORANGE	BLACK	3,300	ORANGE	ORANGE	RED	330,000	ORANGE	ORANGE	YELLOW
36	ORANGE	BLUE	BLACK	3,600	ORANGE	BLUE	RED	360,000	ORANGE	BLUE	YELLOW
39	ORANGE	WHITE	BLACK	3,900	ORANGE	WHITE	RED	390,000	ORANGE	WHITE	YELLOW
43	YELLOW	ORANGE	BLACK	4,300	YELLOW	ORANGE	RED	430,000	YELLOW	ORANGE	YELLOW
47	YELLOW	VIOLET	BLACK	4,700	YELLOW	VIOLET	RED	470,000	YELLOW	VIOLET	YELLOW
51	GREEN	BROWN	BLACK	5,100	GREEN	BROWN	RED	510,000	GREEN	BROWN	YELLOW
56	GREEN	BLUE	BLACK	5,600	GREEN	BLUE	RED	560,000	GREEN	BLUE	YELLOW
62	BLUE	RED	BLACK	6,200	BLUE	RED	RED	620,000	BLUE	RED	YELLOW
68	BLUE	GRAY	BLACK	6,800	BLUE	GRAY	RED	680,000	BLUE	GRAY	YELLOW
75	VIOLET	GREEN	BLACK	7,500	VIOLET	GREEN	RED	750,000	VIOLET	GREEN	YELLOW
82	GRAY	RED	BLACK	8,200	GRAY	RED	RED	820,000	GRAY	RED	YELLOW
91	WHITE	BROWN	BLACK	9,100	WHITE	BROWN	RED	910,000	WHITE	BROWN	YELLOW
100	BROWN	BLACK	BROWN	10,000	BROWN	BLACK	ORANGE	1.0 Meg.	BROWN	BLACK	GREEN
110	BROWN	BROWN	BROWN	11,000	BROWN	BROWN	ORANGE	1.1 Meg.	BROWN	BROWN	GREEN
120	BROWN	RED	BROWN	12,000	BROWN	RED	ORANGE	1.2 Meg.	BROWN	RED	GREEN
130	BROWN	ORANGE	BROWN	13,000	BROWN	ORANGE	ORANGE	1.3 Meg.	BROWN	ORANGE	GREEN
150	BROWN	GREEN	BROWN	15,000	BROWN	GREEN	ORANGE	1.5 Meg.	BROWN	GREEN	GREEN
160	BROWN	BLUE	BROWN	16,000	BROWN	BLUE	ORANGE	1.6 Meg.	BROWN	BLUE	GREEN
180	BROWN	GRAY	BROWN	18,000	BROWN	GRAY	ORANGE	1.8 Meg.	BROWN	GRAY	GREEN
200	RED	BLACK	BROWN	20,000	RED	BLACK	ORANGE	2.0 Meg.	RED	BLACK	GREEN
220	RED	RED	BROWN	22,000	RED	RED	ORANGE	2.2 Meg.	RED	RED	GREEN
240	RED	YELLOW	BROWN	24,000	RED	YELLOW	ORANGE	2.4 Meg.	RED	YELLOW	GREEN
270	RED	VIOLET	BROWN	27,000	RED	VIOLET	ORANGE	2.7 Meg.	RED	VIOLET	GREEN
300	ORANGE	BLACK	BROWN	30,000	ORANGE	BLACK	ORANGE	3.0 Meg.	ORANGE	BLACK	GREEN
330	ORANGE	ORANGE	BROWN	33,000	ORANGE	ORANGE	ORANGE	3.3 Meg.	ORANGE	ORANGE	GREEN
360	ORANGE	BLUE	BROWN	36,000	ORANGE	BLUE	ORANGE	3.6 Meg.	ORANGE	BLUE	GREEN
390	ORANGE	WHITE	BROWN	39,000	ORANGE	WHITE	ORANGE	3.9 Meg.	ORANGE	WHITE	GREEN
430	YELLOW	ORANGE	BROWN	43,000	YELLOW	ORANGE	ORANGE	4.3 Meg.	YELLOW	ORANGE	GREEN
470	YELLOW	VIOLET	BROWN	47,000	YELLOW	VIOLET	ORANGE	4.7 Meg.	YELLOW	VIOLET	GREEN
510	GREEN	BROWN	BROWN	51,000	GREEN	BROWN	ORANGE	5.1 Meg.	GREEN	BROWN	GREEN
560	GREEN	BLUE	BROWN	56,000	GREEN	BLUE	ORANGE	5.6 Meg.	GREEN	BLUE	GREEN
620	BLUE	RED	BROWN	62,000	BLUE	RED	ORANGE	6.2 Meg.	BLUE	RED	GREEN
680	BLUE	GRAY	BROWN	68,000	BLUE	GRAY	ORANGE	6.8 Meg.	BLUE	GRAY	GREEN
750	VIOLET	GREEN	BROWN	75,000	VIOLET	GREEN	ORANGE	7.5 Meg.	VIOLET	GREEN	GREEN
820	GRAY	RED	BROWN	82,000	GRAY	RED	ORANGE	8.2 Meg.	GRAY	RED	GREEN
910	WHITE	BROWN	BROWN	91,000	WHITE	BROWN	ORANGE	9.1 Meg.	WHITE	BROWN	GREEN
								10.0 Meg.	BROWN	BLACK	BLUE

A (Body Color)—The first digit of the number representing the resistance value.

B (End Color)—The second digit of the number representing the resistance value.

C (Dot or Band on Body)—The number of ciphers following the first two digits (A & B). For example, if C = O (Black) nothing follows A and B, hence the resistance value is represented by a two digit number of which A is the first and B the second digit. If C = 1, one cipher (not No. 1) follows A and B, and the value is a three digit number. If C = 2, two ciphers (not No. 2) follows A and B, the value is a four digit number, etc.

D (End Color)—Resistance Tolerance Identification.

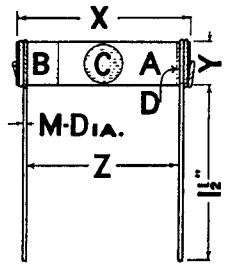


Table of Color Values

Value	Color
0	Black
1	Brown
2	Red
3	Orange
4	Yellow
5	Green
6	Blue
7	Violet
8	Gray
9	White

WARRANTY

The component parts of automatic phonographs and accessory equipment manufactured by the Rudolph Wurlitzer Company are warranted to be free from defects in material and workmanship and to operate properly under normal use and conditions, as follows:

(A) Mechanical parts (Excluding coin equipment) for a period of one year from date of shipment at North Tonawanda, N. Y.

(B) Coin equipment and electrical parts (Including such parts as tubes, speakers, volume control assemblies, pick-up assemblies, amplifiers, motors, junction box assemblies, and all wiring) for a period of three months from date of shipment at North Tonawanda, N. Y.

(C) Cabinets (Subject to the Company's inspection and determination as to defect) for a period of three months from date of shipment at North Tonawanda, N. Y.

The company's liability under this warranty is limited to replacement, free of charge, F.O.B. North Tonawanda, New York, of any part or parts which prove defective within the limitations of said Warranty. The Company shall not be liable for damages of any nature due to delayed shipment, or defective parts.

THE RUDOLPH WURLITZER COMPANY, NORTH TONAWANDA, N. Y.