SERVICE MANUAL

GENERAL ELECTRIC REFRIGERATORS

WITH

CA MACHINES

PRODUCT SERVICE DIVISION

APPLIANCE AND MERCHANDISE DEPARTMENT

BRIDGEPORT, CONNECTICUT

INTRODUCTION

Every General Electric Refrigerator is carefully designed, manufactured, tested and inspected in the factory in order to give satisfactory refrigeration service wherever it is installed. Although these refrigerators are designed and manufactured to give many years of service with a minimum amount of attention, occasionally there will arise conditions or circumstances which will necessitate adjustment by a competent service man.

While only a relatively small percentage of General Electric refrigerators require such special service, much of which is of a minor nature, still it must be remembered that every service call represents a critical point in the customer's goodwill toward the General Electric Company, the distributor and the dealer or utility outlet from whom the refrigerator was purchased. Consequently, the service required should be rendered quickly, courteously, efficiently and effectively.

This material is prepared as a reference and a guide to assist the service man in giving competent service. A casual glance through its pages might give the impression that it is too complete, but a more careful inspection of the way it is indexed and divided into sections will show that while much information is included, it is so arranged that various details can be easily located. Although the great majority of service men will use but a few of the adjustments given, the less common adjustments are also included so that they are available if they should ever be needed.

This Service Manual includes adjustments on refrigerators with CA Monitor Top machines only, which were sold mostly in 1933 and 1934.

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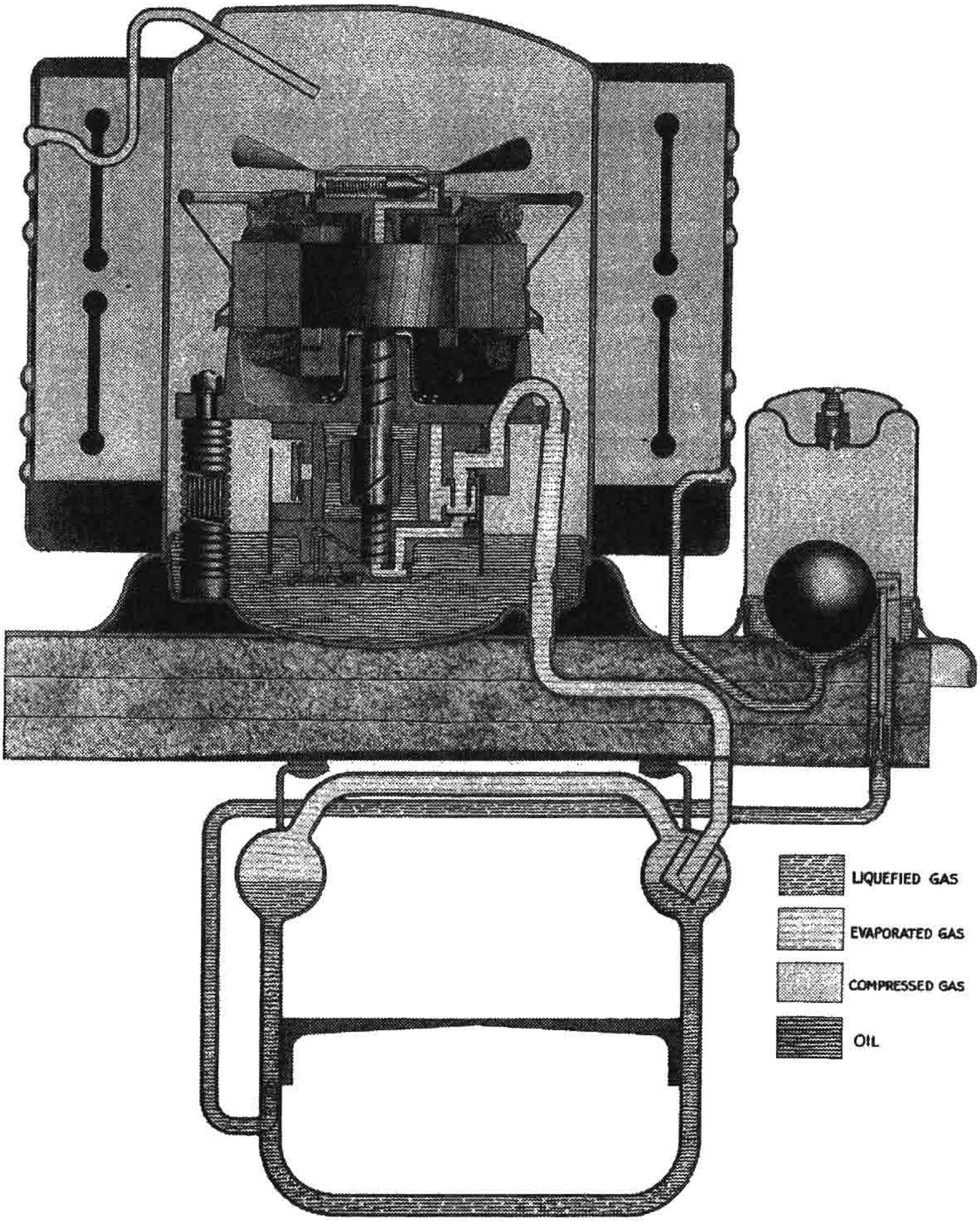
Chart Showing Operation of CA-2A Refrigerating Machine



General Electric Refrigerators

Models HT-47, HX-47, HT-70, HX-70, X-5, X-7 and T-7

DESCRIPTION

Refrigerating Machine (Models CA-1A, CA-2A, CA-1B, and CA-2B)

This refrigerating machine is of Monitor Top design and construction. It is hermetically sealed. It is designed for efficient, quiet and trouble-free performance, and constructed for long life. A Glyptal-baked enamel, developed by the General Electric laboratories, offers a finish of unusual gloss and permanence.

Refrigerant

The refrigerant is methyl formate developed for this use by the General Electric laboratories. It is a low pressure refrigerant with a boiling point of 88° F. at atmospheric pressure.

Pressure-Temperature Table for Methyl Formate

Temp. ° F.	Pressure, lbs. per sq. in., gauge	Temp. ° F.	Vacuum, in. of mercury
150	30.7	80	5.5
140	23.9	70	10.2
130	17.9	60	14.5
120	12.2	50	17.8
110	7.6	40	20.4
100	3.8	30	22.7
90	0.5	20	24.5
88	0	10	25.9
		0	27.0

Compressor

The compressor is located on the high pressure side of the system. It is of the oscillating type, developed especially to handle this new refrigerant. The movable element, the oscillator, is actuated by an eccentric on the vertical shaft. It oscillates rather than rotates, being keyed to the cylinder by a sliding blade. The compressor is spring mounted within the steel case and is carefully balanced so that no vibration is transmitted to the exterior. Oil under pressure lubricates every moving part.

Motor

The motor is mounted directly above the compressor on the vertical shaft. It operates as a resistance split-phase induction motor during starting and as a single-phase induction motor during normal running. The proper resistance is incorporated in the starting winding so that an external resistor is not needed.

Starting Relay

The starting relay used to make and break the starting winding circuit is located on the left rear corner of the box top on the Form A machines. On the Form B units, it is mounted on the condenser on the left rear side. These relays are simple in construction and practically noiseless in operation. The armature settings are different since the armature in the relay used on Form A machines operates vertically, and on the Form B, it operates horizontally.

Condenser

The condensers are of smooth construction, made possible by the use of a low-pressure refrigerant and General Electric developments in the control of automatic electric line welding equipment. The Form B condenser has a smoother appearance with six refrigerant passes, while the Form A had ten evenly spaced passes.

Float Valve

A float valve, similar in construction to that used on previous General Electric refrigerating machines, is located on the high pressure side of the system. On the Form A machine, it can be seen on the right rear corner of the box top, but on the Form B, it is located at the rear of the machine, out of sight from the front.

Cooling Unit

The cooling unit is made of stainless steel. The CA-2A and CA-2B models have an aluminum freezing shelf. The surfaces are smooth, easy to clean and sanitary. The cooling unit is constructed to incorporate forced circulation of the refrigerant, thus assuring the highest cooling efficiency.

Control

The Form A machines have the control located on the front of the machine in the box top. On the Form B, the control is in the front center of the condenser, behind the condenser surface, except for the two knobs which project through the condenser and the round chromium plated escutcheon plate.

Included in the control are a manual switch for turning the machine on or off, an adjustable automatic mechanism for regulating the cooling unit and cabinet air temperatures, a device for protecting the motor from abnormal load or power conditions, and an arrangement for defrosting the cooling unit.

The Form A defrost mechanism is semi-automatic and in the Form B control, the machine is automatically returned to normal operation after defrosting has been completed. Also, the range of average temperatures between positions 1 and 9 is increased in the control used on Form B machines.

Cabinet

A. Model HT-47—Porcelain enamel paneled exterior. CA-1A unit.

Model HX-47—Glyptal-baked enamel exterior. CA-1A unit.

Model X-5—Glyptal-baked enamel exterior. CA-1B unit.

These cabinets are of all-steel construction with one-piece acid-resistant porcelain enamel interiors. New semi-concealed hinges and simple fingertip handle latches further enhance the appearance of the cabinets. Textolite door strips introduced by General Electric and proved for insulating quality and long life are used.

Model X-5 has the interior cabinet light and the foot-pedal door opener.

B. Model HT-70—Porcelain enamel paneled exterior. CA-2A unit.

Model HX-70—Glyptal-baked enamel exterior. CA-2A unit.

Model T-7—Porcelain enamel paneled exterior. CA-2B unit.

Model X-7—Glyptal-baked enamel exterior. CA-2B unit.

These cabinets are of all-steel construction with one-piece acid-resistant porcelain enamel interiors. New semi-concealed hinges and simple fingertip handle latches further enhance the appearance of the cabinets. Textolite door strips introduced by General Electric and proved for insulating quality and long life are used. Sliding shelves with the new feature of adjustable shelf spacing are introduced. The foot-pedal door opener is an added convenience. Automatic lighting of the cabinet interiors occurs as soon as the cabinet doors are opened.

Accessories

A. For HT-47, HX-47, HX-70, X-5 and X-7 Refrigerators.

These models are completely equipped with enameled vegetable pan, glass chiller tray and aluminum ice freezing pans with the General Electric tapered dividers for faster freezing and easier removal of ice cubes. A unit cord with a special locking connector which prevents accidental pulling off, yet is easily detachable with a slight turning motion, is included.

The X-5 and X-7 models have an ice tray lifter included, and the X-7 is equipped with one rubber ice freezing tray.

B. For HT-70 and T-7 Refrigerators.

This model is completely equipped with covered glass food containers, enameled vegetable pan, wire fruit basket, glass chiller tray, aluminum ice freezing pans with the General Electric tapered dividers for faster freezing and easier removal of ice cubes, and a rubber ice tray. A special cord with suitable connectors for the unit and cabinet is included. The connector to the unit is of new locking construction, preventing accidental pulling off, yet easily detachable with a slight turning motion.

The T-7 is also equipped with an ice tray lifter.

Guarantee

The early CA Form A machines carry a standard one-year warranty with an additional three-year service contract on the sealed mechanism. After Oct. 10, 1933, the Form A machines and all the Form B machines have the one-year warranty with a four-year replacement contract on the sealed mechanism.

Cycle of Operation

When the manual switch of the control is turned to the "on" position, an electric circuit is completed to the running winding of the motor. The current flowing is of such a value that as it passes through a coil in the starting relay in series with the running winding, an armature is raised and a pair of contacts are closed, putting the starting winding in parallel with the running winding. The motor starts immediately. As soon as it comes up to speed, the current decreases, and the armature drops, breaking the starting winding circuit. The motor continues to run as a single-phase induction motor.

The compressor is mounted directly below the motor on the vertical shaft. The cylinder is circular in form and is concentric with the center of the shaft. The oscillator of the compressor is cylindrical in form and is mounted on the eccentric of the shaft. The oscillator is keyed to the cylinder so that it oscillates but does not rotate, following around the cylinder wall as the shaft rotates.

On the suction side of the oscillator, gas refrigerant of low density is drawn into the compressor from the cooling unit. This gas is compressed and then expelled through the discharge valve. After passing through an acoustic muffler, it is discharged into the compressor case.

Gas refrigerant from the compressor case passes through the condenser where it is cooled and liquefied. The liquid refrigerant is collected in the float valve and returned to the cooling unit. It is introduced through specially designed nozzles near the bottom of the cooling unit so that forced circulation of the liquid refrigerant is secured.

The liquid refrigerant in the cooling unit evaporates because of the reduced pressure caused by the suction from the compressor. In so evaporating, heat is absorbed through the cooling unit walls from the air in contact with them and from water contained in the ice trays within the cooling unit. Thus refrigeration is obtained.

Unloading

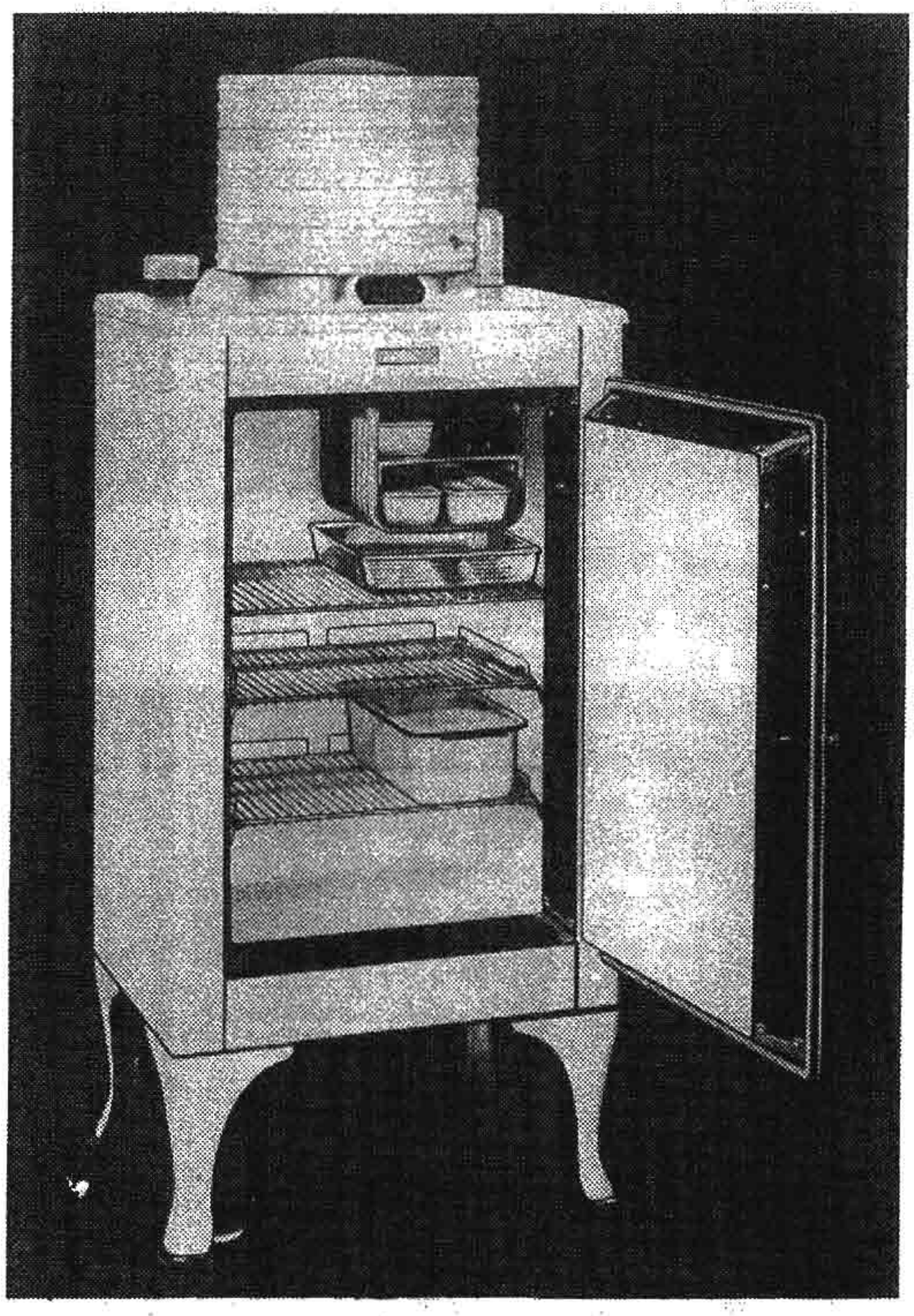
In order to keep the load on the motor during the starting period as low as possible, it is desirable that the pressure of the refrigerant on the suction and discharge sides of the compressor be the same. The process of equalizing this pressure is known as unloading.

Although the pressure within the compressor should be equalized, it is imperative that the higher pressure and warmer gas refrigerant does not leak back into the cooling unit to warm the liquid refrigerant there and thus lose part of the refrigeration obtained during the operating period of the machine. The cooling unit is sealed off from the compressor by means of a check valve at the time of unloading.

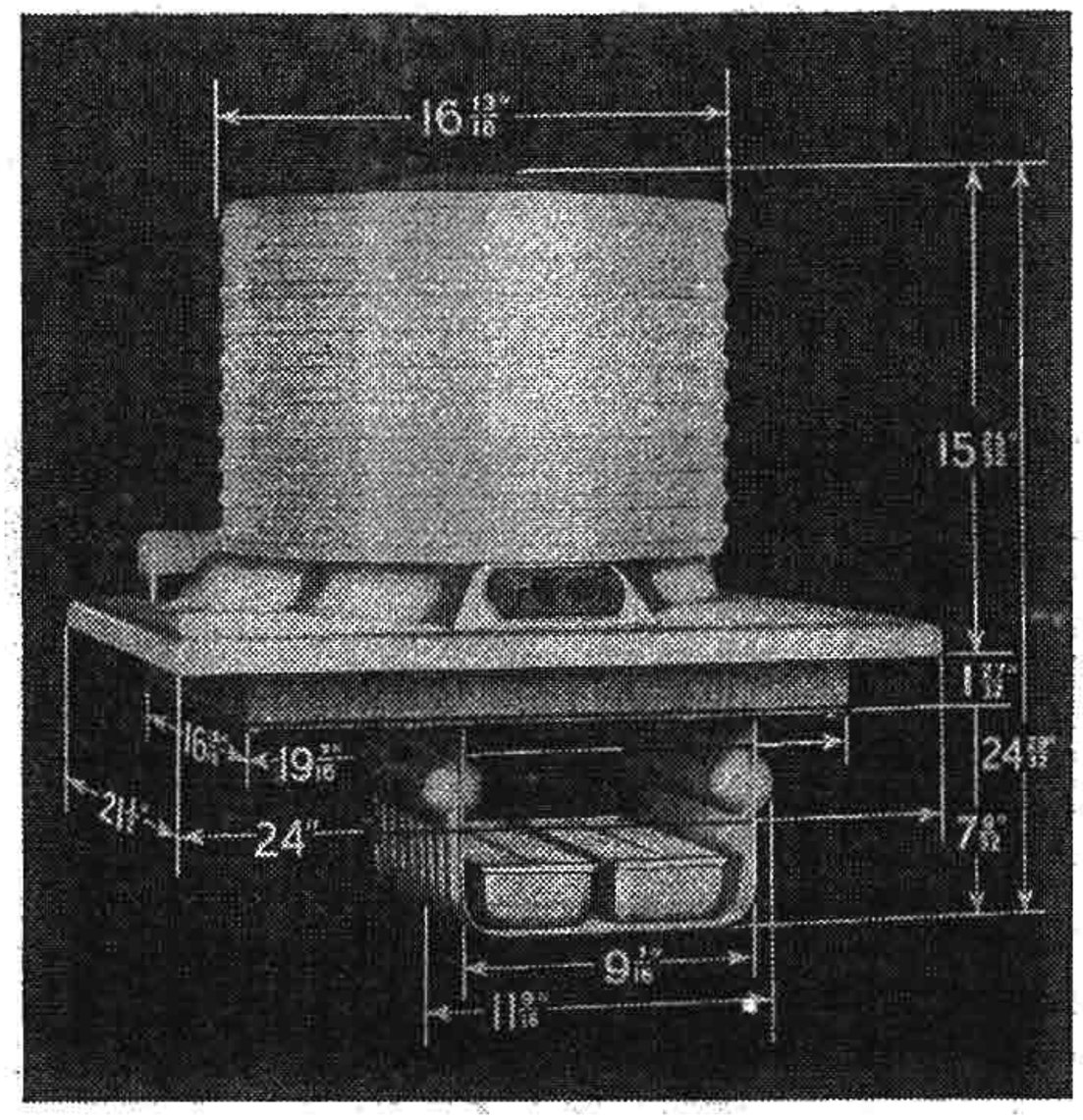
The unloader valve on this model consists of a plunger in a housing mounted on top of the shaft. The centrifugal force on the plunger during normal running operation is such that it overcomes the tension of a spring; the plunger flies out and closes an opening in the housing, which is subject to the pressure of the gas refrigerant in the compressor case. When the electric circuit to the motor is opened, the motor slows down. As it does so, the centrifugal force on the plunger is reduced until the spring draws the plunger back, thus opening the hole in the housing.

When the unloader plunger opens, high pressure gas refrigerant flows through passages in the housing, down a hole drilled through the center of the shaft, through another hole in the bottom plate, and up into the check valve chamber in the cylinder wall. The pressure lifts and holds a small disc check valve against the check valve seat. Some of the gas refrigerant passes into the suction side of the compressor and thus accomplishes the unloading.

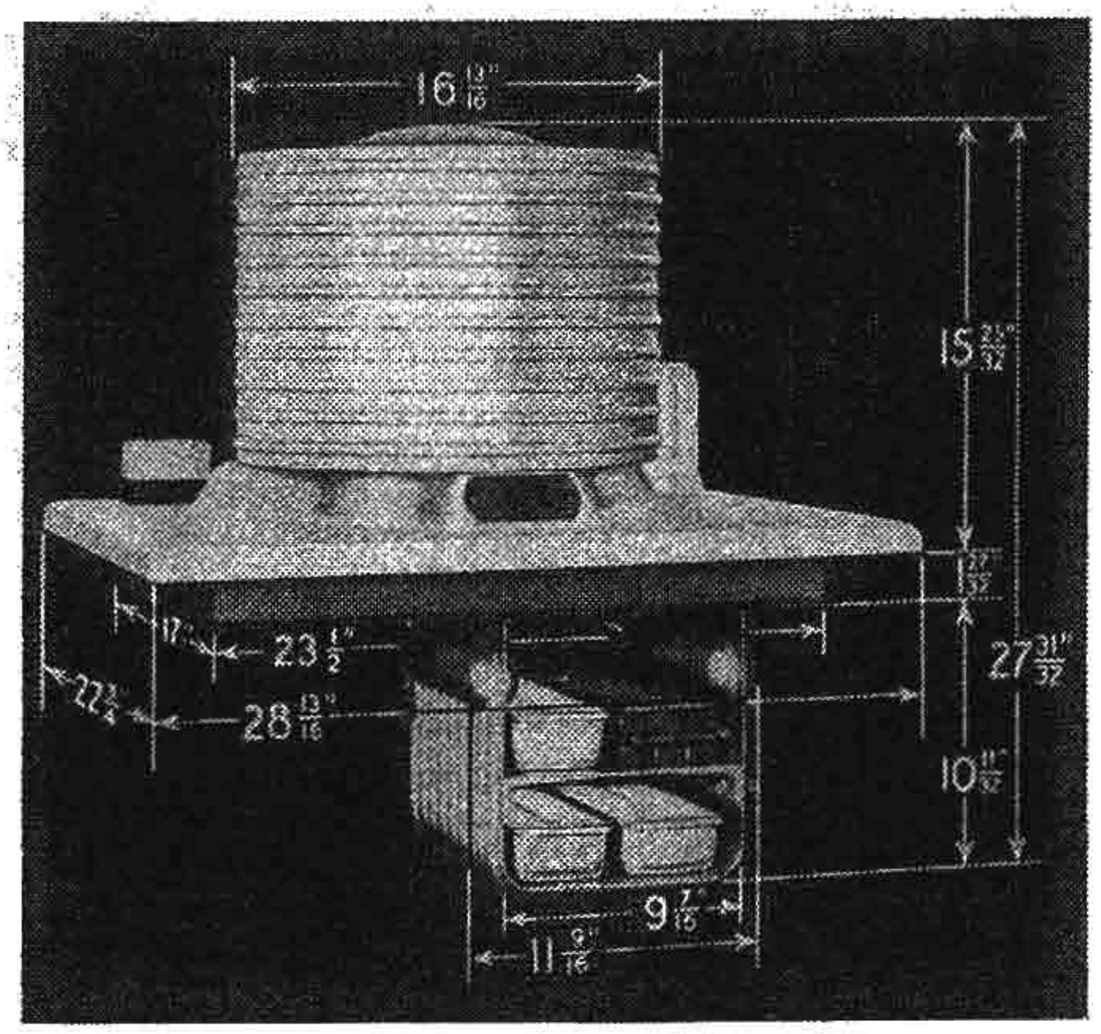
Since the unloading takes place early in the slowing up period, there is no vibration of the machine during stopping. Furthermore, the machine can be started again immediately after it is stopped.



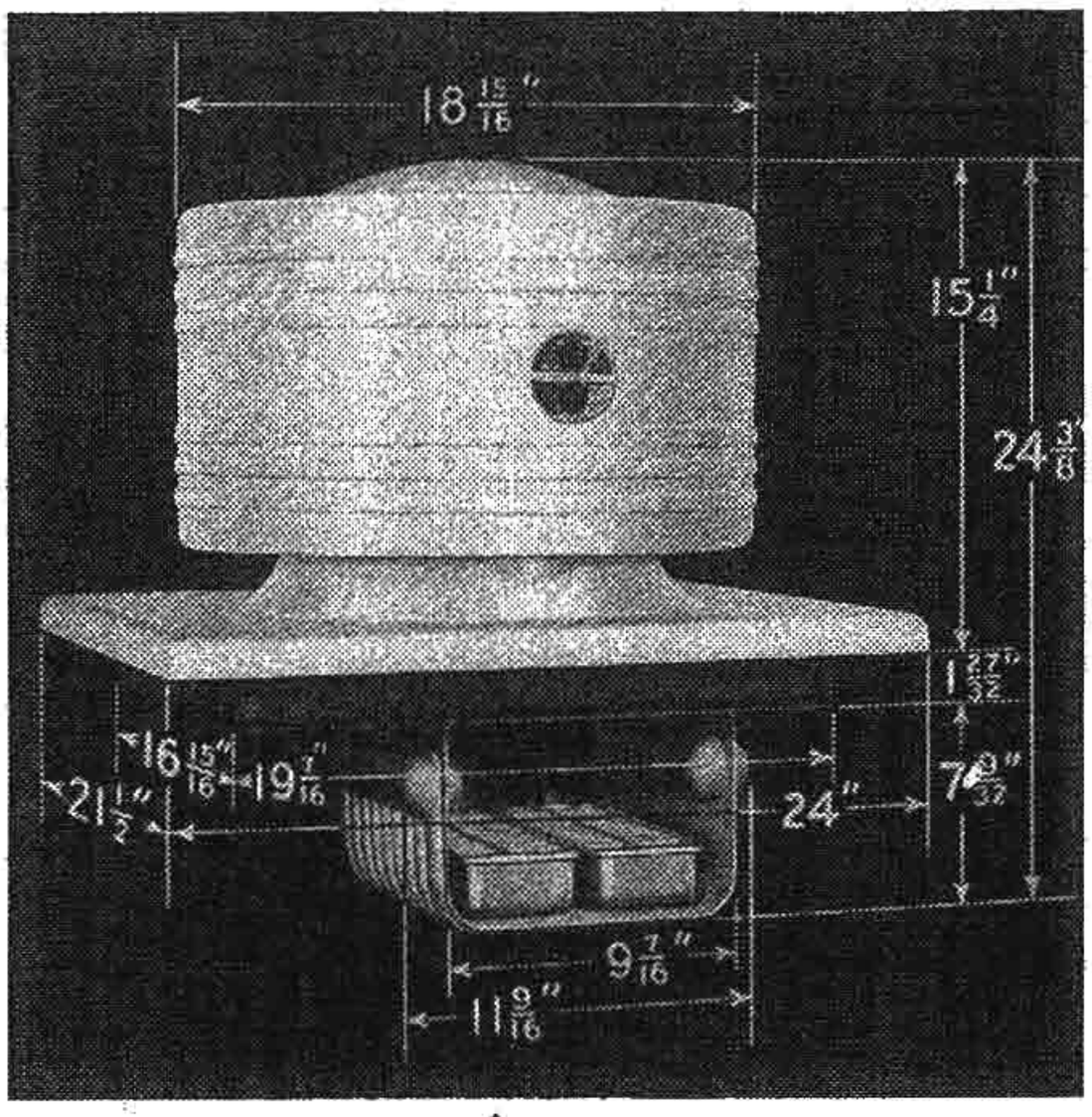
CA-2A Machine on HT-70 Cabinet



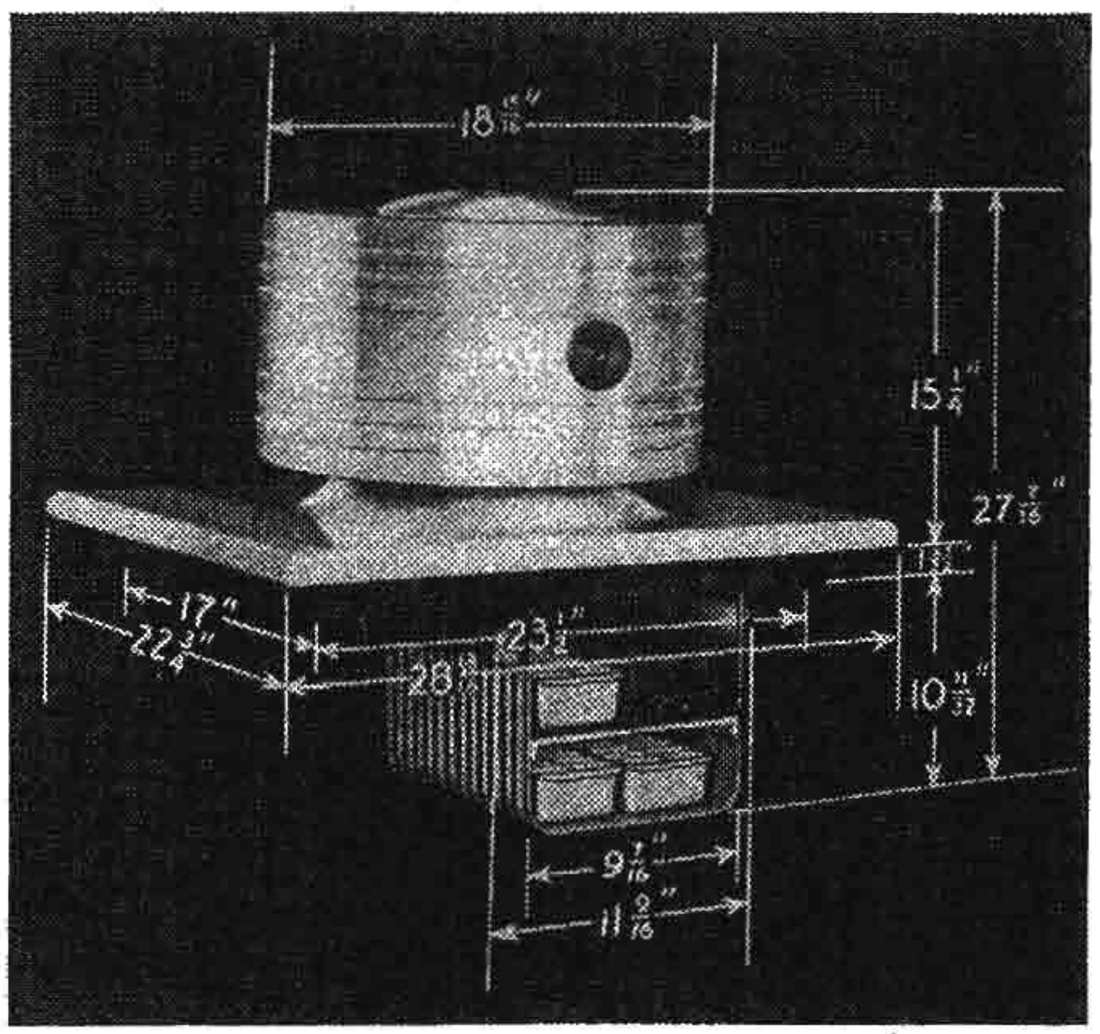
CA-1A Refrigerating Machine



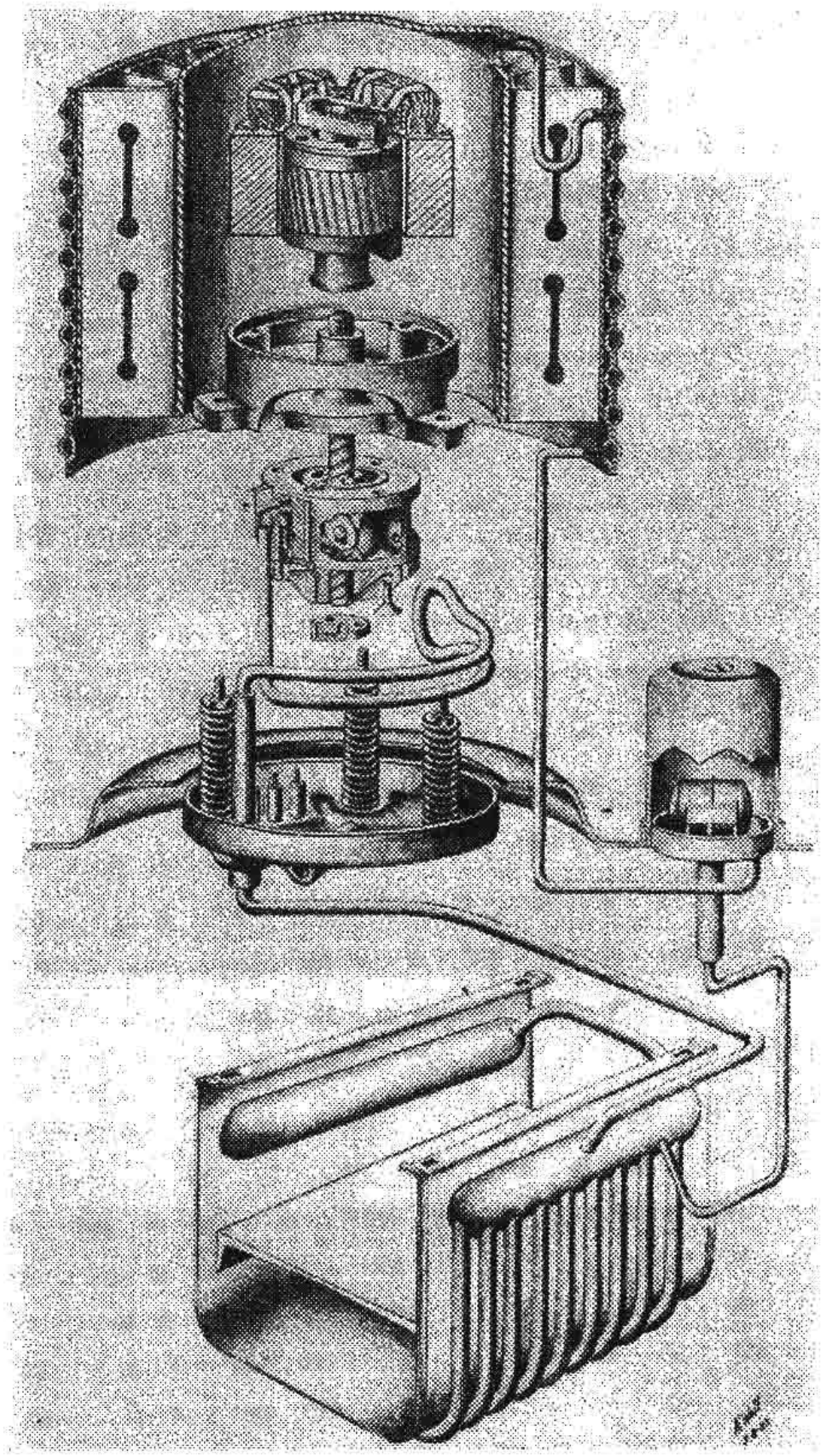
CA-2A Refrigerating Machine



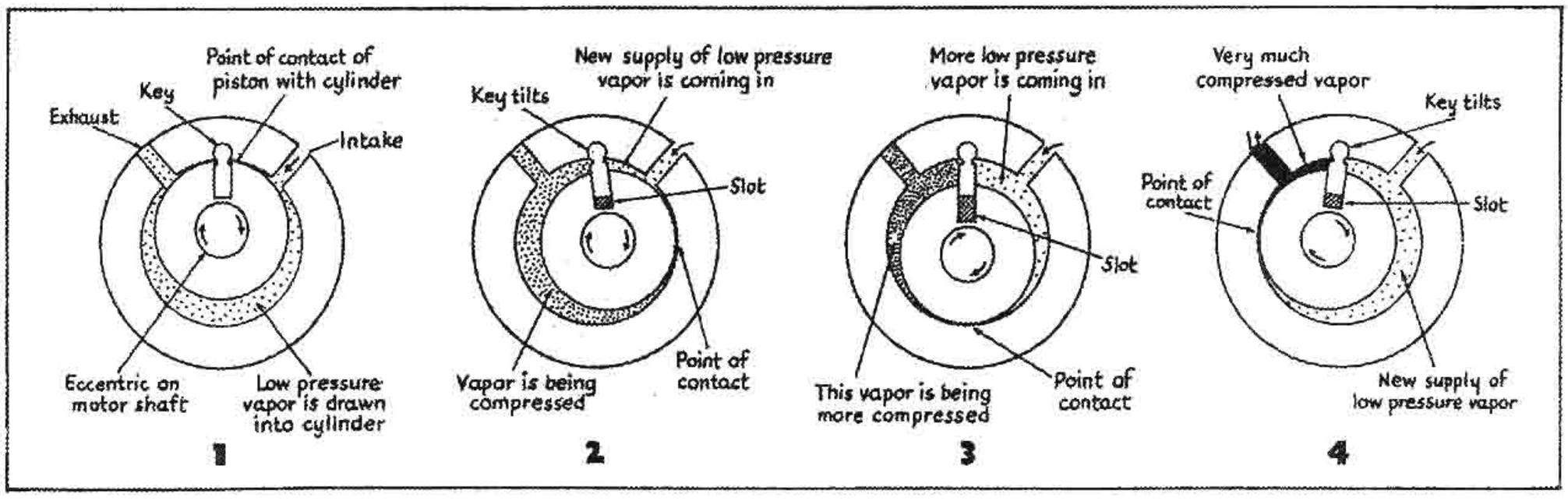
CA-1B Refrigerating Machine



CA-2B Refrigerating Machine



Construction of CA-2A Machine



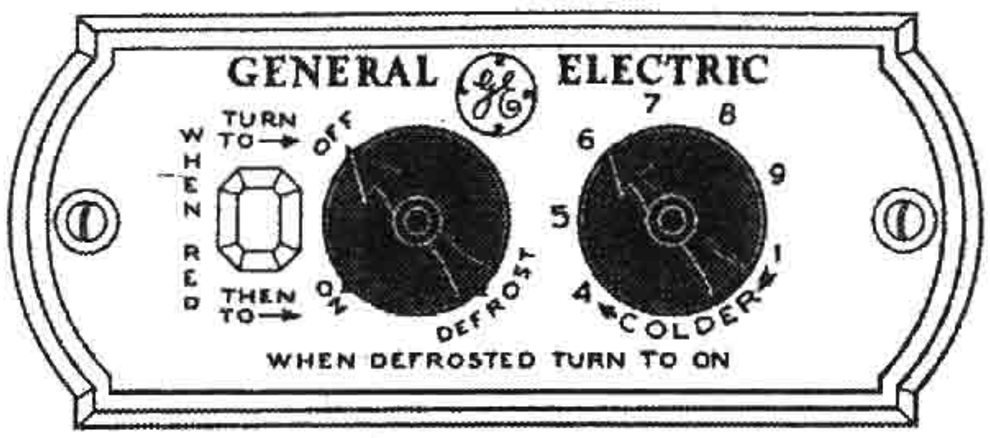
Different Stages of Compressor Cycle

ADJUSTMENTS

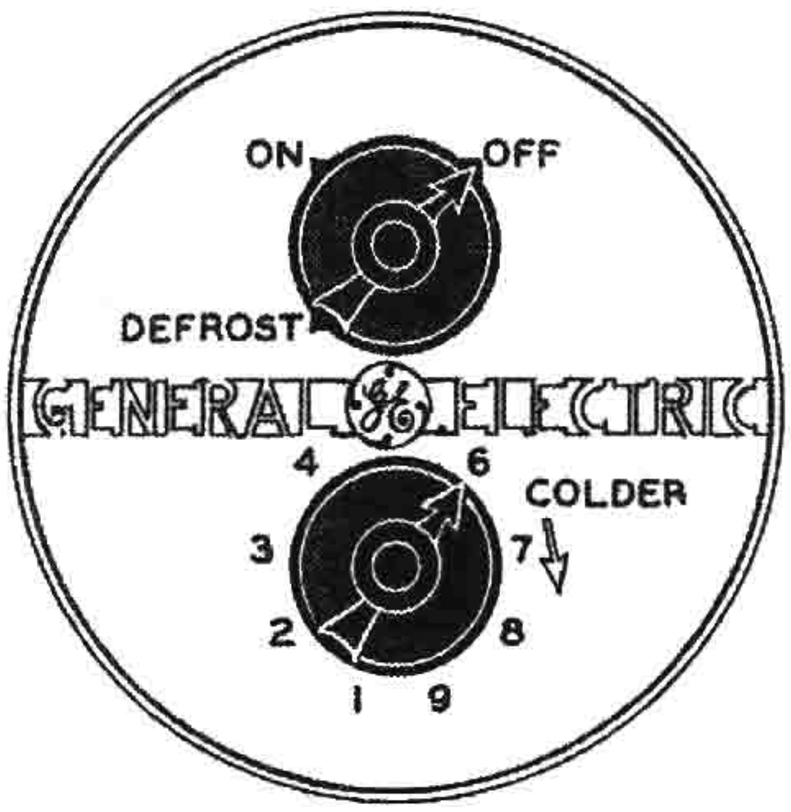
Description of Control, and Instructions for Replacing

Control

The control is completely sealed. There are no internal adjustments that can be made. Directions for operating the control are engraved on the escutcheon plate covering the control. Further explanation of these directions and the details of what happens within the control follow.



Front View of Control and Escutcheon Plate, CA Form A Machines



Front View of Control and Escutcheon Plate, CA Form B Machines

The control contains the manual switch for turning the machine on or off, the adjustable automatic mechanism for regulating the cooling unit and cabinet temperatures, the motor protective device, and the semi-automatic defrosting device.

Main Switch

The main switch on the control serves as a manual switch to turn the machine on or off, to reset the motor protective device, and to defrost the cooling unit.

To Turn the Machine On or Off Manually

The "on" and "off" positions of the two controls pictured above are in different relative locations, but in each case, the "on" and "off" points are clearly marked on the control escutcheon plates, and the "arrow" knob of the main switch (Form A—left, Form B—top) can be easily set to these positions.

When the knob is turned to the "off" position, a cam on the knob moves an extension of the arm on which the movable main contact is mounted so that the contact is opened. When the knob is turned to the "on" position, the cam releases the same arm so that the contacts may be open or closed depending on the toggle switch location which is controlled by the thermostatic bellows.

To Reset the Motor Protective Device

In case of unusual load or power conditions on the motor which cause it to draw excessive current, a protective device trips the machine off. When this protective device operates on a Form A machine, a red signal appears in the window on the front of the control.

The window in the front of the control on the CA Form B machine is not visible except when the escutcheon plate is removed. The escutcheon plate is held in place by two spring clips which are inserted through holes in the condenser. With the escutcheon plate removed, the lower end of the window will be visible just above the upper knob.

On later CA Form B machines the red signal has been left out. The tripping off of the motor protective device will be indicated by an excessively long "off" period during which the cooling unit will defrost.

To turn the machine on again, the manual on and off switch must be turned first to the "off" and then to the "on" position.

This motor protective device is located in series with the main contacts in the common lead to the motor. All of the current to the motor passes through a small heater coil which is wound around a stationary, vertical shaft. On the lower end of the shaft is a ratchet wheel. A film of solder holds the ratchet wheel stationary on the shaft. When excessive current passes through the heating coil, the solder is melted and the ratchet wheel turns, releasing a dog. The dog springs out and strikes the extension of the arm on which is mounted the movable main contact, opening this contact as though the external manual knob were turned to the "off" position.

To reset the device and start the machine, the external knob must first be turned to the "off" position. This movement resets the dog on the ratchet wheel. The knob is then turned to the "on" position and the main contacts are closed.

To Defrost the Cooling Unit

Defrosting of the cooling unit is obtained by turning the knob to the defrost position as marked on the escutcheon plate. Another cam on the knob releases a spring which acts in parallel with the main temperature spring against the bellows arm. The temperature

range on the CA-2A cooling unit is changed from 13.5° – 22° F. to 13.5° – 46° F. It is evident that defrosting will take place since the cooling unit now operates on a defrosting cycle. After defrosting a CA Form A unit, the main switch should be turned to the "on" position.

The mechanism for defrosting the cooling unit of the CA Form B machine operates in the same manner in the control as for the CA Form A machine except that the CA Form B machine is automatically returned to normal operation after a single defrosting cycle. The CA Form A machine continues to operate through defrosting cycles until the knob is manually returned to the normal "on" position.

The automatic return to normal operation after defrosting the CA Form B machine is accomplished by having an arm trip the cam on the main switch which releases the auxiliary defrosting spring when the bellows expands to the point corresponding to the upper defrosting temperature limit. There is a spring in the main switch which snaps it back to the "on" position.

Temperature Knob

The temperature knob on the control allows adjustment of the temperature range of the cooling unit and the cabinet air to satisfy the desires of the user. The movement of the knob changes the compression of the main temperature spring acting against the bellows arm.

The normal setting of the temperature knob is at position 5. The cooling unit temperature range, as measured in the bottom of the cooling unit, is approximately 13.5° – 22° F. for CA-2A units and 10° – 20° F. for CA-1A units at this control setting. The larger the number of the control setting, the colder the cooling unit will run and hence the cabinet will be colder. Form A machines have a range of average cooling unit bottom temperatures of about 10° F. between positions 1 and 9. This range is increased to 18° F. on the Form B units.

With the control set on position 5 (normal) the cabinet air temperature in a room varying between 70° F. and 80° F. with a normal amount of food in the cabinet, will be in the vicinity of 38° F. to 42° F.

Directions for Removing and Installing a Control

The catalog numbers of controls used on the machines when originally manufactured are given below:

Form A Machine (110-volt, 60 cycle A-c.) . . 58 x 25
Form A Machine (110-volt, 50 cycle A-c.) . . 58 x 58
Form B Machine (110-volt, 60 cycle A-c.) . . 58 x 117
Form B Machine (110-volt, 50 cycle A-c.) . . 58 x 120

For replacement purposes Cat. No. M1A181 Universal Replacement Control is furnished. This one control can be used on all type CA Machines regardless of Form or power supply. In order to obtain the same temperature limits as with the original control, this replacement control must be set three control positions warmer. Installation of the Universal Control is the same as for the original controls.

To Remove the Control—CA Form A Machines

1. Loosen the clamp holding the bellows tube to the left side of the cooling unit at the rear.
2. Remove and straighten the bellows tube.
3. Remove the two screws on the front of the control holding it to the cabinet top.
4. Pull the control directly forward, guiding the bellows tube through the rubber bushing in the bottom plate.
   The rubber bushing may cling to the bellows tube and pull up through the cabinet top. It should be replaced.
5. As soon as the control body is out of the cabinet top, the locking connector to the back of the control should be removed with a slight turning motion.

Caution: The locking connector to the back of the control is similar to that on the connecting cord to the relay. It cannot be removed by straight pulling. It must be turned slightly.

6. The control can now be completely removed.

To Install a Control—CA Form A Machines

1. Insert the end of the control tube through the control opening in the cabinet top, push it through the box top insulation and start it through the rubber bushing in the bottom plate.
2. Guide the control tube through the rubber bushing.
3. Connect the locking connector to the prongs on the back of the control before the control enters the opening in the cabinet top.
4. Push the control into place and attach it with the two screws in the front.
5. Bend the bellows tube into place and clamp it to the cooling unit. The upper end of the pinch off of the bellows tube should project just below the clamp so that the liquid will be right under the clamp. The bellows tube at this point should be right against the rear cooling unit channel.

Caution: The control tube should not touch the cooling unit header. If it does, the temperature limits may vary somewhat from the proper ones.

6. The temperature knob should be set at position 5 if normal operating limits under normal operating conditions are desired.

CA Form B Machines

When removing or installing a control on a CA Form B machine, the same instructions can be followed as for the Form A. However, since the control is mounted on the condenser, there are a few added steps.

The control escutcheon plate must be removed when working with the control. It is held in place by two spring clips which are inserted through holes in the condenser.

The control is mounted to the condenser by means of a bracket. Two screws hold the bracket to the condenser and one screw holds the control.

The CA-1B machine requires a longer bellows tube than the CA-2B machine. Since the same control is used for both machines, it will be found that the tube is too long for a CA-2B unit. The extra length can be taken up by putting a bend in the tube just after

it comes through the bottom plate. This bend should be made so that it will not interfere when placing things in the refrigerator.

Directions for Replacing the Control Bellows

1. Remove the control from the machine.
2. Lay the control on a flat working surface with the seal cover uppermost. Remove the two brass screws which hold the bellows cover plate to the control and withdraw the bellows from the control.

   Caution: After these two screws are loosened, and until the new bellows is tightened into place, the control should not be moved violently or changed from the position specified, otherwise, one of the taps which receive the attaching screws may slip out of the slot, and may be lost inside of the mechanism.
3. Before the clamp which holds the replacement bellows during shipment can be removed the bulb *must* be cooled down to −10° F., and the bulb must be kept at this temperature until the bellows has been inserted into the control and fastened in place.

   Place the bellows control tube into a container filled with dry ice. When the temperature of the bulb has been reduced below −10° F., the bellows will contract sufficiently to allow the shipping clamp to be removed.

   Caution: Be sure not to loosen the nut which locks the cover plate to the bellows. In straightening or bending the bellows tube, avoid bending the section near the silver soldered joint where it joins the bellows. A strain at this point may crack the tubing.
4. Insert the bellows, carefully observing the caution under item 3. Be careful to keep the bellows tube cold until the attaching screws are firmly tightened.

   Caution: Be sure that the cupped fiber washer is properly in place between the bellows and bellows arm. The bellows arm is an electrically live point, and must be insulated from the bellows to avoid grounding the motor circuit to the cooling unit.
5. After the control has been replaced on the machine be sure to check the operation of the control and the temperature limits on the cooling unit to see that the control is functioning properly.

To Reset the Temperature Control

1. Disconnect the refrigerator connecting cord from the wall outlet. This is necessary since the screw holding the control knob is at the same electric potential as the movable main contact.
2. Remove the sealing plug from the center of the knob, using a pocket knife.
3. Take out the small screw in the center of the knob.

   Caution: Do not push inward on the spindle to which the knob is attached. If the spindle is pushed in, a small bearing piece may fall out and damage the control.
4. Reset the knob in a clockwise direction to obtain warmer temperatures and counter-clockwise for colder temperatures. The cabinet air temperature is changed about 1° F. between successive numbers on the dial.
5. Replace the knob screw and sealing plug, remembering not to push the knob spindle inward.

Description of Starting Relay, and Instructions for Replacing

Starting Relay

The starting relay, located on the left-rear corner of the cabinet top on the CA Form A machines, and on the rear of the condenser on the CA Form B machines, contains a coil in series with the running winding which, when the machine is started, lifts an armature and closes a pair of electrical contacts. Closing these contacts puts the starting winding of the motor in parallel with the running winding. The motor then starts. As soon as the motor is up to speed, the current in the running winding circuit drops to such a value that the armature drops and breaks the starting winding circuit. The motor continues to run single phase with current in the running winding only.

The lifting of the armature during starting is caused by the repelling force between the coil and the armature itself which forms a single short-circuited turn circuit above the coil. The armature is held steady in the upper position by the small steel bars under the short-circuited turn which tend to stay in the magnetic field between the pole pieces. When the current through the coil decreases to a predetermined value, the armature drops suddenly, giving the desired snap action to the electrical contacts.

Directions for Removing and Installing a Starting Relay

The catalog numbers of relays used on the machines when originally manufactured are given below:

Form A (110-volt, 60 cycle A-c.) . . . 58 x 14
Form A (110-volt, 50 cycle A-c.) . . . 58 x 59
Form B (110-volt, 60 cycle A-c.) . . . 58 x 121
Form B (110-volt, 50 cycle A-c.) . . . 58 x 122

These original relays should not be interchanged either between Form A and Form B machines or between 50 and 60 cycle machines.

For the replacement of starting relays on all CA machines, the later design, Cat. No. M1A162, starting relay is furnished. This is a CR-1057 type R relay with an automatic reset overload device incorporated in it. The automatic reset overload will function before the overload in the control so there should be no trouble because of the two overload devices in the

circuit. On 50 cycle service, the overload may trip a few times during pull-down in a very warm room, but it will immediately reset and operation will continue.

Installation of the Type R starting relay requires special accessories. Directions for replacing the starting relay with both the original style and the Type R are given below.

Caution: Do not disturb or adjust the starting armature.

The armature of the starting relay is carefully constructed and tested at the factory in order that its tension be just right to insure proper starting of the machine. Consequently, the starting relay is sealed and must not be opened unless absolutely necessary.

If it is found necessary to open a starting relay as a last resort before replacing a machine, great care must be used.

Never interchange any motor leads. The starting winding will burn in a short time if left continuously in the circuit.

In some instances, the color of the leads to the relay may not be easily distinguishable. If such is the case, mark them carefully when changing a starting relay.

To Remove the Relay

1. Disconnect the locking connector from the back of the relay, using a slight turning motion.
2. Break the seal on the back of the relay and remove the cover.
3. Disconnect all leads, marking any lead whose color is not easily recognized.
4. Remove the two screws holding the relay to the cabinet top of the Form A machines or the condenser of the Form B machines.

To Install an Original Style Relay

1. Reverse the procedure for removing a relay, making sure that the fiber washers are placed under the corners of the relay in order to prevent warpage of the base.

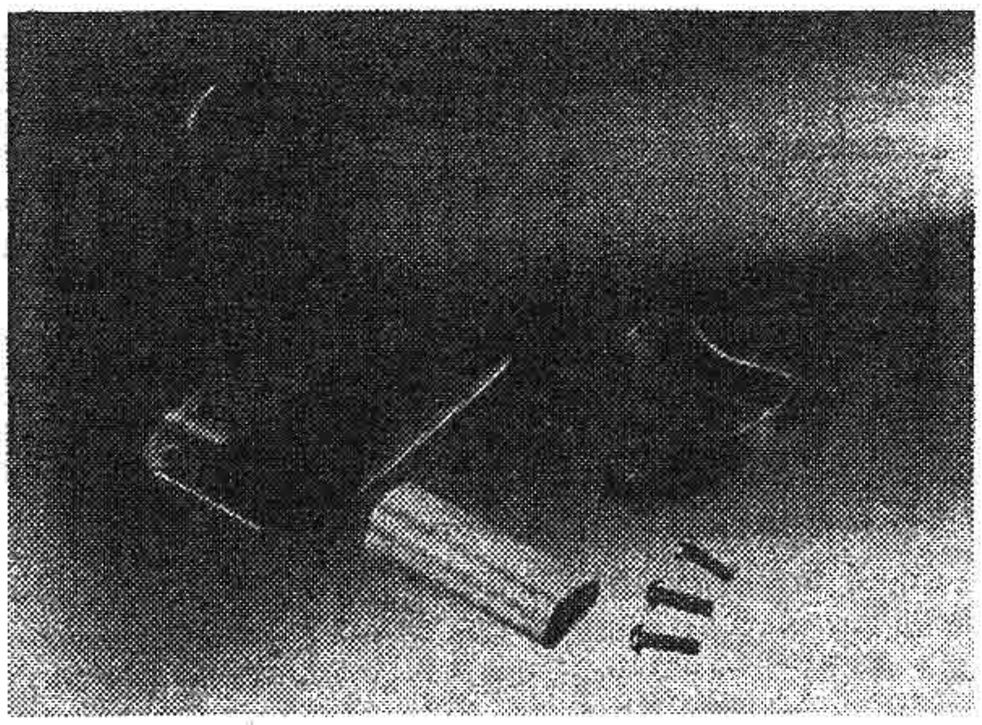
To Install a Type R Replacement Relay

1. Accessories required for Form A machines covered by Cat. No. M15A75. These include an upright mounting bracket and two screws to attach it to the box top, a spring clip to hold the relay to the bracket, a short length of rubber tubing and a long terminal screw.
2. Accessories required for Form B machines covered by Cat. No. M15A32. These include a back plate with a U bolt, nuts and lock-washers for assembling the plate to the relay, two screws for holding the assembly to the condenser and a long terminal screw.
3. If the leads to the relay are in rubber covered cables, strip the covering for a couple of inches to give sufficient length for the leads to reach the terminals of the R relay. Properly tape the leads if the insulation is damaged.
4. On Form A machines, slip the rubber tubing over the leads where they come through the box top.
5. Remove the locking connector from the connecting cord and strip the covering about an inch.

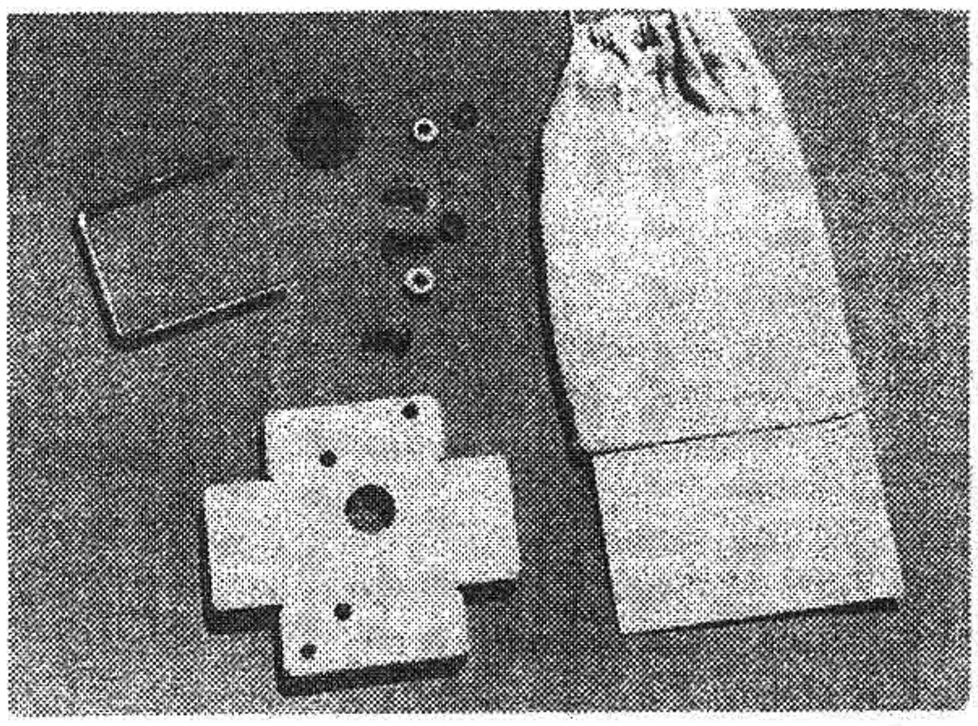
   Note: On those machines with a cabinet light plug in the connecting cord, the cord length between the relay end and the light plug is shortened so that the light connector will not go into the cabinet socket. To lengthen the cord going to the cabinet it is suggested that a short length be added by means of a male connector G-E 2714 and a female connector G-E 2713.
6. **Form A Machines.** Install the mounting bracket. It is held by two screws which go into the tapped holes in the box top where the original relay screws went in. The motor and oil conditioner leads come up through the hole in the base of the bracket.
7. **Form A Machines.** The R relay is mounted in an upright position. The two U-shaped openings in the bottom of the relay cover do not provide enough clearance for all the leads going to the relay terminals. To increase this clearance break off the small piece of the cover between the two openings.
8. **Form B Machines.** Bring the leads through the large hole in the back plate with the turned-over edges of the plate toward the condenser. The rubber bushing which comes with the accessories, because of other applications, cannot be used.
9. Connect the motor, oil conditioner and connecting cord leads to the R relay terminals in accordance with the table given on page 13.
10. Check the starting of the machine before attaching the relay.
11. Attach the relay to the machine with the two cable openings in the cover downward.

On Form A machines the relay is held to the upright mounting bracket by the spring clip.

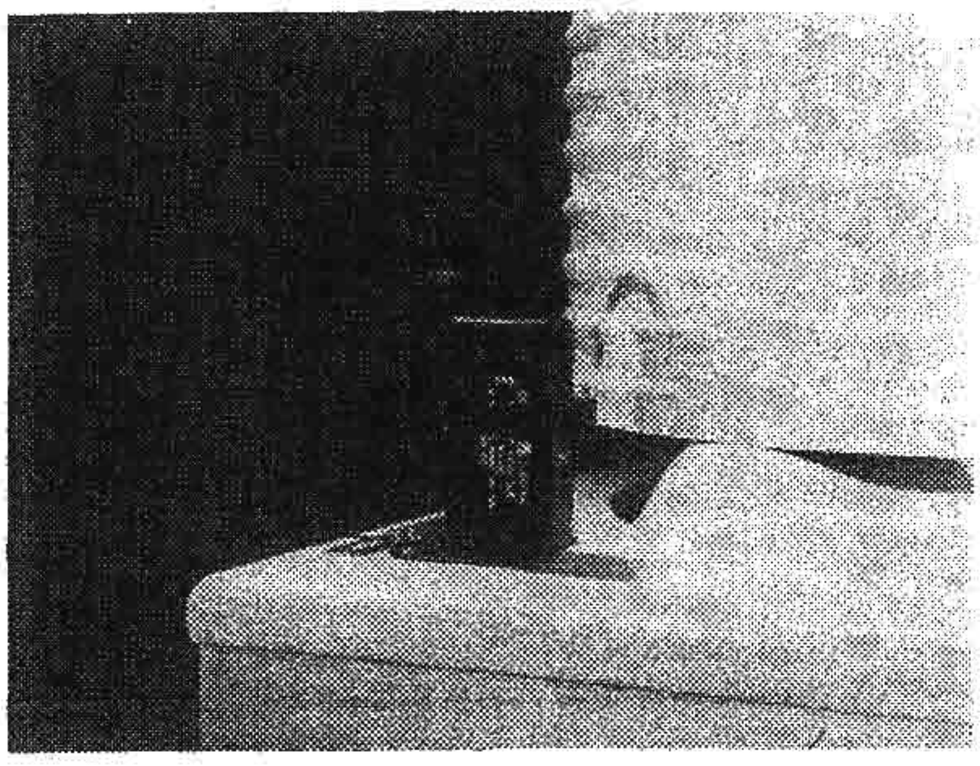
On Form B machines the R relay is attached to the back plate with the U bolt, lockwashers and nuts. This assembly is then mounted on the condenser by two screws going into the tapped holes where the original relay screws went in.



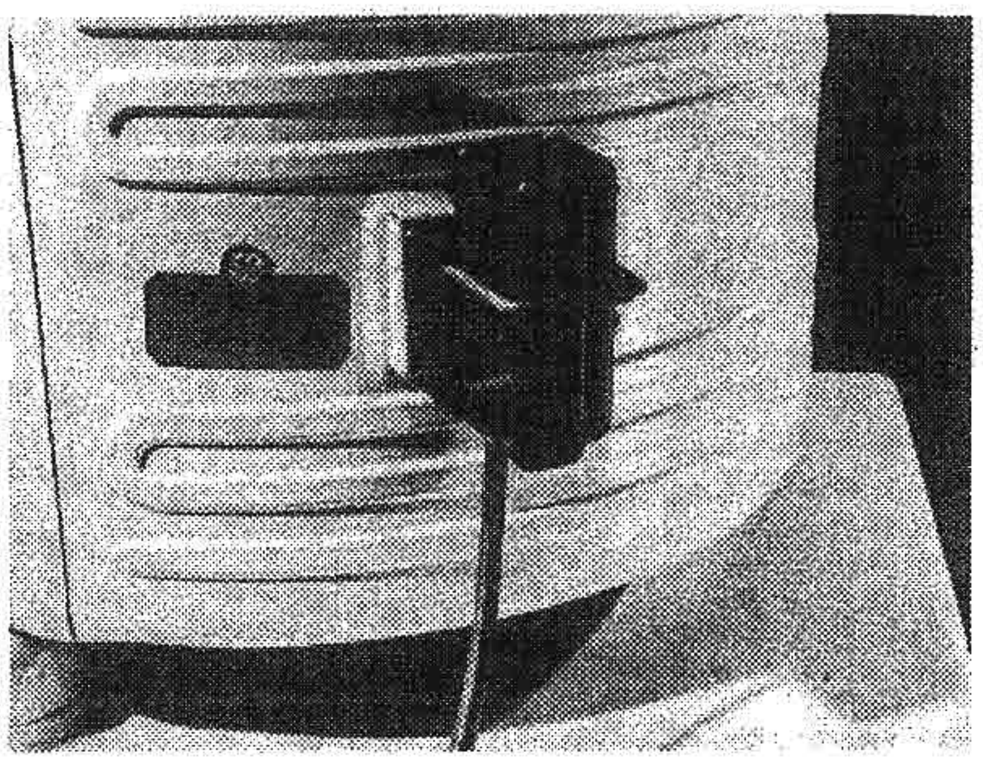
M15A75 Accessory Parts



M15A32 Accessory Parts



R Relay on Form A Machine



R Relay on Form B Machine

Type R Relay Wiring Connections

	3 Wire Cable to Compressor			2 Wire Connecting Cord		2 Wire Cable to Oil Conditioner	
Color of Lead	R	W or Y	B	W	B	W or G	B or G
Terminal No.	3	1	2	2	4	2	4

Color Code: R—Red W—White Y—Yellow B—Black G—Green

Note: It is necessary to use a long screw in terminal 2 of the relay.

Machine Adjustments

I. MACHINE DOES NOT RUN PROPERLY

Symptoms

The refrigerating machine may have one or more of the following symptoms:

1. Stalled (will not start or run at all).
2. Starts and runs only with both windings in the circuit.
3. Burned motor.
4. Will not restart after shutting off.
5. Motor protective device trips off.
6. Runs all the time (does not shut off).

Adjustments

The source of trouble may be external to the machine or it may be in the machine itself. It is recommended that the external factors be checked first. These include such things as the location of the machine, the current and voltage to the machine, and the electrical circuit to the machine. In testing the machine, it is suggested that the parts be checked in the following order: control, starting relay, oil conditioner and finally the machine itself.

1. Stalled (Will not start or run at all)

If the machine will not start or run at all, the possible causes are:

A. Improper current or voltage.
B. Restricted air circulation to condenser.
C. Open circuit.
D. Grounded circuit.
E. Short circuit.
F. Non-condensable gas.
G. Stalled compressor.
H. Excessive load on compressor.

A. Improper Current or Voltage

The machine is designed for operation on 60-cycle alternating current. It will also operate satisfactorily on 50-cycle alternating current if a special control and relay are used.

The machine will not operate on 25 or 40-cycle alternating current, or on direct current.

While the rated voltage on the machine is 110 volts, it will operate satisfactorily on any voltage between 100 and 135.

When the voltage at the machine at the time of starting is less than 100 volts and the machine is operating under heavy load conditions, it may not start and the motor protective device will trip off.

When the voltage is above 135 and the machine is operating under heavy load conditions, the current to the motor may be sufficient to trip the motor protective device.

B. Restricted Air Circulation to Condenser

If the circulation of air is restricted from the condenser, the head pressure may rise to such a point that the machine may trip off or the compressor may stall.

It is recommended that at least one side of the machine be left exposed. The space above the machine top should be at least six inches. If a machine is enclosed more than this amount, it may be necessary to provide forced air circulation in order to obtain satisfactory operation.

C. Open Circuit

a. Circuit to the refrigerator.

Check the electrical circuit to the refrigerating machine by placing a series test lamp across the terminals of the connecting cord connector and noting that it lights, or by observing that the house watt-hour-meter moves when the machine, on which the control is turned to the "Off" position, is connected to the circuit and all other appliances or lights are turned off, indicating a circuit through the oil conditioner. For CA-2A and CA-2B machines it is possible to observe whether the light in the cabinet comes on when the door is opened. If the cabinet light does not come on and the bulb tests all right in a socket on another electrical circuit, there is an open circuit in the supply line. If an open circuit is found, check the cord connections to the machine and to the wall receptacle, making sure that good electrical contact is obtained. Also, check the supply line fuses.

Check both of the locking connectors, the one on the connecting cord which attaches to the relay and the one which attaches to the control, for possible poor contact or open circuit.

One of the wires may have become disconnected in the connector.

The spring contacts in some connectors may not make contact, having lost their spring tension when the wires were soldered.

The small brass screws which hold the fiber disc over the end of the connector may project out far enough to prevent the prongs on the relay from making contact with the spring contacts in the connector. Make sure that the wires in the connector are properly located in the grooves so that they do not interfere with the seating of the disc.

b. Control.

If the circuit to the refrigerator is all right, remove the control as described on page 10. Replace it with a new control. If the machine starts and runs, it is evident that the original control may have had an open circuit.

Caution: Before replacing a control, make sure that the machine is not in the "off" cycle. The bellows tube can be warmed by holding the hand over it on the cooling unit.

A control can be tested for open circuit by placing a test lamp in series with the control in an electric circuit and observing whether the lamp lights when the main switch is turned to the "on" position. If the lamp does not light, there is an open circuit in the control.

An open circuit in a control may be caused by a weak bellows, open lead or connection, burned contacts, or defective toggle device. Since the control is sealed, it must be replaced as a whole. Part replacements cannot be made.

c. Starting relay.

Caution: Do not disturb or adjust the starting armature. The armature of the starting relay is carefully constructed and tested at the factory in order that its tension be just right to insure proper starting of the machine. Consequently, the starting relay is sealed and must not be opened unless absolutely necessary.

If it is found necessary to open a starting relay as a last resort before replacing a machine, great care must be used.

Never interchange any motor leads. The starting winding will burn in a short time if left continuously in the circuit.

In some instances, the color of the leads to the relay may not be easily distinguishable. If such is the case, mark them carefully when changing a starting relay.

If the circuit to the refrigerator and the control proves to be all right but still the machine does not start, the starting relay may be opened and inspected.

Check the electrical connections to the relay, making sure that all are tight and that the proper lead or leads come to each terminal. Refer to the electrical circuit diagram on page 37.

Raise the armature carefully, using a piece of insulating material such as wood or cardboard. The armature should operate freely.

Caution: When raised, the armature is at line voltage so should not be handled. If a person's body is grounded, a serious shock might result.

If the starting contacts do not spark when the armature is raised and lowered, there is an open circuit to the starting winding.

Note: The main switch of the control should be in the "on" position when this test and succeeding tests on the starting relay are made.

Disconnect the red (running) lead in the relay and see if it sparks when touched to its terminal. If it does not, there is an open circuit to the running winding. The open circuit may be in the series coil in the relay, in the running or common lead to the motor, or in the motor.

To test the series coil in the relay, short circuit it with a short piece of insulated wire between the terminal to which the single oil conditioner lead is connected and the terminal to which the red lead is connected. Again see if the red lead sparks when touched to its terminal. If it does but did not before the series coil was short circuited, there is an open circuit in the series coil. The relay must be replaced. Refer to page 12 for instructions for removing and replacing the relay.

If there is evidence of open circuits to both the starting and running windings, check the common lead circuit by disconnecting both the white (starting) and red (running) leads in the relay, placing a test lamp in series with them in an electrical circuit and observing if the lamp lights. If it does, the open circuit is in the common lead. If it does not, the open circuit may be in any two or all of the leads or in the motor.

d. Machine.

If, from the tests conducted on the starting relay, it is proved that there is an open circuit in the common, running or starting circuits or in the motor which cannot be repaired, the machine must be replaced.

D. Grounded Circuit

All electrical circuits and connections are insulated from the refrigerating machine itself. If one of the electrical circuits or connections should come in direct contact with a part of the refrigerating machine, it is considered grounded.

A ground in the circuit to the refrigerator, in the control, starting relay, oil conditioner, or machine may cause blowing of the house fuses, tripping off of the motor protective device, welding of the contacts or burning off of a lead.

A series test lamp will be found necessary to locate the ground.

Caution: The machine itself must not be grounded either through the cabinet or test rack while testing for a grounded circuit; otherwise, the line to the refrigerator may be short circuited to ground.

If the machine can not be conveniently insulated from ground, a series test lamp must be used in each lead from line to the machine.

a. Circuit to the refrigerator.

A ground in the circuit to the refrigerator will cause blowing of the house fuses after the refrigerator is disconnected from the circuit.

Make sure that the ground is not in the cord connector or plug. Look for evidence of arcing. Also, watch for indications of moisture and dirt.

b. Control, starting relay, oil conditioner and machine.

The control, starting relay, oil conditioner and machine can be tested as a group. Then, if a ground is found, each can be tested separately.

Refer to the above *"Caution."*

Plug one terminal of the cord connector into one prong in the back of the starting relay. Put one terminal of the test lamp into the other terminal of the connector. With the knob of the control in the "on" position, touch the other terminal of the lamp to the other prong in the back of the relay. The lamp should light, indicating a circuit through the motor.

Then touch this second terminal of the lamp to some unpainted part of the machine such as the screw on the top of the float valve or one of the screws holding the nameplate to the cabinet top. If the lamp lights, there is a ground, in which case proceed to locate it.

c. Control.

Replace the control with a new one. If the machine starts and runs satisfactorily, there may have been a ground in the original control.

Caution: If the ground is in the starting relay, oil conditioner or machine, the motor protective device may trip off, the main contacts may weld or a lead may be burned off in the new control.

A ground in the control can be verified by plugging first one prong of the control and then the other into a terminal of the cord connector which ordinarily is attached to the starting relay. Put a test lamp in series between the other terminal of the cord connector and the bellows tube. If the lamp lights, there is a ground in the control.

Caution: The control or bellows tube must not be grounded while testing for a grounded circuit; otherwise, the line to the refrigerator may be short circuited to ground.

d. Starting relay.

Caution: Do not open the starting relay unless absolutely necessary. Refer to the "Caution" under "Starting relay" on page 12.

If the grounded circuit is apparently in the starting relay, oil conditioner or machine, it is permissible to open the starting relay and inspect it.

Make a visual inspection of all of the leads and connections. Watch for evidence of arcing.

Remove the two screws holding the relay and lift the relay as far as the leads allow. Check to see that the leads do not chafe each other or the cabinet top. Look to see that there is no evidence of arcing between he screw heads under the relay and the cabinet top. Also, watch for indications of moisture and dirt under the relay.

If a grounded spot is found, eliminate it by taping or otherwise insulating it.

When replacing the relay, carefully follow the directions on page 12.

e. Oil conditioner.

Refer to the "*Caution*" under D on page 15.

Disconnect both oil conditioner leads in the starting relay. Put one lead into a terminal of the cord connector. Put one terminal of the test lamp in the other terminal of the cord connector. Touch the other terminal of the lamp to the second oil conditioner lead. The lamp should light, indicating a circuit through the oil conditioner.

Then touch the second terminal of the lamp to some unpainted part of the machine such as the screw on the top of the float valve or one of the screws holding the nameplate to the cabinet top. If the lamp lights, the oil conditioner is grounded and should be replaced.

f. Machine.

Refer to the "*Caution*" under D on page 15.

Disconnect the red and white leads in the relay. Attach the red lead to a terminal of the cord connector. Put one terminal of the test lamp in the other connector terminal. Touch the other terminal of the lamp to the white lead. The lamp should light, indicating a circuit through the motor.

Then touch the second terminal of the lamp to some unpainted part of the machine such as the screw on top of the float valve or one of the screws holding the nameplate to the cabinet top. If the lamp lights, the machine is grounded and should be replaced.

E. Short Circuit

All electrical circuits and connections are insulated from each other. If two of these circuits or connections should come in contact with each other, a short circuit results.

A short circuit in the circuit to the refrigerator or in the oil conditioner may cause blowing of the house fuses. A short circuit in the relay may cause blowing of the house fuses, tripping of the motor protective device, welding or burning of the starting contacts, or burning off of a lead. A short circuit in the control may cause the machine to run all the time. A short circuit in the machine may cause blowing of the house fuses, tripping off of the motor protective device, welding or burning of the main or starting contacts, or burning off of a lead.

a. Circuit to the refrigerator.

A short circuit in the circuit to the refrigerator will cause blowing of the house fuses after the refrigerator is disconnected.

Make sure that the short circuit is not in the cord connector or plug. Look for evidence of arcing; also, indications of moisture or dirt.

b. Control.

The machine will continue to run even when the main switch is turned to the "off" position if there is a short circuit in the control. Replace the control.

c. Starting relay.

Caution: Do not open the starting relay unless absolutely necessary. Refer to the "Caution" under "Starting relay" on page 12.

If the short circuit seems to be in the starting relay, oil conditioner or machine, it is permissible to open the starting relay and inspect it.

Make a visual inspection of all of the leads and connections, noting that the leads are properly connected and not touching. Look for evidence of arcing.

Observe particularly the terminals on the oil conditioner leads, making sure that the one attached to the terminal with the black (common) motor lead does not touch the upright post supporting the starting armature. Should this happen, there would be a short circuit as soon as the starting contacts close.

Check the other oil conditioner terminal to see that it does not touch the red motor lead or its terminal. If it does, the series coil will be left out of the circuit, the machine will not start and the motor protective device will trip off.

Remove the two screws holding the relay to the cabinet top and lift the relay as far as the leads allow. Check to see that the leads do not chafe each other or the cabinet top. Look for evidence of arcing. Inspect the under side of the relay. Watch for indications of moisture and dirt.

If a short-circuited spot is found, eliminate it by taping or otherwise insulating it.

When replacing the relay, carefully follow the directions on page 12.

d. Oil conditioner.

Disconnect one of the oil conditioner leads in the starting relay and put a series lamp in the circuit between the disconnected lead and its terminal. Turn the main switch to the "off" position. If the oil conditioner is short circuited, the lamp will burn with normal brilliancy. If the oil conditioner is all right, the lamp will glow at reduced brilliancy.

e. Machine.

If there is still a short circuit present after the preceding tests have been completed, it must be in the machine. In this case, the machine should be replaced.

F. Non-Condensable Gas

Any collection of non-condensable gas in the float may increase the head pressure sufficiently to cause the motor protective device to trip off or the compressor to stall.

The non-condensable gas can be bled from the float. For symptoms of non-condensable gas, and complete bleeding instructions, refer to "Bleeding Instructions" under"General Adjustments" on page 25.

G. Stalled Compressor

The compressor may be stuck with corrosion, dirt or mechanical failure of a part. Jarring of the machine may free the compressor if the cause is of minor extent.

Apply 220 volts A.C. *momentarily* to the machine. The compressor may be broken loose with this treatment and then continue to run satisfactorily on normal voltage. Auto-transformer, 220-110 volts, Cat. No. 9AC26A, used backwards, is recommended for obtaining the higher voltage if 220 volt A.C. power is not available.

H. Excessive Load on Compressor

The compressor may stall because of an excessive load on it, particularly during the initial pull-down after the refrigerator is installed or after being shut off for a time. At such times, the evaporator temperature is high and a considerable amount of liquid refrigerant may be in the lubricating oil; both conditions tending to increase the compressor load.

It is recommended that the machine be shut off at the control main switch for a few minutes. The connector cord should be left attached to the relay and the house electrical outlet so that the oil conditioner will be in the circuit. The liquid refrigerant in the base will be boiled out of the lubricating oil.

It may be necessary to restart the machine more than once if it continues to trip off while pulling down. After it has reached normal operating temperatures it will continue to run all right.

2. Starts and Runs Only with Both Windings in the Circuit

The machine may start and run with both windings in the circuit until the motor protective device trips off. This condition is usually brought about by a defective electrical circuit or something that nearly stalls the compressor. With the exception of an open circuit, the possible causes are similar to those for a stalled machine:

A. Improper current or voltage.
B. Restricted air circulation to condenser.
C. Grounded circuit.
D. Short circuit.
E. Non-condensable gas.
F. Hard running compressor.
G. Excessive load on compressor.

Refer to the corresponding sections under "Stalled (will not start or run at all)" for the procedure for locating and taking care of the trouble.

3. Burned Motor

A burned motor will be indicated by a discoloration of the machine case top. If a machine with a burned motor is found, every effort should be made to determine the cause of burning and this information should be included on the report.

4. Will Not Restart After Shutting Off

The machine will not restart for a period of time after shutting off in a cycle or being shut off manually. The period of time may vary from a few seconds to several minutes. If this time is longer than the "off" cycle, the motor protective device will trip off when the machine tries to start. If the time is less than the "off" cycle, the motor protective device does not trip off and the refrigeration is not impaired, then the condition is not serious and does not need attention.

There are three possible sources of trouble when a machine will not restart after shutting off:

A. Unloader stuck shut.
B. Improper motor air gap.
C. Partially weak bellows in control.

A. Unloader Stuck Shut

If the unloader plunger is stuck shut, the machine will not unload, or restart again after shutting off. The motor protective device may trip off when the machine tries to start. The action of the unloader can be heard when the machine stops if it is operating properly.

Start and stop the machine a number of times in rapid succession. Jarring the machine might also loosen the plunger.

B. Improper Motor Air Gap

It is possible that the machine will not restart after shutting off, yet the unloader operates all right. This condition usually occurs only when the machine is operating in high temperature rooms, with heavy food or ice freezing loads, or with low voltage on the power supply. The motor protective device may trip off. The trouble may not occur under lighter loads or with higher voltage. The condition responsible for this is an improper motor air gap.

Check the machine by running it continuously under heavy load conditions by putting pans of hot water in the cooling unit and partly blanketing the condenser. Observe whether the machine restarts immediately after shutting off and unloading properly.

Jarring of the machine may shift the stator the extremely small amount necessary to rectify the defect. Otherwise, if the machine trips off or stalls with this trouble, it should be replaced.

C. Partially Weak Control Bellows

If apparently the unit will not trip on again after being off, it may be due to partially weak control bellows. This would cause the "cut on" point of the control to be at a much higher temperature than normal, and the machine might remain off long enough to cause the cooling unit to defrost.

For instructions on replacing the control bellows, refer to page 11 of the section on "Control Adjustments."

5. Motor Protective Device Trips Off

The motor protective device operates whenever the current to the motor is excessive. It will trip off under any of the following conditions:

A. Improper current or voltage.
B. Restricted air circulation to condenser.
C. Open circuit to starting winding.
D. Grounded circuit.
E. Short circuit.
F. Machine will not restart after shutting off.
G. Non-condensable gas.
H. Hard running or stalled compressor.
I. Excessive load on compressor.
J. Defective relay.

Refer to the previous sections on "Stalled (will not run at all)" and "Will not restart after shutting off."

Tripping off may be caused by a defective relay as noted above in item "J." The machine may operate normally for quite some time before the overload trips and visual inspection reveals nothing wrong with either the machine or the relay. Usually, however, the starting contacts will be found too close together. To adjust a complaint of this nature, replace the starting relay as explained on page 12, and make no attempt to adjust the relay itself.

While the tripping off of the motor protective device will generally be an indication of trouble elsewhere, it is possible occasionally to find a control in which the motor protective device is faulty. If such is believed to be the case, it is recommended that the control be changed. If the new control operates satisfactorily, it is evident that the original one may have been defective.

If absolutely necessary, a motor protective device can be checked by opening the starting relay and holding the starting arm up with a piece of insulating material such as wood or cardboard. The machine should be running. The motor protective device should trip off within ¾ to 1¼ minutes.

Caution: When raised, the armature is at line voltage so should not be handled. If a person's body is grounded, a serious shock might result. Also, refer to the "Caution" under "Starting relay" on page 11.

6. Runs all the Time (Does not shut off)

When a machine runs all the time and fails to shut off, the cause is either unsatisfactory refrigeration or defective control operation. If it is the former, refer to Section II, "Unsatisfactory Refrigeration." If the machine continues to run when the main switch is turned to the "off" position, the fault is in the control.

The stationary main contact is mounted on the end of one of the prongs projecting through the back of the control. If the prong is sprung, the stationary main contact may be pushed inward until it touches the movable main contact even when this latter contact is in the open position. In some cases it will be possible to straighten the prong and return the stationary contact to its proper location. In other cases the control must be changed.

Other possible control defects which might cause continuous running of the machine include a weak bellows, defective bridle action and welded contacts. The control bellows can be replaced as per instructions given on page 11 of the "Control Adjustment" section, but for the other defects the control must be replaced.

II. UNSATISFACTORY REFRIGERATION (MACHINE RUNS ALL RIGHT)

Symptoms

The refrigerating machine may have one or more of the following symptoms:

1. No refrigeration (cooling unit does not cool).
2. Low refrigeration (cooling unit cools but frosts only partially or not at all).
3. Erratic refrigeration (cooling unit frosts at times, not at other times).
4. Cabinet temperature too high (cooling unit frosts satisfactorily).
5. Cabinet temperature too low (cooling unit frosts satisfactorily).
6. Unsatisfactory ice freezing (cooling unit frosts satisfactorily).
7. High per cent running time (cooling unit frosts satisfactorily).
8. High power consumption (cooling unit frosts satisfactorily).

Adjustments

Unsatisfactory refrigeration may result from factors external to the machine or from trouble within the machine. The machine is assumed to run all right; otherwise, it would be classed in Section I "Machine Does Not Run Properly." The frosting of the cooling unit is usually an indication of whether the fault is in the machine or elsewhere.

Caution: In checking a refrigerator for unsatisfactory refrigeration, make sure that the machine has operated for a period of time sufficient to bring normal operating conditions if the machine were operating properly.

1. No Refrigeration (Cooling unit does not cool)

If the cooling unit does not cool at all, yet the machine runs all right, the trouble is in the machine. Possible causes include:

A. Non-condensable gas.
B. No gas in machine.
C. All refrigerant in case.
D. Float valve stuck closed.
E. Float valve stuck open.
F. Unloader stuck open.
G. Check valve stuck closed.

A. Non-Condensable Gas

Any non-condensable will collect in the float valve and restrict the valve operation so that refrigerant is not returned to the cooling unit. Refrigeration will drop off and eventually stop.

The non-condensable gas should be completely bled from the machine by following the "Bleeding Instructions" on page 25, under "General Adjustments."

B. No Refrigerant in Machine

If there is no refrigerant in the machine, the upper three or four turns of the condenser will not warm appreciably even after the machine has been run for fifteen minutes or more. The machine case top may be slightly warm from the heat radiated by the motor, and the unloader will operate normally when the machine is shut off.

Symptoms of a machine with a low refrigerant charge are given under "Low Refrigeration" and instructions for adding refrigerant are given on page 26, under "General Adjustments."

C. All Refrigerant in Case

Directly after installation or after being shut off for a period of time, the machine may fail to refrigerate because all of the refrigerant has condensed in the case. The machine should be shut off at the main switch but left connected to the line so that the oil conditioner will be left in the circuit. In time the refrigerant will be returned to the cooling unit and the machine will refrigerate satisfactorily.

D. Float Valve Stuck Closed

A stuck float valve due to corrosion or mechanical binding is practically unknown in the CA machine.

If refrigerant is not being returned to the cooling unit and refrigeration stops, indicating the float valve is being held closed, the machine should be checked for non-condensable gas as explained in the "Bleeding Instructions," under "General Adjustments" on page 25.

If liquid refrigerant comes out when the purging screw is cracked open for bleeding, it is possible the trouble is due to a plugged orifice, float bulb full of liquid, or binding of the valve mechanism. The machine can be jarred and the sides of the float valve tapped with a rubber mallet or blocks of wood.

Caution:

(a) Do not tap on the purging screw socket of a CA Form A machine as the metal in the float valve top is thin and may break.

(b) Be careful not to injure the finish.

E. Float Valve Stuck Open

If the float valve is stuck open, gas refrigerant from the condenser is returned directly into the cooling unit. There will be little or no refrigeration in the cooling unit. The float valve temperature will be warm and equal to that of the condenser. A slight hissing noise may be heard as the gas passes through the float valve orifice. Jar or tap the float valve as explained under Part D, "Float Valve Stuck Closed."

F. Unloader Stuck Open

If the unloader is stuck open, gas refrigerant from the case, instead of the cooling unit, will be drawn into the compressor. There will be little or no refrigeration in the cooling unit.

The action of the unloader can be heard when the machine starts or stops if the unloader is operating normally. If it cannot be heard, it is probably stuck.

The machine should be started and stopped a number of times in rapid succession to loosen the unloader plunger. Jarring the machine may also help.

G. Check Valve Stuck Closed

If the check valve is stuck closed, the cooling unit is closed off from the compressor. No refrigerant will pass through the compressor. The upper three or four turns of condenser will not warm up appreciably even after the machine has been run for fifteen minutes or more. The machine case top may be slightly warm from the heat radiated by the motor. When the machine is shut off, the unloader can be heard but not the check valve.

Run the machine with pans of hot water or a Monitor Test heater in the cooling unit to build up pressure which will tend to blow open the check valve.

Caution: When using the heater, do not let the coil touch any part of the stainless steel cooling unit. Place it on its back.

2. Low Refrigeration (Cooling unit cools but frosts only partially or not at all)

Most of the causes listed under "No Refrigeration" bring about "Low Refrigeration" when found in an earlier stage or when present in a lesser degree. Refer to items under "No Refrigeration."

There are three conditions however, which may cause "Low Refrigeration" but probably not "No Refrigeration," and these are listed and discussed below:

A. Low gas in machine.
B. Check valve stuck open or leaks badly.
C. Partially weak bellows in control.

A. Low Gas in Machine

Some machines may be found low on refrigerant, due to two possible conditions.

1. The machine has been incorrectly or over bled.
2. A minute leak on the high pressure side of the system. (Usually air will be drawn into the

system through a leak, but some refrigerant may be lost. Refer to Section IV on "Leaks.")

Machines that have a low gas charge will have a low frost line, particularly on the right side of the cooling unit. However, before deciding a machine has lost refrigerant, the following things should be checked, as they will also cause a low frost line.

1. The oil conditioner must be operating all right. (Refer to "Checking and Replacing Oil Conditioner," under "General Adjustments.")
2. The check valve must not leak. (Refer to item "B" of this section.)
3. The machine must be free from non-condensable gas. (Refer to "Bleeding Instructions," under "General Adjustments.")

If there is no possibility of any of the above conditions causing a low frost line, methyl formate should be added to the machine in accordance with the "Monitor Test Instructions" on page 26 under "General Adjustments."

B. Check Valve Stuck Open or Leaks Badly

If the check valve is stuck open or leaks badly, warm refrigerant vapor from the case flows back into the cooling unit when the machine shuts off. The cooling unit is warmed up and the machine soon starts up again, causing abnormally short "off" periods. There will be a hissing noise in the case directly after the machine shuts off and the cooling unit headers, particularly the right one, will partially or completely defrost during the "off" period.

With the machine shut off, heat the cooling unit using a Monitor Test heater, some similar electric heater, or pans of hot water.

Caution: Do not allow the heater coils to touch the stainless steel of the cooling unit.

Start the machine, leaving the heater on, and run it for a few minutes. This procedure flushes refrigerant through the check valve and may correct the trouble.

If the above adjustment is not successful, heat the cooling unit as just described and run the machine with the left side of the box top raised about six or eight inches. This raises the refrigerant level in the right header where the suction tube comes in and increases the flushing action through the check valve.

Check valve leaks or stuck check valves can sometimes be corrected by jarring the machine, which may dislodge the check valve or the particle of dirt or foreign material holding it open.

C. Partially Weak Bellows in Control

A partially weak bellows in the control can cause a machine to operate on a defrosting cycle. Normally, the gas pressure within the bellows follows the pressure-temperature curve of a saturated vapor. Throughout the normal operating range there is some liquid present in the end of the bellows tube.

If there is a minute leak in the bellows or bellows tube, there will come a time when there will be liquid present at the lower end of the temperature range but not at the upper end. The gas pressure will then follow the curve of a superheated vapor. The pressure in the bellows for a given temperature will be less than it would be if the gas were a saturated vapor. Therefore, the cooling unit temperature must rise higher than it normally would to trip the machine on. The tripping-on temperature may be above 32° F. so that the cooling unit will defrost during the "off" part of the cycle.

If the control bellows is weak or flat, it can be replaced as explained on page 11 of the Control Adjustment section.

3. Erratic Refrigeration (Cooling unit frosts at times, not at other times)

When a cause of no and low refrigeration appears and disappears at intervals, erratic refrigeration results. At one time the refrigeration will be normal, at another time there will be little or none. To check the machine when operating normally will reveal no trouble. It must be checked during the period when the refrigeration is low. Then refer to the causes listed under "No refrigeration" and "Low refrigeration."

4. Cabinet Temperature too High (Cooling unit frosts satisfactorily)

Since the cooling unit frosts all right, the trouble is probably not in the machine itself. Possible causes include:

A. Improper control temperature knob setting.
B. Weak bellows in control.
C. Restricted air circulation to condenser.
D. Restricted air circulation in cabinet.
E. Excessive door or cabinet top gasket leakage.
F. Excessively high room temperature.
G. Excessive loading of cabinet.
H. Excessive cabinet door opening.

A. Improper Control Temperature Knob Setting

The cabinet temperature depends to a certain extent on the control temperature knob setting. This setting is made adjustable in order to satisfy the individual desires of the user. If it is desired to make the cabinet air temperature colder, the knob is turned clockwise; if warmer, it is turned counterclockwise.

To illustrate the point, the following table gives approximate cooling unit and cabinet temperatures for CA-2A machines during normal performance in an 80° F. room without food or ice freezing load:

For control temperature settings on the CA Form B machines, refer to the table of Product Data, page 36.

Temperature knob position	Machine trips	Cool. unit bottom temp., ° F.	Cab. air temp., ° F.
1	on	27	41.0
	off	18	
5 (normal)	on	22	38.5
	off	13	
9	on	17	35.0
	off	8	

If the desirable temperature cannot be obtained with the amount of adjustment obtainable with the temperature knob, remove the bakelite seal in the center of the knob. The small screw under the seal can be removed and the knob reset. Be sure to replace the seal since the temperature knob screw is electrically alive.

Caution: Do not reset the knob more than two complete turns, or the stop against which the main temperature spring bears will run off the thread on the shaft and the control will have to be replaced.

B. Partially Weak Bellows in Control

A partially weak bellows in the control may raise the upper temperature limit of the cooling unit so that the average cooling unit temperature is considerably above normal. A higher cabinet air temperature will result. Refer to Part C "Partially weak bellows in control" under "No Refrigeration," on page 20.

C. Restricted Air Circulation to Condenser

If the air circulation to the condenser is seriously restricted, the capacity of the machine will be reduced. If the machine is required to operate in a high room temperature with a heavy load, the reduction of capacity may be noticeable.

It is recommended that at least one side of the machine be left exposed when installed. The space above the machine top should be unrestricted for at least six inches. If a machine is enclosed more than this amount, it may be necessary to provide forced air circulation in order to obtain satisfactory operation.

D. Restricted Air Circulation in Cabinet

Air circulation is necessary to insure uniform temperature distribution in the cabinet. If the air circulation is restricted by excessive crowding of food or by placing coverings over the shelves, the cabinet air temperature in places will be higher than it should be.

E. Excessive Door or Cabinet Top Gasket Leakage

If the door or cabinet top gaskets do not seal properly, warm air will leak into the cabinet and increase the cabinet air temperature.

Test the door gasket seal by placing a .003″ metal feeler against the cabinet where the gasket seals, closing the door and then pulling it out. There should be tension at all points around the door. If there is not, adjust the door hinges or latch to obtain a good seal.

Observe the inner and outer cabinet top gaskets to make sure they seal properly. There are no inner gaskets in later cabinets.

F. Excessively High Room Temperature

The capacity of a refrigerating machine depends on the room temperature in which it operates. With the same control temperature knob setting, the cabinet air temperature will increase with an increase in room temperature. The following approximate figures indicate the relationship of cabinet air temperature to room temperature with the control temperature knob set at position 5:

Room temp., ° F.	Cab. air temp., ° F.
60	34
80	38
100	42

G. Excessive Loading of Cabinet

The cabinet air temperature will rise when a large amount of relatively warm food is placed in the cabinet. The temperature will continue to be higher than normal until the food is cooled. If warm food is constantly being placed in the cabinet, the temperature will average somewhat above normal.

H. Excessive Cabinet Door Opening

Whenever the cabinet door is opened, warm air enters the cabinet and the temperature goes up a few degrees. If the door is left open or is opened excessively, the cabinet air temperature will stay above normal.

5. Cabinet Temperature too Low (Cooling unit frosts satisfactorily)

The machine is evidently refrigerating too much. If the machine runs all the time and fails to shut off, refer to Part 6, "Runs all the time," under Section I, "Machine Does Not Run Properly," page 18. Other possible causes include:

A. Improper control temperature knob setting.
B. Excessively low room temperature.
C. Poor bellows tube contact to cooling unit.

A. Improper Control Temperature Knob Setting

Refer to division A "Improper control temperature knob setting" under Part 4 "Cabinet temperature too high," page 20.

*Note: In **high altitudes** the lower barometric pressures will shift the temperature range of the control lower. This may necessitate resetting the temperature control knob warmer in order not to hold too low a cabinet temperature.*

B. Excessively Low Room Temperature

Refer to division F "Excessively high room temperature" under Part 4, "Cabinet temperature too high," on this page.

C. Poor Bellows Tube Contact to Cooling Unit

If the bellows tube contact to the cooling unit is poor, the cooling unit will run colder than it normally would. Adjust the clamp and bellows tube to improve the contact.

6. Unsatisfactory Ice Freezing (Cooling unit frosts satisfactorily)

If the refrigerating machine does not show low refrigeration as covered in Part 2 or if the cabinet temperature is not too high for any of the reasons listed in Part 4, the cause for slow freezing may be one of the following:

A. Improper control temperature knob setting.

B. Poor contact of ice tray with cooling unit surface.
   a. Tray not frozen in properly.
   b. Tray bottom surface not flat.
   c. Cooling unit needs defrosting.
C. Location of ice tray.
D. Rubber ice tray.
E. Freezing desserts.

A. Improper Control Temperature Knob Setting

For most rapid freezing, the control temperature knob setting should be turned to position 9, so that the machine will run continuously in normal room temperatures, until the freezing is completed. In this way the average cooling unit temperature will be several degrees lower than it would be if the machine operated in cycles.

Caution: When the freezing is completed, the knob should be returned to the normal position. Otherwise, the cabinet air temperature may be reduced to a point where freezing of food will result.

B. Poor Contact of Ice Tray with Cooling Unit Surface

The transfer of heat from the water to the cooling unit surface is accomplished largely through the contact of the ice tray with the cooling unit surface. The better the contact, the faster the freezing rate.

a. Tray Not Properly Frozen in.

If the ice tray is not frozen to the cooling unit surface, the freezing rate will be reduced. It is recommended that a small amount (quarter of a cupful) of water be spread over the cooling unit surface at the time the ice tray is put in.

b. Tray Bottom Surface Not Flat.

If the bottom surface of the ice tray is badly dented or warped, good contact cannot be obtained. The surface should be straightened or the tray replaced.

c. Cooling Unit Needs Defrosting.

If the surface of the frost on the cooling unit is uneven at the time the ice tray is put in, good contact cannot be secured. The cooling unit should be defrosted.

C. Location of Ice Tray

The freezing rate on the bottom shelf of the cooling unit is twice as fast as that on the upper shelf. Therefore, for rapid freezing, the ice tray should be placed on the lower shelf.

D. Rubber Ice Tray

The rubber ice tray is supplied for its ease in removing ice cubes where a few cubes are needed at a time. It is not a fast freezing tray. Generally it will require from two to three times as long to freeze cubes in the rubber tray as in an aluminum tray.

E. Freezing Desserts

The time required to freeze desserts depends on the constituents used. It is usually somewhat longer than the time to freeze water.

7. High Per Cent Running Time (Cooling unit frosts all right)

If the per cent running time of a machine seems abnormally high, the possible cause may be found in one of the following sections:

I. Machine does not run properly.
   6. Runs all the time, page 18.
II. Unsatisfactory refrigeration (Machine runs all right).
   4. Cabinet temperature too high, page 20.
   5. Cabinet temperature too low, page 21.

8. High Power Consumption (Cooling unit frosts satisfactorily)

If the power consumption of a machine seems abnormally high, refer to Part 7 "High per cent running time."

III. NOISE (MACHINE RUNS AND REFRIGERATES SATISFACTORILY)

The refrigerating machine is designed for quiet operation. However, like any piece of moving mechanism, it will have certain characteristic sounds which, though hardly noticeable, can be distinguished. Occasionally, because of abnormal operating conditions, improper adjustment of the starting relay, or a defect in the mechanism, the noise may be objectionable.

Symptoms

In order to classify the various sounds that can be distinguished, the following list will serve as a guide:

1. Relay starting noise.
2. Unloader starting noise.
3. Compressor noise.
4. Cooling unit thump.
5. Float valve discharge noise.
6. Relay hum.
7. Bumper or suction tube hitting case.
8. Radio interference.

Adjustments

1. Relay Starting Noise

This is a buzz or chattering sound coming from the starting relay only when the machine is starting. It is caused by faulty alignment of the armature.

Caution: Do not attempt to adjust the armature by bending or twisting it. The tension on this part is carefully regulated at the factory to insure proper starting of the machine.

Loosen or tighten the two screws holding the relay to the cabinet top or the condenser. Notice whether the noise is still present when the machine is started. It is possible that the warping of the relay base, caused by tightening down the screws holding it, was sufficient to change the alignment of the armature. The small washers under the two corners of the relay base are sometimes used to reduce this warpage. Add another small washer if necessary.

If the noise cannot be eliminated in this way, the starting relay must be replaced. Refer to page 12 for instructions.

2. Unloader Starting Noise

This is a vibrating hum or buzz coming from the unloader only when the machine is starting. It is due to the fact that the unloader is in the motor magnetic field which is especially strong during the starting period. It cannot be eliminated.

3. Compressor Noise

Compressor noises can be divided into three general classes as follows:

A. Flutter or clicky noise.
B. Gurgling or frog pond noise.
C. Rumble or groan noise.

A. Flutter or Clicky Noise

This noise varies considerably in quality depending on the cause and the conditions under which the machine is operating. It may have a fluttering or sputtering sound as though liquid were present, or it may have a dry clicky sound, or again it may resemble a light metallic vibration. In an extreme case, it may appear to be a heavy mechanical pounding. The noise may be steady throughout the cycle like the liquid pumping noise experienced in DR type refrigerating machines after defrosting, when requiring the monitor test, or when operating with a defective oil conditioner. The noise may be intermittent much like the vibrating burr found in some DR type machines.

The possible causes of the flutter or clicky noise include:

a. High cooling unit temperature.
b. Liquid refrigerant in the lubricating oil.
c. Pull-down after installation or after being shut off for a time.
d. Cold room temperature.
e. Changeable room temperature.
f. Defective oil conditioner.
g. Non-condensable gas.

a. High Cooling Unit Temperature

The load on a machine depends on the cooling unit temperature; the higher the cooling unit temperature, the greater the load on the compressor and motor. The noise likewise follows the cooling unit temperature. When the cooling unit temperature is above the normal operating range, the machine may be somewhat noisier than normal.

b. Liquid Refrigerant in the Lubricating Oil

If liquid refrigerant collects in the base, a machine will be noisier than normal until the refrigerant is boiled out of the lubricating oil. The oil conditioner prevents the accumulation of refrigerant except under abnormal conditions.

c. Pull-down After Installation or After Being Shut off for a Time

Because of the high cooling unit temperature and the liquid refrigerant in the lubricating oil, a machine may be noisy during the pull-down period after installation or after being shut off for a time. If the cord connector is plugged into the relay so that the oil conditioner is placed in the circuit for a few minutes before the machine is turned on, the noise during the pull-down period will be considerably reduced.

d. Cold Room Temperature

If a machine operates in a cold room temperature (below 60° F.) for a period of time, some liquid refrigerant may collect in the base and the machine may be slightly more noisy than normal. If the room temperature goes below 60° F. at night, it is possible that the machine may be found slightly noisier than normal in the night or in the early morning although it will operate quietly at other times. Some machines may be found to be more sensitive to cooler room temperatures than others.

Another factor that tends to make a machine run slightly noisier in a cool room is that the temperature knob is frequently turned to a warmer position which raises the cooling unit temperature.

e. Changeable Room Temperature

If a machine is operating in a relatively cool room temperature and the room temperature rises rapidly several degrees, the condenser will warm more quickly than the base so that some liquid refrigerant may condense in the base. As soon as the base warms up, the refrigerant will be expelled and the machine will again sound normal.

f. Defective Oil Conditioner

An oil conditioner which is burned out or open circuited will allow the accumulation of liquid refrigerant in the base, and a slightly lowered frost line.

Refer to "Checking and Replacing the Oil Conditioner" on page 27, under "General Adjustments."

g. Non-condensable Gas

Non-condensable gas in the float valve or condenser will raise the case pressure and consequently the load on the compressor, and will cause condensing of liquid refrigerant in the base. The float valve and lower condenser turns will be relatively cooler than the upper condenser turns and will feel cooler to the hand.

Refer to "Bleeding Instructions" on page 25, under "General Adjustments."

B. Gurgling or Frog Pond Noise

This is a periodic bubbling noise coming from the compressor while the machine is running. It resembles the sound coming from a distant frog pond on a summer night. It is caused by refrigerant bubbling through the oil and can often be eliminated from the few machines where it will be found by changing the temperature setting of the control or by bleeding as described under "General Adjustments."

C. Rumble or Groan Noise

This is a pulsating hollow tone which frequently seems to be more objectionable outside the room than inside the room where the refrigerator is installed. Often the house construction (hollow walls, pipes, etc.) is such that the rumble is carried to other rooms. It is usually possible to eliminate the trouble by bleeding according to instructions under "General Adjustments."

4. Cooling Unit Thump

In some machines there occurs a single thump from the chilling unit directly after the machine starts. This thump may not make its appearance for several months after the machine is installed. It is caused by a slug of refrigerant breaking through the oil film over the refrigerant in the cooling unit. It can be eliminated by bleeding properly and Monitor Testing if necessary.

5. Float Valve Discharge Noise

This is a hissing noise coming from the float valve at times when the float opens. It arises from the liquid refrigerant discharging through the float valve orifice. It cannot be eliminated.

6. Relay Hum

This is a 60 cycle hum coming from the core of the starting relay while the machine is running. It is caused by loose laminations. Replace the relay, referring to instructions on page 12.

7. Bumper or Suction Tube Hitting Case

This is a rattle or vibrating noise, occasionally found during normal running of the machine but more likely found only when the machine starts or stops. It can be verified by shaking the machine gently and observing whether the noise is reproduced.

Check the level of the machine. It is possible that the noise can be eliminated by a slight change in the level of the refrigerator.

8. Radio Interference

There is no radio interference during the normal running of a machine. If radio interference should be traced to the refrigerator, there may be a ground or short circuit in the refrigerator. Refer to "Grounded circuit," page 15, and "Short circuit," page 16, under Section I "Machine Does Not Run Properly."

IV. LEAKS

The refrigerating machine is of hermetically sealed Monitor Top design, carefully constructed and tested to insure against leaks. Should a leak occur after the machine has left the factory, it will seldom be recognized as such for two reasons: (1) the leak will probably be inward since the pressure within the machine is below atmospheric under most conditions; and (2) methyl formate is practically odorless even if it should leak outward. A leak will usually appear as non-condensable gas (air) collecting in the float valve.

Non-condensable gas will restrict the operation of the float valve as explained on page 19, under "Unsatisfactory Refrigeration," and all of the symptoms resulting from non-condensable gas are described in detail in the "Bleeding Instructions," on page 25, under "General Adjustments."

However the presence of non-condensable gas does not necessarily mean the machine has an external leak, and the machine should be properly and completely bled as explained in the "Bleeding Instructions," on page 25, under "General Adjustments."

If a machine fails to refrigerate because of non-condensable gas, is completely and properly bled, and then fails again because of non-condensable gas within a relatively short time, it is quite possible that it is a "leaker." The machine should be properly bled again, and if failure then occurs after a short time, it is almost surely a "leaker." Should such a machine be returned to the factory, it should not be bled after the last failure, but returned with the non-condensable gas remaining in it.

Caution: It must be remembered that if the machine is not properly and completely bled each time, a false indication of a "leaker" may be given. This is true since incomplete bleeding means that some non-condensable is left in the machine, and the formation of a relatively small amount of non-condensable gas may cause unsatisfactory refrigeration. Always follow the "Bleeding Instructions."

V. FINISH ON CA-1A AND CA-2A UNITS

The following instructions are for touch-up work on scratches, nicks, mars, etc., only, and are primarily for the inspector's use in the home. Units will rarely if ever need complete refinishing because of the inherent qualities of the Glyptal-baked enamel put on them at the factory. Complete refinishing, should it be necessary, should be done with the same materials and by the same methods as prescribed for cabinets in the Refinishing Manual.

For Touch-up Work

Material

Use Cat. No. 58X69 special Glyptal Enamel Patching Kit. This kit includes the following:

One bottle of Glyptal Enamel.....Cat. No. 58X70
One bottle of Glyptal Thinner.....Cat. No. 58X71
One bottle of Cleaning Solution....Cat. No. 58X72
One ½ inch Fine Camels Hair Brush Cat. No. 58X73
Four small squares of Emery Paper.

Procedure

Small spots, scratches and nicks can best be repaired by spotting with unthinned material and smoothing over by a quick wiping operation with the thumb or one finger. Somewhat larger spots should be sanded to a feather edge and brushed in as smoothly as possible with the glyptal enamel thinned to a brushing consistency. If the job does not blend into the surrounding surface very well it may be improved by quickly flowing clear thinner over the patched and surrounding area with long fast strokes.

VI. GENERAL ADJUSTMENTS

A certain number of general adjustments apply to various CA unit troubles, and these are listed and discussed below:

I. Bleeding Instructions.
II. Monitor Test Instructions for adding Methyl Formate.
III. Checking and Replacing the Oil Conditioner.

1. Bleeding Instructions

The methyl formate refrigerant used has the unique property of taking care of any excess moisture in the system, by forming harmless non-condensable gas. Absolutely no corrosion or sticking of mechanical parts or freezing of the float valve will result from moisture in the CA machine.

Also, since the boiling point of methyl formate is 88° F., the internal pressures will usually be below atmospheric, and any small leaks will allow air to be drawn into the system, which collects in the float chamber as non-condensable gas.

Given below are complete symptoms by which non-condensable gas in a CA machine may be recognized, and detailed instructions for bleeding it from the machines.

Note: Bleeding is the term we are now using instead of purging, to differentiate between the present method of bleeding off non-condensable gas and the usual purging of refrigerant.

Symptoms

1. Difference in temperature (15° to 20° F.) between the side of the float valve and the upper condenser coils.

   This temperature difference is easily detected by the hands, and is caused by the non-condensable gas collecting in the top of the float chamber. The presence of the non-condensable gas restricts the flow of warm refrigerant into the float chamber and insulates the walls and top of the float valve from the refrigerant, causing a decided temperature difference.

Note: If the machine is in a cool room temperature (below 70° F.) it will be necessary to heat the machine by running it with a Monitor Test heater or trays of warm water in the cooling unit in order to show the temperature difference.

If the system has an excess amount of non-condensable gas, the condenser may remain the same as the float temperature and the dome should be used for comparison.

2. Erratic Refrigeration.

   The cooling unit may periodically defrost although the machine continues to operate. This will be particularly noticeable in cooler room temperatures since the non-condensable gas has more effect on the operation of the float valve when the machine is operating under lower temperatures and pressures.

   When the room temperature is low the unit will run cool and the pressure of the refrigerant will be low within the machine. This low pressure refrigerant will have a harder time forcing a way into the float chamber against the pressure of the non-condensable which remains the same. Near normal operation may be obtained in a high room temperature, with erratic refrigeration resulting from a low room temperature.

3. Low Frost Line.

   The frost line may be below the right, or both headers since the non-condensable gas causes condensation of liquid refrigerant in the base; thus, taking some from the cooling unit.

Note: Low frost can also be caused by a defective oil conditioner (page 27), a leaky check valve (page 20), or a low refrigerant charge (page 19).

4. No Refrigeration.

   Non-condensable gas restricts the operation of the float so that no refrigerant is returned to the cooling unit. This is affected by room temperature as explained under "Erratic Refrigeration."

   If the machine fails to refrigerate because of non-condensable gas it should be noted that there will be little temperature difference between the float valve and the condenser due to the fact that no work is being done by the machine and the condenser will not heat up.

5. Noise.

   There will be a "tinny" noise during the running period caused by liquid refrigerant in the base mixing with the oil. This will be more noticeable in cooler room temperatures.

Note: A defective oil conditioner will cause this noise and should always be checked (page 27).

6. Trips Off or Stalls.

   A large amount of non-condensable gas may increase the internal pressure enough to cause tripping of the overload or stalling of the compressor.

Note: A defective starting relay may also cause periodic tripping off.

Essentials for Bleeding

1. Heat the Machine.

This raises the internal pressure above atmospheric, so no air will be drawn into the system, and assures all of the non-condensable gas being forced into the float chamber. A Monitor Test heater or pans of warm water may be placed in the cooling unit or the condenser can be blanketed to heat the machine.

Caution: Do not let the heater coil touch the stainless steel.

Do not let the cooling unit, dome or condenser temperature get hotter than what the hand can stand.

2. Keep the Machine Running All the Time.

This must be done to maintain a positive pressure and to keep the non-condensable gas in the float valve.

Note: If the machine stalls or trips out due to non-condensable, it should be bled slowly until it can be kept running. The pressure will be outward if non-condensable is the cause.

3. Check for Outward Pressure.

Remove the float valve cap and the auxiliary sealing screw.

Note: Some of the sealing screws were soldered and can be broken loose with a large screw driver, or the solder can be softened with a Monitor Test heater.

Put light oil in the purging screw socket, and open the purging screw just a crack to make

sure the pressure is outward. If oil is sucked in, close the screw immediately.

4. Bleed for Three Minutes—Proper Rate.

This must be done at the proper rate so that the least amount of refrigerant is lost. Bubble the non-condensable gas through the oil as fast as possible without blowing all the oil out, and without getting an odor of methyl formate with the nose six inches above the purging screw.

5. Close Purging Screw for One Minute.

This allows the non-condensable gas in the float valve to collect at the top so that the next time the purging screw is opened, nearly pure non-condensable gas is bled.

6. Continue Bleeding Until All the Non-condensable Gas is Removed.

When the float valve temperature warms up equal to that of the upper condenser coils, all of the non-condensable has been removed. Continue the three-minute open and one-minute closed periods until these temperatures are equal. The bleeding rate should be decreased towards the end of the operation as the amount of non-condensable decreases.

Caution: The satisfactory operation of the machine depends on its being correctly and completely bled.

If the purging screw is opened wide and the bleeding rate increased, the sudden release of pressure in the float valve will cause a violent boiling and mixing of the non-condensable gas and the refrigerant.

The float will then warm up prematurely, indicating the end of the bleeding operation before all of the non-condensable gas has been removed. Proper bleeding cannot then be continued until the non-condensable gas and refrigerant have separated.

Fast purging also causes the loss of an excess of refrigerant which will soon affect the refrigerating capacity of the machine.

2. Monitor Test Instructions

Methyl formate refrigerant should be added to a machine which proves definitely to have a low refrigerant charge.

Monitor Testing is the term used to designate adding refrigerant to a refrigerating machine, and is accomplished by connecting a small drum or bottle of gas to the purging screw by means of an adapter. The set-up is shown in the accompanying drawing:

Equipment needed is as follows:

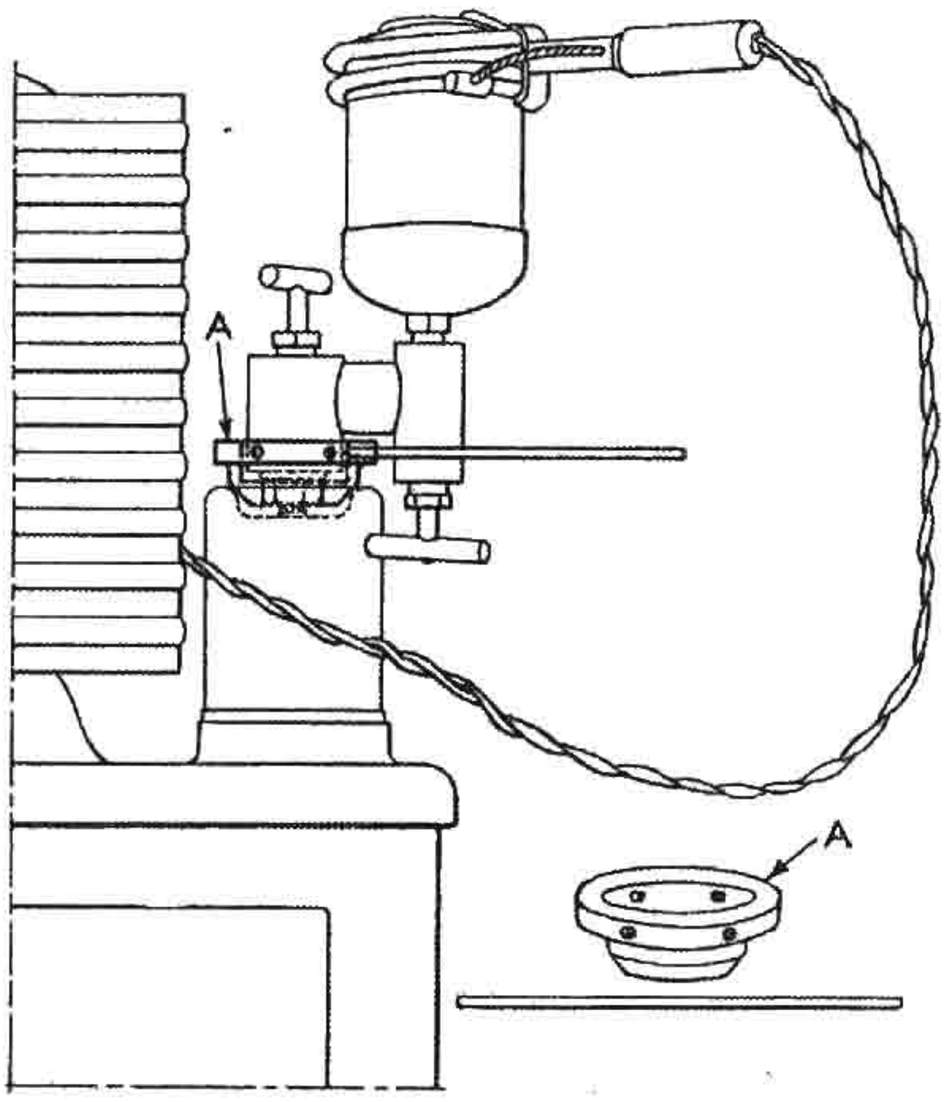
Monitor Test Kit (Cat. No. 11X764).

Monitor Test bottle, containing ½ pound of methyl formate, which is painted white (Cat. No. 58X311).

Special circular adapter wrench for CA Form A machines (Cat. No. A18H12).

The procedure and equipment used is essentially the same as was used with the old DR machines, with the following special conditions:

1. Never add gas until all non-condensable gas has been bled from the machine. Refer to "Symptoms" and "Bleeding Instructions." on page 25, under "General Adjustments."
2. Use only methyl formate.
3. Never open the purging screw in the float valve, bottle, or adapter to the atmosphere until the machine or bottle has been heated. This assures that no air will be drawn into the system, and gives an opportunity to check for non-condensable gas.
4. Use only a clean adapter.
5. On the CA Form A it will be necessary to use the Cat. No. A18H12 circular wrench to tighten the adapter nut to the purging outlet. The use of the wrench is illustrated in the drawing of the Monitor Test set-up.
6. Keep open flames away from methyl formate, as it is inflammable.



Procedure

1. Heat the machine and fill the purging screw socket with light oil. Crack the purging screw and test for outward pressure.
2. Inspect the Cat. No. 11X765 Monitor Test adapter to see that it has a single good Cat. No. 11X768 lead washer in place on each side, and that the purging screw in its side is closed. Be sure the adapter is clean. Loosen the bottle purging screw with the Cat. No. 11X122 purging wrench and assemble the bottle to the adapter. Insert the valve stem into the bottle purging screw and tighten the valve stem nut.
3. Place the bottle and adapter just assembled over the float connection, and tighten the adap-

ter nut. (On CA Form A machines use the circular wrench.) Enter the valve stem into the float valve purging screw and tighten the valve stem gland nut.

4. Assemble the Cat. No. 11X766 heater over the bottle and plug it into an electric outlet. When the top of the bottle is very warm, open the bottle purging screw slightly, allowing methyl formate to enter the adapter, and then close the bottle purging screw. Open the purging screw in the adapter and purge out the air. If the bottle is warm enough and the air is out, the odor of methyl formate should be noticeable.
5. Open the float valve purging screw and the bottle purging screw three complete turns and pull out the valve stems. Leave the purging screws open until the bottle is empty which is indicated by the fact that the valve end of the bottle gets very warm.
6. Close the float purging screw and the bottle purging screw and open the adapter purging screw to relieve the pressure in the adapter. If liquid is in the adapter, the bottle has not been heated long enough. If a large amount of gas escapes, close the adapter purging screw, and open the float purging screw and the bottle purging screw and reseat them.
7. Remove the adapter and bottle, and check the float valve and bottle for leaks with light oil. Replace the auxiliary sealing screw and the cap over the float valve purging screw socket.

3. Checking and Replacing the Oil Conditioner

The oil conditioner is a small 12 to 15-watt heating element located in a sealed tube projecting into the oil sump in the base of the compressor. It is connected directly across the line at the starting relay, and therefore is always drawing current whenever the unit is plugged into an electrical service outlet.

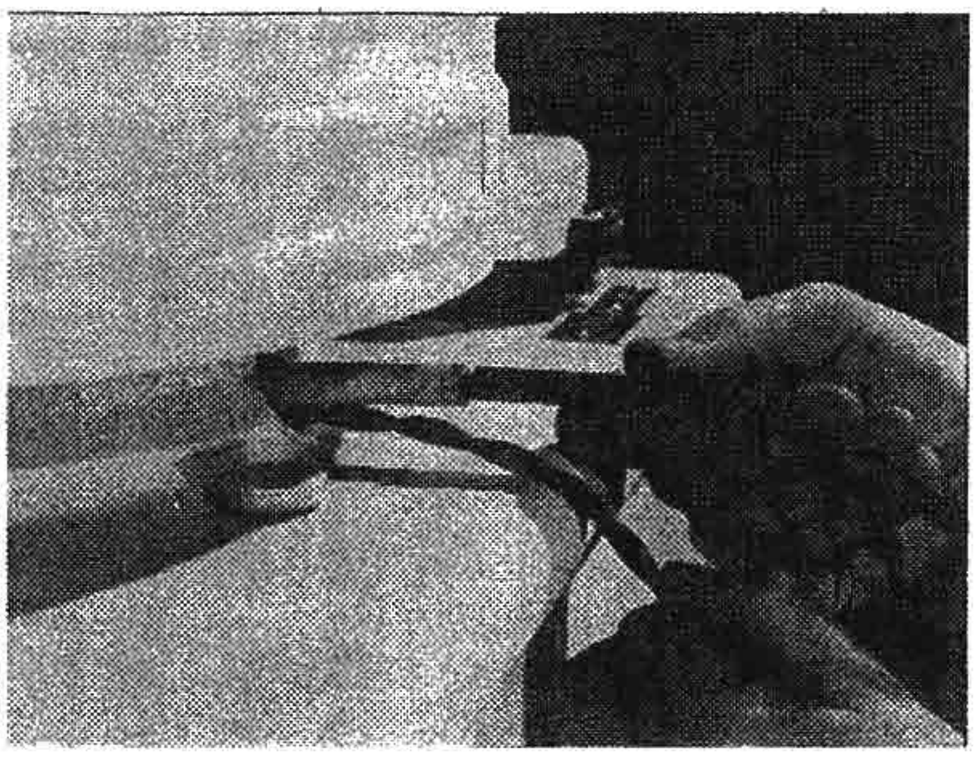
It is installed through a small hole in the curved portion of the cabinet top skirt, just below the compressor case fins. This hole is at the back of the machine and is filled with a rubber plug.

The function of the oil conditioner is to prevent excessive condensation of refrigerant in the oil, and also to keep the oil warm and thin, which brings about a reduction in the watts drawn by the compressor.

Checking the Oil Conditioner

There are three ways to check the oil conditioner:

1. *Series test lamp.* If an ordinary 25-watt lamp is connected with suitable plugs so that it can be put in series between the electric service outlet and the machine connecting cord plug, it offers the easiest and most satisfactory method of checking the oil conditioner. With the control main switch turned "off," the lamp should glow with about half brilliancy, showing a circuit through the oil conditioner. If the oil conditioner is open circuited, the lamp will not light at all and, if short circuited, will light with normal brilliancy.



Replacing Oil Conditioner

2. *Spark an oil conditioner lead.* One of the oil conditioner leads in the starting relay can be disconnected and, after replacing the connecting cord plug in the electric service outlet, it can be sparked to its terminal. The oil conditioner leads are in green-covered cables and have terminals on the ends. They are attached to the two terminals which form part of the locking prongs projecting from the relay. It may be necessary to darken the vicinity of the lead being sparked in order to see the spark. No spark would indicate an open-circuited oil conditioner and an unusually large spark, a short circuit.
3. *Remove oil conditioner.* The oil conditioner can be removed as described below. If the heater element is hotter than the hand can stand it is all right.

Replacing the Oil Conditioner

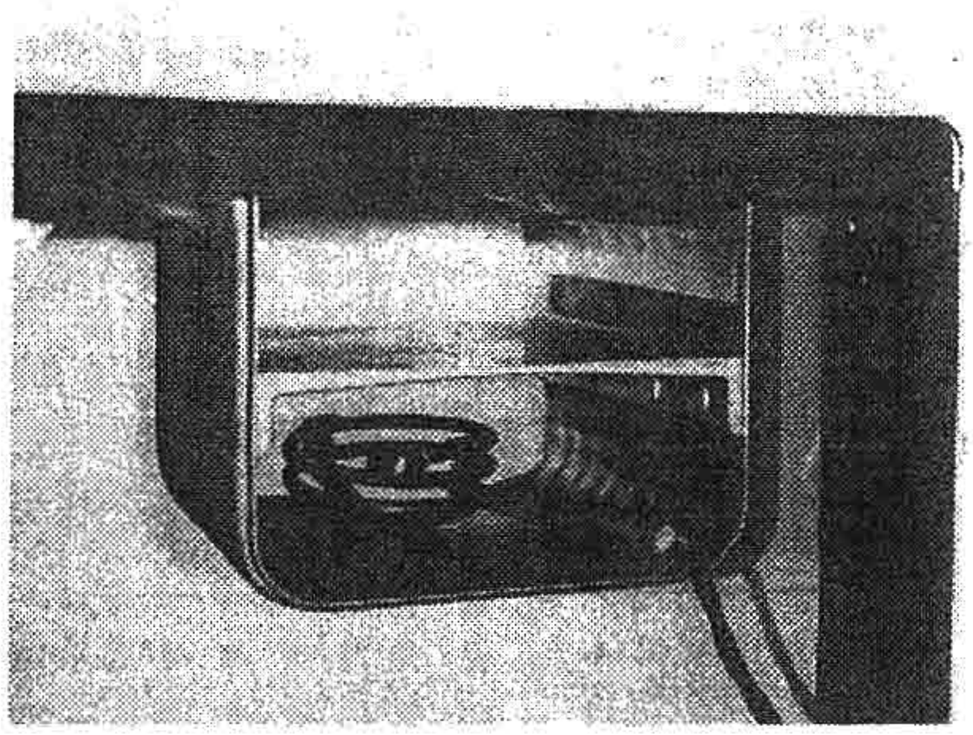
1. Remove the rubber plug which fills the hole in the cabinet top at the rear of the machine.

Caution: Do not push it inward.

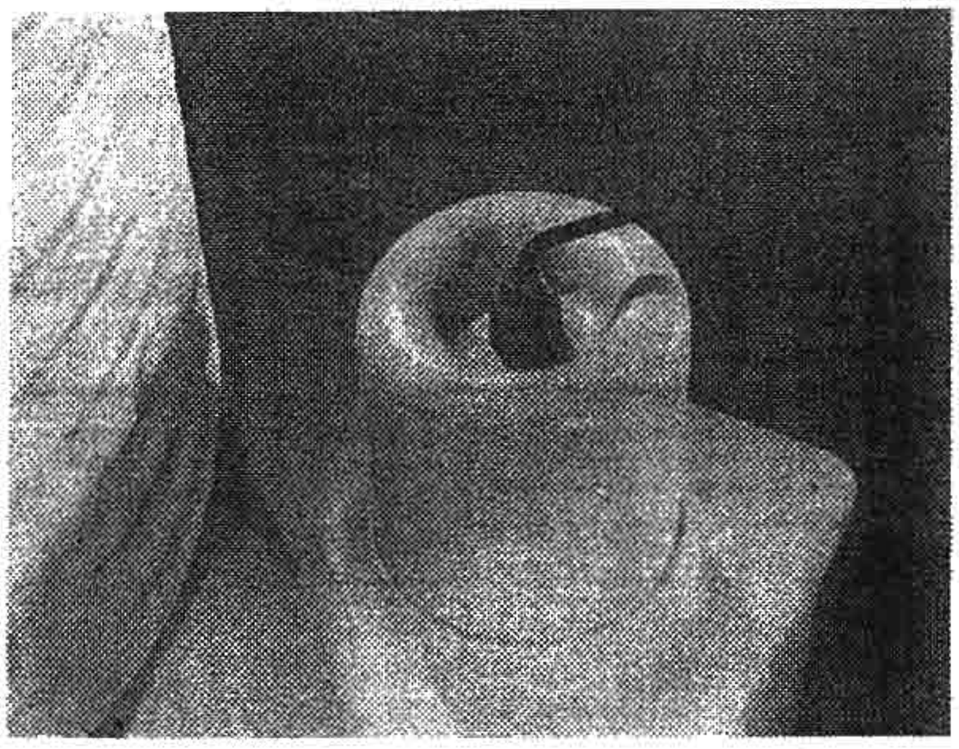
2. With a pair of duck-bill pliers or a hooked wire, fish around inside the cabinet top until you can pull out a section of the green cable. Continue pulling the cable until the oil conditioner comes out.

Caution: Do not attempt to hold the porcelain part (unless the oil conditioner is "dead") nor let it rest on the unit finish.

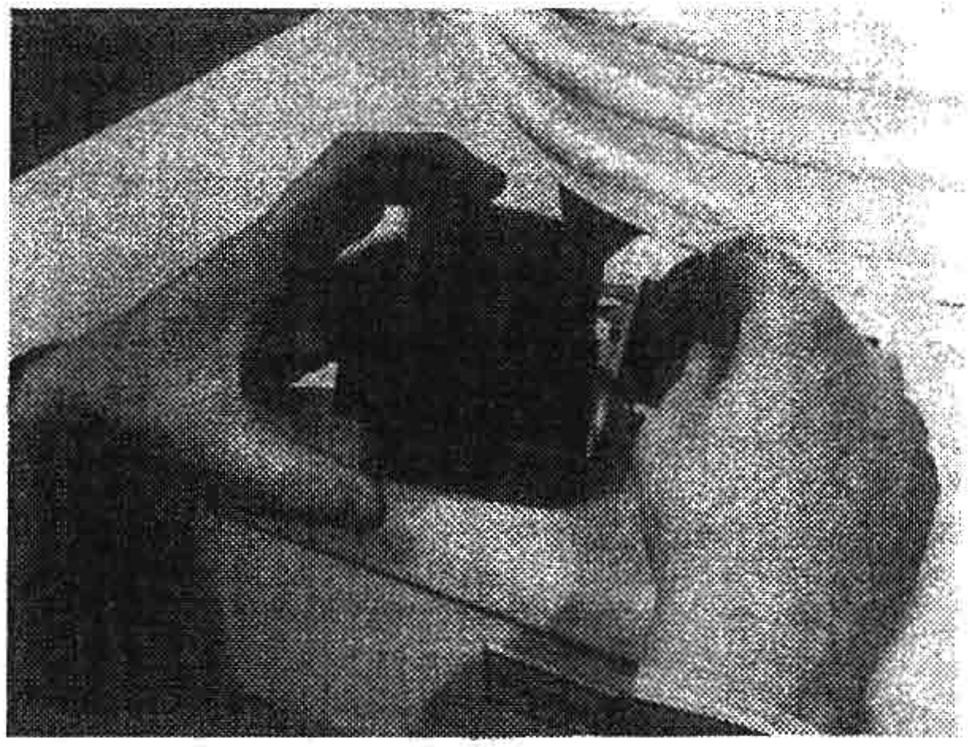
3. If the oil conditioner is hotter than the hand can stand, it is all right. Otherwise, replace it by cutting off the leads at the taped joint, soldering on a new Cat. No. 11X100 oil conditioner, and retaping the joint.
4. Place the oil conditioner back in its tube, using a flashlight to make sure it really goes into the tube the full distance and not down into the cabinet top insulation.
5. Replace the rubber plug in the oil conditioner hole. This is important to prevent the condensation of moisture in the cabinet top.



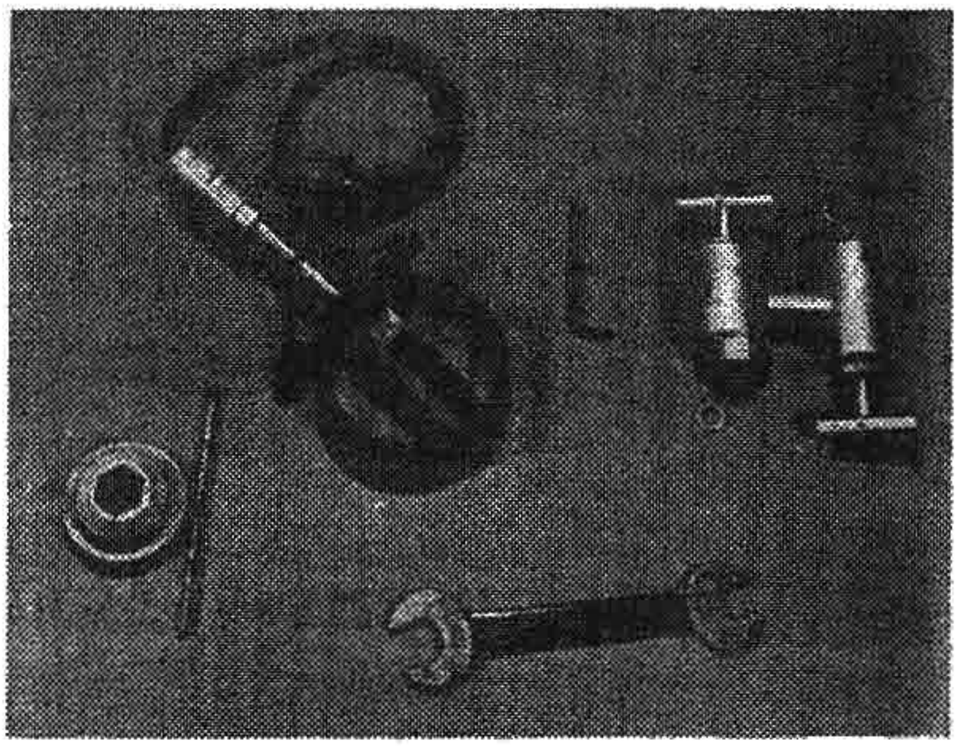
Heating Evaporator



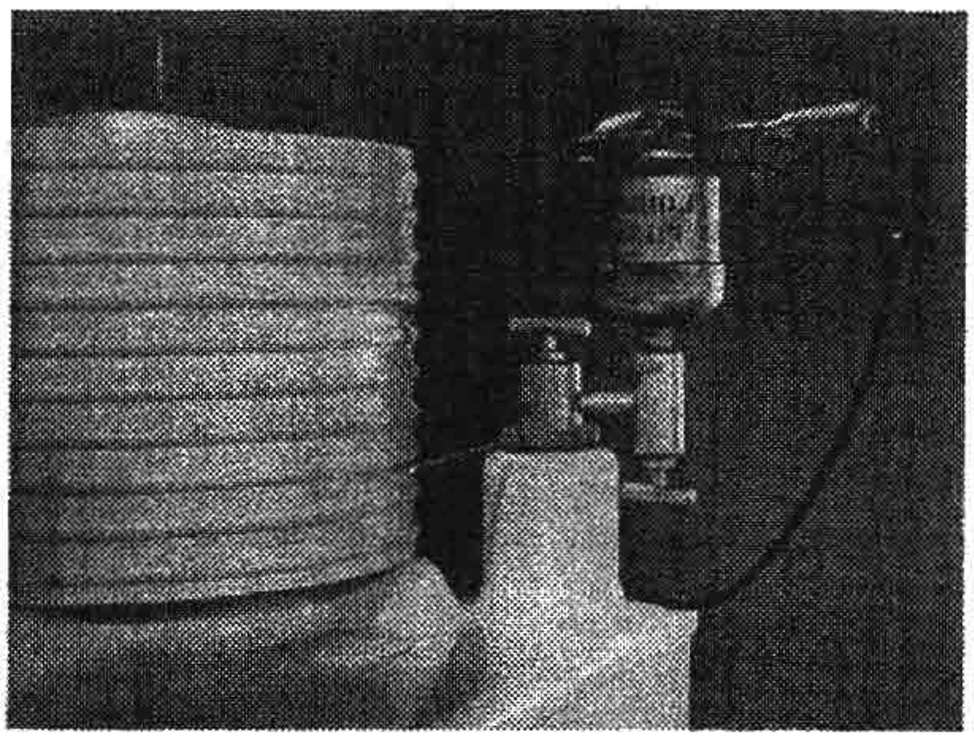
Bleeding Non-condensable Gas



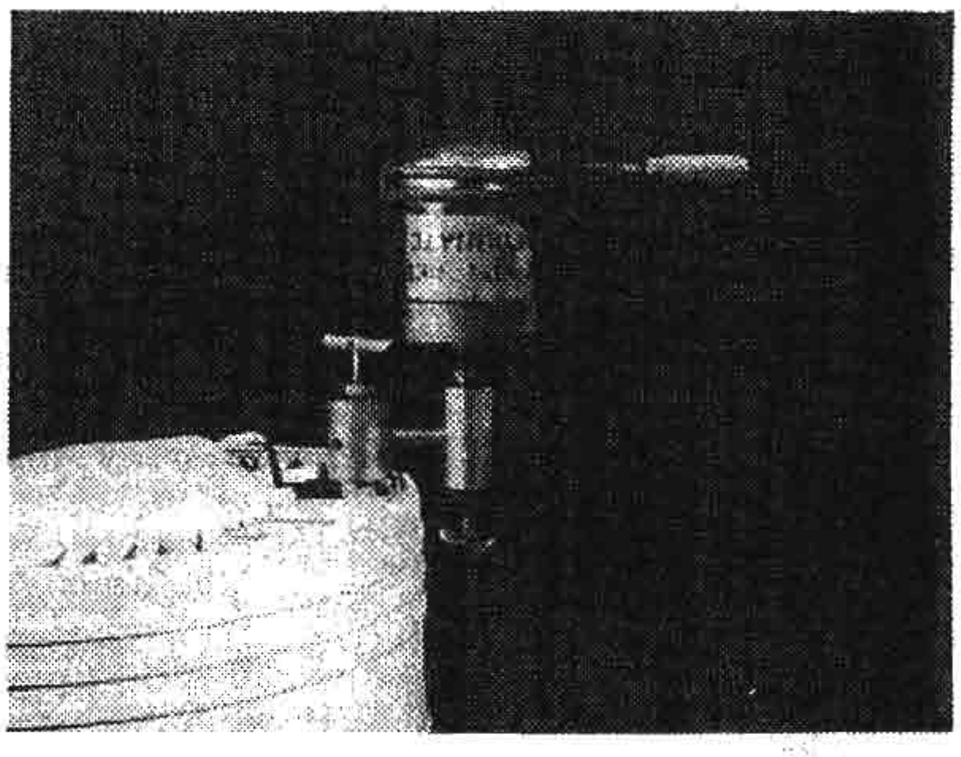
Disconnecting Control



Monitor Test Equipment



Adding Refrigerant to Form A Machine



Adding Refrigerant to Form B Machine

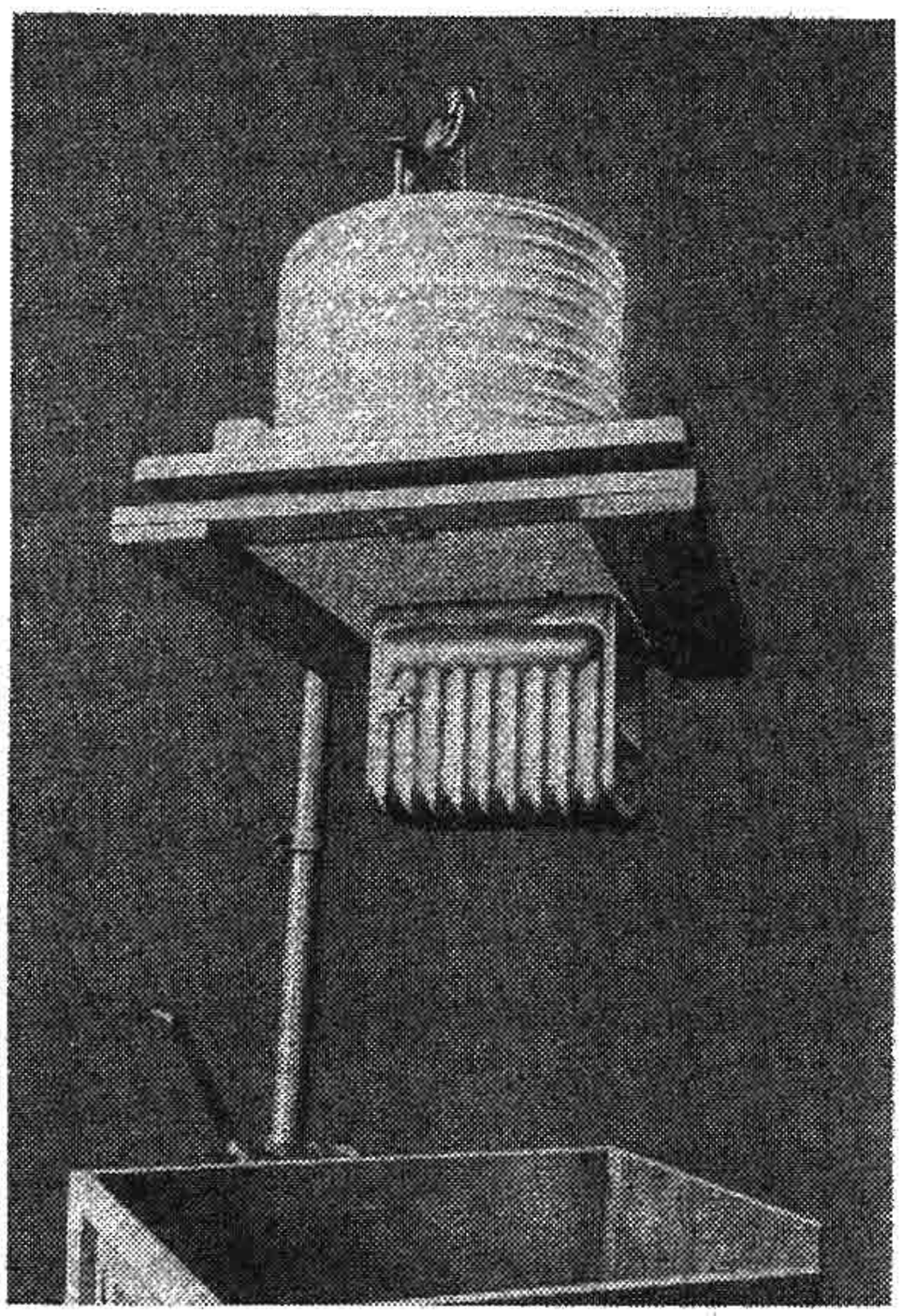
Uncrating, Inspection and Installation

Machine

Uncrating

Remove the cover of the shipping crate. Lift the machine from the crate.

Note: If collapsible lifter Cat. 11X384 is used, special long lifting hooks Cat. 58X32 must be substituted for the hooks originally supplied with the lifter.



Removing CA Form A Unit from Crate

The wooden rack comes out of the crate along with the machine, to protect the finish on the edges of the cabinet top as it is being removed. The rack is fastened to the bottom plate by two clips under two of the screw heads holding the bottom plate to the box top. See the above illustration.

To remove the rack, loosen the screws and turn the clips back under the rack. Be sure to tighten the screws again.

Note: Whenever one of these machines is shipped, the wooden rack must be properly assembled to it before placing it in the shipping crate.

Inspection

At the time the machine is uncrated, examine it carefully for possible damage during shipment. If damage is found, examine the crate and, as nearly as possible, ascertain the reason for the damage.

Also, inspect the machine as follows:

1. Make sure the finish is all right.
2. Make sure that the rubber plug properly seals the oil conditioner hole.

Cabinet

Uncrating

A reasonable amount of care should be used in removing cabinet from the crate. An examination of the crate will generally indicate the best method to use. Most of our crates are easily removable by pulling the nails in the rear of the crate. The cabinet will then slide out, after which the packing collars are removed.

Inspection

Examine the cabinet for the following points:

A. Fit and operation of the shelves.
B. Chips or mars on interior or exterior finish.
C. Operation of foot-pedal door opener.
D. Operation of light.
E. Condition of seal around box top opening.
F. The two wood strips which protect the sponge rubber gasket from the shelves on some models during shipment are removed. (The use of the sponge rubber gasket was discontinued on the X-7 and T-7 models. Reference to it below applies to the HT and HX models.)

Installation

When the machine is being installed in a cabinet, care must be taken not to damage the liquid tube from the float valve to the cooling unit or any of the other pipes.

Before lowering the machine into the cabinet, examine the No-Ox-Id cloth around the box top opening of the cabinet. If it is loose at any point, iron the No-Ox-Id cloth down with a piece of wood.

After the machine is lowered into the cabinet, check the seal of *both* cabinet top gaskets. The seal of the outer (or upper) gasket is most important and must be made tight. If necessary, trim the gasket on the liner. The outer seal is required to prevent condensation of moisture between the cabinet walls.

The cabinet should be installed reasonably level and should set firmly on all four legs on the rubber gliders. It should not be set against the wall or against anything else.

In order to insure sufficient air circulation to the condenser, at least one side of the machine must be left exposed for the whole width of the cabinet. At least six inches of unrestricted space should be left above the machine top.

The control temperature knob should be set at position 5 for normal service.

Cabinet Adjustments

Note: The adjustments given are to cover only those peculiar to the HT-47, HX-47, HT-70, HX-70, X-5, X-7 and T-7 cabinets.

I. Replacement of Porcelain Panels on Porcelain Finish Cabinets

Note: It is not necessary to remove the unit when replacing any of the exterior parts.

1. Top Front Crosspiece.

Remove nameplate, top door jamb corner pieces, and top door jamb insulating strip. Straighten out, with a screw driver, the holding tabs which clamp the nut strips, and pull the crosspiece down and out. The trim will come away with it and may be replaced on the new crosspiece which is installed by reversing this process.

2. Bottom Front Crosspiece.

The bottom crosspiece is removed in the same manner as the top crosspiece except that in place of the nameplate, there are holding tabs which are screwed to the bottom of the cabinet.

3. Side Panel, Hinge Side.

Remove door leaving hinges attached to the door. Remove top and bottom crosspieces. Next loosen all inside screws and remove all outside screws on the jamb strip adjacent to the panel. The panel screws are now removed from the side and the panel may be slid down and forward and lifted free of the cabinet. Reverse the procedure to install new panel. Care should be taken to see that the sponge rubber seal is not wrinkled under the new panel.

4. Side Panel, Latch Side.

It is not necessary to remove the door to replace this panel. Holding tabs are used which fit under the door jamb strip, and these must be lined up properly on the replacement panel, otherwise the procedure is identical with that for the hinge side panel.

II. Replacement of Inner Liner

After the unit is removed, remove the Textolite door jamb strips and disconnect the cabinet light wiring. Carefully remove the No-ox-id cloth top seal, around the top of the liner. Pull the liner up and out of the cabinet. The light socket should then be removed and secured to the new liner. The light socket is removed by bending up the center contact tab, and removing the screw immediately under it. The speed nut for this screw can then be slipped up off the old liner and put on the new liner.

Reverse the procedure to replace the liner. The insulation must be resealed around the top with No-ox-id cloth. The cloth can be securely ironed to the top flange of the liner and the top flange of the outer case, with a smooth wood block. The corners of the No-ox-id seal should be thoroughly sealed with melted No-ox-id grease applied with a brush. Make sure the door gasket seals properly all around. The shelves and shelf frames should also be properly adjusted to the new liner.

III. Lighting Equipment

The lighting equipment consists of a receptacle, a switch and a socket, all easily replaceable. Refer to Wiring Diagram on page 37.

The socket is fastened to the liner with a screw concealed under the center contact tab, which threads into a speed nut clamped to the liner.

The receptacle is standard and obviously replaceable on examination.

The switch is mounted on the jamb strip with a lock nut on either side. Replacement switches and sockets will be shipped with short leads. The old leads are cut and the new ones soldered on and wrapped with varnished cambric followed by friction tape.

The switch is adjusted at the factory so that the light goes out when the door is 1½″ from closed. This is easily adjusted in the field if necessary. The 1½″ is measured between the door gasket and the front of the cabinet.

IV. Foot Pedal Door Opener

(HT-70 and HX-70 cabinets)

There are four possible points which may require servicing on the foot pedal door opener.

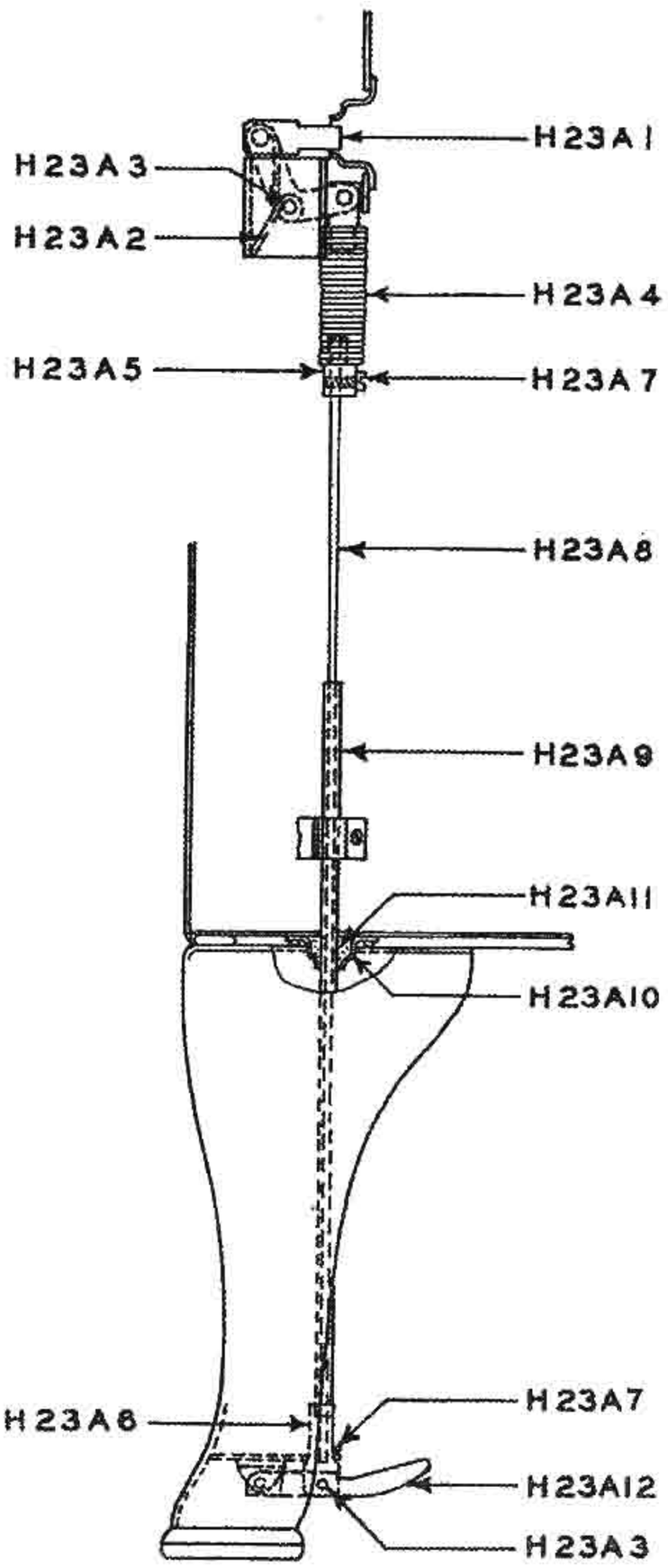
1. If the spaghetti or tubing covering the operating wire becomes bent or kinked, the foot pedal will not return after being pressed down. When this trouble is experienced, the exposed part of the cable should be inspected for kinks and if none are found, the insulating strip should be removed and the loose insulation packed around the cable inspected to see that it is not crowding the cable.

2. The second possible source of trouble is when the foot pedal touches the floor before the door opens. This may be caused by wear or by an uneven floor, and is remedied by loosening the set screw in the socket on the lower end of the operating wire, sliding the wire further into the socket and tightening the set screw. The door opener is so adjusted at the factory that the pedal just barely touches the floor when the cabinet is not on the gliders. Therefore, the foot pedal door opener will not work properly if the cabinet is not up on the gliders as it is intended to be. Before making any adjustments of the foot pedal door opener, be sure that the cabinet is properly equipped with gliders.

3. On rare occasions the operating wire may break. This is replaced by removing the insulating strip, then loosening the set screws holding each end of the wire and pulling the wire out. A new wire is easily inserted in place of the broken one.

4. Occasionally when the door is shut just hard enough to catch, the foot pedal will be inoperative.

This is because the end of the latch bolt just catches on the strike plate and does not quite slide into normal closed position. When this happens the plunger of the door opener strikes the bolt a glancing blow on the rounded edge only and fails to release it.



Foot Pedal Door Opener Replacement Parts, HX-70 and HT-70 Cabinets

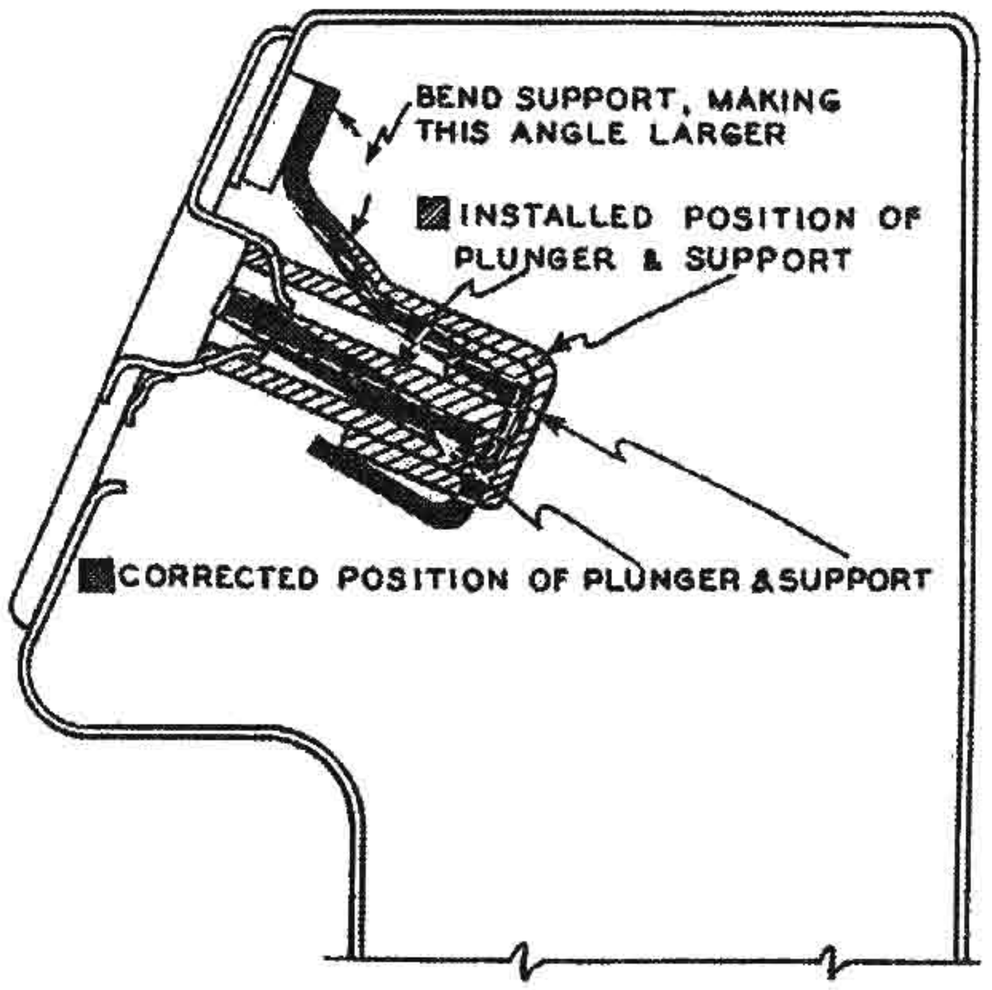
The existence of this condition is easily determined by chalking the end of the plunger and observing where it contacts the bolt.

This condition is easily remedied and positive operation in all bolt positions secured by changing the relative angle of the plunger, by bending the bracket, as shown on the following illustration.

To do this, remove the Textolite strip and the kapok insulation packed loosely around the mechanism. Now remove the two flat headed machine screws which hold the mechanism to the case and take it out where it can be bent as illustrated.

X-5, X-7 and T-7 Cabinets

The foot pedal mechanism is not interchangeable with the 1933 type. The foot pedal is connected to the door opener with three rods, which are hooked together. The middle rod passes through a stuffing box attached to the cabinet bottom. This stuffing box is packed with wool packing and grease which does not allow air leakage and allows free movement of the rod. The lower rod hooks into the eye on the end of the middle rod which allows an easy disassembly. The lower end of the bottom rod is threaded and screws into a connector which has a ball end. The



ball in turn fits into a socket in the foot pedal. For adjusting:

1. Open the cabinet door.
2. Pull down on the bottom rod and disengage the ball and socket joint.
3. Loosen lock nut on top of connector piece and screw the connector in or out to shorten or lengthen the lower rod.
4. Tighten lock nut and reassemble.

The door opener mechanism is permanently attached to the escutcheon plate which in turn is fastened to the Textolite strip with two screws. The holes for these screws in the escutcheon plate are slightly oblong, as are the holes in the strike plate allowing for movement of the complete mechanism. Then, when adjusting for door seal, the tongue of the door opener can be kept in the same position relative to the latch bolt.

Parts of the foot pedal itself and the bottom tread are obviously replaceable. The stuffing box and the door opener itself are also replaceable by removing the Textolite strip which covers them and the screws which hold them in place.

V. Door Seal

Poor door seal usually results in complaints of cabinet sweating inside, excessive frosting of cooling unit, high per cent running time, high power consumption, slow ice freezing and high cabinet air temperature.

Imperfect door seals may be located by the use of a 0.003″ metal feeler. Locate the point of poor seal by inserting the feeler at various points around the door between the gasket and the cabinet front.

If a poor seal is located, first check the gasket to see that it is not excessively worn. Check the hard-

ware to see that it is not sprung or worn and that the screws are tight.

The strike should be inspected and adjusted as follows:

The strike plate is in two pieces of which the strike bar is adjustable. By loosening the two screws in the plate this bar can be moved in or out. When the strike is properly adjusted there should be 1/8" free movement at the end of the latch handle when the door is closed. If the strike bar is too far out there will be no free movement. If it is too far in, the free movement will exceed 1/8".

Often a poor door seal can be corrected by rehanging the door; by replacing the gasket; or by properly adjusting or replacing the hardware.

If, however, the poor door seal is caused by the door being sprung out of line, or by the front of the cabinet being out of line, it can be corrected as follows:

(The operator should be provided with a straightedge approximately 2" longer than the long side of the door, a rubber mallet, a metal feeler approximately $\frac{1}{32}$" thick and a screw driver.)

1. With the straightedge check the cabinet front on all four sides, approximately where the door gasket seats, to see if the front is straight. If it is possible to insert the $\frac{1}{32}$" feeler between the straightedge and the face of the cabinet such points should be corrected.

   If an unevenness does exist, it is very likely that the cabinet front will be bulged outward, generally at the center of the Textolite strip.
2. When the front is bulged outward, loosen the Textolite strip screws approximately 1½ turns on all four sides of the door opening—front side only, not on the liner side.
3. Pound the high point of the cabinet front and keep checking with the straightedge until a comparatively even, flat surface is obtained. If done properly this will not in any way injure the finish. When the front is straight, tighten up all the screws.
4. If the cabinet front is found to be bulged inward, it will probably be found necessary to remove the Textolite strip at that point and pull the front of the cabinet out so that it makes a bulge forward. Then proceed as above.

VI. Shelf Frames on HT-70, HX-70, X-7 and T-7 Cabinets

The shelf frames in these models may be used either side up, giving considerable variation in shelf spacing.

Each set of sliding shelves is individually fitted to the cabinet with which it is shipped from the factory.

However, replacement of liners, replacement of shelves, and the mixing up of shelves may make readjustment necessary in some cases. We wish to caution that in adjusting the open type sliding shelf frames which we are now using, great care must be exercised not to bend them at the welds, or to install them by springing them in position, leaving the welded joints under a strain.

These shelves must be adjusted by bending the tangs back and forth as required. This bending must be done in a suitable clamping device to prevent applying a strain to the welded joints. The shelves should be adjusted so they fit in the liner snugly, but not so tight that they have to be forced into place. Shelves that are fitted too tight may cause chipping of the porcelain liner.

VII. Door Gaskets

It will be noted that the door gasket is one piece and is not interchangeable with any others in the line. To replace a gasket, pull the old gasket off and put the new gasket on the cabinet by forcing the lugs of the gasket into holes in exterior door pan with a blunt tool or pencil.

VIII. Installation of Six-Inch Legs

On the cabinets using CA Form A units (HT and HX models) standard six-inch legs may be used with the exception of the front leg with the bracket for the foot pedal door opener. The wire for the foot pedal door opener will have to be shortened to the proper length.

On the cabinets using CA Form B units (X and T models) a short bottom link is available and will be shipped with the special six-inch leg.

IX. Nameplate

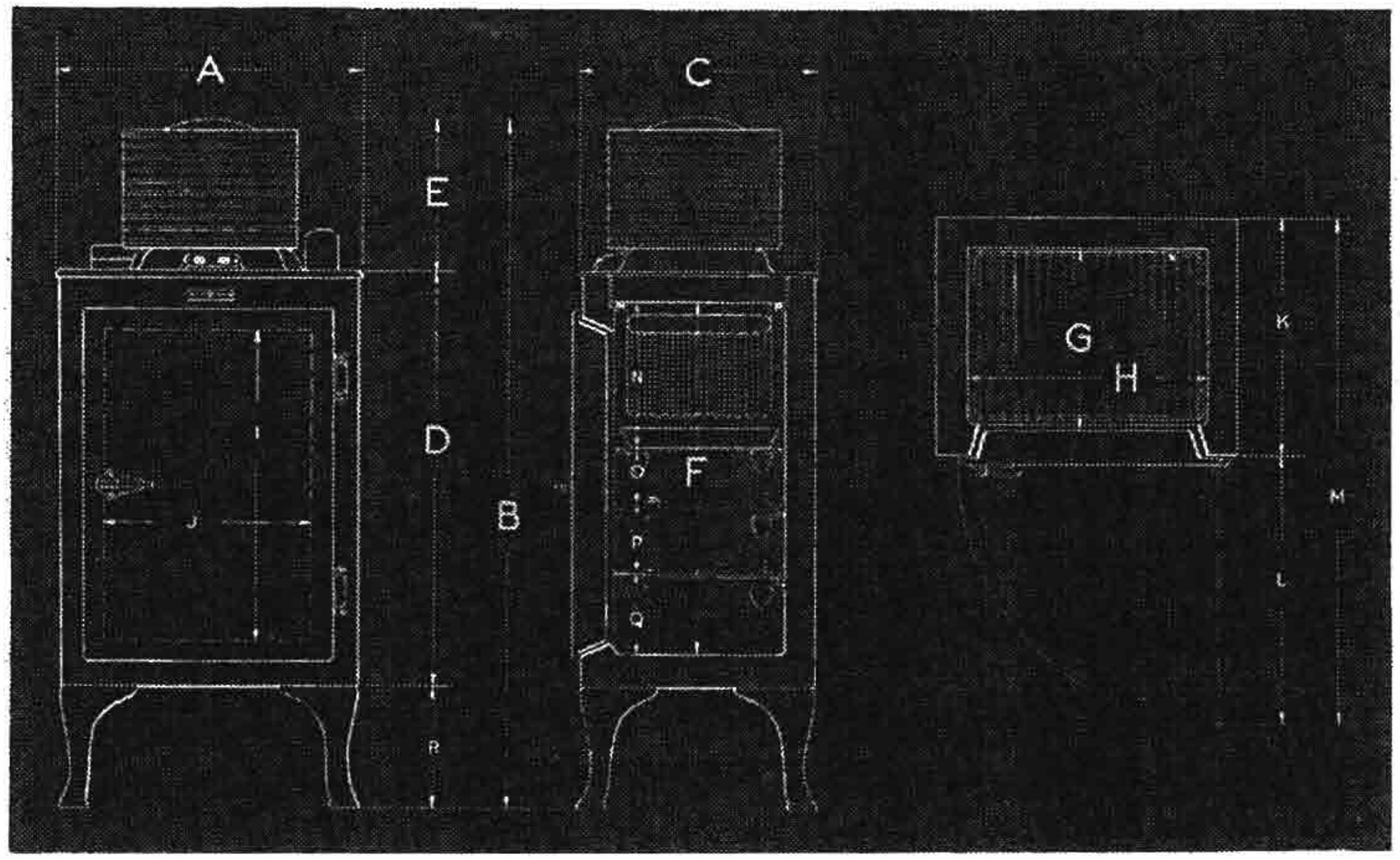
The nameplates on the HX and HT models were held in place with two screws.

The later models (X and T line) had a different type made up of two parts. A concealed cadmium plated base strip is attached to the outer case with two screws, and the nameplate proper snaps onto the base strip.

To remove this nameplate use a small screw driver with a bit approximately $\frac{3}{16}$" wide. With the door of the cabinet open, insert the point of the bit in the slot of the nameplate shell. The slot is located in the right-hand end on the lower side.

Twist the screw driver to unsnap the nameplate shell from its base plate, being careful not to mar the Glyptal or porcelain finish.

To reassemble, slide the left-hand end of the nameplate shell over the base plate and then snap it on.



DIMENSION CHART																		
Model	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
HT-47	24"	64¾"	21½"	38 9/16"	14⅝"	32⅛"	15"	18"	28½"	15½"	21 1/16"	18⅞"	39 15/16"	12¼"	6¾"	5¾"	5 13/16"	11 9/16"
HX-47	24"	64 15/16"	21½"	38⅞"	14⅝"	32⅛"	15"	18"	28½"	15½"	20 15/16"	18⅞"	39 13/16"	12¼"	6¾"	5¾"	5 15/16"	11 9/16"
HT-70	28 13/16"	66 15/16"	22¾"	40¾"	14⅝"	33 13/16"	17"	22⅞"	29⅞"	20"	22 3/16"	25¼"	47 1/16"	13 13/16"	5"	6 9/16"	7 9/16"	11 9/16"
HX-70	28 13/16"	66 3/16"	22¾"	40"	14⅝"	33 13/16"	17"	22⅞"	29⅞"	19⅞"	22 3/16"	25¼"	47 1/16"	13 13/16"	5"	6 9/16"	7 9/16"	11 9/16"
X-5	24"	65¼"	21½"	38⅝"	15"	32¼"	16"	18"	28⅞"	15⅞"	21⅛"	19⅜"	40½"	12 3/16"	6¾"	5⅞"	6"	11 9/16"
X-7	28⅞"	66½"	22¾"	40"	15"	33⅞"	17"	22⅞"	29⅞"	19⅞"	22¼"	25¼"	47½"	13⅞"	5¼"	6¾"	7⅝"	11 9/16"
T-7	28⅞"	68"	26¼"	40⅛"	16⅜"	34⅞"	19⅛"	27⅛"	30½"	24⅝"	25¾"	25¼"	55⅜"	14"	5¼"	7¼"	7⅜"	11 9/16"

Note: Allow ¼" tolerance on all exterior dimensions.

Model HT-47 and HX-47 with CA-1A Refrigerating Machine
Model HT-70 and HX-70 with CA-2A Refrigerating Machine
Model X-5 with CA-1B Refrigerating Machine
Model X-7 and T-7 with CA-2B Refrigerating Machine

Note: Unit pictured above is CA Form A.

Use and Care of the Refrigerator

The General Electric refrigerator is designed to satisfy all normal refrigeration requirements with a minimum amount of attention on the part of the user. A few instructions on the use and care of the refrigerator will assist the user in obtaining the most satisfactory service from it.

Cleaning the Interior

Directly after installation and previous to the time the machine is started, it is recommended that the user carefully clean the interior of the cabinet, the cooling unit, ice trays, chiller tray, and food containers.

For cleaning the interior of the cabinet and the cooling unit, a solution of baking soda in warm water should be used. A satisfactory solution can be made up of one tablespoonful of baking soda in four quarts of water.

Caution: Never clean the interior of the cabinet or the cooling unit with any cleaning agent which has an odor.

Caution: When washing the chiller tray, do not use hot water. Hot water may cause breakage.

It is suggested that the interior of the cabinet and the cooling unit be cleaned each time the cooling unit is defrosted.

Cleaning the Exterior

Mild soap and warm water, or General Electric Liquid Wax should be used in cleaning the Monitor Top and the exterior of the Glyptal cabinets.

Caution: The use of any of the standard cleaning compounds which depend upon abrasive or alkaline action will remove the gloss from the finish on the Monitor Top or Glyptal cabinets.

Starting the Refrigerator

To start the refrigerator after it is installed, turn the left knob on the control on the front of the machine to the "on" position. The machine should start immediately.

If the machine does not start, make sure that the electrical cord is properly attached. Also, make sure that the house fuse on the circuit into which the refrigerator is plugged is all right.

During the first few hours after being started, the machine may be slightly noisy but as soon as it is within the normal operating condition, it will continue to operate quietly.

Cabinet Temperature

When the refrigerator is installed, the temperature knob at the right side of the control should be set at position 5. The control is set at the factory to automatically maintain a cabinet air temperature of between 38° F. and 42° F. in room temperatures between 70° F. and 80° F.

If the room temperature averages below 70° F., the cabinet air temperature may be slightly below 38° F. If this is too cold, the temperature knob can be turned counterclockwise to position 4 or 3, or even to 2 or 1.

If the room temperature averages above 80° F., the cabinet air temperature may be slightly above 42° F. If this seems too warm, the temperature knob can be turned clockwise to positions 6, 7, 8, or 9.

The temperature setting is made adjustable in order to satisfy the individual desires of the user. If it is desired to make the cabinet air temperature colder, the temperature knob can be turned clockwise; if warmer, the knob can be turned counterclockwise.

The use of a thermometer in the cabinet is not recommended unless it be of high quality. The user will find that the refrigerator is maintaining proper temperatures if the food is preserved satisfactorily and is cold enough for the individual taste.

Distribution of Food in the Cabinet

The coldest zone in the refrigerator is within the cooling unit where the temperature is below freezing. The next warmer zone is in the chiller tray where the temperature may be just below or just above freezing. The warmest zone is in the cabinet where the temperature should range between 38° F. and 45° F.

Air circulation is necessary to insure uniform temperature distribution within the cabinet. Therefore, do not restrict the circulation by excessive crowding of food into the cabinet or by placing coverings over the shelves.

The circulation of cold air in the cabinet is from the cooling unit, around the chiller tray, down the right side of the cabinet and up the left side. It is evident that foods with odors, which are not covered, should be placed on the left side of the cabinet near the top in order not to affect other foods.

For most satisfactory results, it is recommended that the following foods be kept in covered containers:

1. Those with strong or objectionable odors such as cantaloupes and onions.
2. Those which absorb odors readily such as butter.
3. Liquids such as milk or cream.
4. Moist foods such as mashed potatoes or creamed vegetables.
5. Fresh vegetables such as lettuce and celery. (Should be kept in the vegetable pan.)

Freezing Ice Cubes

To secure the most rapid freezing of ice cubes, be sure that the ice trays make good contact with the cooling unit freezing surfaces. A quarter cup of warm water spread evenly over the freezing surface will serve to level any unevenness in the frost covering the surface.

The ice freezing rate can be further improved by turning the temperature knob at the right of the control to position 9, the coldest setting. When the ice is frozen, the temperature knob must be returned to the normal position. Otherwise, the cabinet air temperature may be reduced to a point where freezing of food will result.

To remove an aluminum ice tray when frozen, use the tray lifter, or loosen with an upward push directed against the upper rim of the tray. Do not use an ice pick or other sharp instrument. The rubber ice tray can be loosened by lifting on the handle.

To remove ice cubes from an aluminum tray with a minimum loss of ice, allow cold water from the faucet to run on the bottom of the tray until the cubes fall out. An alternate method is to immerse the ice tray in a pan of cold water. Ice cubes are removed from the rubber tray by flexing the tray.

Defrosting

Frost will collect on the cooling unit at a rate depending on the humidity of the air entering the cabinet at times when the door is opened and on the amount of uncovered liquid or moist foods in the cabinet. It is recommended that the cooling unit be defrosted at a time when this accumulation is approximately one-half inch thick or when the accumulation interferes with the removal of ice trays. It is suggested that defrosting take place at least once a month at which time the interior of the cabinet and the cooling unit should be cleaned. However, in many cases defrosting will be necessary oftener than once a month, depending on the conditions.

To defrost the refrigerator, the switch on the left side of the control should be turned counterclockwise to the position marked "defrost." The machine will automatically proceed to operate on a defrosting cycle, allowing the frost on the cooling unit to melt off into the chiller tray, yet not allowing the cabinet air temperature to rise more than a few degrees. On the Form A machines, when defrosting is completed, the main switch should be returned to the "on" position. However, in the Form B machines, the control is so arranged that the unit is automatically returned to normal operation after a single defrosting cycle. Therefore it is not necessary to manually return the knob from "defrost" to the "on" position.

The ice trays, and food stored in the chiller tray should be removed previous to defrosting. The water in the chiller tray after the defrosting is completed should be immediately emptied.

Hot Water Defrosting

In order to hasten the defrosting period, particularly in warm weather when it is desired to preserve the ice cubes and allow only a small rise in cabinet air temperature, pans of hot water can be placed in the cooling unit after either of the two following conditions are observed:

1. Turn the main switch to "off" instead of "defrost," or,
2. Turn the main switch to "defrost" when the *machine is not running.*

If the hot water is placed in the cooling unit when the machine is running and the main switch is turned to "defrost," the machine will continue to run until the water is frozen before starting to operate on a defrosting cycle.

Resetting the Motor Protective Device

A device is incorporated in the control to protect the motor in the machine in case of unusual load or power conditions. On the CA Form A machines, when this device operates, the motor is shut off and a red signal appears in the window on the front of the control. No signal appears on the Form B machines and the operation of the protective device will be indicated by an excessively long "off" period during which the cooling unit will defrost.

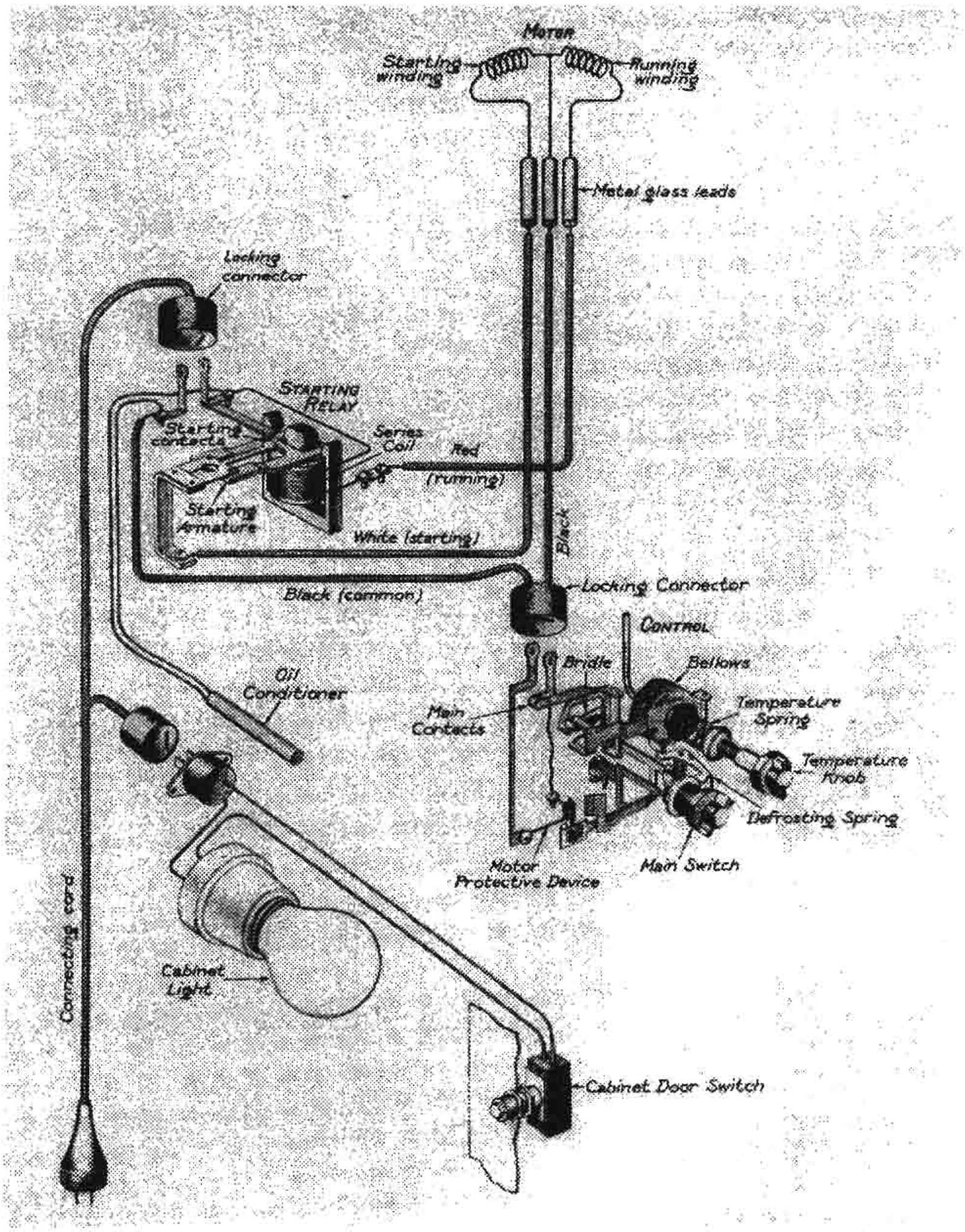
To restart the machine, the switch on the left side of the control must be turned first to the "off" position and then to the "on" position. If the protective device trips immediately and will not remain set, wait a few minutes and try it again.

Changing the Spacing of the Cabinet Shelves

The new sliding shelves supplied with the HT-70, HX-70, X-7 and T-7 refrigerators can be inverted so that the shelf spacing is altered to suit the convenience of the user.

Product Data

REFRIGERATING MACHINE TYPE USED IN REFRIGERATOR MODEL	CA-1A HT-47 HX-47	CA-2A HT-70 HX-70	CA-1B X-5	CA-2B T-7 X-7
Motor				
Rated Voltage	110	110	110	110
Rated Cycles (Use on 50 cycles with special control and relay)	60	60	60	60
Speed (Full Load) R.P.M.	1755	1755	1755	1755
Watts (100° F. Room, 20° F. Cooling Unit)	160	175	160	175
Amperes (100° F. Room, 20° F. Cooling Unit)	2.35	2.40	2.35	2.40
Starting Current, amperes (Locked Rotor)	13.5	13.5	13.5	13.5
Rated Horsepower	⅛	⅛	⅛	⅛
Compressor				
Displacement, cu. in.	3.0	3.0	3.0	3.0
Head pressure, lbs. per sq. in. gauge (100° F., 20° F. Cooling Unit)	17	18	17	18
Suction pressure, inches of mercury vacuum (100° F., 20° F. Cooling Unit)	25	25	25	25
Refrigerator				
Capacity (Approx.) B.t.u./hr. (100° F. Room, 20° F. Cooling Unit)	430	480	430	480
Equivalent ice melting (Approx.) lbs. per 24 hours	72	78	72	78
Temperature range of cooling unit (80° F. performance, thermometer frozen to bottom of cooling unit)				
Temperature knob in position 1, ° F. (warmest)	15–25	18–27	20–30	22–31
Temperature knob in position 5, ° F. (normal)	10–20	13–22	10–20	13–22
Temperature knob in position 9, ° F. (coldest)	5–15	8–17	0–10	4–13
Weight of methyl formate, lbs.	2.15	2.75	2.15	2.75
Volume of methyl formate, cc.	975	1250	975	1250
Cabinet volume, cu. ft.	4.7	7.0	5.0	7.0
Cabinet shelf area, sq. ft.	8.3	12.3	8.9	12.5
Total number of ice cubes	42	84	42	84
Total weight of ice cubes, lbs.	4.5	9	4.5	9
Weight				
Refrigerating Machine, uncrated, lbs.	130	143	130	143
Refrigerating Machine, crated, lbs.	162	188	163	185
Porcelain Cabinets, crated, lbs.	238	318	—	318
Glyptal Cabinets, crated, lbs.	205	312	190	312



Wiring Diagram for CA-2A and CA-2B Machines. (Same for CA-1A and CA-1B except for Cabinet Light and Plug.) Original control and relay are shown. Refer to table below for Type R relay wiring connections.

Type R Relay Wiring Connections

	3 Wire Cable to Compressor			2 Wire Connecting Cord		2 Wire Cable to Oil Conditioner	
Color of Lead	R	W or Y	B	W	B	W or G	B or G
Terminal No.	3	1	2	2	4	2	4

Color Code: R—Red W—White Y—Yellow B—Black G—Green

Note: It is necessary to use a long screw in terminal 2 of the relay.