



DESCRIPTION • RECEIVING • MAINTENANCE

# INSTRUCTIONS

## High Voltage

## AIR BREAK A-C MAGNETIC CONTACTORS

### Class 16-200

Types		
A-C Operated Coil	D-C Operated Coil	Spring Closed
H-130A	H-130D	H-403D
H-230A	H-230D	
H-430A	H-430D	
	H-150D	
	H-250D	
	H-450D	
	H-130DD	
	H-230DD	
	H-430DD	

## WESTINGHOUSE ELECTRIC CORPORATION

BUFFALO MOTOR AND CONTROL DIVISION

BUFFALO 5, N. Y.

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# DESCRIPTION

## INTRODUCTION

These instructions apply to air break magnet operated A-C contactors of the following type:

TYPE	NO. POLES	TYPE OF CLOSING	AMP RATING	VOLTAGE
H-130A	3 open	A-C Magnet	100	2300/4800
H-230A	3 open	A-C Magnet	200	2300/4800
H-430A	3 open	A-C Magnet	400	2300/4800
H-130D	3 open	D-C Magnet	100	2300/4800
H-230D	3 open	D-C Magnet	200	2300/4800
H-430D	3 open	D-C Magnet	400	2300/4800
H-130DD	3 open	D-C Magnet	100	2300/4800
H-230DD	3 open	D-C Magnet	200	2300/4800
H-430DD	3 open	D-C Magnet	400	2300/4800
H-150D	5 open	D-C Magnet	100	2300/4800
H-250D	5 open	D-C Magnet	200	2300/4800
H-450D	5 open	D-C Magnet	400	2300/4800
H-403D	3 closed	Spring Closed	400	2300/4800

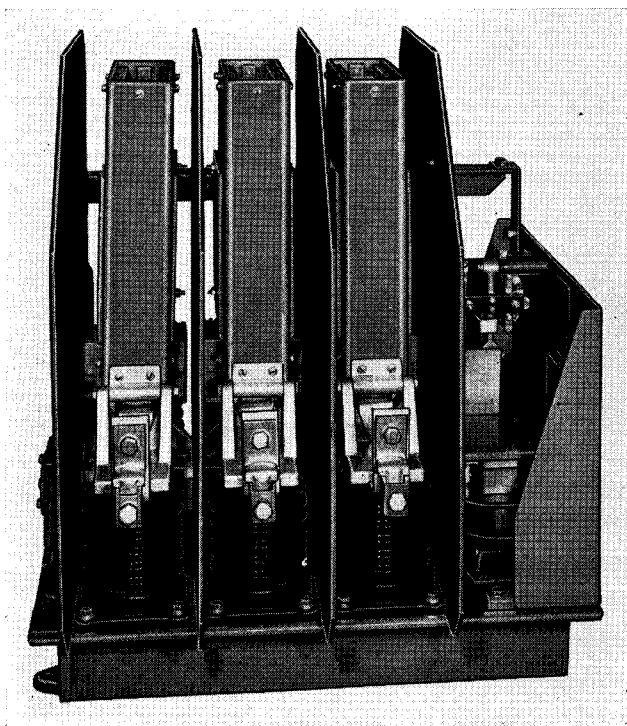


FIG. 1. Type H—3 pole—A-C Magnet Closing

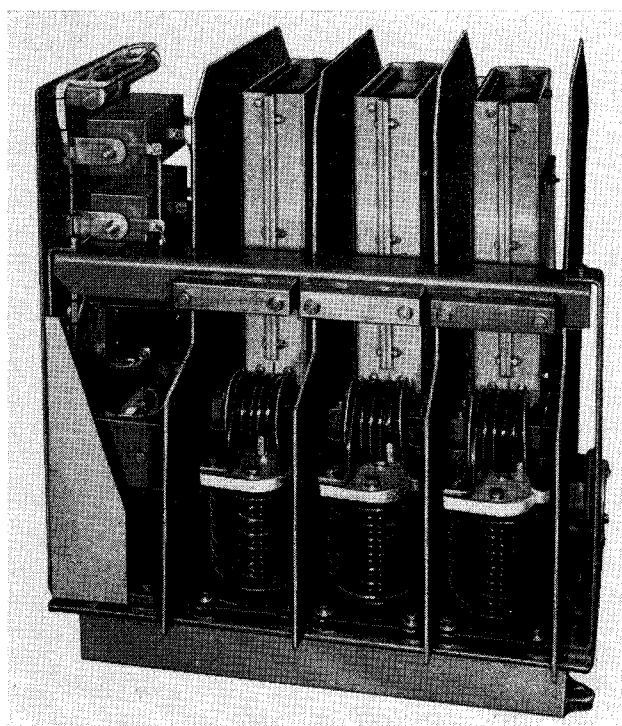


FIG. 2. Type H—3 pole—D-C Magnet Closing with Rectifiers (Rear View)

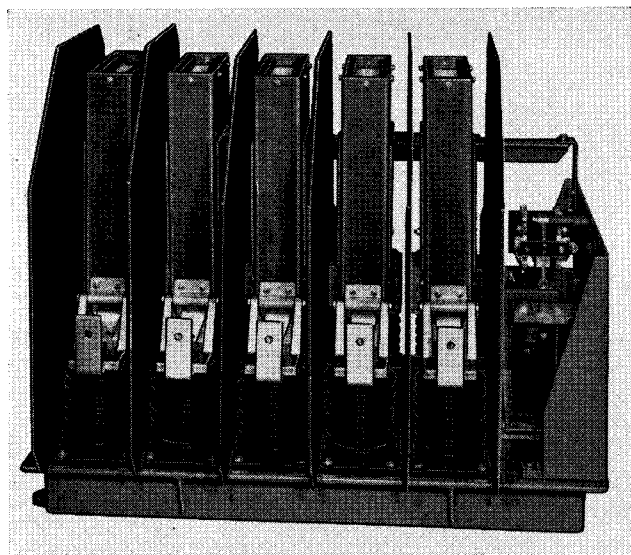


FIG. 3. Type H—5 pole—D-C Magnet Closing

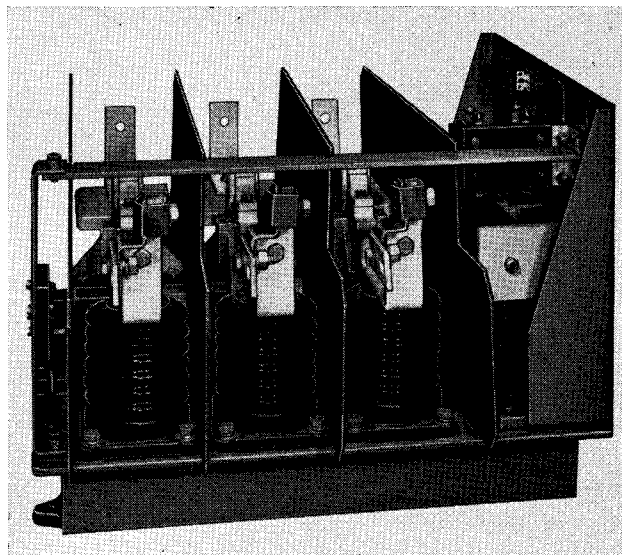


FIG. 4. Type H—3 pole—Spring Closed

### GENERAL DESCRIPTION

These contactors are designed for equipment used in starting or controlling A-C motors on 2300, 4160, or 4800 volt power systems. They should not be used under any circumstances where the actual line voltage exceeds 5280 volts.

Continuous ratings of 100, 200 and 400 amperes are available and are suitable for use with motors up to 3000 maximum horsepower. (See Table No. 2). When used as part of NEMA Class E1 totally enclosed and electrically coordinated controllers, the magnet closed contactors will interrupt short circuit current on circuits having available symmetrical KVA capacity as per Column 3 of Table 1. When used as part of enclosed and coordinated NEMA Class E2 controllers, having fuses to interrupt the short circuit current, they may be used on circuits having available symmetrical KVA capacity as per Column 4 of Table No. 1.

**Table No. 1**

VOLTAGE RATING OF SYSTEM	8 HOUR CONTACTOR RATED AMPERES	SYMMETRICAL THREE PHASE AVAILABLE SHORT CIRCUIT CAPACITY IN KVA AT 25 TO 60 CYCLES	
Column 1	Column 2	Column 3	Column 4
2200-2500	200	25000	150,000
4000-4800	200	25000	250,000
2200-2500	400	50000	150,000
4000-4800	400	50000	250,000

The spring closed contactors are designed for dynamic braking of synchronous motors to close circuit only. They do not have any interrupting rating.

The magnet closed contactors may be used for D-C braking of high voltage A-C motors. For this application, their maximum D-C voltage rating is 250 volts and maximum D-C interrupting rating is 1000 amperes.

Before using on other than motor loads or where conditions are unusual or beyond the scope of above ratings, consult Westinghouse Electric Corporation giving complete rating of the motor, contactor, and other equipment.

### OPERATING MAGNET

The type H three pole magnet closing contactors are available with either A-C or D-C continuous rated magnet coils. The D-C operated contactor is also available complete with rectifier and resistors necessary to supply rectified A-C power to the D-C coils. The five pole magnet closing and the three pole spring closed contactors are available with intermittent rated D-C magnet coils only. The voltage on these coils must be reduced after the contactors have closed.

### ARC CHUTES

Arc chutes are provided for each pole of magnet closed contactors. Easily removeable insulating barriers are used between poles and between poles and grounded parts. Since the arc chutes and barriers may be dismounted for shipment, make sure

they are available and mounted in place. When mounting arc chutes, make certain that the blades on the outer arc runners enter the switch jaws attached to the contact parts. When fully engaged, the arc chutes will be vertical and the jacket will rest against the blowout magnet laminations. **Never operate the contactors when line voltage is applied unless both the arc chutes and the barriers are in place. Failure to observe this precaution may result in injury or serious damage.**

### ARC INTERRUPTION

Provision has been made to rapidly extinguish the arcs resulting from circuit interruption and to confine the conducting arc gases within the arc chutes. Two separate systems of magnetic fields make this possible. A continuously rated blowout coil A, Fig. 5, is connected in series with each contact and a laminated steel yoke B, Fig. 5, is used to direct magnetic flux across the contacts. When an arc is drawn between contacts, this flux moves it upward into the arc chute.

Swinging the hinged arc chute into place automatically connects a pair of arc runners A, Fig. 6, to the contacts. These arc runners become electrical extensions of the contacts which serve to stretch out or lengthen the arc. In the process of traveling out along the runners the arc bows upward and strokes another pair of runners or plates B, Fig. 6, located near the center of the arc chute. This pair of runners is connected together by another series blowout coil C, Fig. 6, having a much larger number of turns. This coil energizes a second laminated steel yoke C, Fig. 5, producing a much stronger magnetic flux and driving the arc rapidly into the arc stacks. These stacks are assemblies of zirconium refractory plates each having a gradually narrowing opening or slot.

The plates are assembled with slots on alternate sides so that the arc, as it travels up into them, is caused to assume a zig-zag shape in which it is lengthened, restricted, and cooled until it becomes non-conducting.

The single arc started across the contact space is rapidly moved away from the contacts into the arc chute where it becomes two arcs in series connected together through a powerful blowout coil. Surrounding both sections of the arc there is an efficient zirconium base refractory quencher assembly. If an arc is established between the center runners which are terminals of the second blowout coil, its voltage will be low and it will occur at the bottom end where there is a set of small auxiliary arc plates D, Fig. 6, designed to interrupt it.

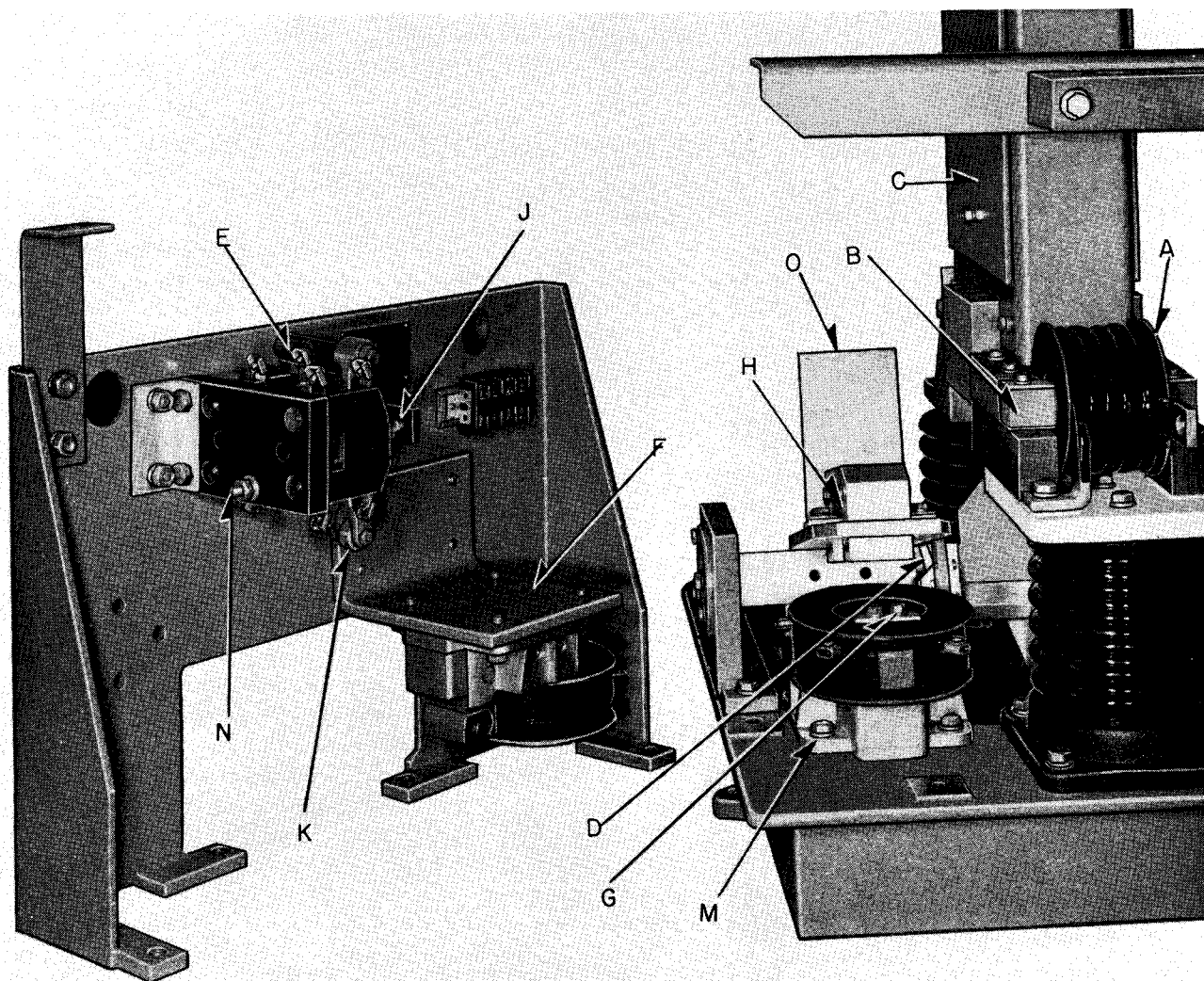
### MAGNETIC LATCHES

It is important to establish and maintain a suitable contact gap when the contactor is opening. In some contactors, spring forces and gravity are depended upon for this purpose. When opening heavy current, especially fault current, magnetic forces react in such a manner as to accelerate their opening speed. This speed may become large enough to cause bouncing and even reclosing of contacts unless preventive means are taken. Mechanical latches are provided on these contactors to engage and hold the magnet armatures in the open position. These latches are magnetically released when the magnets are energized to close the contactor, then drop back into position to re-engage the armatures when their open position is reached. Rebounding is eliminated and there is no tendency for arcs to restroke across the contact gap.

The latch for the A-C magnet is shown at D in Fig. 5. It is supported on the stop bracket for the rear

**Table No. 2  
HORSEPOWER**

TYPES	2200-2300 VOLTS			4000-4600 VOLTS		
	SYNCHRONOUS		INDUCTION	SYNCHRONOUS		INDUCTION
	100 % Power Factor	80 % Power Factor		100 % Power Factor	80 % Power Factor	
H-130A	450	350	350	750	625	625
H-230A	900	700	700	1500	1250	1250
H-430A	1750	1500	1500	3000	2500	2500
H-130D	450	350	350	750	625	625
H-230D	900	700	700	1500	1250	1250
H-430D	1750	1500	1500	3000	2500	2500
H-150D	450	350	350	750	625	625
H-250D	900	700	700	1500	1250	1250
H-450D	1750	1500	1500	3000	2500	2500
H-403D	1750	1500		3000	2500	



**FIG. 5. Details of A-C Magnet**

magnet where it interferes with closing movement unless it is magnetically retracted. Leakage flux from the magnet, when it is energized in the open position, retracts the latch. When the magnet has full closed, the flux leakage disappears and the latch falls back against the magnet armature plate. It is then in position to drop under the plate and prevent rebounding. Should it be necessary to close the contactor by hand the latch must be pushed aside.

The latch for the D-C magnet is shown at A in Fig. 7. It is mounted beneath an extension of the lower armature plate. In principle, it operates just like the A-C magnet latch. The retracting magnet flux is furnished by a small electro magnet coil B, Fig. 7. The circuit to this coil includes a snap acting switch C, Fig. 7, which is closed only when the armature plate is resting against it. When the main magnet coils are energized, the latch magnet retracts the latch and permits the armature plates to move. This movement opens the switch, cuts off the

latch coil current and puts the latch in position to drop under the armature plate and prevent rebounding. Contactors, recently manufactured, use a normally closed interlock mounted on the contactor in place of the snap acting switch.

For certain selective dynamic braking applications, eg., rubber mills, a magnetic holding coil is used rather than the standard latch coil mechanism. This D-C operated mechanism—A of Fig. 8—must be de-energized to close the main contacts and remain energized while the contactor is dropping out and until it has come to complete rest. This feature makes it possible to control closing of the contactor with a control relay located on the main panel. This relay—TR to Fig. 17—is not a part of the contactor and is an external control device. Until TR operates, opening the hold magnet circuit, the contactors cannot close despite any voltage applied to the main closing coils. This type of latching is found on the Type H D-C operated contactors containing the suffix letters DD.

**ELECTRICAL INTERLOCKS**

Each contactor is provided with auxiliary electrical interlock contacts E, Fig. 5, which will control four independent circuits. All of these may be normally open, or all normally closed, or any intermediate combination of normally open and normally closed. Selection of circuit arrangements is optional.

**MECHANICAL INTERLOCKS**

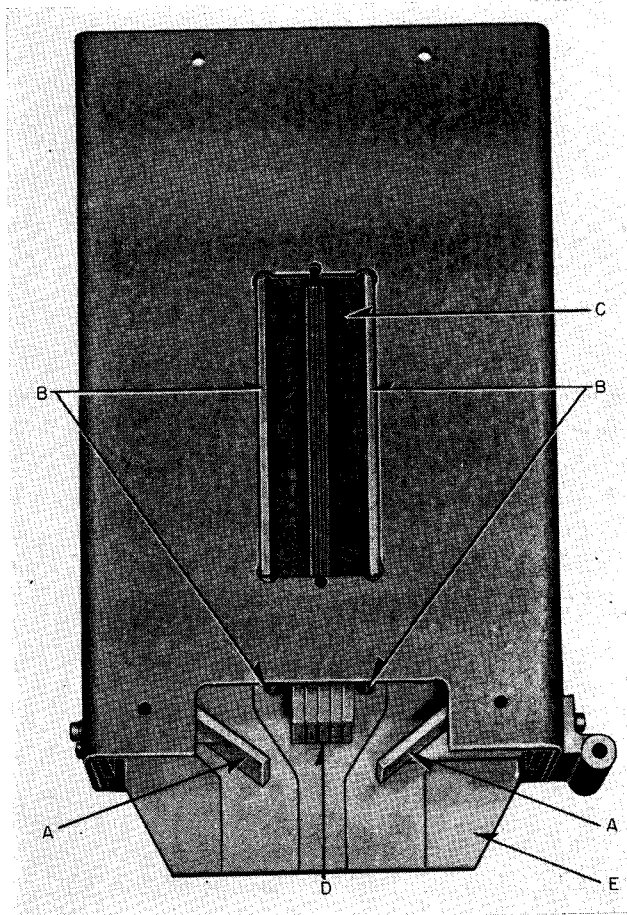
Mechanical interlocks, Fig. 9, are used to prevent two contactors from being closed simultaneously. These clamp around the operating shafts and project through openings in the end frames. Rods and fittings fastened to these projecting parts serve to transmit motion of one contactor to a corresponding point on the other where adjustments can be made. Adjust so that there will be no binding at either contactor and when one set of contact touches, the other set cannot be made to touch. When one set of contacts is fully closed, adjust for only enough movement of the other set to prevent binding of interlock parts.

When a spring closed contactor is interlocked with one or more magnet closed contactors, adjust the connecting rod lengths to exactly fit their lever arms when both sets of magnets are fully closed.

Mechanical interlocking of Type H contactors is possible in several combinations. The table below contains the various interlocking combinations available.

**Table No. 3**

INTERLOCKING COMBINATIONS	RATING OF CONTACTORS
Synchronous, dynamic braking—reversing	100—200—400 amp 2300/4800 volt D-C operated (suffix D or DD) Interlocking with 400 amp spring closed (Type H 403D)
Two normally open contactors mounted vertically	100—200—400 amp D-C operated 3 pole contactor interlocked with 5 pole or 3 pole unit
Three normally open contactors used for two speed reversing applications	100—200—400 amp contactor interlocked for 3 magnet closed contactors (A-C or D-C magnets)
Two normally open contactors mounted horizontally	100—200—400 amp contactor 3 pole interlocked with 5 pole or 3 pole contactor (A-C or D-C operated)
Non-reversing synchronous dynamic braking combination	Similar to synchronous dynamic braking—reversing

**FIG. 6. Arc Chute—Partial Assembly**



# RECEIVING, HANDLING AND INSTALLING

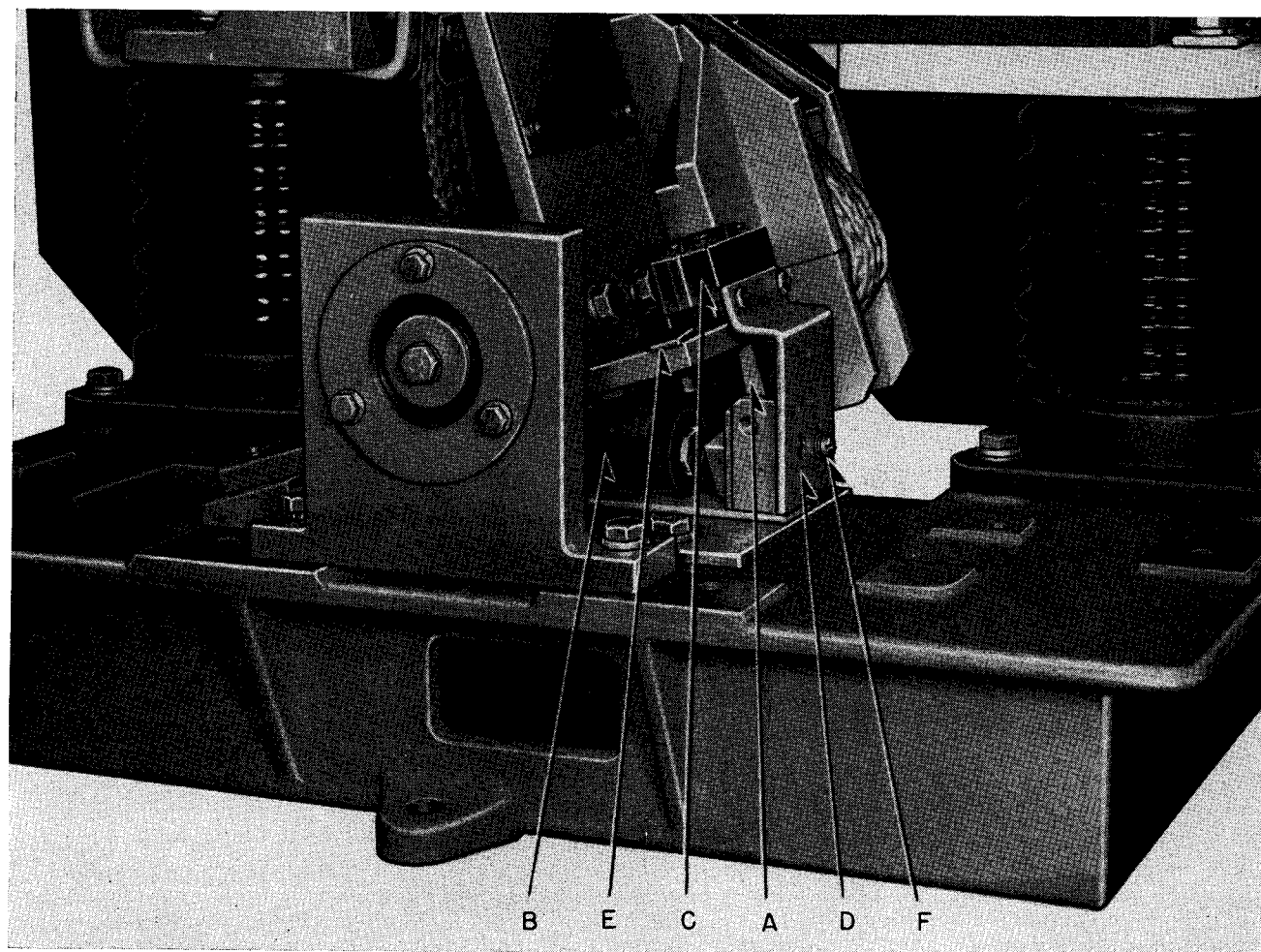


FIG. 7. D-C Magnet Latch

## RECEIVING

These contactors are shipped completely assembled, except for the arc chutes and barriers which are packed separately. Immediately upon receipt, make a careful examination for any evidence of damage received in transit. Remove the shipping crate and packing material carefully using a nail puller instead of a hammer or wrecking bar. If any damage is found or suspected, file a claim promptly with the transportation company and notify the nearest Westinghouse Sales Office.

## HANDLING & INSTALLING

Exercise care when handling and installing contactors. When lifting, use the lifting eyes provided and an equalizer bar or spreader for the cable sling. Install the arc chutes by rotating them carefully

into a vertical position. Make sure that the blades of the arc runners enter the contact jaws attached to stationary parts without fouling. Barriers should be installed between poles and between poles and grounded parts. Lift them far enough to clear the shaft, push them back against the barrier support, then move them down until they rest on the cast base between insulators.

When wiring cables to the blowout coils in the rear side of the contactor, use cable cleats provided. When wiring to the front side, locate cables so that arc boxes may be swung open to expose contact parts for inspection and replacement. Maximum accessibility will be obtained if the cables lead off horizontally to the left end or side away from the magnet. Brace these cables securely to prevent movement during the flow of heavy fault current.



## PART THREE

# MAINTENANCE AND REPAIR

### GENERAL

A maintenance program should be initially established to provide for monthly inspections of the contactor. After the contactor has been inspected a number of times and the condition noted, the frequency of inspection can be increased or reduced to suit the conditions found.

All work on this contactor should be performed with the main branch circuit disconnect device open. Magnetic operation of the contactor should be achieved by use of a separate source of control power and one secondary lead of the control transformer disconnected to prevent inducing a high voltage in the other controller parts.

The contactors should be maintained in a clean, dry condition. If necessary, space heaters should

be used to prevent the condensation of moisture on the contactor. Dust should be removed by blowing off with compressed air or use of a vacuum cleaner with particular attention paid to the operating magnet pole faces and latch. Dust should be removed when it has the appearance of a coating of frost, but before it appears like a layer of snow.

The insulation resistance between poles and from each pole to ground should be measured and recorded. It is not feasible to establish the correct absolute value of this reading since it is dependent on other connected apparatus and conditions of environment. However, any abrupt reduction in this value from the previous reading would indicate a possible source of trouble and the cause should be established and corrected.

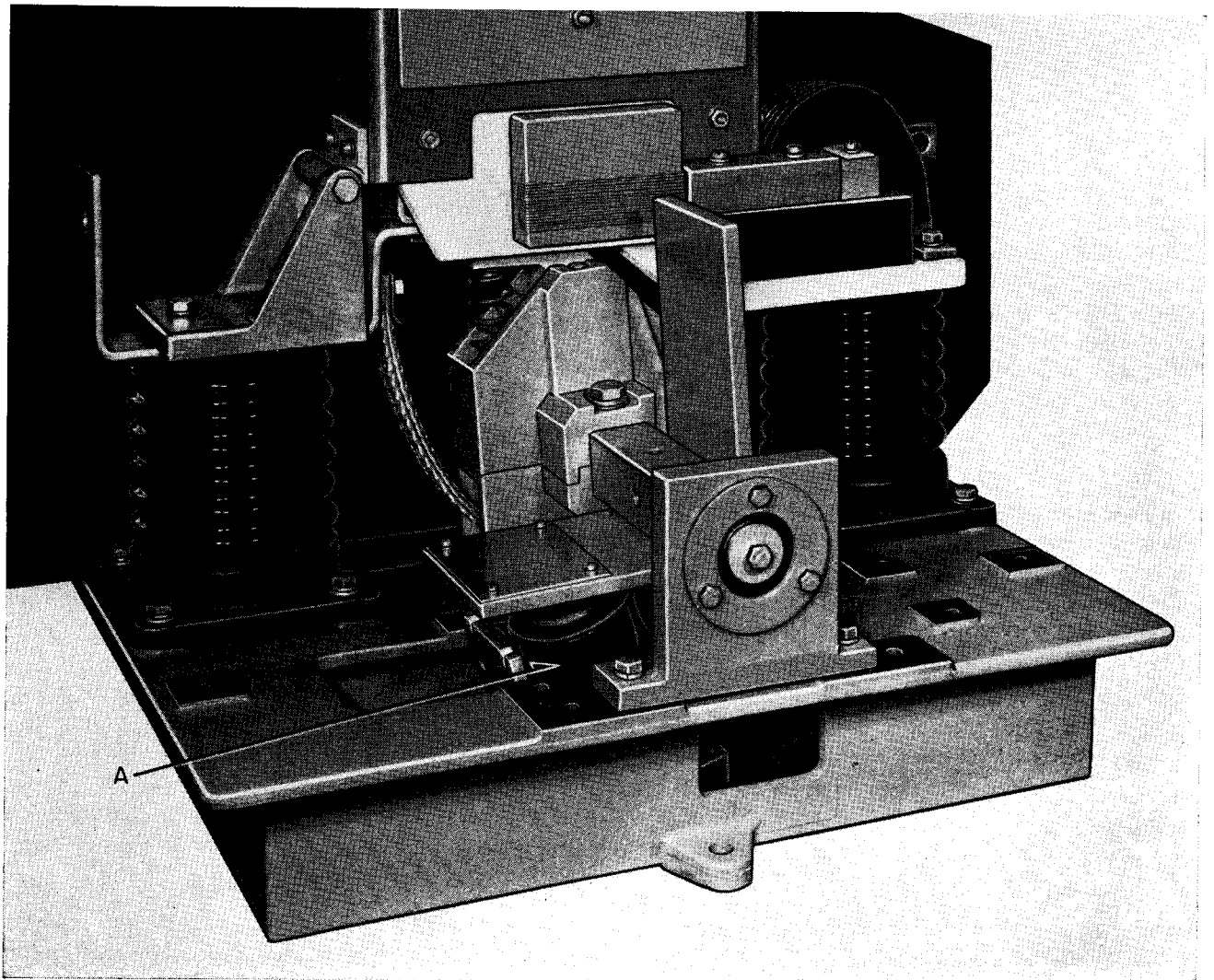


FIG. 8. D-C Holding Magnet

**OPERATING MAGNETS**

The pole faces should be checked that they are clean and smooth. A file or other instrument which would scratch the pole faces should not be used, but cleaning should be accomplished with a solvent.

The armature plates ( $\frac{3}{8}$ " thick steel plates carrying moving armature) should be inspected to insure that they are not bent or cracked. The alignment of the moving armatures should be checked to insure that they enter the coils without interference. If there is interference, the armature supports can be adjusted by means of the two bolts holding each support to the shaft.

The operation of the magnetic (anti bounce) latch should be checked by manually operating the latch, closing the contactor by hand, and abruptly releasing the contactor moving system. The latch should catch the moving system without bouncing. If feasible, this operation should also be checked by operating the contactor electrically. The set screw for this latch on the AC operated contactor should normally protrude  $\frac{1}{8}$  to  $\frac{5}{32}$ ". This latch is adjusted at the factory and no further attention should be required.

The recommended procedure for changing coils and de-noising the AC magnets is contained on pages 10 and 11 of the instruction book. After re-installing the front stationary magnet assembly, it is suggested that the four mounting bolts be partially tightened and the magnet tapped from the top to obtain the quietest operation while securing these bolts.

**CONTACTS**

Contacts are exposed and visible for inspection, Fig. 10, when the arc chutes are swung back on their hinges. No special tools are needed to remove contact bolts. When replacing contacts, make sure that they fit down over the tenons on their supports and rest flat against support surfaces. Tighten bolts firmly until lock washers are fully compressed. All contacts should touch at nearly the same time. The allowable variation is  $\frac{1}{32}$ ". Do not fail to swing arc chutes into place and re-install barriers.

The final contact pressure measured with the contactor closed by pulling horizontally on the moving contact bolt, as shown in Fig. 12, should be approximately 27 to 33 pounds for new contacts. If a separate source of control power cannot be obtained to electrically operate the contactor, a wedge can be used to close the contactor after manually operating the anti bounce latch. The contacts should

be replaced when wear causes the final pressure to drop below 20 pounds.

The general condition of the contacts and shunts should be noted, especially with respect to any discoloration other than on the contact faces themselves, which would indicate excessive heating due to loose hardware, high current, or low contact pressure. The bolts which fasten the current carrying parts should be tightened as necessary.

Dressing or filing of the contacts is normally not necessary. Since a perfectly smooth contact surface is not necessary, only major surface irregularities should be removed. For example, after a severe interruption metal beads may appear around the contacts. This does no harm unless they occur on the contact face proper and are quite large ( $\frac{1}{16}$ " diameter or more). These beads should be removed with a file, but it is not necessary to reshape the contact face or clean the entire contact face down to bright metal.

**SHUNTS**

To replace shunts, Fig. 10, remove contacts, disconnect stationary ends of shunts by removing bolts A, remove contact hinge pin screws B, and withdraw the assembly of contact support and shunt. Shunt fastening bolts may then be removed.

**REPLACING COILS—D-C MAGNETS**

Disconnect leads from coil terminals and remove the bolts which hold the magnet cores to the right angle support brackets. Core and coil will then come off together. When replacing coils, the end which has a taped lead running across its face should be placed at the outer end of the core (end farthest from right angle support). The cushion washer should be placed at the other end, next to the support. Be careful not to pinch the washer between the core and support. Reconnect as before and check wiring to be sure of correct magnetic polarity which is not the same for both coils. Polarity will be right when the terminal nearest the end of one coil is connected to the same point as the opposite terminal on the other coil.

Coils for D/C holding magnets A, Fig. 8, (when used) can best be removed by taking off the entire holding magnet. When replacing, assemble coil end with taped lead at the end of the core farthest from the angle frame. Polarity connections for this coil are not important.

**REPLACING COILS—A-C MAGNETS**

Disconnect leads from the terminals. For the front magnet F, Fig. 5, which is suspended from a

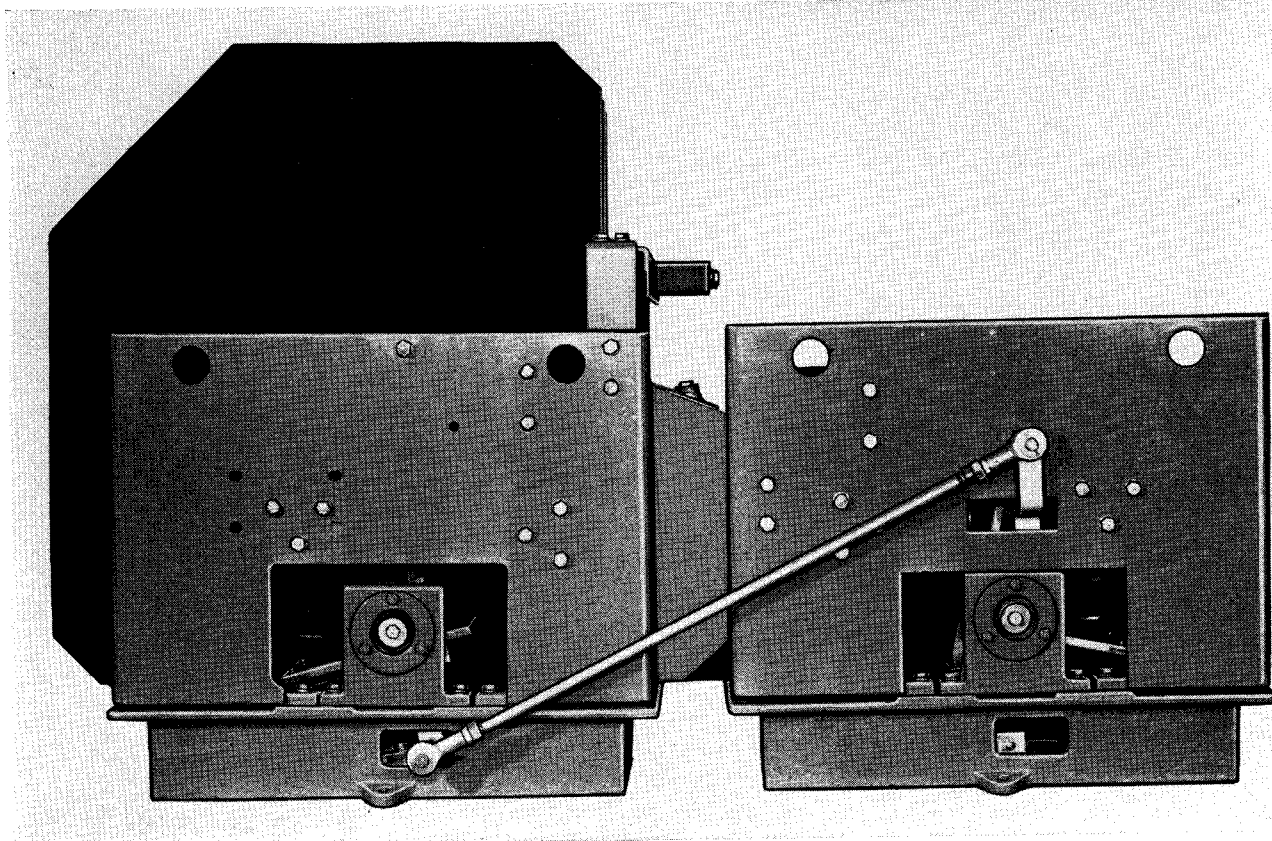


FIG. 9. Mechanical Interlock

bracket on the end frame, remove the stationary magnet and bracket together by taking out four bolts which secure the bracket to the end frame.

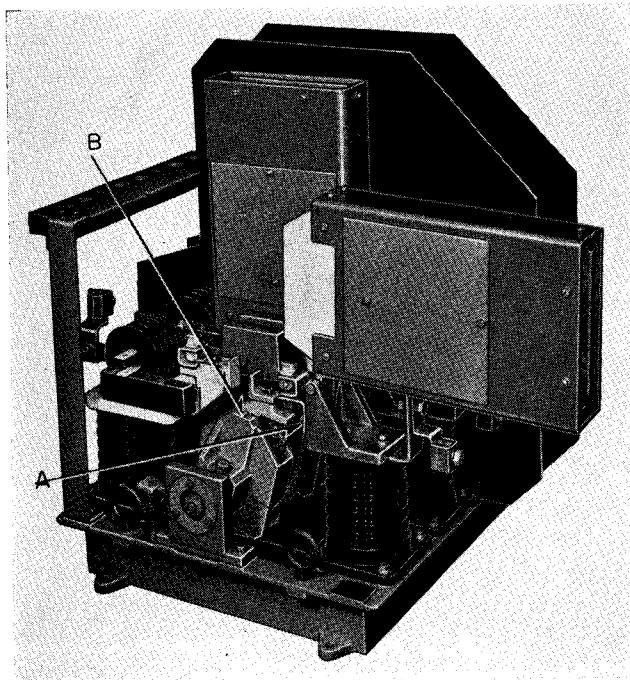


FIG. 10. Open for Inspection

The coil can then be replaced by removing the two bolts and a metal strip G, Fig. 5, fastening the coil to the magnet. When reassembling these bolts and strip, turn the strip so that its wider side is toward the outer edge of the coil.

For the rear magnet M, Fig. 5, which rests on the contactor base, it is necessary to remove the armature before the coil can be removed. This can be done by taking out two bolts tapped into the shaft. After this, the coil can be replaced as described above.

### REASSEMBLY—A-C MAGNETS

When reassembling magnets, make sure that the laminated moving armatures close squarely over the laminated stationary parts with a minimum of overhang, being sure not to hit the coil spool. No adjustment can be made on the rear magnet. Adjustment of the front magnet may be necessary to reduce magnet noise. Loosen the four bolts holding the bracket to the end frame, energize the coils and close the contactor. Place a lever preferably of the wood or insulating material, under the moving armature laminations, Fig. 11. Using the edge of the cast base as a fulcrum, force the entire magnet upward until noise becomes minimum.

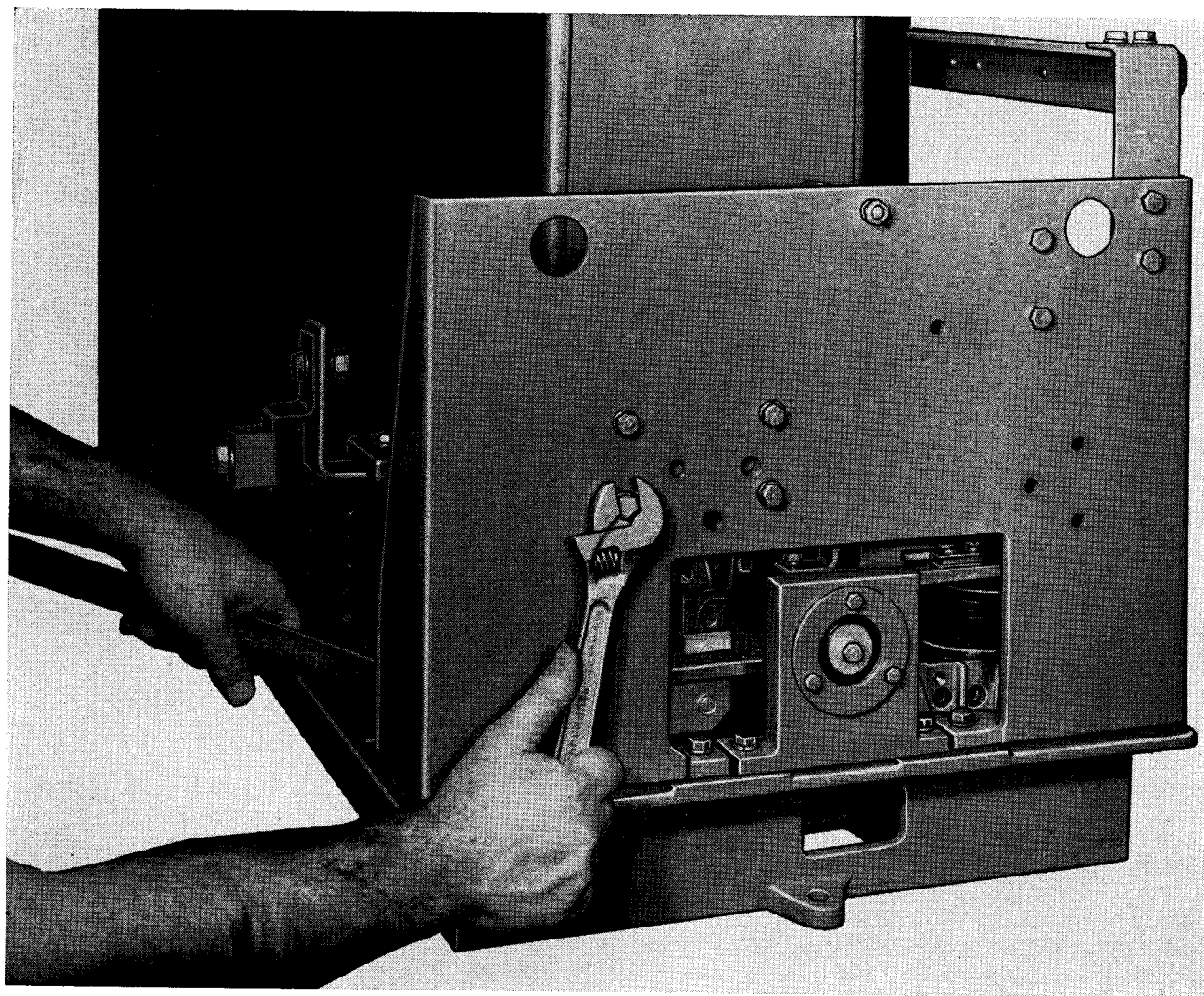


FIG. 11. Adjusting A-C Magnet

## ELECTRICAL INTERLOCK ADJUSTMENT

The L-61 electrical interlocks are operated by movement of an operating arm attached to the main contact shaft (O of Fig. 5). The maximum travel of  $\frac{3}{8}$ " is obtained by adjusting the two hex head bolts on the insulating arm attached to the operating lever and the hex head bolt which serves as a stop for the operating lever. It is important that this stop bolt does not limit travel of the interlock operating arm before the contactor is fully closed. These adjustment bolts are items J and N on Fig. 5. Fig. 13 shows where to measure travel and the amount of allowable overtravel. Contacts should be replaced when their overtravel is reduced to less than  $\frac{1}{32}$ ".

The roller on the operating arm (K of Fig. 5) is struck by the vertical armature plate of the main contact shaft (O of Fig. 5) forcing the insulating arm inward to actuate the interlocks. This roller should be checked periodically to insure that it rotates

freely and is not worn unevenly. If flat spots or an oval shape is detected, the roller should be replaced.

## ADJUSTING MAGNETIC LATCHES

The magnetic latches, as previously explained, obstruct continued movement of the contactor armatures until the magnet coils are energized. There is a normal clearance of approximately  $\frac{3}{64}$ " at the latch point which permits only enough armature movement to insure freedom of latch motion. Latches must move freely to get out of the way before the moving armature strikes them. Parts have been made light and non-corrodible.

Light springs of stainless steel wire normally bias the latches toward their normal latching position. Since the spring force is opposite to the magnetic force retracting the latch, it is important to maintain correct spring force. Care should be used to prevent distortion when removing or handling. It



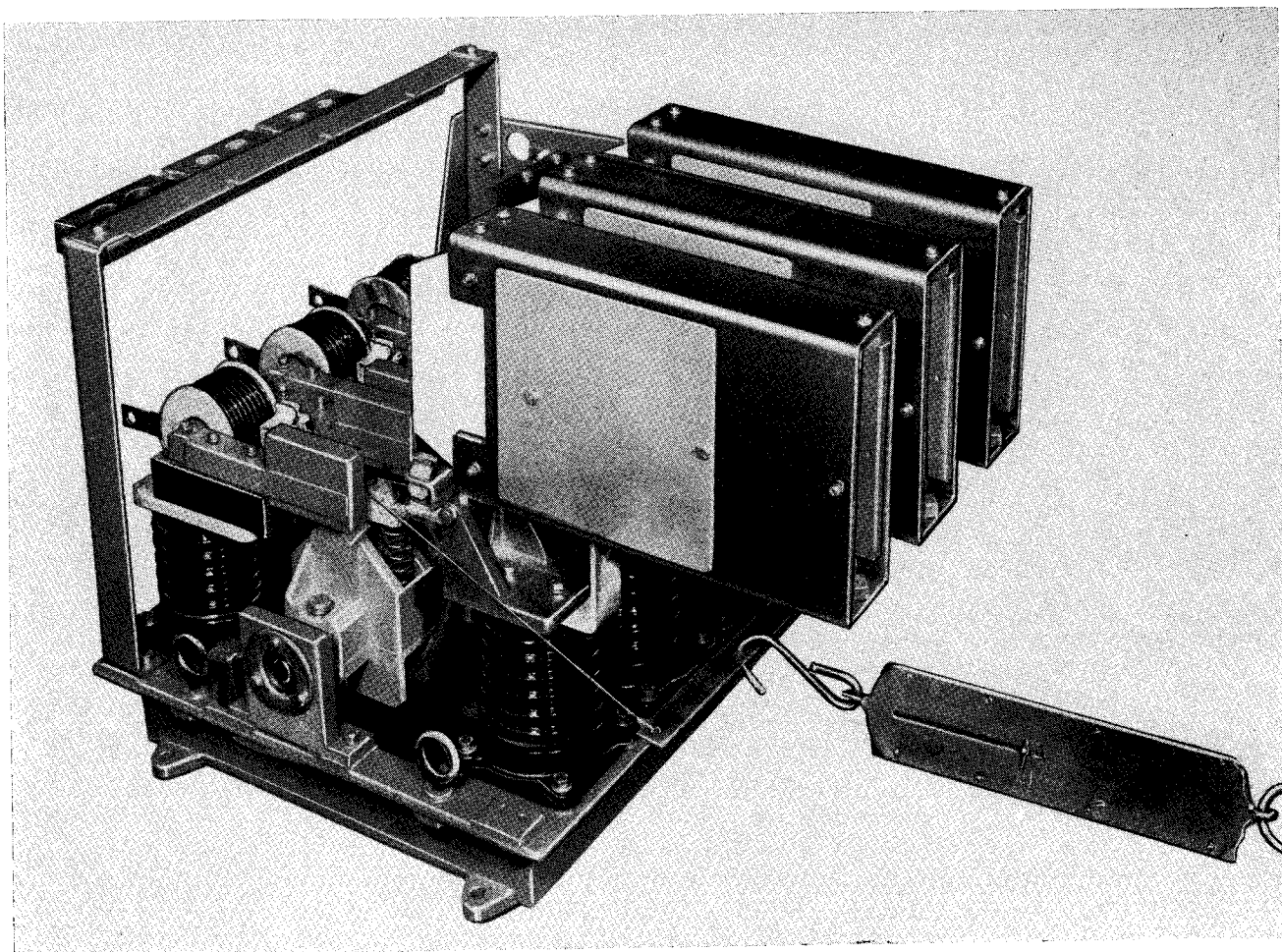


FIG. 12. Determination of Spring Pressure

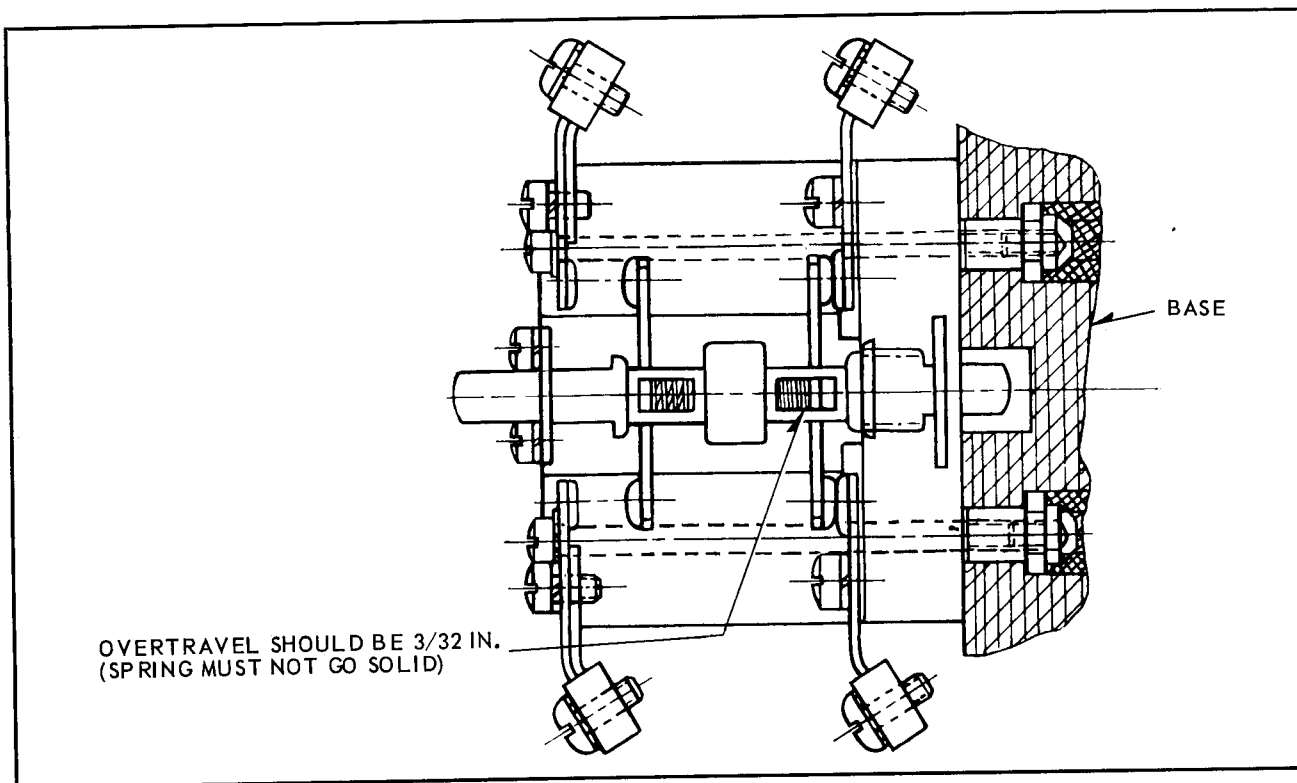
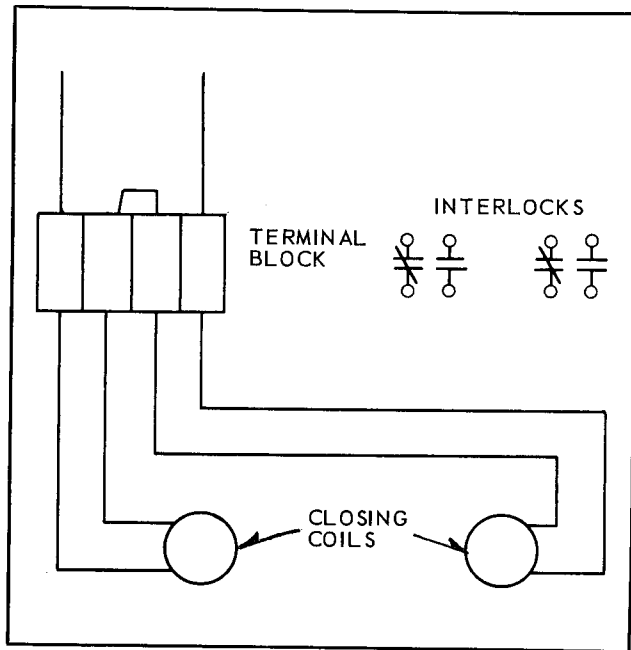


FIG. 13. L61 Electrical Interlock



**FIG. 14. Connections for A-C Magnet Coils**

is important to keep the latch and spring clean to eliminate friction.

The A-C magnet latch operates from the same magnetic flux that closes the contactor. A small adjusting screw controls the pickup of the latch. Factory adjustment of this screw should not be changed.

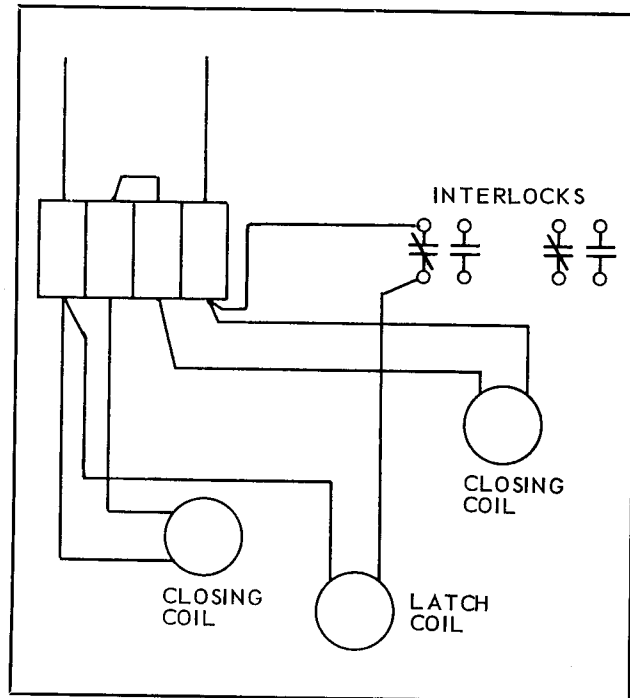
The D-C magnet latch operates from a separate small electro magnet. Its cutoff switch must be located accurately in order to close only when the armature is near its full open position. The small bracket on which the switch is mounted is provided with slotted holes D, Fig. 7, which allows a small up and down movement. To adjust switch position, place a  $\frac{1}{32}$ " thick shim between the black switch operating button and the armature at point E, Fig. 7, then tighten screws F and remove the shim.

This switch has two circuits identified by diagrammatic symbols moulded in its case near the terminal screws. Use the circuit which is normally open and shown by symbol  $\rightarrow \leftarrow$ .

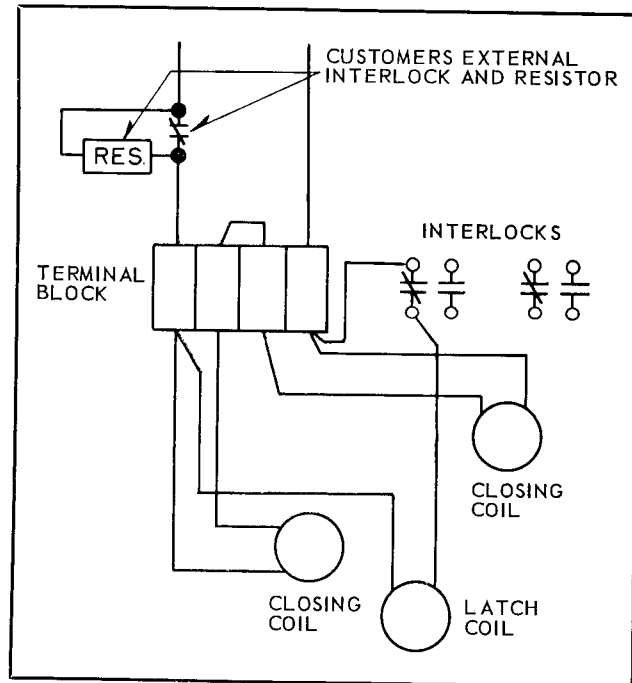
For contactors of more recent manufacture, the D-C magnet latch utilizes a normally closed electrical interlock mounted on the contactor as a cut off switch. The snap switch and bracket are not supplied.

### ARC CHUTES

Only the best and most suitable materials have been used in the efficiently designed arc chutes. Those in the direct PATH of the arc are non organic. Parts exposed to the high voltage arc are zirconium



**FIG. 15. Connections for 3 pole D-C Magnet Coils (Using N. C. Interlock as Latch Switch)**



**FIG. 16. Connections for 5 pole D-C Magnet Coils (Using N. C. Interlock as Latch Switch)**

refractories proved by years of experience in Westinghouse contactors and air circuit breakers.

These materials are not burned by the intense heat of the arc but fuse and become glazed over on the surface. After prolonged use, or after interruption of heavy fault current, there may be enough

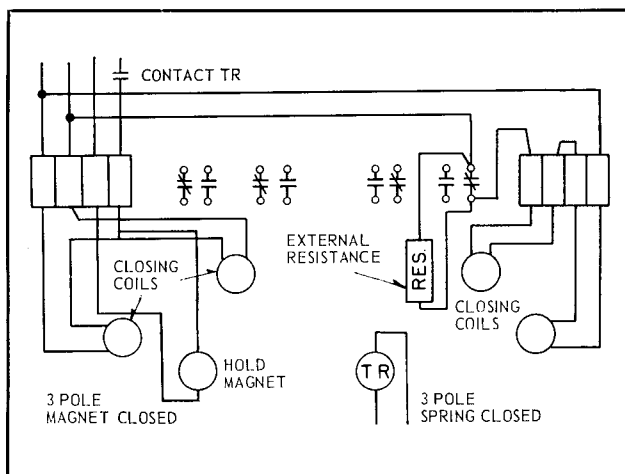


FIG. 17. Connections for D-C Magnet Coils—  
Synchronous Dynamic Braking Service

erosion to require replacement. This should be noted especially at the narrow upper end of the slots in the arc stacks. When the upper end of the slot becomes enlarged beyond  $\frac{3}{16}$ " diameter, the stack should be replaced.

The insulating parts of the arc chute remain in the circuit across the contacts at all times. During the time that the contacts are open, these insulating parts are subjected to the full voltage across the contactor. Ability to withstand this voltage depends upon the care given the insulation.

During general inspections, blow out the arc chute with dry compressed air directed upward from the contact area and out through each of the slots between the arc splitter plates. Direct the dry air thoroughly over the refractory liners in the lower end of the chute where the arc is drawn.

Periodically a more thorough inspection should be made by removing the arc stacks for cleaning and to permit examination of adjacent parts. Remove any residue of dirt or arc products with a cloth or by light sanding. Do not use a wire brush or emery cloth for this purpose as they may scratch or roughen the surfaces and invite increased future deposits of dirt.

The ceramic side plates along with the small grids in the center bottom should be checked and replaced if found broken. The retaining blocks in the top of the arc chutes should be turned and tightened in a position which will adequately restrain movement of the corresponding arc runner.

The refractory material in the arc chutes may have a dirty appearance after repeated arc interruptions. This does not necessarily indicate low dielectric strength. If in doubt apply A-C test voltage not over 15 KV for 1 minute, or check insulation

resistance with a megger. Reading should be practically infinite.

### DISMANTLING ARC CHUTES

The following procedure is prescribed for arc boxes and chutes built before mid year, 1958.

To dismantle arc chutes for inspection, remove 4 fibre blocking strips at upper end, withdraw arc stacks and arc runner assemblies from top of chutes E, Fig. 6, and group of small arc splitter plates D, Fig. 6, near the contacts can be removed through the bottom of the chute. Should it be necessary to remove center arc runners, or blowout coils, remove entire laminated magnetic structure, disconnect the blowout coils at top and bottom ends and then pull the coils upward until clear. Center arc runner plates can then be removed one at a time if they are rotated about one edge until the opposite edge comes out of the rectangular hole in arc chute jacket.

For arc boxes and chutes built after mid year, 1958, the internal construction of the arc boxes is identical to that of the older type. The arc box is dismantled by removing the six screws along the sides. This allows the arc box to be split in half exposing the internal plates, runners, and chutes.

### REASSEMBLING ARC CHUTES

Reassemble center arc runners and blowout coils. Reinstall liners and arc splitter plates, assembling them so that slots in adjacent plates are staggered and do not line up with the slots in adjacent plates. Put outer arc runner assemblies in place noting that the narrower runner belongs on the hinge side of the chute. Next insert arc stacks with the side having a rope spacer turned toward the center arc runner. At the same time, make sure that the slot in the plate nearest the center of the chute is directly above the small arc tip brazed to the center runner. Use fish paper shims between the arc runner assemblies and the end walls of the micarta jacket to fill up surplus space. Install the small Micarta tube above the blowout coils. Finally, replace fibre blocks to hold the entire assembly together.

### MAGNET COIL CONNECTIONS

Fig. 13 to Fig. 17 illustrate schematically how the various magnet coils should be connected.

When reassembling magnets, make sure that the laminated moving armatures close squarely over the laminated stationary parts with a minimum of overhang, being sure not to hit the coil spool. No adjustment can be made on the rear stationary



## MAINTENANCE AND REPAIR

magnet. Adjustment of the front magnet may be necessary to reduce magnet noise. Loosen the four bolts holding the bracket to the end frame, energize the coils and close the contactor. Place a lever preferably of the wood or insulating material, under the moving armature laminations, Fig. 11. Using the edge of the cast base as a fulcrum, force the entire magnet upward until noise becomes minimum.

After re-installing the front stationary magnet assembly, it is suggested that the four mounting

bolts be partially tightened and the magnet taped from the top while securing the bolts to obtain the quietest operation. This should equalize the torque load on the two magnets. As a check, remove the lever and note whether the space H, Fig. 5, between the moving laminations and the thick armature plate is approximately the same on both magnets. If it is not, the one having the larger space is carrying less than its share of the load. Readjustment may be necessary.

## Engineering Data

DESCRIPTION	H-130A H-230A H-430A	H-130D H-230D H-430D	H-130DD H-230DD H-430DD	H-150D H-250D H-450D	H-403D
Number of Poles.....	3 open	3 open	3 open	5 open	3 closed
Type of Operating Magnet.....	A-C	D-C	D-C	D-C	D-C
Outline Drawing.....	21C3423	21C3423	21C3423	21C3424	32B1438
Weight—Pounds.....	500 lbs	500 lbs	500 lbs	750 lbs	350 lbs
Contact—Gap Inches.....	1 1/4	1 1/4	1 1/4	1 1/4	1 5/16
Contact Pressure—LB Initial.....	10	10	10	10	4
Contact Pressure—LB Final.....	30	30	30	30	10
Open Gap Volt—Amperes.....	7200	.....	.....	700	700
Closed Gap Volt—Amperes.....	640	.....	.....	300	215
Open Gap Watts.....	1850	285	180	*800	*735
Closed Gap Watts.....	160	175	185	300	220

\* These values given to show requirement with series resistor shorted.

## Renewal Parts List

DESCRIPTION	STYLE	QUANTITY PER CONTACTOR			
		H-130A H-230A H-430A	H-130D H-230D H-430D	H-150D H-250D H-450D	H-403D
Moving Contact.....	1780 613	3	3	5	3
Stationary Contact.....	1780 678	3	3	5	3
Shunt.....	1780 669	3	3	5	3
Contact Spring.....	1780 601	3	3	5	..
Arc Chute Complete.....	1780 702	3	3	5	..
Arc Stacks.....	1799 417	6	6	10	..
Auxiliary Arc Plates.....	1799 936	15	15	25	..
Electrical Interlock Complete.....	1486 685	2	2	2	2
Front Stationary Contact.....	1625 818	4	4	4	4
Rear Stationary Contact.....	1745 080	4	4	4	4
Moving Contact.....	1437 667	4	4	4	4
Contact Spring.....	1486 698	4	4	4	4
Push Rod Spring.....	1486 697	2	2	2	2
Contact Spring.....	1780 619	..	..	..	3

\* Order coils by style number appearing on coil label.