RECEIVING • OPERATION • MAINTENANCE

INSTRUCTIONS

Horizontal Drawout

SWITCH AND FUSE UNIT

Type DSF

For use in

Indoor and Outdoor

Metal Clad Switchgear

TYPE	VOLTAGE RATINGS		FUSE INTERRUPTING RATING RMS AMPS.	SWITCH	
	Rated Kv.	Max. Design Kv.		Max. Amperes Continuous 60 Cycles	Max. Interrupting Current Amperes
50-DSF	4.16	5.0	60,000	600	600 @ 50% P.F.
150-DSF	13.8	15.0	50,000	600	600 @ 50% P.F.

WESTINGHOUSE ELECTRIC CORPORATION

SWITCHGEAR APPARATUS DEPARTMENTS

EAST PITTSBURGH PLANT • EAST PITTSBURGH, PA.

NEW INFORMATION

MAY, 1960

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TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

DESCRIPTION

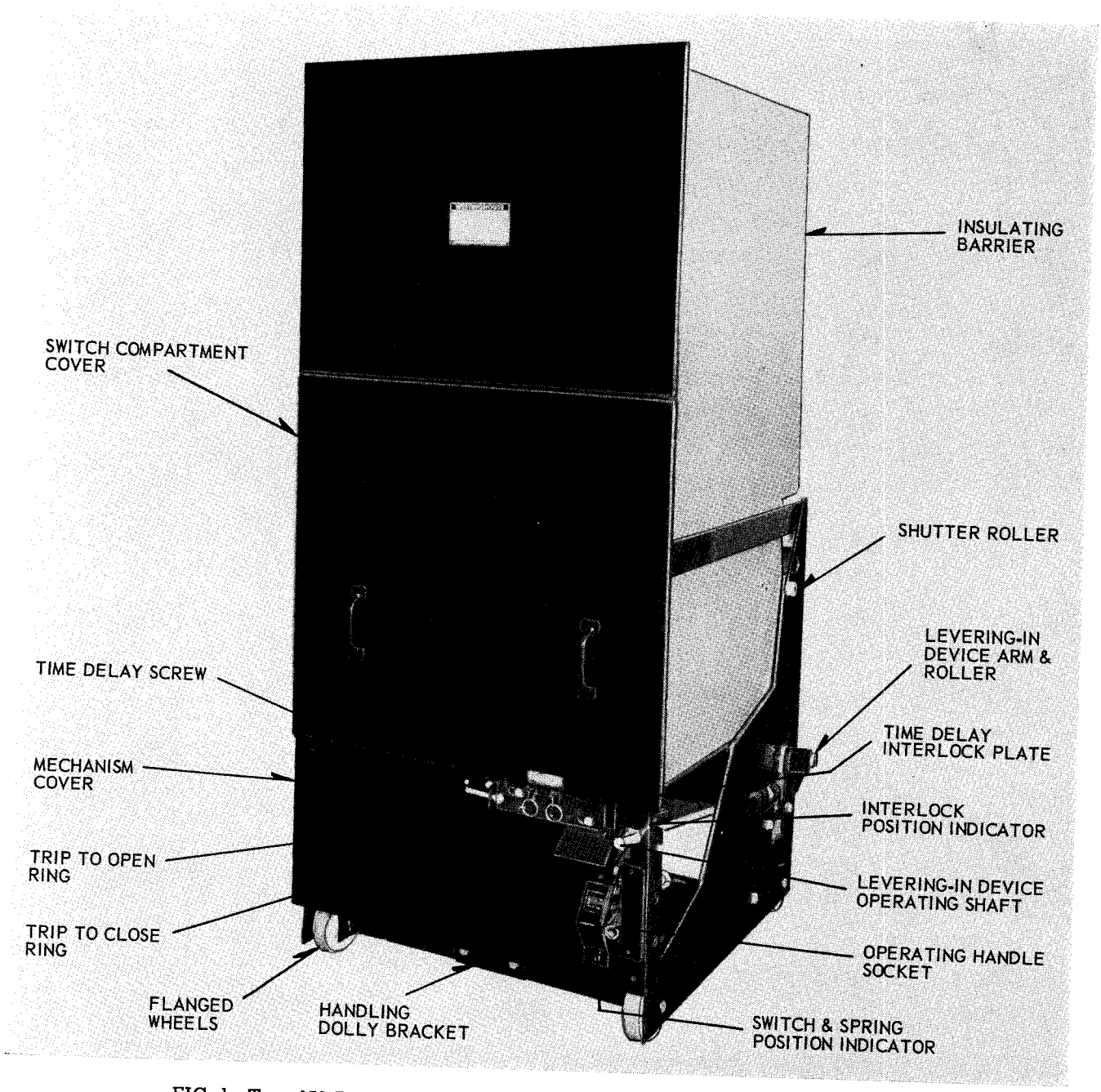


FIG. 1. Type 150-DSF Switch and Fuse Unit Completely Assembled, Front View

The type DSF Switch and Fuse Unit is a three-pole, mechanically operated, horizontal drawout unit for use in metal-clad switchgear. Various ratings are tabulated on Page 1.

The unit contains a three-pole, spring operated disconnect switch and three current limiting power fuses. The switch is capable of interrupting the continuous current of the largest fuse, and the mechanism has sufficient force to successfully close the switch against the limited current of the fuse.

Overload and short circuit protection is provided for the circuit by the power fuses connected

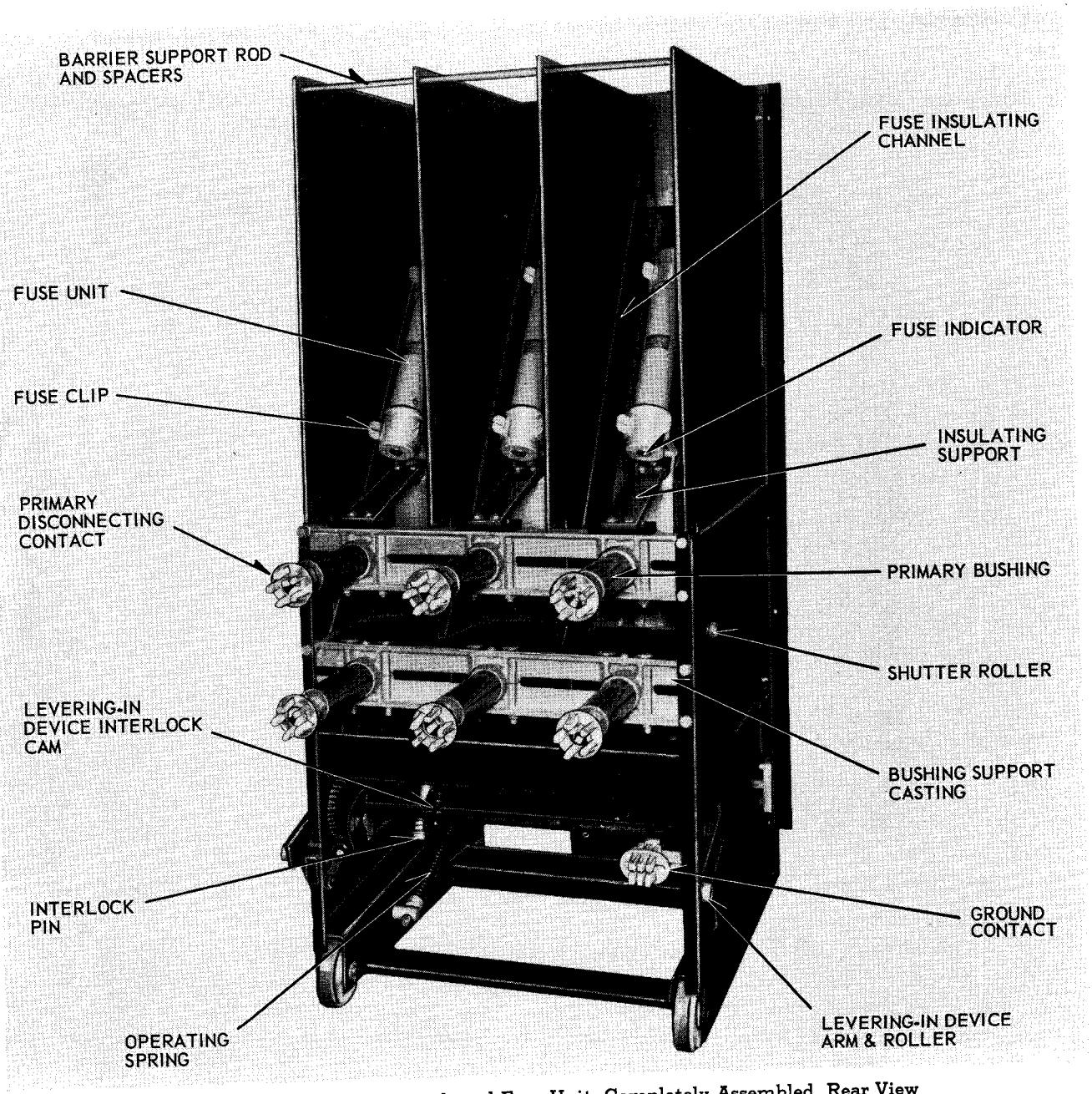


FIG. 2. Type 150-DSF Switch and Fuse Unit, Completely Assembled, Rear View

in series with the switch. When a fault occurs, the fuses will operate to clear the circuit.

Figure 1 shows the front and right side of a type 150-DSF unit completely assembled, while Fig. 2 shows the same unit from the left rear and ready to be placed in a metal-clad cell. Names of the various parts are indicated.

These components are supported on a welded steel frame which is mounted on flanged wheels for mobility. The live parts of the assembly are supported by porcelain insulators and Redarta bushings. At the rear of the bushings are the primary disconnecting contacts which are clusters of contact fingers arranged to engage the stationary contacts of the metal-clad cell.

In the lower rear part of the frame is located the levering-in device for moving the unit into final contact engagement. This is interlocked with the mechanism to prevent inserting or withdrawing the unit when the switch is closed, and also prevents closing the switch unless the unit is completely in or completely out of the operating position of the cell.

In the lower front part of the frame is located the switch operating mechanism. Energy for this device is obtained by manually charging a spring by means of a removable handle inserted at the front of the unit. Upon charging the spring, the mechanism is restrained from immediate operation by means of two latches: one to initiate closing the switch and the other to initiate opening the switch. These latches are operated by the two rings near the lower front of the unit. A time delay device prevents an immediate opening operation of the switch after it has been closed. Also located at the lower front of the frame are the switch and spring position indicator and the levering-in device interlock position indicator.

PART TWO

RECEIVING, HANDLING AND STORING

RECEIVING

The Switch and Fuse unit is completely assembled and given operating tests at the factory, and is then carefully inspected and prepared for shipment. The complete unit is shipped in a single crate.

After the equipment has been unpacked, make a careful inspection for any damage which may have occurred in transit. If the apparatus has been damaged, file a claim immediately with the carrier and notify the nearest Westinghouse Sales Office.

HANDLING

Remove crating and packing carefully. To avoid damage from negliegent handling of crow bars or other tools use a nail puller for the uncrating.

The base of the crate may be used as a skid for moving the unit, or it may be lifted with slings under the crate. If the unit is to be lifted with slings, move it while it is still crated. After the Switch and Fuse unit is unpacked, the best way to move it is by rolling it on its own wheels. If it is necessary to lift it with slings, place them under the frame. Care must be taken in lifting as the center of gravity is high.

STORING

The storing of the Switch and Fuse unit for any period of time should be in a clean dry place sufficiently warm to prevent moisture condensation.

WEIGHTS

Units Complete with Covers and Fuses:
Type 50-DSF— 5 KV—700 lbs.
Type 150-DSF—15 KV—850 lbs.

OPERATION

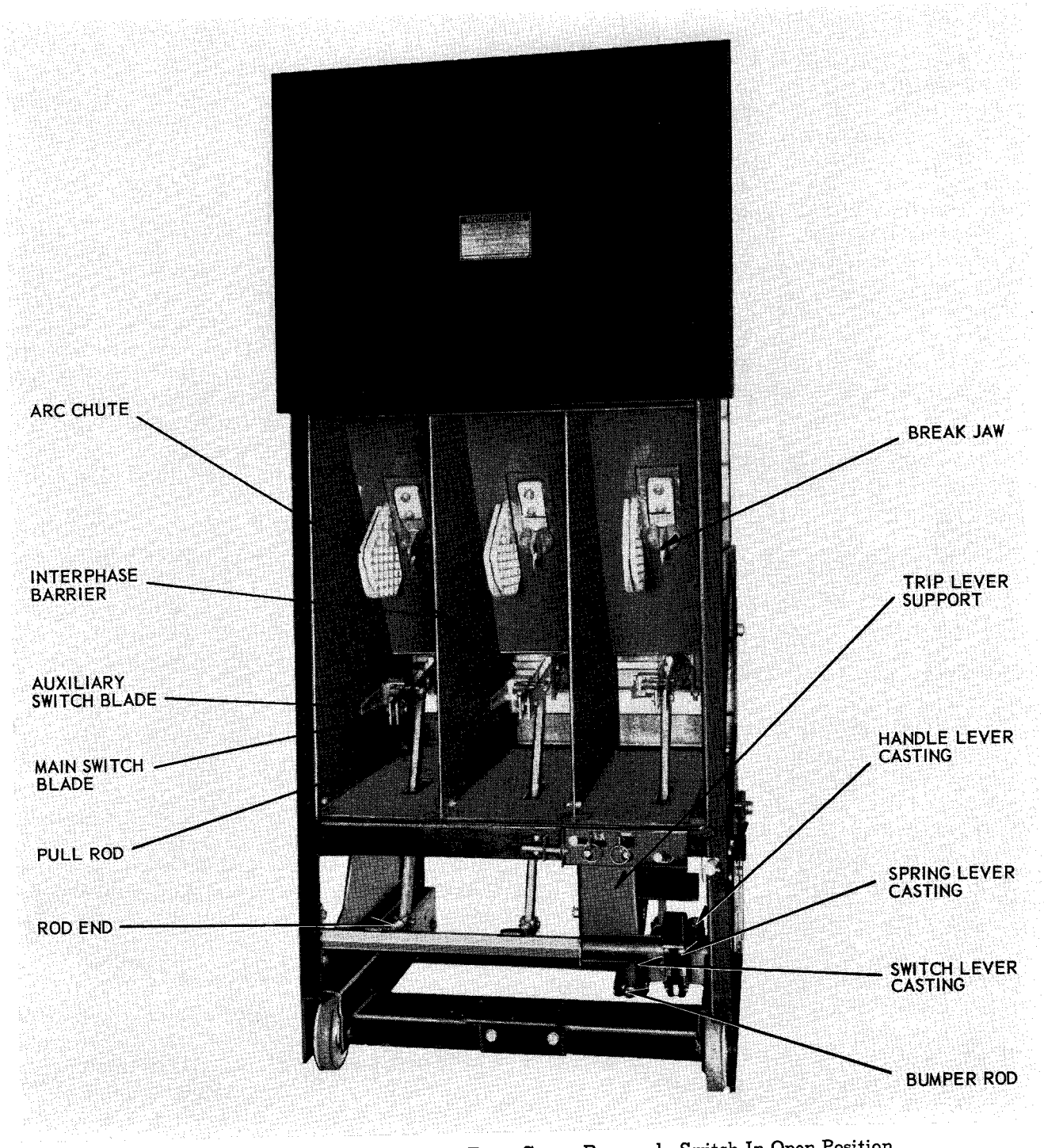


FIG. 3. Type 150-DSF Unit With Front Covers Removed—Switch In Open Position

Before placing the Switch and Fuse Unit in service, it is advantageous to become familiar with the construction and function of the various parts described in the following paragraphs. This material should be studied carefully before placing the unit in service.

The general arrangement of the components for the Type 150-DSF unit is shown in Figs. 2 and 3.

In Fig. 3, the front cover over the middle section has been removed to show the three poles of the gang operated load-break switch. This is in the open position. Also the lower cover has been removed to show the operating mechanism.

The three current circuits may be traced between the disconnecting contacts on the rear of the primary bushings as follows:

The front of each of the three upper primary bushings connects to the bottom clip of its respective fuse by copper bus. The top fuse clip connects by a copper bus passing through the insulating barrier to the break jaw and arc chute of the load-break switch. The primary circuit is completed through the switch blades to the hinge which forms a part of its lower primary bushing.

Figure 4 is the front view of the equivalent Type 50-DSF Unit for use in systems having a rated service voltage of 4160 volts and below. Construction and operation of this unit is similar to the Type 150-DSF Unit. In the rear view of the Type 50-DSF unit, Fig. 5, the center fuse unit has been removed from its clips to show part of the current circuit between the upper fuse clip and the load-break switch in the front of the unit.

LOAD-BREAK SWITCH

The load-break switch combines the functions of a disconnecting switch and a circuit interrupter which is capable of interrupting its rated current at rated voltage. The assembly consists of a pair of main blades for carrying the continuous current, and an auxiliary quick-break blade and a "De-ion" arc chamber for current interruption.

The parallel main blades have a silver ring hinge contact which insures proper electrical contact at this moving point. The break-jaw contact consists of a series of fine parallel ridges of pure silver on each blade to produce a series of "knife-edge" or high-pressure line contacts. Action of the switch forces any dirt into the spaces between the ridges keeping the contact lines clean and eliminating maintenance. Permanent high contact pressure is maintained by self adjusting spring washers.

When the switch is closed, practically all the current flows through the main blades. As the switch begins to open, and the contacts on the main blades separate from the break jaw, current is transferred momentarily to the quick-break blade, which is maintained in the circuit by a set of high-pressure contact fingers in the arc chute.

The main blades continue to open until a stop on the quick-break blade hinge prevents further angular movement between main and quick-break blades. This starts the quick-break blade moving out of the contacts in the arc chamber. The additional pull of a torsional spring snaps the quick-break blade into its open position at high speed. The heat of the arc inside the arc chamber releases a blast of de-ionizing gas from the gas-generating lining of the arc chamber. This combination of quick-break and De-ion action quickly extinguishes the arc and the circuit is safely de-energized.

FUSES

Type BAL De-ion current-limiting power fuses are connected in series with the three poles of the load-break switch to provide overload and short circuit protection for both the connected apparatus and the feeder system. On overloads of long duration, the main fuse element provides desired time-current characteristics. This element of the fuse is spring operated to insure positive separation of the fuse element on low fault current operations. The element operates through a small hole in blocks of solid compressed boric acid which have excellent arc interrupting qualities.

The current limiting feature of the fuse unit limits the short circuit current to a value which can be safely handled by the interrupting element. This part consists of a number of silver wires placed in slots in a fibre rod which is surrounded by sand on which the silver vapor condenses when a high fault current causes the silver to melt.

The Type BAL fuse also controls the surge voltage which is produced when the short circuit current is limited. This surge voltage results from the system's released magnetic energy.

Since the fuse is completely enclosed, there is no flame discharge upon operation. The operation is quiet as a built-in condenser takes all of the steam evolved from the boric acid during interruption of fault currents.

MECHANISM

The three pole gang operated load-break switch is operated by means of a heavy spring manually charged by an operating handle at the front of the unit. The rear view of the mechanism is shown in Fig. 7 with a diagram of the mechanism operation in Fig. 6.

When the spring is charged, the switch and mechanism are restrained from operating by two latches: one to control the switch closing, and the other to control the switch opening. The spring exerts a horizontal force through the spring rod to the spring lever casting. Refer to Figs. 3 and 7.

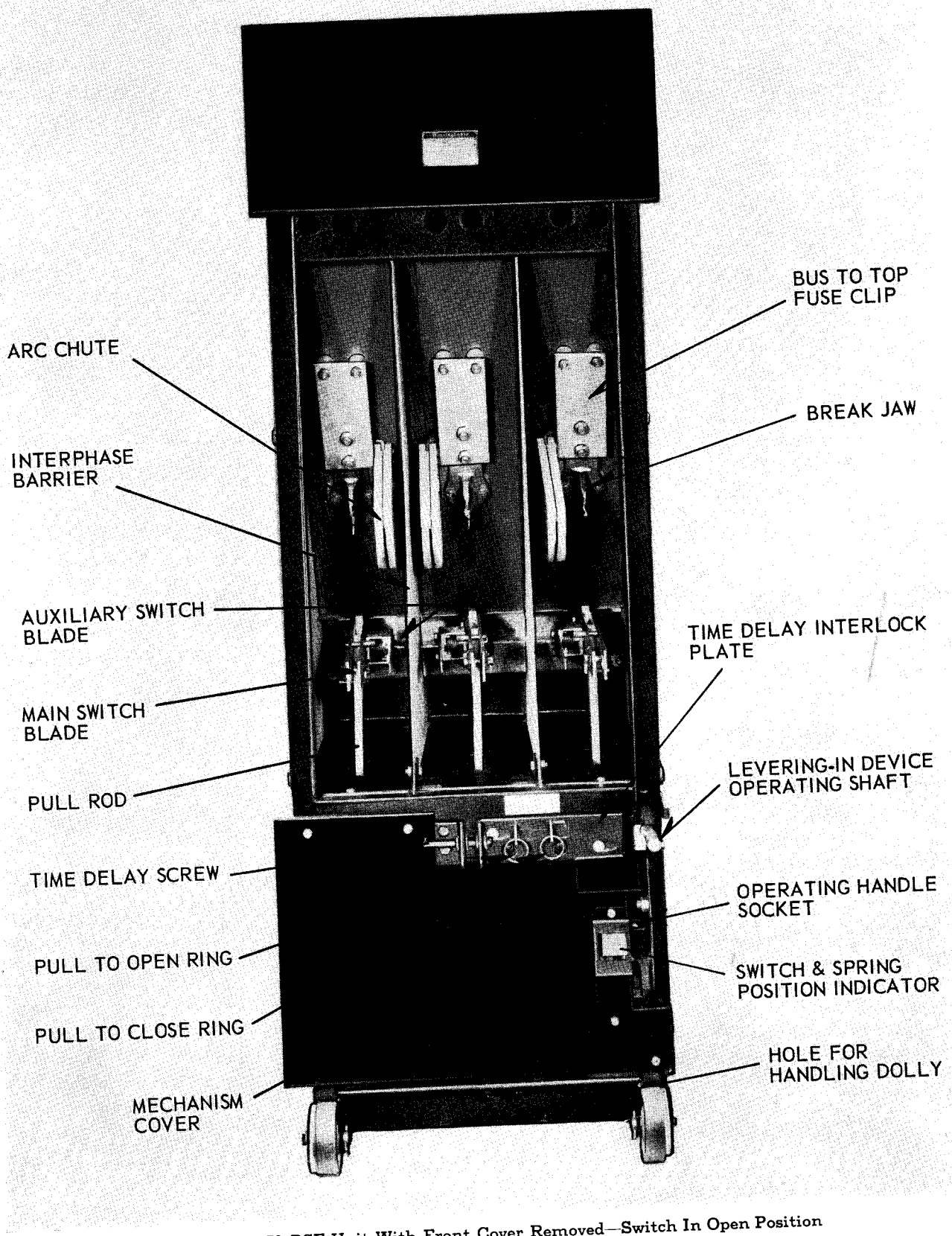


FIG. 4. Type 50-DSF Unit With Front Cover Removed—Switch In Open Position

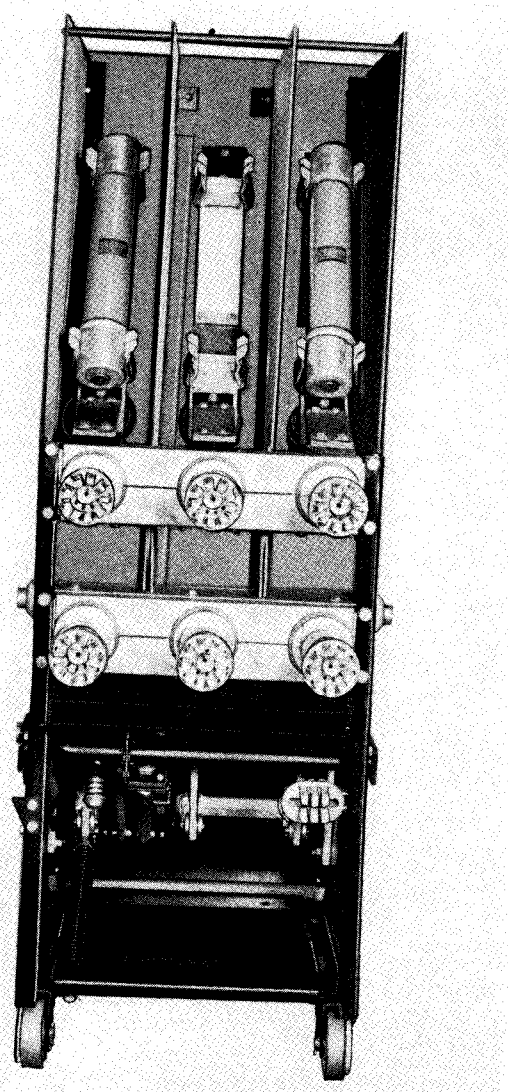


FIG. 5. Type 50-DSF Unit, Rear View, Center Phase Fuse Element Removed

The spring lever casting in turn exerts a torque on the switch lever casting. This casting carries the two lugs which engage the switch opening and closing latches, and also is pinned to the hexagonal operating shaft. When the holding latch is released, the torque from the spring rotates the shaft which opens or closes the three poles of the switch through the three insulating pull rods. Thus the opening and closing speed of the switch blades is entirely independent of the operator, and the spring will supply sufficient force to close the switch against the limiting current of the largest fuse.

MECHANISM PANEL

Switch and Spring Position Indicator. Fig. 1 gives a positive indication that the switch is open, closed, spring charged to open switch, or spring charged to close switch.

Interlock Position Indicator. The interlock position indicator gives a positive indication of the levering-in device interlock. It operates from the levering-in device shaft. When the indicator points to the word "OPERATE", the interlock is free and the load-break switch may be opened or closed. When the indicator points to the word "INTERLOCK", the interlock is functioning; and the switch cannot be closed. Since the interlock is operative only when the Switch and Fuse Unit is in an intermediate position between fully engaged and fully withdrawn, it also serves as a means of indicating when the unit is all the way into the operating position and the main disconnecting contacts fully engaged or completely in the test position with the contacts separated.

LEVERING-IN DEVICE

In order to move the Switch and Fuse Unit in or out of the metal-clad cell against the resistance of the primary disconnecting contact fingers, a levering-in device is provided on each unit. An arm is mounted on each side at the rear of the truck, and is connected on a common shaft across the frame. Each arm has a roller which engages a grove in the side-wall of the cell. See Fig. 9. A removable crank engages another shaft, Fig. 1, at the right front corner of the unit which turns the arms through a worm gear and pinion arrangement.

Preparation for Placing in Cell. Before a Switch and Fuse Unit can be rolled into a cell, the arms with rollers must point to the rear and slightly downward as shown in Fig. 10. The arms travel 193 degrees and assume the horizontal position shown in Fig. 9 when the unit is cranked into the operating position in the cell. To place the arms in the position shown in Fig. 10, place the crank on the operating shaft at the front right corner of the unit (refer to Fig. 1), push in and rotate to engage the coupling in the levering-in device shaft. The load-break switch must be open or the interlock will prevent engaging the coupling. The indicator will point to "Interlocked" when the coupling engages. Rotate the crank counterclockwise to the end of the travel. During this time, the interlock mechanism will hold the coupling engaged. At the end of the travel when the arms with rollers reach the rear stop, the interlock will release, the crank will be moved toward the front, and the indicator will point to the word "Operate".

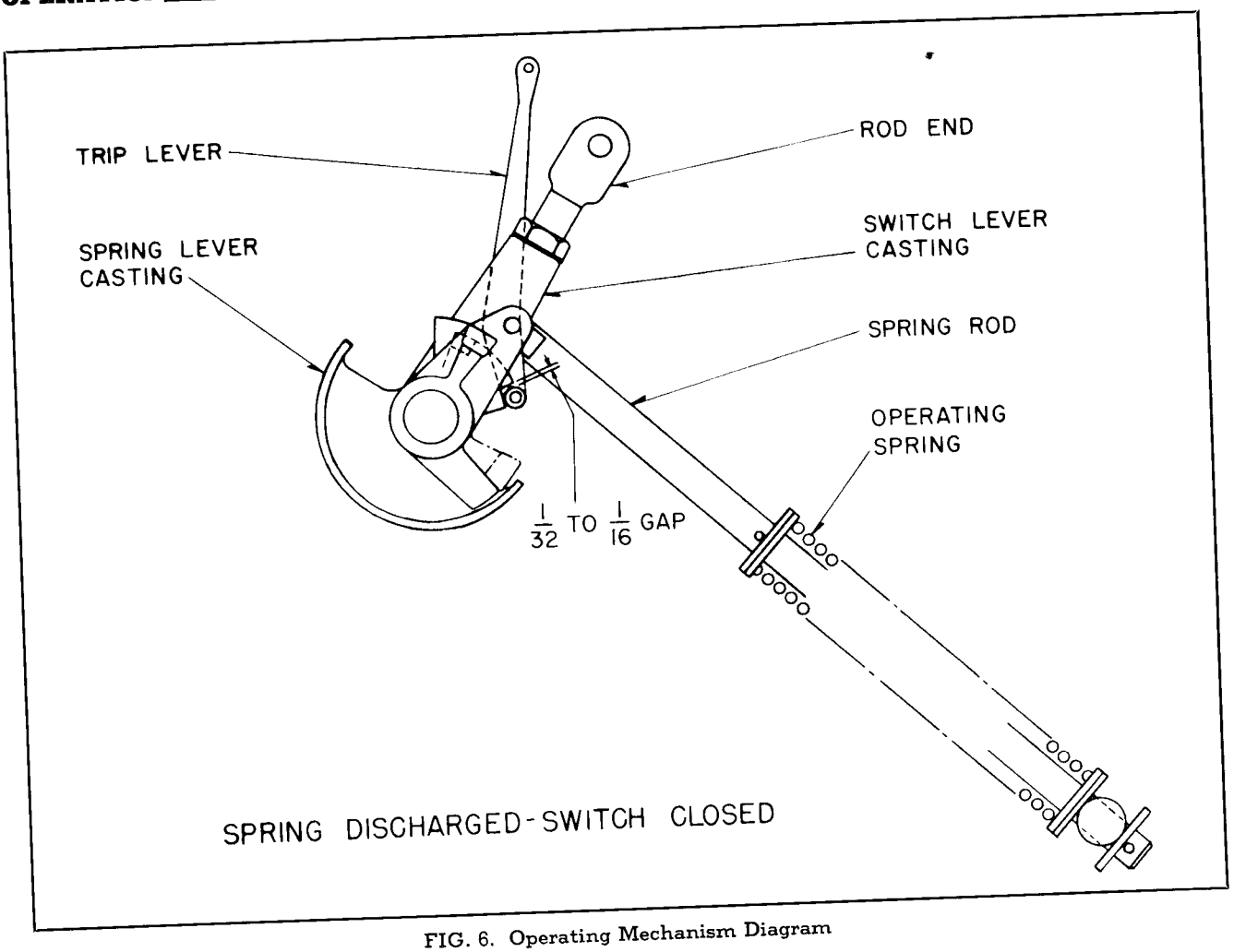


FIG. 6. Operating Mechanism Diagram

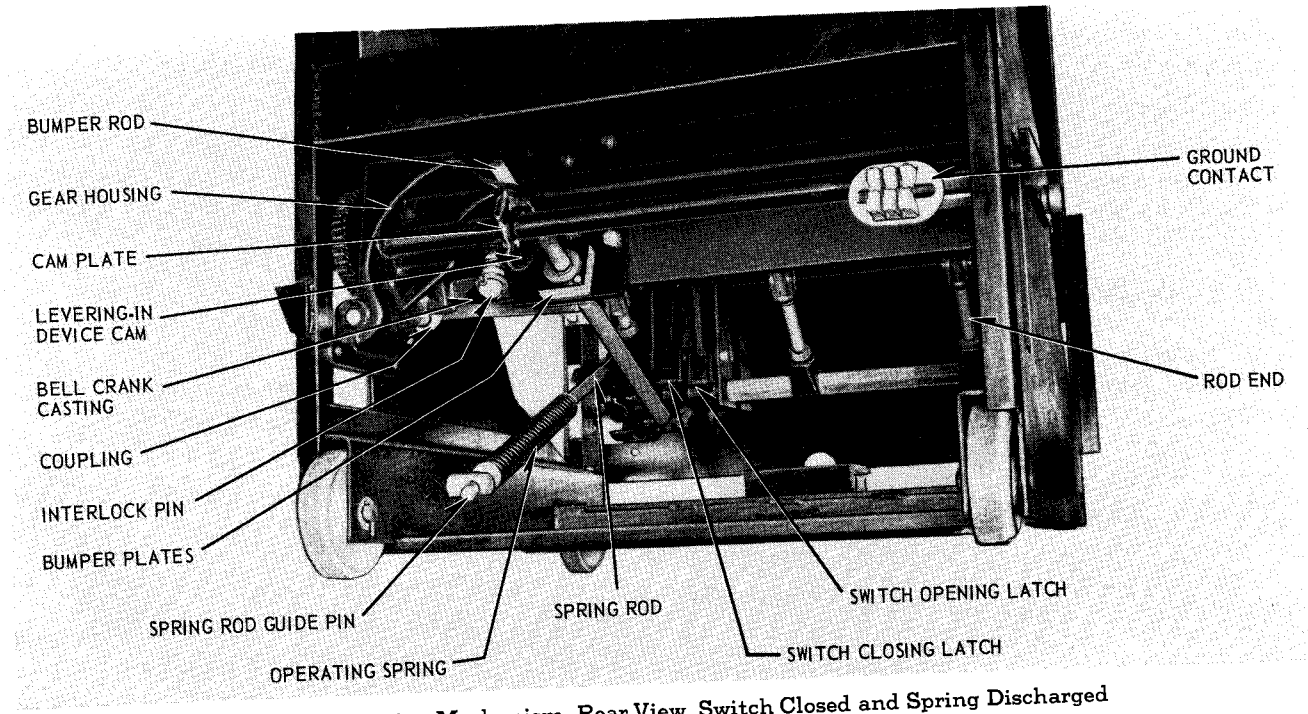


FIG. 7. Operating Mechanism, Rear View, Switch Closed and Spring Discharged

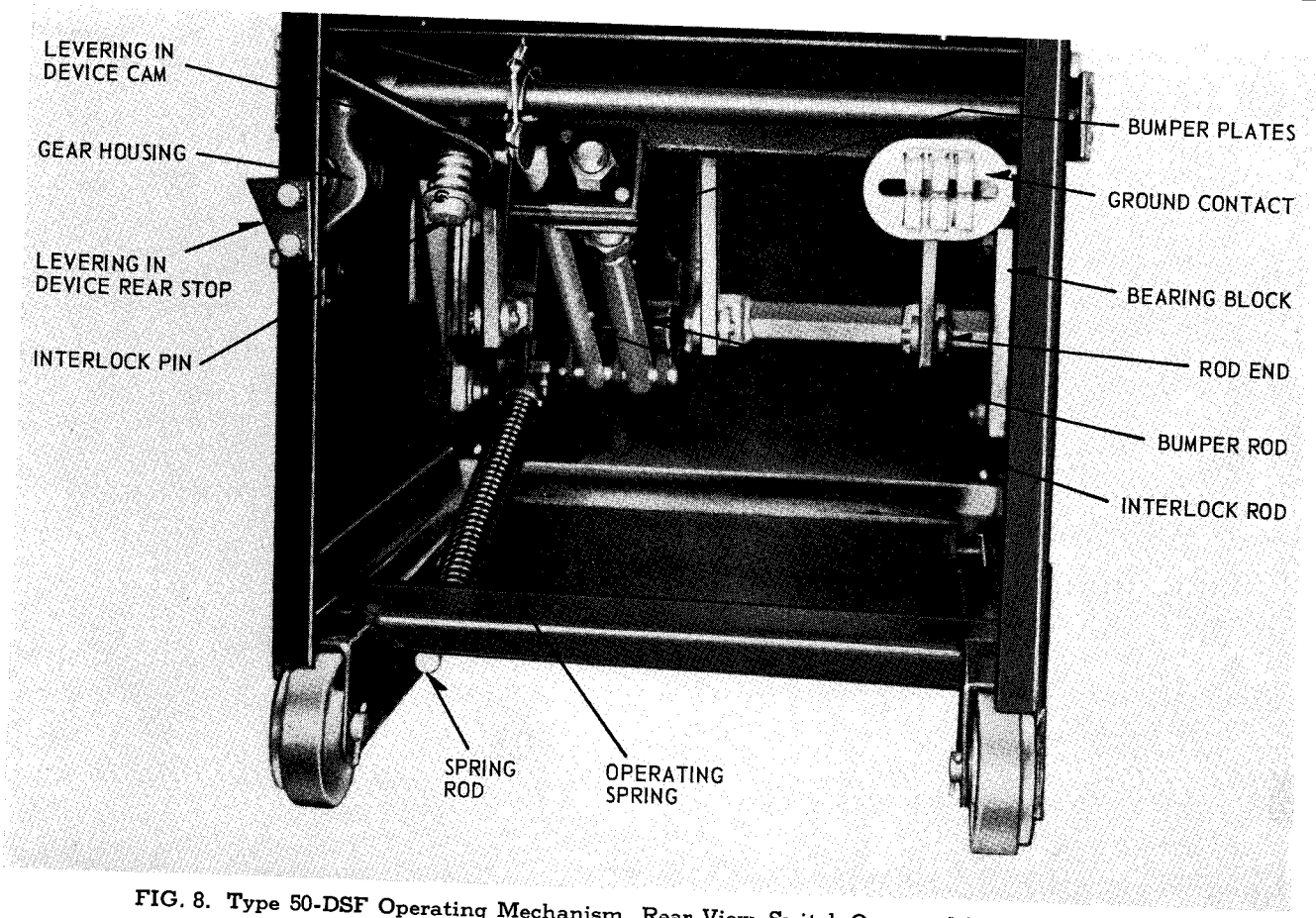


FIG. 8. Type 50-DSF Operating Mechanism, Rear View, Switch Open and Spring Discharged

Test Position. With the arms to the rear and down as shown in Fig. 10, the unit is ready to be rolled into the cell as far as the test position. The rollers on the arms strike vertical angles on the cell wall and stop the unit at the test position.

Caution: The unit should never be moved beyond the test position in the cell without the middle steel cover and insulating sheet securely bolted in place over the switch compartment.

Operating Position. To move the unit from the test position to the operating position where the primary disconnecting contacts are engaged, place the crank on the shaft, push in and rotate to engage the coupling, crank clockwise. The torque required will increase when the primary contact fingers engage the stationary contact studs in the cell. Continue cranking to the end of the travel where the interlock will again fall free, pushing the crank to the front. Remove the crank. The indicator will point to the word "OPERATE".

To remove the unit from the operating position, first check that the load-break switch is open. The levering-in device coupling cannot be engaged unless the switch is open. Put the crank on the operating shaft, push in and rotate to engage the coupling, and turn counter-clockwise until the unit returns to the test position. Remove the crank. The switch may be operated at the test position as the primary disconnecting contacts are separated from the energized contacts in the cell, and a metal shutter is closed completely isolating all high voltage parts from the unit.

INTERLOCK

The levering-in device interlock on the DSF Switch and Fuse Unit has two functions to perform. First, it prevents the unit from being moved from the test to the operate position or vice versa with the switch closed. Second, if the unit is in some intermediate position between the test and operate positions, it prevents the switch from being closed.

The interlocking action is accomplished by having the bumper rod (See Fig. 7), operated by the switch casting of the operating mechanism and the interlock pin, operated by the levering-in device, move at right angles to each other.

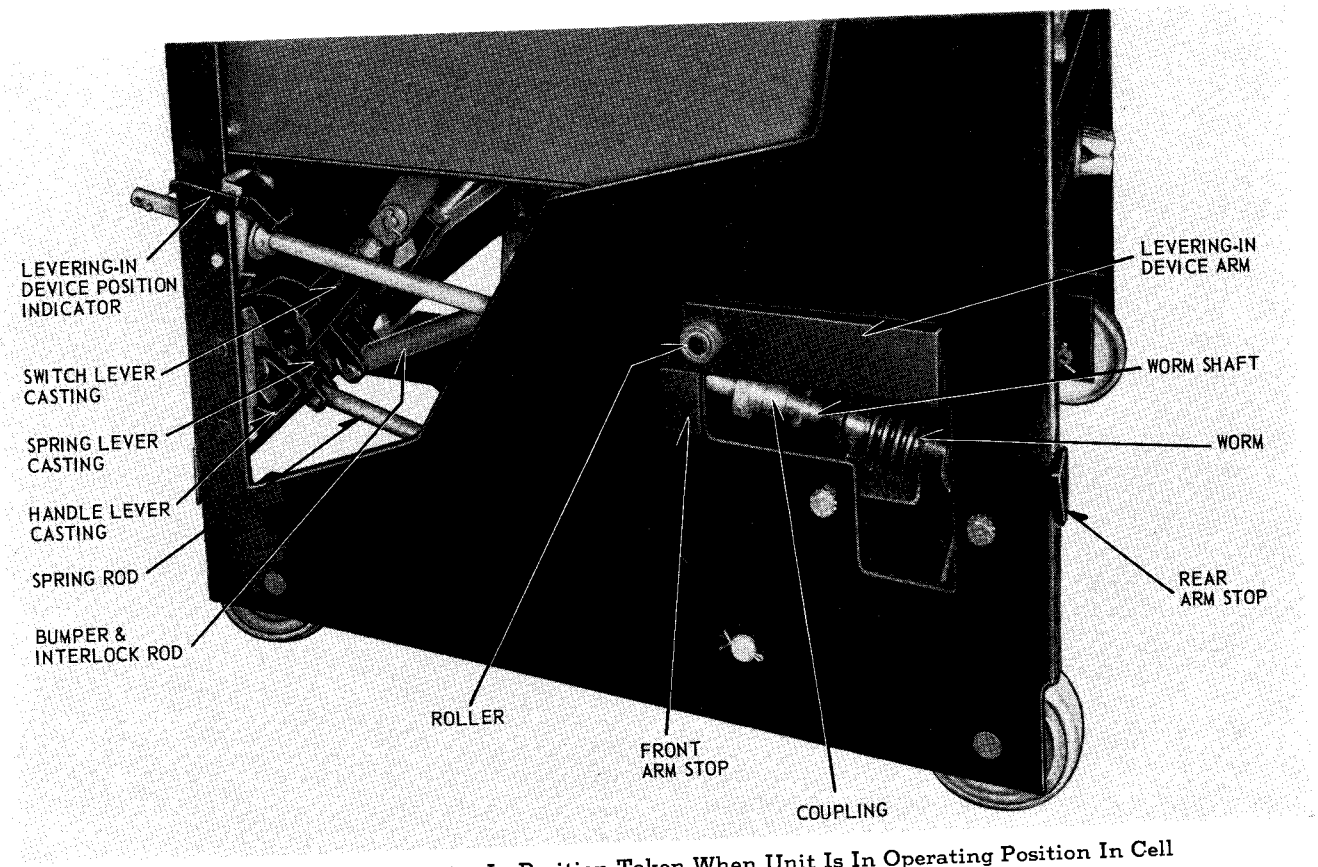


FIG. 9. Levering-In Device In Position Taken When Unit Is In Operating Position In Cell

When the switch blades open, the bumper rod moves toward the front of the unit and is clear of the interlock pin. Then as the levering-in crank is pushed toward the rear to engage the split coupling, Fig. 9, the bell crank casting rotates and in turn lifts the interlock pin. This will block any movement of the bumper rod toward the rear, and the switch operating mechanism cannot move from the open position.

As the levering-in crank is turned, the double cam plates on the shaft rotate and hold the bell crank and interlock pin in the raised position until the arms have reached either end of their travel. At this time the spring on the bottom of the interlock pin will pull the pin down and separate the split coupling.

When the switch closes, the bumper rod moves to the rear and is over the interlock pin as shown in Fig. 7. This prevents the latter from moving upwards which in turn holds the split coupling apart through the action of the bell crank casting.

The above mentioned figures cover the type 150-DSF unit. The action of the mechanism for the Type 50-DSF unit is the same, and is shown in Fig. 8. The interlock rod is separate from the bumper rod, but both are pinned to the switch casting to perform the same action as outlined above.

GROUND CONTACT

The ground contact is located at the left rear of the frame. See Figs. 7 and 8. Six spring loaded floating contact fingers engage the stationary ground contact at the rear of the cell and insure a low impedance path to ground.

TIME DELAY INTERLOCK

The switch opening latch has a time delay interlock plate located on the front panel of the unit. Refer to Fig. 1. The function of this device is to prevent an immediate opening operation of the switch after it has been closed. This is to insure sufficient time to allow the fuse element to clear any current above the interrupting rating of the load-break switch if it should be closed against a faulted circuit.

PART FOUR

INSTALLATION

The Type DSF Switch and Fuse Unit is shipped completely assembled, adjusted, and ready for service when placed in its metal-clad cell. No change in adjustments should be required, and none should be made unless it is obvious it has been disturbed. However, the unit should receive a visual inspection and operational check to determine that all components are in working order before placing in service.

Caution: Severe injury may be sustained if struck by the switch blades, the mechanism castings or the spring parts. Extreme care should be followed when inspecting the moving parts after the main operating spring has been charged. Never release the mechanism with the spring charging handle in the handle socket.

After the unit has been removed from the shipping crate, place it in a convenient position where the following sequence of operations may be performed.

1. Remove the switch compartment cover to expose the three pole load-break switch as shown in Figs. 3 and 4. On the 15 kv unit this cover is held in place by two bolts, one at the side of each of the front vertical frame angles. The 5 kv unit switch cover is held by means of six bolts to the front frame angles. The unit is shipped with the switch in the closed position.

2. Open the switch by charging the spring. If the lower right hand tab of the time delay interlock plate (Figs. 1 and 11) is blocking the full travel of the spring charging handle when the latter is inserted into the operating handle socket, the plate must be moved to the extreme left of its travel. This is accomplished by rotating the time delay screw counterclockwise when viewed from the left of the unit. The spring charging handle, which is a 3/8 inch diameter solid steel bar about 25 inches long, may then be inserted into the operating handle socket and rotated upward until the spring snaps over toggle. The travel of the handle is 94 degrees and will be complete 15 degrees before the vertical position is reached. This charges the spring for the opening operation.

The time delay interlock plate is then returned to the extreme right of its travel by rotating the screw clockwise. The mechanism is then released by the "Pull To Open" ring. See Fig. 11.

3. When the switch is open, the open gap between the auxiliary blade and the edge of the interrupting chamber must be 3 1/2 inches for the 5 kv rating and 6 inches for the 15 kv rating. Also, clearances from live parts to grounded metal should be at least equal to these distances.

4. A light film of graphite grease is applied to the hinge contact surfaces and also the serrated contacts at the break jaw. This should not be disturbed, but other dust or foreign material should be wiped from the switch parts. Also the bushings, porcelain insulators, and all insulating parts should be wiped clean of any accumulated dust or dirt.

5. The hinge and break jaw contact pressure has been adjusted at the factory and will be maintained by the spring washers at each end of the switch blades. Although the tie bolts may appear loose when the blades are in the open position, the adjustment should not be altered until the blades have been accurately checked in the closed position.

6. The three current limiting fuse units may be shipped in separate cartons and must be placed in their clips at the rear of the unit as shown in Fig. 2. It is customary to insert the fuse with the indicator at the bottom fuse clip. The silver plated contact surfaces between the clip and the fuse ferrule must be clean.

7. To close the switch, move the time delay interlock plate to the left, as previously instructed. Insert the spring charging handle in its socket and press down until the operating spring snaps over toggle. It is not necessary to return the time delay interlock plate to the right of its travel when closing the switch, and the mechanism is released by pulling the "Pull To Close" ring. Close and open the switch several times to be certain that all parts are functioning properly. The switch operation should be quick and positive in both closing and opening.

Both the main switch blades and the auxiliary blade must be in proper alignment with their stationary counterparts. When the switch is closed, each set of main blades should have beetween 1/16 and 1/8 inch overtravel remaining at the bottom of the slot in the center of the break jaw. If it is necessary to change, this adjustment is made for each switch pole by removing the 1/2 inch diameter pin at the upper end of the corresponding rod end. See Fig. 3. After loosening the lock nut at the bottom, the rod end is turned in the proper direction

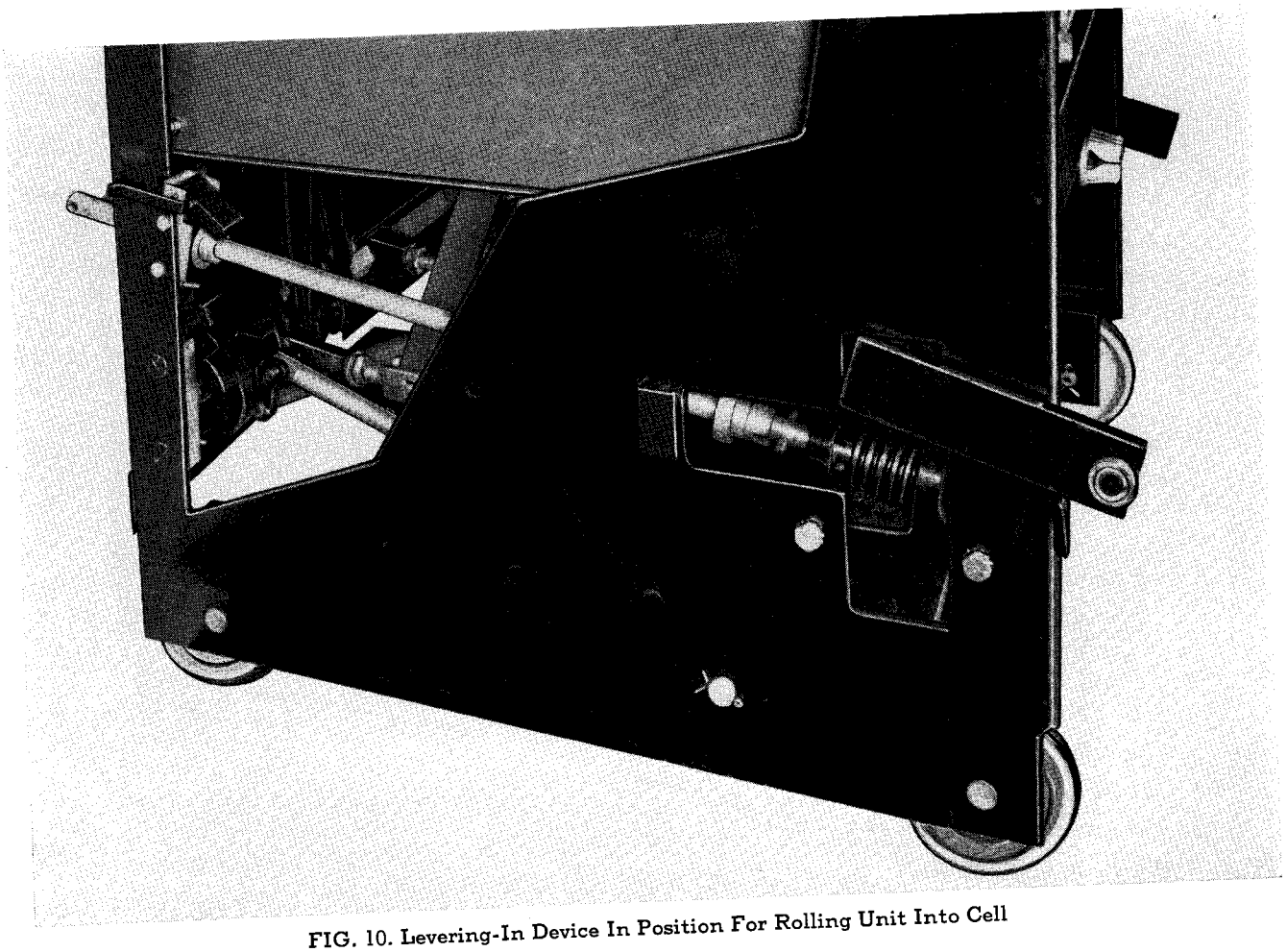


FIG. 10. Levering-In Device In Position For Rolling Unit Into Cell

to correct the switch blade overtravel. The pin is replaced at the top of the rod end and secured by cotter pins and the lock nut tightened. The switch should be operated several times and then the adjustment rechecked.

8. Replace the switch compartment cover making certain that the glass polyester insulating liner is secured to its back, and facing toward the load break switch.

9. Prepare levering-in device to move unit into cell. Units are shipped with the levering-in device arms pointing toward the front as shown in Fig. 9. Before placing the unit in the cell, the arms must be turned toward the rear of the unit and slightly downward as shown in Fig. 10. To put the arms in the position just described, place the levering-in crank over the shaft extending through the right top corner of the mechanism compartment. Press in on the crank to engage the coupling, and rotate the crank counterclockwise until the arms come to the end of their travel against the solid rear stop. The switch must be in the open position to engage the coupling.

10. Place unit in test position. Position the unit at the front of the cell so that the flanged wheels ride on the rails on the bottom of the cell, and roll it in until it comes against the solid stop. This is the test position where the disconnecting contacts at the rear of the bushings are still separated from the stationary high voltage contacts by the closed shutter in the cell.

11. Lever unit into cell. To move the unit to the operating position, the switch must be open. Place the crank on the levering-in device operating shaft, press in to engage the coupling, and rotate the crank clockwise to the end of the travel. The torque required will increase when the primary contact fingers engage the stationary contact studs in the cell. Continue cranking until the solid stop is reached at which point the crank will be forced out, and the indicator on the mechanism panel will point to "Operate". The unit must be all the way in for the interlock to release and permit the switch to be closed. Remove the levering-in crank.

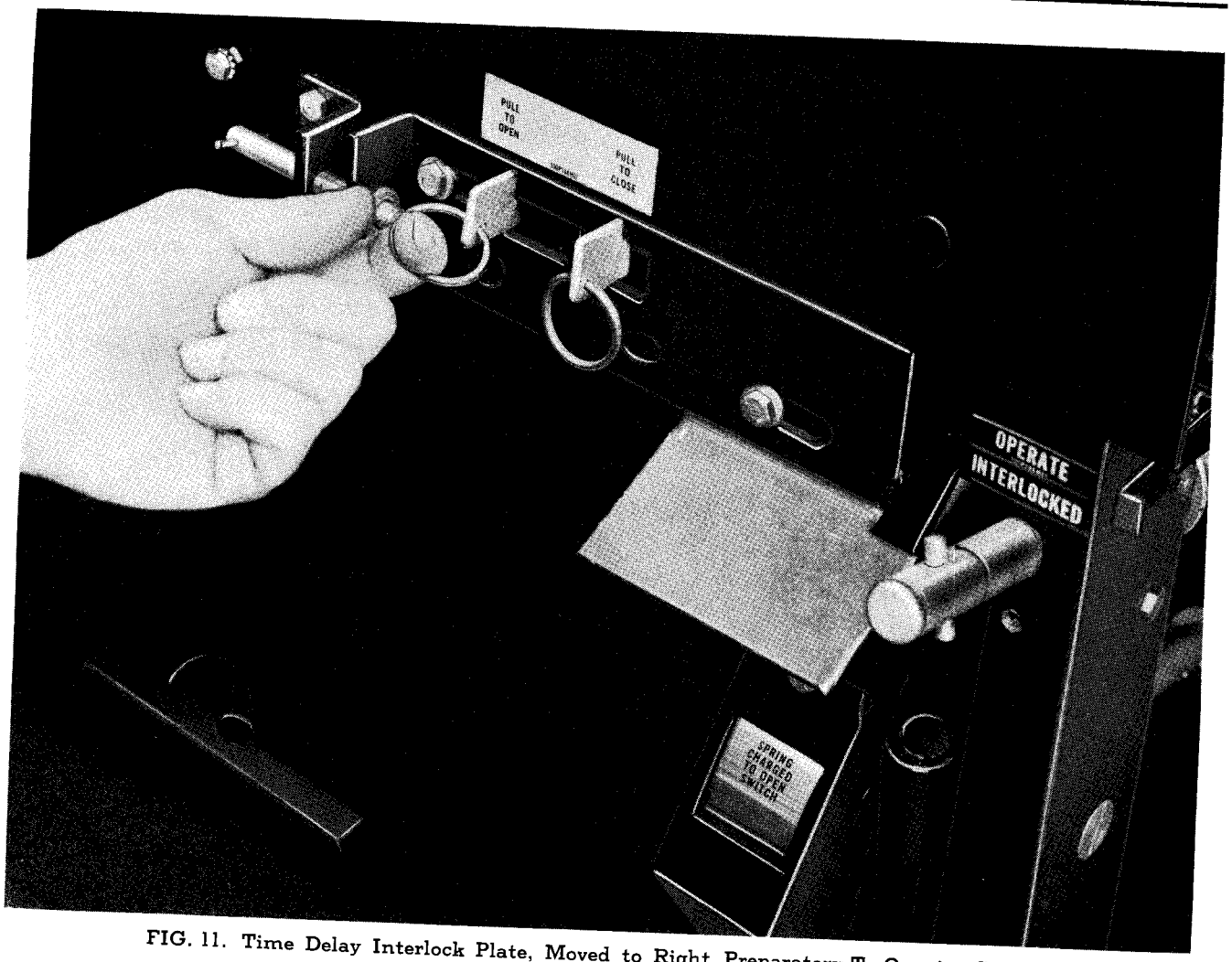


FIG. 11. Time Delay Interlock Plate, Moved to Right, Preparatory To Opening Switch

PART FIVE

ADJUSTMENT AND MAINTENANCE

MECHANISM

The mechanism of the unit is adjusted at the factory, and is designed to give long, trouble free performance. Do not make any adjustment unless faulty operation is observed.

Opening and Closing Latches. If either roller latch fails to hold and the mechanism immediately operates when the main spring is charged, a probable cause is failure of the roller to fully seat on the notch of its lug on the switch lever casting. Refer to Figs. 3 and 7 and Mechanism Diagram Fig. 6. This may be traced to friction in the trip lever casting Fig. 14 Item 7, particularly where it slides on the trigger link, Item 15 or 16. These links must return to their "full-in" position, and the trip lever front spring, Item 20, must return the trip lever casting to the end of its travel.

With the main spring discharged and the switch closed, there should be 1/32 inch minimum to 1/16 inch maximum clearance between the roller of the "Pull To Open" trip lever and its latching surface on the switch lever casting lug. Refer to Fig. 6.

With the main spring discharged and the switch open, a similar clearance should exist between the roller of the "Pull To Close" trip lever and its latching surface.

These clearances are adjusted by adding or subtracting shims, Fig. 14 Item 22, located between the trip lever support channel, Item 21, and the front horizontal member of the unit frame. The shims are held in place by two 1/4—20 pan head machine screws reached through holes in the sliding time delay interlock plate. Adding shims will reduce the clearance on the closing latch and increase the clearance on the opening latch an equal amount. Removing shims will have the opposite effect upon the two clearances.

If shims are added, care must be taken to insure that the latch rollers return to the bottom of their notches.

LOAD-BREAK SWITCH

The contact pressures at the break jaw and the hinge of the main blades of the switch have been adjusted at the factory, and should not be changed throughout the life of the switch. However, if the main blades have been removed for any reason they are re-adjusted as follows. The "acorn" hex nut at the hinge side of the blade is turned to "finger tight" and then tightened by a wrench an additional "4-flats" and on to the nearest cotter pin location. Replace and spread the cotter pin.

With the switch in the closed position, the "acorn" hex nut at the top or break jaw is turned to "finger tight" and then an additional "3 flats", or half turn, to the nearest cotter pin location. When the switch blades are open, this will appear loose.

The hex nut on the pivot bolt of the auxiliary blade must be tight enough to prevent side play of the blade assembly, but must not distort the main blades nor cause binding of the auxiliary blade.

The switch contacts should never be cleaned with abrasive material. It is recommended that the switch be opened and closed and wiped off occasionally to remove excessive dirt accumulation. A very light film of graphite grease (Westinghouse No. 8831-9) should be applied to the moving contact surfaces of the main blades.

"DE-ION" ARC CHAMBER

With ordinary usage and relatively small currents, the interrupting chambers should require no maintenance other than an occasional inspection. The normal life of the chamber is 100 operations at its full rating of 600 amperes at 50% powerfactor. When the current interrupted is smaller, the life is proportionally longer. If at inspection, there appears to be considerable wear, the complete chamber should be replaced.

The auxiliary blade should be replaced when the tungsten alloy tip has eroded to approximately one-half of its original thickness or 1/16 inch. Also if any pieces are broken from the insert, the blade should be replaced.

When an arc chamber or auxiliary blade is replaced, the pull rod should be disconnected from the mechanism by removing the 1/2 inch diameter pin (Fig. 13 Item 15), at the lower end or rod end. This will allow the individual pole to be closed by hand to a point where it can definitely be determined that all switch parts are in proper alignment and that the auxiliary blade enters the interrupting chamber and contacts properly. Excessive friction due to misalignment will retard quick opening action and may cause failure. After it is found that the pole units operate freely, the pull rod is reconnected to the mechanism by replacing the 1/2 inch diameter pin and the cotter pins.

As previously covered, the main blades should have between 1/16 and 1/8 inch overtravel at the break jaw when the switch blade has been closed by the mechanism. This is measured at the break jaw blade tie bolt. If necessary to change, this adjustment is made at the rod end, (Fig. 13 Item 16). The lock nut on the rod end must be securely tightened.

Lubrication. In general, lubricants are not in wide spread use on equipment of this type. For most of the operating parts, lubricants can be avoided. In a few places, the use of a special lubricant is desirable—PROVIDED IT IS DONE CAREFULLY. This means applying it in small quantities to avoid drippings and accumulation. Experience will dictate the amount required.

Since it is not expected that the mechanism of the Switch and Fuse Unit will have many operations per year, most of the moving parts will perform best with the surfaces clean, and only a very light film of lubrication. After a long period of service with few operations, an accumulation of dried or oxidized lubricant may make it necessary to disassemble the parts and clean them. Carbon tetrochloride is a good solvent for this, but care should be exercised to use it only in well ventilated areas.

The needle bearings on each end of the hex operating shaft should receive a very light application of graphite grease (W) No. 8831-9. A light film of the same material should be applied to the

moving surfaces between the rounded part of the hex shaft and the spring casting and handle casting.

The rollers and pins of the two trip latches should receive a very small quantity of molybdenum lubricant (W) No. 8577-2. Care should be taken that this material is not applied to any current carrying surfaces.

The levering-in device rollers and shutter rollers should also receive the molybdenum lubricant. The levering-in shaft bearings and worm gear should receive (W) Material No. 5435-1.

The silver plated contact surfaces on the hinge and break jaws of the switch should be lubricated with graphite grease (W) No. 8831-9.

Soft petrolatum may be used on the primary disconnecting contacts at the rear of the bushings.

Any good grade of grease may be used for the unit wheel bearings.

Insulation. Porcelain insulators and flame retardant, glass-mat polyester insulating materials are used in the Switch and Fuse Unit for supports, barriers, bushing ties and similar purposes. These materials have a long established record for insulation and mechanical dependability.

Insulation maintenance consists primarily in keeping the surfaces of the material clean. This can be done by wiping the surfaces with cloths free of grease or metalic particles each time the unit is removed from the cell for inspection.

In case there is any tightly adhering dirt which will not come off by wiping, it can be removed with Westinghouse Solvent No. 1609-1 or -2.

PART SIX

PARTS IDENTIFICATION

Detailed parts identification for the units are shown in the various illustrations throughout this book. Figures 1, 2, and 3 show the overall major components. The details of the levering-in device are shown in Fig. 12. The bushings and load-break switch details are shown in Fig. 13, and the operating mechanism details are shown in Fig. 14.

RENEWAL PARTS

Following are two lists of the parts on this apparatus that are most subject to wear in ordinary operation, and to damage or breakage due to possible abnormal conditions. The first covers parts recommended to be kept in stock, and are listed on the basis of the number required for one unit. In the case of several units in service one set of parts is normally sufficient for average conditions. However, for several units employing different fuse ratings, a complete set of fuse units of each rating is recommended for stock. The rating and style number of the fuse unit will be found on its nameplate, or may be obtained from the nearest sales office.

The second tabulation is a style number reference for several parts that may be required for replacement under severe conditions.

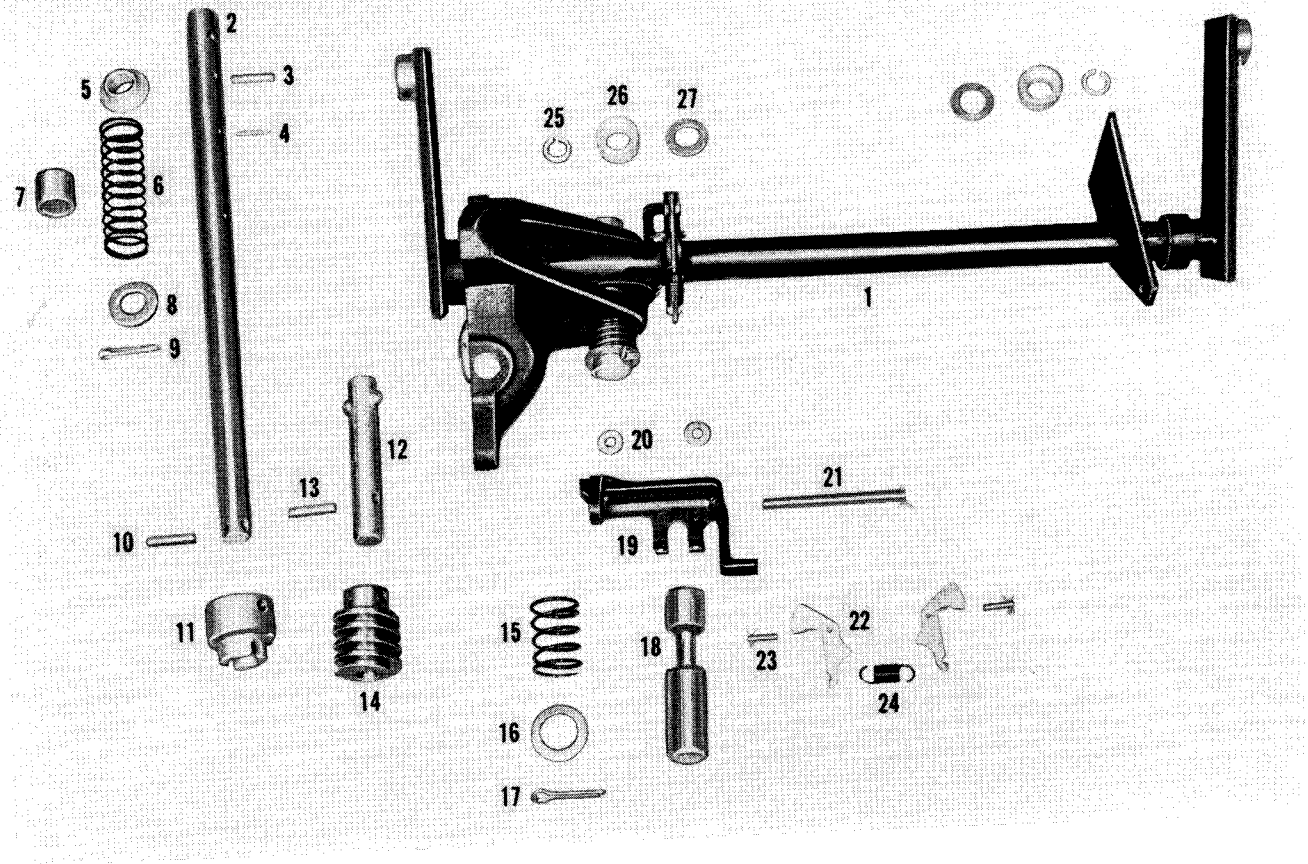
RECOMMENDED STOCK RENEWAL PARTS REFERENCE STYLE NUMBERS

When ordering renewal parts, always specify the part name and style identification. If this is not available, identify the part by name and item number from a particular figure in this instruction book, and include I.B. number. In all cases, supply full information from the stamped nameplate on the front panel of the DSF unit with the order.

RECOMMENDED STOCK RENEWAL PARTS

DESCRIPTION	TOTAL USED ON ONE DSF UNIT	STYLE NO.	
		5 Kv	15 Kv
ARC CHUTE AND AUXILIARY BLADE ASSEMBLY	3	1615 515	44A9002G01
MAIN OPERATING SPRING	1	130A906H06	130A906H04
FRONT TRIGGER SPRING	2	130A906H03	130A906H03
REAR TRIGGER SPRING	2	130A906H02	130A906H02
INTERLOCK STOP PIN SPRING	1	27D6214H10	496A354H12
CAM PLATE SPRING	1	125A592H01	125A592H01
LEVERING-IN SHAFT SPRING	1	130A906H05	130A906H01
RIGHT HAND AUXILIARY BLADE SPRING	1	11D1586H02	11D1586H02
TYPE BAL CURRENT-LIMITING FUSE UNIT	3	*	*

* AS PER REQUIREMENTS

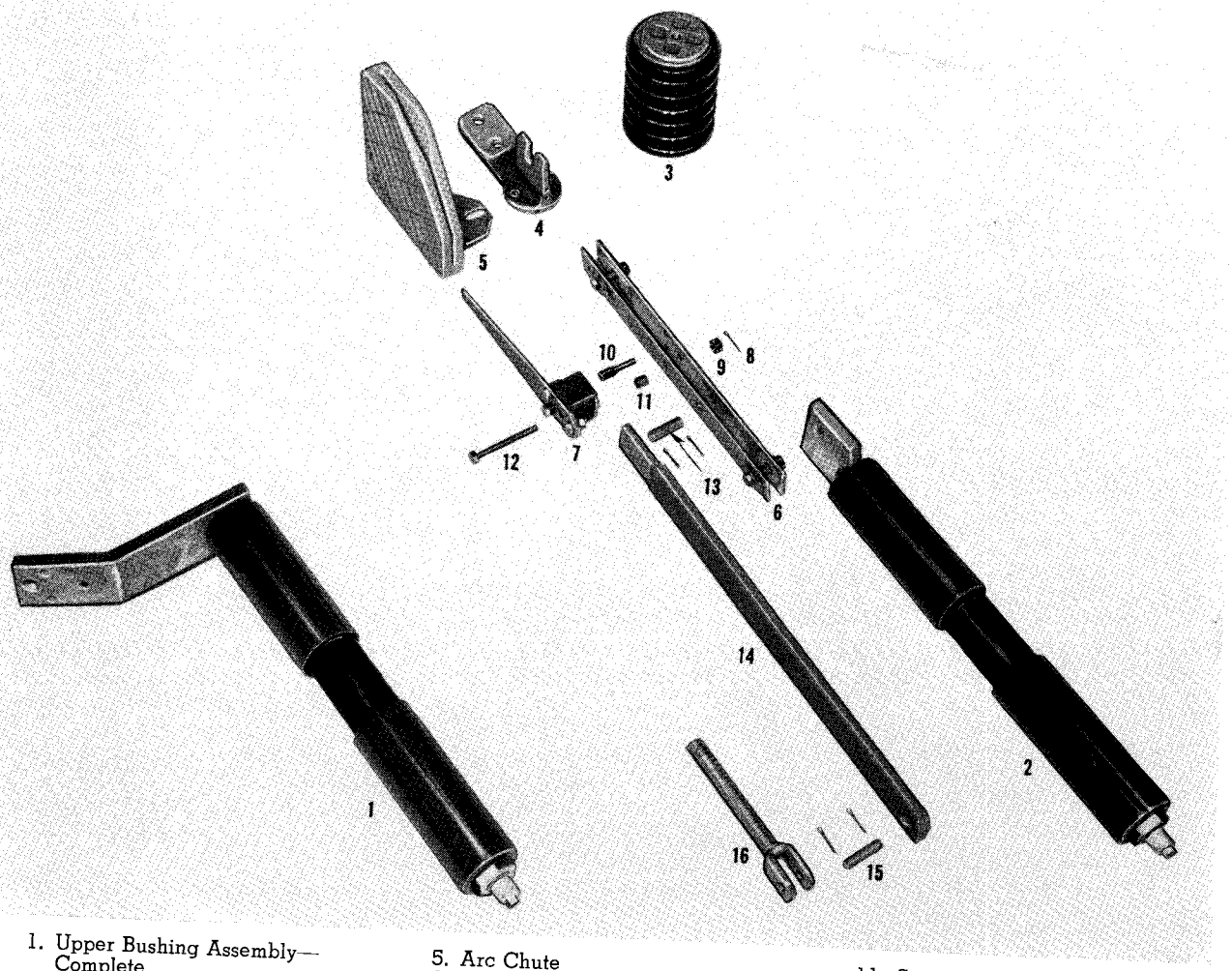


1. Levering-In Device—Complete
2. Operating Shaft
3. Crank Pin
4. Collar Pin
5. Interlock Position Indicator Collar
6. Operating Shaft Spring
7. Spring Spacer
8. Spring Retaining Washer
9. Spring Cotter Pin
10. Coupling Pin
11. Coupling
12. Worm Shaft
13. Worm Pin
14. Worm
15. Interlock Pin Spring
16. Spring Retaining Washer
17. Spring Cotter Pin
18. Interlock Pin
19. Bell Crank Casting
20. Washers
21. Bell Crank Pin
22. Cam Plates
23. Cam Plate Pins and Cotters
24. Cam Plates Spring
25. Roller Snap Ring
26. Levering-In Arm Roller
27. Roller Spacer

FIG. 12. Levering-In Device Assembly

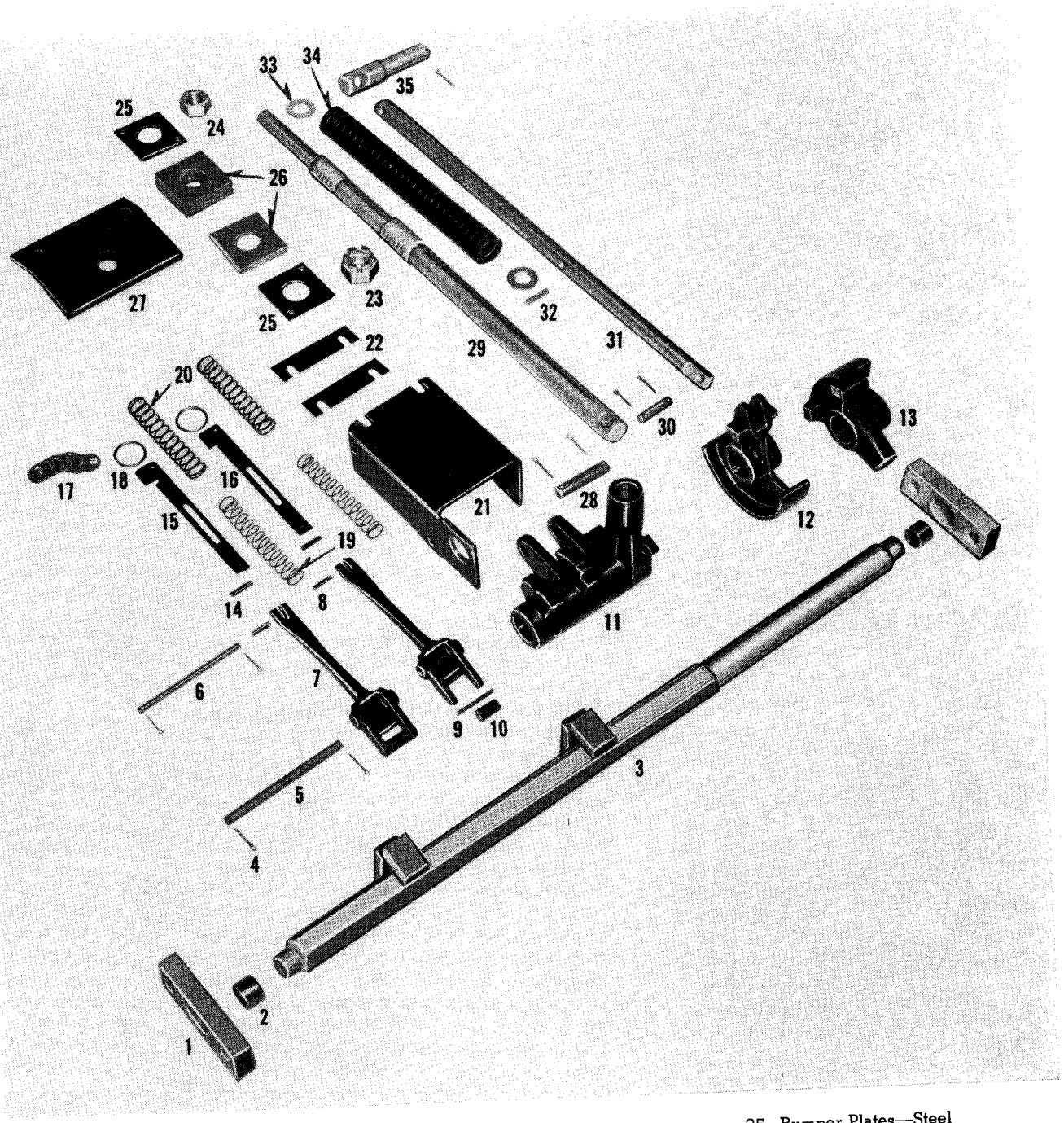
PARTS REFERENCE STYLE NUMBERS

DESCRIPTION	TOTAL USED ON ONE DSF UNIT	STYLE NO.	
		5 Kv	15 Kv
SWITCH MAIN BLADE ASSEMBLY	3	13B8816G17	13B8816G27
UPPER PRIMARY BUSHING ASSEMBLY	3	308C003G01	307C747G01
LOWER PRIMARY BUSHING ASSEMBLY	3	308C003G02	307C747G02
PORCELAIN INSULATOR	6	1581 768	1581 770
PRIMARY DISCONNECTING CONTACT	6	1332 614	1332 613
GROUND CONTACT ASSEMBLY	1	44A8857G04	44A8857G05



1. Upper Bushing Assembly—Complete
2. Lower Bushing Assembly—Complete
3. Porcelain Insulator
4. Break-Jaw
5. Arc Chute
6. Switch Main Blades
7. Switch Auxiliary Blade Assembly
8. Cotter Pin
9. Acron Nut
10. Spring Pin
11. Spacer
12. Bolt
13. Pin—Upper Pull Rod
14. Pull Rod
15. Pin—Lower Pull Rod
16. Rod End

FIG. 13. Load-Break Switch and Bushing Assembly



1. Bearing Block
2. Needle Bearing
3. Shaft
4. Cotter Pin
5. Trip Lever Pivot Pin
6. Trip Lever Stop Pin
7. Trip Lever—Complete
8. Trip Lever Upper Pin & Truarc Rings
9. Trip Lever Roller Pin & Truarc Rings
10. Trip Lever Roller
11. Switch Lever Casting
12. Spring Lever Casting
13. Handle Lever Casting
14. Groove Pin
15. Trigger Link—Switch Opening
16. Trigger Link—Switch Closing
17. Spring Washers
18. Operating Ring
19. Trigger Spring—Rear
20. Trigger Spring—Front
21. Trip Lever Support Channel
22. Trip Lever Support Shims
23. Bumper Nut—Front
24. Bumper Nut—Rear
25. Bumper Plates—Steel
26. Bumper Plates—Aluminum
27. Bumper Support Bracket
28. Bumper Rod Pin & Cotters
29. Bumper Rod
30. Spring Rod Pin & Cotters
31. Spring Rod
32. Spring Stop Pin
33. Spring Washers
34. Operating Spring
35. Spring Rod Guide Pin & Cotter

FIG. 14. Mechanism Assembly

MEMORANDUM

MEMORANDUM


WESTINGHOUSE