INSTRUCTIONS
AND
RENEWAL PARTS

GEH-1802R
SUPERSEDES
GEH-1802P AND GEF-3837

METAL-CLAD SWITCHGEAR

Types M-26 and M-36
For Magne-blast Air Circuit Breaker
Types AM-4.16 and AM-13.8

SWITCHGEAR DEPARTMENT

GENERAL ELECTRIC

PHILADELPHIA, PA.

LIST OF ILLUSTRATIONS

Renewal Parts

CONTENTS

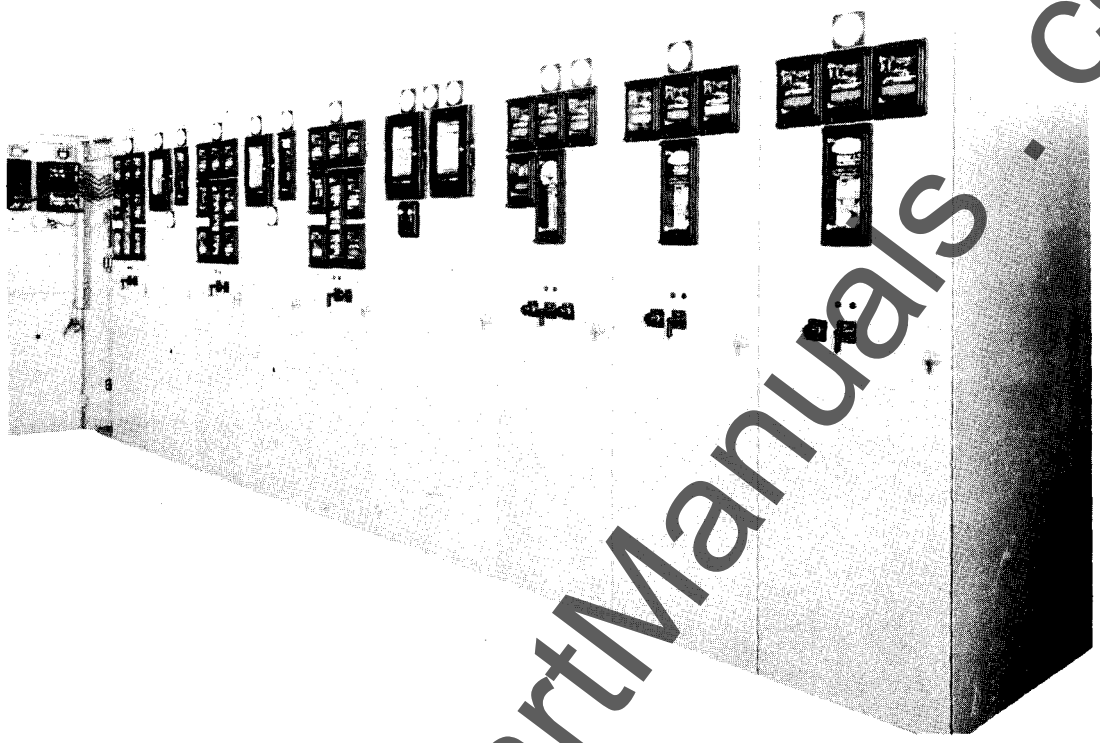


Fig. 1 (8021315)

Fig. 1 Typical Indoor Metal-clad Switchgear Equipment

Fig. 2 (1169287)

Fig. 2 Typical Outdoor Metal-clad Switchgear Equipment - Front View

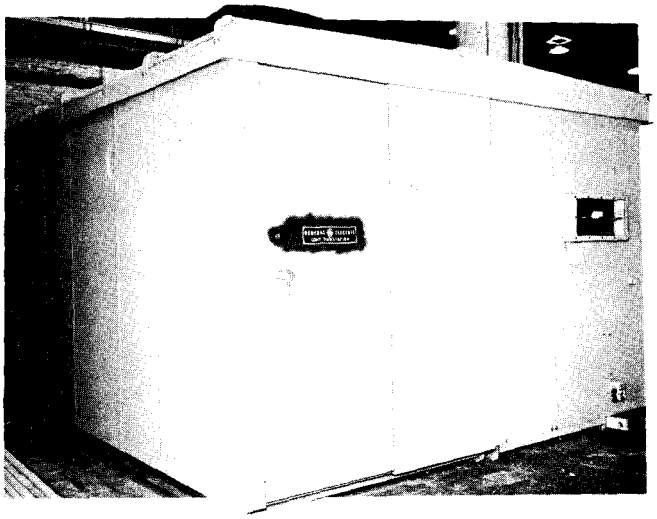


Fig. 3 (8025290)

Fig. 3 Typical Outdoor Metal-clad Switchgear Equipment With Protected Aisle - Side View

METAL-CLAD SWITCHGEAR
TYPES M26 AND M36
FOR MAGNE-BLAST AIR CIRCUIT BREAKER TYPES AM-4.16 AND AM-13.8

Metal-clad switchgear is equipment to control and protect various types of electrical apparatus and power circuits.

The switchgear consists of one or more units which are mounted side by side and connected mechanically and electrically together to form a complete switching equipment. Typical equipments are shown in Figures 1, 2 and 3.

The circuit breakers are easily removable to provide maximum accessibility for maintenance with minimum interruption of services. The switchgear is designed to provide maximum safety to the operator. All equipment is enclosed in grounded metal compartments.

The equipment is available in the ratings listed in the following table. The ratings of the equipment and devices are based on usual service conditions as covered in AIEE and NEMA standards. Operation at currents above the equipment rating will result in temperature rises in excess of NEMA standards, and is not recommended. For outdoor installation the same basic equipment is built into a weatherproof housing as in Figures 2 and 3.

CIRCUIT BREAKER	INTERRUPTING CAPACITY KVA	CURRENT	FIGURE
TYPE M-26			
AM-4.16-150	150,000	1200	4
AM-4.16-250	250,000	1200 - 2000	4
AM-4.16-350	350,000	1200 - 3000	5
TYPE M-36			
AM-13.8-150	150,000	1200	4
AM-13.8-250	250,000	1200	4
AM-13.8-250	500,000	1200 - 2000	4
AM-13.8-750	750,000	1200 - 2000	4
AM-13.8-1000	1,000,000	1200 - 3000	6
AM-7.2-250	250,000	1200	4
AM-7.2-500	500,000	1200 - 2000	4

Fig. 4 (8012851)

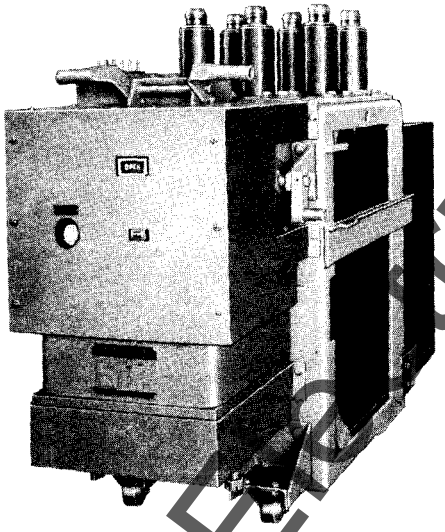


Fig. 4

Fig. 5 (8023154)

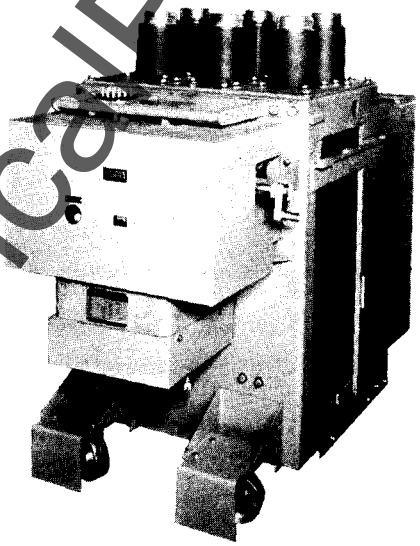


Fig. 5

Fig. 6 (8024212)

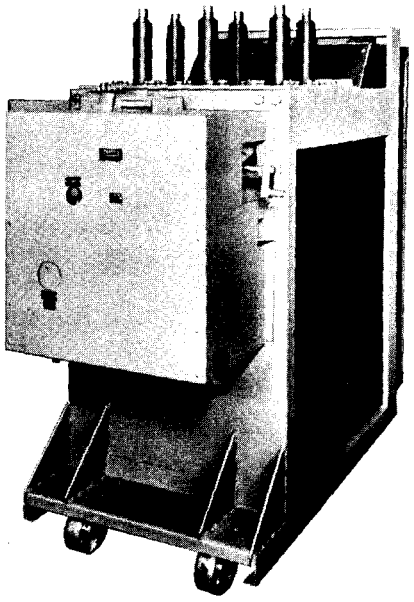
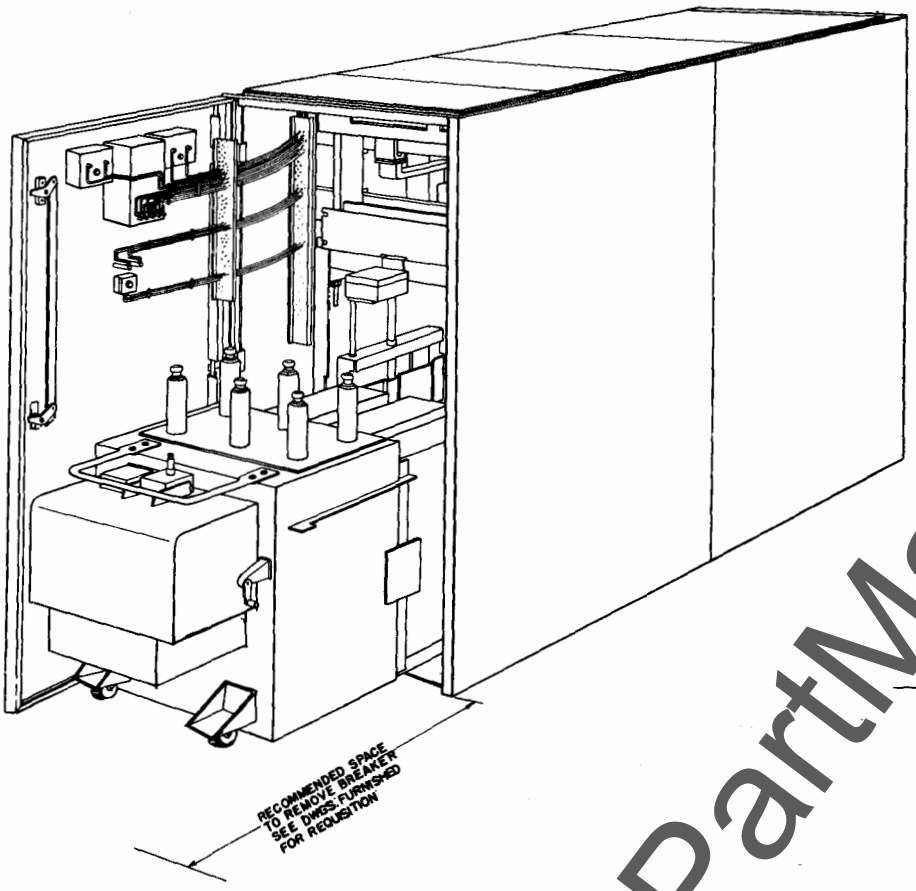


Fig. 6

Magne-blast Breakers

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company.



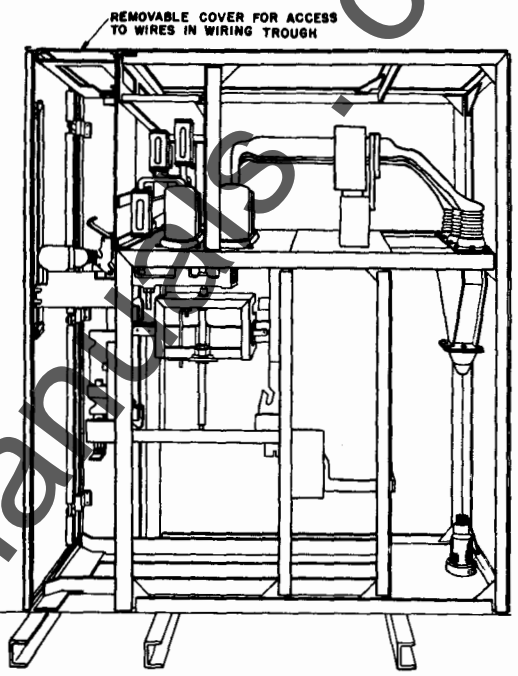
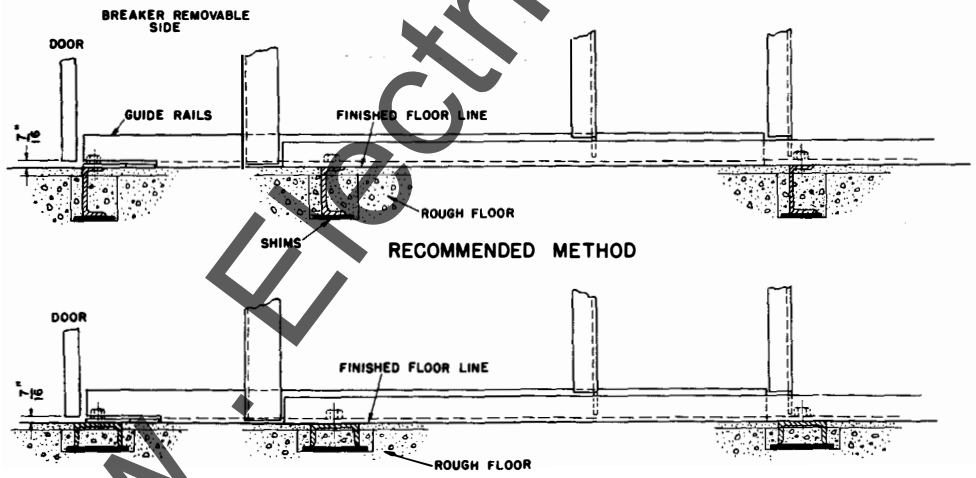


Fig. 7 (TT-6482630)

ALL FLOOR STEEL TO BE FURNISHED BY PURCHASER

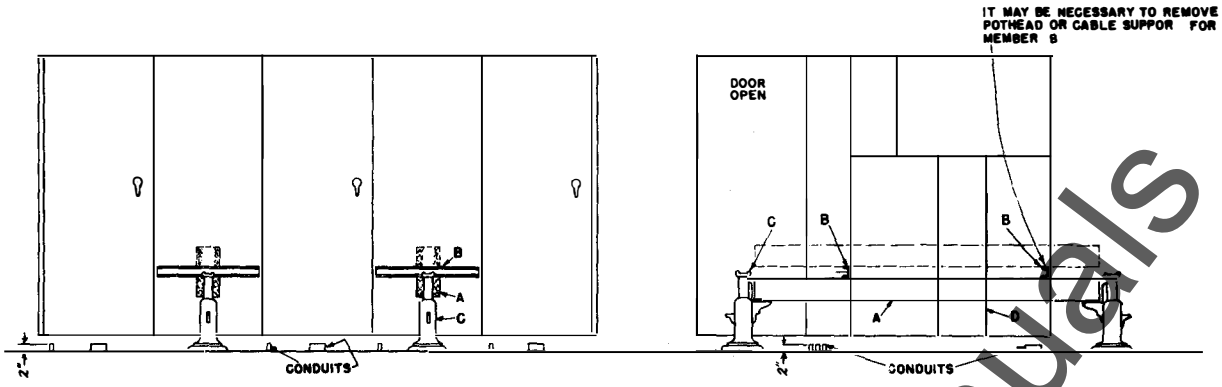
CHANNELS SHOULD BE SET LEVEL WITH EACH OTHER AND SHOULD BE LEVEL OVER THEIR FULL LENGTH

ROUGH FLOOR THICKNESS AND REINFORCING DEPENDS ON LOADING AND OTHER NORMAL FACTORS, AND SHOULD BE DESIGNED IN ACCORDANCE WITH RECOMMENDED PRACTICE



NOTE: IT IS IMPERATIVE THAT FLOOR STEEL BE EVEN WITH FINISHED FLOOR AND THAT BOTH BE LEVEL

Fig. 7 Installation Details



METHOD OF LIFTING

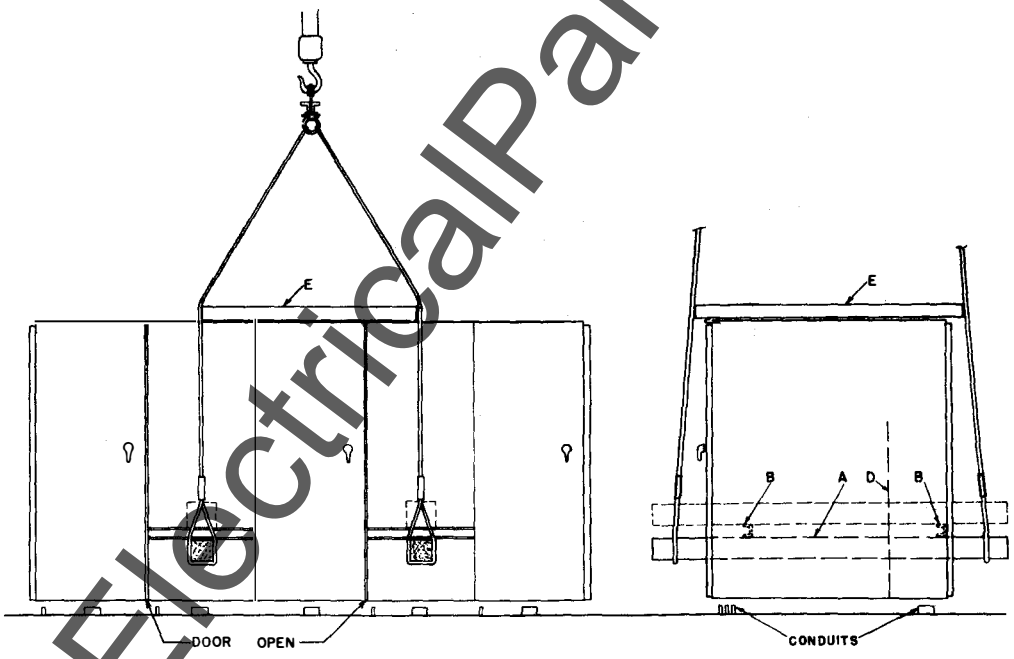
MEMBERS A-& C ——— TO BE FURNISHED BY PURCHASER
A- RAISING MEMBER - CHANNEL OR WOOD BEAM

B- 3" CHANNEL FURNISHED WITH GEAR

C- LIFTING JACKS
D- COVER TO BE REMOVED AND REASSEMBLED AFTER UNITS ARE IN PLACE

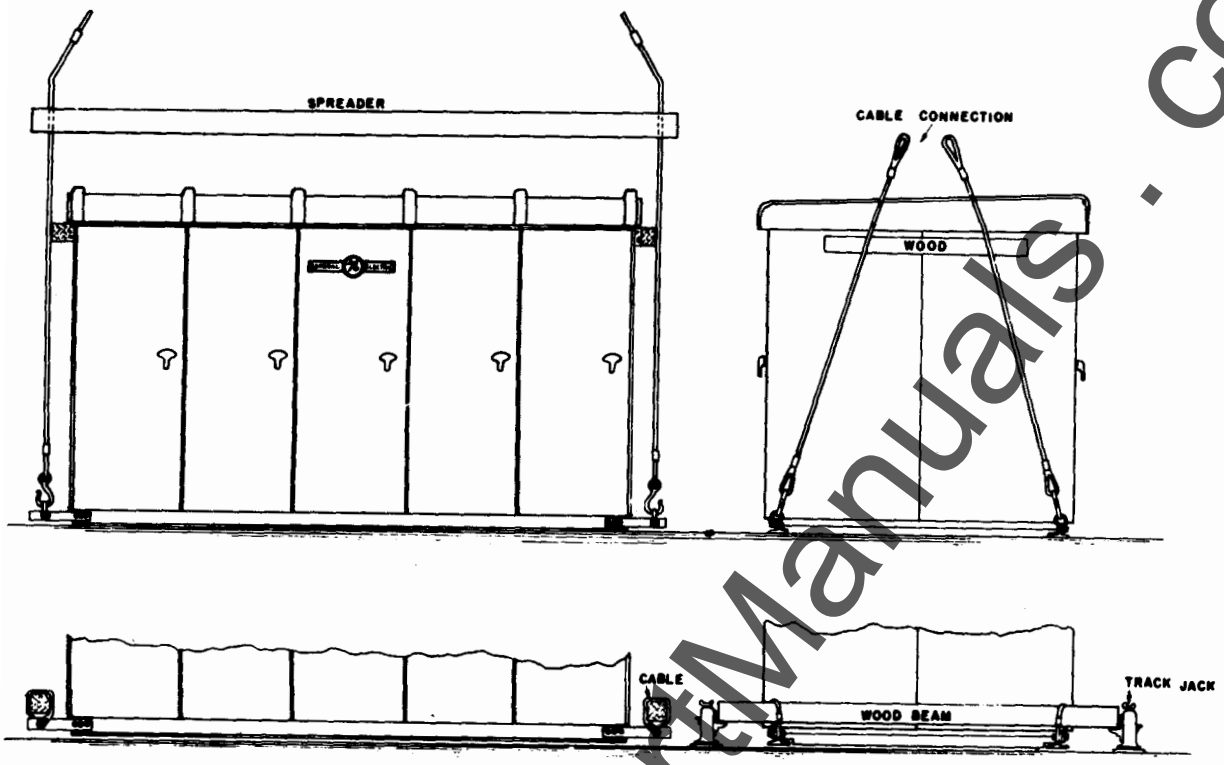
NOTE: WHEN LIFTING M-26 SWITCHGEAR LOCATE BEAM "A" ABOVE LIFTING CHANNELS "B"

Fig. 7 (TT-6482630)

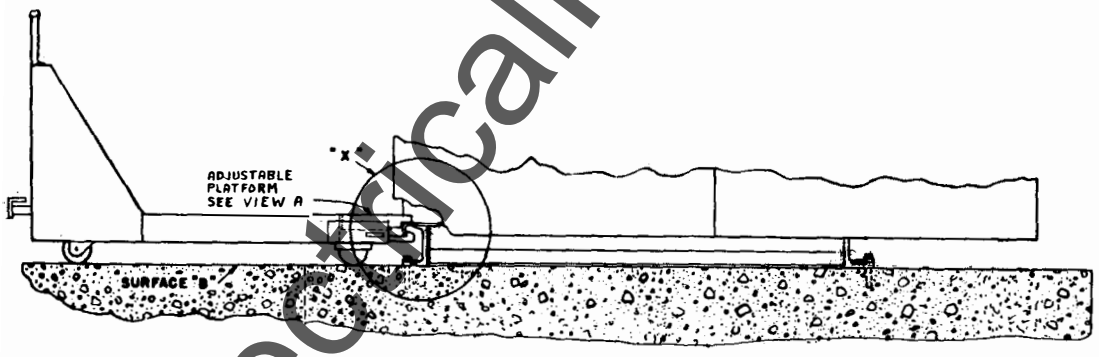


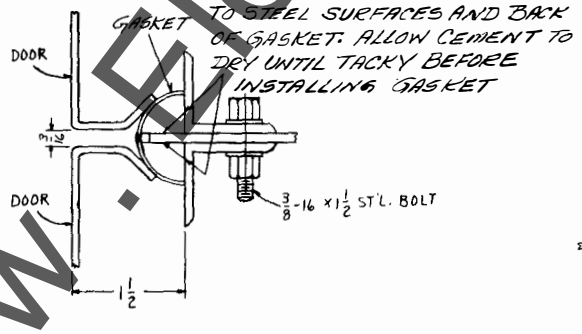
ALTERNATE METHOD OF LIFTING

MEMBERS A & E TO BE FURNISHED BY PURCHASER
B - 3" CHANNEL FURNISHED WITH GEAR
D - COVER TO BE REMOVED AND REASSEMBLED AFTER UNITS ARE IN PLACE
E - SPREADER

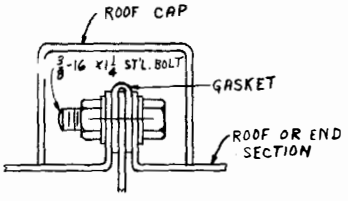


METHODS OF LIFTING





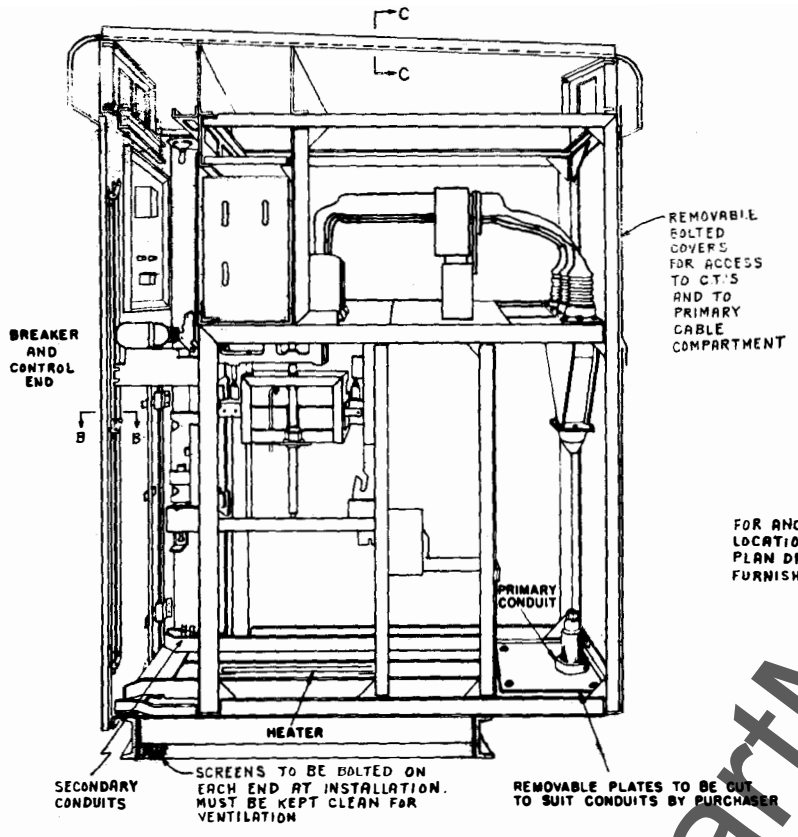
ENLARGED SEC. B-B
METHOD OF ASSEMBLING DOOR GASKET AT SHIPPING SPLITS



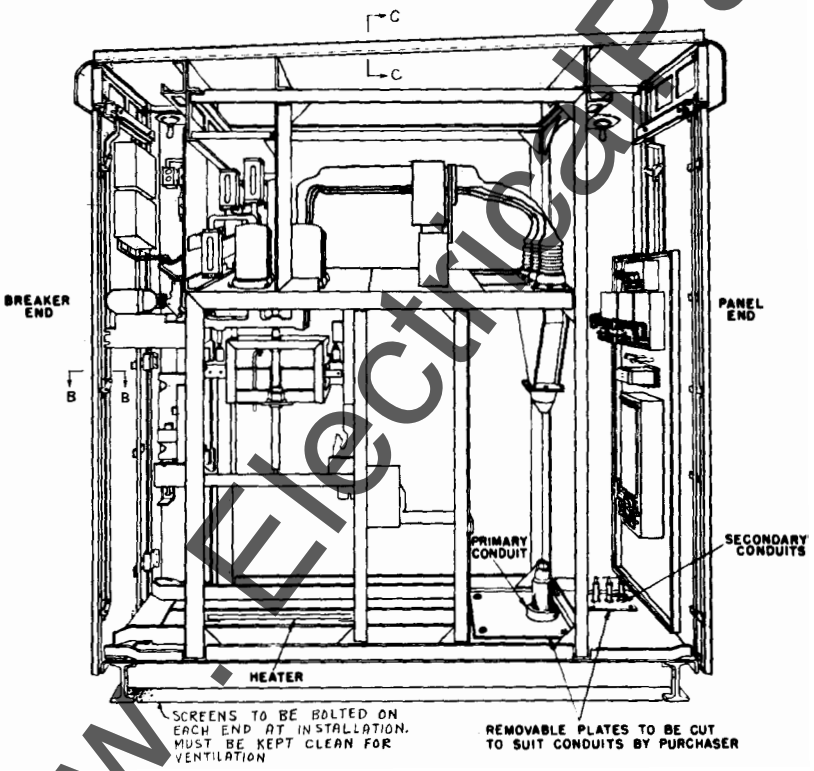
ENLARGED SEC. C-C
METHOD OF ASSEMBLING ROOF CAP AND GASKET AT SHIPPING SPLITS

Fig. 8 Installation Details

Fig. 8 (118RD728 & TT-6482615)



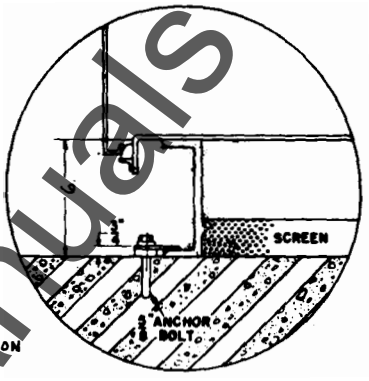
Without Rear Enclosure



With Rear Enclosure

Fig. 8 (118RD728 & TT-6482615)

for Outdoor Metal-clad Switchgear



FOR ANCHOR BOLT LOCATIONS SEE FLOOR PLAN DRAWINGS FURNISHED WITH REQUISITION

VIEW "X"

SHOWING ANCHORING OF UNITS WITH CHANNEL BASE

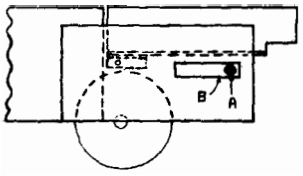
FOUNDATION DATA

AREA AND DEPTH OF SOIL BEARING SURFACES OF EACH FOUNDATION MUST BE ALTERED TO SUIT SOIL CONDITIONS.

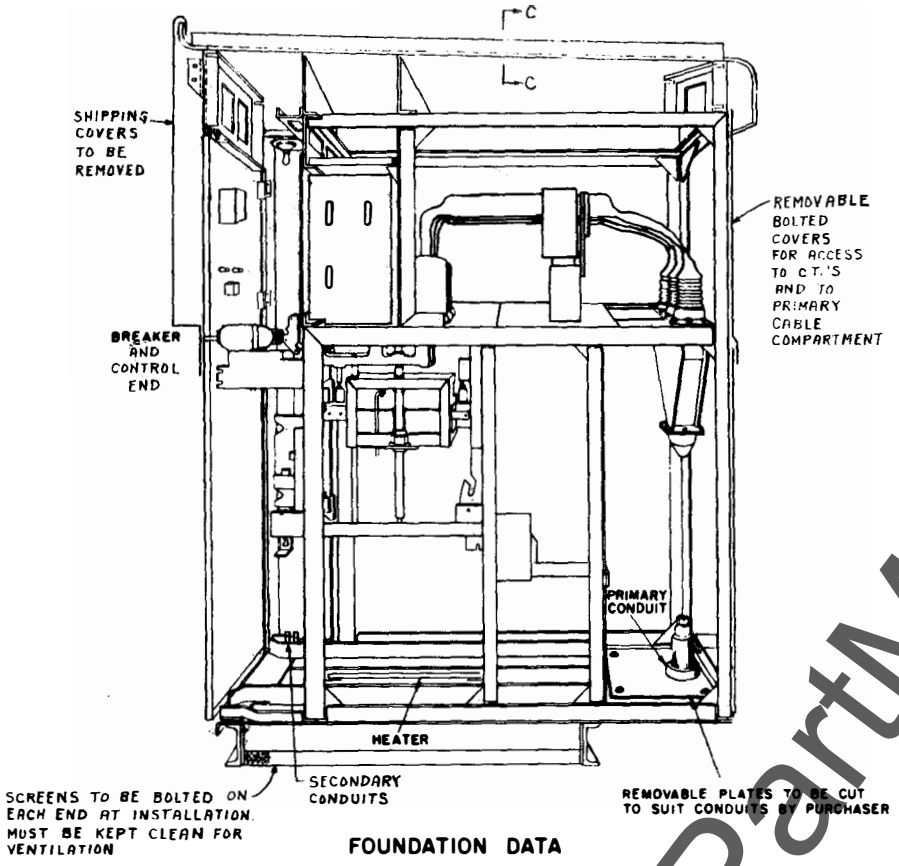
BOTTOM SURFACES OF FOUNDATIONS SHOULD BE BELOW FROST ACTION OR BACKFILLED WITH PERVIOUS MATERIAL AND ADEQUATELY DRAINED.

SURFACE "B" SHOULD BE LEVEL OVER ITS FULL LENGTH TO INSURE EASY HANDLING OF REMOVABLE ELEMENTS. CONCRETE PAD SHOULD BE REINFORCED IN ACCORDANCE WITH STANDARD PRACTICE.

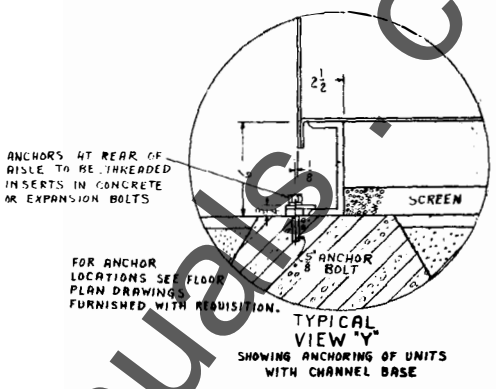
TO CHANGE HEIGHT OF TRUCK FLOOR LOOSEN NUT "A". ADJUST LEVER "B" TO GIVE DESIRED HEIGHT AND LOCK BY TIGHTENING NUT "A".



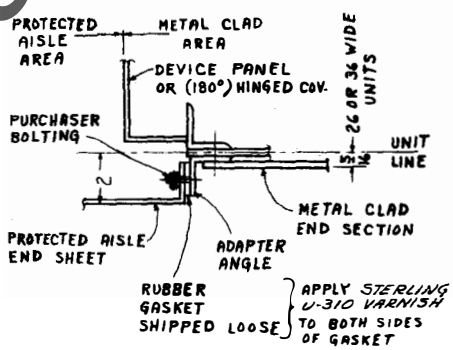
ADJUSTABLE PLATFORM VIEW "A"



FOUNDATION DATA

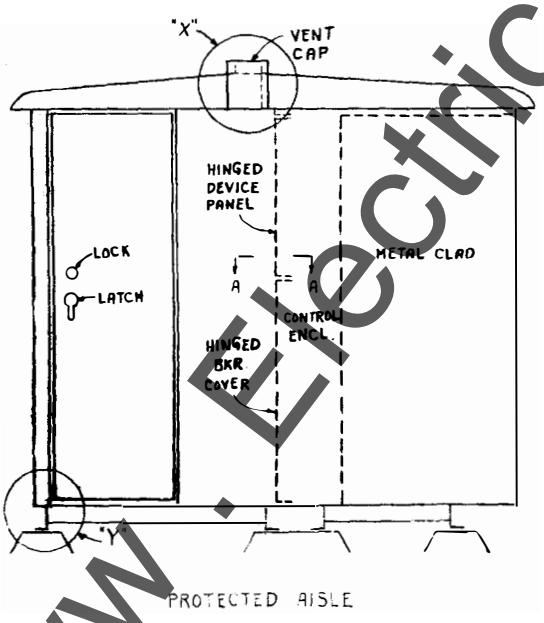


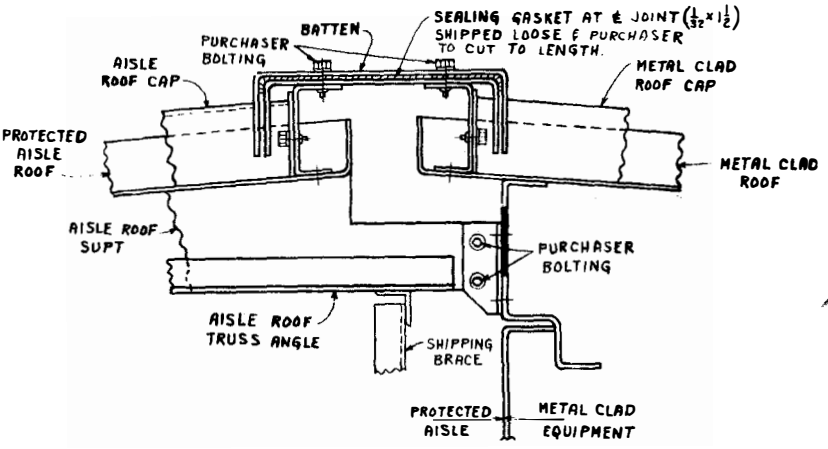
TYPICAL VIEW "Y"
SHOWING ANCHORING OF UNITS WITH CHANNEL BASE



TYPICAL SECTION A-A

Fig. 9 (118RD727)





VIEW "X"
ENLARGED INTERIOR SECTION SHOWING AISLE TO METAL CLAD BOLTING & VENTILATOR CAP ASSEMBLY

Fig. 9 Installation Details for Outdoor Metal-clad Switchgear with Protected Aisle

RECEIVING, HANDLING AND STORAGE

RECEIVING

Every case or crate leaving the factory is plainly marked at convenient places with case number, requisition number, customer's order, front or rear, and when for size and other reasons it is necessary to divide the equipment for shipment, with the unit number of the portion of equipment enclosed in each shipping case.

The contents of each package of the shipment are listed in the Packing Details. This list is forwarded with the shipment, packed in one of the cases. The case is especially marked and its number can also be obtained from the Memorandum of Shipment. To avoid the loss of small parts when unpacking, the contents of each case should be carefully checked against the Packing Details before discarding the packing material. Notify the nearest General Electric Company representative at once if any shortage of material is discovered.

All elements before leaving the factory are carefully inspected and packed by workmen experienced in the proper handling and packing of electrical equipment. Upon receipt of any apparatus an immediate inspection should be made for any damage sustained while enroute. If injury is evident or an indication of rough handling is visible, a claim for damage should be filed at once with the transportation company and the General Electric Company notified promptly. Information as to damaged parts, part number, case number, requisition number, etc., should accompany the claim.

HANDLING

Before uncrating, indoor equipment may be moved by a crane with slings under the skids. If crane facilities are not available, rollers under the skids may be used. Fig. 7 shows suggested method of handling the switchgear after it is removed from the skids.

Methods of handling outdoor equipment are shown in Fig. 8. After the equipment is in place the lifting plates should be removed and reassembled, "turned in" so that passageway at the ends of the equipment will not be obstructed.

STORAGE

If it is necessary to store the equipment for any length of time, the following precautions should be taken to prevent corrosion:

1. Uncrate the equipment.

2. Cover important parts such as jack screws, gears and chain of lifting mechanism, linkage and moving machine-finished parts with a heavy oil or grease.

3. Store in a clean, dry place with a moderate temperature and cover with a suitable canvas to prevent deposit of dirt or other foreign substances upon movable parts and electrical contact surfaces.

4. Batteries should be uncrated and put on trickle charge immediately on receipt.

5. If dampness or condensation may be encountered in the storage location, heaters should be placed inside the units to prevent moisture damage. Approximately 500 watts of heaters per unit will be required. Remove all cartons and other miscellaneous material packed inside units before energizing any heaters. If the equipment has been subjected to moisture it should be tested with a 1000v or 2500v megger. A reading of at least 200 megohms should be obtained.

6. Breakers should be prepared for storage separately. Refer to appropriate breaker instruction book.

DESCRIPTION

Each unit is made up of a secondary enclosure and a primary enclosure, as shown in Figure 10.

SECONDARY ENCLOSURE

The secondary enclosure is usually located at the breaker withdrawal side of the unit, although in certain units it may be on the side opposite to the breaker withdrawal area. It consists of a compartment with a hinged door or panel upon which are mounted the necessary instruments, control and protective devices. The terminal blocks, fuse blocks, and some control devices are mounted inside the enclosure on the side sheets and a trough is provided at the top to carry wiring between units.

PRIMARY ENCLOSURE

The primary enclosure contains the high voltage equipment and connections arranged in compartments to confine the effects of faults and so minimize the damage.

BREAKER REMOVABLE ELEMENT

The removable element consists of a circuit breaker with trip-free operating mechanism mounted directly on the breaker frame, interlock mechanism, the removable portion of the primary and secondary disconnecting devices, the operating mechanism control device, and necessary control wiring. The magne-blast breakers are equipped with wheels for easy removal and insertion. Refer to Figs. 4, 5 and 6.

The circuit breaker interlock mechanism is designed to obstruct the operator from lowering the breaker from the connected position or raising it from the disconnected position unless the breaker is in the open position. This interlock is also

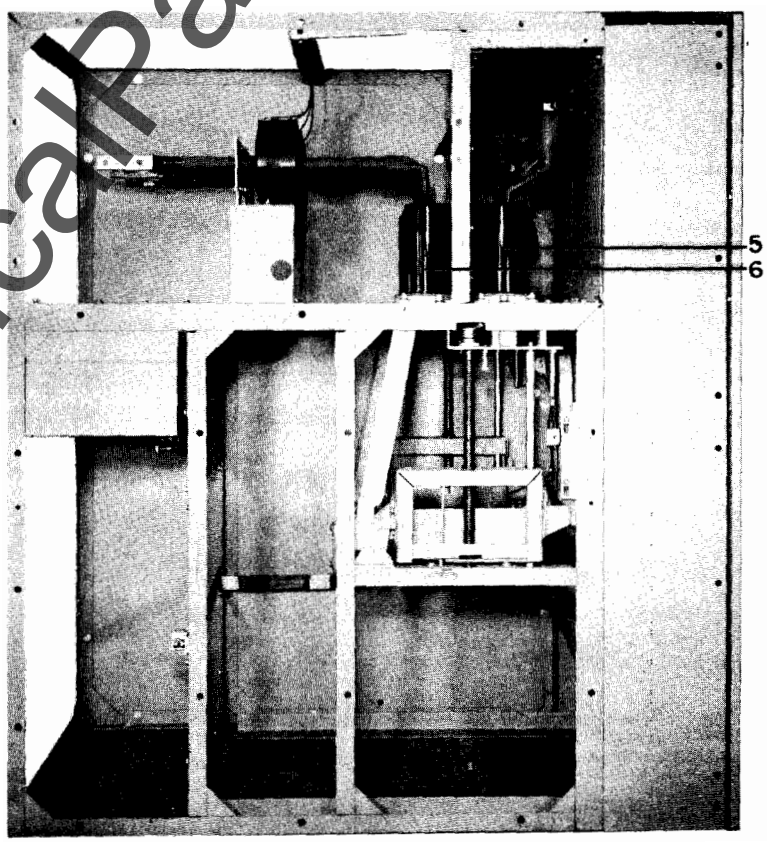


Fig. 10 Metal-clad Switchgear

Fig. 10 (8028600)

designed to keep the breaker in the open position while it is being elevated or lowered. With this arrangement it is imperative that the circuit breaker be tripped prior to any vertical travel of the removable element. A positive stop prevents overtravel of the removable element when raised to its connected position. The secondary disconnecting device coupler is used for connecting outside control circuits to the circuit breaker, operating mechanism, trip coil and auxiliary switches. This coupler makes contact automatically when the removable element is raised to the connected position. A control test jumper is furnished which is plugged into the coupler on the stationary and removable elements when it is desired to operate the breaker in the test position.

All removable elements furnished on a particular requisition and of like design and ratings are completely interchangeable one with the other. The removable as well as the stationary elements are built with factory jigs and fixtures thus insuring interchangeability.

BREAKER ELEVATING MECHANISM

The elevating mechanism for elevating or lowering the removable element to or from its connected position supports the removable element in the operating position. In the test position the breaker is lowered to the guide rails. This mechanism consists of heavy-duty steel jack screws on which are carried nuts to support the elevating carriage. The carriage is so designed that the removable element can be readily inserted or withdrawn after the carriage has been lowered to the disconnected position without necessitating the removal of any bolts, nuts or screws. The breaker cannot be lowered or raised until it has been tripped. The breaker cannot be closed except with the breaker in either the operating or test position.

Guide rails are built into the metal-clad frame to guide the removable breaker element into correct position before the breaker is raised into the operating position by means of the elevating mechanism which is motor operated.

PRIMARY DISCONNECTING DEVICE

The primary disconnecting devices utilize silver to silver contacts to insure against reduction of current carrying capacity due to oxidation of the contact surfaces. These contacts are of the high pressure line contact tube and socket design, the tube being backed up by heavy garter springs to insure contact pressure. Refer to Figure 11.

BUS COMPARTMENT

The main buses are enclosed in a metal compartment with removable front covers to provide accessibility.

The bus is supported by an insulating material which is practically impervious to moisture, and an excellent dielectric.

The bus insulation is molded on the bars except at the joints where the insulation is completed by means of compound filled boxes, molded boots or tape.

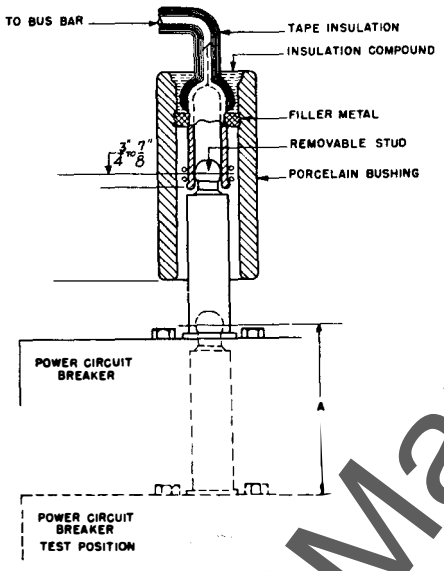


Fig. 11 Measurement of Adjustment of Primary Disconnecting Devices

CURRENT TRANSFORMER AND CABLE COMPARTMENT

The current transformers are mounted in a compartment isolated from the other equipment. Provision is made in this compartment for connecting the purchaser's primary cable by means of potheads or clamp type terminals.

POTENTIAL TRANSFORMER COMPARTMENT

Potential transformers are located in a compartment above the current transformers or in a separate unit adjacent to the breaker units.

The transformers are mounted on a movable support equipped with primary and secondary disconnecting devices. When the potential transformers are disconnected, they are at a safe striking distance from all live parts of the switchgear. In addition a grounding device is provided which contacts the fuses when the potential transformers are disconnected, effectively discharging the transformers. In this position the transformer fuses may be safely removed and replaced. A barrier mounted at the rear of the carriage moves with the carriage to a position in front of the stationary part of the primary disconnect device. See Figure 12.

DUMMY REMOVABLE ELEMENT

Dummy removable elements, Fig. 13, are used as a means of isolating circuits or bus sections, where operation is infrequent and a circuit breaker cannot be economically justified. The device consists of a framework to simulate the circuit breaker removable element with a set

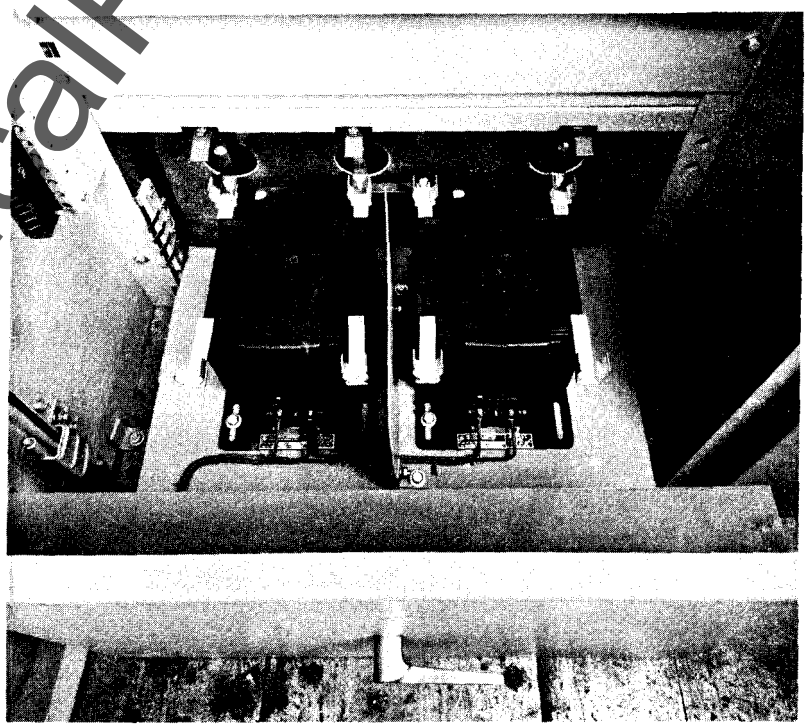


Fig. 12 Potential Transformer Rollout Shown in Withdrawn Position

Fig. 11 (121A6981)

Fig. 12 (8028333)

Fig. 13 (8026011)

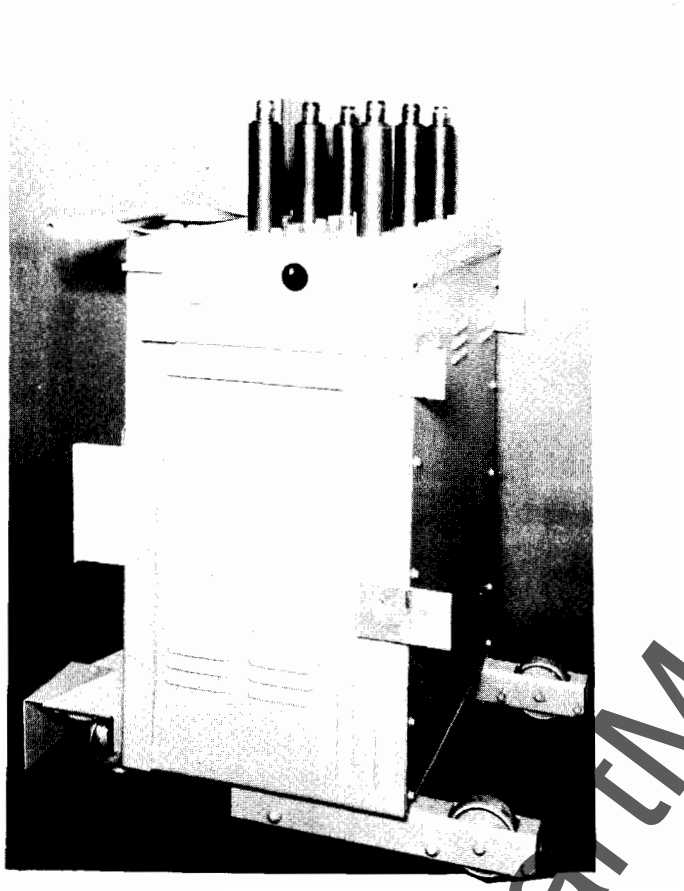


Fig. 13 Dummy Removable Element

of six studs similar to those on the magne-blast breakers. The lower end of the studs are connected, front to back, by copper bars which are fully insulated and metal-enclosed. The stationary structure is the same as for a circuit breaker. When the device is elevated into position, it connects the front set of metal-clad disconnecting devices to the rear set.

Under no conditions must the dummy element be elevated or lowered when the bus or the unit is energized. Key interlocks are applied to insure that all source of power are disconnected before the dummy element can be operated. Refer to Figure 15.

ROLLOUT FUSE-SWITCH UNITS

Rollout load-break disconnect switches, with or without current limiting fuses of high interrupting capacity, are sometimes used in metal-clad switchgear to protect and switch small transformers and circuits where circuit breakers cannot be economically or functionally justified.

The rollout switch is designated as type SE-10, and the units in which they are used are designated as type SEM-26 or SEM-36. For additional information on these equipments, refer to the supplementary instructions furnished.

FUSE DISCONNECTING DEVICE

Current limiting fuses with high interrupting rating are sometimes used in metal-clad switchgear to protect small transformers or circuits where circuit breakers cannot be economically or functionally justified.

Fig. 14 (8004507)

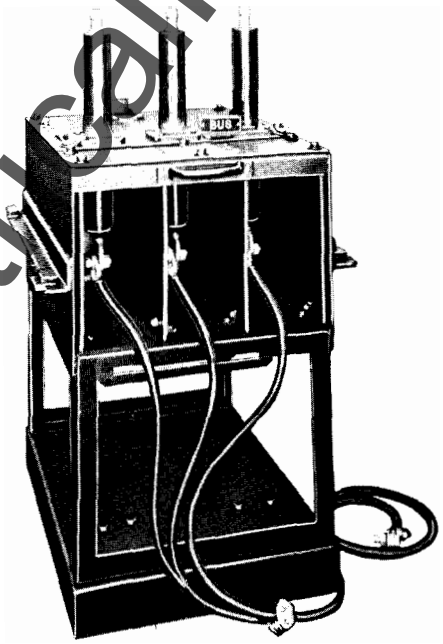


Fig. 14 Ground and Test Device
(Cable shown not furnished by G. E. Co.)

The fuses are mounted on a movable support equipped with disconnecting devices. Control power transformers of 15 kva and smaller may be mounted on the rollout with the fuses. See Figure 16.

When the fuses are disconnected, they are at a safe striking distance from all live parts of the switchgear. In addition a grounding device is provided which contacts the fuses after they are disconnected, effectively removing any static charge from the fuses. In this position the fuses may be safely removed and replaced. The disconnecting devices are capable of interrupting transformer magnetizing current, but should not be used to interrupt load current. Mechanical or key interlocks are applied to prevent operating the disconnecting device while the load is connected. This is genearally accomplished by interlocking so that the transformer secondary breaker must be locked in the open position before the disconnecting device can be opened or closed.

GROUNDING AND TEST DEVICE

The grounding and test device, Figure 14, provides a convenient means of grounding the cables or the bus in order to safeguard personnel who may be working on the cables or the equipment. The device can also be used for applying power for high potential tests or for fault location, to measure insulation resistance (Megger). By using potential transformers, it can also be used for phasing out cables.

The three studs of the device are similar to those of the magne-blast circuit breakers. The studs are mounted on a removable plate which can be placed in either of two positions. In one position the studs will engage the front (Bus) contacts only and in the other position the studs will engage the rear (Line) contacts only of a metal-clad unit.

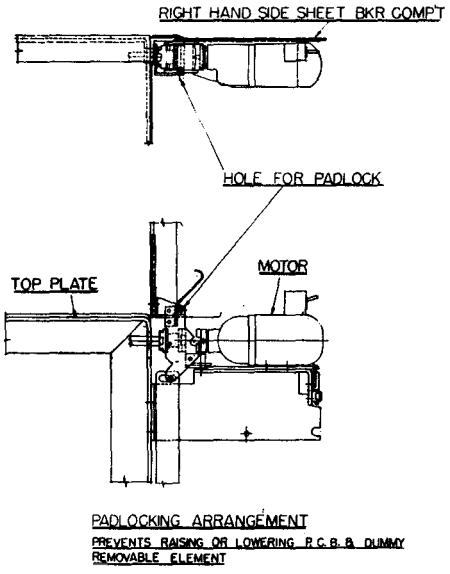
To indicate the proper placement of the studs on the device, opposite sides of the assembly are marked "Line" and "Bus". The word corresponding to the desired position must be toward the operator.

To use, the device is rolled into the metal-clad housing in place of the circuit breaker, and raised into or lowered from the connected position by means of the circuit breaker elevating mechanism.

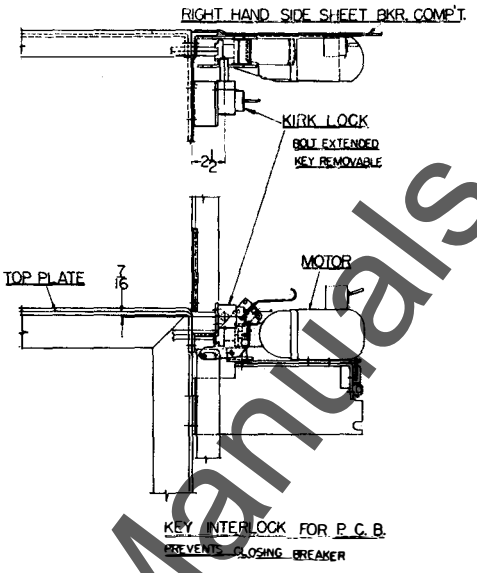
In addition to the device described above, there is available a form of grounding and testing device equipped with both bus and line side buildings, power operated grounding contacts, phasing receptacles, and a complete safety interlocking system. For details of construction and operation of this device, refer to GEI-38957 for 4.16 kv equipment, or GEI-50114 for 7.2 kv and 13.8 kv equipment.

TANDEM LOCK (WHEN FURNISHED) FOR OUTDOOR UNITS

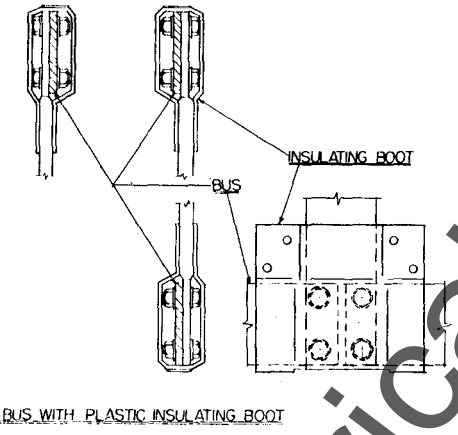
Outdoor metal-clad equipments with more than one unit may be provided with a tandem locking arrangement which makes it necessary to padlock only one door on each



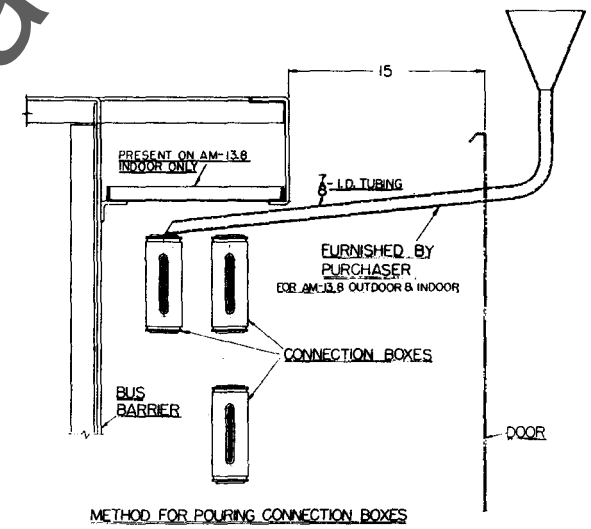
PADLOCKING ARRANGEMENT
PREVENTS RAISING OR LOWERING P.C.B. & DUMMY REMOVABLE ELEMENT



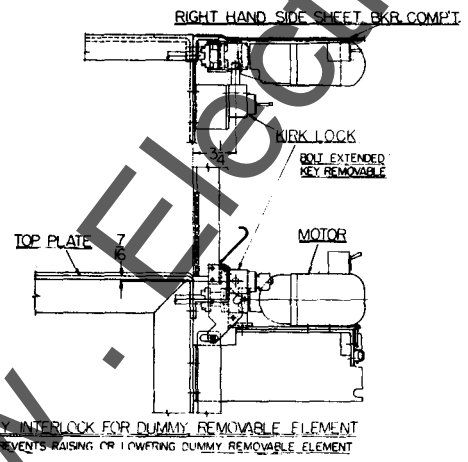
KEY INTERLOCK FOR P.C.B.
PREVENTS CLOSING BREAKER



4/6 BUS WITH PLASTIC INSULATING BOOT



METHOD FOR POURING CONNECTION BOXES



KEY INTERLOCK FOR DUMMY REMOVABLE ELEMENT
PREVENTS RAISING OR LOWERING DUMMY REMOVABLE ELEMENT

Fig. 15 (T-991368)

Fig. 15 Padlocking Arrangement, Key Interlocking and Method for Pouring Connection Boxes

Fig. 16 (8020825)

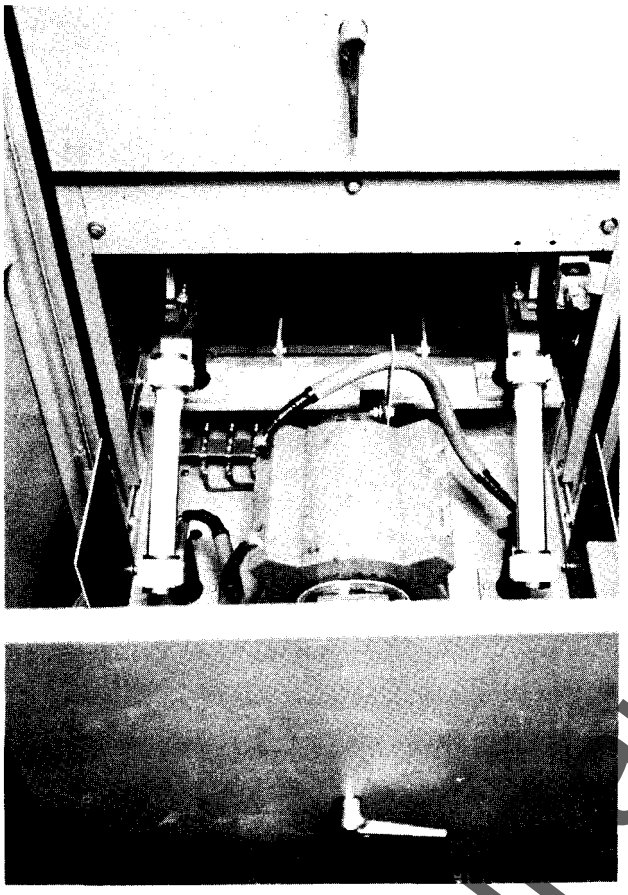


Fig. 16 Control Power Transformer Rollout Shown in Open Position

Fig. 17 (8011450)

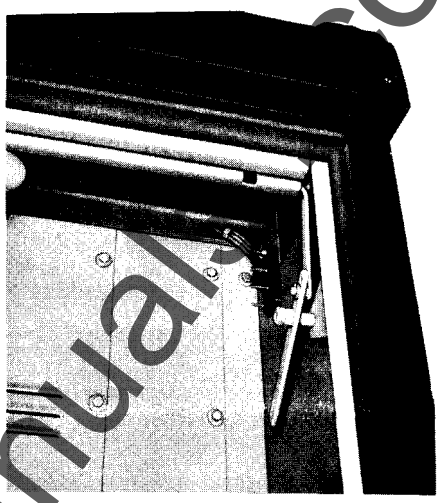


Fig. 17 Tandem Lock for Outdoor 13.8 Units

side. (In exceptionally long installations two or more locks may be required on each side). The unit containing the operating arm of the tandem lock is clearly marked on the drawings and also by nameplate on the equipment itself. Refer to Figure 17.

Before any door in the equipment can be opened, it is necessary to open the padlocked door and operate the tandem locking arm to the open position. In locking the equipment the reverse procedure should be used.

Where it is desired to separately lock any particular door, the tandem lock can be disconnected in that unit by unbolting a connecting clip between the tandem bar and the locking bar, and a separate padlock used on that door.

The light switches, front and rear, will be located in the units with the tandem lock.

INSTALLATION

Before any installation work is done, consult and study all drawings furnished by the General Electric Company for the particular requisition.

These drawings include arrangement drawings, wiring and elementary diagrams and a summary of the equipment. Mats, screens, railings, etc., which are external to the switchgear, but which may be required to meet any local codes, must be furnished by the purchaser.

LOCATION

The recommended aisle space required at the front and at the rear of the equipment is shown on the floor plan drawing furnished for the particular requisition. The space at the front must be sufficient to permit the insertion and withdrawal of the circuit breakers, and their transfer to other units. The space at the rear must be sufficient for installation of cables, for inspection and maintenance, and on some equipments to draw out potential transformers.

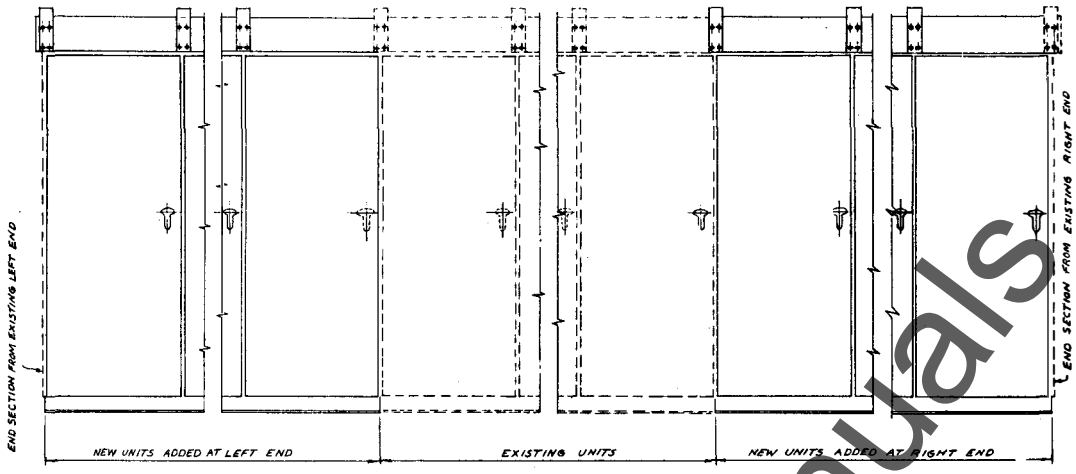
PREPARATION OF FLOOR - ANCHORING

Indoor Equipment

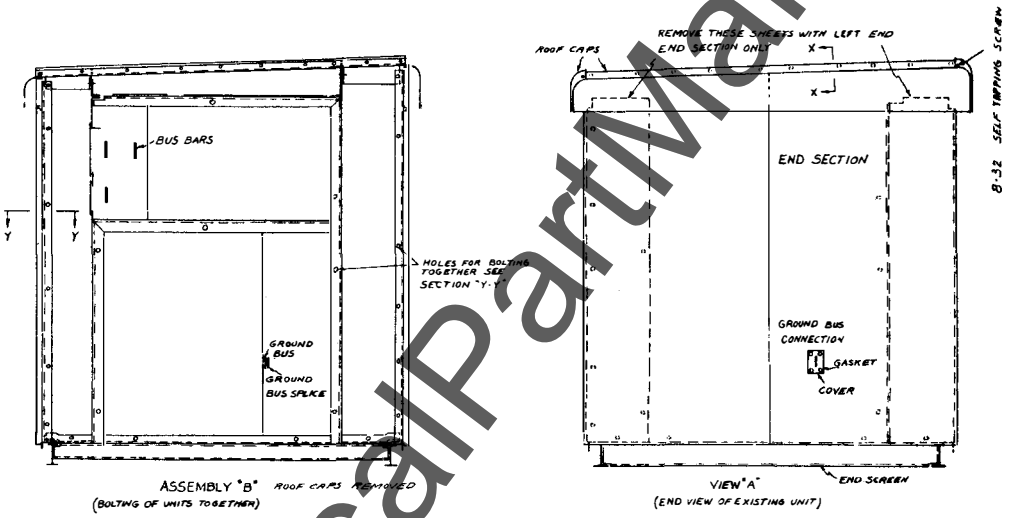
The station floor must be strong enough to prevent sagging due to weight of the switchgear structure and to withstand the impact stress caused by the opening of the circuit breakers under short circuit conditions. The impact loading is approximately 1-1/2 times the static load.

Suitable means must be provided by the purchaser for anchoring the equipment to the floor. It is essential that the floor be level to avoid distortion of the switchgear structure and the equipment be completely aligned prior to final anchoring. The recommended floor construction is shown in Figure 7. The floor channels must be level and straight with respect to each other. Steel shims should be used for final leveling of the switchgear if necessary. Care should be taken to provide a smooth, hard, and level floor under and in front of the units to facilitate installation and removal of the breaker. If the floor is not level and flush with the floor channels, it will be difficult to handle the breaker because it will not be level with respect to the stationary element.

Recommended practice is to weld the switchgear structure to the floor channels, using a tack weld at points indicated for anchoring on the drawing. If welding facilities are not available the gear should be bolted to the floor channels.



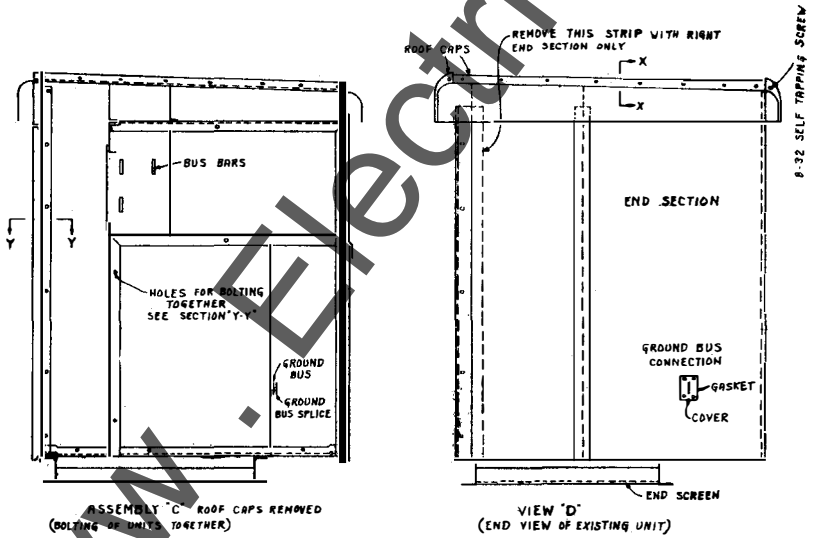
FRONT VIEW
(PANEL END)



ASSEMBLY "B" ROOF CAPS REMOVED
(BOLTING OF UNITS TOGETHER)

VIEW "A"
(END VIEW OF EXISTING UNIT)

WITH REAR ENCLOSURE



ASSEMBLY "C" ROOF CAPS REMOVED
(BOLTING OF UNITS TOGETHER)

VIEW "D"
(END VIEW OF EXISTING UNIT)

ROOF CAP

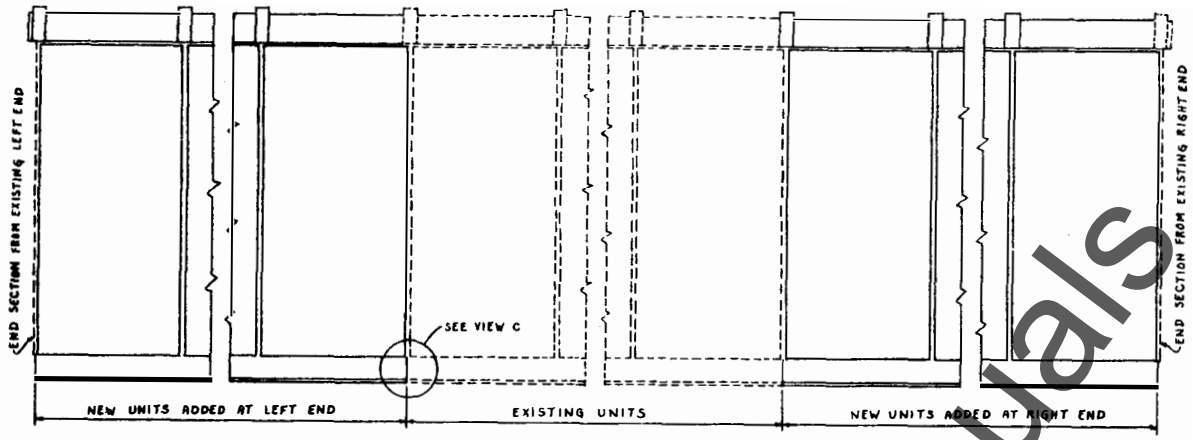
WITHOUT REAR ENCLOSURE

PROCEDURE

1. REMOVE ROOF CAP, END SCREEN, GROUND BUS CONNECTION, AND END SECTION. SEE VIEW "A" & VIEW "D"
2. SET NEW UNIT(S) IN PLACE AND BOLT TOGETHER AS SHOWN IN ASSEMBLY "B" & ASSEMBLY "C"
3. ASSEMBLE ITEMS LISTED IN PROCEDURE NO.1
4. ASSEMBLE NEW ROOF CAPS AS SHOWN IN VIEW "A" & VIEW "D".
5. ASSEMBLE GROUND BUS SPLICE BETWEEN EXISTING AND NEW GROUND BUS. AS SHOWN IN ASSEMBLY "B" & ASSEMBLY "C"
6. ASSEMBLE BUS BARS AND INSULATE PER INSTRUCTION BOOK.

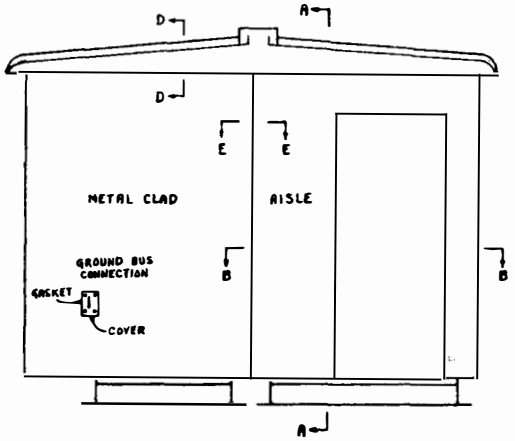
Fig. 18 (545D856)

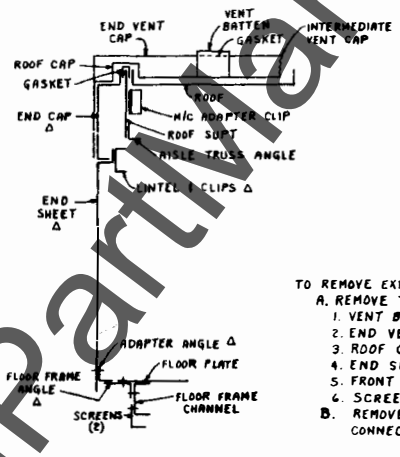
Fig. 18 Outdoor Metal-clad Switchgear - Addition of Units to Line-up



FRONT VIEW

Fig. 19 (7180383)





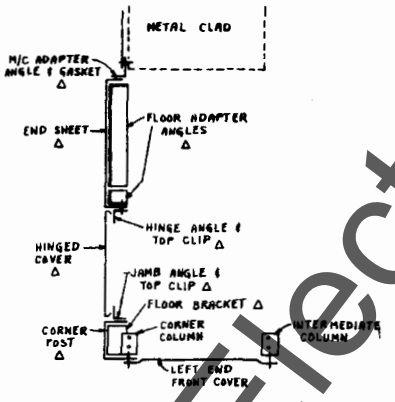
SECTION A-A

TO REMOVE EXISTING END SHEET (LEFT)
- A. REMOVE THE FOLLOWING ITEMS FROM AISLE SECTION
  1. VENT BATTEN
  2. END VENT CAP
  3. ROOF CAPS
  4. END SECTION CONSISTING OF ITEMS MARKED Δ
  5. FRONT COVER (MOVE TO NEW UNIT)
  6. SCREENS (2)
- B. REMOVE ROOF CAP, END SCREEN, GROUND BUS CONNECTION AND END SECTION FROM METAL CLAD SECTION

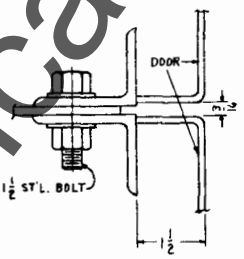
TO INSTALL NEW METAL CLAD UNITS (LEFT)
1. SET NEW UNIT(S) IN PLACE AND BOLT TOGETHER
2. ASSEMBLE ITEMS LISTED IN B
3. ASSEMBLE NEW ROOF CAPS
4. ASSEMBLE GROUND BUS SPLICE BETWEEN EXISTING AND NEW GROUND BUS
5. ASSEMBLE BUS BARS AND INSULATE PER INSTRUCTION BOOK

TO INSTALL NEW PROTECTED AISLE UNITS (LEFT)
1. INSTALL NEW FLOOR FRAMES AND FLOOR PLATE TIE DOWN ANGLE
2. REPLACE FLOOR FRAME ANGLE AT NEW END POSITION
3. INSTALL NEW FLOOR PLATES
4. ERECT NEW CORNER COLUMN (ANGLE)
5. ADD NEW AISLE TRUSS ANGLE AND METAL CLAD ADAPTER CLIP TO EXISTING END ROOF TRUSS AND SUPPORT
6. INSTALL NEW END AISLE TRUSS SUB-ASSEMBLY CONSISTING OF ROOF TRUSS ANGLE, ROOF SUPT, COLUMN CLIP, METAL CLAD ADAPTER CLIP AND ROOF SUPT CLIPS
7. REINSTALL THE ITEMS REMOVED IN A-4
   NOTE:- USE NEW GASKETS AND ALSO INSTALL PREVIOUS END FRONT COVER ON FRONT OF NEW END UNIT
8. INSTALL WIRING AND LIGHTING TROUGH

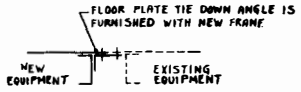
NOTE:- A SIMILAR PROCEDURE IS USED FOR RIGHT END ADDITIONS



SECTION B-B



SECTION E-E



INTERNAL VIEW C

Fig. 19 Outdoor Metal-clad Switchgear with Protected Aisle

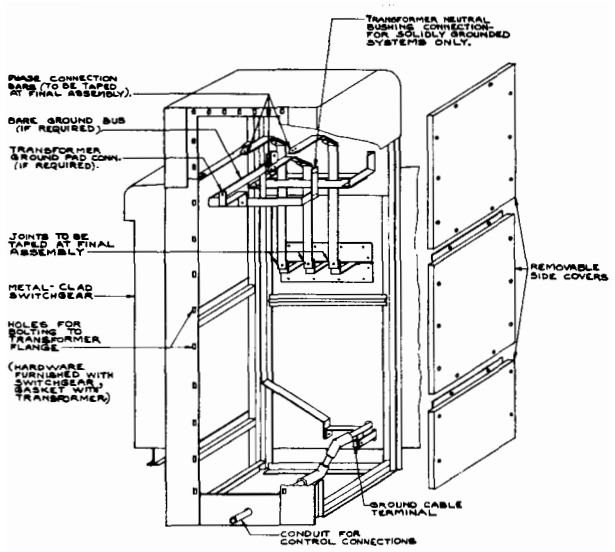


Fig. 20

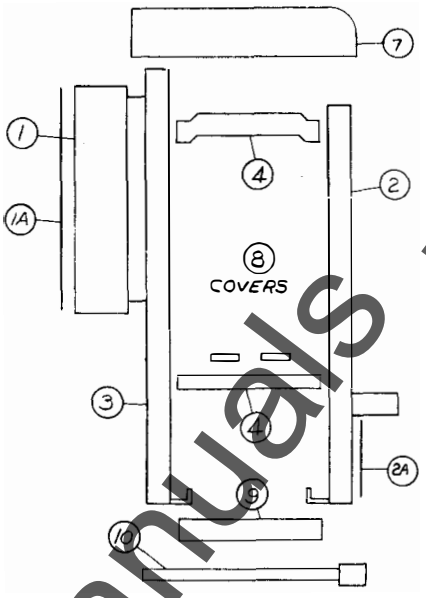


Fig. 21

Outdoor Transition Compartment

Provision should be made in the floor for conduits for primary and secondary cables, located as shown on the floor plan drawing furnished for the particular requisition. If desired, the conduits may be installed before the switchgear. Consideration should be given to conduits which might be required for future connections.

Outdoor Equipment

Outdoor equipments are furnished both with and without rear enclosures. Recommendations for foundations for both types are given in Fig. 8. Primary and secondary conduits should be installed in accordance with the requisition drawings, before the equipment is put into place.

Since outdoor equipments are provided with a 6" base, a transfer truck is required to place the breaker in the housing. The level adjustment on the truck is shown in Fig. 8.

When outdoor equipments are shipped in more than one section, the joint between sections must be weatherproofed. Assemble the gasket between the doors, using cement provided. Refer to Fig. 8, Section B-B. Assemble the gasket between the roof sections, bolt together and install the roof caps. Refer to Fig. 8, Section C-C.

Outdoor Equipment with Protected Aisle

When specified by the purchaser, outdoor equipment is furnished with an enclosed, weatherproof operating aisle. See Fig. 3. The aisle enclosure is shipped separately from the switchgear.

The following procedure outlines the steps necessary to install outdoor equipment with a protected aisle:

(1) Install the switchgear in accordance with the procedure given above for outdoor equipment.

(2) Remove the shipping covers from the control panels. Since the relay and instrument cases are not weather-proof, the control panels should be protected from inclement weather until the installation of the aisle enclosure is completed.

(3) Apply Sterling U-310 varnish to both sides of the gaskets furnished for the joint between the ends of the switchgear and the aisle enclosure and to the surfaces against which the gasket presses and hang the gaskets on the projecting studs at the ends of the switchgear lineup. See Fig. 9, section A-A.

(4) Move the aisle enclosure into position, guiding the holes in the end sheets over the studs on the switchgear lineup and guiding the roof sills between the support clips bolted to the upper front of the switchgear units above the control panels. This operation may be simplified by temporarily loosening the support clips. The floor of the aisle enclosure must fit under the hinged breaker cover of the metal-clad, so the aisle enclosure must be moved into position on a level with the switchgear units. If desired, this job may be simplified by removing the doors over the circuit breaker compartment. To remove these doors, loosen the two bolts holding the lower hinge, remove the hinge, and lower the door to remove the hinge pin from the upper hinge.

(5) Bolt the aisle enclosure in place at both ends, and bolt the roof sills to the support clips, tightening any support clips loosened in the previous operation. Replace any breaker compartment doors previously removed.

(6) If the aisle enclosure was shipped in more than one section, bolt the sections together and assemble the roof caps in the manner described above for roof joints in outdoor switchgear.

(7) Anchor the outside floor sill of the aisle enclosure with anchor bolts placed in accordance with the requisition drawing. See Fig. 9, view Y.

(8) Assemble the dome over the roof opening between the switchgear and the aisle enclosure. See Fig. 9, view X.

(9) Remove shipping braces from aisle enclosure. These braces should be left in place until the aisle enclosure is assembled in order to maintain alignment of the enclosure.

(10) Connect secondary wiring to lights, convenience outlets, etc., in accordance with the wiring diagrams furnished for the equipment.

Since the aisle floor is level with the floor of the switchgear units, no transfer truck is required for outdoor equipment with a protected aisle.

The above procedure describes installation of a protected aisle enclosure with switchgear on one side of the aisle only. If the aisle is common to two lineups of switchgear, the procedure will require slight modification. See the drawings furnished with the requisition for specific instructions.

Transition Compartments

Transition compartments for outdoor unit substations may be one of two types (Figs. 20 and 21). These compartments are normally shipped assembled. The full height compartment (Fig. 20) cannot be disassembled for installation. The throat type compartment (Fig. 21) can be installed in any of three ways, in accordance with the following instructions:

(a) Should the switchgear be positioned on its foundation prior to the power transformer, the complete transition can be mounted on the metal-clad as assembled. Remove covers #8. Apply Sterling U 310 varnish to both sides of gasket 2A, and to the surfaces against which the gasket presses. Bolt transition compartment to throat on metal-clad switchgear. Before jacking the power transformer into its final location, apply Sterling U 310 varnish to both sides of gasket 1A and to the surfaces against which the gasket presses, and place the gasket over the mounting studs on the transformer tank wall. Slide transformer in place, guiding the transformer mounting studs through the mounting holes in #1. Center rubber seal between

Fig. 21 (453A738)

Fig. 20 (261C416)

#1 and #3 before tightening nuts, maintaining 24" between transformer tank wall and end of metal-clad. Do not apply varnish to the rubber seal between #1 and #3. Cut secondary conduit #10 to length and assemble under the transition.

(b) Should the power transformer be positioned on its foundation prior to the switchgear, follow the procedure of paragraph (a) above, except move the switchgear up to the power transformer after assembling the transition compartment to the switchgear.

(c) If the power transformer and metal-clad switchgear are in place, disassemble transition as follows: Remove covers #8 and #9, adapter #1, dome #7, braces #4. Apply Sterling U 310 varnish to both sides of gasket #2A, and to the surfaces against which the gasket presses, before bolting #2 to metal-clad throat. Apply Sterling U 310 varnish to both sides of gasket #1A, and to the surfaces against which the gasket presses, and loosely fasten #1 and #1A to transformer tank. Slide throat of #3 into #1 and maintain approximately 4 1/2" from #3 to tank. Assemble braces #4 top and bottom to maintain size and proper alignment, then tighten #1 to transformer tank. Assemble connections, terminals, supports and complete all joints. Assemble dome #7, side covers #8 and bottom cover #9. Cut secondary conduit #10 to length and assemble under the transition.

Connect heaters located in 13.8 kv class transition compartment.

Indoor transition compartments are shipped assembled together with the adjacent metal-clad switchgear units.

BREAKER REMOVABLE ELEMENT

Before installing or operating the removable element consult the circuit breaker instructions for directions on installation and inspection. The operation of the interlock device is given below.

The elevating mechanism is accurately leveled and checked at the factory and should need no adjustment. Do not install or remove the breaker or make any adjustments unless the breaker is open.

Rub a small amount of contact lubricant D50H47 on the silvered portion of the breaker studs to form a thin coating for contacting purposes.

Lower the elevating mechanism lifting brackets until the lifting brackets are in the fully lowered or test position. The breaker should then enter the housing freely. Push the breaker into the housing until the wide part of the breaker supporting plate rests against the front part of the lifting bracket of the elevating mechanism. The clearance between the interference block on the breaker and the interference block on the interlock mechanism (dimension "X", Fig. 22) should be from 1/16" to 1/8".

Carefully raise the breaker to the connected position. The clearance between the breaker supporting plate and the stop bolts should be not more than 1/32". Then lower and remove it from the unit. When elevating, note that breaker studs center with respect to the stationary disconnecting device or injury to the contacts may result.

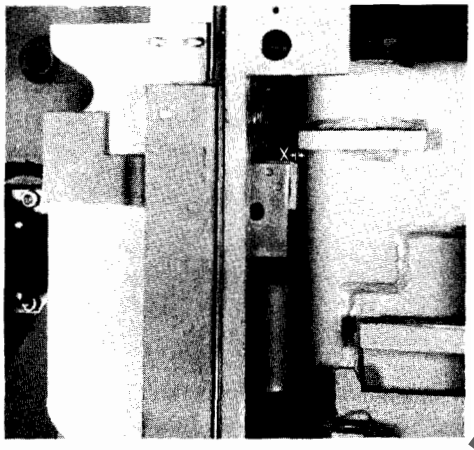


Fig. 22 (802H804)

Fig. 22 Positive Interlock Mechanism Interference Block

Inspect the contact surfaces of both the breaker studs and the stationary disconnecting devices.

(a) Each segment of the stationary disconnecting device should make a heavy impression in the contact lubricant D50H47 on the breaker studs. Contact wipe should start not less than 1/8" from top of contact ball although each contact need not start at the same dimension.

(b) The wipe of the breaker stud inside the stationary disconnecting device, as indicated by the contact lubricant D50H47, should be 3/4" to 7/8". This indicates that the breaker studs contacted at the full pressure center of the silver band on the stationary disconnecting device. See Fig. 11.

(c) Should the inspection of the contacts show that the breaker is not being raised to the proper position, readjust the upper stop bolts and limit switches to raise or lower the breaker to the proper location. Lock the stop bolts in the new position.

(d) If proper contacting cannot be attained by the above methods, it is necessary to adjust the stationary disconnecting device tube. DO NOT MAKE ANY ADJUSTMENT. COMMUNICATE WITH THE NEAREST GENERAL ELECTRIC CO. OFFICE FOR ADDITIONAL INFORMATION.

The trip interlock should be checked to see that the removable element is obstructed from being raised to or lowered from the operating position. Using the manual closing device, close the breaker and then push it into place for elevating. Snap the selector switch to the "Raise" position and pull the clutch handle forward. A definite stop should be encountered preventing the motor circuit limit switch from energizing the circuit. Then trip the breaker manually and elevate to the raised position. Electrically close the breaker. Snap the selector switch to the "Lower" position and pull the clutch handle forward. Again, a definite stop should be encountered preventing the motor circuit limit switch from energizing the circuit.

If the interlock does not function as indicated above DO NOT MAKE ANY ADJUSTMENTS. COMMUNICATE WITH THE NEAREST GENERAL ELECTRIC CO. OFFICE FOR ADDITIONAL INFORMATION.

On units equipped with stationary auxiliary switches (Fig. 45A, reference #69), the clearance between the end of the switch mechanism operating rod and the operating plunger on the circuit breaker should be 0 to 1/8" with the circuit breaker in the raised and open position. Any adjustment in this dimension must be made on the circuit breaker. See instruction book furnished with circuit breaker for method of adjustment. Care should be taken to prevent destroying interchangeability of circuit breakers by excessive adjustment on one breaker.

TESTING CABINET

The testing cabinet, Fig. 23, should be installed on the wall at a location where maintenance and testing of the breaker can be conviently done. Conduits must be installed to carry cables to supply control power for testing.

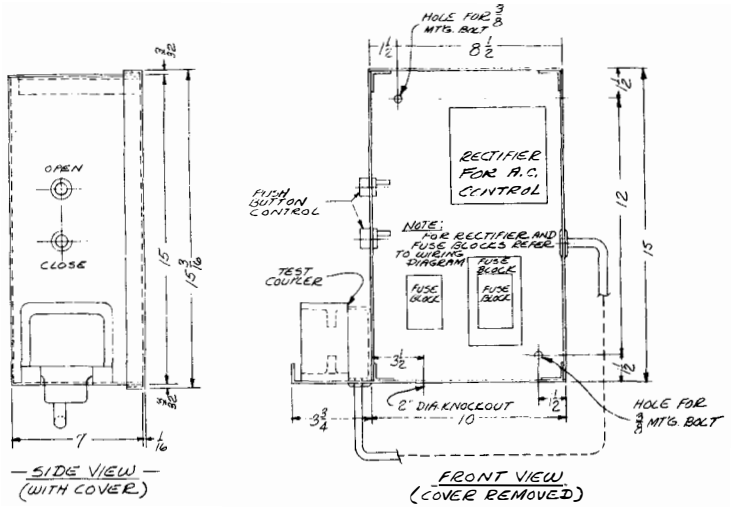


Fig. 23 (899B745)

Fig. 23 Inspection Box for 13.8 KV Metal-clad Switchgear

ADDITION OF UNITS TO EXISTING EQUIPMENT

Before adding units to existing equipment, consult and study all drawings furnished with the equipment. In addition to the usual drawings furnished with new equipment, special drawings may be furnished covering complicated or special assembly work. Also, check to make sure all necessary parts are on hand.

BEFORE ANY COVERS ARE REMOVED OR ANY DOORS OPENED WHICH PERMIT ACCESS TO THE PRIMARY CIRCUITS, IT IS ESSENTIAL THAT THE CIRCUIT BE DE-ENERGIZED.

Figure 18 indicates the special procedures required to add new metal-clad units to outdoor equipment without protected aisle, and Figure 19 indicates the special procedures required to add new metal-clad units to outdoor equipment with protected aisle. For indoor equipment, it is usually necessary only to remove the end cover sheets and to re-assemble them on the new units after these are located and bolted to the existing units. Otherwise, the installation procedure is the same as described above.

When the units are in place and mechanical assembly is completed, assemble the main bus and other primary connections per the instructions below. (Removal of existing compound-filled connection boxes can be easily accomplished by packing the box in dry ice for 2 - 3 hours. Remove the dry ice and the cord tying the box in place, and strike the box with a hammer. The hardened box and compound will crack away from the joint.)

Secondary wiring and control bus connections should be made in accordance with the wiring diagrams furnished with the equipment.

CONNECTIONS

The main bus bars and other connection bars may be either copper or aluminum. In either case, the connection surfaces will be silver plated.

All field assembled joints in conductors, regardless of material or method of insulation, should be made as follows:

(1) Wipe silver clean. Do not use sandpaper or any abrasive on the silvered surface. Avoid handling of cleaned surface as much as possible.

(2) A sufficient quantity of D50H47 grease should be applied to the joint at each contact area so that the complete contact area will be thoroughly sealed with excess grease squeezed out of the joint when tightened.

(3) Brush a thin coat of D50H47 over the outside surfaces of the joint area and hardware covering the silvered area.

(4) In some cases external connections are made to metal-clad bus by bars. The metal-clad bars are normally silver plated. Unplated bars, either copper or aluminum, should not be used to connect to silver plated bars.

MAIN BUS ASSEMBLY

(1) For 13.8 kv or 7.2 kv equipment:
(a) Remove compartment covers.

(b) Bolt splice plates and bus bars together, following assembly instructions above. See also Fig. 25 and Table A, Fig. 24.

TABLE A
Torque Values for Metal-clad Switchgear
(Torque in Inch-Pounds)

Bolt Size	Copper or Steel	Aluminum or Compound
3/8"-16	180-300	180-240
1/2"-13	360-540	360-480
5/8"-11	420-600	420-540

Fig. 24

(c) Complete the taping of the vertical riser bars using insulating tape furnished (2/3 lap) stopping the tape at the bus bar. If the riser bars connect to the bus from below, sufficient tape should be added to prevent compound leakage when filling. Apply a layer of glass tape (1/2 lap) over the insulating tape, stopping the glass tape just inside molded splice cover.

(d) Place molded covers around the bolted splice joints. Note that compound filling space is at top of joint, and add filler pieces furnished for the purpose to the bottom of box and around bus bar laminations (Fig. 20) to prevent compound leakage while filling. Duxseal should be placed over the joints to make the box free of leaks while filling. The Duxseal should be removed after the compound has set. G.E. #860 cord should be used to hold the molded parts securely in place.

(e) Heat G.E. D50H49 compound (furnished) to minimum 200°C and maximum of 220°C. Avoid overheating the compound for the dielectric strength may be seriously affected. Pour the compound into the molded covers intermittently, allowing an interval of cooling to prevent formation of gas or air pockets. The final pouring should be level with the top of the box and should be done only after due allowance for shrinkage is made. Refer to Fig. 15.

(f) Paint the exposed glass tape on vertical riser bars with U310 or U311 varnish furnished.

(g) Taped joints may be used instead of boxed joints. If they are, insulate as follows:

(1) Fill all cavities around bolts and nuts with Duxseal compound to form smooth surface for taping, thus preventing air voids. This compound is not an insulating medium and should not be used for that purpose.

(2) Place 4" wide Irrathene tape over the Duxseal, as shown in Fig. 26.

(3) Wrap with insulating tape provided, as shown in Fig. 39. Where there are sharp angles, apply additional layers to obtain the equivalent of the insulation of the flat surfaces.

(4) Over the insulating tape, apply one layer of glass tape, half lap, as a binder.

(5) Over the glass tape, brush a good coat of U-310 varnish. Varnish may be thinned if necessary, with Xylene, D5B9.

(h) Replace all covers previously removed.

(2) For 4.16 kv equipment:

(a) Remove compartment covers.

(b) Bolt splice plates and bus bars together, following assembly instructions. See Fig. 25 and Table A, Fig. 24.

(c) Place flexible molded cover over joint, as shown in Fig. 15. Note that on joints where no tap is made from bus the opening in the molded cover should be at the top.

(d) Secure flexible cover with self-locking fasteners furnished. Joint insulation is now completed.

(e) Replace all covers previously removed.

(3) In unit substations, the connection bars should be assembled in the transition compartment (Fig. 20 and 21) and the connections at the transformer terminals greased, taped and painted as indicated above. The conduit for secondary circuits should also be assembled in or below the transition compartment.

BUS DUCT

Bus ducts connecting between groups of metal-clad switchgear, or between metal-clad switchgear and other apparatus, should be installed as shown on the arrangement drawings furnished with the ducts. Supports should be provided as indicated on the drawings.

All joints in the bus, including adjustable joints, should be assembled and insulated as described above for main buses. Adjustable joints are provided in long runs of bus duct to allow for variations in building construction, etc. These joints should be loosened before installation of the duct, then tightened after being set in the position required by the fixed points at the ends of the duct.

Outdoor bus ducts must be gasketed at the joints between shipping sections. Coat both sides of the flat gasket and the flanges of both duct sections with Sterling U310 or U311 varnish before assembly. Bolt the two duct sections together. Remove the top cover from one duct section and place 3/8" elastic compound bead along top of joint. Bolt top cover in place and fasten roof cap in place over the joint. See Fig. 24A.

Removable front and rear covers of vertical sections of bus duct must also be

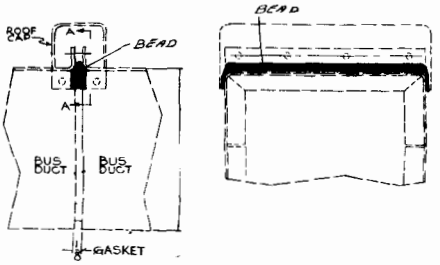


Fig. 24A Bus Duct Gaskets

Fig. 24A (121A6235)

gasketed. Coat both sides of the gasket, the flange of the duct, and the edges of the inside surface of the cover with Sterling U310 or U311 varnish before assembly. Do not bolt these covers in place until all interior assembly work on the duct is completed and access will no longer be required.

Outdoor bus ducts of the 13.8 kv class are provided with heaters. Connect these heaters in accordance with the wiring diagrams furnished with the equipment before energizing the bus duct.

PRIMARY CABLES

The primary cable connections in indoor switchgear are reached by removing the rear bolted covers. In outdoor switchgear with rear enclosures the hinged instrument panel, if present, must be swung open and the bolted covers behind it removed.

Before any primary cable connections are made, the cables should be identified to indicate their phase relationship with the switchgear connections. This is necessary to insure that motors will rotate in the proper direction and that the phase rotation is the same when interconnecting two different sources of power.

There are two common methods of making primary cable connections:

(a) Potheads (see Figs. 40 and 41) are used when it is desired to hermetically seal the end of the cable to make a moisture-proof connection between the cable and the switchgear bus. A pothead also prevents seeping of oil from the end of oil impregnated varnish cambric or paper insulated cable.

(b) Clamp type terminals and wiping sleeve or cable clamp.

In all cases carefully follow the cable manufacturer's recommendations for installation of the type of cable being used, as well as the instructions contained herein. See Figs. 43 and 44. If the cable is aluminum, the conductor surface must be carefully abraided and the cable covered liberally with a joint compound recommended by the cable manufacturer.

POTHEADS

Potheads are mounted on an adapter plate extending across the width of the metal-clad unit as shown in Fig. 10. Where necessary the adapter plate is split into two parts to facilitate the installation of the potheads.

Three-Conductor Potheads

The following description applies to the installation of a three-conductor lead-sheathed cable with a wiping sleeve cable entrance fitting on the pothead. This is the type most generally used. Instructions for installation of other types are included in the text following:

(a) Remove the wiping sleeve and cut the tapered end at a point where the cable will enter it freely, and file off sharp edges. Temporarily reassemble on the pothead.

(b) Train the cable in front of the pothead allowing it to extend about two inches above the top of the porcelain bushings. Handle with care and avoid sharp

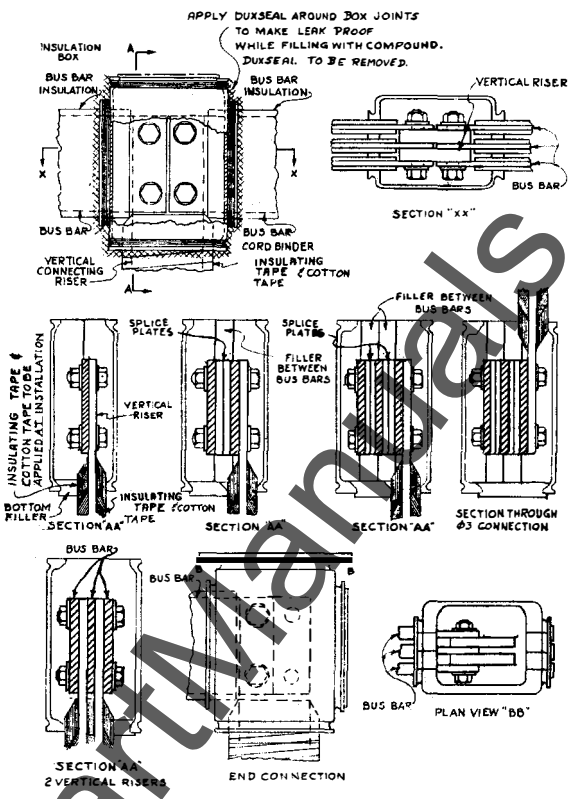


Fig. 25 (K-6500903)

Fig. 25 Method of Making Bus Bar Connections

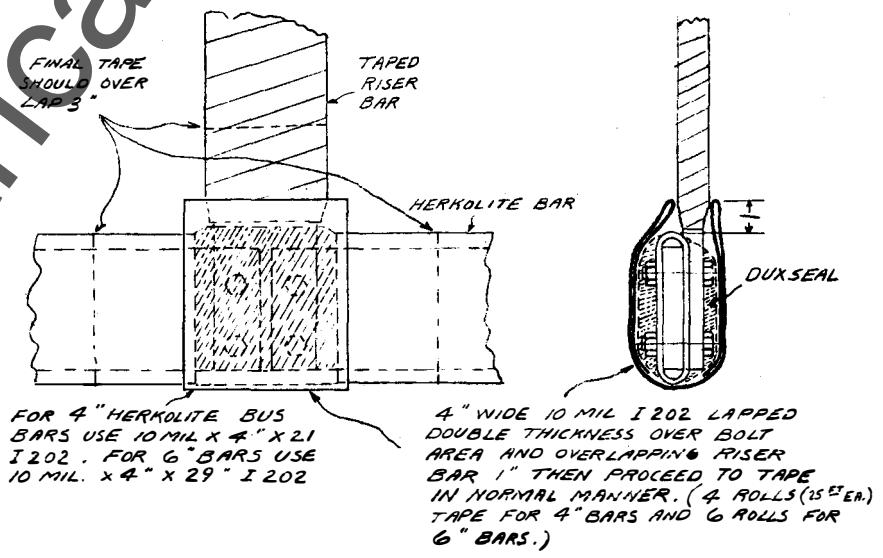


Fig. 26 (10A2714)

Fig. 26 13.8 KV Taped Joints

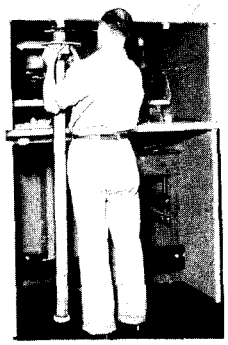


Fig. 27

Fig. 28

Fig. 29

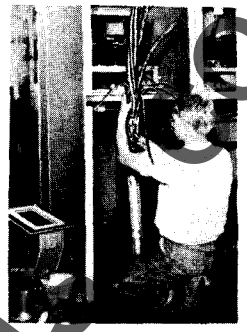


Fig. 30

Fig. 27 (857623)
Fig. 28 (857622)
Fig. 29 (857621)

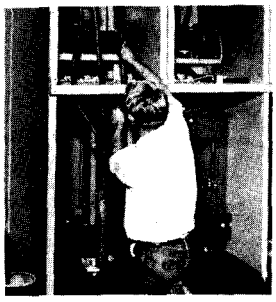


Fig. 31

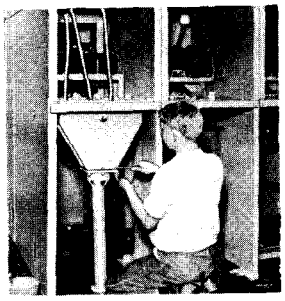


Fig. 32

Fig. 33

Fig. 34

Fig. 30 (857618)
Fig. 31 (857611)
Fig. 32 (857606)

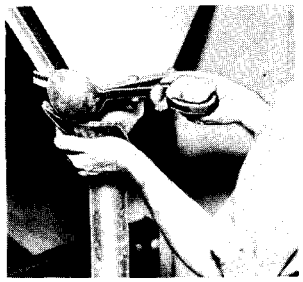


Fig. 35

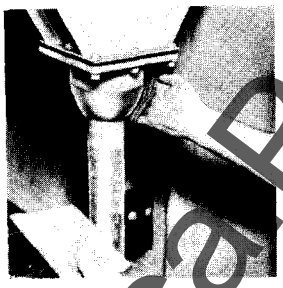


Fig. 36

Fig. 37

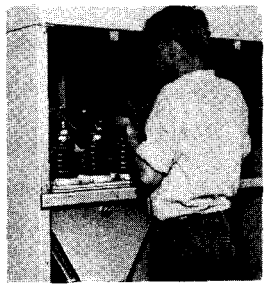


Fig. 38

Fig. 33 (857610)
Fig. 34 (857619)
Fig. 35 (857609)

bending which might damage the insulation. Mark a point on the lead sheath of the cable about 1-1/2 inch above the bottom of the wiping sleeve.

(c) Remove the pothead from the unit, disassemble the wiping sleeve and slip it and its gasket over the cable as shown in Fig. 27.

(d) Remove the lead sheath from the cable to the point marked in operation "b" as shown in Figs. 28 and 29 proceeding as follows:

First, make a cut around the cable half through the sheath at the reference point. Second, split the sheath lengthwise between the cut and the cable, holding the cutting tool at an angle to the cable radius to avoid damaging the insulation. Third, remove the sheath by catching the split edge with pliers and pulling directly away from the cable axis.

Clean and tin the outside of the lead sheath for about 3 inches and bell out the end of the lead sheath.

(e) Remove the belt and interphase insulation down to within 1-1/2 inches of the lead sheath as shown in Fig. 30. The last few layers should be torn off to avoid damaging the individual conductor insulation. To reinforce and protect the conductor insulation, wrap two layers of half lapped varnished cambric or irrathene tape over the factory insulation.

(f) Disassemble insulator support plate from pothead body. The insulators should not be removed from the support plate because they are factory assembled for proper compression of their gaskets. Place pothead body over cable and then fan out the conductors into approximately the final position, as shown in Figs. 31, 32. The middle conductor should be bowed slightly for final adjustment of length. Avoid sharp bends and damage to the insulation, particularly at the crotch.

(g) For system voltage above 7500 volts it is recommended that stress relief cones be built up when single-conductor or three-conductor shielded cable is used. Construct stress relief cones in accordance with the recommendations of the cable manufacturer. See Fig. 41 for one recommended method. On lower voltage cables, belling out the end of the lead sheath ordinarily provides sufficient stress relief. (Stress cone material will not be furnished with pothead).

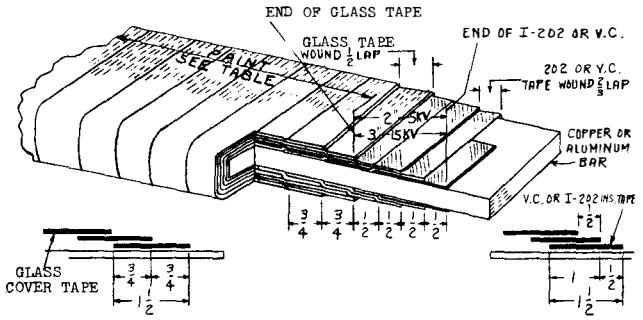
(h) Bolt pothead body to metal-clad adapter plate. Shape conductors into final position, then cut off each conductor to fit its terminals.

(i) Remove pothead terminals from insulators. Remove two inches of insulation from the end of each conductor and assemble pothead terminals to cables.

(j) Assemble gaskets where shown in Fig. 41 and bolt insulator support plate and wiping sleeve to pothead body. Compress gaskets by a partial turn on each bolt successively until the gasket is uniformly compressed to dimensions shown in Fig. 41. Check to be sure the terminal studs are seated properly on their gaskets, then screw contact nut in place after assembling top gaskets and washers. See Figs. 32, 33 and 34.

Fig. 36 (857604)
Fig. 37 (857607)
Fig. 38 (857608)

Fig. 39 (K-6500514)



INSULATION LEVEL	INSULATION LAYERS (NOTE 1) I-202 NOTE 2	GLASS NOTE 3	V.C. NOTE 4	PAINT APPLY ONE COAT LIBERALLY
5000V	2	1	4	STERLING U-311 BLACK
15,000V	4	1	7	STERLING U-310 BROWN

NOTE 1:
I-202 & V.C. - One layer, wound 2/3 lap requires 3 turns around bar in one width of tape. One layer thickness is 3 times tape thickness.
GLASS - One layer, wound 1/2 lap requires 2 turns around bar in one width of tape. One layer thickness is 2 times tape thickness.

NOTE 2:
Irrathene #202, width 1 1/2" thickness 0.010". Keep tension on tape at all times while applying.

NOTE 3:
Glass A2L12B width 1 1/2" thickness 0.004".

NOTE 4:
Varnished cambric A22A11A (#992) width 1 1/2", thickness 0.012".

Fig. 39 Insulation of Connection Bars

Fig. 40 (41A4757)

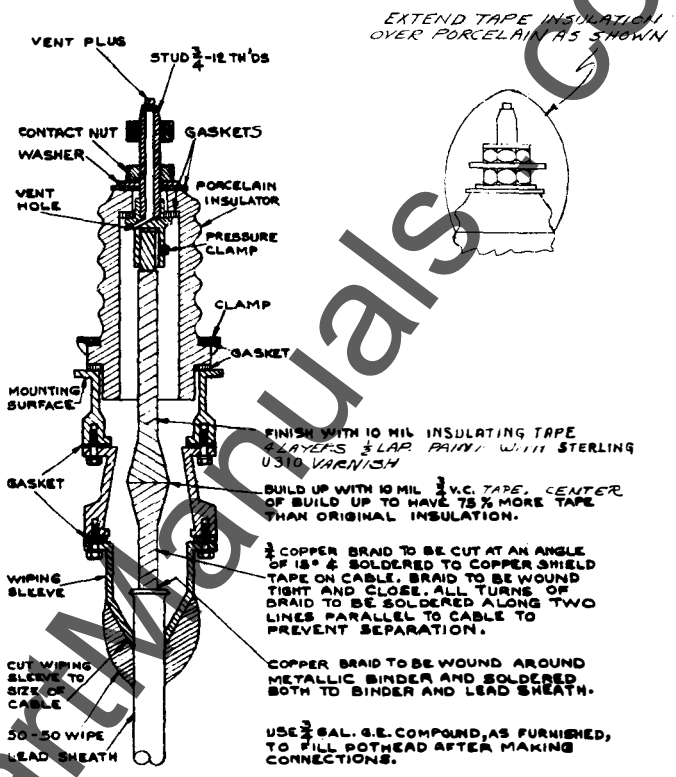


Fig. 40 Single-Conductor Pothead with Stress Cone

(k) Make a plumber's wiped joint between the wiping sleeve and the lead sheath of the cable, as shown in Figs. 35 and 36.

(l) Remove the 3/4" filling plug in the pothead body, the pipe plugs in the top of the studs and in the insulator supportplate. Insert a stand pipe and funnel in the filling hole of sufficient height to extend above the top of the studs as shown in Fig. 37.

Heat compound to the pouring temperature, 165°C for #227 or 135-160°C for Novoid "X". Do not overheat compound as higher temperatures may injure cable insulation and also result in excessive shrinkage of the compound while cooling. Before and while filling, warm pothead body and stand pipe to prevent sudden chilling of compound which may result in the formation of air voids. The pothead may be warmed by playing a blowtorch over the body, taking care that no direct heat reaches the porcelains or gaskets.

Pour until the compound appears at the insulator support plate plug holes. Insert plugs and continue filling until it appears at holes at the top of terminal studs. Insert plugs and continue pouring while the pothead and compound cools to fill air voids which might form.

When the pothead has cooled, remove filling pipe and insert plug. Clean off compound which might have overflowed on the outside of the porcelains.

(m) Assemble pothead connection bars, applying grease as outlined under "Connections" (Page 20). See Fig. 39. Insulate connections as follows:

(1) Fill all cavities around bolts and nuts with Duxseal compound to form smooth surface for taping, thus preventing air voids. This compound is not an insulating medium and should not be used for that purpose.

(2) Wrap with I202 Irrathene tape provided, as shown in Figs. 39, 40 and 41, the number of layers depending on the voltage rating of the equipment. Where there are sharp angles, apply additional layers to obtain the equivalent of the insulation of the flat surfaces.

(3) Over the insulating tape, apply one layer of glass tape, half lap, as a binder.

(4) Over the glass tape, brush a good coat of varnish (U-310 for 15 kv and U-311 for 5 kv). Varnish may be thinned if necessary, with Xylene, D50B9.

Single-Conductor Potheads

The procedure for installation of single-conductor potheads is in general the same as described for three-conductor potheads.

Cable Entrances Other Than Wiping Sleeves

Stuffing box cable entrance fittings are used for cables other than lead sheathed. These fittings may be provided with or without armor clamps as necessary.

The fitting consists of a cast and machined base, one or more rubber or neoprene washers, and a packing nut which compresses the washers around the cable. These parts should be assembled on the cable in the above order, with the base nearest to the pothead. The packing nut should be tightened after the cable is located in the pothead and before any compound is poured.

Where an armor clamp is required, it is usually made an integral part of the packing nut. This requires that the packing nut and armor clamp be tightened on the cable before the assembly of the pothead is completed.

Cable Sheath or Conduit Grounding

Where three-conductor conducting sheath or shielded cables are used, or where non-conducting sheath cable is carried in metallic ducts or conduits, it is usually desirable that both ends of the cable sheath or conduit be grounded directly to the switchgear ground bus or structure or other apparatus. In some cases this may be accomplished by the mounting of potheads or terminating fittings on a grounded support. When such mounting cannot be arranged, a separate ground wire should be connected between the cable sheath or conduit and the switchgear ground bus.

Where single conductor conducting sheath cables are used, the same procedure should be observed, except that only one end of the sheath should be grounded. This also applies to single conductor non-conducting sheath cables in separate metallic conduits. Where three phases are carried by single conductors in a common metallic conduit, grounding procedure should be the same as that described for three conductor cables.

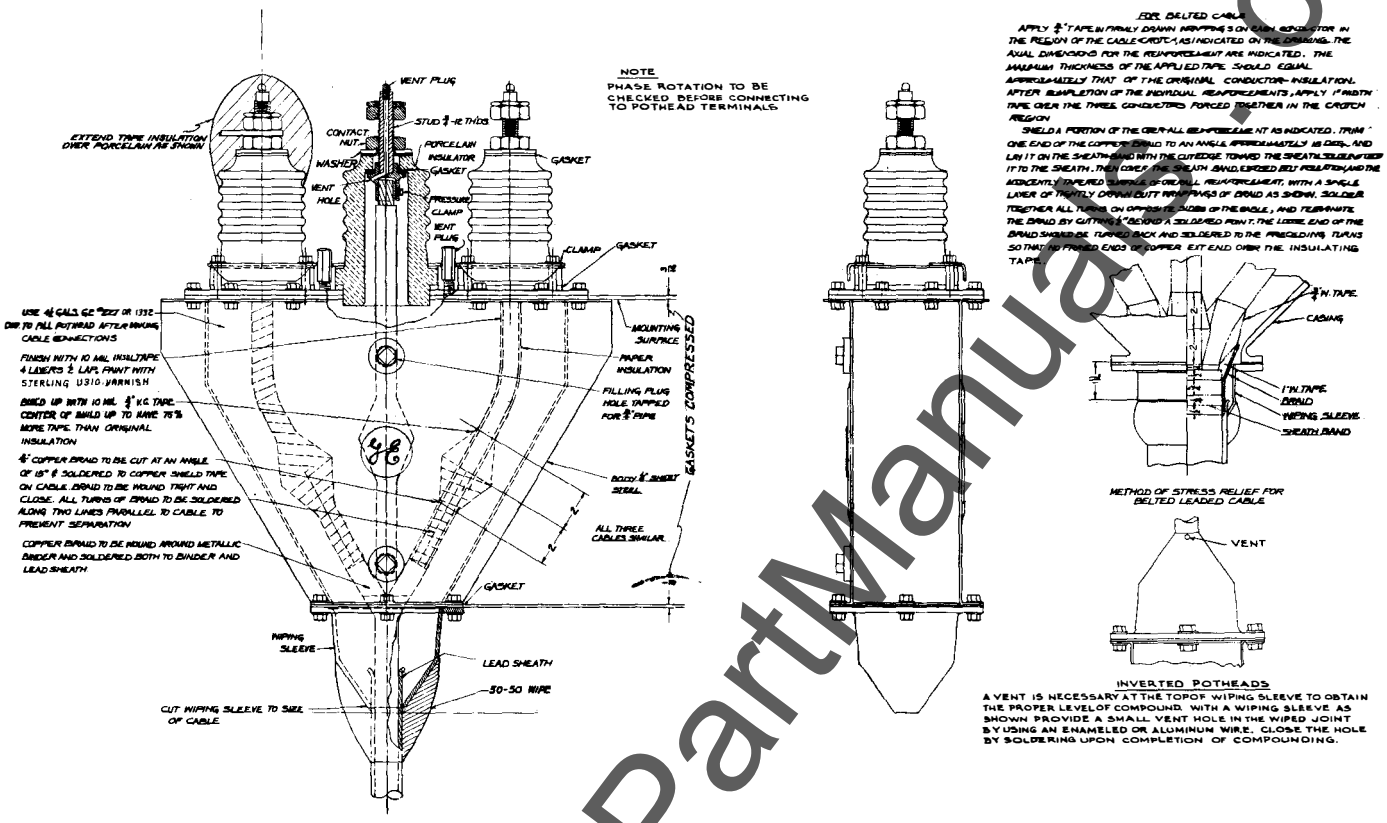


Fig. 41 (T-6595322)

Fig. 41 Triple-Conductor Pothead

TERMINATION WITHOUT POTHEAD SINGLE-CONDUCTOR

1. Cut cable to proper length.

2. Remove jacket and cable tape for distance of A plus B plus 3 inches, plus length to be inserted into terminal lug.

3. Unwrap shielding tape to point M, cut and solder it in place avoiding excessive heat on insulation. Remove outer semi-conducting tape for same distance. Thoroughly clean surface from which the semi-conducting tape was removed.

4. Remove insulation and inner semi-conducting tape to expose conductor for distance of one inch plus length to be inserted into terminal lug.

5. Attach terminal lug to conductor. If the cable is aluminum, the conductor surface must be carefully abraided and the cable covered liberally with a joint compound recommended by the cable manufacturer.

6. Taper insulation for one inch as shown.

7. Apply end seal. Clean surface over which splicing tape is to be applied and coat with G.E. No. A50P68 adhesive cement or equivalent. When solvent evaporates, build up with splicing tape GE8380 or equivalent, as shown.

Rated kv Phase to Phase	Dimensions in Inches	
	A*	
	Indoors Dry Locations	B
2 to 5	5	2
6 to 10	9	3
11 to 15	13	4

* For ungrounded neutral use 1.33 times the dimensions in selecting distance A.

8. Build stress cone. Clean cable surface and coat with G.E. No. A50P68 adhesive cement or equivalent. When solvent evaporates, build up cone with splicing tape GE-8380 or equivalent, for length B plus B. Between points M and P, tape is applied so that wrapped thickness at N is equal to 75% of the original insulation thickness - and so that the cone tapers to zero thickness at points M and P. Apply one layer No. 33 Scotch tape or equivalent, half lapped. Obtain a smooth wrapping but do not stretch tape more than necessary.

9. Pass a turn of tightly drawn braid around exposed portion of shielding tape at point M and solder in place. Then apply shielding braid in tightly drawn 1/6 inch lap wrappings to point N and spot solder. Terminate the braid by cutting 1/2 inch beyond soldering point. Turn down and solder loose ends to preceding turns. Wrap four to six turns of No. 19 AWG tinned copper wire around shielding braid and solder. Solder all turns of braid together along three lengthwise lines equally spaced around braided surface.

10. Solder ground strip over shielding tape near cable covering. Cover stress cone with one layer No. 33 Scotch tape, half lapped. Obtain a smooth wrapping but do not stretch tape more than necessary. Add two layers of splicing tape.

11. Pencil jacket for 1/2 inch as shown. Clean surface. Take particular care in cleaning outside jacket surface in order to entirely remove black wax finish. Coat with G.E. No. A50P68 adhesive cement or equivalent. When solvent evaporates, apply splicing tape GE8380 or equivalent and make sheath seal as shown on drawing. Apply one layer No. 33 Scotch tape or equivalent, half lapped. Obtain a smooth wrapping but do not stretch tape more than necessary.

12. Over entire termination, apply two layers of No. 33 Scotch tape or equivalent, half lapped, in manner to shed water. Obtain a smooth wrapping but do not stretch tape more than necessary.

Fig. 42 (8026383)

Fig. 43 (8230046C)

Fig. 44 (8232004C)

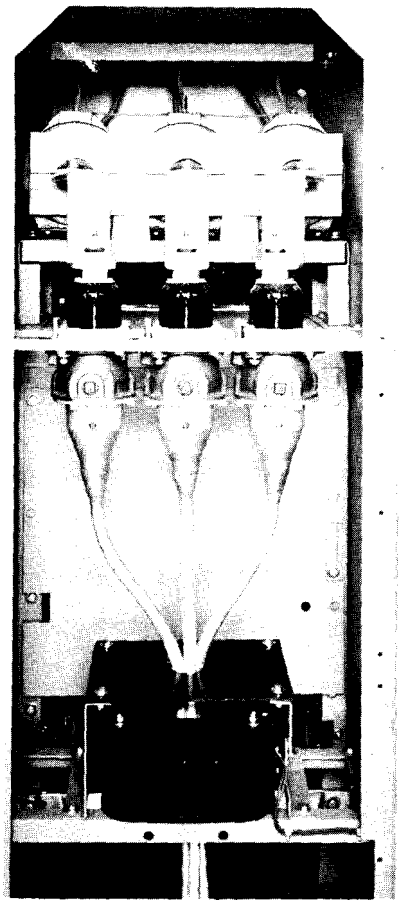


Fig. 42 Rear View of Unit Showing Through-Type Current Transformers

TERMINATION WITHOUT POTHEAD MULTI-CONDUCTOR

Make termination as indicated for single-conductor except - substitute the following for paragraphs 10, 11 and 12;

Pencil jacket 1/2 inch. Clean surface over which sheath moisture seal is to be applied. Take particular care in cleaning outside jacket surface in order to entirely remove black wax finish. Coat with G.E. No. A50P68 adhesive cement or equivalent. Allow to dry. Apply splicing tape GE8380 or equivalent to make moisture seal as shown. This is done by starting wrapping tape near end of jacket and wrapping over ground wires for 1-1/2 inches. Bend ground wires out and back over taping just applied and continue applying lapped layers of tape to completion of moisture seal including a complete tape seal in crotch formed between the three conductors. Bond and ground the ground wires.

For a multi-conductor cable not having ground wires, the individual terminations should have grounding strips applied as for a single-conductor termination. These

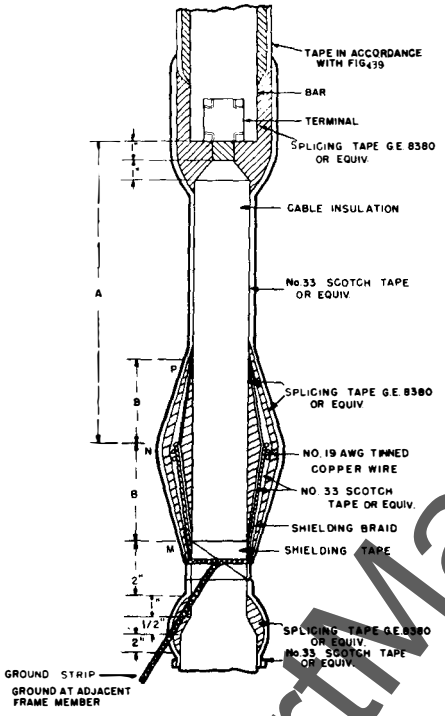


Fig. 43 Termination Without Pothead Single-Conductor

grounding strips are to be joined together to a common ground. This common ground must then be grounded.

GROUND FAULT CURRENT TRANSFORMERS (THROUGH-TYPE)

Through-type current transformers (see Fig. 42) are furnished where specified for sensitive protection against ground faults. These transformers are normally installed in a horizontal position directly above or below the primary cable terminals, so that the primary cable or cables can pass through them. One transformer is required for each three-phase circuit.

Where armored cable is used, the armor must be terminated and grounded before the cable passes through the transformer. Armor clamps are furnished for this purpose when specified.

When lead or other conducting sheath cable, or cable with shielding tape or braid is used, it is recommended that the sheath or shield be grounded solidly to the switchgear ground bus. The ground lead should be bonded to the sheath or shield on the side of the current transformer away from the primary terminals. In cases where the ground cannot be applied before the cable passes through the transformer, bond the lead to the sheath or shield between the transformer and the primary terminals. The ground conductor must then be passed back along the cable path through the current transformer before being connnected to the ground bus.

Where potheads are used in units provided with ground fault current transformers, the pothead mountings must be insulated from ground.

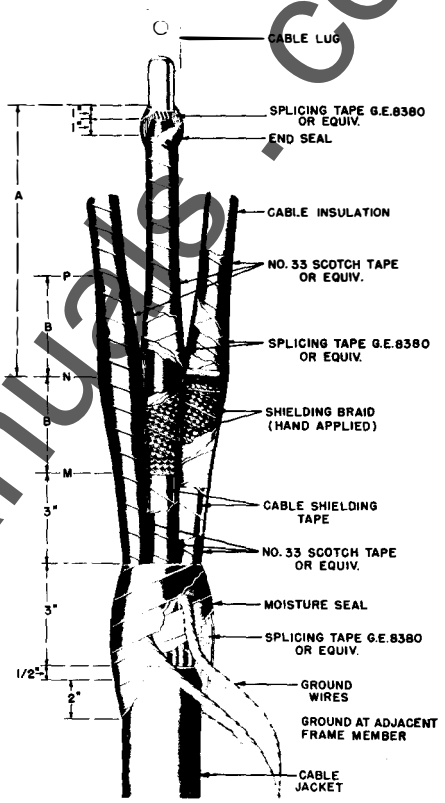


Fig. 44 Termination Without Pothead Multi-Conductor

CONTROL CABLES

When control conduits enter the unit from below, the conduit should not extend more than 4 inches above the floor. The control cables may be pulled through the conduits before or after the switchgear is installed, whichever is more convenient.

Connect the cables to the terminal blocks in accordance with the wiring diagrams furnished for the requisition.

If the control conduits enter from above, drill the top and bottom covers of the front enclosure wiring trough to suit the conduits. Fasten the conduits to the bottom cover with locknuts.

The cables from the control power source to the switchgear should be large enough to avoid excessive voltage drop when the circuit breakers are operated. See testing instructions.

Where units have been split for shipment, any control or other secondary leads which must connect across the split will be arranged with terminal blocks in the cross trough or convenient side sheet so that the wires can be reconnected. The wires will be cut to length and formed before being folded back so that a minimum of time will be required for reconnecting them.

GROUND BUS

The ground bus is bolted to the rear of the frame near the bottom. It is arranged so that connections to the station ground can be made in any unit. Where the equipment is shipped in more than one group, the sections of ground bus must be connected by using the splice plates furnished with the equipment. Apply grease and assemble joints as outlined under "Connections" (Page 20). Ground bus connections are made in the lower portion of the cable entrance compartment. The switchgear ground bus must be connected to the station ground bus by a conductor having a current carrying capacity equal to that of the switchgear ground bus. It is very important that the equipment be adequately grounded to protect the operator from injury when short circuits or other abnormal occurrences take place and to insure that all parts of the equipment, other than live parts, are at ground potential.

LIGHTNING PROTECTION

It will be the responsibility of the purchaser to provide suitable lightning arresters to protect the switchgear from damage due to lightning. The General Electric Company's recommendations as to the types of circuits requiring lightning protection, and a list of recommended lightning arresters, are contained in Bulletin GER-141, copies of which are available upon request.

DOOR ALIGNMENT

If for any reason it is necessary to realign the doors of metal-clad switchgear during installation the procedure given in the following paragraphs should be followed.

After checking that the switchgear is level and plumb as described above, start at either end of the switchgear lineup and realign each door individually as required.

The top of each door should be level with the adjacent doors; the sides of each door plumb; the surface of each door flush with the adjacent doors; and the space between adjacent doors equalized to permit their free swing and present a neat appearance. The door stops should be adjusted to permit a door swing of approximately 105°.

Doors may be raised or lowered vertically, or moved forward or backward horizontally, by loosening the hinge mounting nuts on the left side sheet and shifting the hinge and door assembly as allowed by the slotted holes in the hinge.

Doors may be shifted to the right or left by adding or removing washers or shims from between the hinge and side sheet.

Doors may be plumbed by slightly bending the appropriate hinges. To do this, open the door and insert a drift pin in either of the two holes in the hinge. Pulling forward on the drift pin will move the door to the right, and pushing back will move the door to the left. Adjust each hinge individually as required to plumb the door.

When properly aligned, the doors of outdoor switchgear should be tightly seated on the gasket all around. After aligning such doors, close and latch the door and check the seal by running a 3" x 5" card, shipping tag, IBM card, or some similar card around the edge of the door. If the card will pass between the door and the gasket, the door is improperly adjusted, and should be readjusted until the card will no longer pass through.

TESTING AND INSPECTION

After the equipment has been installed and all connections made, it should be tested and inspected before putting in service. Although the equipment and devices have been completely tested at the factory, a final field test should be made to be sure that the equipment has been properly installed and that all connections are correct and have not become loose in transportation. The primary equipment should be completely de-energized while the tests are in progress.

Directions for testing devices such as relays, instruments and meters are given in the instruction book furnished for each device. The settings of the protective relays must be coordinated with the other relays on the system and therefore these relays must be set by the purchaser. General instructions on setting the relays are given in the relay instruction books. Special instruction books are furnished for complicated automatic equipments, describing the sequence of operation of the devices required to perform the desired function.

When transformers are furnished to supply the control power, the primary taps should be selected so that the control voltage indicated on the wiring diagram is obtained on the secondary of the transformer. When a battery is used to supply the control power, the cables from the battery to the switchgear should be large enough to avoid excessive voltage drop. The voltage at the terminals of the breaker closing coils, when the breaker is being closed, should not be less than 112.5 volts for 125 volt coils and 225 volts for 250 volt coils.

The operation of the breaker with its associated devices may be tested in the unit while the equipment is energized by use of the test coupler which is furnished. Lower the breaker to the test or down position. Attach the test coupler to connect the breaker secondary disconnecting device to that on the structure.

High potential tests to check the integrity of the insulation are not necessary if the installation instructions in this book are carefully followed. If the purchaser wishes to make high potential tests the voltage should not exceed 75% of the AIEE factory test voltages.

Potential transformers and control power transformers must be disconnected during high voltage testing.

OPERATION

The operation of metal-clad switchgear is similar to that of other types except that it provides maximum safety to the operator and the feature of easy removal and replacement of the circuit breaker.

All circuit breaker removable elements of the same type and rating which have duplicate wiring may be interchanged.

BREAKER POSITIONING

To place the circuit breaker in operating position, proceed as given below:

Clean contacts and cover with a very thin coating of Contact Lubricant D50H47.

Push the breaker into the unit until it rests against the stop.

To raise the breaker, operate the elevating control selector switch on the elevating motor to "Raise". A clutch handle just above the elevating motor is then pulled forward until it closes the clutch limit switch and engages the motor to raise the breaker in the housing. The clutch handle is held in this position until a limit switch on the structure opens to stop the motor at the end of the upward travel of the breaker. The selector switch must not be used to energize or interrupt the motor circuit at any time.

To lower the breaker, proceed the same as for raising except operate selector switch to "Lower".

The clutch must be held in the engaged position; otherwise, a spring will return it to its normal position opening the electrical circuit to the motor.

The breaker may be raised and lowered by an emergency hand wrench which can be inserted after removing the motor.

The motor is removed by unlatching the motor assembly from the support and disconnecting the motor lead plug.

After removing the motor, pull the clutch forward and insert the manual wrench into the end of the clutch coupling. The breaker must be tripped before the wrench can be inserted and held in the clutch coupling.

TRANSFER TRUCKS

Circuit breaker transfer trucks are furnished with outdoor metal-clad switch-

gear to facilitate moving of circuit breakers from unit to unit or to maintenance areas. The platform at the front end of the transfer truck is adjustable in height. See Fig. 8, view A, for instructions for adjustment. The truck is equipped with two latches, one to hold the breaker on the truck and one to hold the truck to the metal-clad switchgear unit. Both latches engage automatically, and both are released by a single T-shaped foot pedal on the rear of the truck. Depressing the left side of the pedal unlatches the truck from the switchgear unit, and depressing the right side of the pedal unlatches the breaker from the truck.

SPACE HEATERS

Space heaters are provided in all outdoor equipment in order to keep the inside temperature several degrees higher than that outside. Heaters are also furnished for indoor equipment when it is known that abnormal atmospheric conditions exist at the installation, or when specified by the purchaser.

By maintaining a slight temperature differential, the heaters help facilitate drying and prevent condensation and the resulting corrosion and insulation deterioration which might occur.

Heaters are normally located at the sides of the breaker units, a few inches above the floor. In auxiliary compartments with a single rollout, the heaters will be in the space above the rollout. In auxiliary compartments with two rollouts, the heater will be on one of the rollouts, for greater accessibility. Heaters may also be located in superstructure compartments, transition compartments, and in bus ducts, if the operating conditions require them.

Before energizing the heaters, be sure the power source is of the proper voltage, frequency, and phase arrangement, and is connected in accordance with the wiring diagrams furnished with the equipment. Also, be sure to remove all cartons and miscellaneous material packed inside the units before energizing the heaters.

Heaters should be visually inspected several times a year to make sure they are operating properly.

It is recommended that the heaters be energized at all times and that thermostatic control not be used. If thermostatic control is used, the contacts of the thermostat should be set to close between 95 F and 100 F on falling temperature, de-energizing the heaters only when strong sunlight beats on the switchgear. Under no condition should a differential thermostat be used to control the heaters because under conditions of extremely high humidity this type of thermostat will not operate at all times to keep the heaters on enough to prevent condensation in the switchgear.

MAINTENANCE

A regular maintenance schedule should be established to obtain the best service and reliability from the switchgear. Plant operating and local conditions will dictate the frequency of inspection required. For specific information regarding the maintenance of devices, such as circuit breakers, relays, meters, etc., refer to the separate instruction book furnished for each device. The inspection cabinet, which is furnished, provides a convenient means for maintaining the circuit breakers. Under normal conditions the protective relays do not operate, therefore, it is important to check the operation of these devices regularly.

A permanent record of all maintenance work should be kept, the degree of detail depending on the operating conditions. In any event, it will be a valuable reference for subsequent maintenance work and for station operation. It is recommended that the record include reports of tests made, the condition of equipment and repairs and adjustments that were made.

BEFORE ANY COVERS ARE REMOVED OR ANY DOORS OPENED WHICH PERMIT ACCESS TO THE PRIMARY CIRCUITS, IT IS ESSENTIAL THAT THE CIRCUIT BE DE-ENERGIZED.

The primary circuits of metal-clad switchgear are insulated in order to reduce the size of the equipment. However, this insulation, except in one or two instances, requires a certain amount of air gap between phases and to ground to complete the insulation. Inserting any object in this air space, when equipment is energized, whether it be a tool or a part of the body, may under certain conditions, in effect, short circuit this air gap and may cause a breakdown in the primary circuit to ground and cause serious damage or injury or both.

Care should be exercised in the maintenance and checking procedures that accidental tripping or operation is not initiated.

The switchgear structure and connections should be given the following overall maintenance at least annually.

1. Thoroughly clean the equipment, removing all dust and other accumulations. Wipe clean the buses and supports. Inspect the buses and connections carefully for evidence of overheating or weakening of the insulation.

2. Measure the resistance to ground and between phases of the insulation of buses and connections. Since definite limits cannot be given for satisfactory insulation resistance values, a record must be kept of the reading. Weakening of the insulation from one maintenance period to the next can be recognized from the recorded readings. The readings should be taken under similar conditions each time if possible, and the record should include the temperature and humidity.

High potential tests are not required, but if it seems advisable, based on the insulation resistance tests or after repairs, the test voltage should not exceed 75% of the AIEE factory test voltage. Potential transformers and control power transformers must be disconnected during high voltage testing.

3. Clean elevating mechanism and lubricate jack screws and gears with lubricant G.E. Co. #D50H15 (Atlantic Ref. Co. #52 or equal).

4. Check primary disconnecting device contacts for signs of abnormal wear or overheating. Clean contacts with silver polish. Discoloration of the silvered surfaces is not ordinarily harmful unless atmospheric conditions cause deposits such as sulphides on the contacts. If necessary the deposits can be removed with a good grade of silver polish.

Before replacing breaker, apply a thin coat of contact lubricant D50H47 to breaker studs for lubrication.

5. Check to see that all anchor bolts and bolts in the structure are tight. Check tightness and continuity of all control connections and wiring.

6. If the switchgear is equipped with heaters, check to see that all heaters are energized and operating.

OUTDOOR ACRYLIC PAINT FINISH

The outside of standard outdoor switchgear has acrylic paint finish, blue gray ASA #24, providing improved resistance to all atmospheric conditions, longer life and less maintenance than with ordinary paint finishes.

If it is desired to refinish acrylic painted switchgear, it is necessary to use one of the following procedures in order to secure the best adhesion of the paint to the original finish.

A. Refinishing with Acrylic Paint. It is recommended that refinishing be done with Du Pont acrylic paint of the desired color. Obtain materials and instructions for application from the Du Pont Company.

B. Refinishing with Alkyd or Oil Base Paints. Two methods are recommended:

1. Spray one sealer coat of Du Pont 233E75300 or equivalent which has been reduced to spraying viscosity with Du Pont 37692 or 37666 thinner. Air dry for one hour. Apply alkyd or oil base paint.

2. Spray one sealer coat of Arco 214-806 primer which has been reduced to spraying viscosity with Xylol. Air dry for one hour. Apply alkyd or oil base paint.

RENEWAL PARTS

ORDERING INSTRUCTIONS

1. RENEWAL PARTS SHOULD BE ORDERED FROM THE HIGH VOLTAGE SWITCHGEAR DEPARTMENT.
2. ALWAYS SPECIFY THE REQUISITION NUMBER ON WHICH THE EQUIPMENT WAS ORIGINALLY FURNISHED.
3. SPECIFY THE QUANTITY, REFERENCE NUMBER, DESCRIPTION AND THIS BULLETIN NUMBER.
4. STANDARD HARDWARE, SUCH AS SCREWS, BOLTS, NUTS, WASHERS, ETC., IS NOT LISTED. SUCH ITEMS SHOULD BE PURCHASED LOCALLY.
5. FOR PRICES, REFER TO THE NEAREST OFFICE OF THE GENERAL ELECTRIC COMPANY.
6. IF INSULATING MATERIAL, SUCH AS TAPE, VARNISH, COMPOUND, ETC., IS REQUIRED, IT MUST BE SPECIFIED SEPARATELY.
7. IF PARTS LISTED SEPARATELY ARE TO BE ASSEMBLED AT THE FACTORY, ORDER MUST SO STATE.
8. NOT ALL PARTS LISTED HEREIN WILL BE USED ON ANY ONE EQUIPMENT. PARTS NOT USED IN ORIGINAL EQUIPMENT SHOULD NOT BE ORDERED AS RENEWAL PARTS.

PRIMARY DISCONNECT DEVICES (SEE FIG. NO. 10)

REF. NO.	DESCRIPTION
5	Front Primary Disconnect Device Assembly, 3 Pole, Complete with Connections
6	Rear Primary Disconnect Device Assembly, 3 Pole, Complete with Connections

NOTE: Insulating material required for Ref. Nos. 5 and 6 will be furnished with order.

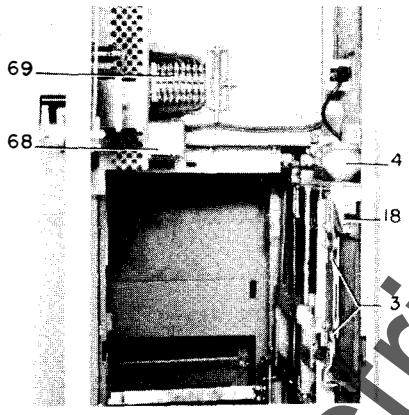
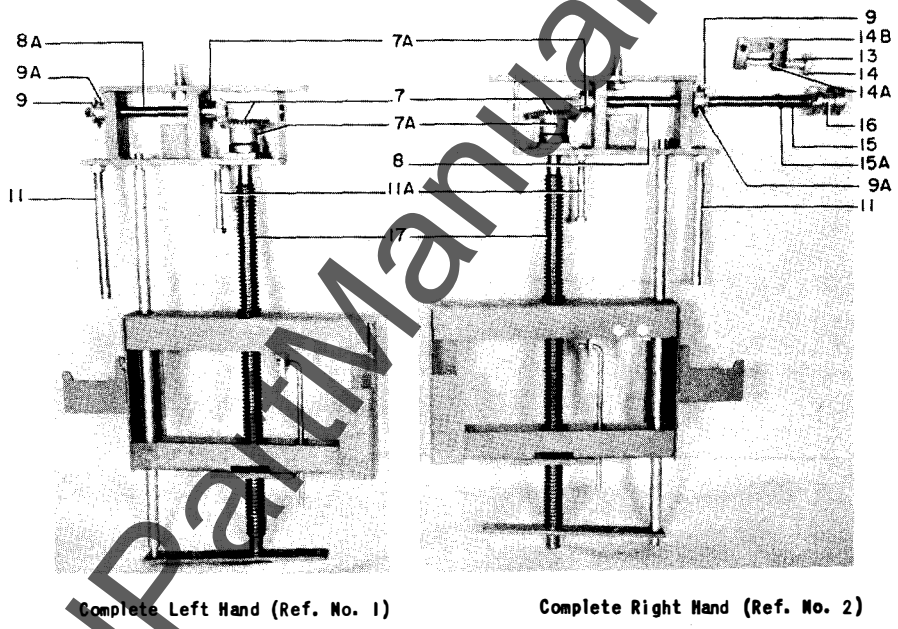


Fig. 45A View Showing Elevating Mechanism Motor and Control Unit

POSITIVE MECHANICAL INTERLOCK (FIG. NO. 45A)

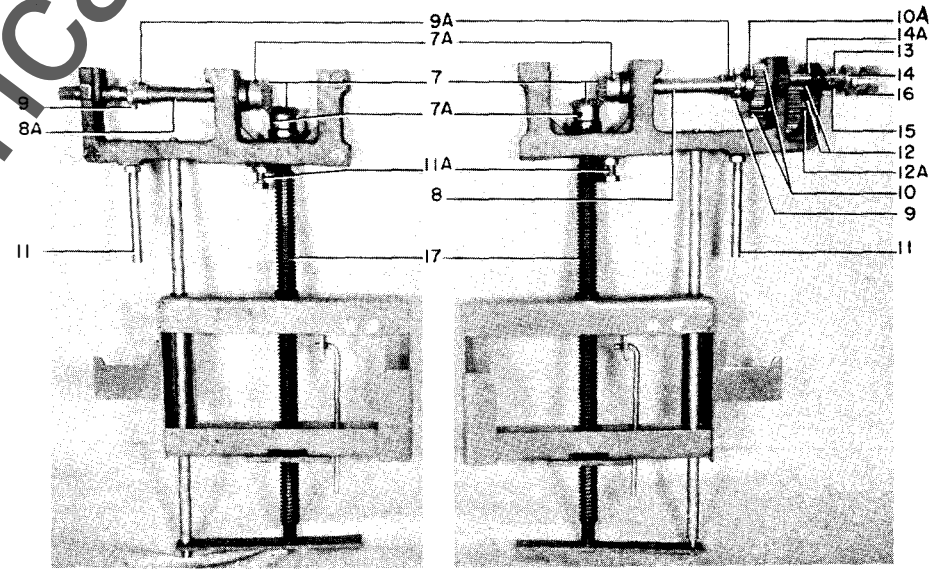
REF. NO.	DESCRIPTION
3	Complete positive mechanical interlock assembly
4	Elevating mechanism motor (115-v d-c)
4	Elevating mechanism motor (230-v d-c)
4	Elevating mechanism motor (230-v d-c)
18	Spring only



Complete Left Hand (Ref. No. 1) Complete Right Hand (Ref. No. 2)

Fig. 45A (8024142)

Fig. 45 Elevating Mechanism for M-26 Equipments Rated 250 mva or less and M-36 Equipments Rated 1200A 500 mva or less



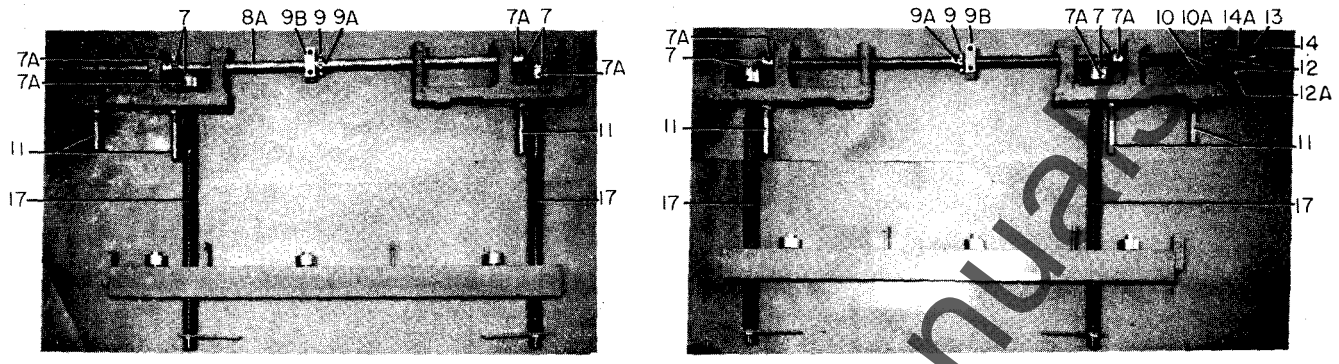
Complete Left Hand (Ref. No. 1A) Complete Right Hand (Ref. No. 2A)

Fig. 45 (8024360)

Fig. 46 (8024362)

Fig. 46 Elevating Mechanism for M-36H Equipments Rated 750 mva, M-26H Equipments Rated 350 mva and M-36 Equipments Rated 2000A

Fig. 46A (8027408 & 8027409)



Complete Left Hand (Ref. No. 1B) Complete Right Hand (Ref. No. 2B)

Fig. 46A Elevating Mechanism for M-36HH Equipments Rated 1000 MVA

Fig. 47 (8024364)

ELEVATING MECHANISMS
Figs. 45, 46 and 46A

REF. NO.	DESCRIPTION
7	Miter gears, pair
7A	Roll pin for miter gear
8	Shaft, right
8A	Shaft, left
9	Sprocket
9A	Roll pin for sprocket
9B	Bearing Block
10	Spur gear
10	Pinion gear and rod
10A	Roll pin for spur gear
11	Stop stud
11A	Stop bolt
12	Pinion gear and rod
12	Spur gear
12A	Roll pin for spur gear
13	Locking spring
14	Stop shaft
14A	Roll pin for stop shaft
14B	Stop shaft bracket
15	Clutch spring
15A	Roll pin for clutch spring
16	Slide Clutch
17	Jack Screw

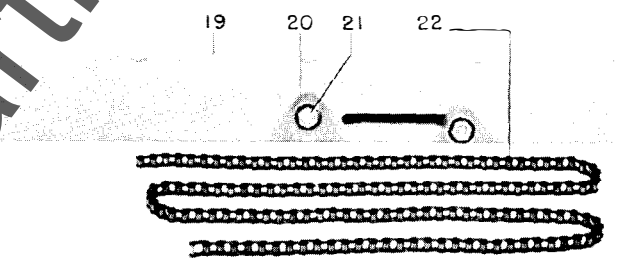


Fig. 47 Angle Bracket and Chain Drive

REF. NO.	DESCRIPTION
19	Bracket
20	Roller
21	Retainer
22	Chain

Fig. 48 (8024366)

Fig. 48 Shutter Mechanism Assembly M-26

Fig. 49 (8027367)

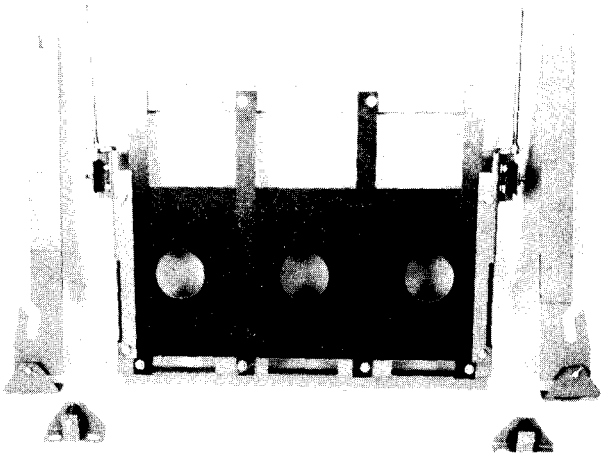


Fig. 49 Shutter Mechanism Assembly M-36

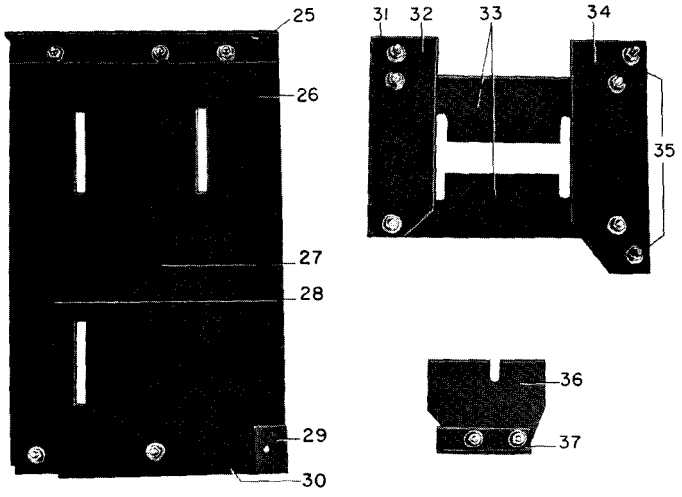


Fig. 50 Bus Supports

REF. NO.	DESCRIPTION
25	Isolating barrier support angle
26	Rear isolating barrier
27	Intermediate isolating barrier
28	Front isolating barrier
29	Isolating barrier clip
30	Isolating barrier support
31	Front support clip (not shown)
32	Front intermediate support
33	Intermediate support
34	Rear intermediate support
35	Rear support clip (not shown)
36	Lower intermediate support
37	Lower intermediate support clip

REF. NO.	LOCATION	RATING	DESCRIPTION
38	int.	1200A.	1 connection bar, down
39	int.	1200A.	1 connection bar, up
40	end	1200A.	1 connection bar, down
41	end	1200A.	1 connection bar, up
42	int.	1200A.	no connection bar
43	end	1200A.	no connection bar
44	int.	1600A.	1 connection bar, down
45	int.	1600A.	1 connection bar, up
46	end	1600A.	1 connection bar, down
47	end	1600A.	1 connection bar, up
48	int.	1600A.	no connection bar
49	end	1600A.	no connection bar
50	int.	2000A.	1 connection bar, down
51	int.	2000A.	1 connection bar, up
52	end	2000A.	1 connection bar, down
53	end	2000A.	1 connection bar, up
54	int.	2000A.	no connection bar
55	end	2000A.	no connection bar
56	int.	2000A.	2 connection bars, down
57	int.	2000A.	2 connection bars, up
58	end	2000A.	2 connection bars, down
59	end	2000A.	2 connection bars, up
59A	*	*	Insulating boot
59B			Plastic rivet for boot

* Specify unit number and phase on which boot is to be used.

Fig. 50 (8020152)

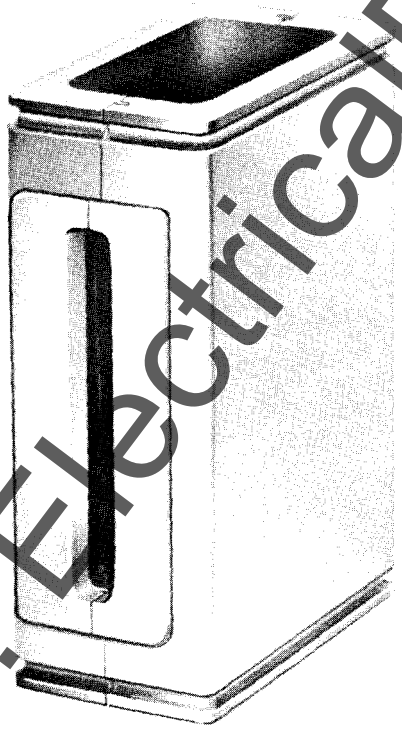


Fig. 51 (8012365)

Fig. 51 Bus Connection Box
(4.16 or 13.8 kv Units)

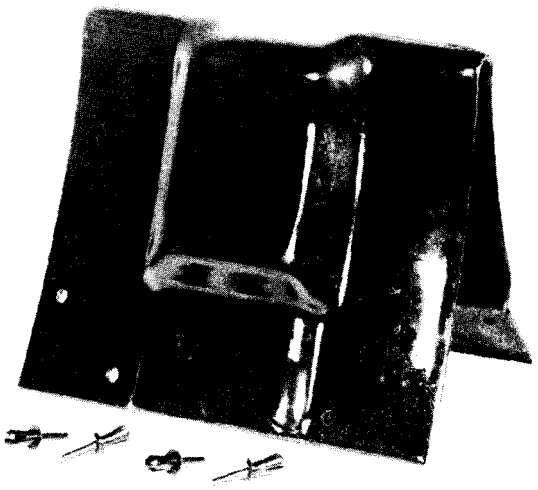


Fig. 52 (8026455)

Fig. 52 Bus Connection Boot
(4.16 kv Units Only)

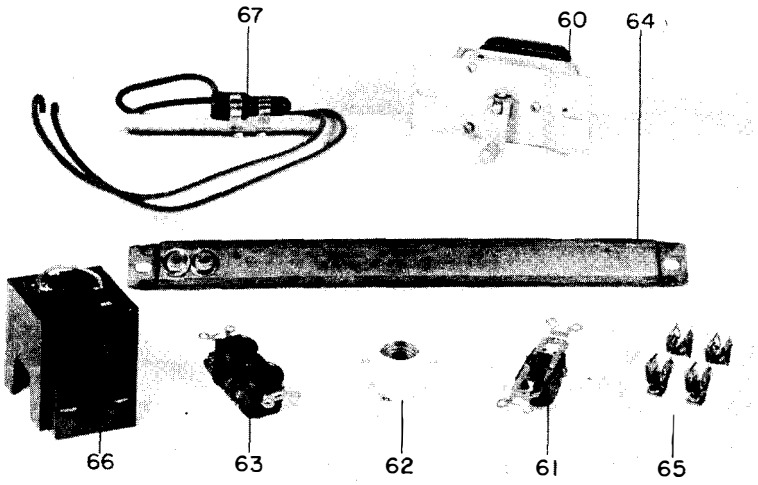


Fig. 53 (8024863)

Fig. 53 Wiring Devices and Miscellaneous Parts

REF. NO.	DESCRIPTION
60A	Limit Switch SB1 type (upper)
60B	Limit switch SB1 type (lower)
61	Light switch
62	Keyless receptacle
63	Duplex receptacle
64	Strip heater
65	Fuse block, open type*
66	Fuse block, dead front*
67	Limit switch, mercury type
See Fig. 45A (68)	Complete secondary disconnect device
See Fig. 45A (69)	Complete stationary auxiliary switch and mechanism

* Specify amp rating of fuse and number of poles.

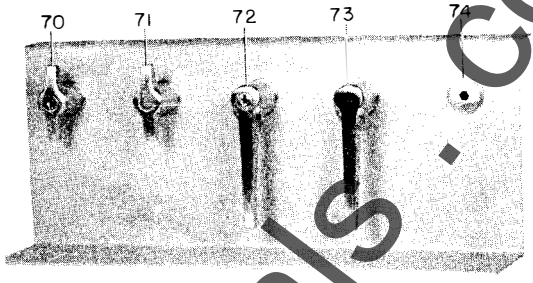


Fig. 54 (8011607)

Fig. 54 Door Handles and Locks

REF. NO.	DESCRIPTION
70	Panel locking handle
71	Panel handle
72	Door locking handle
73	Door handle
74	Socket

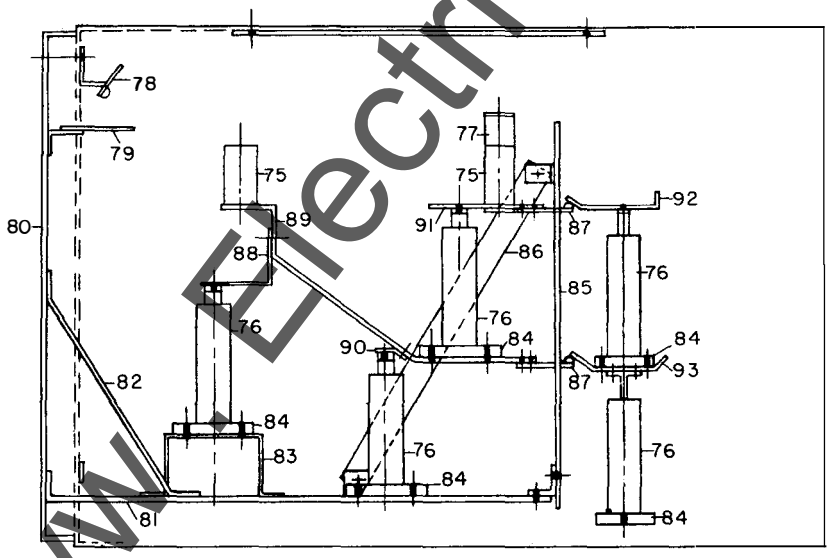


Fig. 55 (835C403)

Fig. 55 Fuse Rollout Unit

FUSE ROLLOUT UNIT

REF. NO.	DESCRIPTION
75	Fuse clip
76	Insulator
77	Ground Bar
78	Ground Finger
79	Barrier
80	Cover
81	Tray
82	Strap
83	Insulator Support
84	Insulator Clamp
85	Barrier
86	Compound Strap
87	Finger
88	Connection bar
89	Connection bar
90	Connection bar
91	Connection bar
92	Connection bar
93	Connection bar

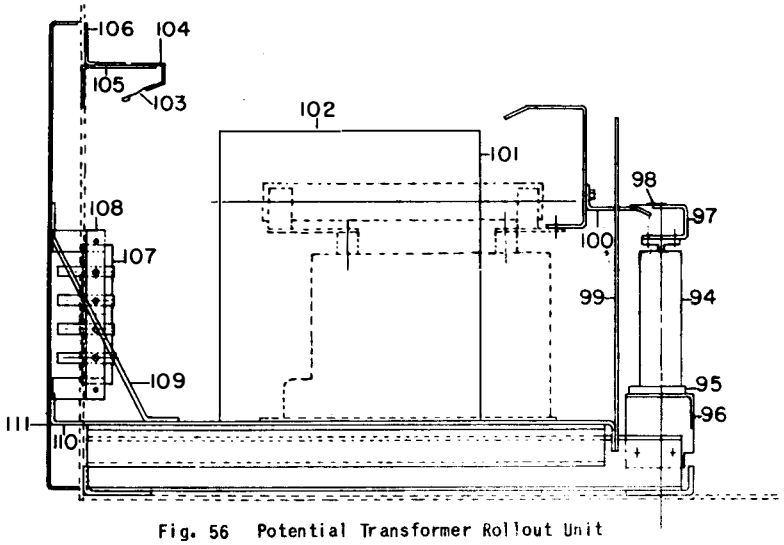


Fig. 56 Potential Transformer Rollout Unit

POTENTIAL TRANSFORMER ROLLOUT UNIT	
REF. NO.	DESCRIPTION
94	Insulator
95	Insulator clamp
96	Insulator support
97	Disconnect bar1
98	Finger
99	Barrier
100	Disconnect bar
101	Disconnect bar
102	Barrier
103	Ground finger
104	Ground finger support
105	Ground finger support
106	Barrier
107	Sec. disconnect (stationary)
108	Sec. disconnect (movable)
109	Brace
110	Tray
111	Cover

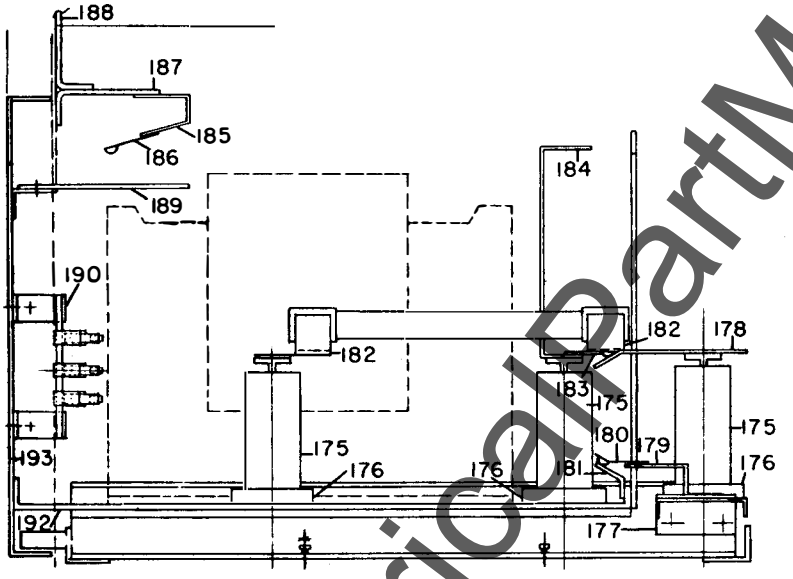


Fig. 57 Control Transformer Rollout Unit

CONTROL TRANSFORMER ROLLOUT UNIT	
REF. NO.	DESCRIPTION
175	Insulator
176	Insulator clamp
177	Insulator support
178	Contact bar
179	Ground finger support
180	Ground finger
181	Ground shoe contact
182	Fuse clip
183	Primary contact
184	Ground bar
185	Ground finger support
186	Ground finger
187	Cross angle
188	Barrier
189	Barrier
190	Sec. disconnect (movable)
191	Sec. disconnect (stationary) (not shown)
192	Tray
193	Cover

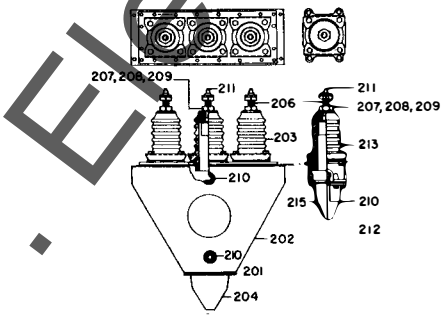


Fig. 58 Single and Triple-Conductor Potheads

SINGLE & TRIPLE-CONDUCTOR POTHEADS	
REF. NO.	DESCRIPTION
201	Triple-conductor pothead assembly
202	Body
203	Insulators and support
204	Wiping sleeve
205	Gaskets for triple-conductor pothead
206	Terminal
207	Contact nut
208	Washer
209	Palnut (3/4 in. - 12)
210	Pipe plug (3/4 in. std.)
211	Pipe plug (1/8 in. std.)
212	Single-conductor pothead assembly
213	Body and insulator
214	Gaskets for single-conductor pothead
215	Wiping sleeve

Fig. 56 (835C401)

Fig. 57 (835C402)

Fig. 58 (110340)