power circuit breakers

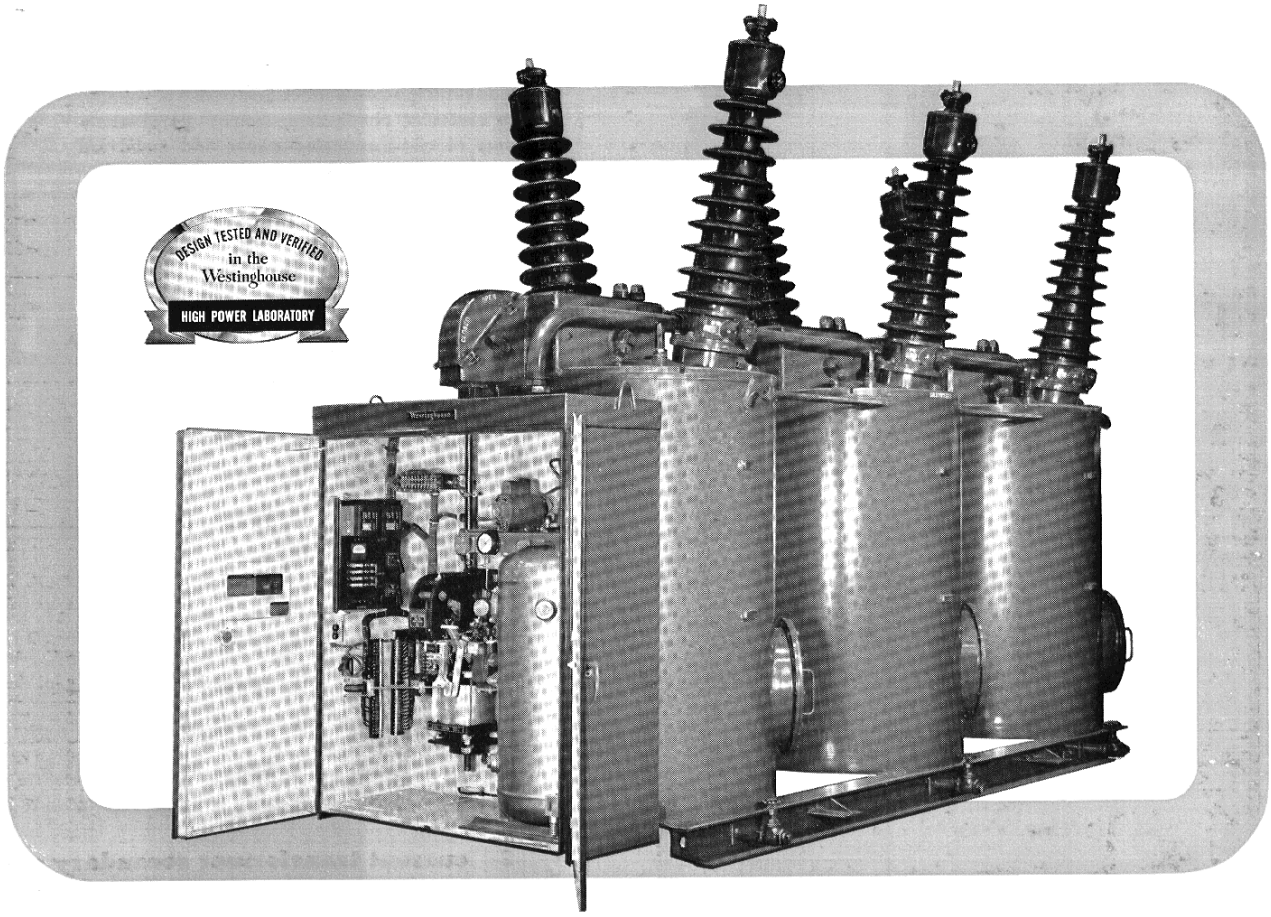
outdoor oil breakers
type GM · floor mounted

69 through 161 kv
1500 through 15000 mva

descriptive bulletin

33-253

page 1



application

Type GM De-ion® grid oil circuit breakers are designed for use on 69 through 161 kv transmission systems—20 cycle reclosing and transmission line switching.

standard ratings (60-cycle basis)

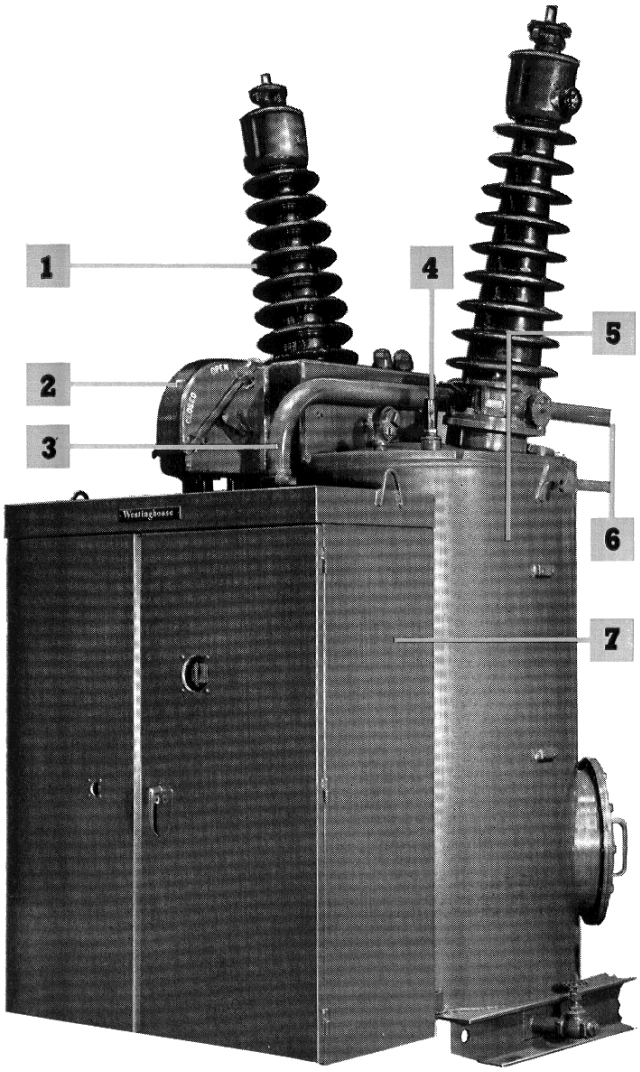
rated voltage kv	continuous current rating, amps	interrupting capacity 3-phase, mva	interrupting time (cycles)
69	1200	2500	5
	2000	3500	5
	2000	5000	5
115	800	1500	5
	1200	5000	3
	1600	10000	3
138	1200	5000	3
	1600	10000	3
	2000	15000	3
161	1200	5000	3
	1600	10000	3
	1600	15000	3

advantages

- **De-ion grid interrupters** insure short arcing time, reduced arc energy, low maintenance, and high interrupting capacity.
- **Type O condenser bushings** built to ASA dimensions, provide maximum mechanical and electrical strength with minimum size and weight. Metal and porcelain enclosure gives complete protection under all weather conditions.
- **Unit base mounting** construction of three-pole assembly on steel base simplifies shipment and installation.
- **Pneumatic and solenoid operating mechanisms** provide efficient circuit breaker operation. Selection of most suitable design can be made to suit application requirements.
- **5 and 3 cycle interrupting times** insure fast arc extinction and give better protection with less maintenance.
- **Fast reclosing time** with pneumatic mechanism permits re-establishment of circuits before parts of the power system fall out of step, thereby maintaining greater stability.

May, 1960
supersedes descriptive bulletin 33-253 dated July, 1956
mailed to: E/280/DB; C/331/DB

design features external



unit base mounting

To reduce field installation expense, type GM breakers are shipped with tanks permanently mounted on heavy structural steel bases. The three tanks are factory-assembled into a single three-pole unit, with interpole conduit, connecting rods, current transformers, secondary wiring, etc., installed and tested before the breaker leaves the factory. This construction eliminates three-fourths of the field work, and greatly reduces foundation work.

1 type O condenser bushings

The condenser-type entrance bushings combine high mechanical strength with electrically coordinated insulation based on the fundamentally sound principle of electrostatic division of voltage. The series of condensers, formed by alternate layers of oil-impregnated paper and metal foil wound on the central conducting stud, equalize the electrical stress internally and over the bushing surface. Thus the bushing is both small in size and free from radio interference. Effective seals and provision for expansion over normal operating temperature range insure long life.

A leak-proof magnetic indicator at the top of the bushing indicates oil level at all times. Space is provided on each bushing for mounting one or two bushing-type current transformers.

Taps are brought out from the condenser unit for use with an optional potential device for relay and instrument indication. This tap may also be used for making ungrounded power factor tests on the condenser bushing without removing the tap cover.

Type O condenser bushings are built to ASA standard dimensions.

type O condenser bushing

2 bell crank and position indicator

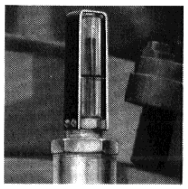
A semaphore indicator attached to the bell crank shows the position of the circuit breaker contacts. Remote indication at the control board is obtained by indicating lamps connected to a rotary-type auxiliary switch attached to the mechanism pull rod.

3 current transformer secondary conduit

All secondary leads from the multi-ratio bushing-type current transformers are carried in a single conduit to terminal blocks in the mechanism housing for convenience in changing ratios.

4 float-type oil gauge

A float-type oil gauge is mounted on the top of each tank. Since it is above the oil level, leakage and loss of oil through breakage of glass are eliminated. Fire hazard from oil leaking from broken glass is removed.



5 pole unit tank

Breaker tanks are of boiler-plate construction with dome-shaped tops and bottoms. All seams are welded and carefully inspected and tested to prevent oil leakage.

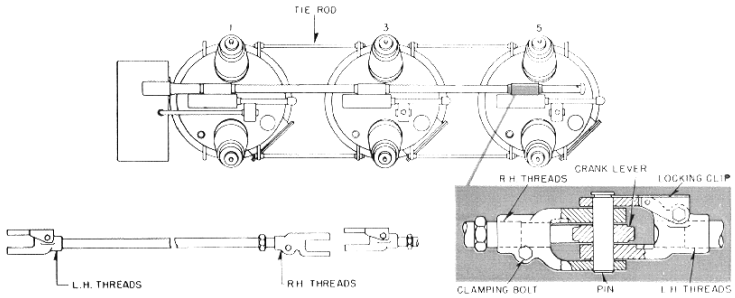
hinged manhole covers on the side of each tank provide access to the interior for inspection and maintenance.

oil drain valve is connected to the lowest point on each tank bottom.

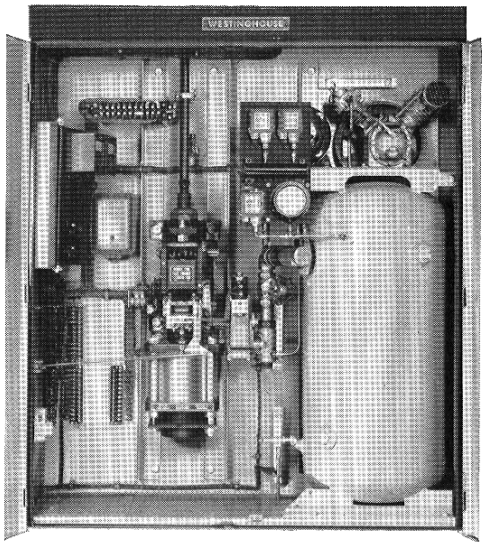
filling connection is mounted on the tank top next to each oil gauge.

6 inter-pole pull rods

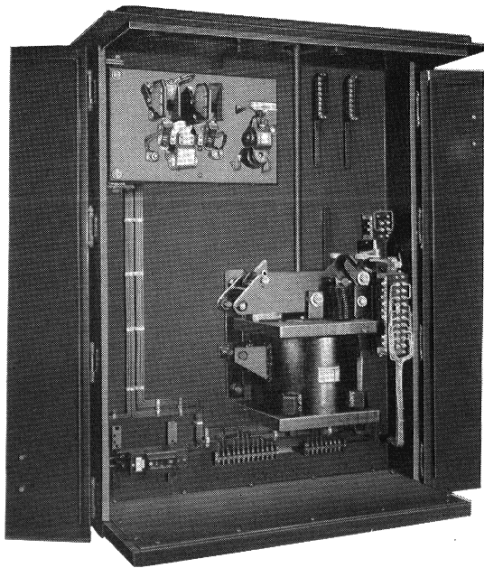
The vertical motion of the operating mechanism is transmitted through the bell crank and pull rods to the pole-unit lever system within each tank to control the position of the contacts. On the type 690GM5000 and all three-cycle breakers, these pull rods have right and left hand threads with turnbuckle action to permit adjustment of each set of contacts during installation. After the contacts are set, locking devices prevent any further adjustment.



7 pneumatic and solenoid operating mechanisms



type AA-10 pneumatic operating mechanism



type SAF-6 solenoid operating mechanism

pneumatic operating mechanisms—Types AA-7, AA-10 and AA-14 electro-pneumatic mechanisms are available especially for applications requiring high reclosing speed and for installations where large storage batteries are not justified. These mechanisms are mechanically trip-free and electrically trip-free through electrical control relays.

Each mechanism is complete with its own storage reservoir, motor-driven compressor, pressure relay, pressure gauge, and safety valve to prevent excessive pressures. At normal operating pressure, the reservoir contains sufficient air for five immediate closing operations without operation of the compressor. A drain valve is provided to remove condensed moisture from the reservoir. The air supply system meets all the requirements of the ASME and State and Insurance codes.

The weatherproof cabinet has two large doors, sealed with rubber gaskets, which provide easy access for inspection and maintenance. A heater element provides continuous inside-outside temperature differential, with two additional thermostatically-controlled heaters for winter use.

Included in the housing are necessary auxiliary switches, cut-off switch, latch check switch, alarm switch, and operation counter. The control relays and three control knife switches (one each for the control circuit, compressor motor, and heater circuit) are mounted on a hinged panel. Terminal blocks on the side and back of the housing are provided for control and transformer wiring.

high speed reclosing—When equipped with type AA pneumatic mechanisms, these breakers are ideal for high speed reclosing. Reclosing speeds of 20 cycles maximum (60-cycle basis) from the instant of initial tripping impulse until the current is re-established are common, and faster reclosing speeds have been obtained.

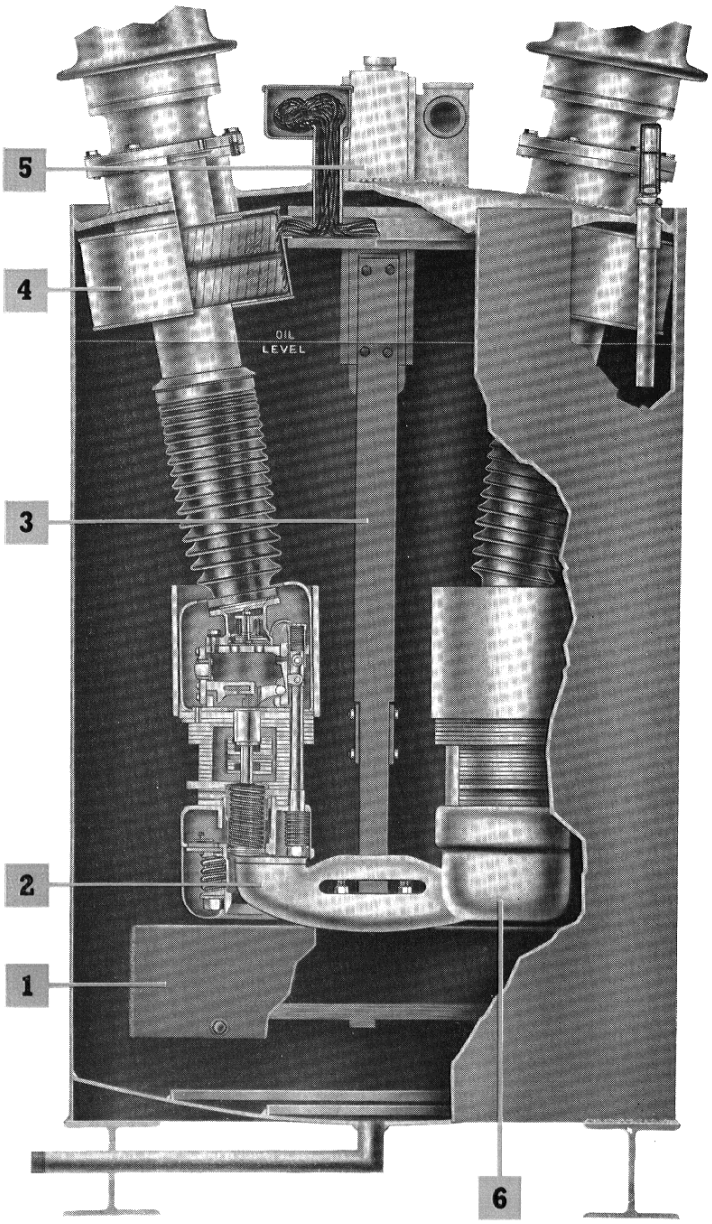
On the AA-10 and the AA-14 mechanisms, used with most of these breakers, selective tripping provides unretarded opening even when the breaker is closed on a fault, but at the same time provides for high speed or ultra high speed reclosing. Starting from a normally closed position with no high pressure air in the closing cylinder, the breaker trips in such a manner that the closing piston and the contacts remain tied together. Preset relays start the closing action by admitting air into the cylinder shortly after the contacts have parted. The air pressure stops the movement of the contacts before they reach the full open position, reverses their travel, and immediately carries them to the closed position. This ability to reverse the direction of contact movement before the contacts reach the full open position holds the reclosing time to a very minimum.

The type AA-7 mechanism, used to operate the type GM-3 115-kv breaker, operates as a mechanically trip-free mechanism at all times.

solenoid operating mechanisms—Where sufficient power is available, this solenoid mechanism gives efficient operation. It is mechanically trip free from the breaker in any position of the closing stroke and is electrically trip free in the closed position. The shunt trip device operates on a roller type latch to trip the breaker.

Standard accessories include a cut-off switch, latch checking switch and rotary type auxiliary switch. A fused knife switch is provided in the control circuit. The control relays are mounted in a suitable location and all connections are wired to terminal blocks. A Rectox unit to close from a suitable a-c supply can be provided. A heater unit reduces condensation within the mechanism housing.

design features internal



1 tank air cells

To absorb the pressure shock transmitted through the oil during heavy fault interruptions, two inverted air cells are provided near the bottom of type GM breakers rated 10,000 mva and above. Air is trapped automatically in these cells when the tanks are filled with oil. This forms an air cushion which reduces the pressure shock. Floats within the air cells minimize the absorption of air into the oil by reducing the area of contact between air and oil and by preventing oil circulation.

2 moving contact

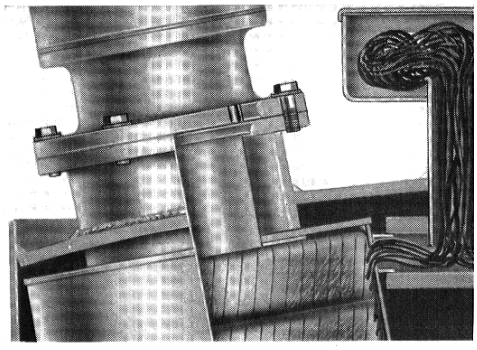
A moving contact of ample conductivity bridges between the two stationary contacts to complete the circuit. The structural shape provides adequate mechanical strength and the smooth curved surfaces with rounded edges reduce the dielectric stresses.

Bayonet type lower moving contacts are used with the type MF-1 De-ion grids. The moving contacts used with MF-3 and multi-break grids make butt-type connection with captive lower contacts mounted inside the grid.

3 Micarta® lift rod and guide

Wood-base Micarta is used for contact lift rods and guides. Laminated selected wood impregnated with phenolic resin and molded under heat and pressures, produces a dense, uniform, high-strength, shock-resistant material of high dielectric strength, especially adaptable to this application.

4 bushing-type current transformers



Type GM breakers are normally equipped with six multi-ratio bushing-type current transformers of relay accuracy mounted one on each bushing of the breaker. Space is available for two transformers per bushing when required. The standard transformer is the type BYM, 1200/5 or 2000/5 ampere, 10L800 accuracy. When desired, linear couplers for use for bus-differential protection, or metering accuracy transformers, can be provided. All of these transformers meet NEMA and ASA published standards.

When installed within the breaker, metal transformer cases provide mechanical protection and support the transformers in place. The leads are brought out through a neoprene rubber compression seal to prevent entrance of moisture or loss of oil into the conduit. Leads are terminated in the mechanism housing for convenience in changing ratios.

5 pole unit lever system

A simple lever system inside each tank transmits the horizontal motion of the interpole pull rods into straight-line vertical movement for the contact lift rods. Hydraulic bumpers cushion the opening stroke and eliminate rebound. Gas-tight seals prevent the gas from passing from one pole unit to another, or into the mechanism housing.

6 De-ion grid interrupters

multi-flow grids

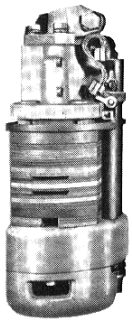
Multi-flow De-ion grids provide highly effective circuit interruption. These grids consist essentially of two chambers: an upper pressure chamber in which a pressure generating arc is drawn, and a lower de-ionizing chamber in which the arc is confined and extinguished within vulcanized fibre plates bolted together with wood base Micarta tie rods.

five-cycle grids

Type MF-1 grids are arranged to provide sequential formation of the pressure-generating arc between the upper and intermediate contacts, followed by the interrupting arc between the intermediate and lower contacts.

type MF-1
69 and 115 kv

three-cycle grids



type MF-3
115 and 138 kv

type MF-3
161 kv

Type MF-3 grids provide simultaneous opening of pressure-generating contacts and interrupting contacts. A side operating rod operates the rocker-type pressure-generating contact at the same time the lower contact parts. High ohmic resistors divide the recovery voltage equally between the two grids in each pole.

A spring-operated piston acts as an oil pump to provide supplementary oil flow to the interrupting chamber when the breaker interrupts low currents. The captive construction of the lower moving contact within the grid (as compared with the bayonet construction of the MF-1) permits closer fit in the orifice plates, more efficiently directing the flow of oil into the interrupting chamber. It also provides greater tolerance in the alignment between the lower end of the grids and the moving contact crossarm on the breaker lift rod.

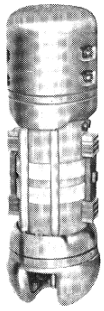
multi-break grids

Multi-break De-ion grids are available for use with those type GM oil circuit breakers having the higher ratio of interrupting capacity to service voltage.

five-cycle grids

Type MB-1 grids have a single set of finger and bayonet contacts mounted within a heavy insulating tube and a spring driven pump mounted in the lower casting of the grid, otherwise it is similar to the type MB-2 grid.

type MB-1
69 kv



type MB-2
161 kv

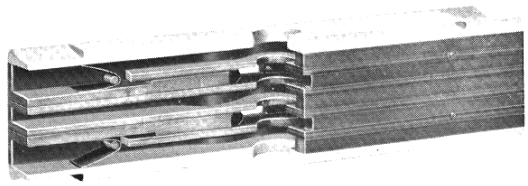
type MB-2
138 and 115 kv

three-cycle grids

Type MB-2 De-ion grids used on 115 through 161 kv breakers each have two sets of finger and bayonet contacts in series mounted within a heavy insulating tube. The contact elements are unit assemblies that operate in unison and require no critical adjustment. The stationary contacts are heavy-duty, silver-plated fingers with arc-resisting silver tungsten surfaces that provide long life. The moving contacts are properly spaced and insulated from each other by wood-base Micarta rods.

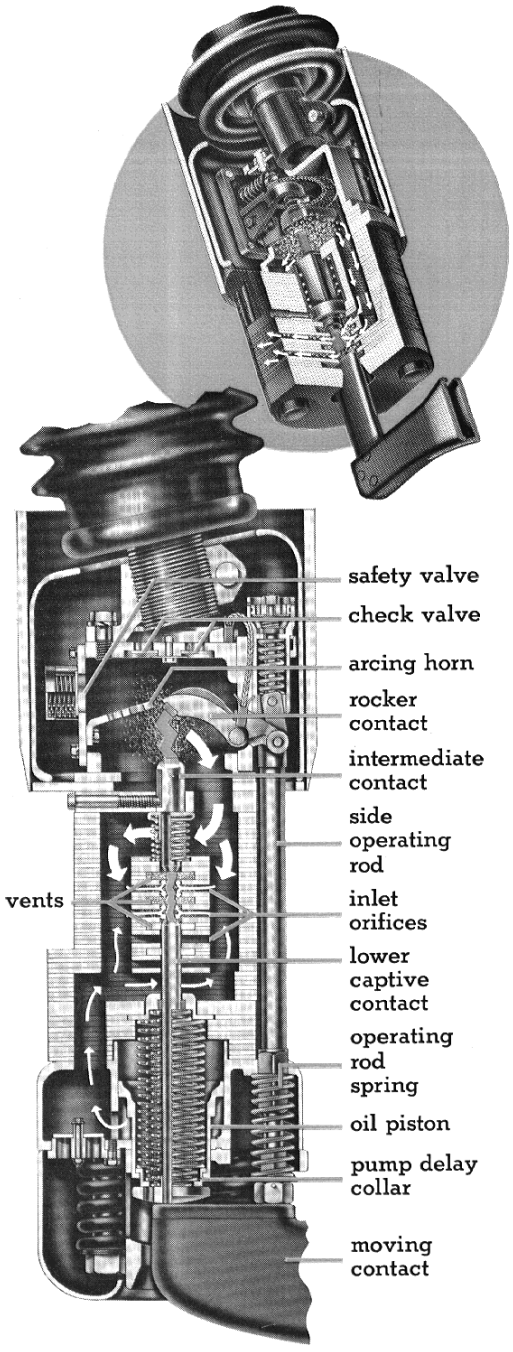
Each set of contacts part within a removable laminated and cemented fiber block that guides the oil flow in the arcing region of each contact gap, and vents the arc gases and contaminated oil into the breaker tank. The oil stored in the arcing regions produces self-generated de-ionizing action that is effective for high current operation. A spring-driven pump at the top of each assembly provides oil flow at each break for the interruption of line charging currents. This pump also performs a flushing action immediately following each interruption to clear out all gases and arc products in preparation for the next operation.

Quick inspection of the fixed and moving contacts may be made simply by loosening the "keeper" plate on one side of the grid and removing the fiber interrupter block.



grid interrupter block, cutaway view

operation



The inset at the top is an MF-1 grid cut away to show the action during interruption. The main illustration is a three-cycle grid, also cut away to show the interrupting operation. In both cases, the white arrows show oil flow.

three cycle fault current interruption

types MF-3A and MF-3F grids

When the breaker is called upon to open under fault conditions, the breaker accelerating springs act through the lift rod to open the moving contacts rapidly. Three springs open the lower contact inside the grid and at the same time the rocker-type upper contact is opened by the action of the spring-operated side operating rod extending from the moving contact to the top of the grid.

As the contacts part, the pressure-generating arc drawn in the upper chamber, between the upper and intermediate contacts, forces the oil in the center chamber through the inlet orifices into and along the closely confined main interrupting arc. Gases formed by contact of oil with the arc pass through exhaust vents in the grid into the main body of oil in the breaker tank.

The multi-flow principle of arc interruption uses a number of inlet orifices and exhaust vents proportioned to the voltage rating. As the moving contact uncovers successive inlet orifices the flow of fresh oil from the pressure generating chamber de-ionizes the entire length of the arc and interrupts it at a minimum length and in the shortest time.

The symmetrical arrangement of the inlet orifices and vents within the grid structure provides balanced flow and reaction forces. The flow of oil and gas centers the arc in the interrupting chamber away from the fiber plates, minimizing wear of the interrupter.

Following the interruption, the arc gases and carbonized oil are flushed through the vents and replaced by fresh oil in preparation for the next operation. This flushing action is provided by the operation of a spring driven piston located at the bottom of the grid. The check valve in the top of the pressure chamber opens to release the residual gas and the chamber refills with fresh oil.

During normal operation this open valve permits circulation of oil through the grid to cool the current carrying parts.

As a protective feature, a safety valve is provided to open if the gas pressure within the pressure chamber should become too great during an interrupting operation.

low current operation

To assure three-cycle interrupting time for low magnetizing and line-charging currents, the oil driving piston at the bottom of the grid augments the oil flow from the pressure arc. To avoid arc re-strikes and overvoltage surges when interrupting line-charging currents, the oil piston action is purposely delayed. Interruption is attempted only after the contacts are parted sufficiently to support the double voltage which will appear across the contacts one-half cycle after interruption.

scavenging action for reclosing duty

At higher currents, where the pressure-arc generates greater pressure than that obtainable from the piston, the piston does not operate until after the arc is interrupted; it then serves to flush the arc products from the grid. This is particularly important on high speed reclosing where it is desirable to clean out the gases from the first interruption before the circuit breaker may be called to open the circuit again within 20 cycles or less.

five-cycle operation

The MF-1 operates as above except that the pressure generating break and interrupting break operate sequentially without the use of a side operating rod.

operation continued

three cycle fault current interruption
type MB-2 grids

The type MB-2 multi-break De-ion Grid has two sets of finger and bayonet contacts in series mounted in a ladder arrangement within a heavy insulating tube. Under normal operating conditions with the breaker carrying load current oil circulates by natural convection through a spring biased inlet check valve located at the bottom of the grid, the exhaust passages in the interrupter blocks and out through the check valve in the top of the grid to cool the current carrying parts.

On fault operation of the breaker as the accelerating springs act through the lift rod to drive the cross arm toward the open position, two accelerating springs in the top casting assembly of the grid drive the interrupter contacts toward the open position. Arcs are drawn between the captive moving contacts and the stationary finger contacts within the fiber interrupter blocks. The heat from these arcs volatilizes some of the oil and generates a pressure which immediately closes the check valves.

Since the grid is now essentially a sealed vessel except for the exhaust vents in the interrupter blocks, the pressure generated by the arcs forces oil to flow into the two intake passages on each side of the interrupter blocks and axially along the arc to deionize it and interrupt the flow of current. The gases formed by contact of the oil with the arc pass through the exhaust passages in the interrupter block and into the main body of oil in the breaker tank. Each interrupter block has one main unobstructed exhaust passage-way out each end of the assembly with two additional vents having pressure relief devices which will open on high capacity faults and allow additional venting. Thus a self-generated pressure and oil flow principal is utilized in the tubular type grids to interrupt the flow of fault current.

During interruption, voltage distribution between the two interrupters in each pole is equalized by a series of high resistance carbon resistor units shunting each interrupter.

The symmetrical arrangement of the inlet orifices and vents within the interrupter blocks provide balanced oil flow and reaction forces. The flow of oil and gas centers the arc within the interrupting block away from the fiber plates thus minimizing wear of the interrupters. They are easily removable from the assembly for inspection.

The symmetrical construction of the interrupter blocks makes it possible to invert them in the grid structure and in effect double their operating life.

When these blocks are removed, the contact surfaces can be easily inspected. The complete stationary and moving contact assemblies can be withdrawn from the tube when necessary for maintenance without disturbing the alignment of the tube or pump assembly.

low current operation

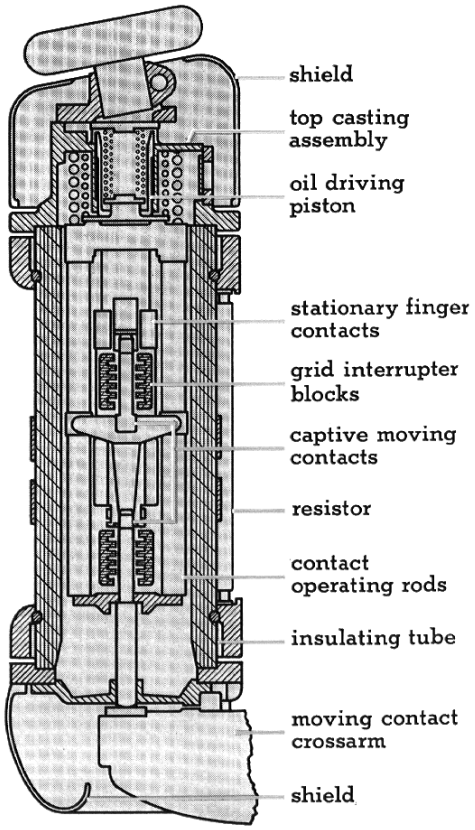
A spring driven oil piston is located in the top casting assembly. During high current operation the back pressure generated by the arcs is sufficient to stall the movement of the oil piston but for low current operation the oil piston operates to augment the oil flow due to the self-generated pressure to achieve three cycle interrupting time even for low magnetizing and line-charging currents. To avoid arc restrikes and the resulting overvoltage surges when interrupting line charging currents, the oil piston action is purposely delayed. Interruption is attempted only after the contacts are parted sufficiently to support the double voltage which will appear across the contacts one half cycle after interruption.

scavenging action for reclosing duty

At the higher currents, where the arcs generate greater pressure than that obtainable from the piston, the piston does not operate until the arc is interrupted, it then serves to flush the arc products from the grid. This is particularly important on high speed reclosing where it is desirable to clean out the gases due to the first interruption before the circuit breaker may be called to open the circuit again within 20 cycles or less.

five cycle fault current interruption
type MB-1 grids

The 69 kv, 5 cycle tubular interrupter differs from the type MB-2 in that it has only one set of finger and bayonet contacts and the oil driving piston is located in the lower casting of the interrupter assembly.



wiring diagram

pneumatic mechanism

d-c control circuit with automatic reclosing standard AEIC diagram

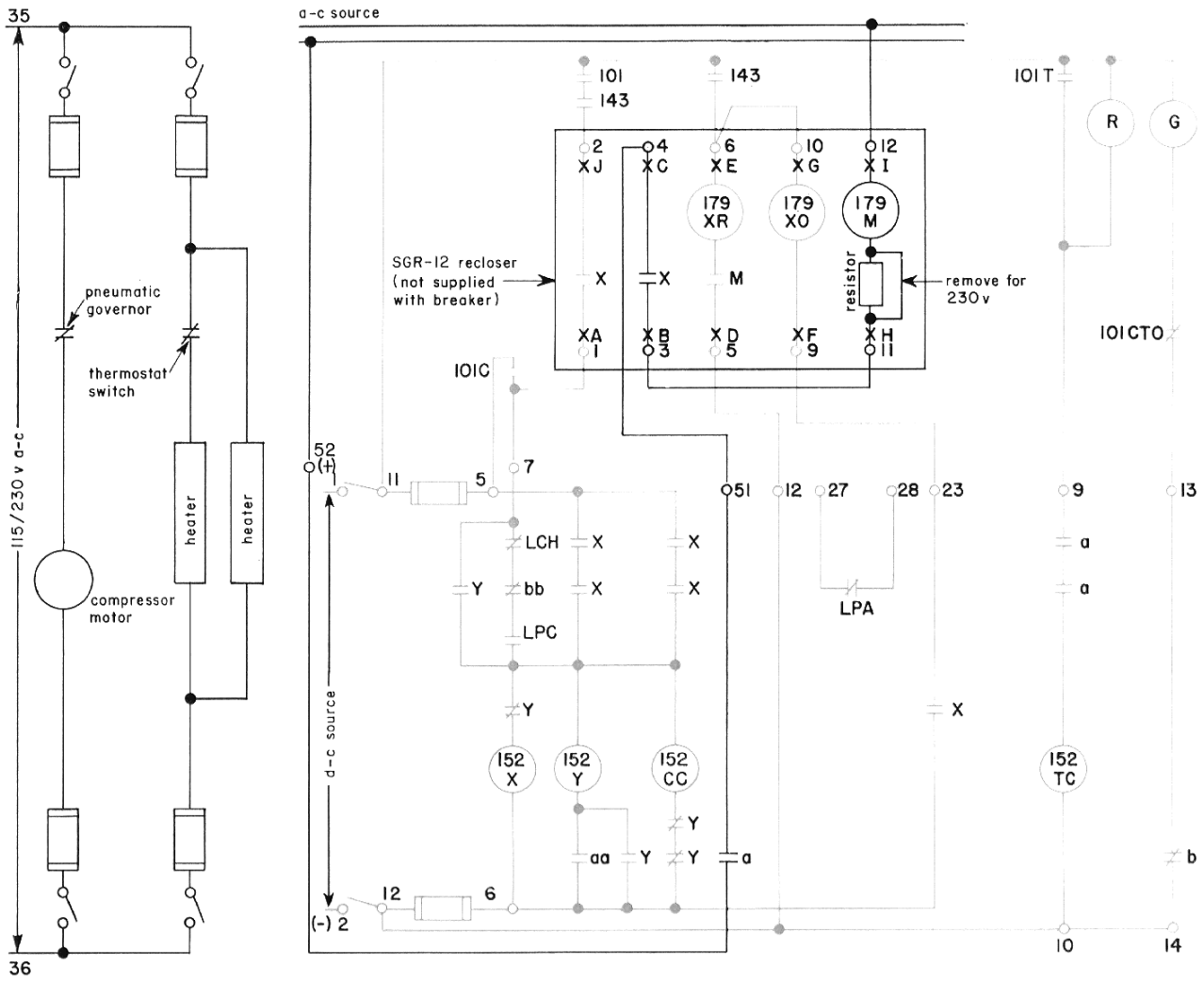


diagram in accordance with A E I C industry standard

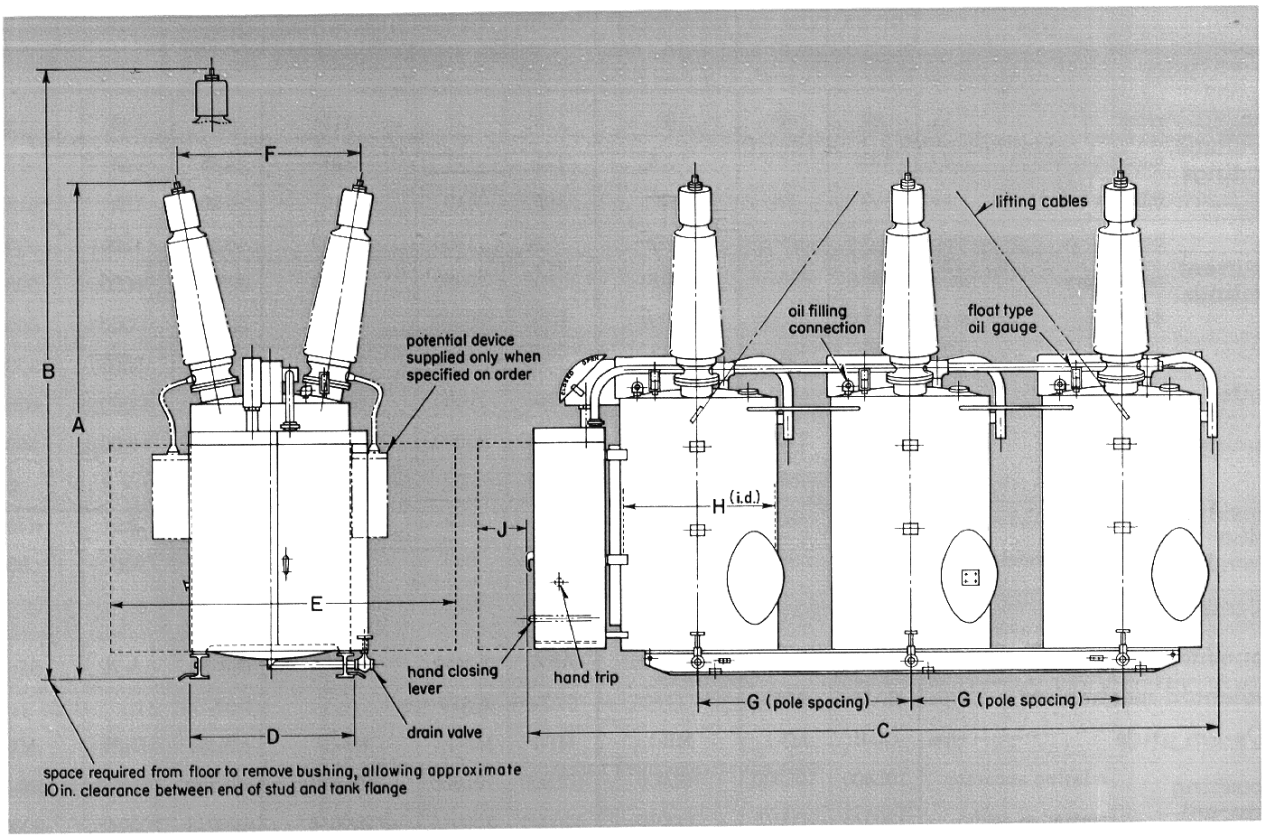
legend

note: 1. auxiliary switches shown for open breaker
2. relay contacts shown de-energized
3. pressure switches shown for low pressure

152CC closing coil
152TC trip coil
LCH latch check switch
LPA low pressure alarm (closed on low pressure)
LPC low pressure cut-off (open on low pressure)

101 control switch
143 toggle switch
—○— accessible terminals
—| |— open contacts
—|/|— closed contacts
——— a-c
——— d-c

dimensions inches • approximate, not for construction purposes



breaker type	rated kv	mva interrupting capacity	A	B▲	C	D	E	F	G	H	J✣
GO-5A	69	2500	145	200	211	46	85	50	66	50	20
GM-6B	69	3500	142	198	217	45	122	50	66	50	29
690 GM5000	69	5000	142	198	217	45	122	50	66	50	29
GM-3B	115	1500	152	205	199	47	85	57	60	50	20
GM-6B	115	5000	159	213	235	56	122	60	72	54	29
1150 GM10000	115	10000	171	225	241	64	122	68	72	62	29
GM-5C	138	5000	170	227	235	56	122	65	72	54	29
GM-7B	138	10000	179	236	241	64	122	68	72	62	29
1380 GM15000	138	15000	188	244	258	64	134	69	72	62	31
GM-5B	161	5000	188	248	265	64	122	73	84	62	29
GM-7B	161	10000	201	261	276	54	122	73	88	66	29
1610 GM15000	161	15000	201	261	276	54	122	73	88	66	29

▲ Space required to remove bushing.
✣ Space required to open mechanism door.

selector guide

standard ASA ratings: 3-pole • 2-CO 15 sec. duty cycle

	rated voltage	69 kv			115 kv			138 kv		
	type	GO-5A	GM-6B	690GM5000	GM-3B	GM-6B	1150GM10000†	GM-5C	GM-7B	1380GM15000
ratings:	Ratings based on recommendations of EEI—AEIC—NEMA joint committee on power circuit breakers. For definitions, see technical data 33-060.									
voltage ratings	rated . . . . . kv	69	69	69	115	115	115	138	138	138
	maximum design . . . . . kv	72.5	72.5	72.5	121	121	121	145	145	145
	min. for rated mva . . . . kv	60	66	66	105	110	110	120	132	132
current ratings	continuous, 60 cycle amp	1200	2000	2000	800	1200	1600	1200	1600	2000
	momentary . . . . . amp	38000	49000	70000	13500	39000	78000	36000	66000	99000
	4-second . . . . . amp	24000	31000	44000	8300	26000	52000	24000	44000	66000
interrupting ratings	3-phase . . . . . mva	2500	3500	5000	1500	5000	10000	5000	10000	15000
	rated voltage . . . . . amp	21000	29000	42000	7500	25000	50000	21000	42000	63000
	maximum . . . . . amp	24000	31000	44000	8300	26000	52000	24000	44000	66000
	opening . . . . . cycles	5	5	5	5	3	3	3	3	3
insulation level	60-cycle test . . . . . kv	160	160	160	260	260	260	310	310	310
	impulse withstand . . . . kv	350	350	350	550	550	550	650	650	650
components										
pneumatic mechanisms	type	AA-7	AA-10	AA-10	AA-7	AA-10	AA-10	AA-10	AA-10	AA-14
solenoid mechanism	type	SAF6	SAF6	. . .	SAF4	SAF6	. . . .	SAF7½	. . .	. . .
De-ion grids	type	CDH	MF-1	MB-1	MF-1	MF-3A	MF-3F	MF-3A	MF-3F	MB-2
bushing current transformers	relaying accuracy . .	10L400	10L800	10L800	10L800	10L800	10L800	10L800	10L800	10L800
	maximum ratio	1200/5	2000/5	2000/5	1200/5	1200/5	2000/5	1200/5	2000/5	2000/5
	additional available ratios	100 500 200 600 300 800 400 900 1000	300 1100 400 1200 500 1500 800 1600	300 1100 400 1200 500 1500 800 1600	100 500 200 600 300 800 400 900 1000	100 500 200 600 300 800 400 900 1000	300 1100 400 1200 500 1500 800 1600	100 500 200 600 300 800 400 900 1000	300 1100 400 1200 500 1500 800 1600	300 1100 400 1200 500 1500 800 1600
condenser bushings	type	O	O	O	O	O	O	O	O	O
weight and oil requirements										
net weight with oil	lb	26000	26000	26500	30800	38200	54360	37450	51500	55200
shipping weight less oil . .	lb	14500	14500	14400	18000	22600	30500	21000	28500	29000
tank diameter	in.	50	50	50	50	54	62	54	62	62
oil capacity	gal.	1575	1575	1650	1680	2145	3540	2190	3195	3600
operating currents										
pneumatic mechanism	closing (125v, d-c) . . amp	9	9	9	9	9	9	9	9	18
	tripping (125v, d-c) . amp	10	10	10	10	20	20	20	20	30
	motor (230v, a-c) . . . amp	4	5	5	4	5	5	5	9.5	9.5
solenoid mechanism	closing (125v, d-c) . . amp	120	175	. . . . .	120	200	. . . . .	175	. . . . .	. . . . .
	tripping (125v, d-c) . amp	10	10	. . . . .	10	10	. . . . .	10	. . . . .	. . . . .

† This rating has not been standardized by EEI—AEIC—NEMA Joint Committee.

	161 kv		
	GM-5B	GM-7B	1610GM15000
	161	161	161
	169	169	169
	150	154	154
	1200	1600	1600
	29000	57000	84000
	19200	38000	56000
	5000	10000	15000
	18000	36000	54000
	19300	38000	56000
	3	3	3
	365	365	365
	750	750	750
	AA-10	AA-10	AA-10
	. . .	. . .	. . .
	MF-3A	MF-3F	MB-2
	10L800	10L800	10L800
	1200/5	2000/5	2000/5
	100 500 200 600 300 800 400 900 1000	300 1100 400 1200 500 1500 800 1600	300 1100 400 1200 500 1500 800 1600
	O	O	O
	52000	60500	61000
	28500	30500	31500
	62	66	66
	3195	4080	4080
	9	9	9
	20	20	20
	6.6	9.5	9.5
	. . .	. . .	. . .
	. . .	. . .	. . .

specification details

included with standard circuit breaker:

Wemco® "C" universal oil in tank cars or non-returnable drums
six type O condenser bushings with potential and/or power factor test tap, threaded for terminal connection
bushing terminals; specify type (clamp or tube) and size
six type BYM multi-ratio bushing current transformers
cases and supports for bushing current transformers
weatherproof metal conduit for transformer leads to mechanism housing
oil drain valve, filling connection and sight gauge for each pole unit
mechanical "open" and "closed" indicator
accelerating springs
maintenance closing device (one per station)
weatherproof mechanism housing and mechanism (see below)

pneumatic mechanism housing includes:

pneumatic closing mechanism, 48, 125 or 250 volts d-c (specify)■
shunt trip coil, 48, 125 or 250 volts d-c (specify)■
control relay panel with electrically trip-free control relay
■Refer to Westinghouse if other control voltages or a-c control required
air compressor and reservoir with automatic controls
three 2-pole fused knife switches; one for control circuit, one for heater circuit, and one for compressor motor
necessary terminal blocks
type W auxiliary switch, 11-pole
type W cutoff switch, 2-pole
latch-checking switch
operation counter
thermostatically controlled space heaters

solenoid mechanism housing includes:

solenoid closing mechanism 125 or 250 volts d-c (specify)
shunt trip coil; 48, 125 or 250 volts d-c (specify)
10-stage auxiliary switch
1-fused knife switch for control circuit
necessary terminal blocks
cutoff switch
operation counter
space heater

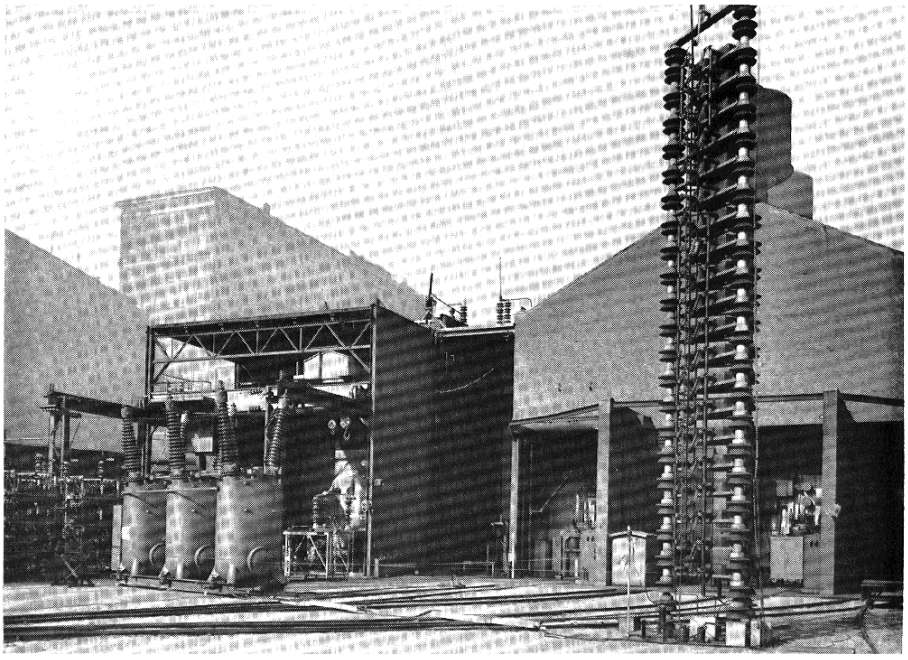
optional equipment available at extra cost:

(for details see price modifications 33-240)

230 volt a-c—Rectox for solenoid operated breaker
resistor grids for capacitor switching: see technical data 33-063
flood-proofed mechanism housing
extra creepage or high altitude bushings
linear couplers for bus differential relaying
metering type bushing current transformers
expansion terminals
key interlocks
thermostat for solenoid mechanism housing
440-volt control or three-phase motor for pneumatic mechanism
special relays, meters, instruments and cabinets

equipment for breakers with automatic reclosing includes:

reclosing relay, type RC or SGR-12
three overcurrent relays, type CO
three panel ammeters, type R-35
type W control switch and indicating lamps
(optional) overcurrent ground relay, type CO



Westinghouse High Power Laboratory—power circuit breaker proving grounds

Drop-center cars may be used for shipment of completely assembled type GM floor mounted breakers

further information

prices: price list 33-220
price modifications 33-240

AA mechanisms: descriptive bulletin 33-350

condenser bushings: descriptive bulletin 33-354

De-ion grids: descriptive bulletin 33-355

bushing current transformers: descriptive bulletin 33-356

type PBA bushing potential device: descriptive bulletin 33-357

Westinghouse Electric Corporation
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