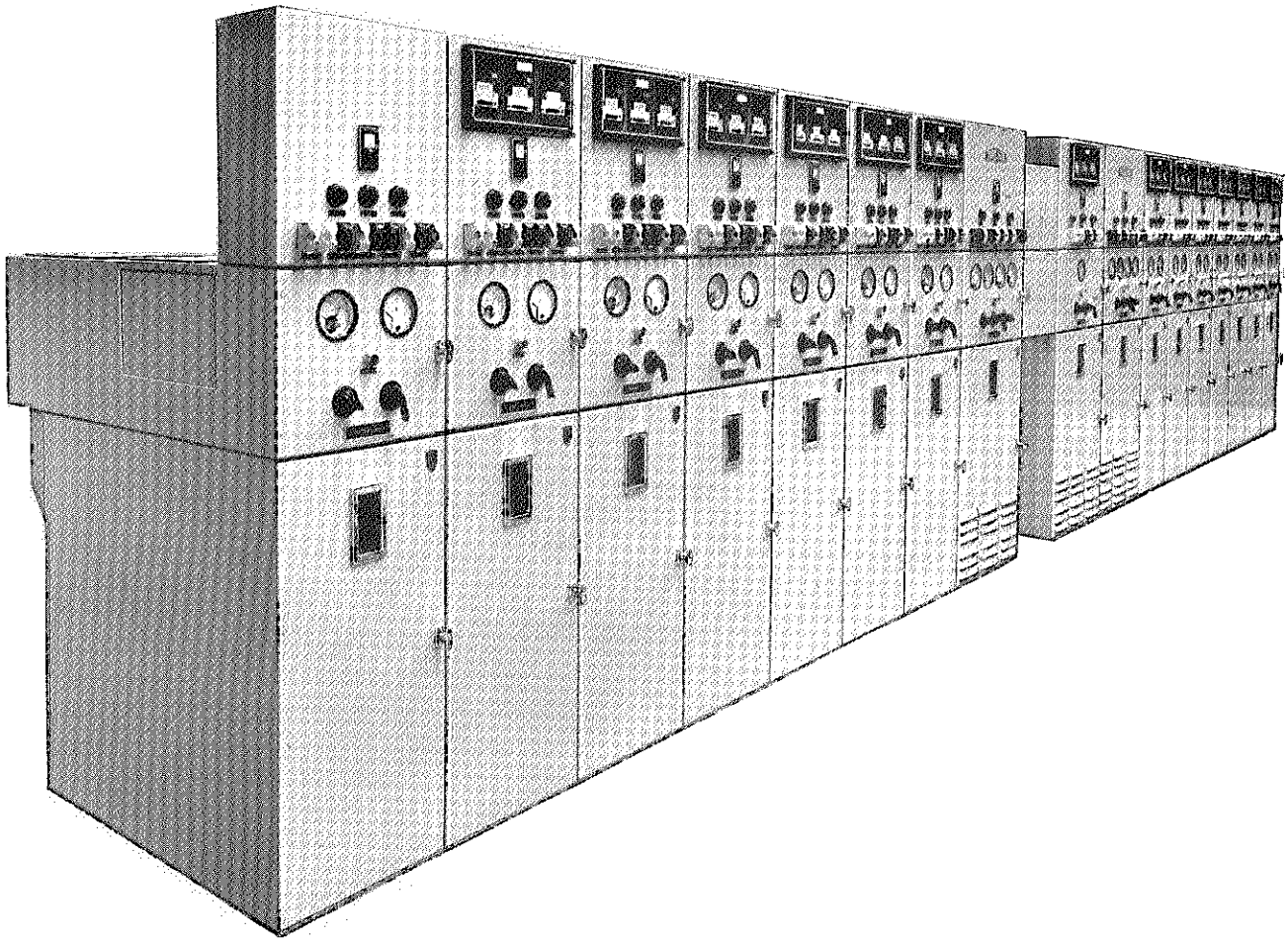
Type VSI

METALCLAD SWITCHGEAR

Incorporating Integral Earthing



Short-Circuit Ratings up to 350 MVA, 6·6 kV
500 MVA, 11 kV
750 MVA, 13·8 kV

Current Ratings up to 2000 amperes

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Issue: 1st August 1971
Supersedes issue 20th October 1970

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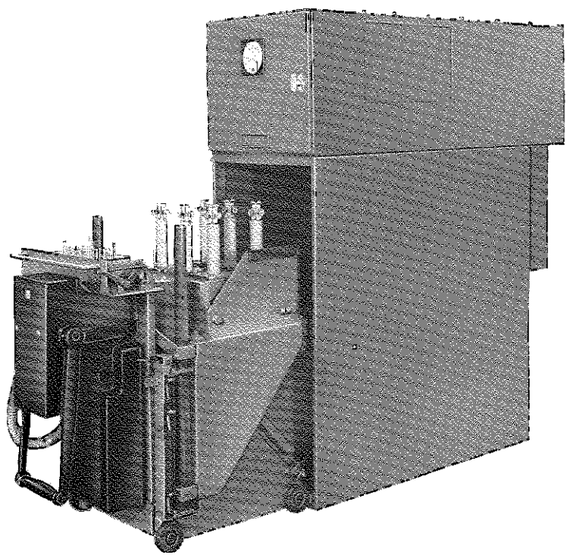
Metalclad Switchgear
Incorporating Integral Earthing

Main Features

- ★ *Vertical Isolation — Horizontal Withdrawal*
- ★ *Single Busbar*
- ★ *Air-insulated, with extensive use of Epoxy Resin*
- ★ *Transfer Integral Earthing*
- ★ *Attractive, flush-fronted appearance*
- ★ *Easy access for Inspection and Maintenance*
- ★ *Good Cabling Facilities*
- ★ *Fully Interlocked*
- ★ *Readily extensible in all current ratings*
- ★ *Comprehensively tested*
- ★ *Complies with British Electricity Boards' Specification S2 (1955) and Addendum (1959), B.S.116 : 1952 (including Amendments up to November 1962), and all appropriate British Standards*



400-ampere, Type VSI unit with flush-front door removed and circuit-breaker carriage withdrawn

General

The type VSI range of switchgear is suitable for use on systems up to and including 13·8 kV with short-circuit fault values up to and including 750 MVA. It is available with normal-current ratings up to and including 2000 amperes.

It is of the vertical-isolation, horizontal-withdrawal, metalclad type; fitted with bulk-oil, double-break circuit-breakers. The fixed housing is air-insulated. Cast epoxy-resin insulation has been used extensively, enabling the number of joints in the current-carrying conductors to be kept to a minimum.

Cable and busbar earthing is integral within the unit and is effected by means of circuit-breaker transfer. Care has been taken to ensure that the selection of the busbar and cable-earth positions is simple and positive. Only two sizes of housing are used; one size for 400, 800 and 1250 ampere ratings and another for 1600 and 2000 ampere ratings. Busbars in one size of unit line up exactly with those in the other size and no trunks or joggle chambers are necessary.

Extensive testing has been carried out in our own laboratories and those of K.E.M.A., Holland, to prove compliance with B.S.116 : 1952.

With normal assembly. the impulse withstand is 75 kV peak. When the unit is TOTALLY encapsulated. the impulse withstand level is 95 kV peak.

The type VSI range complies with British Electricity Boards' Specification S2 (1955) and addendum, for Standard Distribution Switchgear, and S7 (1961) for Cable-Sealing Boxes for Switchgear.

Housing

The fixed housing consists of two parts—a bottom housing which contains safety shutters, selector mechanism, earth bars, etc., and into which the circuit-breaker and its carriage are inserted—and a top housing containing instrument chamber, busbar chamber and current-transformer chamber. On top of the housing are mounted a relay chamber and voltage-transformer, when required.

The housings consist of folded-steel sections welded together and are of robust construction. The bottom housing is fitted with a hinged door to give a flush front appearance. A large window coincides with the circuit-breaker ON-OFF indicator. The door can be lifted off its hinges to give greater accessibility during maintenance and erection.

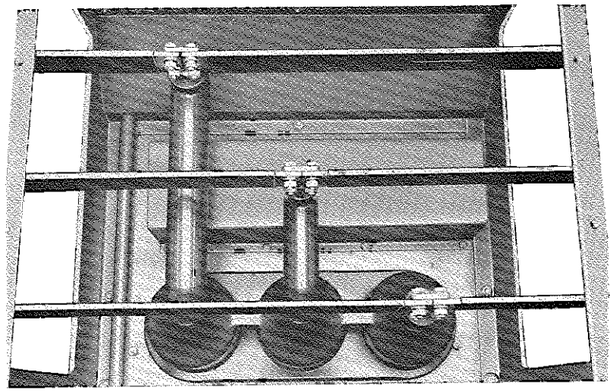
Busbar Chamber

The busbar spouts and the connections from the spouts to the busbars are cast in epoxy-resin as a three-phase monobloc. Busbars, of unit length, are made of high-conductivity hard-drawn copper bar and are insulated with shrunk-on P.V.C. sleeving, or epoxy-resin. Busbar support barriers between units are unnecessary.

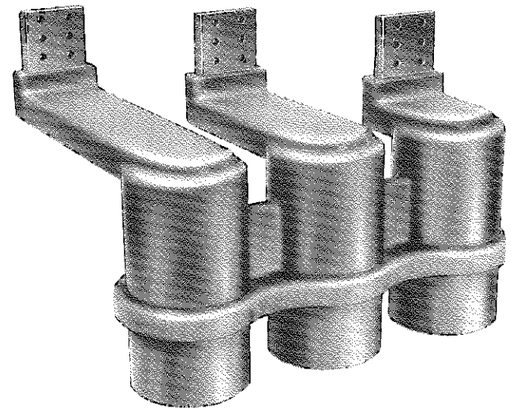
At each end of a switchboard the end of the busbar chamber is blanked off with a steel cover. This cover is fitted from the inside of the chamber, the exterior of the chamber being kept free of all protuberances. Thus, when an existing switchboard is being extended, the new units can be grouted in position and the cables made off whilst the existing busbars are still alive. Finally, the busbars are made dead, the internal end cover removed and the new busbars fitted between the existing and the new units. *In this way loss of supply on the switchboard is kept to an absolute minimum.*

Current-Transformer Chamber

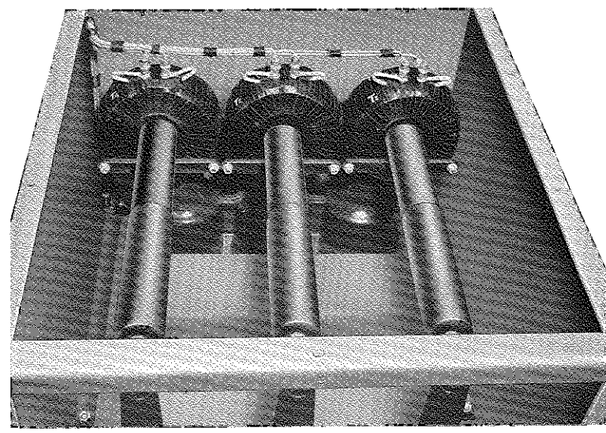
When ring-type current-transformers are fitted (for ratios 100/5 and upwards), the insulated primary is cast, in epoxy-resin, integrally with the circuit spouts, either as a three-phase monobloc or as single-phase assemblies. An earthed metal screen is provided on the primaries, over which are clamped the current-transformer cores and secondary coils. Each current-transformer primary and spout assembly is individually tested to ensure that it is discharge-free at working voltage.



Plan view of busbar chamber on a 400-ampere unit

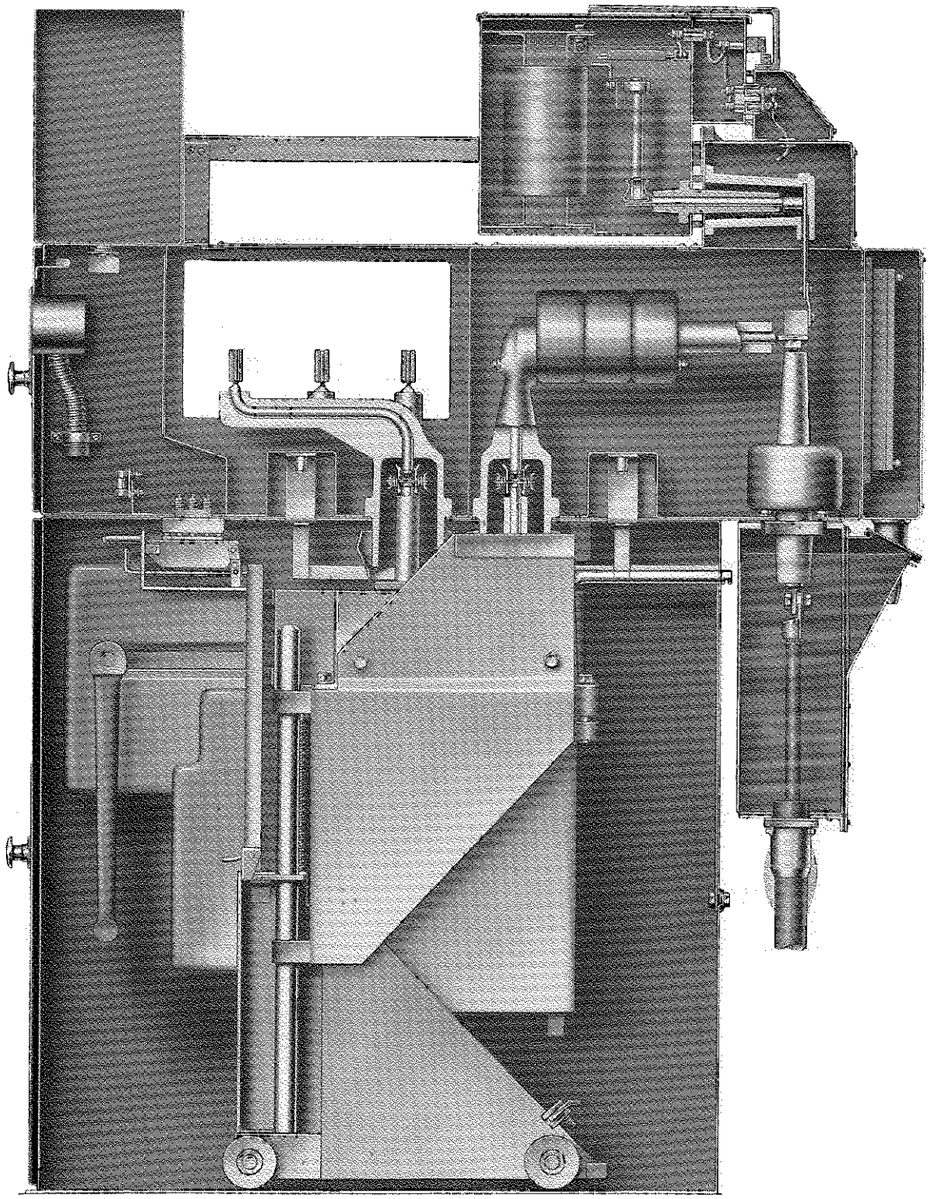


Assembly of spouts and busbar connections for a 2000-ampere unit

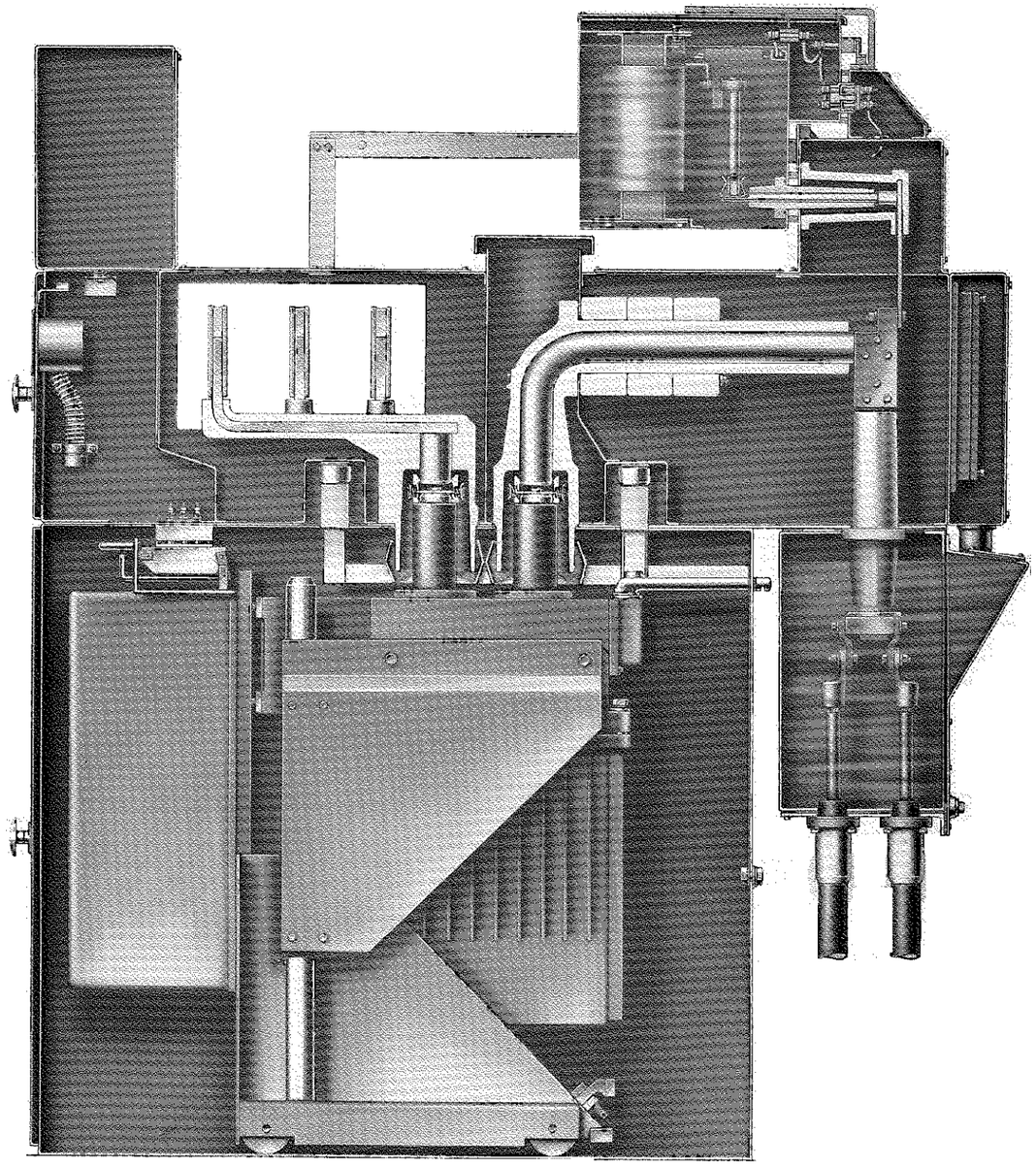


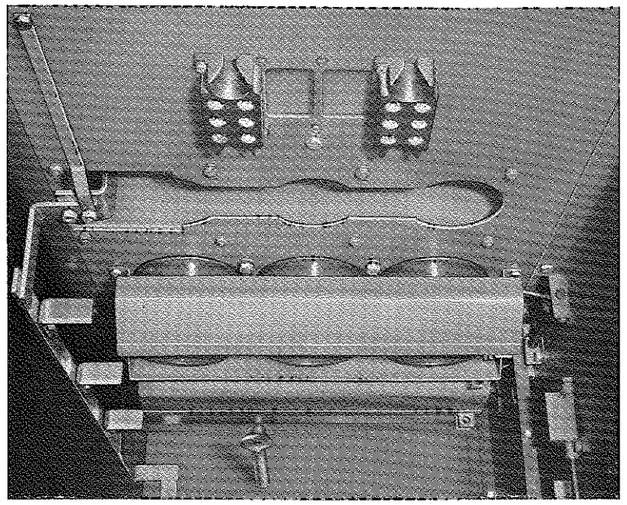
Current-transformer chamber

400-ampere Type VSI Unit



2000-ampere Type VSI Unit





View of inside of bottom housing showing safety shutters, secondary isolating sockets, vent pipe, top-plate earthing contacts. The front (busbar) shutters are shown held open for inspection or maintenance purposes

When wound-type current-transformers are used (for ratios up to 150/5), they are of cast epoxy-resin design. In these cases the spouts are not integral with the current-transformer primaries.

Cable-box bushings are cast in epoxy-resin. They can accommodate extra ring-type current-transformers when necessary.

Cable-Boxes

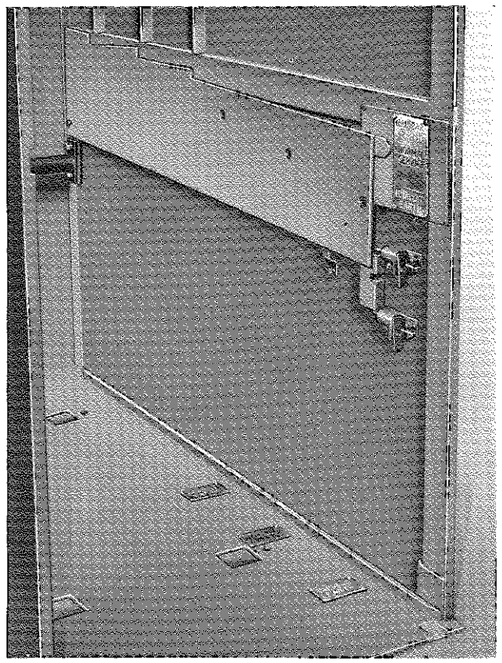
All cable-boxes are of welded-steel construction. They are designed to make cable-jointing as easy as possible. Generous filling spouts are provided. They comply with British Electricity Boards' Specification S7.

Boxes to suit all types, sizes and numbers of cables are available.

Voltage-Transformer

The voltage-transformer and its associated high-tension fuses are accommodated in a welded steel, draw-out type tank which runs on rails on the top of the unit. The bushings on the tank, and the spouts into which they are inserted, are cast in epoxy-resin. The secondary fuses are mounted outside the tank and are readily accessible.

Safety-shutters automatically seal off the spouts when the V.T. tank is withdrawn. The shutters can be padlocked closed. For testing or maintenance purposes the shutters can be kept open by means of a manually-operated catch which is self-cancelling when the transformer is returned to service.



Selector device

The voltage-transformer can be connected either to the cable side of the current-transformers or to the busbars.

Main Safety-Shutters

Automatic safety-shutters cover the busbar and circuit spouts when the breaker is withdrawn. They are positively operated both when opening and closing. They can be padlocked in the closed position.

Either or both sets of shutters can be kept open for testing or maintenance purposes by means of manually-operated catches which are automatically cancelled when the breaker is inserted into the housing.

During earthing operations only the appropriate shutter opens. It is possible, therefore, to padlock the other shutter closed.

Integral Earthing

Integral earthing, of the breaker transfer type, is provided on every unit. For this purpose a set of three earthed contacts are placed to the front of the busbar spouts and a similar set to the rear of the circuit spouts. To earth the busbars the circuit-breaker is raised to its "ENGAGED" height with the carriage in a position forward to that which it normally occupies. The circuit-breaker is then closed, thereby making direct connection with the busbars, through the circuit-breaker, to earth.

Similarly, the circuit side is earthed by placing the circuit-breaker in a position to the rear of its normal service position.

These three positions are labelled "BUSBAR EARTH", "NORMAL SERVICE" and "CIRCUIT EARTH". Positive location in these positions is achieved by means of a simple selector device which is situated inside the bottom housing. With the carriage withdrawn, the selector is set to indicate the position required. The carriage is then inserted into the housing and is automatically stopped at the pre-selected position. In this position (and this one only) a shoot bolt on the carriage is moved across to engage in a hole in the selector device. Moving the bolt also causes a shutter to uncover the shaft onto which the circuit-breaker raising and lowering handle fits. The handle can now be inserted and the breaker elevated.

Briefly, the selector—

(*a*) Stops the carriage in the selected position, and

(*b*) prevents any attempt to elevate the breaker in other than the selected position.

The selector can be padlocked *in any* position and can also be padlocked *out of either* earth position.

In addition, labels on the baseplate of the housing indicate, at a glance, the position in which the breaker is located.

Earth-Bars

The main earth-bar runs along the rear and outside of the bottom housing at a convenient height for the earthing of incoming cables on site.

From the main earth-bar is connected an earth-bar system situated inside the bottom housing. To this system is connected the integral earthing contacts previously described. Also connected to this system are a number of earth contacts which engage with contacts bolted to the top of the circuit-breaker top-plate in such a manner that the top-plate is solidly earthed in the "BUSBAR-EARTH", "NORMAL SERVICE" and "CIRCUIT EARTH" positions. These earth contacts make contact before the main isolating contacts as the circuit-breaker is elevated.

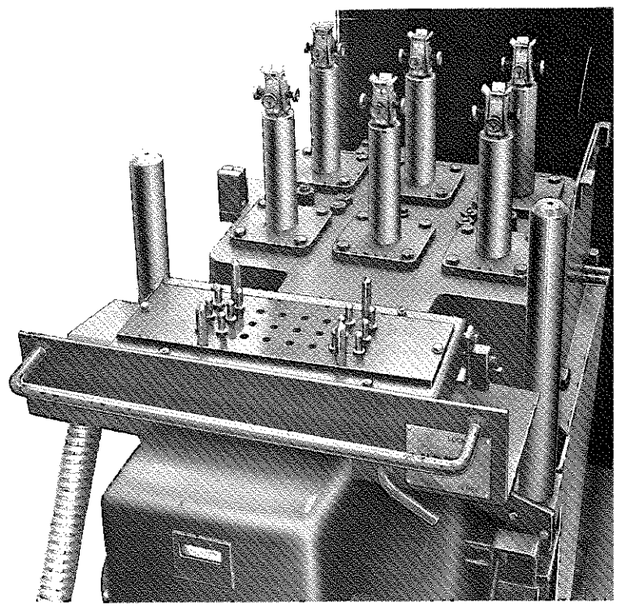
All earth-bars are made of hard-drawn, high-conductivity copper and short-circuit tests have proved that the earth-bar systems are capable of carrying the full fault currents, associated with the various short-circuit ratings, for a period of three seconds.

When required, an insulated earth-bar can be provided for use with leakage-to-frame type protection.

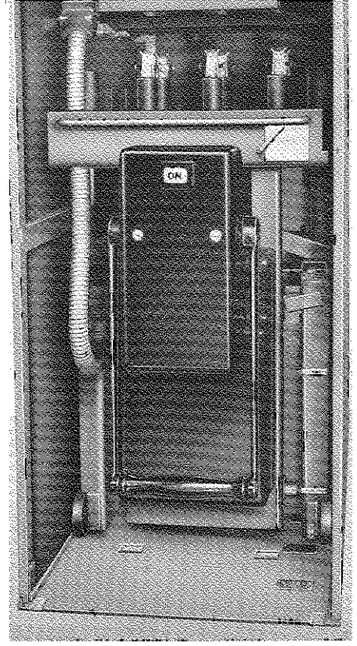
Secondary Isolating Contacts

The secondary wiring is carried from the mechanism, via a flexible tube, through secondary isolating contacts, into the bottom of the instrument chamber. The isolating sockets are contained in moulded blocks fastened to the bottom of the instrument chamber. The isolating plugs are contained in a plug box fastened to the mechanism. This box is detachable and, with the breaker in its isolated position, the plug box can be plugged into the sockets at the bottom of the instrument chamber, thus allowing checking of secondary circuits without actually having the breaker in service. It is not necessary to disturb the secondary circuits after such checking because, if the circuit-breaker is now elevated to its "ENGAGED" position, the plug box automatically latches into its original position on the mechanism.

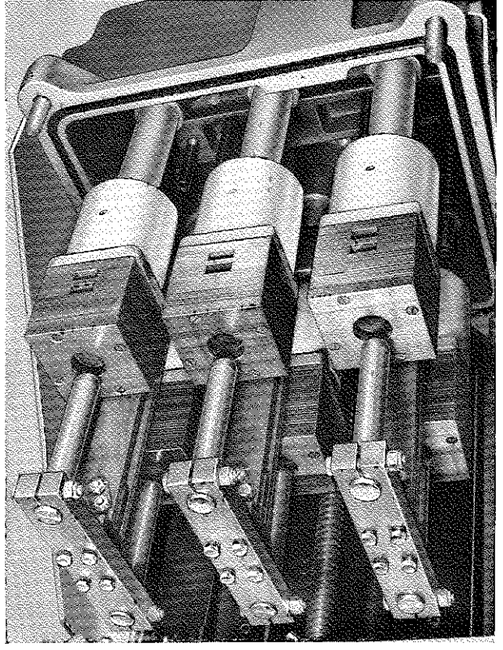
The secondary isolating sockets are arranged in three groups so that the isolating plugs make contact when the circuit-breaker is raised in the "BUSBAR EARTH", "NORMAL SERVICE" and "CIRCUIT EARTH" positions. Sockets for tripping circuits are not provided in the "EARTH" positions, thereby making the circuit-breaker non-automatic in these positions. Sockets for closing circuits *are* provided in the "EARTH" positions.



400-ampere circuit-breaker on carriage, showing secondary isolating plugs in foreground



View from front of a 400-ampere unit with the front door removed. The circuit-breaker is in the "ISOLATED" position. The secondary isolating-contact plug-box is in the "ENGAGED" position so that the secondary circuits can be tested



400-ampere, Type R4 circuit-breaker on its carriage, with tank removed

Interlocks

Interlocks are provided as follows:—

1. The circuit-breaker cannot be inserted into the housing unless the tank is fitted.
2. The circuit-breaker cannot be inserted into the housing unless it is in the "ISOLATED" position.
3. The circuit-breaker cannot be closed unless it is in its "ENGAGED" or "ISOLATED" positions.
4. The circuit-breaker cannot be raised or lowered unless it is open.
5. The circuit-breaker cannot be raised in any position other than that which has been selected on the selector mechanism.
6. The top cover of the voltage-transformer tank cannot be removed unless the transformer is isolated.

Circuit-Breaker Carriage

The circuit-breaker is mounted in a carriage of sturdy, folded-steel construction. Vertical movement of the breaker is guided by two substantial steel rods. It is elevated by means of a single jack-screw which is rotated through a bevel gear, by a removable handle situated at a convenient height.

The breaker has two normal positions in the housing, namely "ENGAGED" and "ISOLATED", and these are clearly indicated by labels. When removing the tank, the breaker is lowered, below the "ISOLATED" position, so that the tank is resting on the floor. The tank bolts are then unfastened and the breaker raised past the "ENGAGED" position to the limit of its upward travel, leaving the tank on the floor. The breaker is then closed, using the maintenance closing device, and the carriage, complete with circuit-breaker, wheeled away.

Circuit-Breakers

Circuit-breakers are available in the following current ratings:

400/630 amperes : designated type R4
800 amperes : designated type R8
1250 amperes : designated type R12
1600 amperes : designated type Q16
2000 amperes : designated type Q20

They have been short-circuit tested, to B.S.116 : 1952, in the appropriate type VSI housings, at the K.E.M.A. Laboratories, Holland. The following Certificates of Rating apply:—

400-amp. and 800-amp. circuit-breaker with spring-operated manual-closing mechanism M19.

250 MVA at 11 kV : Certificate No. 245–64

400-amp. and 800-amp. circuit-breaker with spring-operated, power-closing, and solenoid-operated power-closing mechanisms M14C/D, M14E.

250 MVA at 11 kV : Certificate No. 274–63
350 MVA at 11 kV : Certificate No. 275–63
500 MVA at 11 kV : Certificate No. 276–63
250 MVA at 6·6 kV : Certificate No. 277–63
350 MVA at 6·6 kV : Certificate No. 278–63
150 MVA at 3·3 kV : Certificate No. 279–63

1200-amp. circuit-breaker with spring-operated, power-closing and solenoid-operated, power-closing mechanisms M14C/D, M14E.

250 MVA at 11 kV : Certificate No. 280–63
350 MVA at 11 kV : Certificate No. 281–63
500 MVA at 11 kV : Certificate No. 282–63
250 MVA at 6·6 kV : Certificate No. 283–63
350 MVA at 6·6 kV : Certificate No. 284–63
(M14E) 500 MVA at 6·6 kV : Certificate No. 1202–68
150 MVA at 3·3 kV : Certificate No. 285–63

1600-amp. and 2000-amp. circuit-breaker with solenoid-operated, power-closing mechanism M14E.

250 MVA at 11 kV : Certificate No. 293–63
350 MVA at 11 kV : Certificate No. 295–63
500 MVA at 11 kV : Certificate No. 244–64
750 MVA at 11 kV : Certificate No. 1200–89
250 MVA at 6·6 kV : Certificate No. 294–63
350 MVA at 6·6 kV : Certificate No. 365–64
500 MVA at 6·6 kV : Certificate No. 1201–68

1600-amp. and 2000-amp. circuit-breaker with spring-operated, power-closing mechanism M14C/D.

250 MVA at 11 kV : Certificate No. 409–64
350 MVA at 11 kV : Certificate No. 363–64
250 MVA at 6·6 kV : Certificate No. 362–64

Short-circuit tests have also been carried out on a close/open—15 seconds—close/open duty cycle to prove the suitability of the circuit-breakers for ratings up to 750 MVA at a normal voltage of 13·8 kV (rated maximum voltage 15 kV).

General

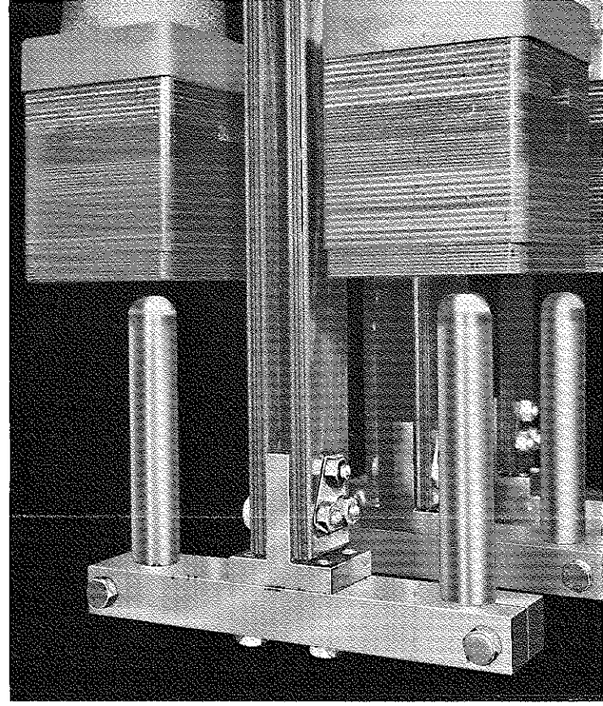
Types R and Q circuit-breakers are of the bulk-oil, double-break type with side-vented arc-control devices.

Top-Plate

The top-plate is cast in aluminium alloy to B.S.1490 LM-8-WP. For the type R breakers it is die-cast, and for the type Q breakers it is sand-cast. The upper surface is machined all over to provide a good seating for the circuit-breaker bushings.

Tank

The tank is of welded-steel construction. Steel inter-phase barriers are fitted which, in addition to greatly strengthening the tank, ensure that inter-phase faults are impossible. The walls and the inter-phase barriers are lined with insulating material.



Arc-control devices, contact bars and lifting bars on a 400-ampere, Type R4 circuit-breaker

The oil level, with the tank off, is marked on the inside and the outside of the tank. An oil and gas-tight joint between tank and top-plate is ensured by means of a gasketed tongue and groove type of joint in the case of the R circuit-breakers and a gasketed flange-type, machined joint in the case of the Q circuit-breakers. In each case the gaskets are continuous and have no joints.

Bushings and Isolating Contacts

The bushings are of synthetic-resin-bonded-paper construction and incorporate stress-controlling condenser layers. Fixing flanges, die-cast in aluminium alloy to B.S.1490 LM-8-WP, are shrunk onto the bushings.

Easily removable isolating contacts are fitted to the upper ends of the bushings. These contacts consist of a number of silver-plated copper fingers, the number varying with the current-rating. The fingers are individually spring-loaded and the contact points are spherically-shaped so that positive contact is ensured. A rolling action at these contact points allows sufficient flexibility to cater for any misalignment of the contacts when the circuit-breaker is plugged into the spouts.

Main Contacts

For short-circuit ratings up to 250 MVA at 11 kV and 150 MVA at 6·6 kV, the fixed contact consists of a cluster of four individually spring-loaded, brass contacts. One of the fingers is extended to form an arcing contact. The moving contact is of brass with

List of VSI Short-Circuit Ratings

OCB Normal Current Rating	Short-Circuit Rating	Mechanism Type	Certificate and Report Numbers
400	250/11	S	A.7710 + B.3283–02
400	350/11	S	A.7710
400	350/11	XA : XM : XE : XEM	A.7710 + AS.7852
400	250/6·6	XM : XE : XEM : S	277–63
400	150/3·3	XM : XE : XEM : S	279–63 + 817–72
400	500/11	XM : XE : XEM : S	276–63 + 817–72
400	350/6·6	XM : XE : XEM : S	278–63 + 817–72
800	250/11	S	A.7710 + AS.7788 + B.3346–01
800	350/11	S	A.7710 + AS.7788
800	350/11	XA : XM : XE : XEM	A.7710 + AS.7788 + AS.7858
800	250/6·6	XM : XE : XEM : S	277–63
800	150/3·3	XM : XE : XEM : S	279–63 + 817–72
800	500/11	XM : XE : XEM	276–63 + 817–72
800	500/11	S	233–71 + 817–72
800	350/6·6	XM : XE : XEM : S	278–63 + B.1270 + 817–72
1200	250/11	XM : XE : XEM : S	280–63
1200	350/11	XM : XE : XEM : S	281–63
1200	250/6·6	XM : XE : XEM : S	283–63
1200	150/3·3	XM : XE : XEM : S	285–63
1200	500/11	XM : XE : XEM : S	282–63
1200	350/6·6	XM : XE : XEM : S	284–63
1200	500/6·6	S	1202–68
1600	250/11	XM : XE : XEM	409–64
1600	250/11	S	293–63
1600	350/11	XM : XE : XEM	363–64
1600	350/11	S	295–63
1600	250/6·6	XM : XE : XEM	362–64
1600	250/6·6	S	294–63
1600	500/11	S	244–64
1600	350/6·6	S	365–64
1600	750/11	S	1200–68
1600	500/6·6	S	1201–68
2000	250/11	XM : XE : XEM	409–64
2000	250/11	S	293–63
2000	350/11	XM : XE : XEM	363–64
2000	350/11	S	295–63
2000	250/6·6	XM : XE : XEM	362–64
2000	250/6·6	S	294–63
2000	500/11	S	244–64
2000	350/6·6	S	365–64
2000	750/11	S	1200–68
2000	500/6·6	S	1201–68

General

Types R and Q circuit-breakers are of the bulk-oil, double-break type with side-vented arc-control devices.

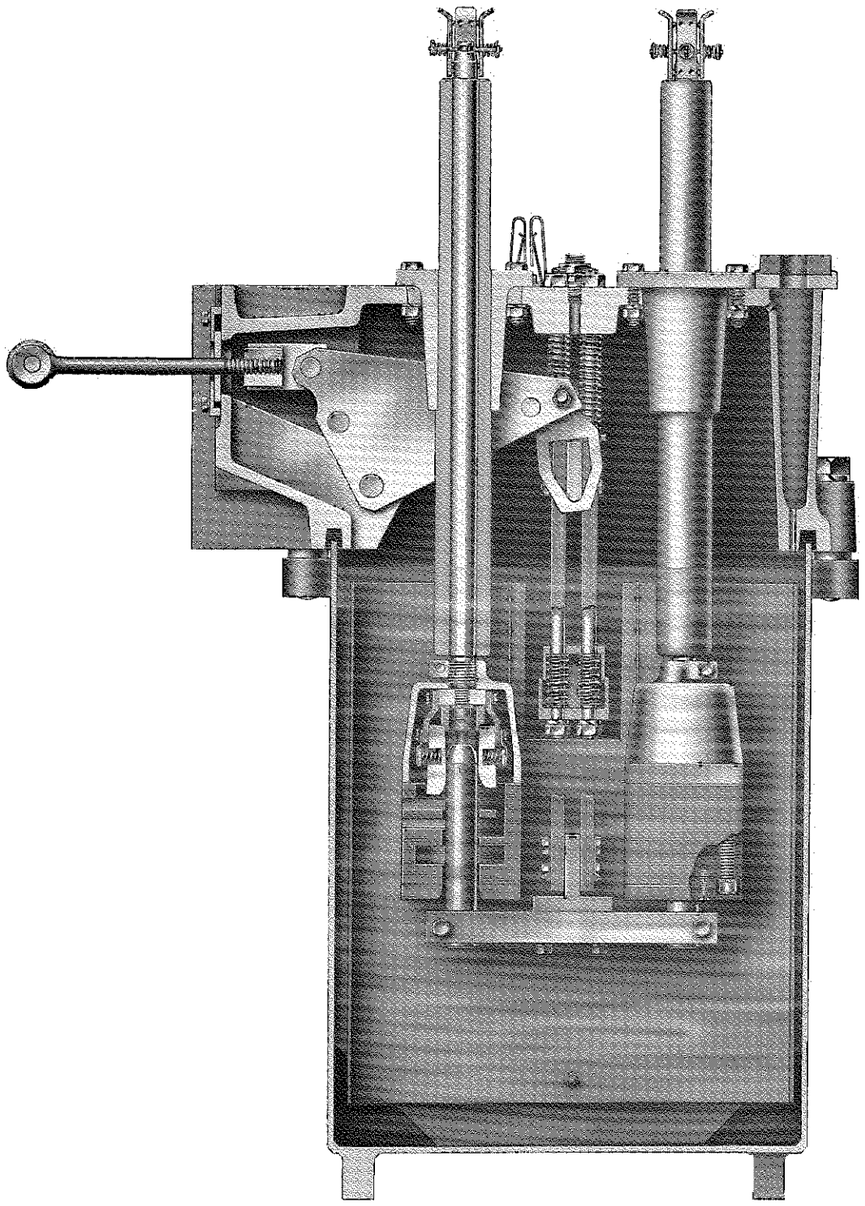
Top-Plate

The top-plate is cast in aluminium alloy to B.S.1490 LM-8-WP. For the type R breakers it is die-cast, and for the type Q breakers it is sand-cast. The upper surface is machined all over to provide a good seating for the circuit-breaker bushing flanges.

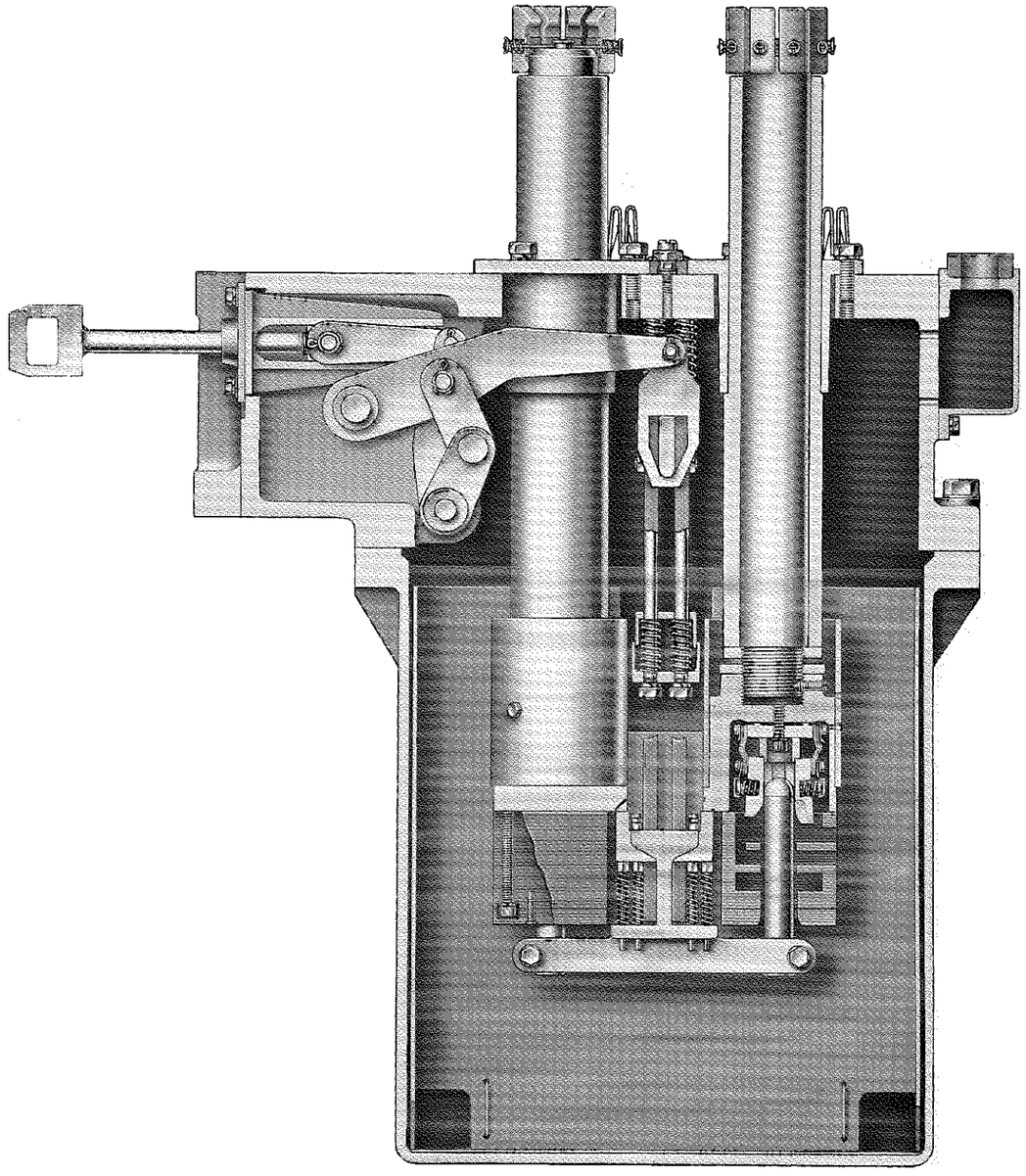
Tank

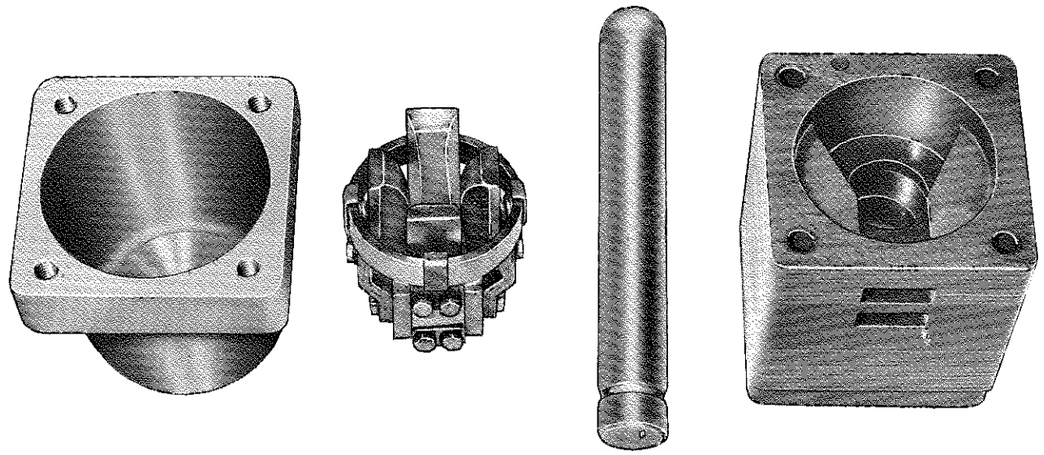
The tank is of welded-steel construction. Steel inter-phase barriers are fitted which, in addition to greatly strengthening the tank, ensure that inter-phase faults are impossible. The walls and the inter-phase barriers are lined with insulating material. The oil level, with the tank off, is marked on the inside and the outside of the tank. An oil and gas-tight joint between tank and top-plate is ensured by means of a gasketed tongue and groove type of joint in the case of the R circuit-breakers and a

250 MVA, 11kV, 400-ampere, Type R4 Circuit-Breaker



500 MVA, 11kV, 1600-ampere, Type Q16 Circuit-Breaker





Exploded view of arc-control device and contacts of a Type R4 circuit-breaker

a steel arcing tip. It is clamped into a brass contact bar and is positively located by means of a clamping screw which fits into a groove in the contact.

For short-circuit ratings above 250 MVA at 11 kV and 150 MVA at 6·6 kV, the fixed contact consists of six brass contacts, one of them being extended and tipped with sintered-copper-tungsten to form an arcing contact. The moving contact is made of copper and has a sintered-copper-tungsten arcing tip.

800-amp. circuit-breakers have the fixed and moving contacts silver-plated.

1200, 1600 and 2000-amp. circuit-breakers are fitted with additional butt-type, silver-plated contacts situated external to and between the arc-control devices of each phase. When the circuit-breaker opens, these contacts open before the cluster-type contacts within the arc-control device. Thus, no arcing takes place outside the arc-control device.

Throughout this range of circuit-breakers, for similar short-circuit ratings, the same arc-control stacks and fixed and moving contacts are used, regardless of normal current rating, with the exception that the 800-amp. contacts are silver-plated. Also, the same tank-linings are used on the 400, 800 and 1200-amp. circuit-breakers, and on the 1600 and 2000-amp. circuit-breakers. Thus the stocking of spares is kept to a minimum.

The contacts and arc-control device have been designed so that the time and labour necessary for their inspection and replacement is kept to a minimum. No adjustments are necessary when fitting new contacts, all contacts being positively located in their correct position. No special tools or setting gauges are required.

Arc-Control Device

The arc-control device incorporates a cast brass or copper (according to current-rating) body which is threaded and clamped to the bottom of each bushing stem. The fixed contact cluster fits into this body, a spigot pin ensuring that the arcing contact is correctly positioned. To the underside of the body is bolted the arc-control stack, which is made of synthetic-resin-bonded-wood laminate. The stack is of the side-blast, self-compensated type and has two vents. To ensure that these vents are correctly positioned, a spigot pin in the body locates in a hole in the top of the stack.

Dash-Pots

Two piston-type dash-pots give smooth deceleration and bring the moving contacts to rest at the end of the opening stroke.

Opening Springs

Two sets of springs provide the stored energy for positive opening of the circuit-breaker contacts. The accelerating springs are comparatively light and are situated on the inner guide rods. They act throughout the opening stroke. The throw-off springs are heavier and are situated on the outer guide rods. They act only during the initial stage of the opening stroke when the force of the fixed cluster contacts has to be overcome.

Venting

An expansion chamber is incorporated in the top-plate to prevent expulsion of oil from the breaker when breaking heavy short-circuit currents. In the normal service position the outlet of this expansion chamber is connected to a pipe which leads the vented gases outside the housing. Special short-circuit tests have proved the efficiency of the sealing between the pipe and the expansion chamber.

Circuit-Breaker Operating Mechanisms

Four types of operating mechanisms are available:

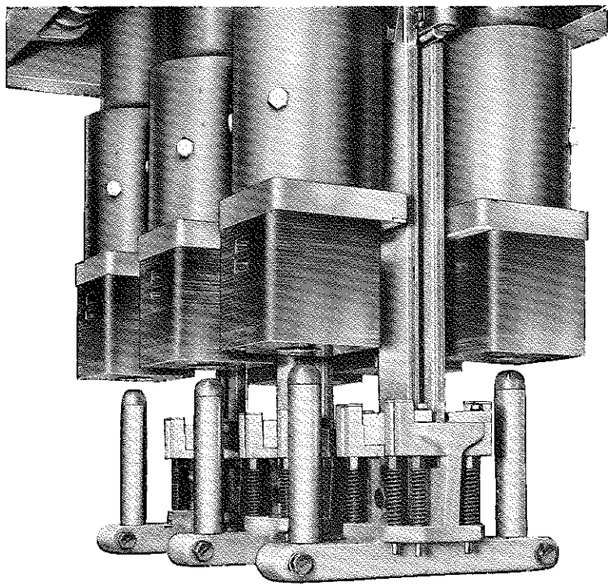
(*a*) type M19, independent manual operated mechanism

(*b*) type M14C, dependent power operated mechanism, spring hand charged

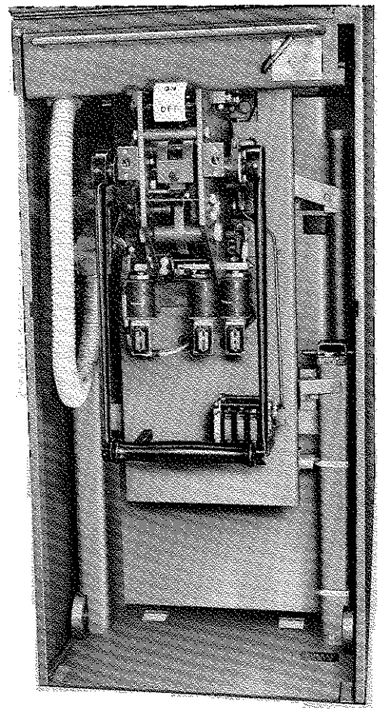
(*c*) type M14D, as *b* but spring motor charged

(*d*) type M14E, as *b* but solenoid operated

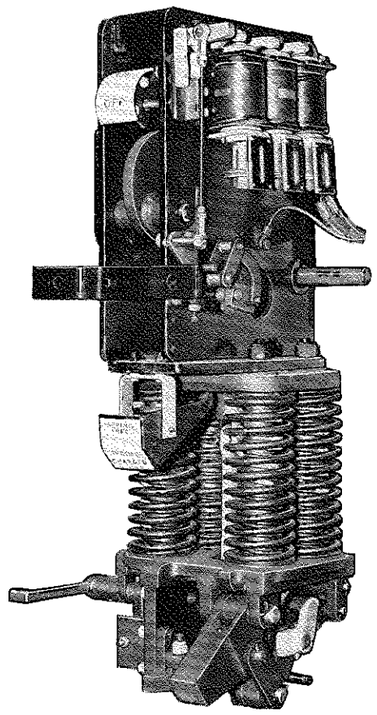
The spring-operated, manual-closing mechanism has been designed so that the speed of closing is entirely independent of the operator. Initial downward movement of the operating handle causes the moving contacts to travel to a predetermined distance from the fixed contacts. The clearance between fixed and moving contacts at this point is more than adequate to withstand the normal service voltage across the circuit-breaker. Further movement of the handle charges the closing springs but does not cause the contacts to close any further. Just before completion of the handle stroke, the springs are released and the circuit-breaker closed under the action of the



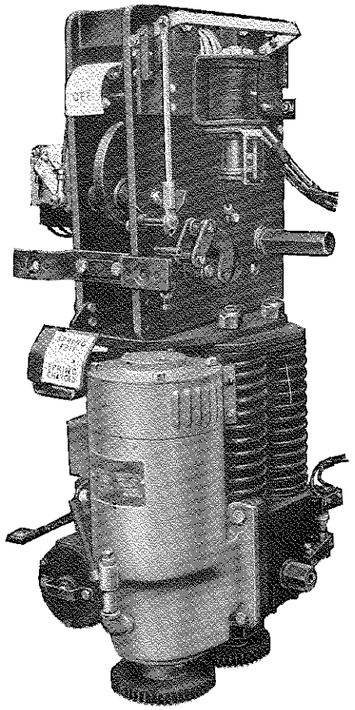
2000-ampere, Type Q20 circuit-breaker



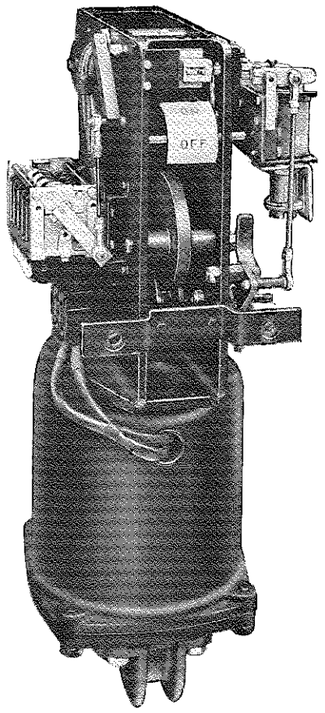
View from front of a 400/630 A unit, showing a Type M19, independent manual operated with its cover removed



Type M14C, dependent power operated mechanism, spring hand charged



Type M14D, dependent power operated mechanism, spring motor charged



Type M14E, dependent power operated mechanism solenoid operated

springs. Tripping is effected by an upward movement of the handle. The handle can be padlocked to prevent mechanical tripping when the circuit-breaker is closed, or closing when the circuit-breaker is open. For maintenance purposes a device is provided which permits the circuit-breaker to be opened and closed slowly by hand. This device can be fitted only when the mechanism cover is removed.

The power-operated mechanisms all use the same linkage, varying only in the type of actuator, i.e. spring or solenoid. Conversion from one type of mechanism to another is thus simplified. These mechanisms have push-button tripping which can be padlocked to prevent mechanical tripping. A maintenance operating lever is provided which enables the circuit-breaker to be opened and closed slowly. This lever can only be fitted when the mechanism cover is removed.

The spring-operated, power-closing mechanisms are suitable for single-shot, auto-reclose duty, i.e. the springs can be recharged when the circuit-breaker is closed, thus allowing the breaker to be reclosed immediately it opens. The springs can be released either mechanically or electrically.

All mechanisms are of the trip-free type, i.e. they are free to open immediately the trip-circuit is energised during the closing operation. The connection between the actuating lever and the circuit-breaker contact bars is such that, under all conditions, the drive is positive in both directions and the mechanism and moving contacts operate in unison.

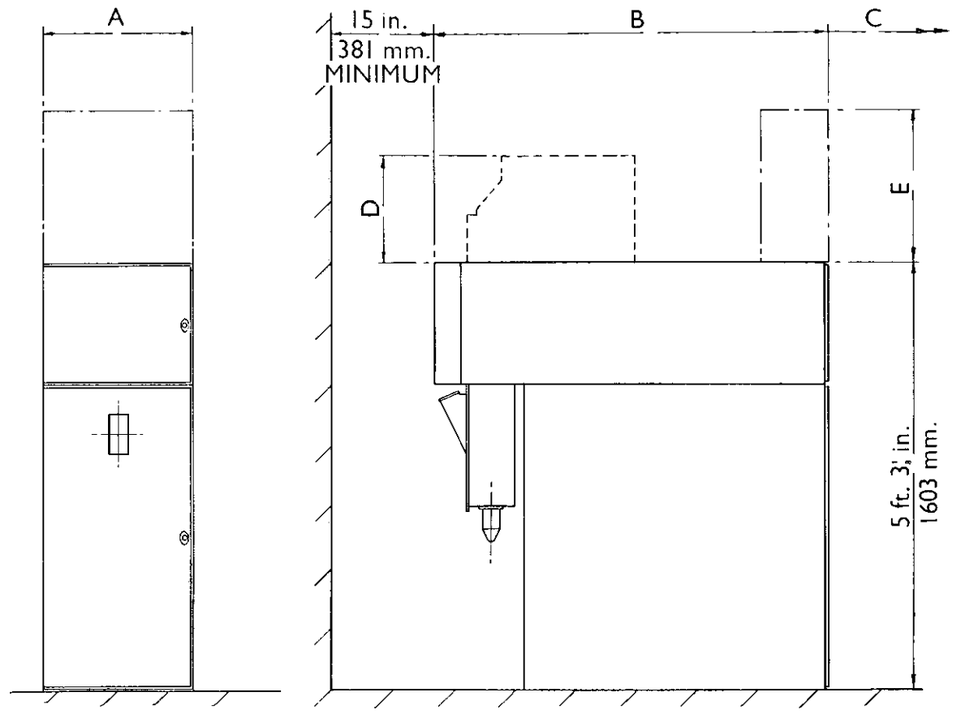
A mechanically-operated "ON" and "OFF" indicating device is provided on all mechanisms and is positively driven in both directions, through a coupling from the circuit-breaker draw-bar, to give a true indication of contact position.

Any normal combination of current-transformer-operated, overcurrent and earth-fault trip-coils, shunt-trip or under-voltage release coils can be fitted.

Oil Switch

Type ILSA oil-switches, constructed and tested in accordance with B.S.2631, are available for use with Type VSI switchgear. The busbars in the ILSA unit are identical with those in the VSI units, thus facilitating extensions to or re-arrangements of switchboards.

These switches are described in publication No. 52/3008.



CURRENT RATING OF UNIT			400/800 amp.		1200 amp.		1600/2000 amp.	
			in.	mm.	in.	mm.	in.	mm.
A	Width of unit		22	559	22	559	30	762
B	Length of unit		59	1499	59	1499	69	1753
C	Minimum distance for withdrawal of circuit-breaker		39½	995	39½	995	47½	1198
D	Height of voltage transformer	3 limb type	16⅛	410	16⅛	410	18⅝	473
		5 limb type	25⅛	645	25⅛	645	27⅝	702
E	Height of relay chamber		Depends on number of relays required					
Oil Quantities			Galls. 13·5	Litres 61	Galls. 12·5	Litres 57	Galls. 20	Litres 91
Weight of basic unit without oil, V.T's or relays			lbs. 1300	kg. 590	lbs. 1500	kg. 680	lbs. 2100	kg. 953

The design and manufacture of Brush Switchgear are subject to constant review and the illustrations may, therefore, vary in some details from the equipment supplied

Brush Switchgear is Registered to MOD Standard 05—24

CURRENT RATING OF UNIT			400/800 amp.		1200 amp.		1600/2000 amp.	
			in.	mm.	in.	mm.	in.	mm.
A	Width of unit		22	559	22	559	30	762
B	Length of unit		$60\frac{1}{2}$	1537	$60\frac{1}{2}$	1537	$69\frac{3}{8}$	1762
C	Minimum distance for withdrawal of circuit-breaker		$39\frac{3}{8}$	1000	$39\frac{3}{8}$	1000	48	1219
D	Height of voltage transformer	3 limb type	$16\frac{1}{8}$	410	$16\frac{1}{8}$	410	$18\frac{5}{8}$	473
		5 limb type	$25\frac{1}{8}$	638	$25\frac{1}{8}$	638	$27\frac{5}{8}$	702
E	Height of relay chamber		Depends on number of relays required					
Oil Quantities			Galls. 13·5	Litres 61	Galls. 12·5	Litres 57	Galls. 20	Litres 91
Weight of basic unit without oil, V.T's or relays			lbs. 1300	kg. 590	lbs. 1500	kg. 680	lbs. 2100	kg. 953

The design and manufacture of Brush Switchgear are subject to constant review therefore slight variations may occur between the details given and the equipment supplied