Westinghouse

Types B-5, B-13, F-24, F-24-R, F-25 and F-25-R Oil Circuit-Breakers

INSTRUCTION BOOK

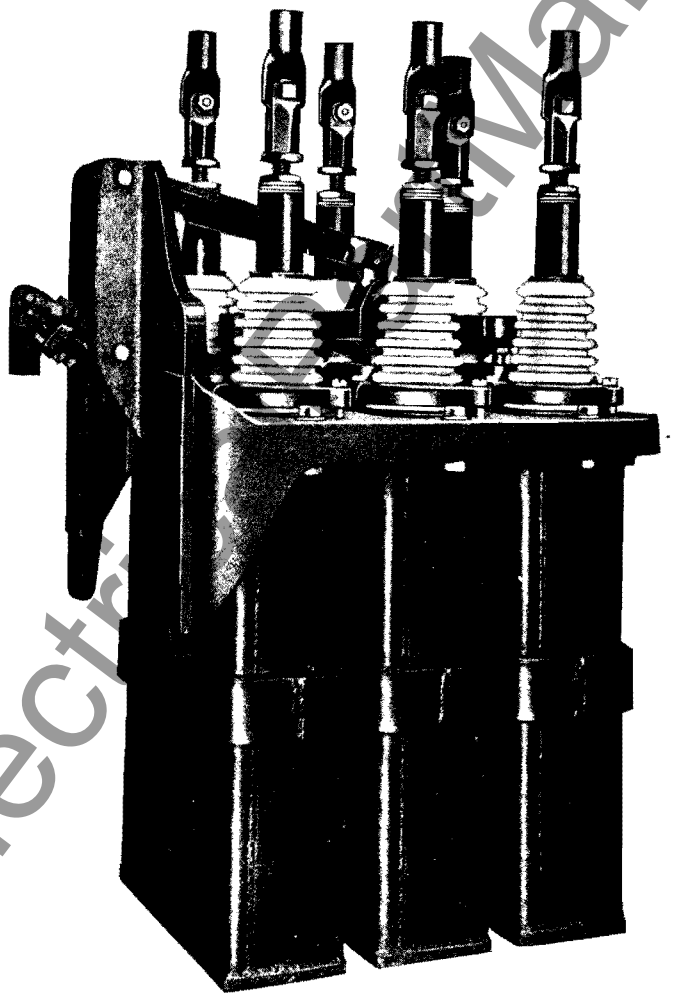


Fig. 1—Type B-13 Common Frame Oil Circuit-Breaker
600 Amps., 25,000 Volts

Westinghouse Electric & Manufacturing Company
East Pittsburgh Works East Pittsburgh, Pa.
I. B. 5251-B

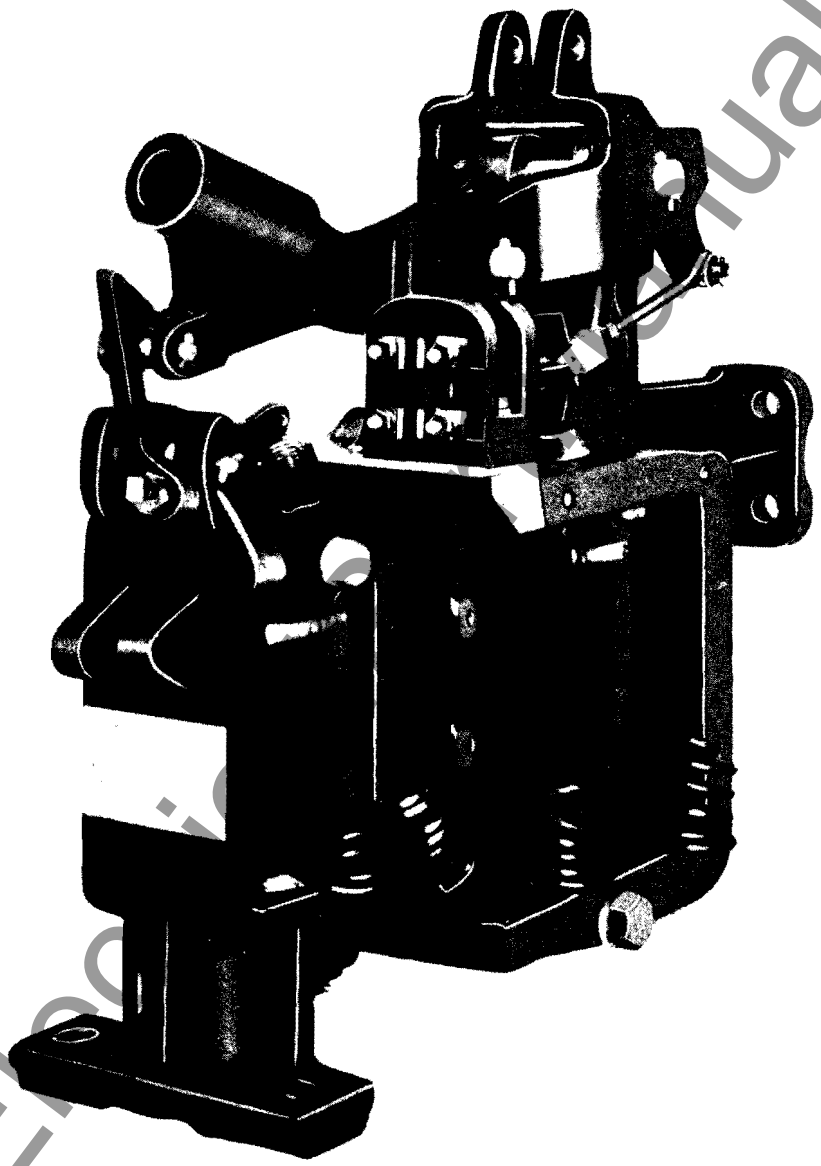


Fig. 2—Small 3″ Mechanism—Wall, Pipe and Floor Mounting

Westinghouse

Types B-5, B-13, F-24, F-24-R, F-25 and F-25-R Oil Circuit-Breakers

General Information

Checking

Upon receipt of the breakers, all boxes, barrels, packages and loose pieces should be checked with the shipping list to make certain that all parts have been received. If there is a shortage, claim should be made to the carrier immediately.

Storage

In the event, the breakers are not to be installed immediately, but are to be placed in storage awaiting installation, it is recommended that they be stored in the original shipping packages and containers. This serves to protect the breakers from dust, dirt and breakage. Do not store the breakers where they will be subjected to rain or dampness; or in the immediate vicinity of construction work, as material might be piled on the breakers that would endanger the porcelains and other parts.

Machined surfaces should be slushed. If the breakers are to be stored for any length of time, they should be inspected periodically to make sure that rusting has not started.

Unpacking

It is essential that care be used in unpacking the breaker, otherwise porcelains may be fractured or contact surfaces injured, which would result in unnecessary repair expense before installation is made. After the breaker is removed from its container, all excelsior, packing, paper and other foreign matter should be removed from off and about the breaker parts. Check to see that all packing blocks and tie wires are removed from the mechanism. Examine the breaker mechanism parts for breakage, distortion, or anything else that might cause improper operation. If any of the parts have been lost or damaged, they should be replaced or repaired before placing the breaker in service. The tank lining should be examined for signs of mechanical injury, or damage by moisture. Be certain there is no foreign matter in the tank that might float or dissolve in the oil. The electric operating mechanism, especially, should be gone over to remove all particles of dirt from the cores and auxiliaries, and to see that they are in proper operating condition. Excelsior or dirt around or between the cores of overload, undervoltage, or direct trip mechanisms will render them inoperative. Special care should be taken to see that all such dirt is removed.

Claims

If either before or after unpacking the breaker any shortage or breakage is discovered, claim should be made to the carrier immediately, as it will be difficult to get any adjustment if the claim is delayed.

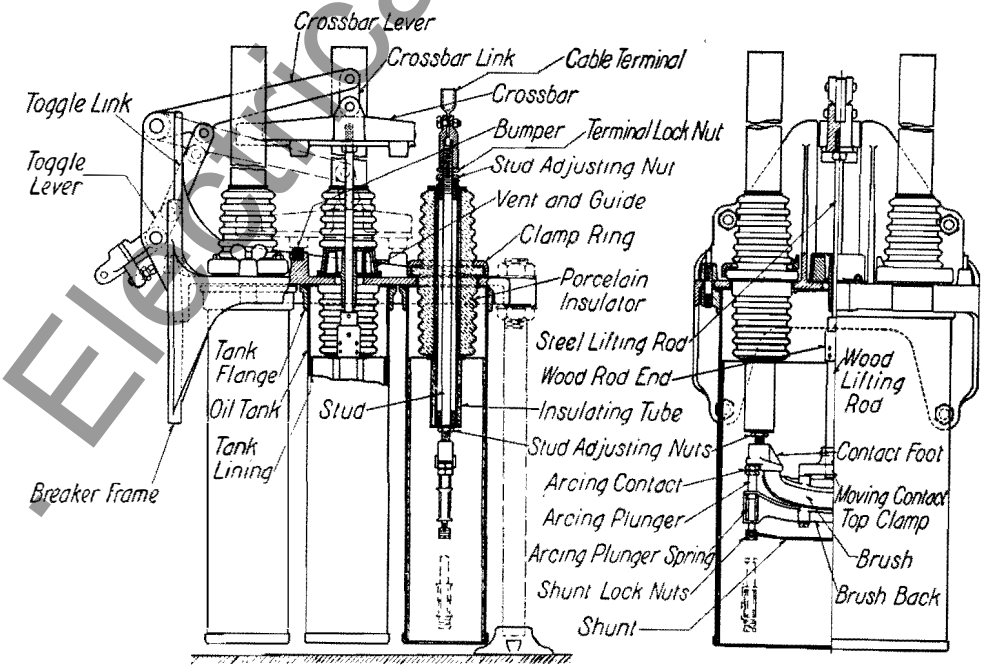


Fig. 3—Type B-13 Common Frame Oil Circuit-Breaker—300 Amperes—25000 Volts

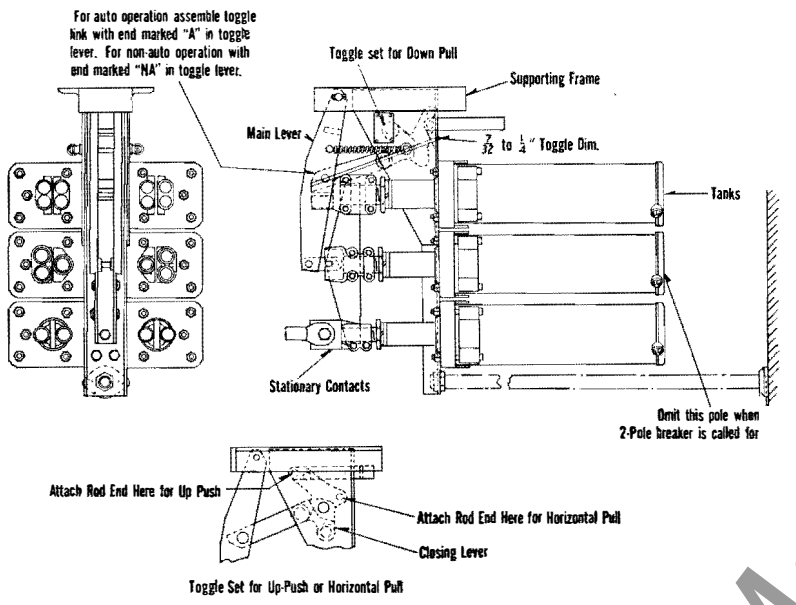


Fig. 4—Type F-24, F-25 Oil Circuit-Breaker—1200, 1600 and 2000 Amperes—7500 Volts

Handling

It is necessary to give proper consideration to the manner of handling, lifting, and moving the breaker and its parts. Considerable damage may result to the breaker, and its operation be impaired, by improper handling. Do not attempt to lift the breaker or its mechanism by the levers, cross bars, or studs nor move the attachments around by catching hold of the coil leads. In handling the breaker, operating mechanism, or attachments, always take hold of the frame, which is rugged and is built to withstand handling.

Installation

General

To obtain good results from the oil circuit-breaker, it is essential that it be mounted rigidly and level. This also applies to all electric mechanisms and intermediate mechanisms such as bell cranks, etc. An oil breaker that is not mounted on a rigid foundation, or is connected to an operating mechanism (electric or manual) that is mounted on a springy foundation, will not give good results, as the quality of the contact is dependent upon the permanent relationship between the breaker and its mechanism.

If necessary, the breaker can be leveled by placing shims between the breaker frame and the mounting brackets.

In mounting breakers and mechanisms together, be certain that the breakers and mechanisms were built on the same stock order. Breakers and mechanisms built on the same stock order will work together. We do not guarantee that breakers and mechanisms built on different stock orders will work together unless this requirement is contained in the order.

The design of these breakers is such that considerable latitude is allowed in the location of the mechanism. Conventional outline drawings and dimension leaflets will be furnished when requested. These drawings and leaflets show typical installations, so designed that if the outline, or dimension leaflet, is followed, the breaker will operate properly. If necessary, however, departure may be made from such drawings with respect to the erection of the mechanism bases and possibly in their location. When such changes are made, however, it is essential that they be made with a full understanding of the operating requirements of the breaker. Some of the requirements to be borne in mind when installing the breaker are as follows:

1. Be sure that the direction of pull of the mechanism, when transmitted to the breaker, corresponds to that of the breaker.

2. See that all parts of the remote controlled breaker are operating and that if the length of a pipe exceeds 15 feet that it is supported at intermediate points. Also, if the remote control mechanism of the breaker is extended, it may be necessary to provide additional acceleration to compensate for the moving of the extra parts. In such cases the problem should be referred to the manufacturer for recommendations.

3. All long operating rods should be in tension rather than compression during the closing operation. Short lengths of extra heavy operating pipes may be used in compression, however, without danger of buckling.

4. All bell cranks and accelerating devices as shipped are for above floor mounting. They may be reassembled for below floor mounting when desired, however, by removing the fulcrum pin and replacing it in the lower hole of the bracket.

When installing a breaker, the breaker unit is usually mounted on its supporting member, leveled and securely bolted first. The operating mechanism is ordinarily installed last. Heavy pulls are exerted by the electric operating mechanism. It is essential that it be securely fastened to the floor or structure and that it be properly located with respect to the breaker unit, so as to avoid

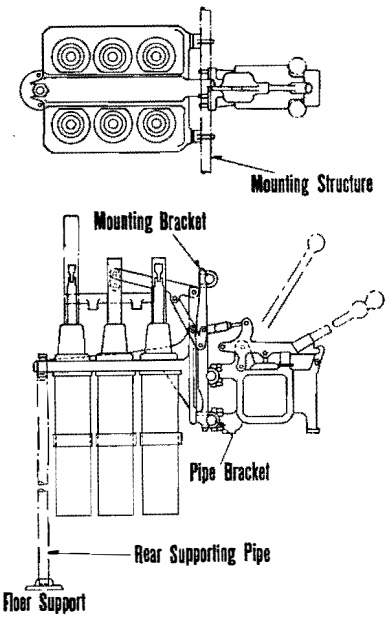


Fig. 5—Type B-13 Common Frame Oil Circuit-Breaker—300 and 600 Amperes—25000 Volts

friction due to side pulls, etc. When mounting on a concrete floor or wall, we recommend that a steel plate or structural member be first grouted into the floor or wall and securely fastened by means of bolts, which pass through a steel plate or bar on the other side of the floor or wall. This method prevents loosening of the mechanism after it has been operated. If such construction is not used, the mechanism may be mounted on channel or angle iron which is securely bolted and grouted into the floor. If the mechanism is mounted on pipe or structural steel framework, it is essential that the mounting frame be so constructed that the mechanism will not move or spring the frame when a load is imposed upon it.

In bolting the mechanism to the floor, wall or framework, and the breaker unit to the wall or framework, it is essential that care be used in tightening the mounting bolts and in adjusting the rear support of the breaker unit. The bolts should be tightened equally and in such a way that they will not put an unusual strain on any one of the mounting lugs of the mechanism. The pipe nuts on the rear support of the breaker unit should not be turned up sufficiently to place an excessive strain on the breaker frame.

The length of operating rod or connection between the electric mechanism and breaker unit closing lever should be such that when the breaker is closed electrically, there will be a clearance of approximately $\frac{1}{8}$" between the roller and the trigger latching surface. Due to lost motion in the linkage, it will, of course, be possible to draw the lever down by hand so as to obtain greater than $\frac{1}{8}$" clearance. When this condition is fulfilled, the breaker unit closing lever will strike stop only lightly. Always operate the breaker by hand before closing electrically to make sure that all parts are rigidly assembled and are in proper operating condition.

In the case of remote controlled breakers, the same construction applies to the bell crank brackets. The base of the bracket should be mounted on concrete or wood flooring only when necessary. If they are so mounted, difficulty may be experienced in keeping them tight. In mounting bell cranks and brackets, be sure they line up, otherwise friction will occur which will hamper the operation of the breaker. The pipe between bell cranks should be so adjusted that the arms travel equally on either side of the vertical or horizontal center lines. The operating pipes should be threaded with standard $\frac{3}{4}$" taper pipe threads on one end, and standard $\frac{3}{4}$" straight pipe threads $2\frac{1}{4}$" long, on the other end. The pipe should be cut 4" shorter than the distance between the centerlines of the levers which they connect. The shorter rod end on each bell crank should be screwed tightly to the end of the pipe with the taper pipe thread, while the longer rod end should be screwed on the end of the pipe with the straight pipe thread and should be used to adjust the length of the rod. A lock nut must be used to clamp the rod end in place when the adjustment has been properly made. The adjustment should be such that the coverplate handle latches just before the breaker unit closing lever strikes the stop on automatic breakers, or such that the handle lever does not strike the coverplate casting at either end of the travel on non-automatic

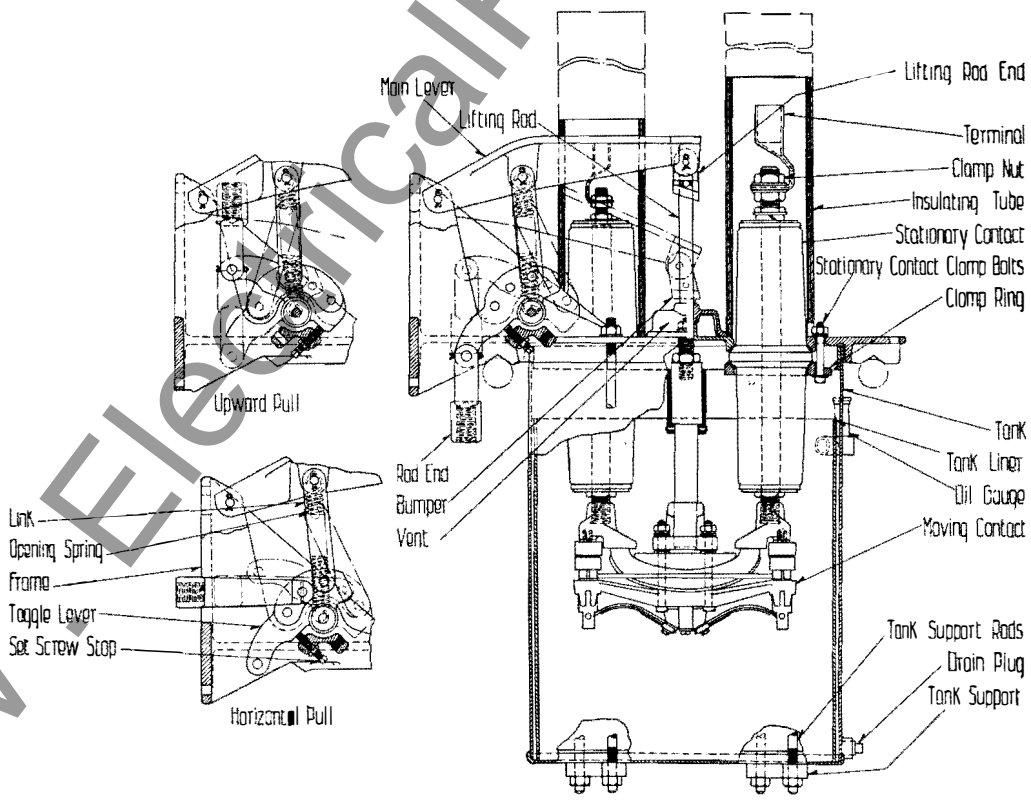


Fig. 6—Type B-13 Multiple Single-Pole—Oil Circuit-Breaker—600 and 1200 Amperes—15000 Volts

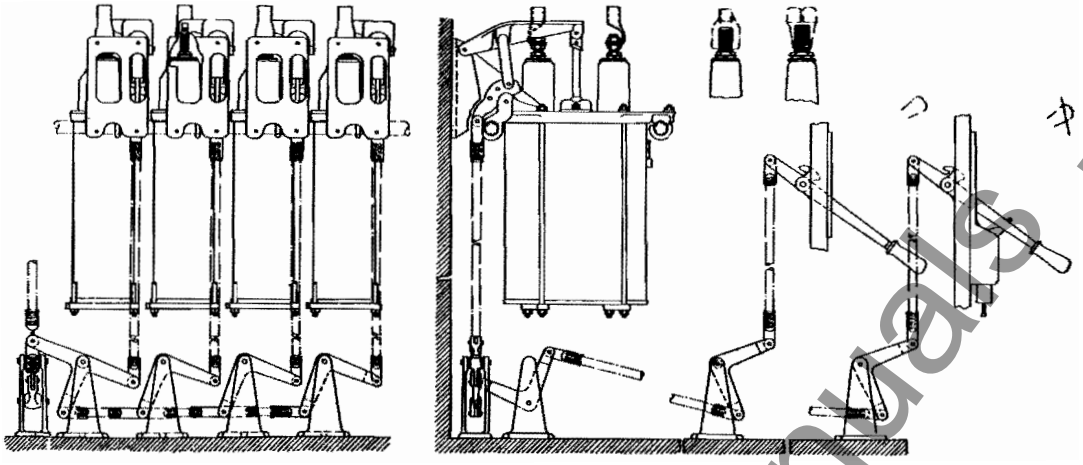


Fig. 7—Types B-5 and B-13 Multiple Single-Pole Oil Circuit-Breakers

breakers. Non-automatic breakers are locked in the closed position by the closing lever toggle going over center. If the adjustment of the breaker has not been disturbed since leaving the factory, the contacts should now be making satisfactory contact without further adjustment. It is essential, however, that the tanks be dropped and the contacts inspected as described later.

Accelerating Device

The lower ampere capacity, manually operated, remote control breakers are provided with an accelerating device in one of the bell crank bracket housings. The above precaution regarding the mounting of the bell crank and bracket is necessary in mounting an accelerating device of this type. A further precaution is necessary in that the accelerating device must be so adjusted that the full travel of the breaker is obtained without striking stops on the accelerating device at either end of the travel. The purpose of this device is to hasten the opening of the breaker and provide a cushion to absorb a portion of the shock at the end of the breaker travel. This cushion is obtained by means of an air dashpot which is regulated by a small screw valve on the end of the dashpot cover. To increase the cushion, the screw should be backed out; to decrease the cushion, the screw should be turned in. After adjustment at this point, the screw should be securely locked by means of the lock nut provided.

Attachments

All attachments are mounted on the main breaker parts before shipment from the factory. The location and operation of the various attachments are described in the instruction cards covering this subject. All attachments should be given a preliminary trial before putting the breaker in service to make sure that they will fulfill their respective functions in a reliable manner.

Connections

The circuit-breaker should next be connected to the line. The cross sectional area of the main conductor should be in accordance with the requirements of the National Electric code. Cables should be carefully soldered into the cable terminals. All contact surfaces should be cleaned and should be free from dents or burrs. If copper straps are used, the straps should be grained and the contact nuts drawn down firmly and evenly so their entire conducting surface is in contact with the copper strap. The lower contact nuts should not touch the upper clamping nut of the insulator. In fitting copper to a breaker, always bend the copper to exact shape, so that when it is bolted to the breaker there will be no tendency for it to spring the stationary contacts out of alignment. The studs are not designed to carry cable or bus bar strains, and if necessary, intermediate supports should be installed between the breaker and the bus. In bolting the copper to the stationary contacts of the breaker, it is very important to see that the studs of the breaker are not turned when tightening the bolts or contact nuts. Any turning of the studs will destroy the contact alignment and make recontacting of the breaker necessary. There is also danger of cracking the porcelain insulators. Always inspect the contact surface between the stationary contact and moving contact, after tightening the terminals, to make sure that the contact surface is in perfect alignment.

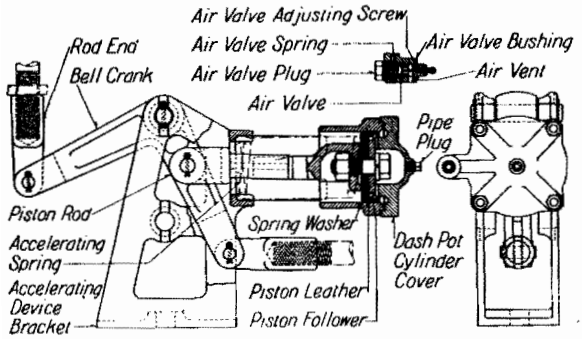


Fig. 8—Bell Crank Accelerating Device

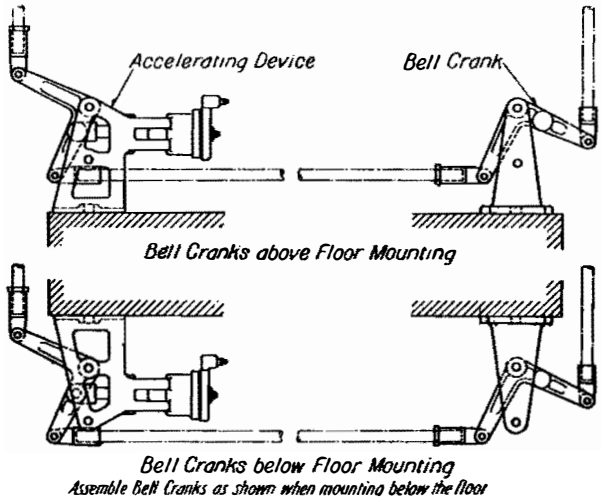


Fig. 9—Automatic Remote Control Bell Crank Arrangement

After connecting the main leads, the terminals should be insulated with tape or insulation tubes. When insulation tubes are used, their top and any exposed copper metal should be encased with tape so that any gas expelled from the circuit-breaker, when opening heavy short-circuits, will not cause a short-circuit between terminals, or between terminals and ground.

As a safety measure, the frames of the breaker unit and the electric mechanism should be grounded.

Before placing the breaker in service, the oxide film which forms on the copper contact surfaces during shipment and while in storage should be removed by means of sandpaper or a fine file. This oxide causes the contacts to become dark in color; complete removal of the oxide is indicated when the contact shows a bright red copper color all over. Do not use emery cloth for this purpose. The particles of emery are electrical conductors and any such material remaining in the breaker, from the cleaning of the contacts, serves to lower the insulating value of the oil.

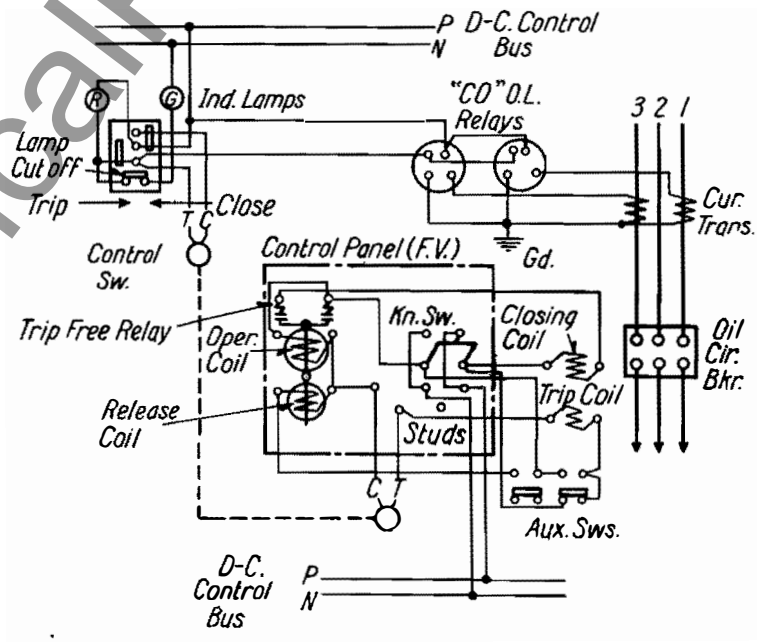
Control Leads to Electric Operating Mechanism

In connecting the solenoid operating mechanism to the source of power, it should be borne in mind that the operating mechanism is designed to operate on a given voltage at the terminals of the mechanism. Standard mechanisms contain coils wound to operate at 125 volts normal impressed across the terminals of the coils. When the mechanism is located a considerable distance from the battery or transformer, allowance should be made for the voltage drop between the battery or transformer and the terminals on the operating coil. If the proper allowance is not made for this drop it is difficult to make the breaker operate at the minimum operating voltage. 125 volts is the normal operating voltage, but the mechanism will operate satisfactorily within the range of 90 to 130 volts unless otherwise specified.

Installation of Control Relay

It is necessary to use a control relay to open the closing coil circuit on the electrically operated breaker. For the breakers covered by this Instruction Book, we recommend the Westinghouse type "S" or "30-C" relay, depending on the type of control.

Control panels mounted on the mechanism at the factory have the closing and tripping coil leads connected to the control panel, and the auxiliary switch adjusted to open the type "S" control relay (which breaks the closing coil circuit) at the proper time. When the control panel is mounted separately (on pipe framework or wall), the closing and trip coil leads and auxiliary switches should be connected to the control



NOTE:—Trip Free Relay: Energizing Relay Operating Coil closes Relay Contacts. Energizing Relay Release Coil opens Relay Contacts which remain open until Relay Operating Circuit is de-energized and again energized.

Aux. Sw's. shown for the open position of Breaker.

Relay Contacts shown in the de-energized position of the Relay.

Fig. 10—Connection Diagram of Type S Control Relay Panel

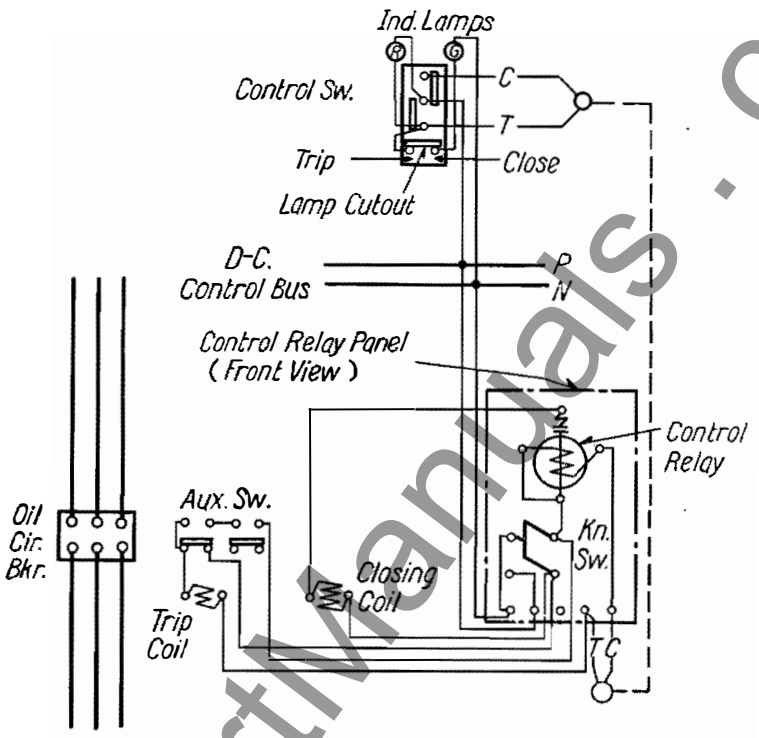
panel as indicated on the diagram supplied. The time of the type "S" control relay cut-off can be adjusted by varying the auxiliary switch linkage so that the switch makes contact either earlier or later in the closing stoker. Adjusting the time of relay cut-off serves to increase or decrease the minimum closing voltage. Do not allow the switch to strike stops at either end of the travel.

Testing

After the breaker has been wired according to the wiring diagram, and all attachments have been connected, it should be operated a number of times at normal voltage, minimum voltage, and if possible, an operating voltage slightly above normal to see that it acts properly. If the breaker has been carefully set up, it should be in good operating condition and should not require further investigation. If the operation is satisfactory, the tanks should be thoroughly wiped out and filled with WEMCO "C" oil according to the instruction plate on the breaker. The Westinghouse Electric & Manufacturing Company assumes the responsibility of breaker operation only when the insulating oil employed is in accordance with its recommendations. The breaker should be examined to see that all parts are functioning properly before bolting the tanks in place. All tools, system wire, copper filings, and other remnants from the installation should be removed, after which the breaker should be given a high potential test before being put into operation. This high potential test usually consists of subjecting the insulation to voltage equal to 2¼ times the rated voltage of the breaker plus 2000 volts. Control wiring should be tested at 1200 to 1500 volts. After this has been done the breaker is ready to go into operation.

Contact Adjustment

The contact surfaces of these breakers are at a slight angle so that as the brush approaches the contact foot of the stationary or moving contact, the outer leaves of the brush make contact first. As the moving contacts proceed upward the outer leaves are pushed farther and farther out and the inner leaves come into contact with the contact foot. There is a definite position in which all the leaves of the brush make good contact on the contact foot. Should the moving contact be drawn up too far it will be found that the outer leaves will be forced away from the contact foot. Correct brush pressure is obtained when the breaker travels approximately 1/32" after the inside leaves of the brush have first made contact with the stationary or moving contact. When the brushes are properly adjusted, it should be impossible to get a .0015" feeler under either the heel or toe of the brush.



Aux. Sws. shown for open position of Bkr.

Fig. 11—Connection Diagram of Type 30-C Control Relay Panel

Should the stationary contacts have moved out of alignment during shipment so that not all of the brushes are in contact, it will be necessary to loosen the clamping ring bolts or clamp nuts and to rotate the stationary contact assembly into alignment. Vertical adjustment should be unnecessary, although it can be secured on the B-5 and B-13 breakers by loosening the upper and lower clamping nuts and shifting the copper stud in the porcelain insulator. Always be sure that all nuts are tightened after re-adjustment.

The arcing contacts should operate freely and should remain in contact for some time after the main contacts separate. The amount of this varies with different breakers. With the breaker completely closed, the arcing contacts not relied upon to carry current, although they will have firm contact pressure and will carry such current.

Adjustment of the B-5 and B-13 moving contacts is provided by the screw thread of the lifting rod. A fine adjustment can be secured by removing or adding shims between the brush center casting and the lower end of the lift rod stick end.

Adjustment of the F-24, F-24R, F-25 and F-25R moving contacts is secured by pulling the lower pin and dropping the contact bar. The rod end will then be free to turn up or down on all except the 400, 600 and 800 amp. F-24 and F-24-R breakers. It is necessary to remove the small taper pin to free the rod end on these particular breakers.

The stop nut on the steel lift rod should be adjusted to clear the lift rod guide by $\frac{1}{16}$" when the breaker is in the closed position. This nut is intended to prevent excessive over-travel of the brush.

Do not try to adjust the brushes by changing the toggle lever on the breaker. The toggle of the breaker is set at the factory, and should never be disturbed for any purpose unless it has accidentally been disturbed.

When changing the direction of operating rod travel (up, down or horizontal pull) it is always necessary to recontact the breaker. Changing the direction of operating rod travel of the B-2 and B-13 common frame breakers involves substituting a new closing lever casting. The direction of pull of all other breakers can be changed by means of the toggle links, as illustrated in the various breaker unit cuts.

Construction and Operation

Breaker Unit

The general construction of these breakers is illustrated in Figs. 1 to 7. The breaker unit mechanism consists of a heavy supporting frame, a main lever, a toggle lever, a cross bar and lifting rod guides. On the B-13 common frame, B-13 multiple single pole and B-5 multiple single pole breakers, the lifting rod guides contain baffles to regulate the escape of gases from the breaker tanks, while on the remaining breakers the gases are vented directly around the lifting rods. On automatic, manually operated breakers and all electrically operated breakers, the closing lever stop should prevent the toggle from going over center, while on non-automatic manually operated breakers, the stop should allow the toggle to go over the center. The proper setting is approximately ¼" off or over-center on all except the 1200 and 2000 ampere B-13 common frame breakers, when it should be approximately ½". This is a very important point should it ever become necessary to adjust the toggle setting, as it is obvious that once the toggle goes over the center, on automatic manually operated and electrically operated breakers, the breakers will not trip electrically but must be opened by hand.

The breaker toggle is kept off, or thrown over, center in the following ways:

B-2, B-5, B-13—lengthening or shortening set screw stop.

All lower ampere capacity F-24, F-24R, F-25 and F-25R and the 3-pole F-24R and F-25R higher ampere capacity breakers—Relocating stop pin in adjacent hole.

All other breakers—Reverse toggle link. For automatic operation the end marked "A" should be towards stop pin. For non-automatic operation the end marked "NA" should be towards stop pin.

NOTE—The closing lever stop is not designed to absorb the entire closing shock resulting from electrical operation, but is intended only to prevent the momentum of the moving parts from carrying the toggle over center. The principal portion of the closing shock should be absorbed between the moving and stationary cores of the electric mechanism.

Stationary Contacts

The stationary contacts, illustrated in Figs. 12 and 13, consist of copper rods placed in and clamped to insulators which, in turn, are clamped to the supporting frame.

Moving Contact

The moving contacts are shown in Figs. 14 and 15.

Tanks

When replacing an oil drain plug, after draining off the old oil, it is recommended that a sealing compound, such as white lead, be used on the plug threads.

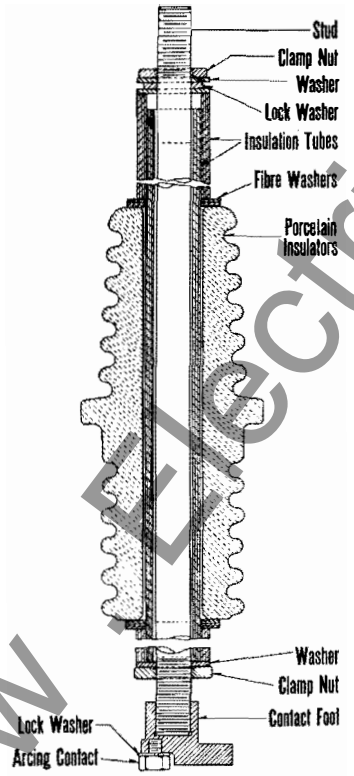


Fig. 12—Type B-13 Common Frame—600 Ampere—Stationary Contact

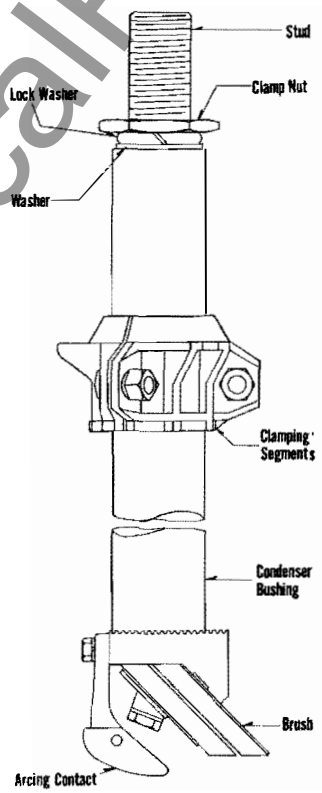


Fig. 13—Type F-24, F-24R, F-25, F-25R—1600 Ampere—Stationary Contact

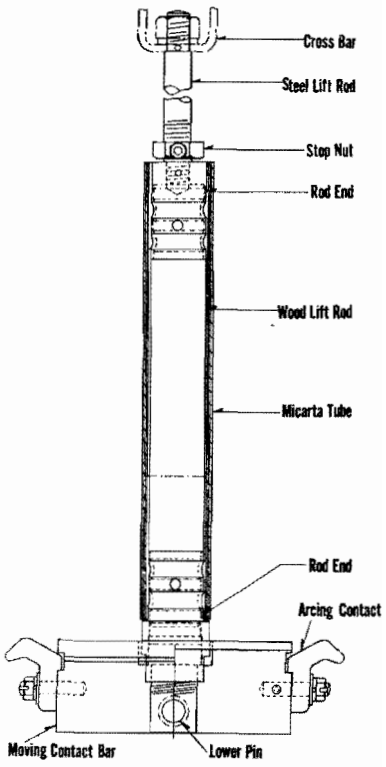


Fig. 14—Type F-24, F-24R, F-25, F-25R—1200, 1600 and 2000 Ampere—Moving Contact

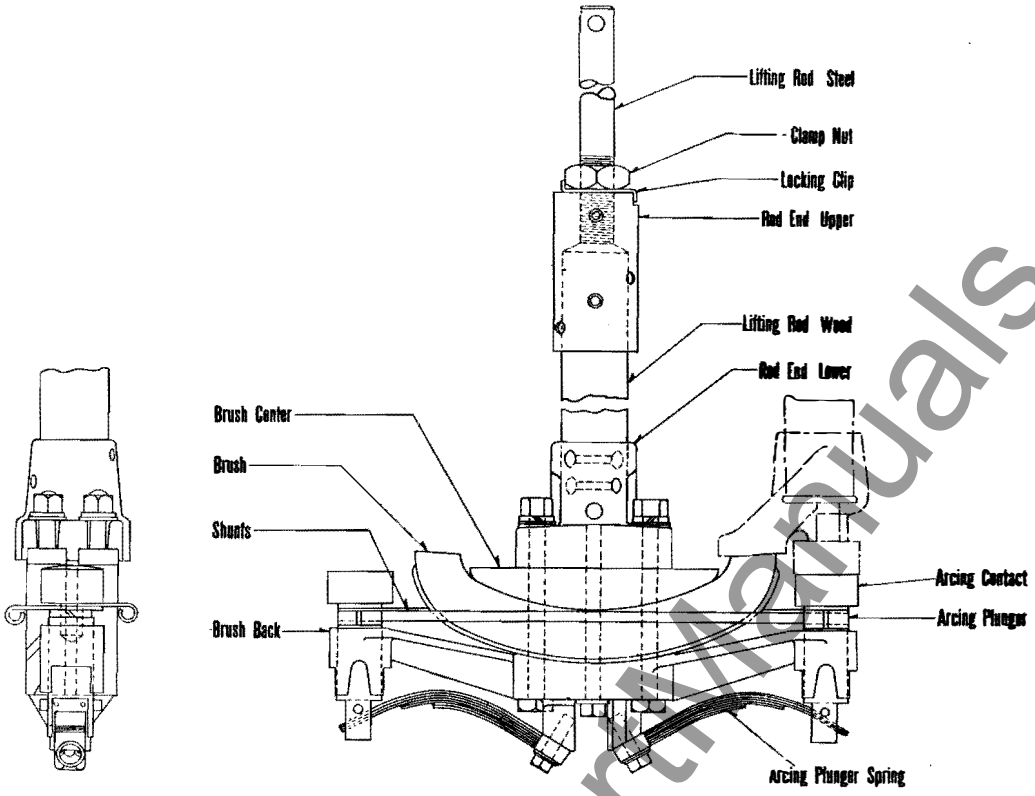


Fig. 15—Types B-5 and B-13 M. S. P.—1200 Ampere—Moving Contact

Small 3″ Mechanism

Wall, pipe and floor mounting: This mechanism, shown in Fig. 16, is manufactured with two different lengths of plunger travel, one 2″ and one 3″. The mechanism with the 2″ plunger travel, shown in the above mentioned cut, is used with the lower ampere capacity breakers and for this reason is equipped with an accelerating spring. The mechanism with the 3″ plunger travel, not illustrated, is used with the higher ampere capacity breakers and consequently does not have an accelerating spring as the weight of the breaker unit moving parts is sufficient to properly accelerate the opening of the breaker.

When the moving core is drawn down by the closing coil, the air between the moving and stationary cores is compressed and thus acts to cushion the closing stroke and eliminate slamming. The rate of escape of the compressed air is regulated by an adjustable valve located in the bottom of the stationary core. Turning the screw upward raises the ball off its seat and thus enlarges the opening through which the air escapes and reduces the cushioning effect. Turning the screw downward increases the cushioning effect as the size of the opening is decreased. Always tighten the lock nut after adjusting the air valve. Increasing or decreasing the cushioning effect serves to raise or lower the minimum closing voltage and consequently decreases or increases the closing slam. Within the usual operating range, increasing or decreasing the cushioning does not materially affect the closing time. This valve is adjusted at the factory to give the best closing operation at the control voltage specified.

The leather washer, fastened to the bottom of the moving core by a piston follower and metal expander, should be kept pliable by oiling with a few drops of light oil occasionally; do not flood with oil as this will cause the leather to soften.

The moving core is connected to the main lever by means of an eye-bolt. The main lever is so pivoted that when the moving core is drawn down, the roller end of the main lever is engaged by the trigger, holding the mechanism in the closed position. The mechanism is adjusted to latch properly when the back lash (distance between roller and latching surface of trigger) is approximately 1/8″ when the breaker is closed electrically. This is accomplished by manually holding the control relay in the closed position, so that the control voltage is held on the closing coil, until after the breaker is closed, at which time the back lash may be estimated by the eye. Do not hold the current on the closing coil longer than necessary (15 to 20 seconds) as the closing coil may burn out otherwise. Due to lost motion in linkage, it will, of course, be possible to draw the lever down by hand so as to obtain greater than 1/8″ clearance. The back lash is adjusted by loosening the lock nut on the eye-bolt and turning the moving core up or down until the proper position is reached. Always tighten the lock nut after the adjustment is made. If the back lash is not approximately correct, trouble may be experienced in the latching of the breaker. If the back lash is not sufficient, the trigger spring will not snap the trigger into position before the rebound of the main lever. If the back lash is too great, the roller, on the end of the main lever, will strike the lower part of the trigger, knocking it back and allowing the main lever to rebound before being engaged by the trigger.

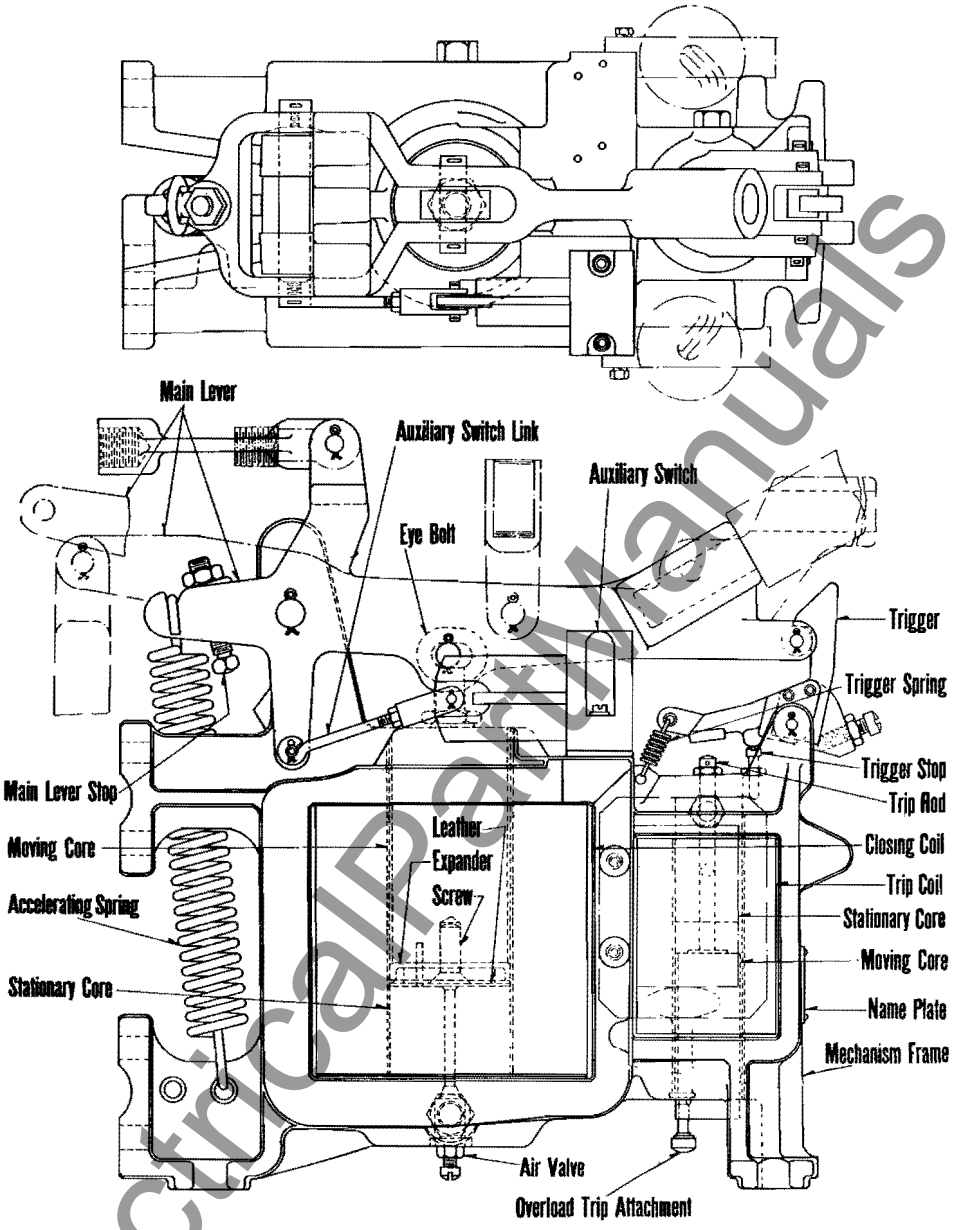


Fig. 16—Small 3″ Mechanism—Wall, Pipe and Floor Mounting

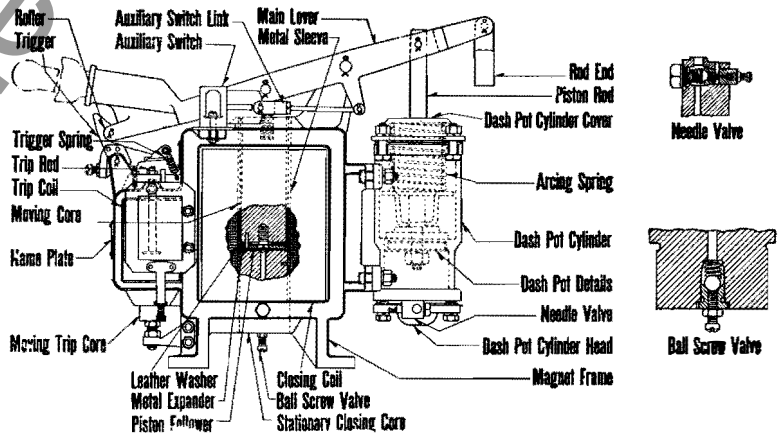


Fig. 17—Large 3″ Mechanism—Floor Mounting

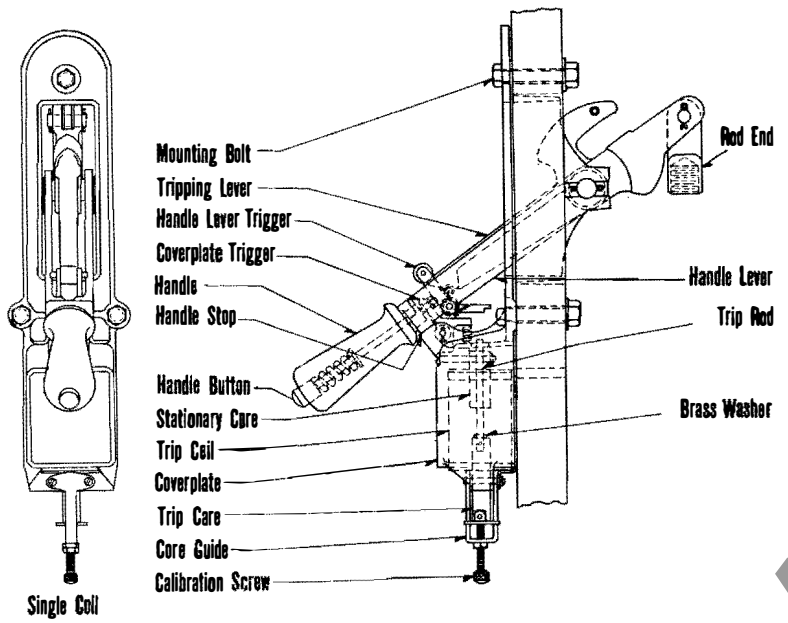


Fig. 18—Single Handle Coverplate

The trigger, which engages the roller on the end of the main lever, is drawn into the latched position by means of a trigger spring. Trigger stops are provided so that the trigger will not rotate too far forward when the main lever is in the open position or will not rotate too far backward when the coil is energized. The forward stop should be adjusted so that there is 1/32″ clearance between the head of the stop and the trigger casting when the main lever is in the closed position. The back stop should allow the roller on the main lever to clear the trigger by 3/16″ during the tripping operation.

In case it becomes necessary to remove the moving core from the metal sleeve, care should be taken upon replacement to see that the metal expander is not bent out of shape. An easy way to accomplish the replacement is to force an auxiliary tube of the same inside diameter as the metal sleeve down over the moving core and leather washer. The moving core can then be pushed into the metal sleeve by placing the auxiliary tube on top of the metal sleeve so that the two are directly in line.

3″, 4″ and 6″ Mechanisms

Floor Mounting: Fig. 17 covers the 3″ mechanism and also serves to illustrate the 4″ and 6″ mechanism construction. The operation of these mechanisms is the same as the small 3″ mechanism, except that an accelerating spring is used in all cases. The accelerating spring is of the compression type, placed in an auxiliary cylinder, and having a dashpot device to cushion the opening stroke. The regulation of the

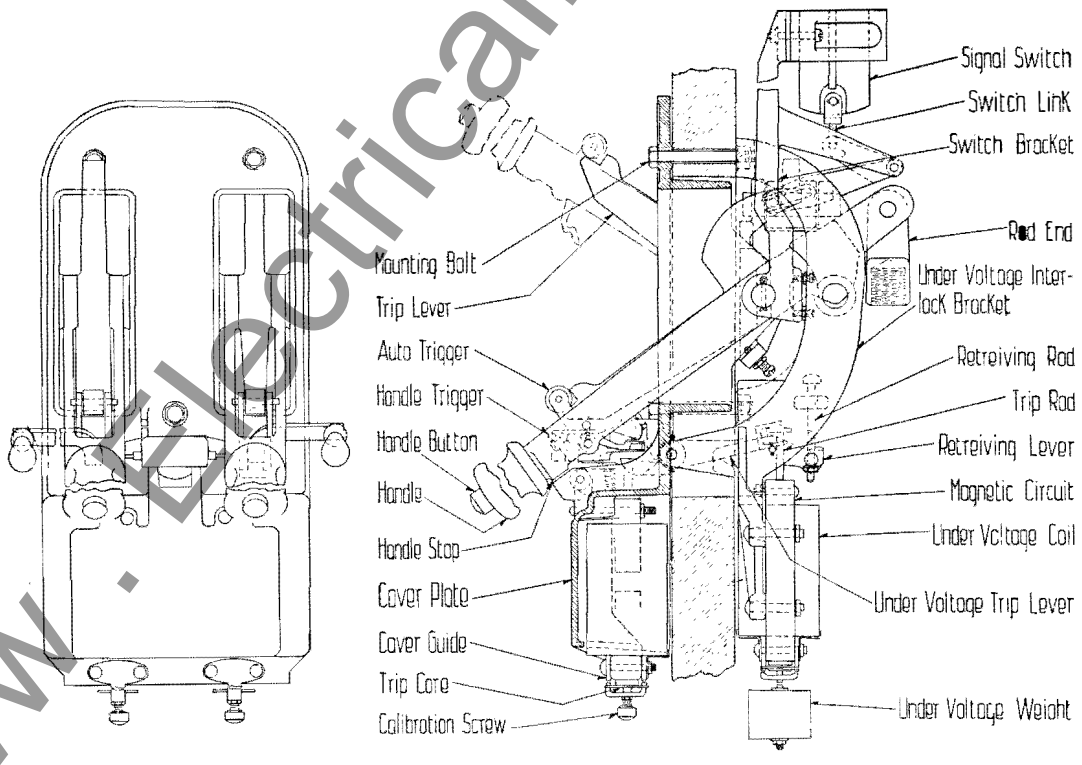


Fig. 19—Double Handle Coverplate

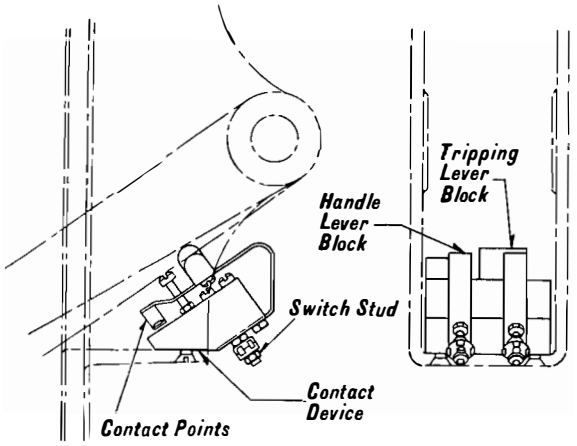


Fig. 20—Bell Alarm Attachment

adjustable air valve on this dashpot is the same as previously described.

Coverplates

The general construction of the coverplate used with these breakers is the same. Refer to Fig. 19. The handle and tripping levers are a part of the coverplate. The operating levers travel through an angle of approximately 71 degrees.

On automatic breakers, the operating handles consist of an outside handle lever carrying the trigger which engages with the inside tripping lever to which the breaker unit is fastened. The handle lever is held in the closed position by a latch located on the coverplate. When the moving core is drawn upward by the tripping coil, the push rod, which is fastened to the moving core, strikes the trigger and frees the tripping lever, thus allowing the breaker to open. Pushing the handle lever button, dis-engages the coverplate latch and permits the raising of the handle lever to re-engage the tripping lever.

For automatic tripping, the handle lever trigger should dis-engage the tripping lever just before the moving core strikes the stationary core.

The current required to trip the breaker can be varied from 100 to 180% of coil rating. The various settings being obtained by raising or lowering the moving core, by means of the calibration screw, until the plate on the bottom of the moving core coincides with the required ampere setting on the moving core guide. The calibration markings are given in secondary amperes required to trip the breaker and are approximate only.

Non-automatic coverplates utilize the handle lever only as the breaker is locked in the closed position by the breaker toggle going over center.

When two or more breakers are used as a double-throw breaker, as for the starting and running throws of a motor starting combination, the double handle coverplate shown in Fig. 20 is used. The construction and operation are identical with the above.

Maintenance

It is vitally important that the breaker be inspected periodically, at which time the mechanism, contacts and attachments should be examined carefully. Any hesitation in the operation of, or excessive looseness in the mechanism or attachments should be immediately adjusted. Any pitting of the contacts should be cleaned off, or, if badly burned, they should be replaced. The oil should be tested for dielectric strength and if found to be below the danger line, should be discarded and replaced with clean oil. I. B. 5336 contains complete information regarding the care and use of insulating oil. The arcing contacts should be renewed, if they are worn down sufficiently to allow arcing on the main contacts or if there is danger of arcing occurring on the main contacts before the next inspection.

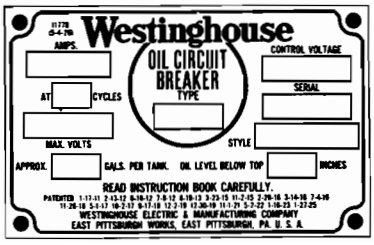


Fig. 21—Name Plate

Keep the bearing surfaces of the toggles and levers adequately oiled as the breaker cannot operate properly with "sticky" bearings.

Keep the breaker and attachments clean, particularly when the breaker and attachments are subjected to corrosive fumes.

Be sure that the breaker is disconnected from the line before removing the tanks and inspecting or repairing.

Renewal Parts

Ordering Instructions

Cases of trouble with this apparatus should be taken up at once with the nearest Westinghouse Service Shop. A list of these Service Shops appears on the inside back cover of this book. When ordering renewal parts, the following information should always be given:

1. A description of the part.

2. Complete nameplate reading of the breaker unit and mechanism nameplate.

3. Normal voltage and frequency of all coils.

4. Refer to the parts by name as given in the illustrations in this book, or in Part Catalogue Nos. 6135 and 6135-2. See Part Catalogue Nos. 6135 and 6135-2 for complete renewal parts data.

Recommended Stock of Renewal Parts

A list of the renewal parts and the minimum quantities of each that should be carried in stock will be found on the following pages. These are the parts most subject to wear in ordinary operation, and to damage or breakage due to possible abnormal conditions. The maintenance of such stock will minimize service interruptions caused by breakdowns.

Recommended Stock of Renewal Parts

Types B-5 and B-13 Multiple Single-Pole Circuit-Breakers

The following list covers one single pole unit.

Breaker Pole Units In Use Up To and Including		2	5	15
NAME OF PART	NO. PER UNIT	RECOMMENDED FOR STOCK		
Breaker Pole Unit Complete	1	0	0	0
Bumper	2	0	1	1
Moving Contact Complete	1	0	1	1
Lift Rod	1	0	1	1
Brush—600 ampere	1	0	0	1
Brush—1200 ampere	2	0	1	1
Brush—1600 ampere	3	0	1	1
Brush—2000 ampere	4	0	1	2
Arcing Contact	2	4	6	8
Arcing Plunger	2	1	2	4
Arcing Plunger Spring—(set of 3 springs)	2	0	1	2
Shunt	2	0	1	2
Stationary Contact Complete	2	0	1	1
Porcelain Insulator	2	0	1	1
Contact Foot	2	0	1	1
Arcing Contact	2	4	6	8
Oil Tank	1	0	0	1
Tank Liner	1	0	0	0
For Manually Operated Breakers				
Trigger	1	0	0	1
Trigger Spring	1	0	0	1
Trip Coil	1	0	0	1

Electrically Operated Mechanism for Types B-5 and B-13 Electrically Operated Circuit-Breakers.

Mechanisms In Use Up To and Including		2	5	15
NAME OF PART	NO. PER MECHANISM	RECOMMENDED FOR STOCK		
Mechanism Complete	1	0	0	0
Leather Washer for Moving Closing Core	1	0	0	1
Expander for Leather Washer	1	0	0	1
†Metal Sleeve for Moving Core	1	0	0	1
Leather Washer for Dash Pot Piston	1	0	0	1
Expander for Leather Washer	1	0	0	1
Closing Coil	1	0	0	1
Trip Coil	1	0	0	1

Parts indented are included in the part under which they are indented.
†Metal sleeve essential in changing leather for moving core.

Recommendations for stocking Renewal Parts for your complete equipment will be supplied upon request to the nearest Sales Office.

Recommended Stock of Renewal Parts—Continued

Type B-13 Common Frame Circuit-Breakers, 3 Pole

Circuit-Breakers In Use Up To and Including		2	5	15
NAME OF PART	PER BKR.	RECOMMENDED FOR STOCK		
Circuit-Breaker Unit Complete	1	0	0	0
Bumper	2	0	1	1
Moving Contact Complete	3	0	1	1
Lift Rod	3	1	2	3
Brush—300 to 600 ampere	3	0	1	1
Brush—1200 ampere	6	1	2	3
Brush—1500 ampere	9	1	2	4
Brush—1750 to 2000 ampere	12	2	4	6
Arcing Contact—300 to 600 ampere	6	12	18	24
Arcing Contact—1200 to 2000 ampere	12	24	36	48
Arcing Plunger—300 to 600 ampere	6	1	2	3
Arcing Plunger—1200 to 2000 ampere	12	2	4	6
Arcing Plunger Spring—300 to 600 ampere	6	1	3	6
Arcing Plunger Spring—1200 to 2000 ampere	12	4	8	12
Shunt—300 to 600 ampere	3	1	2	3
Shunt—1200 to 2000 ampere	6	2	4	6
Stationary Contact Complete	6	1	2	3
Porcelain Insulator	6	1	2	3
Contact Foot	6	1	2	3
Arcing Contact—300 to 600 ampere	6	12	18	24
Arcing Contact—1200 to 2000 ampere	12	24	36	48
Oil Tank—300 to 600 ampere	3	0	0	0
Oil Tank—1200 to 2000 ampere	3	0	0	0
Tank Liner	3	1	2	3
For Manually Operated Breakers				
Trigger	1	0	0	1
Trigger Spring	1	0	0	1
Trip Coil	1	0	0	1

Type F-24, F-24-R, F-25, F-25-R, Oil Circuit Breakers 2 & 3 Pole, 1200, 1600, 2000-A, 7500 V.

Circuit-Breakers In Use Up To and Including	Two-Pole				Three-Pole			
	2	5	15		2	5	15	
Name of Part	No. Per Bkr.	Recommended for Stock			No. Per Bkr.	Recommended for Stock		
Breaker Unit Complete	1	0	0	0	1	0	0	0
Lift Rod	2	0	1	2	3	1	2	3
Moving Contact Bar	2	0	1	2	3	1	2	3
Arcing Contact (moving)	4	8	12	16	6	12	18	24
Condenser Bushing	4	0	1	2	6	1	2	3
Arcing Contact (stationary)	4	8	12	16	6	12	18	24
Brush	4	0	1	2	6	1	2	3
Tank Liner	2	0	1	2	3	1	2	3
Electrically Operated Mechanism	1	0	0	0	1	0	0	0
Auxiliary Switch—2-Pole	1	0	0	0	1	0	0	0
Moving Contact	2	0	1	1	2	0	1	1
Contact Finger	4	1	2	4	4	1	2	4
Auxiliary Switch—10-Pole	1	0	0	0	1	0	0	0
Moving Contact	10	2	4	6	10	2	4	6
Contact Finger	20	5	10	20	20	5	10	20
Latch Spring	1	0	0	1	1	0	0	1
Holding Latch	1	0	0	1	1	0	0	1
Retrieving Spring	2	0	1	1	2	0	1	1
Trigger	1	0	0	1	1	0	0	1
Trigger Spring	1	0	0	1	1	0	0	1
Accelerating Spring	1	0	0	1	1	0	0	1
Closing Coil	1	0	0	1	1	0	0	1
Trip Coil	1	0	0	1	1	0	0	1

Parts indented are included in the part under which they are indented.