

# Westinghouse

## Indoor Oil Circuit Breakers

### Single Tank Construction

Types BH, BK, BKB, B-20-HA, B-20-HB, B-24-HA,  
B-24-HB, B-28-HA, B-28-HB and B-36-HB

Ampere Capacities to 3000

Voltages to 34,500

Canadian Westinghouse Company, Limited

Head Office: Hamilton, Ontario

District Offices: Vancouver, Calgary, Edmonton, Regina, Winnipeg, Fort William, Toronto, Ottawa (Ahearn & Soper), Montreal, Halifax.

Bulletin H-7040-A

## BIBLIOGRAPHY

In a publication of this sort it is hardly feasible to discuss the theory of circuit interruption in detail. For those who would like to obtain some further information on this subject, the following references will be of considerable interest:

- Research Improves Circuit Breakers.* (Editorial), Elec. World, Feb. 1, 1930.
- Circuit Interruption--a Rapidly Changing Art.* (Editorial), Elec. World, April 26, 1930.
- Extinction of Long A.C. Arc.* by Dr. Joseph Slepian,  
(A.I.E.E. Trans., 1930).
- The Use of Oil in Arc Rupture.* by Baker and Wilcox,  
(A.I.E.E. Trans., 1930).
- Field Tests on De-ion Grid Breakers.* by L. W. Dwyer,  
(Elec. World, April 19, 1930).
- Field Tests on De-ion Grid Breakers.* by L. W. Dwyer,  
(Elec. World, April 26, 1930).
- System Tested with 600 Short Circuits.* by E. G. Ralston and E. H. Klemmer,  
(Elec. World, February 11, 1933).
- Indianapolis System Field Tests on De-ion Grid Breakers.* by F. S. Douglas and A. C. Monteith,  
(Elec. Journal, February, 1933).
- Indianapolis System Field Tests on De-ion Grid Breakers.*  
(Elec. Journal, March, 1937).

In connection with the foregoing, it is of great interest to note how the tremendous improvements in the art of circuit interruption in the last decade have followed the theory of De-ionization as propounded by Dr. Slepian in the articles listed above.

# Westinghouse

## Complete "B" Line Oil Circuit Breakers

### Oil Tight

#### GENERAL

The type "B" oil circuit breakers described herein comprise a complete new line of modern oil-tight shaft operated breakers to meet present-day operating requirements. They are designed for applications up to a rating of 34,500 volts and can be supplied in 400, 600, 800, 1200, 1600, 2000 and 3000 ampere capacities, pipe or frame mounting and either electrically or mechanically operated.

#### APPLICATION

These oil circuit breakers have been designed for use in metal clad structures, for both indoor and outdoor service, as well as for general indoor service and are well adapted for pipe, cell or frame mounting.

#### DISTINCTIVE FEATURES

The "B" line of oil circuit breakers have the following distinctive features:

##### Single Tank Construction:

This arrangement, in which all poles are enclosed in a single tank, results in a very rugged and compact structure.

##### Oil-Tight Assembly:

In this design the lifting rod and linkage are operated by means of a rotating shaft passing through oil-tight bushings in the dome, which completely encloses the lifting rod and linkage. This results in an oil-tight enclosure which definitely prevents the ejection of oil.

##### Ease of Inspection:

It is necessary to remove only one tank when inspecting contacts.

##### De-ion Grid Contacts:

The types BKB, B-20-HB, B-24-HB, B-28-HB and B-36-HB breakers are equipped with the well-known De-ion grid contacts, insuring rapid arc extinction, decreased maintenance and oil deterioration, resulting in higher interrupting capacities.

#### CONSTRUCTION

##### Main Frame:

The dome of these breakers is of heavy welded steel with non-magnetic inserts for larger current ratings. This dome supports the tank which is drawn up by heavy holding bolts against resilient packing placed in a groove on the under side of the dome. The terminal bushing flanges are bolted against carefully machined surfaces on the upper side of the frame.

##### Tanks:

The BH and BK breakers are supplied with rectangular tanks with reinforced welded joints at the bottom. The B-20-HA B-20-HB, B-24-HA and B-24-HB breakers are furnished with one-piece circular seamless drawn steel tanks, twenty and twenty-four inches respectively in diameter. The B-28-HA, B-28-HB, and B-36-HB breakers have welded tanks, 28" and 36" in diameter respectively.

An oil gauge of the sight glass type is provided to facilitate inspection of the oil level.

A ring welded to the bottom of all round tanks forms a base which allows the tank to stand upright on the floor when for any reason it is removed from the breaker.

The drain connection in the bottom of the tank permits drawing off the oil without lowering the tank and if desired the tank may be filled while it is in position by removing the oil separator from the main frame.

The inside of the tank is protected by a heavy removable insulating lining, and barriers of the same material, forming part of the tank lining assembly, extend completely across between phase contact assemblies, the whole being carefully designed to permit free circulation of the oil. This tank construction provides maximum dielectric strength, maximum strength against internal pressures, and a high head of oil over the contacts.

##### Bushings:

Heavy wound micarta bushings are used in breakers up to and including 7500 volts. For voltages of 15000 and up, the well-known Westinghouse condenser form of bushing is employed.

## Westinghouse Indoor Oil Circuit Breakers

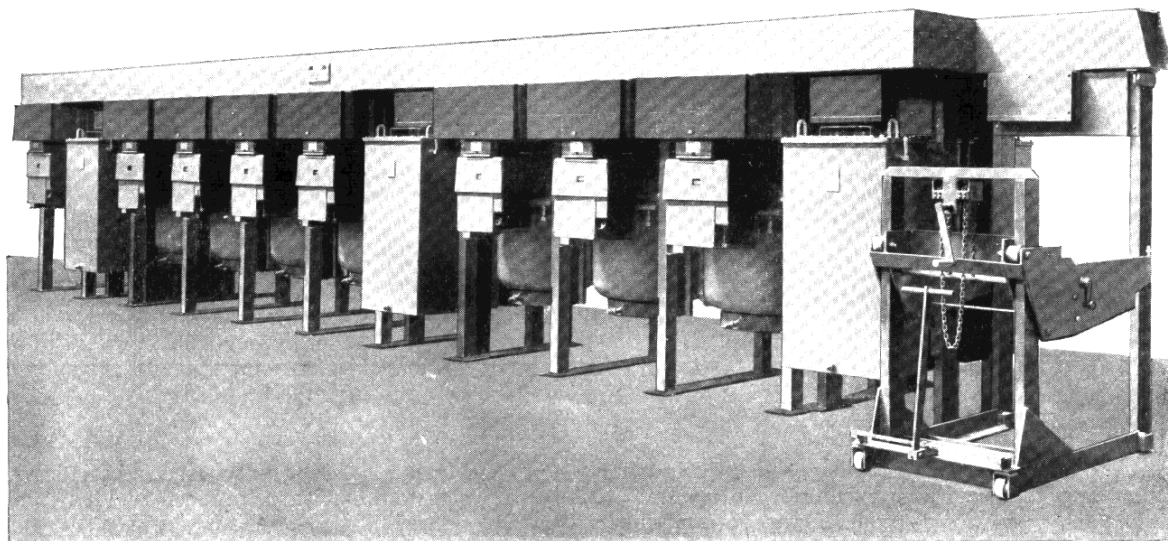


Fig. 1—12 Cell Type B-28-B, 13,800 Volt Double Bus, Two-position Structure.



Fig. 2 25 Cell Type B-24-IIB Oil Circuit Breakers, as installed in the large municipal plant.

## Westinghouse Indoor Oil Circuit Breakers

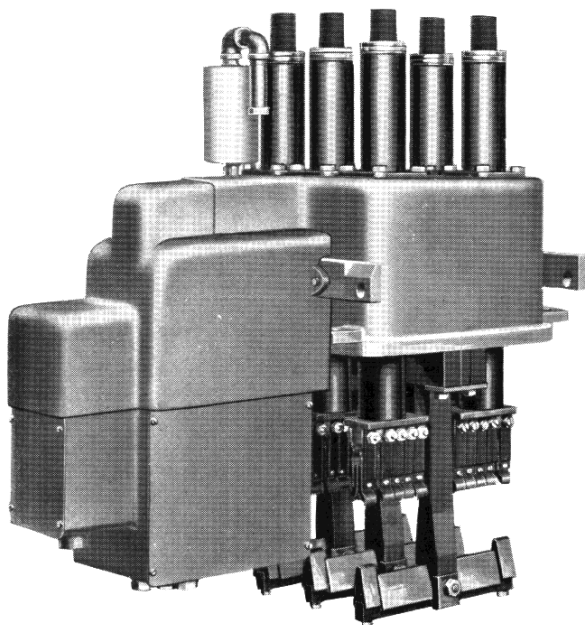


Fig. 3—1000 Ampere, 2500-Volt, Type BH Oil Circuit Breaker.  
Solenoid Operated. Tank Removed.

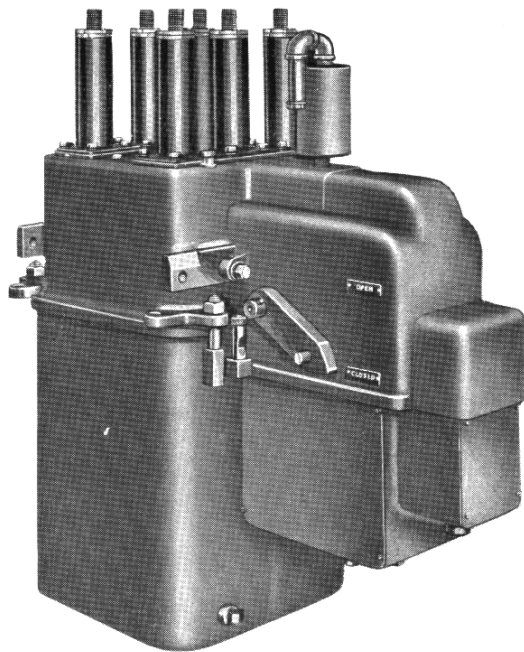


Fig. 4—Type BH Oil Circuit Breaker.  
600 Ampere, 7500-Volt, Solenoid Operated.

The condenser bushings are made up of concentric layers of insulating material and metallic foil wound on a metal rod conductor. This design is especially notable for low dielectric stress, small bushing diameter, light weight, absence of brittle insulation, high mechanical strength and elimination of static.

The bushing flanges are heavy bronze span on the bushings, no castings or cement being used.

### Contacts:

The types BH, BK, B-20-HA, B-24-HA and B-28-HA breakers up to 1600 ampere capacity are equipped with the well-known wedge and finger type of contact. This form of contact provides liberal contact area and the flat steel springs bearing against the fingers ensure high contact pressure. For 1600 and 2000 ampere ratings high pressure silver butt contacts are employed.

The main contacts are protected by arcing contacts which are placed outside of the main contacts and take the full effect of the arc when the breaker opens. The renewable arcing tips are of extruded copper, having high thermal capacity to minimize the amount of burning in circuit interruption.

The BKB, B-20-HB, B-24-HB, B-28-HB and B-36-HB breakers are equipped with the well-known De-ion Grid contacts as shown in the accompanying illustrations. This form of contact is generally recognized as the most efficient arc extinguishing device produced to date.

The special features of this contact are: decreased arc energy dissipated in the structure, decreased gas volume, decreased tank pressure, decreased oil deterioration, decreased contact burning and maintenance, and decreased system disturbance owing to speed of clearance.

A detailed description of the De-ion contacts will be found in leaflet 20523-A.

## Westinghouse Indoor Oil Circuit Breakers

A bumper suspended on springs helps absorb the shock of the moving contact when the breaker opens and also acts as a guide for the lifting rod. Oil dashpots are used on the larger breakers.

### OPERATING MECHANISMS

#### Trip Free Operation:

All breakers designed for normal operation by hand are trip free on overload or short circuit. All breakers designed for motor operation, and all solenoid operated breakers for interrupting capacities of 150,000 Kva. and up, are trip free on overload or short circuit when electrically operated and also when operated manually for maintenance purposes by means of the emergency manual operating device. Solenoid

operated breakers for interrupting capacity ratings below 150,000 Kva. are normally trip free only on electrical operation; they can, however, also be furnished trip free on manual maintenance operation if specially ordered.

#### Manual-Operating Mechanisms:

Manually operated breakers are furnished in two arrangements, namely, direct hand operated with handle levers and trip coils mounted directly on the circuit breaker, and remote control hand operated from coverplate and handle levers mounted on a panel, up to a maximum distance of fifty feet, with an arrangement of bell cranks and connecting rods.

These breakers may also be used for panel pipe mounting which is a combination of the

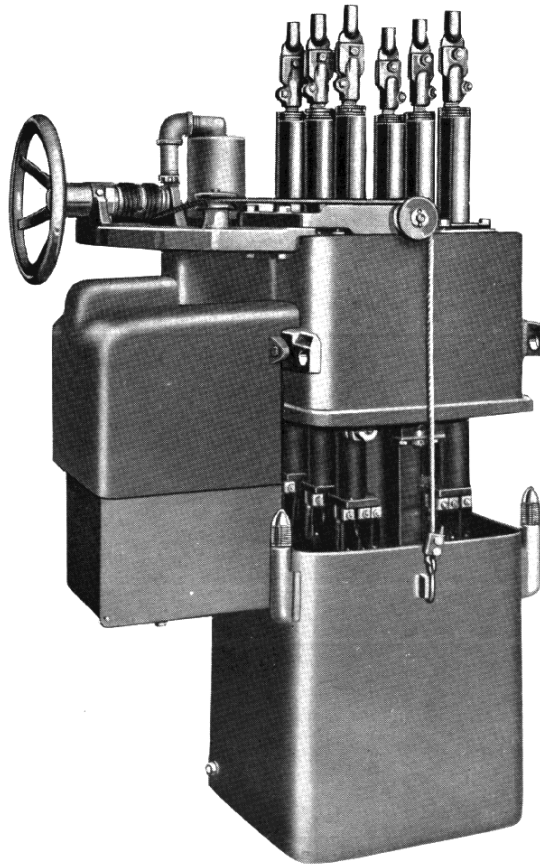


Fig. 5—Type BK Oil Circuit Breaker, Solenoid Operated with Removable Cable Type Tank Lifter.

## Westinghouse Indoor Oil Circuit Breakers

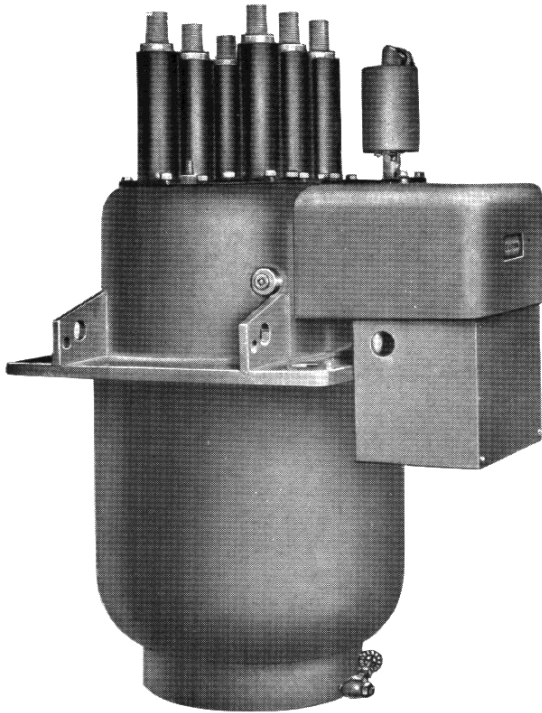


Fig. 6—Type B-20-HB Oil Circuit Breaker, Solenoid Operated, 1200 Ampere, 15000-Volt.

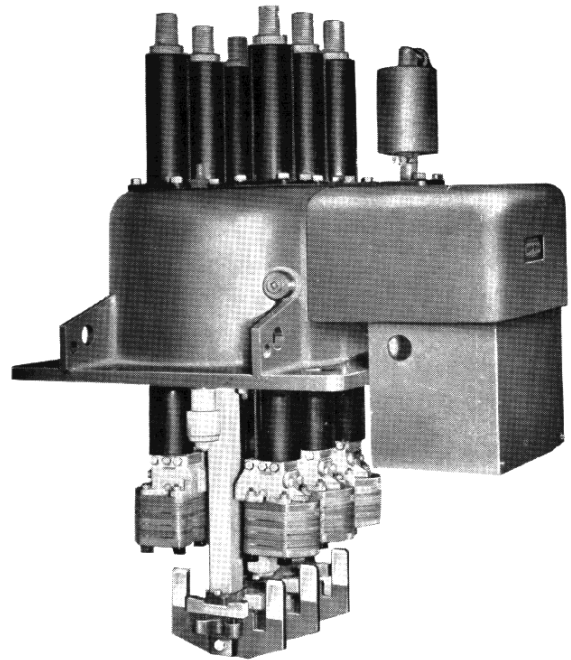


Fig. 7—Type B-20-HB Oil Circuit Breaker, Solenoid Operated, 1200 Ampere, 15000-Volt, Tank Removed.

above methods, in which the breaker is mounted at the rear of the panel on a pipe framework with direct hand operating lever for closing or tripping projecting through the panel.

### Electric Operating Mechanisms:

These circuit breakers can be furnished for remote electrical control by means of either a solenoid operating mechanism or a motor operating mechanism.

### Solenoid Operating Mechanism:

The solenoid mechanism consists of a magnetic circuit with closing coil and trip coil which are bolted directly to the circuit breaker unit and completely enclosed as shown in the accompanying illustrations.

### Motor Operating Mechanism:

The type BC motor operating mechanism used in this line of circuit breakers is a unique

Westinghouse development, its outstanding features being reliability, speed of operation and compactness.

As will be seen from the accompanying illustrations, it comprises a small high speed vertical motor, the shaft of which is geared to a horizontal clutch unit comprising a magnetic clutch coil and a steel band clutch.

Complete detailed descriptive information on this mechanism can be obtained by reference to leaflet H-6105.

## MECHANISM

The levers operating the moving contacts are entirely enclosed under the dome of the main frame, and are operated by a shaft which passes through an oil-tight bearing from the dome of the main frame to the solenoid or hand operating mechanism mounted on the front of the breaker.

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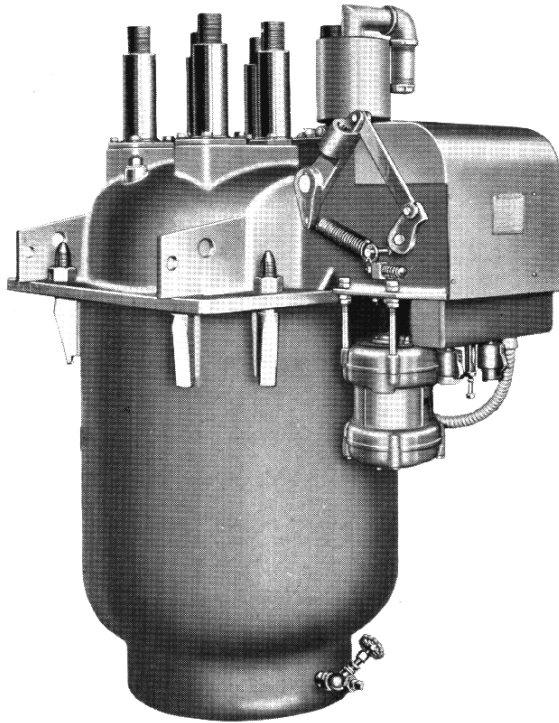


Fig. 8—Type B-28-HB Motor Operated Oil Circuit Breaker, 1200 Ampere, 15000-Volt.

The rugged steel operating levers are arranged to raise and lower the movable contacts in a straight line, the result being a proper alignment of the contacts when closing the breaker.

### VENT

Each breaker is equipped with a Westinghouse improved oil separator vent. This consists of a metallic drum enclosing several concentric cylinders, the outer one connecting direct to the tank and the inner chamber opening to the atmosphere. A slot is cut in each cylinder, slots in adjacent cylinders being spaced 180° apart. Thus as the hot vapours proceed from one compartment to the next with a continually changing direction, the gases are cooled, and the oil is condensed and drops away from the gas, returning to the breaker tank by gravity. This oil separation is also aided by the centrifugal action involved.

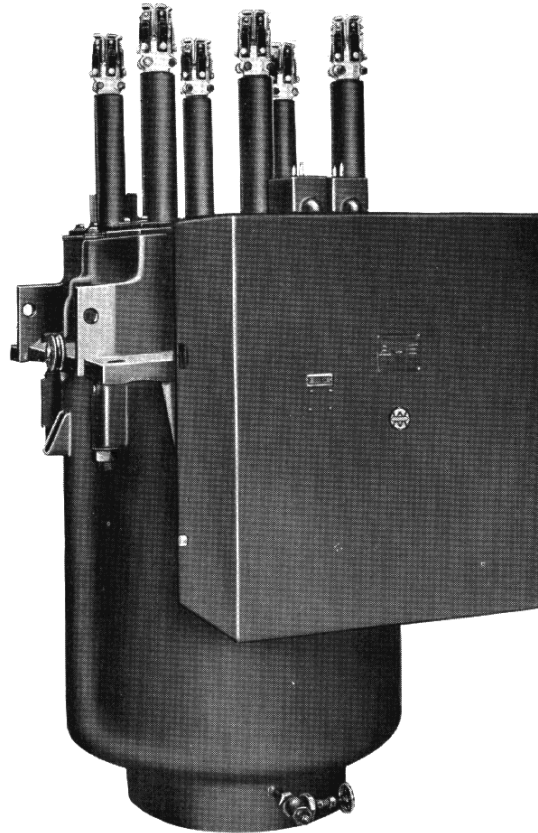


Fig. 9—Type B-36-HB Oil Circuit Breaker, 1600 Ampere, 34,500-Volt, Solenoid or Motor Operated.

### Tank Lifter:

A compact cable type tank lifter is provided as shown in Figure 5, for cell mounted circuit breakers (one per installation).

When circuit breakers are built into a metal-clad equipment, a truck type circuit breaker lifter is provided, as shown in Figure 1 (one per installation).

### INSULATING OIL

Oil for circuit-breaker service must have certain very special characteristics to secure which the oil must be refined under rigid control to meet the requirements of strict specifications.

The Canadian Westinghouse Company supplies Wemco "C" oil for this service and the performance of Westinghouse breakers is only guaranteed when Wemco "C" oil is used.



## Table of Ratings - Type "B" Indoor Circuit Breakers

Circuit Breaker †	Max. Rated Volts	Current Ratings 60 Cycle Amperes	Interrupting Capacity Ratings in KVA at Rated Voltage* (AIEE-OCO-15 sec. OCO Duty Cycle)
BH	7500	400, 600, 800, 1200.	50,000
BK	15000	400, 600.	100,000
BK	7500	400, 600, 800, 1200.	100,000
BK	5000	1600, 2000.	100,000
BKB	15000	600.	150,000
BKB	7500	600, 1200.	150,000
BKB	5000	1600, 2000.	150,000
B-20-HB	15000	600, 800, 1200.	250,000
B-24-HA	15000	1600, 2000.	250,000
B-24-HB	15000	600, 800, 1200, 1600, 2000.	350,000
B-28-HB	15000	600, 800, 1200, 1600, 2000.	500,000
B-36-HB	15000	1200, 1600, 2000, 3000.	1,000,000
B-36-HB	34500	800.	750,000

**\*Note:** On account of possible thermal and mechanical limitations, applications involving rupturing capacities at lower voltages should be referred to the Company's Engineering Department for recommendations.

**†Note:** It will be observed that the B-20-HA, B-28-HA, and the lower ampere ratings of the B-24-HA breakers are omitted from this tabulation, the reason being that these items duplicate rupturing capacities of breakers with De-ion Grid contacts in the next lower size. In some cases where future requirements necessitate a greater rupturing capacity than is required immediately, the HA, plain contact breaker can be installed for present requirements, and the increased rupturing capacity obtained later by the addition of De-ion Grid Contacts in place of the plain break contacts. Type designations ending in B indicate breakers equipped with De-ion Grid contacts, all others having the conventional wedge and finger, or high pressure silver butt contacts.

# Westinghouse Indoor Oil Circuit Breakers

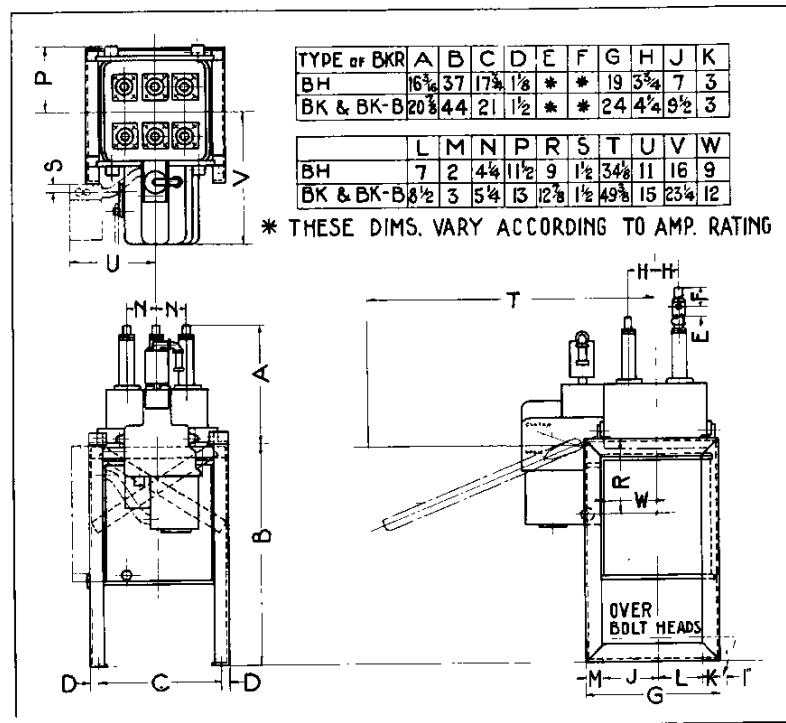


Fig. 10—Types BH, BK and BK-B Oil Circuit Breakers, Frame Mounted, Solenoid Operated, General Dimensions.

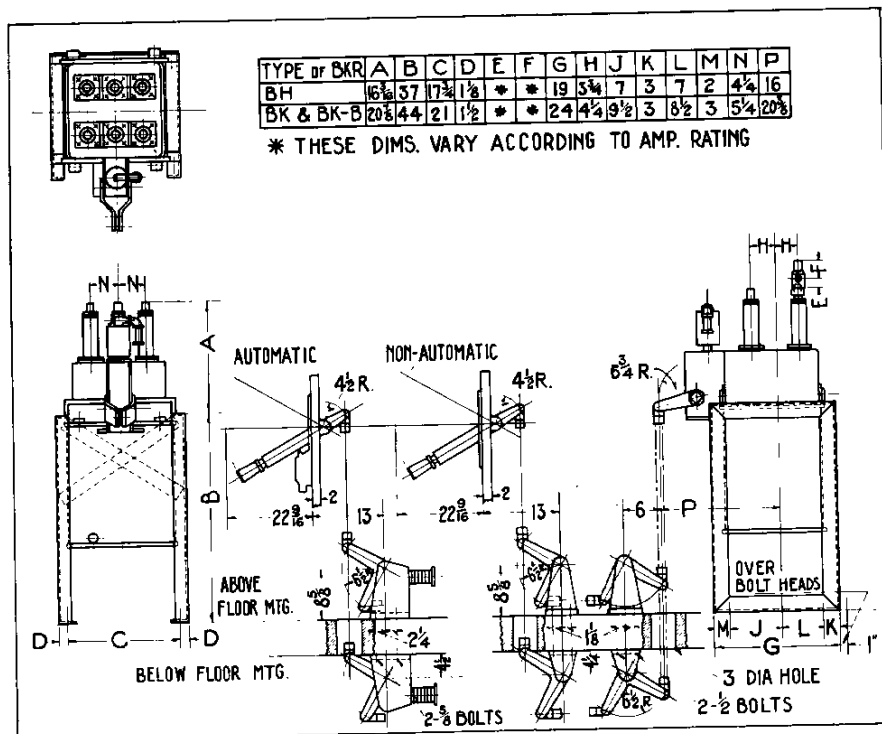


Fig. 11—Types BH, BK and BK-B Oil Circuit Breakers, Frame Mounted, Hand Operated, Remote Control. General Dimensions.

# Westinghouse Indoor Oil Circuit Breakers

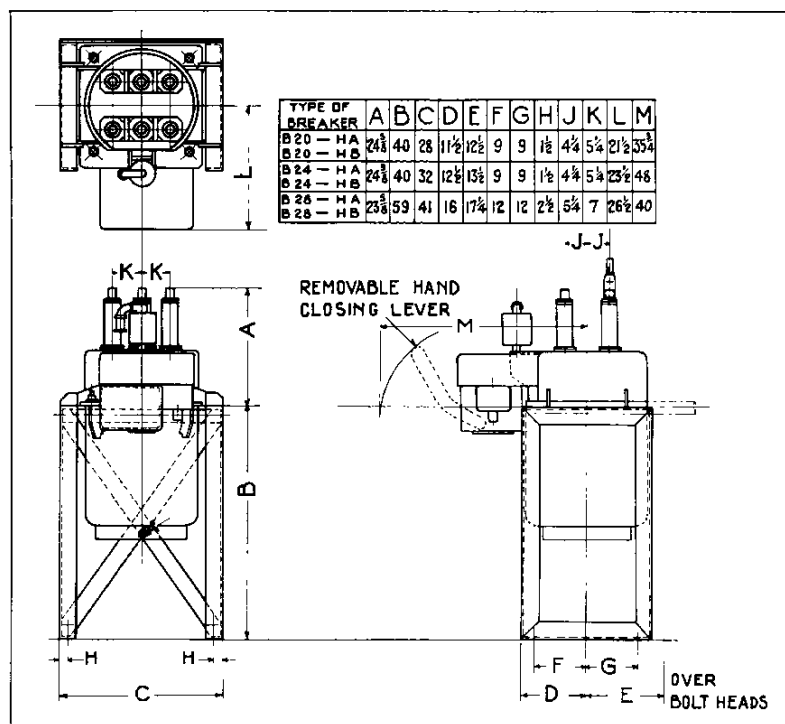


Fig. 12 -Types B-20-HA, B-24-HA, B-28-HA, B-20-HB, B-24-HB and B-28-HB Oil Circuit Breakers, Solenoid Operated, Frame Mounted. General Dimensions

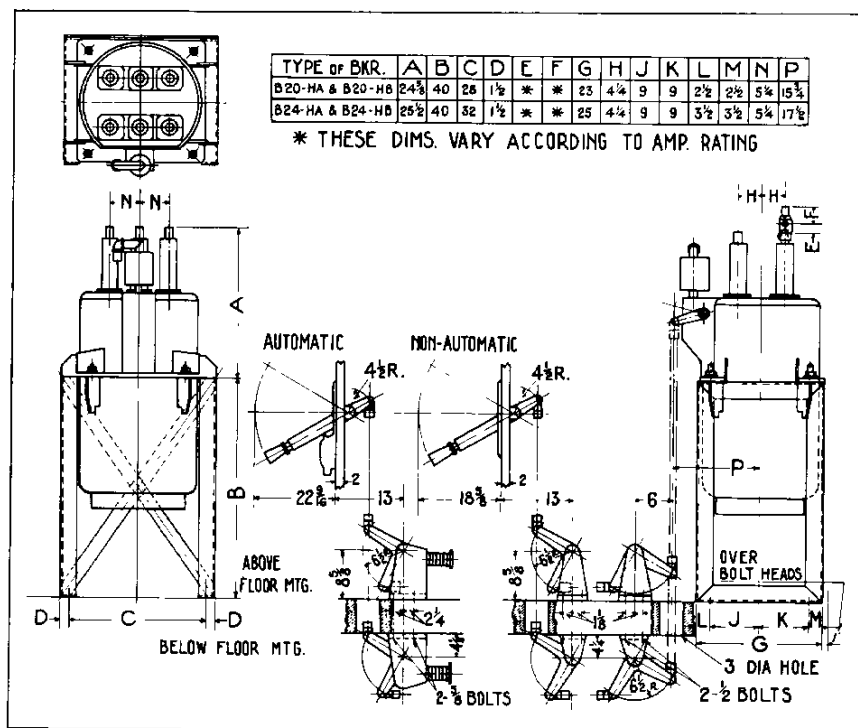


Fig. 13—Types B-20-HA, B-24-HA, B-20-HB and B-24-HB Oil Circuit Breakers, Frame Mounted, Hand Operated. Remote Control, General Dimensions.

