TYPE CS SQUIRREL CAGE INDUCTION MOTORS
TYPES CW AND CI WOUND ROTOR INDUCTION MOTORS
Built in Frames No. W 254 to 800-C
With Oil Lubricated Sleeve Bearings
INSTRUCTIONS

Installation

1. **Inspection**—Unpack the motor and make sure that it was not damaged during shipment. See that the nameplate reading agrees with the voltage and frequency provided for the motor. The motor is guaranteed for successful operation only with voltage variation within 10% and frequency variation within 5% of the nameplate rating.

2. **Mounting**—The motor should be located in a well ventilated, easily accessible place, where the external air temperature will not exceed 40°C. or 104°F. The foundations must be rigid enough to prevent excessive vibration.

For wall, or ceiling horizontal mounting (for 800 series frames and smaller), turn the motor brackets through 90° or 180° to keep the oil reservoirs below the shaft.

Method of Drive

1. **Belt Drive**—Mount the motor on the slide rails or bedplate, which allows for adjusting the belt tension. Mount the motor pulley close to the bearing housing, allowing sufficient clearance for rotor end play. Align the pulleys so that the belt runs true, and tighten the belt just enough to prevent slippage. Use a belt wide enough to carry the load without excessive tension.

2. **Chain Drive**—Mount the motor on the slide rails or bedplate, which allows for adjusting the chain tension. Mount the motor sprocket close to the bearing housing, allowing sufficient clearance for rotor end play, and align the sprockets accurately.

3. **Gear Drive**—Mount the motor and driven unit so as to maintain accurate alignment. The gears must mesh accurately to prevent vibration. Mount the motor gear close to the bearing housing to minimize the overhang, allowing sufficient clearance for rotor end play. Dowel the motor to the base.

4. **Direct Drive**—The motor shaft and the driven shaft must be in line, except for a slight allowance with flexible couplings. Dowel the motor to the base.

Lubrication

Before starting the motor, fill both oil reservoirs through the **combination overflow gauge and filling device** with best quality clean dynamo oil. (See Fig. 1). The oil used should have a viscosity of from 185 to 212 seconds viscosity at 40°C. No oil should be poured in the top of the brackets through the pipe plug hole, or the oil ring slot cover inside the bracket. No oil need be added till the oil drops below the full level, which is $\frac{1}{8}''$ below the top of the overflow gauge. Do not flood the bearings. After oiling, close the cover of the overflow gauge. If any oil is accidentally spilled on the bracket, it should be wiped off with a rag or waste. This prevents dirt from collecting on the oily surface of the motor. It also eliminates any possibility of oil getting into the windings which in time may mean an expensive repair job.

The construction of the Sealed Sleeve Bearing is such as to require no "flushing out". At intervals of about two years in average service, or during general overhaul periods, remove the bracket and thoroughly wash out the bearing housings, using hot kerosene oil and compressed air if available.

Electrical Connections

Connect the motor and starter by referring to the diagrams furnished with the starter. Install all wiring and fusing in accordance with the National Electric Code, and local requirements.

When the motor is mounted on a bedplate, or on slide rails for belt adjustment, flexible metallic conduit should be used to protect the leads to the motor. In making this connection a squeeze connector should be used for attaching the flexible conduit to the conduit box. Squeeze connectors may be straight, 45° or 90°.

Construction

Type CS motors are squirrel cage induction motors, for constant speed service. Types CW and CI motors are wound rotor induction motors, for constant or varying speed service, having continuous and intermittent ratings respectively.

The completely wound primary core (frames No. 445 and smaller) is pressed into the stator frame and anchored by tack welds or set screws. If the coils should be damaged by overload or accident, these tack welds may be chipped out, the damaged stator element pressed out and a new factory wound core pressed in. The replacing core may be anchored either by tack welds or by drilling and tapping holes for two set screws.

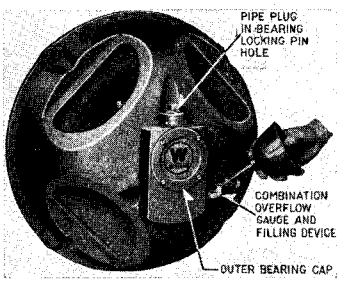

FIG. 1—SEALED SLEEVE BEARING BRACKET SHOWING METHOD OF OILING

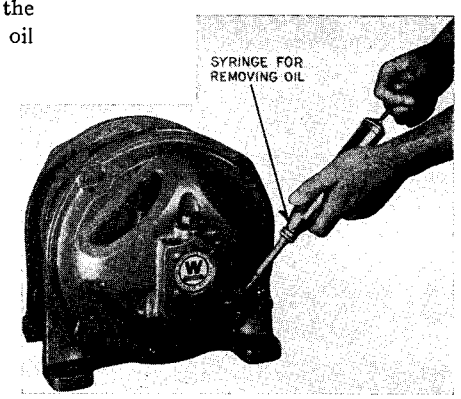

FIG. 2—TO PREVENT THE POSSIBILITY OF LEAKAGE THE DRAIN PLUG HAS PURPOSELY BEEN OMITTED. OIL MAY BE READILY REMOVED FROM THE SEALED SLEEVE BEARING BY MEANS OF AN INEXPENSIVE SYRINGE HAVING THE NOZZLE FITTED WITH A FLEXIBLE RUBBER TUBE ABOUT SIX INCHES LONG AND SMALL ENOUGH TO PASS READILY THROUGH THE STEM OF THE OVERFLOW GAUGE INTO THE INTERIOR OF THE OIL RESERVOIR.

TYPE CS SQUIRREL CAGE INDUCTION MOTORS
TYPES CW AND CI WOUND ROTOR INDUCTION MOTORS
With Oil Lubricated Sleeve Bearings

INSTRUCTIONS—Continued

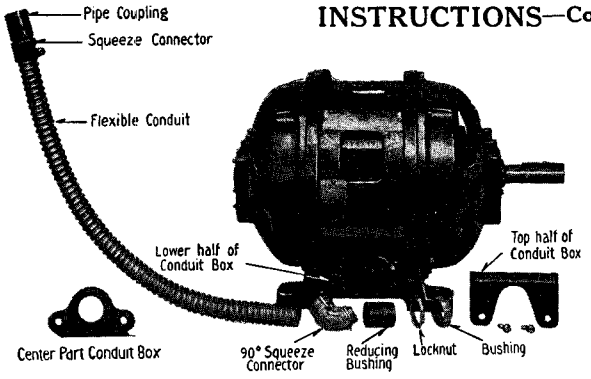

FIG. 3—METHOD OF CONNECTING MOTOR TO LINE

In order to connect a squeeze connector to the conduit box shown in Fig. 3, first remove the cover of the box. Run a locknut well down the threads of the connector and place the connector in the large hole of the middle section of the conduit box. Screw a conduit bushing over the end of connector, swing the connector to the desired position and draw the locknut up tight against the box. Follow the same procedure with rigid conduit or reducing bushing.

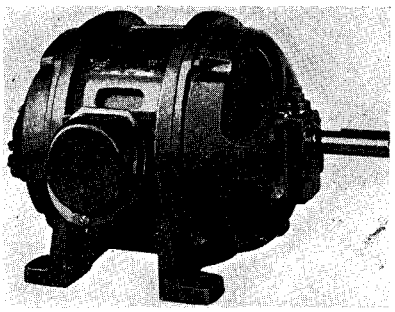

FIG. 4

THIS TYPE OF CONDUIT BOX IS USED FOR SOME MOTORS WHILE OTHERS HAVE THE TYPE OF CONDUIT BOX SHOWN IN FIG. 3.

Connection of Motor to Power Circuit with Standard Number of Terminals.

Three Phase, (Three Terminals)—Connect any lead to any motor terminal. To reverse the direction of rotation, interchange any two leads.

Two Phase, Four Wire (Four Terminals)—Connect the leads from one phase to motor terminals T1 and T3 and the leads from the other phase to motor terminals T2 and T4. To reverse the direction of rotation, interchange the leads of one phase.

Two Phase, Three Wire (Four Terminals)—Connect the two outside leads to motor terminals T1 and T2 and the common lead to T3 and T4. To reverse the direction of rotation, interchange the two outside leads.

Connection of Motor with More Than Standard Number of Terminals—Refer to the connection plate on the motor or to the connection sheet filed in the instruction envelope.

Operation

Run the motor without load to check the connections, and direction of rotation. To stop the motor, refer to the instructions furnished with the starter. When the motor is first started under load, check the temperature of the bearing housing occasionally to detect possible overheating. Do not rely on the hand to test the motor temperature. Rigid inspection and test before shipment insures a temperature rise within the motor rating. When necessary to check the temperature, do so by a thermometer.

Maintenance

Bearings—Excessive wear or overheating of the bearings is usually traced to one of the following causes.

(1) Excessive belt tension.
(2) Poor alignment causing excessive vibration or binding.
(3) Dirt in the bearing.
(4) Bent shaft.
(5) Excessive end or side thrust due to gearing, flexible couplings, etc.

If the bearing becomes hot enough to smoke, or if the rise in temperature above the surrounding air, measured by thermometer inserted through the inspection hole in the top of the housing, exceeds 30°C. for open motors running at 1800 rpm. or less, proceed as follows: (For totally enclosed motors and motors above 50 hp. running at speeds of 3000 rpm. and above, 40°C. bearing temperature rise is permissable). First, slacken the belt if one is used. Reduce the load if possible and furnish a liberal supply of oil through the inspection hole in the top of the housing, allowing surplus oil to escape through the overflow gauge which should be temporarily opened for this purpose. Check to see that the oil ring is revolving. If the bearing continues to heat excessively, it will then be necessary to shut down the motor, keeping the rotor revolving slowly until the bearing cools so as to prevent "sticking" or "freezing". To determine the cause of the trouble it may be necessary to disconnect the motor from the load entirely. Worn bearings may be detected by checking the clearance between rotor and stator. They should be replaced before there is danger of rubbing, for this is likely to cause expensive repairs.

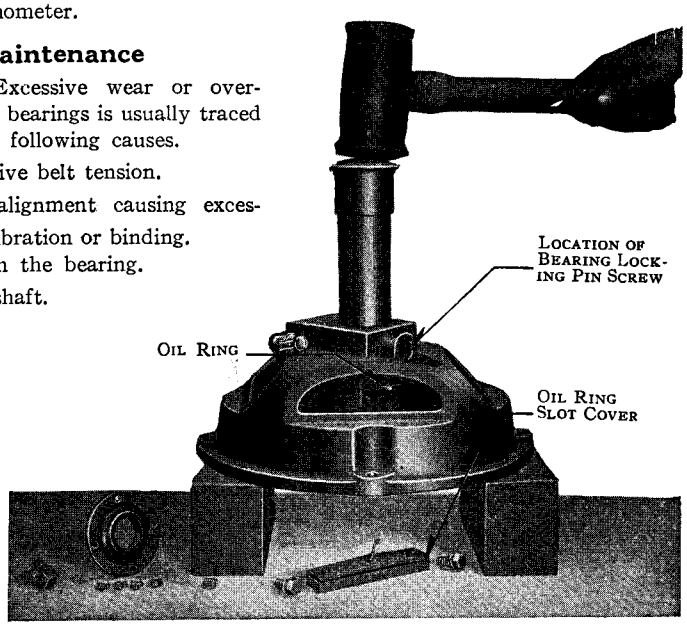

FIG. 5—METHOD OF REMOVING BEARINGS

INSTRUCTIONS—Continued

Removing Solid Sleeve Bearings—If it becomes necessary to remove bearings proceed as follows:

1. Remove the bolts holding the bracket to the frame and force the bracket loose by striking it with a soft mallet or other soft material in a direction parallel to the shaft. Pull the bracket off the shaft.
2. Remove the outer bearing caps (and inner bearing caps if they are furnished) and the oil ring slot cover with cork gasket (inside the bracket arm).
3. Remove the pipe plug covering the bearing locking pin screw. Remove the bearing locking pin screw.
4. Turn the bracket so that the oil ring will drop from the oil ring slot in the bearing as far as possible which will prevent damage to the oil ring.
5. Press the bearing out toward the inside with a press or use a piece of brass or other soft material and a mallet. (See Fig. 3). **Be sure the oil ring is as far out as possible during this operation.**

To replace, reverse the above procedure, except take care to keep the oil ring clear of the bearing as before and preferably assemble the bracket on the shaft upside down so that the oil ring will not be caught and damaged between the end of the shaft and the side of the oil ring slot in the bearing. Before bolting the bracket in place, it may be revolved on the shaft to the correct position. After bolting in place check to see that the oil ring revolves with the shaft. This check should be made through the inspection hole, with the aid of a flashlight, after the oil ring slot cover with oil ring keeper attached is securely bolted in place.

Coils—Do not allow dirt and oil to collect on the stator coils. Inspect the insulation regularly.

After a few years service, or oftener for very severe conditions, it is advisable to apply a coat of baking Varnish. (Baking Varnish No. 335 is much superior to any air drying Varnish). Varnish can be obtained from the nearest Westinghouse Dealer. Westinghouse Service Shops are equipped to bake motors.

Brushes and Slip Rings for Types CW and CI Wound Rotor Motors

The Brushes—Should make good contact with the slip rings along the whole face of the brush. If necessary, grind the brushes in with fine sandpaper. Maintain a free sliding fit between the brushes and the brush holder by cleaning both thoroughly when necessary.

Maintain the brush spring tension at the correct value, determined by the grade of brushes and the local service conditions. Make the pressure as low as consistent with good brush slip ring contact. A correct pressure per square inch is between 2 and 3 pounds for carbon or graphite brushes and between 3 and 5 pounds for metallic brushes. Each brush should bear equal pressure. Do not use lubricants. Use the correct grade of brushes which may be obtained from the nearest Westinghouse Dealer.

Secondary Connections—A squeeze connector is supplied to accommodate the secondary leads; no leads are furnished. Customer should extend leads from the conduit through the squeeze connector to the terminals on the brushes.

The Slip Rings—Should be maintained smooth and true. Grind or turn them if necessary to restore a smooth and true surface. For additional information, methods of locating and correcting troubles, and making repairs, apply to the nearest Westinghouse District Office.

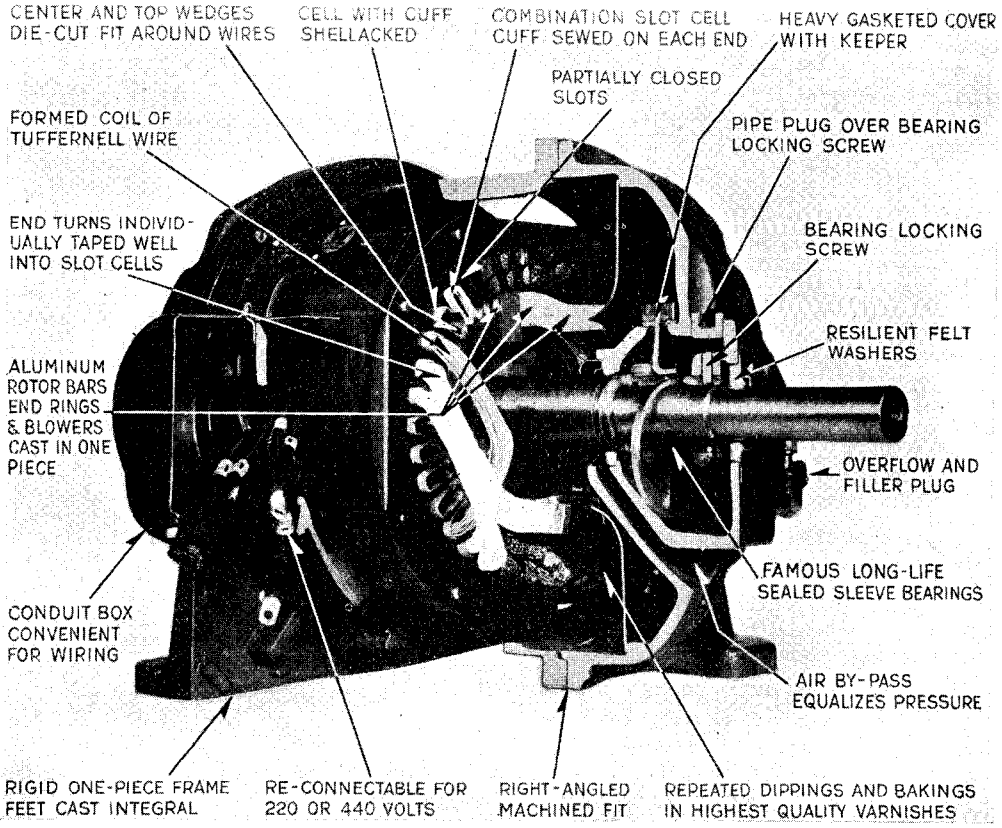

FIG. 6—5 HORSEPOWER 1740 RPM TYPE CS SQUIRREL-CAGE MOTOR WITH SEALED SLEEVE BEARINGS. ILLUSTRATING SOME OF THE FEATURES WHICH MAKE FOR LONG LIFE.

TYPE CS SQUIRREL CAGE INDUCTION MOTORS
TYPES CW AND CI WOUND ROTOR INDUCTION MOTORS
BUILT IN FRAMES NO. W-254 TO 800-C
With Oil Lubricated Sleeve Bearings
RENEWAL PARTS DATA

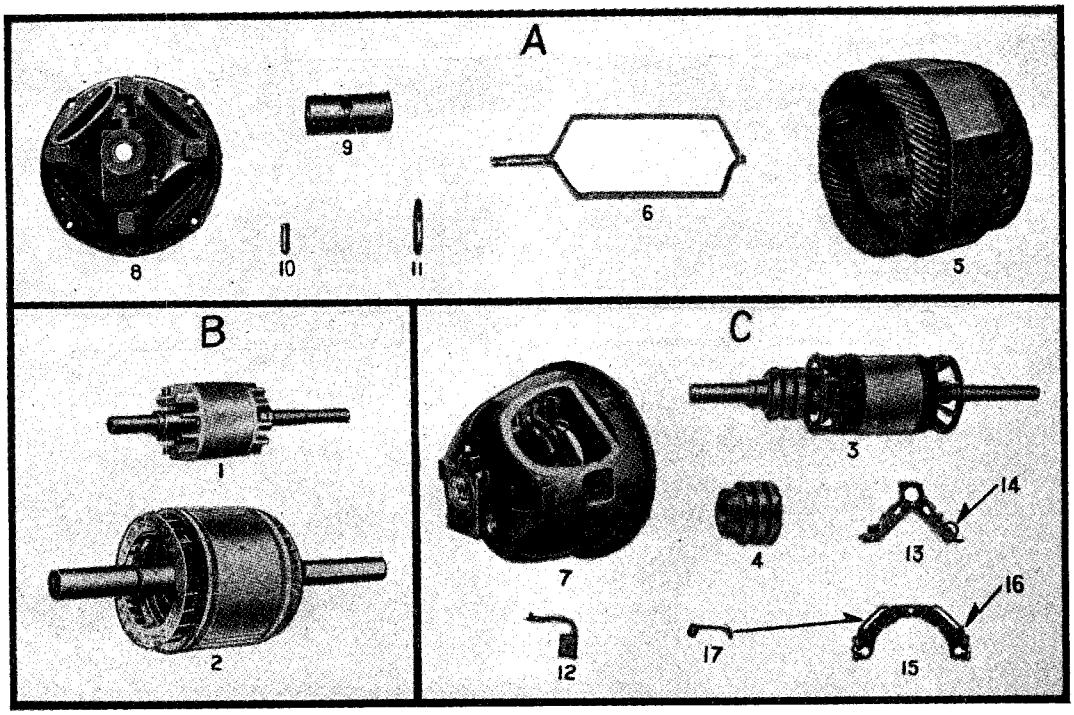

FIG. 7—A—PARTS COMMON TO TYPES CS, CW AND CI MOTORS
B—PARTS USED ONLY ON TYPE CS MOTORS
C—PARTS USED ONLY ON TYPES CW AND CI MOTORS

RECOMMENDED STOCK OF RENEWAL PARTS

The following is a list of the Renewal Parts and the quantities of each that we recommend should be stocked by the user of this apparatus to minimize interrupted operation caused by breakdowns. The parts recommended are those most subject to wear in normal operation or those subject to damage or breakage due to possible abnormal conditions. This list of Renewal Parts is given only as a guide. When continuous operation is a primary consideration, additional insurance against shut-downs is desirable. Under such conditions more renewal parts should be carried, the amount depending upon the severity of the service and the time required to secure replacements.

Types CW and CI Motors

Motors in use		1	5
Ref. No.	Description of Part	No. Per Motor	Recommended For Stock
3	Rotor Complete	1	0	0
6	Rotor Coil	1 Set	⅓ Set	1 Set
†	Cut Winding Insulation, Class No. 1	1 Set	⅓ Set	1 Set
4	Collector	1	0	0
5	x Pre-wound Stator Core	1	1	1
6	or Stator Coil	1 Set	⅓ Set	1 Set
†	or Cut Winding Insulation, Class No. 1	1 Set	⅓ Set	1 Set
7	Bearing Bracket with Brush Rig (Front)	1	0	0
9	Bearing	1	1	1
10	Steady Pin	1	0	0
11	Oil Ring	1	1	1
12	Brush	1 Set	1 Set	2 Sets
13	xBrushholder	1 Set	1	1
14	xSpring	1 Set	1	1
15	△Brushholder	1 Set	1	1
16	△Spring	1 Set	1	1
17	△Pressure Finger	1 Set	0	1
8	Bearing Bracket—Rear	1	0	0
9	Bearing	1	1	1
10	Steady Pin	1	0	0
11	Oil Ring	1	1	1

Type CS Motors

Motors in use		1	5
Ref. No.	Description of Part	No. Per Motor	Recommended For Stock
1 or 2	Rotor Complete	1	0	0
5	x Pre-wound Stator Core	1	1	1
6	or Stator Coil	1 Set	⅓ Set	1 Set
†	or Cut Winding Insulation, Class No. 1	1 Set	⅓ Set	1 Set
8	Bearing Bracket—Front	1	0	0
9	Bearing	1	1	1
10	Steady Pin	1	0	0
11	Oil Ring	1	1	1
8	Bearing Brkt.—Rear (Coupling End)	1	0	0
9	Bearing	1	1	1
10	Steady Pin	1	0	0
11	Oil Ring	1	1	1

Parts indented are included in the part under which they are indented.
† Not illustrated.
x Used only on Frames W-445 and smaller.
△ Used only on Frames W-504 and larger.

ORDERING INSTRUCTIONS

Name the part and give the complete nameplate reading. State whether shipment is desired by express, freight or by parcel post. Send all orders or correspondence to nearest Sales Office of the Company. Small orders should be combined so as to amount to a value of at least $1.00 net. Where the total of the sale is less than this, the material will be invoiced at $1.00.

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