INTERTAIRE EQUIPMENT, TYPE RB AND RV

Instructions

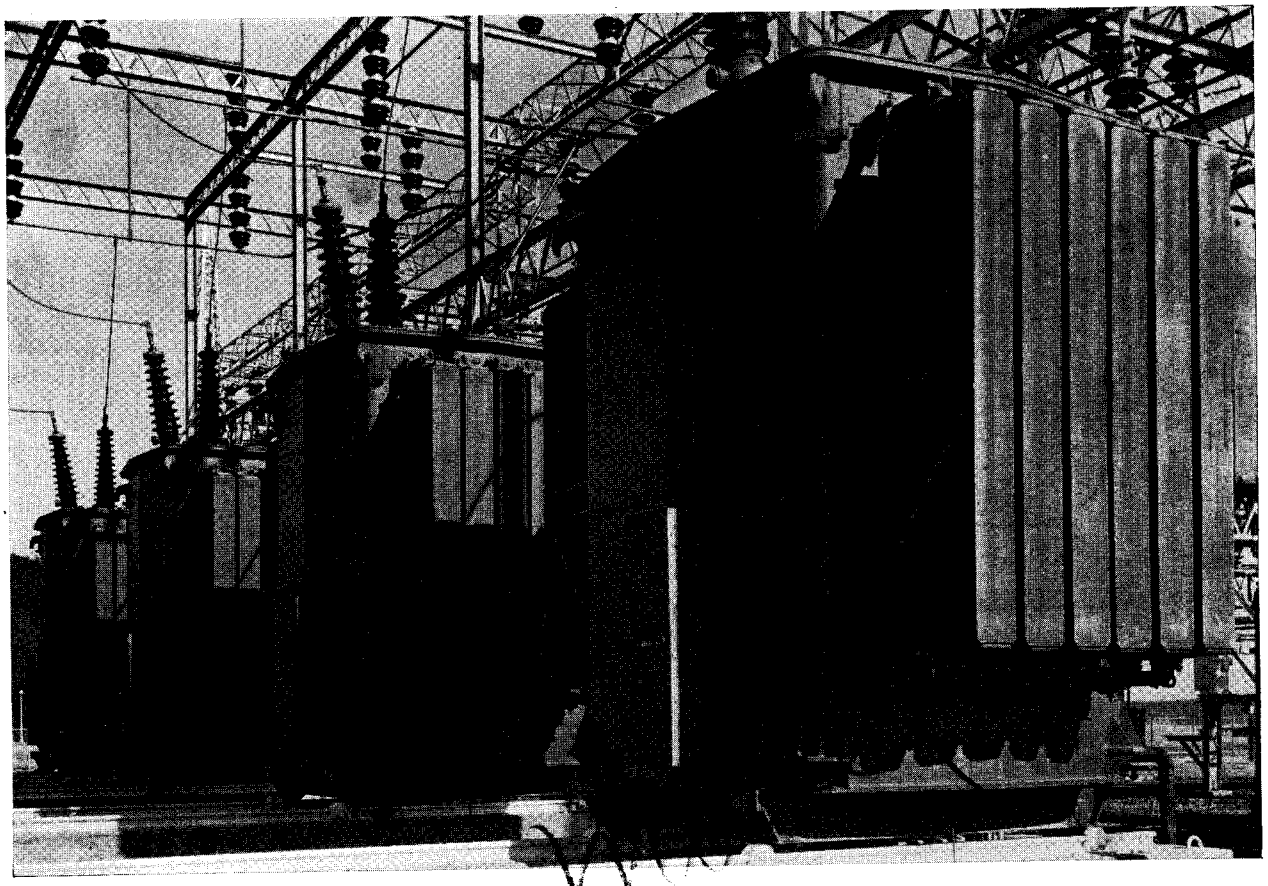


FIG. 1—TYPICAL INERTAIRE TRANSFORMER

GENERAL

Inertaire is the name originally given by Westinghouse to a system for removing oxygen and moisture from the air being drawn into a transformer tank when decreasing temperature would create a partial vacuum within the tank. With the oxygen and moisture removed, the remaining inert gases are almost wholly nitrogen. Subsequent development has evolved means for feeding dry nitrogen at low pressures into the transformer tank from high pressure nitrogen cylinders, instead of depending on removing oxygen and moisture from the air drawn in during breathing.

Westinghouse types RV or RB Inertaire equipment maintains a cushion of inert gas above the oil of transformers or similar oil-filled equipment.

The inert gas is nitrogen supplied from a steel cylinder which is initially filled to a pressure of 2,000 pounds per square inch. A pressure reducing valve will feed nitrogen into the transformer when the transformer pressure falls below ½ pound per square inch.

A breathing regulator conserves the nitrogen in the gas space by permitting it to escape to the atmosphere only when the pressure, due to the expansion of the oil with temperature, exceeds the pre-determined value of 5 pounds for "RV" or 10 pounds for "RB".

Other fittings are provided so the gas space above the oil may be blown out initially with dry nitrogen from extra cylinders when needed. A sampling valve is connected to the gas space so that a sample of gas may be taken direct from the gas space to determine its oxygen content.

CONSTRUCTION AND OPERATION

Reducing Valve and High Pressure Gauge

A two-stage reducing valve is used. The low pressure chamber of the valve is connected to the gas space in the transformer and the high pressure chamber is connected to the nitrogen cylinder. The valve is adjusted at the factory to feed nitrogen into the gas space when the pressure falls below ½

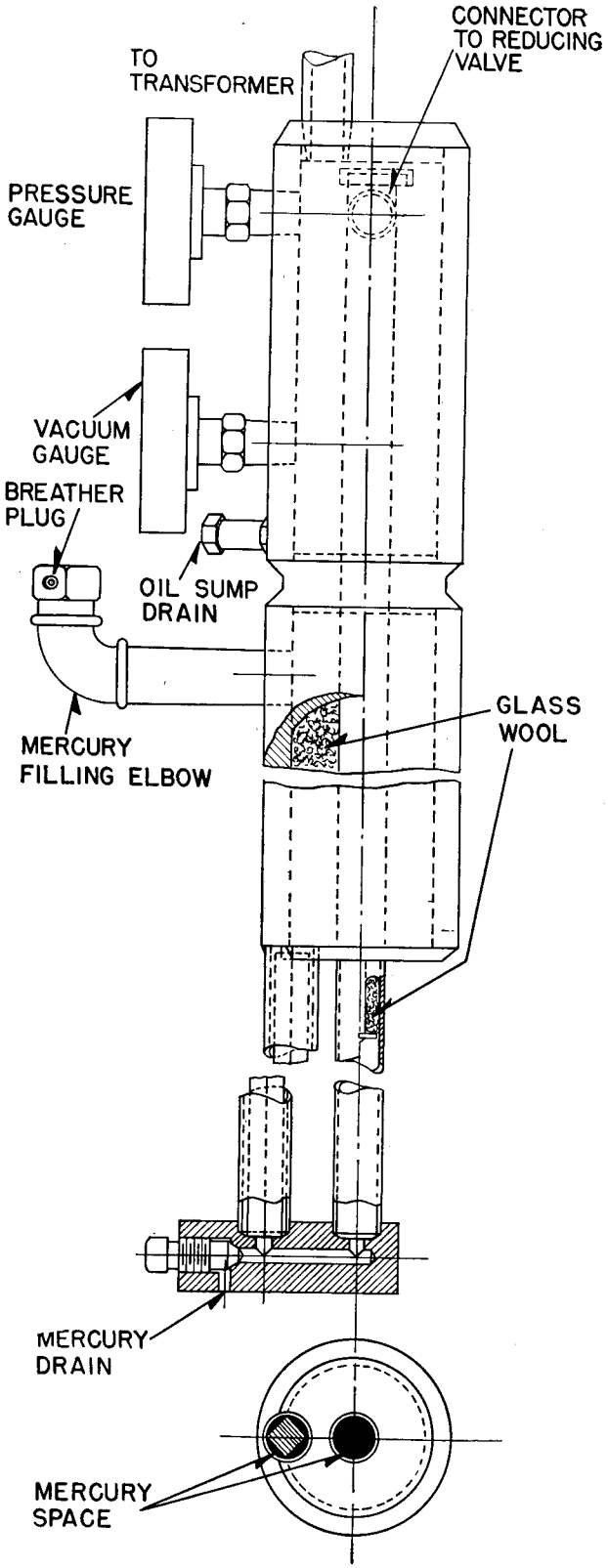


Fig. 2

pound per square inch and seal off the gas space from the nitrogen supply when the pressure rises above ½ pound per square inch.

The pressure at which nitrogen is fed into the gas space can be adjusted to any value from ¼ to 1 pound per square inch. This adjustment is made by loosening the locking screws in the end of the low pressure bonnet, removing the protecting screw cap on the end of the low-pressure bonnet, and turning the set screw either in or out. Turning the set screw clockwise (inward) increases the pressure, and turning it counterclockwise (outward) decreases the pressure at which nitrogen is supplied to the gas space. **CAUTION:** In making this adjustment care should be taken that the set screw is not turned clockwise so far as to disengage the threads. Once the threads have been disengaged, it is necessary to return the reducing valve to the factory, as it is almost impossible to remove and replace the low pressure bonnet without ruining the low-pressure diaphragm.

CAUTION: The reducing valve is a precision instrument and adjustment other than the one mentioned above should not be attempted. If the valve or its high pressure gauge does not operate correctly, notify the nearest Westinghouse District Office and send the combined valve and gauge to the Westinghouse Company, Sharon Works, for replacement. Repair of reducing valves and high pressure gauges should not be attempted in the field nor should they be sent to any place other than the Westinghouse Company, Sharon Works, for repair.

The 4,000 pounds per square inch pressure gauge with alarm contacts, connected to the high pressure chamber of the reducing valve, indicates the nitrogen pressure in the cylinder. This gauge is equipped with electrical contacts which close when the cylinder pressure falls to 200 pounds per square inch and thus warns the operator that only 10% of a full cylinder of nitrogen is left. The reducing valve will continue to function, however, until the cylinder is empty.

Breathing, Regulator, Pressure and Vacuum Gauge

The mercury breathing regulator, Fig. 2, acts to prevent the transformer pressure from exceeding some fixed value (5 pounds per square inch for type RV

and 10 pounds per square inch for type RB). It is a modified U-tube with the surface area on the atmosphere side equal to one-half the surface area on the transformer side. When the gas pressure on the transformer side exceeds 5 pounds per square inch for RV, or 10 pounds per square inch for RB Inertaire, the Mercury in the transformer tube is forced down to the bottom of the tube. This permits the gas to escape to atmosphere and the excess pressure is relieved. If the transformer pressure is ever reduced below a given vacuum (-2.5 pounds per square inch for RV and -5 pounds per square inch for RB) the Mercury in the atmosphere side tube is forced down below the end of the tube and air will be drawn in, relieving the vacuum. It should be noted that air will never be drawn into the tank except in case the nitrogen cylinder is allowed to become empty or reducing valve should fail to preform its function.

Below the breather plug and above the Mercury level, an annular space is packed with glass wool. This serves to remove any Mercury globules carried by the gas stream when the transformer is exhausting to atmosphere.

Likewise, the upper end of the transformer tube is packed with glass tape for the same purpose in case of excessive vacuum. The upper portion of the breathing regulator includes an oil sump to catch any oil which might be carried over from the transformer into the breathing regulator. **This oil sump should be drained before putting the equipment into operation and should be drained once a year thereafter** to prevent any oil coming in contact with the Mercury of the breathing regulator. To drain, remove oil sump drain cap, replace cup when when gas begins to blow out.

If oil gets on the Mercury, the breathing action will eventually form a Mercury-oil emulsion and the Mercury seal will become an oil seal. This is because the breathing operation forms tiny globules of Mercury which when coated with oil will not run together again. If this happens the breathing regulator can be cleaned with benzine or some other cutting solvent that will remove the oil. If emulsification has not gone too far, the Mercury can also be recovered this way.

On the side of the oil sump are mounted two dial type gauges, one to indicate approximate pressures of the gas space and the other to indicate approximate vacuum should it occur. The small pressure gauge is not suitable for measuring operating pressure of reducing valve, since approximately one pound is required to start the pointer from the pin and instead the water column of the gas analyzer should be used; 28 inches of water equals 1 pound.

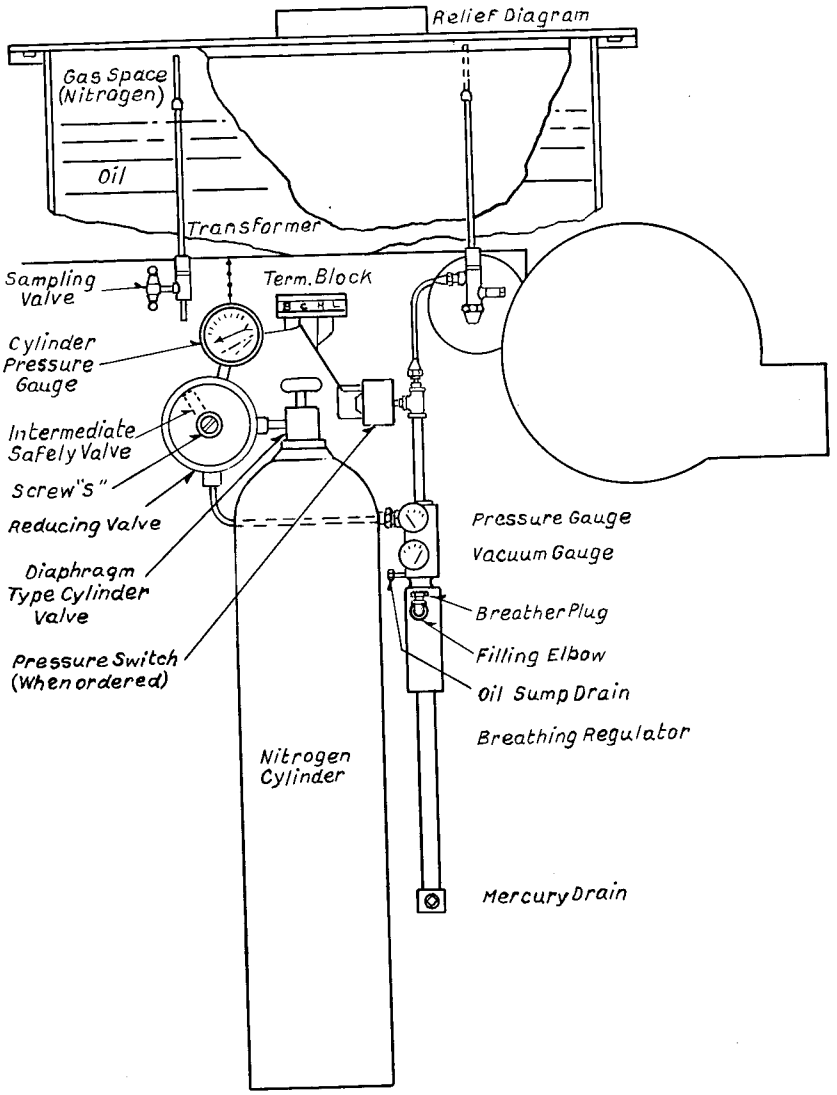


FIG. 3

Shut-off Valve

A three-way shut-off valve with blow-out fitting, located above the breathing regulator, connects the breathing regulator to the gas space, above the transformer oil, through a pipe attached to the transformer tank. See Fig. 3. The three positions of the valve are as follows:

(1) Shut-off (clockwise). This shuts off the gas space and connects the breathing regulator to the blow-out fitting. This position is used to seal the gas space, and also for testing the operating pressure of the breathing regulator.

(2) Mid-position shown in Fig. 3. In this position of the valve, the gas space, the breathing regulator, and the blow-out fitting are connected together. This position is used when it is desired to blow-out the gas space, initially with dry nitrogen. In blowing out the

gas space, the sampling valve must be opened.

(3) Operating (counter-clockwise). In this position, the blow-out fitting is closed and the gas space is connected to the breathing regulator.

Sampling Valve

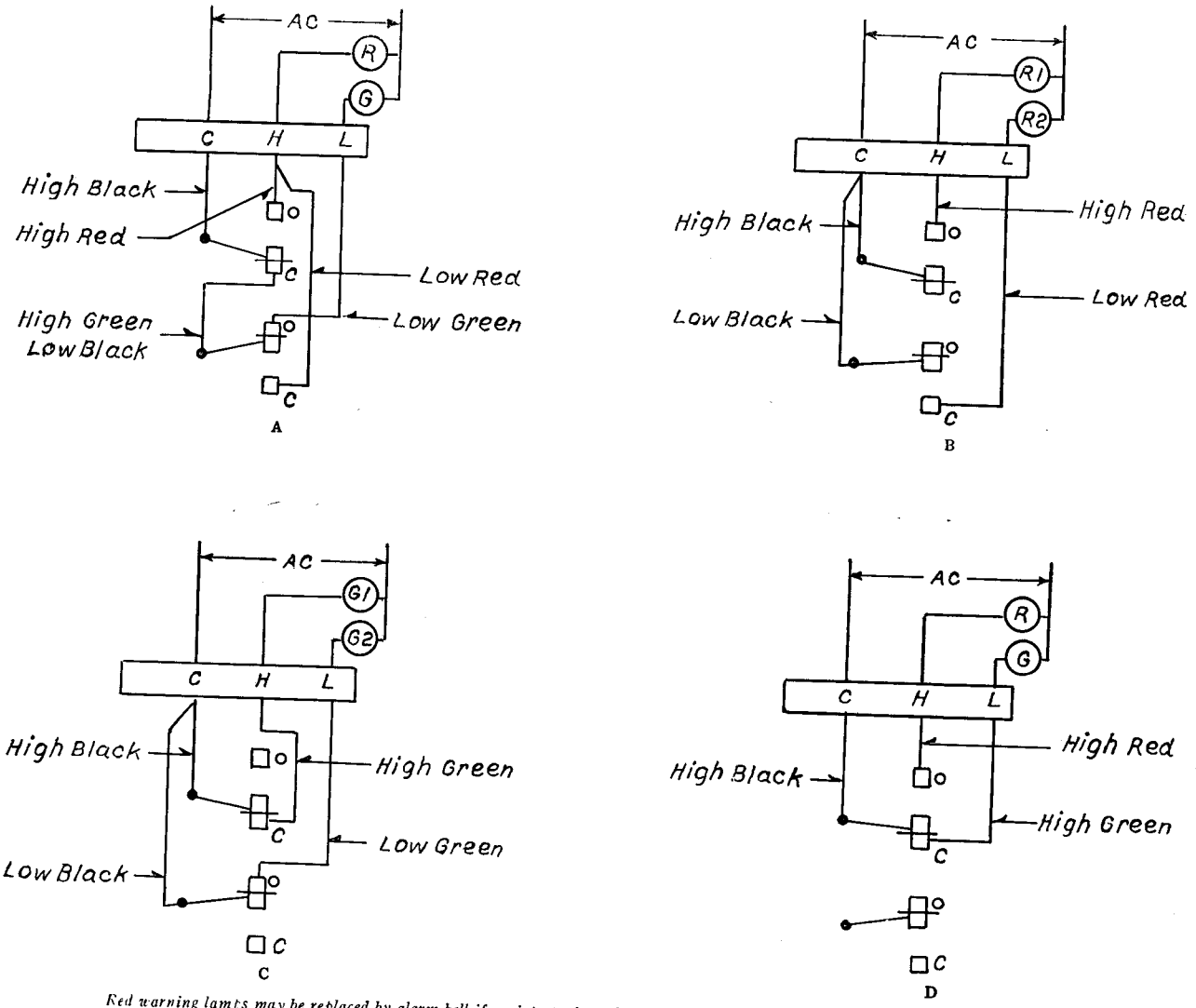
The sampling valve is a needle valve, connected to the gas space, above the oil, through a pipe attached to the tank wall. This valve is used as an exhaust valve in blowing-out the gas space. It is also used for obtaining sample of the gas from the gas space for oxygen content analysis.

Pressure Alarm Switches

When supplied, pressure operated switches are normally set to give an alarm whenever the pressure in the transformer is abnormally high (10½ pounds per square inch for RB and 5½ pounds per square inch for RV) or abnormally low (¼ pound per square inch for RB and RV equipments). These switches are single pole, double throw so the alarm circuit may be connected either for the contacts to make or to break at the alarm setting. See Fig. 4 for suggested connections. These switches have approximately 2 pounds differential; that is, if high alarm operates, pressure must fall 2 pounds for switch to reset; if low alarm operates, pressure must rise 2 pounds for switch to reset. They can be reset by hand by, pushing down on the bellows until the switch "clicks" for high alarm and pulling up for low alarm.

Deoxygenation Fitting for Blowing Out

When the Inertaire transformer is first put into service, air might be present in the space above the oil. It is desirable to start the transformer in service with inert gas above the oil so provision is made for blowing-out the gas space with nitrogen at the time the transformer is



Red warning lamps may be replaced by alarm bell if an interposing relay is used to handle the bell current or if the current required by bell does not exceed 2 amperes.

FIG. 4

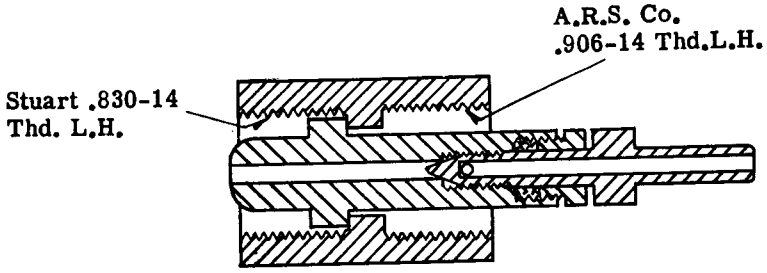


FIG. 5

installed. The deoxygenation fitting, Fig. 5 is used to reduce the nitrogen pressure from 2,000 pound per square inch in the cylinder to a convenient pressure which will safely and rapidly blow out the gas space. This pressure is variable by adjusting the needle in the stem. The unit nut is made reversible so that one end will fit Air Reduction Sales Company, the other end Stuart Oxygen Company nitrogen cylinders. **CAUTION:** The needle should **not** be backed away from the closed position by more than ⅙ of a turn or the pressure may be excessive.

INSTALLATION

Mounting

Inertaire equipment usually is shipped separate from the transformer tank and consists of: (1) The reducing valve and high pressure gauge assembly (2) one operating nitrogen cylinder for RB and two for RV Inertaire, (3) two short copper tubes which connect between the cabinet and the tank, (4) four anti-vibration mounting pieces, Fig. 6, (5) the cabinet with all other parts of the equipment mounted in it.

In mounting the cabinet on the Transformer, the four springs are first screwed into the bushing in the back of the Inertaire cabinet until they are centered (equal projection inside and outside of bushing). Next put the bolts, with the washers and gaskets in place, through the springs and screw them into the pads on the transformer tank. The bolt should be tightened until the spring is slightly compressed and the gaskets touch the spring bushing. See Fig. 6.

The copper connecting tubes should be connected at the top of the cabinet by means of union nuts on the copper tubing. Care should be taken to get a gas tight connection.

The mercury for the breathing regulator should be poured through the filling elbow with vent plug removed. **Care should be taken not to spill any mercury as it will attack solder, brass or gold.**

Remove the valve protecting cap from the nitrogen cylinder, and install the cylinder in the cabinet. The cylinder valve protecting cap should be kept in the cabinet for use when cylinder is sent away for refill.

The reducing valve may be installed after cylinder valve protecting cap has been removed and placed in the cabinet. This is done by connecting the union on the reducing valve to the cylinder and connecting the reducing valve to its tubing by means of the union nut connection. The chain on the high pressure alarm gauge should be fastened to the hook in the top of the cabinet.

Tank Leak Test

If the tank is to be tested for leaks by filling completely with oil and applying an additional oil head, **close the shut-off valve** (clockwise) and the **sampling valve** and remove the **cap from the blow-out connection.** When leak test is completed, the oil should be lowered in the following manner: open the needle valve in the deoxygenation fitting $\frac{1}{16}$ turn, connect the deoxygenation fitting Fig. 5 to a "blow-out" cylinder (on small transformers there will not be any extra nitrogen cylinders for blowing out; operating cylinder will be used for this purpose), and the other end of the hose connected to the blowing-out connection. Open the cylinder valve, start to draw down the oil, and open the transformer shut-off valve to mid-position (2½ turns). This procedure will blow most of the oil in the connection between the tank and cabinet back into the tank and fill the gas space with pure nitrogen, thus accomplishing the initial deoxygenation of the gas space.

Open the oil sump drain valve and draw off any oil which might have entered the sump; close the sump drain; open the sampling valve to drain off the oil in this line. Nitrogen will come out of this valve when line is free of oil. Close the sampling valve. Back seat (counter-clockwise) the shut-off valve.

CAUTION: Before using the deoxygenation fitting, check to be sure that the needle is **not** backed away from the closed position by more than one-sixth of a turn. If the opening is greater than this, the gas pressure in the transformer tank may become excessive before it is realized.

Deoxygenation

Deoxygenation or blowing out of the gas space may be accomplished by means of the deoxygenation fitting, Fig. 5, explained above, and the back-seating shut-off valve, Fig. 3.

For this operation the deoxygenation fitting is connected to the nitrogen cylinder and the hose is connected between it and the blow-out fitting on the shut-off valve. With the shut-off valve in mid-position (2½ turns from either extreme position) and the sampling valve wide open, open the nitrogen cylinder valve. This permits the nitrogen to flow into the gas space, forcing the air out the sampling valve. The nitrogen should be allowed to flow until the oxygen in the escaping gas is reduced to 3%.

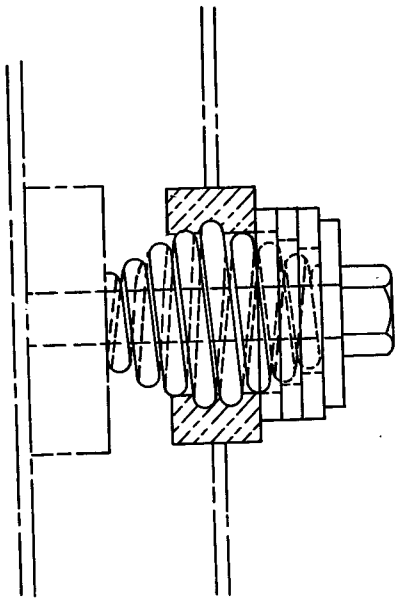


FIG. 6

If the transformer is large and requires more than 100 cubic feet of nitrogen to blow it out, spare nitrogen cylinders will be supplied. These cylinders are the property of the nitrogen supplier and should be promptly returned as demurrage will be charged after 30 days.

During shipment the oil may absorb oxygen which will be replaced slowly by the nitrogen. Thus the oxygen content of the gas may actually increase after installation. Additional blowing-out operation may be necessary as explained under "Maintenance".

While the equipment is connected for deoxygenation it is usually convenient to check the tank for leaks, and to check the blow-out pressure of the breathing regulator. These procedures are explained below.

Testing for Leaks

If an oil pressure test cannot be conveniently made to check the tightness of the tank and fittings the following method is suggested.

After the deoxygenation process is completed close the sampling valve and **carefully** allow the pressure in the gas space to reach 5 lb. per square inch. Close the cylinder valve and back seat (counter-clockwise) the shut-off valve. Allow the transformer to stand several hours with this pressure. If the pressure falls off, a leak is present and it can best be found by applying soapy water to all joints and connections. In checking for leaks the newly made Inertaire connections should not be overlooked.

CAUTION: Extreme care should be observed, when blowing out the gas space with nitrogen from a high pressure container, not to seal the transformer off tight until the gas in the gas space has reached ambient temperature. The expansion of nitrogen from a very high pressure (1500 to 2000 pounds per square inch) to atmospheric pressure results in the nitrogen entering the gas space at very low temperature. Unless the gas is free to expand as it warms up to ambient temperature, the pressure within the tank may increase to such a value as to rupture the relief diaphragm. If no diaphragm is provided, the pressure may distort the tank.

If the breathing regulator is connected to the gas space, it will relieve any pressures in excess of ten pounds per square inch.

Checking the Blow-Off Pressure of Breathing Regulator

Having completed the deoxygenation and tests for leaks, the blow-off pressure of the breathing regulator should be checked. This is done by first isolating the gas space from the Inertaire equipment (turn shut-off valve clockwise to the limit). With the deoxygenation fitting set for a very small gas flow, build the pressure up slowly in the breathing regulator. Gas will escape from the throttle vent plug at blow-off.

This blow-off pressure can be set for any value up to 10 lb. per square inch by varying the amount of mercury in the regulator.

CAUTION: For the RV equipment this pressure must not exceed 5 lbs. per square inch and for RB must not exceed 10 lbs.

Air will be drawn in at a **negative** pressure of one-half the blow-off pressure.

MAINTENANCE

Westinghouse Inertaire transformers are designed to require very little maintenance and attention on the part of the customer. Since the tank is nearly always under a positive pressure of at least ½ lb. per square inch there is small likelihood of the oxygen or moisture content becoming high.

The amount of nitrogen used by the transformer and the frequency of cylinder replacement will depend on the tightness of the tank as well as the load cycle. In order to be sure that the equipment is operating correctly and that there are no leaks in the system, it is recommended that the following readings be taken during the first month of operation.

(1) Weekly oxygen content analysis to determine when the additional blowing out is necessary. This should be done before the oxygen content reaches 7% which is the permissible upper limit which will prevent explosions in the gas space.

If a flue gas analyzer is not obtainable, we recommend the use of a Hays Gas Analyzer, S#-436039 which may be purchased from the Westinghouse Company, Sharon Works. Complete instructions for determining the oxygen content is supplied with each analyzer.

Additional blowing-out may be accomplished in the same manner as previously described, but if the only nitrogen available is in the operating cylinders, deoxygenation may be accomplished by opening the sampling valve and letting enough nitrogen flow through the reducing valve until the oxygen content of the gas from the sampling valve is below 3%.

(2) For the first week, take daily reading, of nitrogen cylinder pressure, transformer pressure as indicated by the tank pressure gauge, transformer oil temperature and ambient temperature. Weekly readings of the above will suffice for the remainder of the month.

After the first month of observation has shown that the equipment is functioning properly no further readings are necessary except that check analysis of the oxygen content should be made in about three months. During normal operation the oxygen content should remain below 1%.

Nitrogen Cylinders

Since the nitrogen used in Inertaire equipment will last a relatively long time, it is not feasible to rent cylinders from a nitrogen supplier. The cylinders which are used normally with the equipment are equipped with a special packless valve and are shipped to the customer with the transformer, and become the property of the customer. These cylinders are painted gray so that they may be identified easily.

Extra cylinders when needed for deoxygenation, are painted a different color and cannot be used for the permanent installation. This is because of the valve, which is packed valve, and is only tight in the closed position. These cylinders are shipped directly to the customer for the nitrogen supplier and are the property of the supplier. They should be returned to the supplier when empty as there is a demurrage charge if they are kept over 30 days.

The cylinders may be identified as follows:

(1) Westinghouse cylinders for regular use with Inertaire equipment.
(a) Each Westinghouse cylinder

is painted gray and is marked with black letters about 1¼" high "Westinghouse Inertaire Nitrogen."

(b) Each cylinder is provided with a tag, form 17212.

(c) Each cylinder is originally shipped from Sharon Works with the transformer.

(2) Extra cylinders for blowing-out transformers.

(a) Cylinders belong to suppliers are painted orange for the lower two-thirds and red or wine color for the upper one-third.

(b) Each cylinder is provided with a tag, form 15067.

(c) Each cylinder is shipped from the nitrogen supplier direct to the customer.

Additional blowing-out cylinders may be obtained from the following suppliers:

(1) Air Reduction Sales Co., Jersey City, N. J.

(2) Air Reduction Sales Co., Philadelphia, Penna.

(3) Air Reduction Sales Co., Pittsburgh, Penna.

(4) Air Reduction Sales Co., Chicago, Illinois

(5) Stuart Oxygen Co., San Francisco, California

Additional nitrogen for blowing out can be ordered from any of the above suppliers as Westinghouse Inertaire Nitrogen, P.D.S. 5622. Do not use any other grade of nitrogen or any other gas.

When the nitrogen cylinder for regular use with the "RV" Inertaire equipment drops to 150 to 200 lb. per square inch, it should be replaced with a full cylinder. For "RB" Inertaire Equipment the reducing valve may be left hanging from its chain while the cylinder is being refilled. These cylinders can be properly refilled only by the above suppliers.

As it is usual for nitrogen suppliers to exchange cylinders it is suggested that the customer's requisition read as follows: "Refill cylinder, Serial No. 000000 with Westinghouse Inertaire Nitrogen, P.D.S. 6306 and return same cylinder to purchaser." The serial number will be found stencilled on the side of the cylinder.

CAUTION: Do not use any other grade of nitrogen or any other gas.

Drain the oil sump once a year to prevent any appreciable oil coming in contact with the mercury in the regulator.

Check blow-off pressure of breathing regulator to determine if mercury-oil emulsion may have occurred since last inspection. Refer to paragraphs under "Installation" for instructions.

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① **Changed or added since previous issue.**

September, 1945
Supersedes Issue dated May, 1945

INERTAIRE EQUIPMENT, TYPES RB AND RV

Instructions

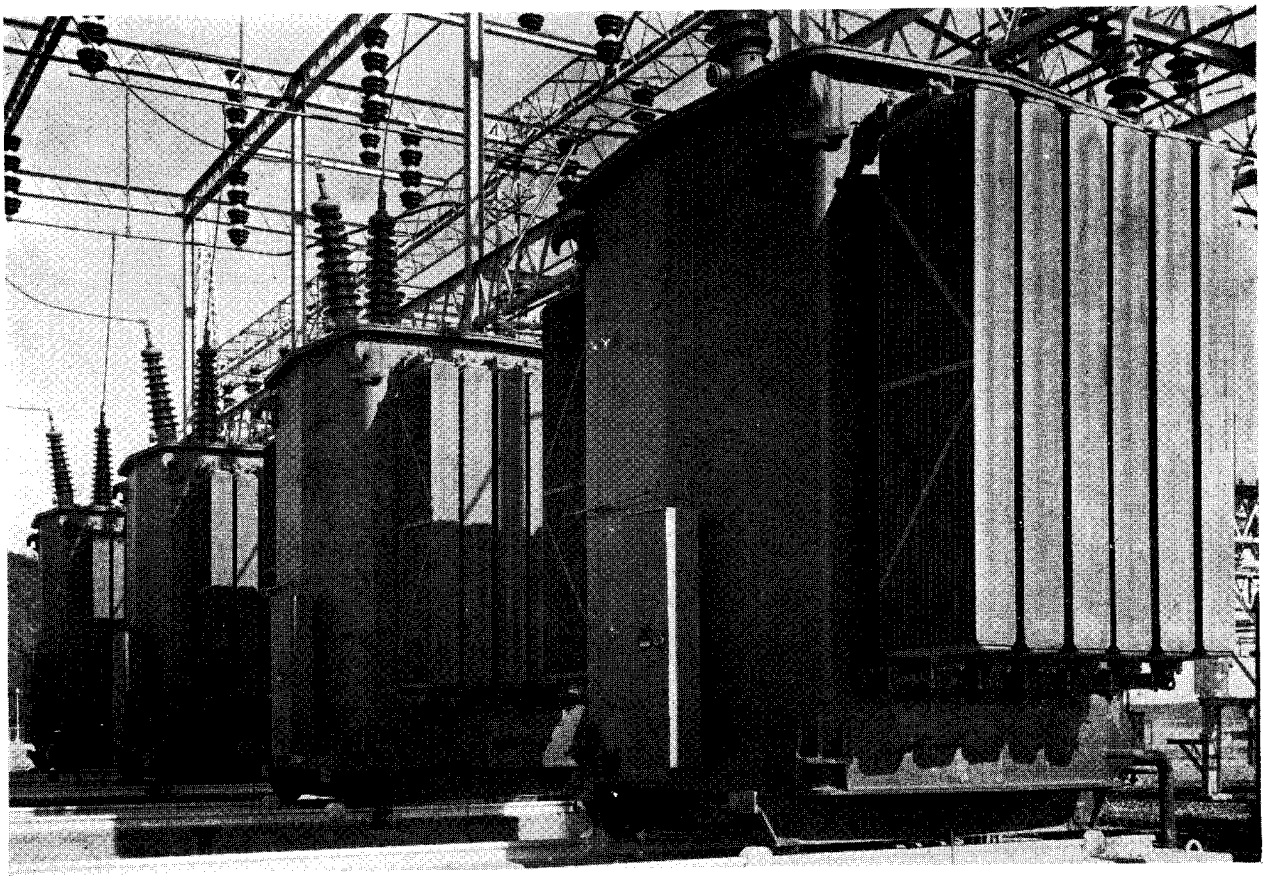

FIG. 1—TYPICAL INERTAIRE TRANSFORMER

GENERAL

Inertaire is the name originally given by Westinghouse to a system for removing oxygen and moisture from the air being drawn into a transformer tank when decreasing temperature would create a partial vacuum within the tank. With the oxygen and moisture removed, the remaining inert gases are almost wholly nitrogen. Subsequent development has evolved means for feeding dry nitrogen at low pressures into the transformer tank from high pressure nitrogen cylinders.

Westinghouse types RV or RB Inertaire Equipment maintains a cushion of inert gas above the oil of transformers or similar oil filled equipment. It consists of a supply of nitrogen under pressure, the flow of which is automatically controlled by a reducing valve. The nitrogen in the gas space is conserved by means of a breathing regulator.

The nitrogen supply is obtained from a steel cylinder which is initially filled to 2000 lbs. per square inch. The reducing valve is adjusted at the factory to reduce the cylinder pressure in two stages to ½ lb. per square inch, i.e., when the transformer pressure falls below ½ lb. per square inch, the reducing valve will feed nitrogen into the tank until the pressure rises slightly above ½ lb. per square inch.

The breathing regulator conserves the nitrogen in the gas space by permitting it to escape to the atmosphere only in the event that the pressure, due to the expansion of the oil with temperature, exceeds some predetermined value.

Fittings are provided in order that the gas space above the transformer oil may be blown out initially with dry nitrogen. A sampling valve is also supplied so the oxygen content of the gas space may be determined by the use of a gas analyzer.

Reducing Valve

A two stage reducing valve is used. The low pressure chamber of the valve is connected to the gas space in the transformer and the high pressure chamber is connected to the nitrogen cylinder.

The valve is adjusted at the factory to feed nitrogen into the gas space when the pressure falls below ½ lb. per square inch and to seal off the gas space from the nitrogen supply when the pressure rises above ½ lb. per square inch.

The pressure at which nitrogen is fed into the gas space can be adjusted

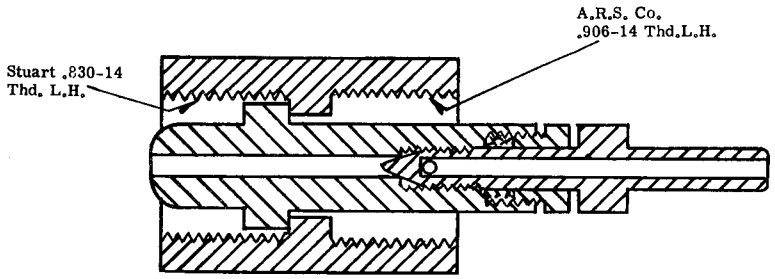

FIG. 5

the reducing valve to the cylinder and connecting the reducing valve to its tubing by means of the union connections. The chain on the alarm gauge should be fastened to the hook in the top of the cabinet.

CAUTION—If the tank is to be tested for leaks by filling completely with oil and applying an additional oil head, the Inertaire connections to the tank should not be made until after this is done. If such a test must be made after the Inertaire has been installed close the shut-off valve (clockwise), the cylinder valve, and the sampling valve before making the test, and drain the connecting tubes completely before putting the Inertaire equipment back in service.

Deoxygenation

Deoxygenation or blowing out of the gas-space is accomplished by means of the deoxygenation fitting, Fig. 5, explained above, and the back-seating shut-off valve, Fig. 6.

For this operation the deoxygenation fitting is connected to the nitrogen cylinder and the hose is connected between it and the blow-out fitting on the shut-off valve. With the shut-off valve in mid-position (2½ turns from either extreme position) and the sampling valve wide open, open the nitrogen cylinder valve. This permits the nitrogen to flow into the gas space, forcing the air out the sampling valve. The nitrogen should be allowed to flow until the oxygen in the escaping gas is reduced to 3%.

If the transformer is large and requires more than 100 cubic feet of nitrogen to blow it out, spare nitrogen cylinders will be supplied. These cylinders are the property of the nitrogen supplier and should be promptly returned as demurrage will be charged after 30 days.

During shipment the oil may absorb oxygen which will be replaced slowly by the nitrogen. Thus the oxygen content of the gas may actually increase after installation. Additional blowing-out operation may be necessary as explained under "Maintenance".

While the equipment is connected for deoxygenation it is usually convenient to check the tank for leaks, and to check the blow-out pressure of the breathing regulator. These procedures are explained below.

CAUTION—Before using the deoxygenation fitting, check to be sure that the needle is **not** backed away from the closed position by more than one-sixth of a turn. If the opening is greater than this, the gas pressure in the transformer tank may become excessive before it is realized.

Testing for Leaks

If an oil pressure test cannot be conveniently made to check the tightness of the tank and fittings the following method is suggested.

After the deoxygenation process is completed close the sampling valve and **carefully** allow the pressure in the gas space to reach 5 lb. per square inch. Close the cylinder valve and back seat (counter-clockwise) the shut-off valve. Allow the transformer to stand several hours with this pressure. If the pressure falls off a leak is present and it can best be found by applying soapy water to all joints and connections. In checking for leaks the newly made Inertaire connections should not be overlooked.

Checking the Blow-Off Pressure of Breathing Regulator

Having completed the deoxygenation and tests for leaks, the blow-off pressure of the breathing regulator should be checked. This is done by first isolating the gas space from the Inertaire equipment (turn shut-off valve clockwise to the limit). With the deoxygenation fitting set for a very small gas flow, build the pressure up slowly in the breathing regulator. Gas will escape from the throttle vent plug at blow-off.

This blow-off pressure can be set for any value up to 10 lb. per square

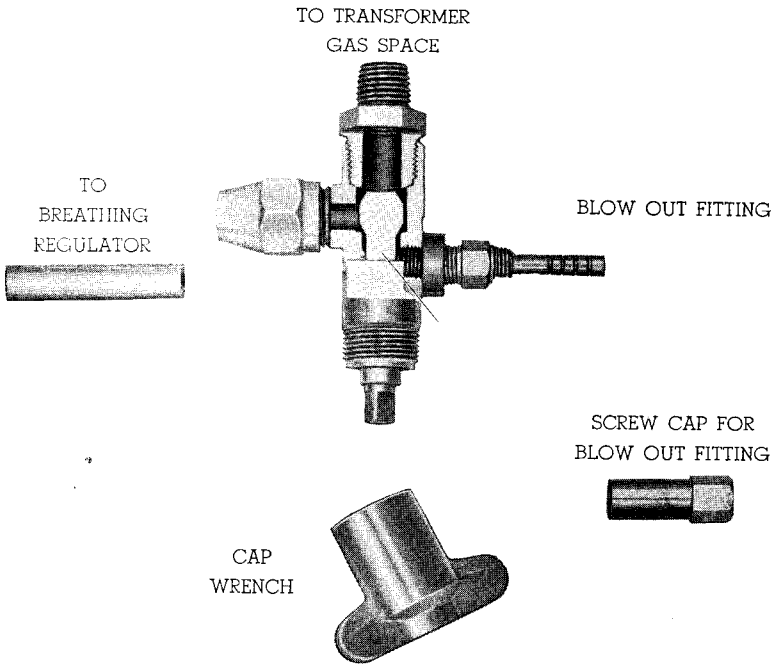

FIG. 6

inch by varying the amount of mercury in the regulator.

CAUTION: For the RV equipment this pressure must not exceed 5 lbs. per square inch and for RB must not exceed 10 lbs.

Air will be drawn in at a **negative** pressure of one-half the blow-off pressure.

MAINTENANCE

Westinghouse Inertaire transformers are designed to require very little maintenance and attention on the part of the customer. Since the tank is nearly always under a positive pressure of at least ½ lb. per square inch there is small likelihood of the oxygen or moisture content becoming high.

The amount of nitrogen used by the transformer and the frequency of cylinder replacement will depend on the tightness of the tank as well as the load cycle. In order to be sure that the equipment is operating correctly and that there are no leaks in the system, it is recommended that the following readings be taken during the first month of operation.

(1) Weekly oxygen content analysis to determine when the additional blowing out is necessary. This should be done before the oxygen content reaches 7% which is the permissible upper limit which will prevent explosions in the gas space.

If a flue gas analyzer is not obtainable, we recommend the use of a Hays Gas Analyzer, S#-436039 which may be purchased from the Westinghouse Company, Sharon Works. Complete instructions for determining the oxygen content is supplied with each analyzer.

Additional blowing-out may be accomplished in the same manner as previously described, but if the only nitrogen available is in the operating cylinders, deoxygenation may be accomplished by opening the sampling valve and letting enough nitrogen flow through the reducing valve until the oxygen content of the gas from the sampling valve is below 3%.

(2) For the first week, take daily reading, of nitrogen cylinder pressure, transformer pressure as indicated by the tank pressure gauge, transformer oil temperature and ambient temperature. Weekly readings of the above will suffice for the remainder of the month.

After the first month of observation has shown that the equipment is functioning properly no further readings are necessary except that check analysis of the oxygen content should be made in about three months. During normal operation the oxygen content should remain below 1%.

Nitrogen Cylinders

Since the nitrogen used in Inertaire equipment will last a relatively long time, it is not feasible to rent cylinders from a nitrogen supplier. The cylinders which are used normally with the equipment are equipped with a special packless valve and are shipped to the customer with the transformer, and become the property of the customer. These cylinders are painted gray so that they may be identified easily.

Extra cylinders when needed for deoxygenation, are painted a different color and cannot be used for the permanent installation. This is because of the valve, which is a packed valve, and is only tight in the closed position. These cylinders are shipped directly to the customer from the nitrogen supplier and are the property of the supplier. They should be returned to the supplier when empty as there is a demurrage charge if they are kept over 30 days.

The cylinders may be identified as follows:

(1) Westinghouse cylinders for regular use with Inertaire equipment.
   (a) Each Westinghouse cylinder is painted gray and is marked with black letters about 1¼" high "Westinghouse Inertaire Nitrogen".
   (b) Each cylinder is provided with a tag, form 17212.
   (c) Each cylinder is originally shipped from Sharon Works with the transformer.

(2) Extra cylinders for blowing-out transformers.
   (a) Cylinders belong to suppliers are painted orange for the lower two-thirds and red or wine color for the upper one-third.
   (b) Each cylinder is provided with a tag, form 15067.
   (c) Each cylinder is shipped from the nitrogen supplier direct to the customer.

Additional cylinders may be obtained from the following suppliers:

(1) Air Reduction Sales Co., Jersey City, N. J.

(2) Air Reduction Sales Co., Philadelphia, Penna.

(3) Air Reduction Sales Co., Pittsburgh, Penna.

(4) Air Reduction Sales Co., Chicago, Illinois.

(5) Stuart Oxygen Co., San Francisco, California.

Additional nitrogen for blowing out can be ordered from any of the above suppliers as Westinghouse Inertaire Nitrogen, P.D.S. 5622. Do not use any other grade of nitrogen or any other gas.

When the nitrogen cylinder for regular use with the "RV" Inertaire equipment drops to 150 to 200 lb. per square inch it should be replaced with a full cylinder. For "RB" Inertaire Equipment the reducing valve may be left hanging from its chain with its protecting cap in place while the cylinder is being refilled. These cylinders can be properly refilled only by the above suppliers.

As it is usual for nitrogen suppliers to exchange cylinders it is suggested that the customer's requisition read as follows: "Refill cylinder, Serial No. 000000 with Westinghouse Inertaire Nitrogen, P.D.S. 6306 and return same cylinder to purchaser". The serial number will be found stencilled on the side of the cylinder.

CAUTION: Do not use any other grade of nitrogen or any other gas.

Westinghouse Electric & Manufacturing Company

Sharon, Pennsylvania

Westinghouse Press
Printed in U.S.A. (Rep. 9-42)

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†PORTLAND, OREGON, 2138 N. Interstate Ave.
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†SALT LAKE CITY, UTAH, 346 A Pierpont Ave.
#SALT LAKE CITY, UTAH, 520 West Second South St.
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¶*SAN FRANCISCO, CALIF., 1 Montgomery St.
§SAN FRANCISCO, CALIF., 1355 Market St.
¶#†*SEATTLE, WASH., 3451 East Marginal Way
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*SIOUX CITY, IOWA, 2307 Kennedy Drive
*SOUTH BEND, IND., 216 East Wayne St.
xSOUTH PHILA. WKS., Essington, Pa. First-class mail, P.O. Box 7348, Phila., Pa.
*SPOKANE, WASH., 158 S. Monroe St.
*SPRINGFIELD, ILL., 601 E. Adams St., Box 37
¶*†SPRINGFIELD, MASS., 395 Liberty St.
xSPRINGFIELD, MASS., 653 Page Boulevard
xSUNBURY, PA., 1354 Susquehanna Ave.
*SYRACUSE, N. Y., 420 N. Geddes St.
*TACOMA, WASH., 1115 "A" St.
*TAMPA, FLA., 417 Ellamae Ave., Box 230
*TOLEDO, OHIO, 245 Summit St.
xTRAFFORD, PA.
*TULSA, OKLA., 303 East Brady St.
¶*†#UTICA, N. Y., 113 N. Genesee St.
¶*WASHINGTON, D. C., 1625 K Street, N. W.
*WATERLOO, IOWA, 328 Jefferson St., P.O. Box 147
*WICHITA, KANSAS, 233 S. St. Francis Ave.
†¶*WILKES-BARRE, PA., 267 N. Pennsylvania Ave.
*WORCESTER, MASS., 507 Main St.
*YORK, PA., 137 So. George St.
*YOUNGSTOWN, OHIO, 25 E. Boardman St.

Where address and P.O. box are both given, send mail to P.O. box, telegrams to address indicated.

WESTINGHOUSE AGENT JOBBERS

Westinghouse Electric Supply Company—Headquarters—150 Varick St., New York, N. Y.

Fully equipped sales offices and warehouses are maintained at all addresses.

ALBANY, N. Y., 454 No. Pearl St.
ALLENTOWN, PA., 522 Maple St.
ATLANTA, GA., 1299 Northside Drive, N. W.
AUGUSTA, MAINE, 90 Water St.
BALTIMORE, MD., 40 South Calvert St.
BANGOR, MAINE, 175 Broad St.
BINGHAMTON, N. Y., 87 Chenango St.
BOSTON, MASS., 88 Pearl St.
BURLINGTON, VT., 208 Flynn Ave.
BUTTE, MONTANA, 50 East Broadway
CHARLOTTE, N. C., 210 East Sixth St.
CHICAGO, ILL., 113 North May St.
§CINCINNATI, OHIO, 2329 Gilbert Ave.
CLEVELAND, OHIO, 6545 Carnegie Ave.
COLUMBIA, S. C., 915 Lady St.
CORPUS CHRISTI, TEXAS, North end of Mesquite St.
DALLAS, TEXAS, 405 No. Griffin St.
DAVENPORT, IOWA, 402 E. Fourth St.
DES MOINES, IOWA, 1400 Walnut St.
DETROIT, MICH., 547 Harper Ave.
DULUTH, MINN., 308 W. Michigan St.
ERIE, PA., 1013 State St.
EVANSVILLE, IND., 201 N. W. First St.
FORT WAYNE, IND., 612 S. Harrison St.
FORT WORTH, TEXAS, 210 Jones St.
GRAND RAPIDS, MICH., 511 Monroe Ave. N. W.
GREENVILLE, S. C., 226 Pendleton St.
HOUSTON, TEXAS, 1903 Ruiz St.
INDIANAPOLIS, IND., 137 S. Pennsylvania St.
JACKSONVILLE, FLA., 37 South Hogan St.
*LITTLE ROCK, ARK., 204 Commercial Bank Bldg.
LOS ANGELES, CALIF., 905 East Second St.
MADISON, WISC., 1022 E. Washington Ave.
MEMPHIS, TENN., 366 Madison Ave.
MIAMI, FLA., 11 N. E. Sixth St.
MILWAUKEE, WISC., 546 N. Broadway
MINNEAPOLIS, MINN., 215 South Fourth St.
NEWARK, N. J., 49 Liberty St.
NEW HAVEN, CONN., 240 Cedar St.
zNEW YORK, N. Y., 150 Varick St.
NORFOLK, VA., 300 Main St.
OAKLAND, CALIF., Tenth & Alice Sts.
OKLAHOMA CITY, OKLA., 850 N. W. Second St.
OMAHA, NEB., 117 North Thirteenth St.
PEORIA, ILL., 418 S. Washington St.
PHILADELPHIA, PA., 1101 Race St.
PHOENIX, ARIZONA, 315 West Jackson St.
PITTSBURGH, PA., 575 Sixth Ave.
PORTLAND, OREGON, 134 N. W. Eighth Ave.
PROVIDENCE, R. I., 66 Ship St.
RALEIGH, N. C., 319 W. Martin St.
①READING, PA., 619 Spruce St.
RICHMOND, VA., 301 South Fifth St.
ROANOKE, VA., 726 First St., S. E.
ROCHESTER, N. Y., 1048 University Ave.
SACRAMENTO, CALIF., 20th and "R" Sts.
ST. LOUIS, MO., 1011 Spruce St.
ST. PAUL, MINN., 145 East Fifth St.
SALT LAKE CITY, UTAH, 235 West South Temple St.
SAN ANTONIO, TEXAS, 1211 E. Houston St.
SAN FRANCISCO, CALIF., 260 Fifth St.
SEATTLE, WASH., 1051 First Ave., So.
SIOUX CITY, IOWA, 1005 Dace St.
SPOKANE, WASH., 152 So. Monroe St.
SPRINGFIELD, MASS., 46 Hampden St.
SYRACUSE, N. Y., 961 W. Genesee St.
TACOMA, WASH., 1115 "A" St.
TAMPA, FLA., 417 Ellamae St.
TERRE HAUTE, IND., 234 So. Third St.
TOLEDO, OHIO, 1920 N. Thirteenth St.
TRENTON, N. J., 444 S. Broad St.
TULSA, OKLA., 307 East Brady St.
UTICA, N. Y., 113 N. Genesee St.
WASHINGTON, D. C., 1216 "K" St., N. W.
WATERLOO, IOWA, 328 Jefferson St.
WHEELING, W. VA., 1117 Main St.
WICHITA, KANSAS, 233 So. St. Francis Ave.
WILLIAMSPORT, PA., 348 W. Fourth St.
WILMINGTON, DEL., 216 E. Second St.
WORCESTER, MASS., 17 Mulberry St.
YORK, PA., 143 S. George St.

* Sales Office † Mfg. and Repair Shop x Works # Warehouse § Merchandising Products Only z Headquarters ¶ District Eng. and Service Dept.

①Changed or added since previous issue.

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