Westinghouse

Type S Drum Contactor Controllers

INSTRUCTION BOOK

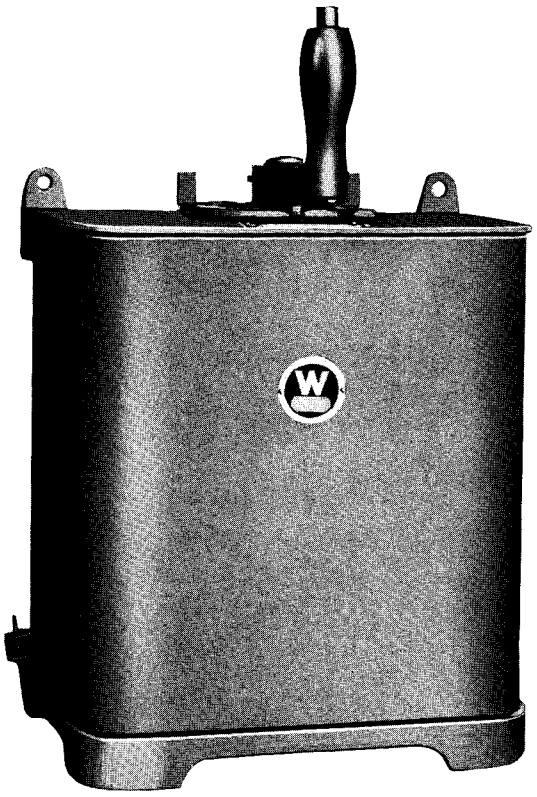

Fig. 1—Type S-20 Controller, Horizontal Handle.

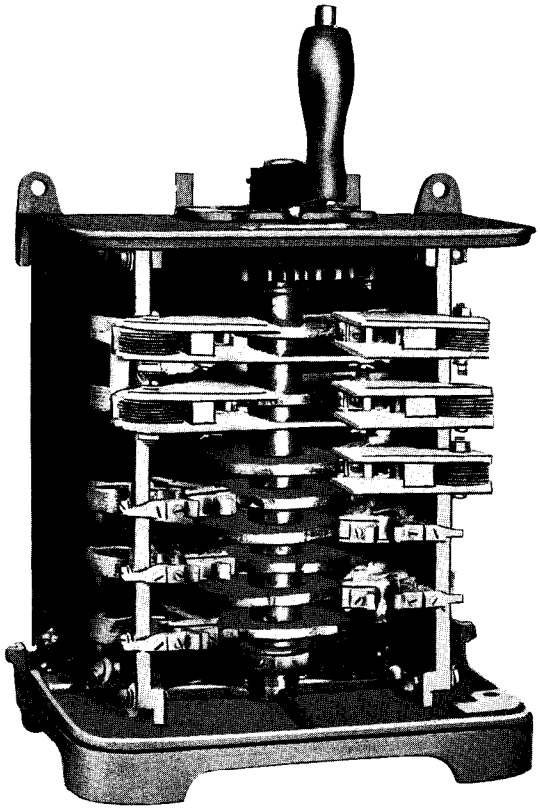

Fig. 2—Type S-20 Controller, Horizontal Handle—Cover Off.

The contactor units are illustrated in figure 12. The terminals are on the sides next to the cover and readily accessible.

Westinghouse Electric & Manufacturing Company

East Pittsburgh Works **East Pittsburgh, Pa.**

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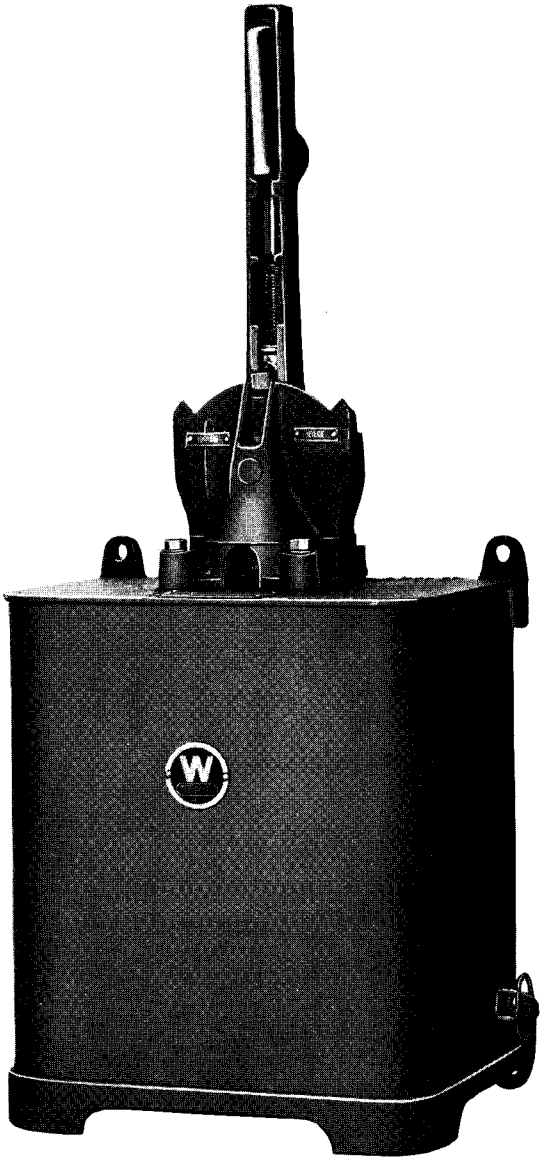


Fig. 3—Type S-20 Controller, Vertical Handle.

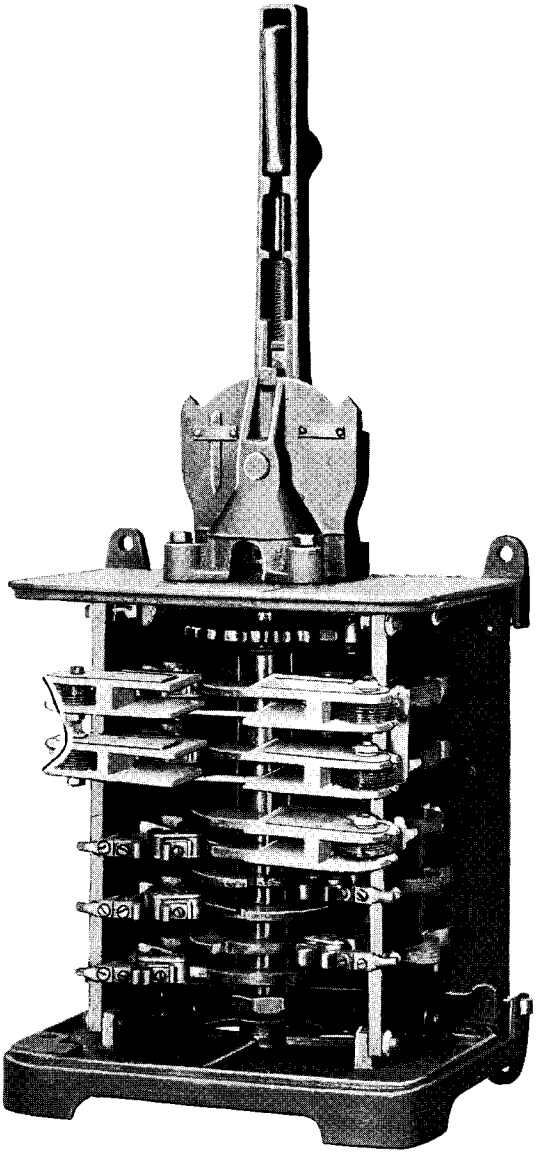


Fig. 4—Type S-20 Controller, Vertical Handle, Cover Removed.

The master switches are of the same construction as the controllers. The standard master switches are designed for two, four, six and eight points of control in each direction of rotation.

Westinghouse
Type S Drum Contactor Controller

GENERAL INFORMATION

Unpack'ng—At the time of unpacking the apparatus, check it with the shipping report and if any parts are missing or broken, notify the transportation company and the nearest district office of the Westinghouse Electric & Manufacturing Company. The apparatus should be given a careful examination by the electrician in charge of the installation after he has carefully read these instructions.

Inspection—Inspect all of the moving parts to see that they are clear of packing material and work freely. Examine small parts, such as interlocks, to see if they have been bent or damaged during handling. Inspect all of the wiring connections to see that there are no loose nuts or terminals.

The controller may have been exposed to moisture in a warehouse or storeroom for a considerable length of time. If there is evidence of this exposure, remove any rust that appears and see that the insulation is thoroughly dried out before connecting it to full line voltage. All contact surfaces should be clean and free from dirt or grease.

INSTALLATION

Location to Motor—The controller should be located as near the motor as operating conditions will permit. It is desirable to place it so that the operator can see the motor and the machinery which the motor operates.

The manual controllers are entirely enclosed with a sheet iron cover in order to protect the operator against shock and burn. The controller should not be operated without the cover being in place (except for purposes of inspection).

The protective panel when furnished may either be enclosed with sheet iron or grill work, or it may be placed out of reach of the operator. The resistors should be located far enough from the operator so that he will not be directly exposed to the heat, and should be protected by a grill or screen unless they are located out of reach of the operator or other persons.

The wiring connections should be made exactly as shown on the diagram. The stand-

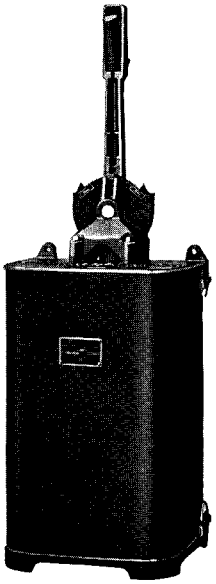
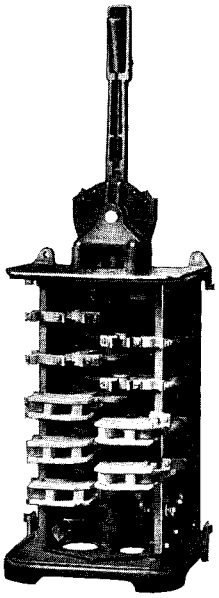


Fig. 5—No. 30 Controller with Lever Handle.



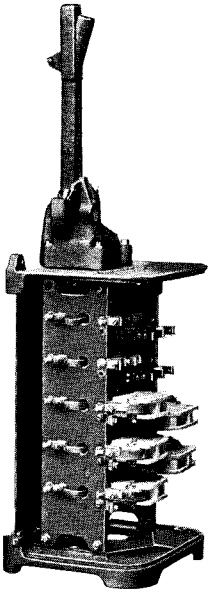


Fig. 6—No. 30 Controller with Cover Removed

The contactors used in this controller are similar to the ones illustrated in figure 13.

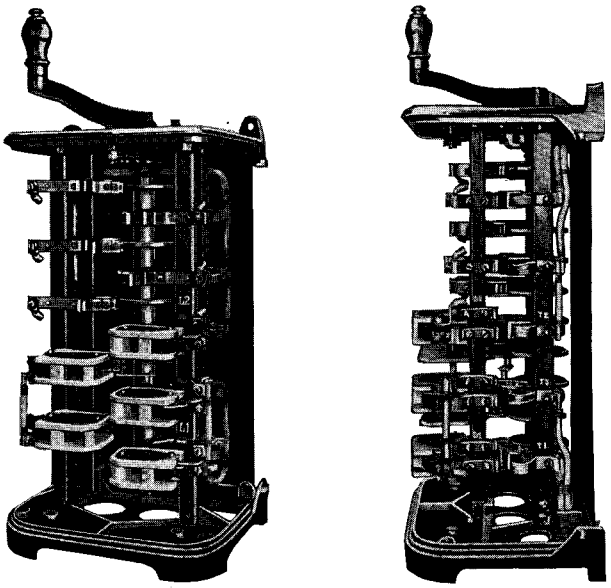


Fig. 7—No. 40 and No. 50 Controllers with Covers Removed

The contactors used in these controllers are shown in detail in figure 13. They are mounted on steel bars insulated with micarta tubing. Note the absence of wood in the construction of all type S controllers. Also note that this construction uses the minimum amount of combustible material. Micarta insulation resists heating very well and is not easily injured by flashing in the controllers. If flameproof wire is used within the controller this construction makes a controller that is substantially fire-proof.

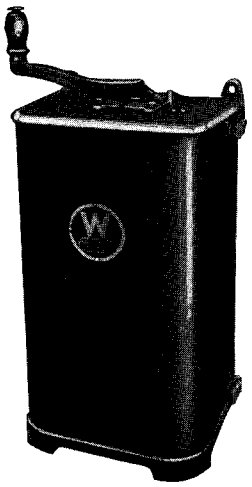


Fig. 8—No. 40 and No. 50 Controller with Rotating Handle

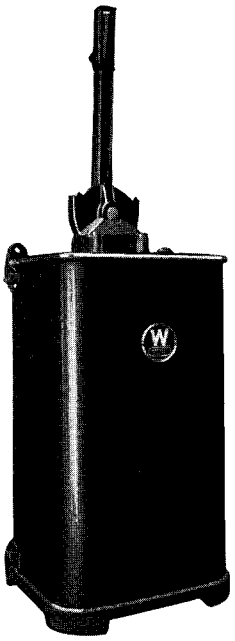


Fig. 9—No. 40 and No. 50 Controller with Lever Handle

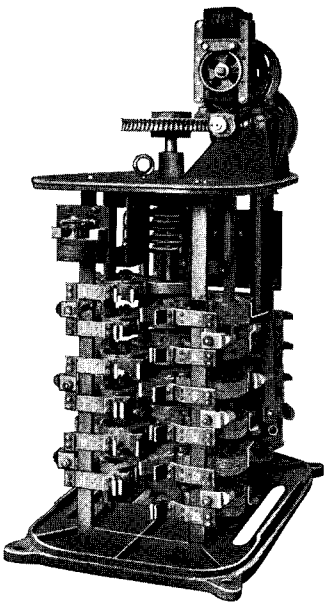


Fig. 10—No. 70 Controllers, Drum Mounted

This illustration shows a motor operated controller. These controllers can also be operated by hand by properly gearing the operating means. Large controllers of the manual type are usually applied to motors which are started at infrequent intervals.

ard reversing controllers may be used for either alternating-current or direct-current motors by changing some of the connections inside of the controller. The additional connections for direct-current motors are indicated by dotted lines on the diagram. The internal connections are often made from copper strap. These copper straps should be taped where they are adjacent to other conducting parts. All terminals on the controller, the protective panel and the resistors are marked in accordance with the diagram.

Symbols or Conventions Used on the Diagram—In order to more readily understand the diagram of connections, the following list of symbols is given: See figure 11.

Resistors—Resistors of either the grid or tube type are usually furnished with these controllers and may be designed for starting or regulating purposes depending on their capacity. Resistors are for the purpose of asborbing electrical energy and converting it into heat, therefore they require good ventilation.

The units, if of the grid type, should be mounted with the grids in the vertical plane. Do not place the resistor frames more than three tiers high and leave ample space between the tiers of resistor frames for ventilation. This is particularly necessary where the resistors are used for regulating the speed of the motor. Locate the various frames or resistors so that the ones in service the longest are well distributed throughout the various tiers. Do not place all of the frames connected to the last steps of the controller one above the other as this concentrates the heating.

Resistors should be treated in the same manner as stoves. Do not locate them close to combustible material. If woodwork or other inflammable material forms the floor or walls of the room where the resistors are located, protect such material from the direct radiation of the grids by asbestos or sheet iron.

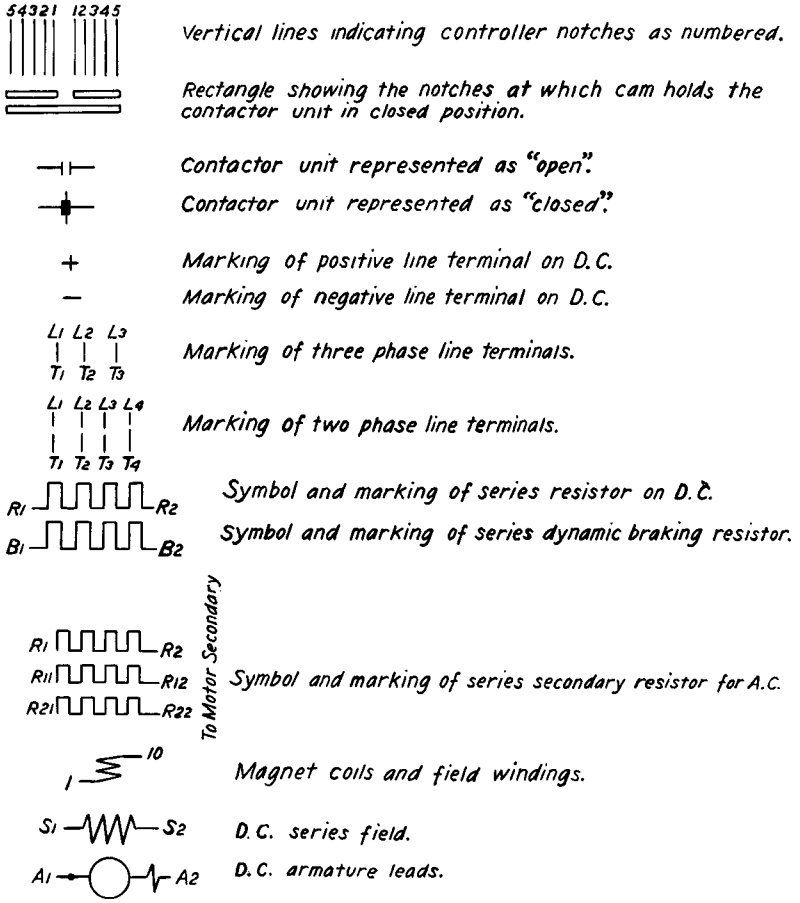
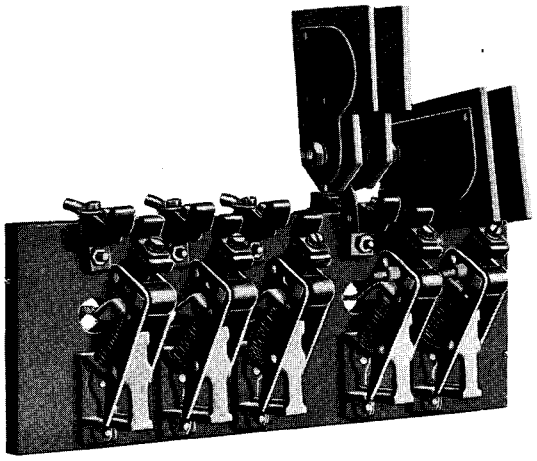


Fig. 11—Symbols Used in Westinghouse Wiring Diagrams for Type S Controllers

DESCRIPTION

General Construction—Type S controllers are made in seven sizes. Each size is given a frame number. The ratings of these controllers are given in table I, page 8. The manual controllers are usually limited to sizes 20, 30, 40 and 50, although larger sizes are sometimes manually operated for starting and regulating service. All sizes can be motor operated. The manually operated controllers are usually mounted in self-contained frames similar to drum controllers. The operating handle may be either of the rotating type or the lever type. See figures 8 and 9. The motor operated controllers may be either of the drum type or panel type. See figures 10 and 16.

Contacts—These are exactly the same as the contacts used on magnetic contactors and may or may not be provided with blowouts. The contacts engage at the tip and roll down to the heel. The arcing takes place at the tip and the current is carried at the heel. This gives a clean surface for current-carrying purposes and the contact action exerts a powerful leverage to rupture any welds which may occur from improper manipulation of the controller. The action of these contacts is shown in figure 12 and applies to all sizes.



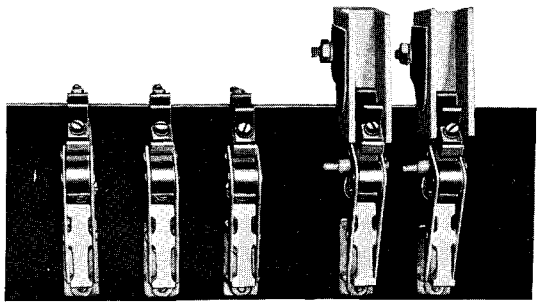
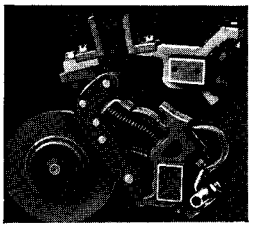
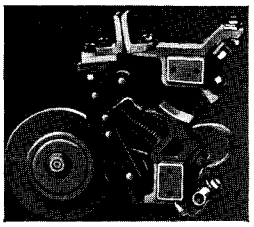


Fig. 12—Details of Contactors Used in No. 20 Controllers.





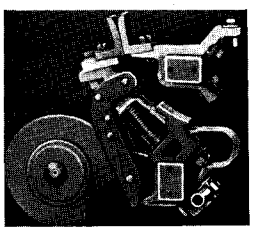


Fig. 13—Details of Contactors Used in No. 40 and No. 50 Cam Controllers

The contact pressure is measured by attaching a spring balance to the head of the bolt holding the contact in place and pulling at right angles to the contact surface.

The contactors used in No. 30 controllers are exactly like the above except they are clamped to insulated plates instead of bars. See figure 12.

The contacts in Fig. 13 are of the rolling type —note the action during closing. The contact is established at the tips and rapidly transferred to the heel or lower portion of the contacts during the closing process. This process takes place by a rolling action. When opening, the process is reversed, throwing all of the arcing at the tip of the contact.

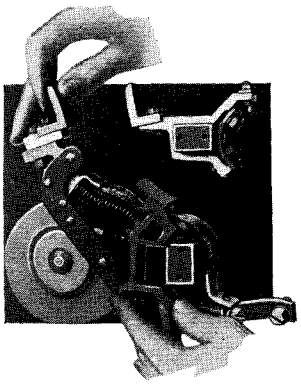


Fig. 14—Method of Removing No. 40 and No. 50 Contactor Elements.

This figure illustrates the movable contactor element showing that the entire element may be easily taken out and a new one replaced in case of accident. The clamp is located at the side of the controller next to the cover where it is very accessible. See figure 7.

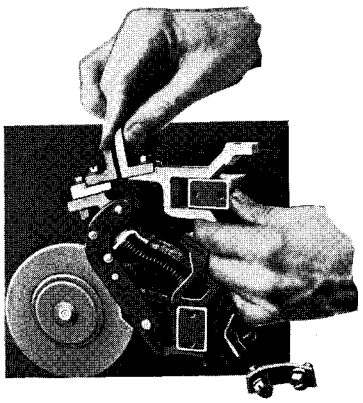


Fig. 15—Method of Removing the Stationary Element Used in the No. 40 and No. 50 Controllers.

The illustration shows a stationary contact without blowout. This same mounting is used for the stationary contacts having a blowout coil, the coil being attached to the casting. The other end of the blowout coil is attached to a clamp adjacent to the contact support. See figure 7.

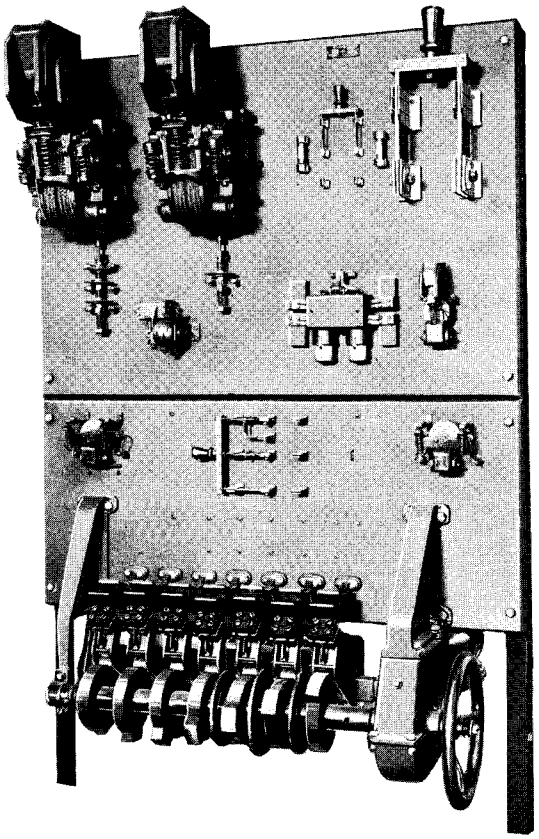


Fig 16—No. 80 Controller, Panel Mounted

This illustrates a motor operated controller of the panel type. Controllers of this design are used for time element where forced acceleration is required. This construction is very flexible and has a wide range of application. Motor is on rear of panel.

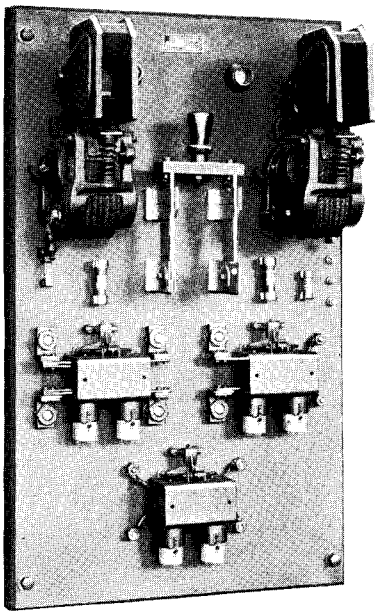


Fig. 17—Protective Panel

The illustration shows a panel suitable for a crane equipped with five motors. Where the number of motors is more or less, the number of relays is changed to correspond so there is one overload relay coil for each motor and one totalizing relay coil.

Blowout—The blowout and arc shields are exactly the same as those used for magnetic contactors; the arc shields are interchangeable.

MAINTENANCE

Adjustment—The contacts and other parts of the type S cam controller ordinarily do not require adjustment. The contacts on the movable part are adjusted at the factory to obtain the proper action in closing and no other adjustments should be necessary.

The controller notches are indicated by a pawl engaging a star wheel by means of a spring. The tension of this spring can be changed by means of an adjusting screw.

The resistance may be adjusted by changing the location of the terminals. These terminals are forked at the end and can be removed by loosening the nuts on the tie rods. The ohms per step should be in geometric proportion. The six point reversing controller for general application has five sections of resistance divided as follows:

1st section 41% of total resistance.
2nd section 26% of total resistance.
3rd section 17% of total resistance.
4th section 10% of total resistance.
5th section 6% of total resistance.

This sub-division is approximate only and varies a little for different applications.

RENEWAL PARTS

The contacts require renewing from time to time and occasionally an arc box wears out and must be replaced. These parts, together with other details are shown by style number in Table II.

The motor operated type is actuated by a pilot motor which carries its own individual name plate. Refer to this name plate when ordering renewal parts for the pilot motor.

TABLE I

RATINGS AND CONTACT DATA

Nominal Ampere Rating	Frame Number	CONTACT TIPS Width Inches	Thickness Inches	Spring Pressure Lbs.
50	20	5/8	1/4	1½ to 2½
75	30	5/8	1/4	5 to 7
125	40	3/4	1/4	7 to 9
250	50	1⅛	1/4	12 to 15
350	60	1⅛	3/8	18 to 22
500	70	1½	3/8	32 to 36
800	80	2	3/8	48 to 52

TABLE II

STYLE NUMBER FOR RENEWAL PARTS

Nominal Amp. Rating	Frame No.	Contacts	Shunt	Spring	Arc Shield	Complete Moving Part	Complete Stationary Part With Blowout	Complete Stationary Part Without Blowout
50	20	184665	326614-A	221847	325012	466722	325015	325013
75	30	178791	293604	293605	287838	455672	288950	288949
125	40	256922	293606	293607	281052	455557	286351	286350
250	50	286674	293608	293609	281086	455823	286673	286672
350	60	94401	293610	293611	279039	466785	279037-B	279038-B
500	70	74833	293612	293613	293586	466811	293588	293589
800	80	293590	293614	293615	293591	466812	293593	293594

Recommended Stock of Renewal Parts

(Quantities based on number of duplicate controllers in service)

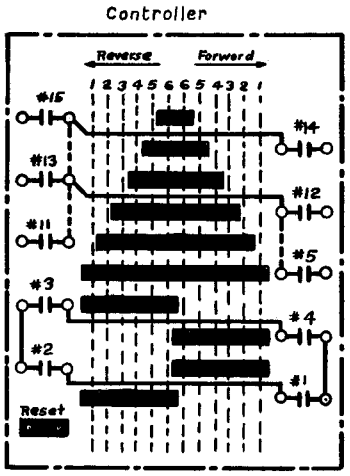
The following is a list of the renewal parts and the minimum quantities of each that should be carried in stock. These are the parts most subject to wear in ordinary operation and damage or breakage due to possible abnormal conditions. The maintenance of such stock will minimize service interruptions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

		No. of Controllers		
Controllers in use up to and including		**2**	**5**	**15**
Name of Part	No. Per Controller	Quantity Recommended		
Controller complete	1	0	0	1
Moving contact element	1 Set	⅓ Set	½ Set	1 Set
Contact	1 Set	2 Sets	4 Sets	8 Sets
Contact screw	1 Set	1 Set	2 Sets	4 Sets
*Contact adapter	1 Set	⅓ Set	½ Set	1 Set
Contact spring	1 Set	1 Set	1 Set	2 Sets
Cam-roller	1 Set	⅓ Set	½ Set	1 Set
Cam-roller pin	1 Set	⅓ Set	½ Set	1 Set
Shunt	1 Set	⅓ Set	½ Set	1 Set
Stationary contact element	1 Set	⅓ Set	½ Set	1 Set
Cutout	1 Set	2 Sets	4 Sets	8 Sets
**Stationary contact support	1 Set	⅓ Set	½ Set	1 Set
Blowout coil	1 Set	⅓ Set	⅔ Set	1 Set
Arc shield	1 Set	⅓ Set	⅔ Set	1 Set
Insulation tube	1 Set	1 Set	1 Set	2 Sets
*Insulated support	1 Set	0	1	1
**Stationary contact base, R.H.	1 Set	0	1	1
**Stationary contact base, L.H.	1 Set	0	1	1
Horizontal handle	1	0	0	1
Vertical handle	1	0	0	1
Pawl with roller and pin	1	0	1	1
Pawl spring	1	1	1	2
Reset switch	1	0	0	1
Reset moving contact element	1	0	1	1
Contact finger	1	2	4	8
Reset spring	1	1	1	2
Reset stationary contact	1	2	4	8
*Interlock bar	1	0	1	1
Shaft complete with cams	1	0	0	1

*Used only on Frame Nos. 40, 50, 60, 70 and 80 Controllers.
**Used only on Frame Nos. 20 and 30 Controllers.

Instructions for Ordering

When ordering renewal parts, give the name plate reading. Always give the name of the part wanted, also the stock order number or style number of the apparatus on which the part is to be used. Refer to the back of this publication for nearest District Office from which to order parts.

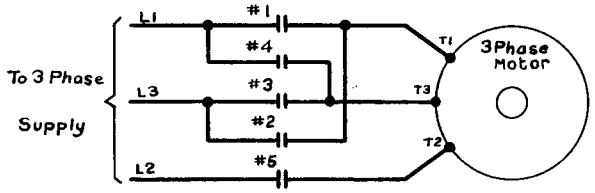


Note:- Remove dotted lines When A.C. Motors are used.

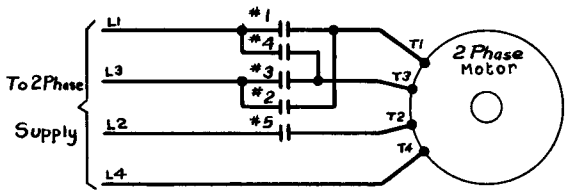
Control Sequence Table

Contactor No.	Reverse 6	5	4	3	2	1	Forward 1	2	3	4	5	6
1	○	○	○	○	○	○						
2							○	○	○	○	○	○
3	○	○	○	○	○	○						
4							○	○	○	○	○	○
5	○	○	○	○	○	○	○	○	○	○	○	○
11	○	○	○	○	○			○	○	○	○	○
12	○	○	○	○					○	○	○	○
13	○	○	○							○	○	○
14	○	○									○	○
15	○											○
Reset						○						

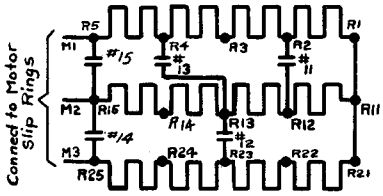
Primary Schematic 3 Phase A.C. Motor



Primary Schematic 2 Phase A.C. Motor

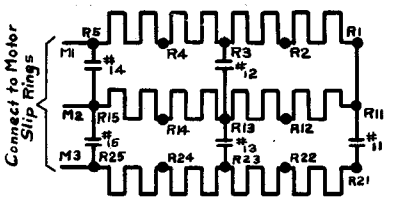


Rotor Schematic #2



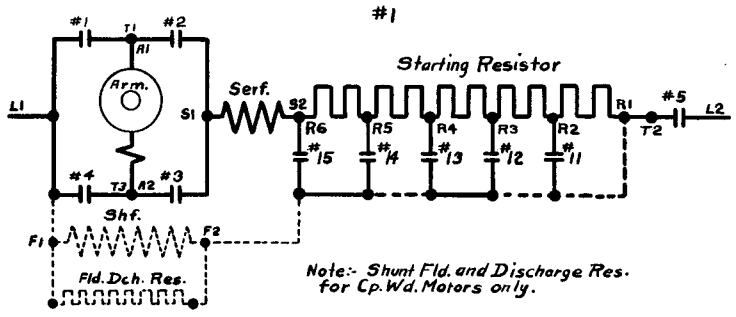
Note:- Connect Resistor as per Schematic #2 for high torque on first Point of Controller.

Rotor Schematic #3



Note:- Connect Resistor as per Schematic #3 for low torque on first Point of Controller.

Scheme of Connections for D. C. Cp. Wd. and Ser. Motors



Note:- Shunt Fld. and Discharge Res. for Cp. Wd. Motors only.

Fig. 18—Diagram of Connections for the No. 20 Controller.

Outline of Controller is marked by dot and dash lines; all connections crossing this line must be made by Customer. The sequence of contactor's table indicates, by circles in the squares under each controller point, the contactors that are closed on that point of the controller.

Standard controllers are arranged for six points of speed control in each direction of operation.

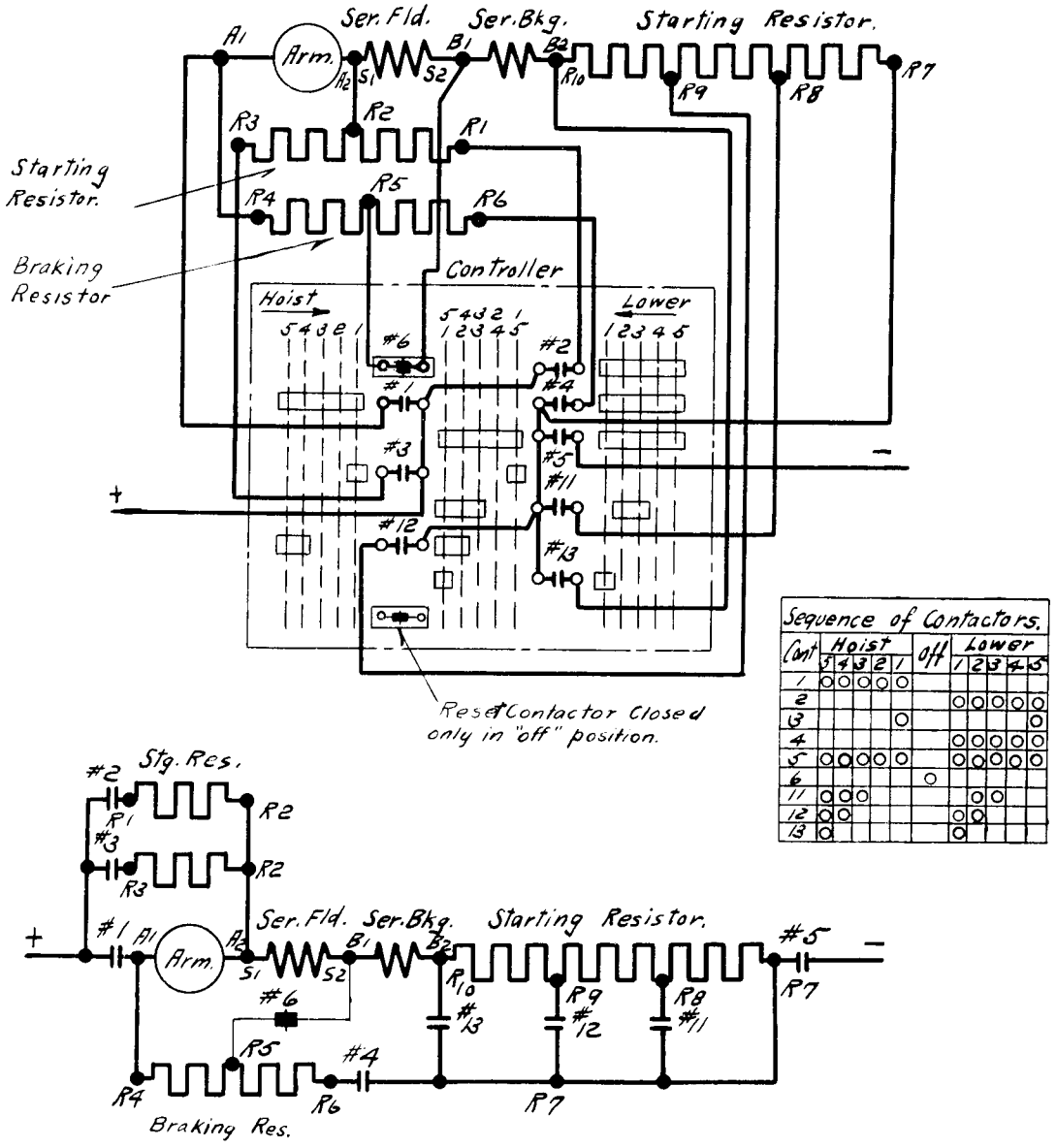


Fig. 19—Diagram of Connections for No. 20 Hoist Controller.
This Controller Has Five Points of Speed Control in Each Direction of Operation.

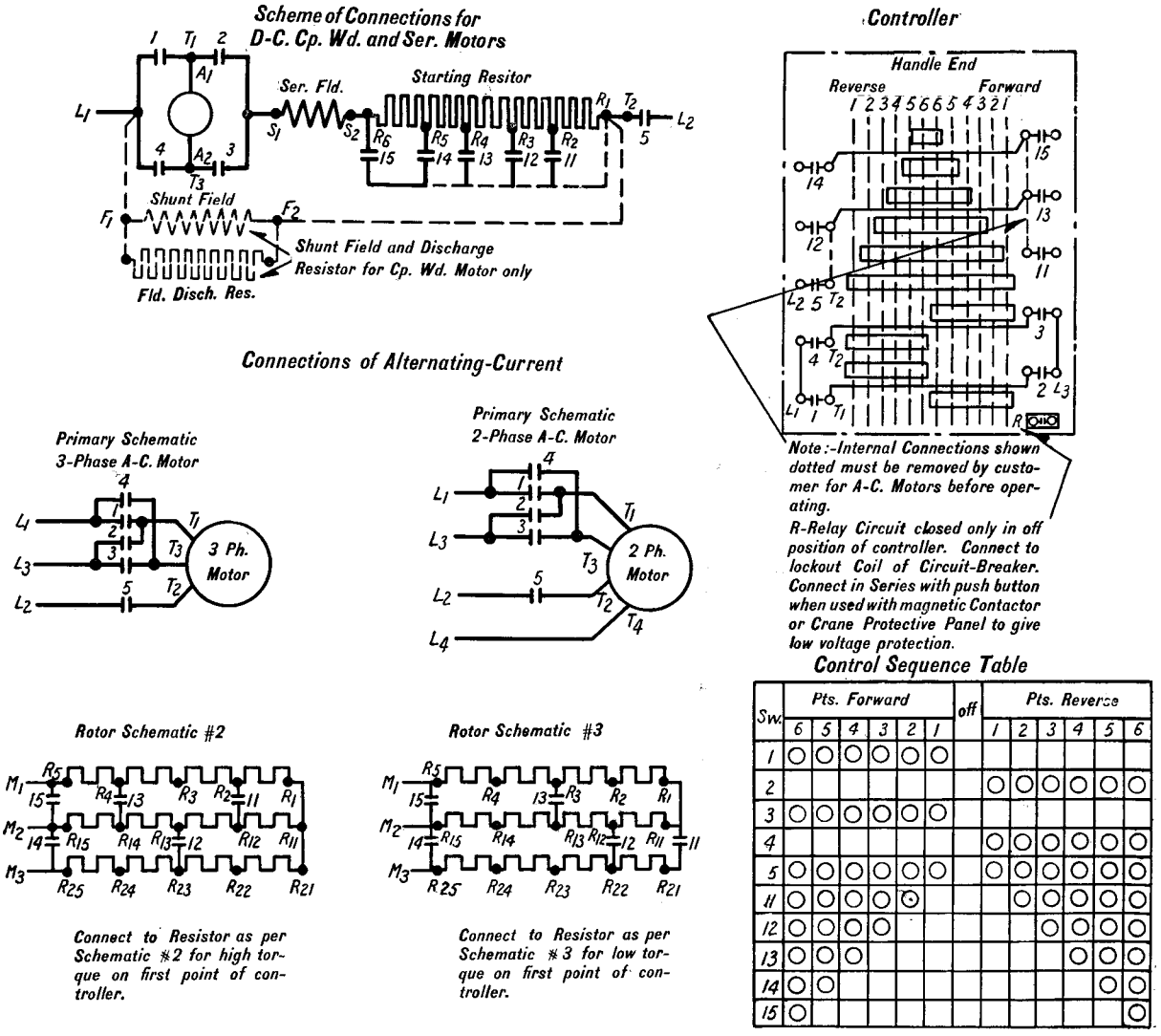
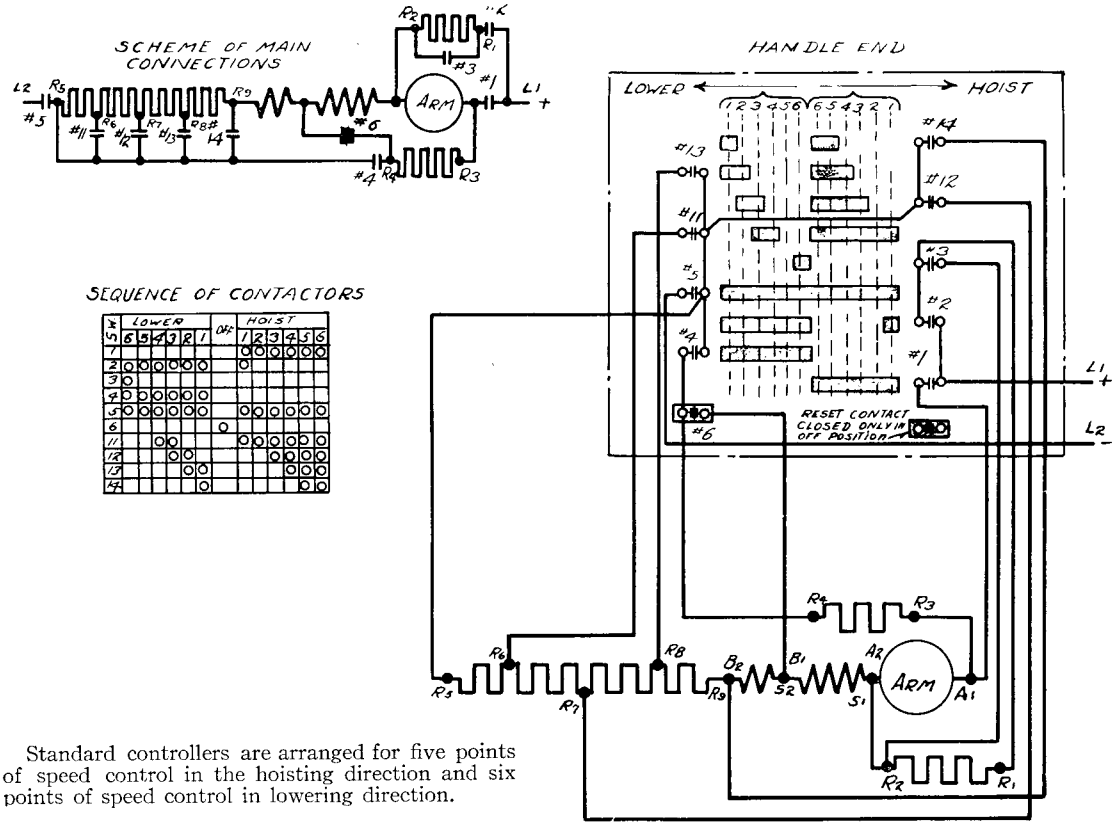


Fig. 20—Diagram Connections for No. 30 Reversing Controller.

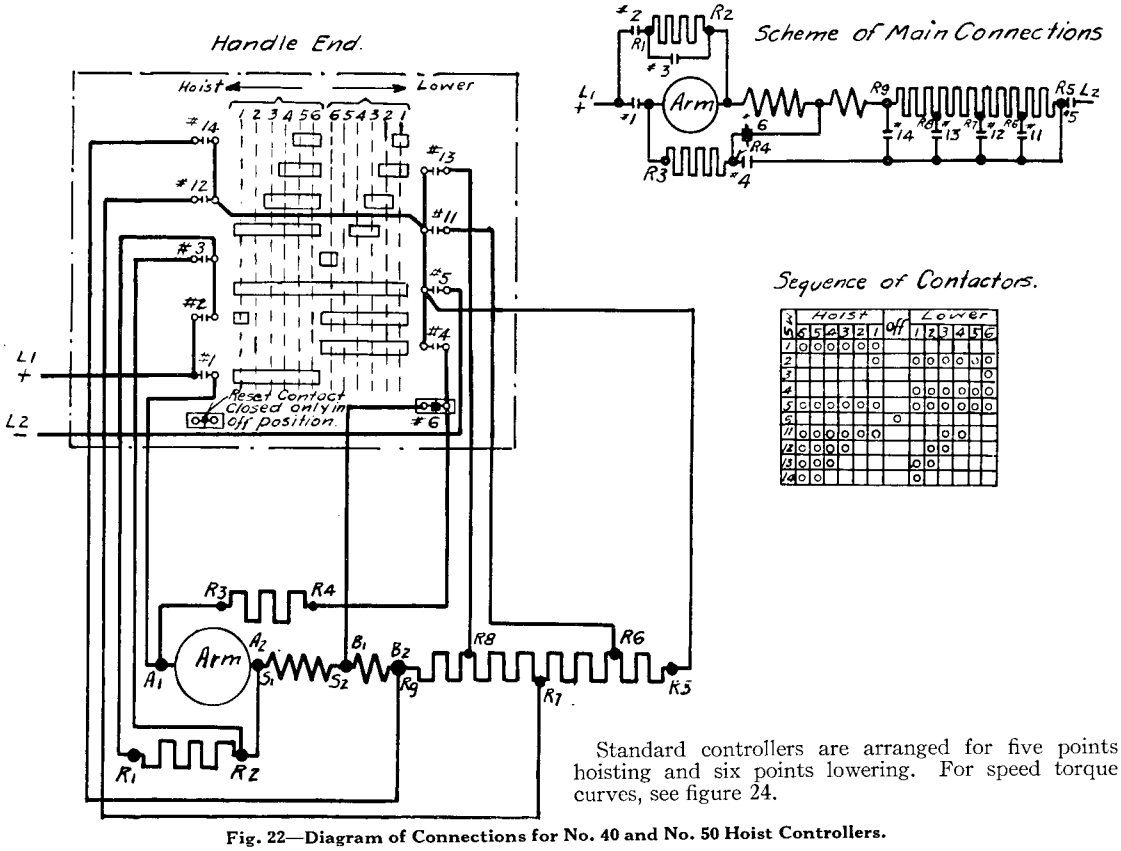
Outline of controller is marked by dot and dash lines; all connections crossing this line must be made by customer. The sequence of contactor's table indicates, by circles in the squares under each controller point, the contactors that are closed on that point of the controller.

The standard controller has six points of speed control in each direction of operation.



Standard controllers are arranged for five points of speed control in the hoisting direction and six points of speed control in lowering direction.

Fig. 21—Diagram of Connections for No. 30 Hoist Controller



Standard controllers are arranged for five points hoisting and six points lowering. For speed torque curves, see figure 24.

Fig. 22—Diagram of Connections for No. 40 and No. 50 Hoist Controllers.

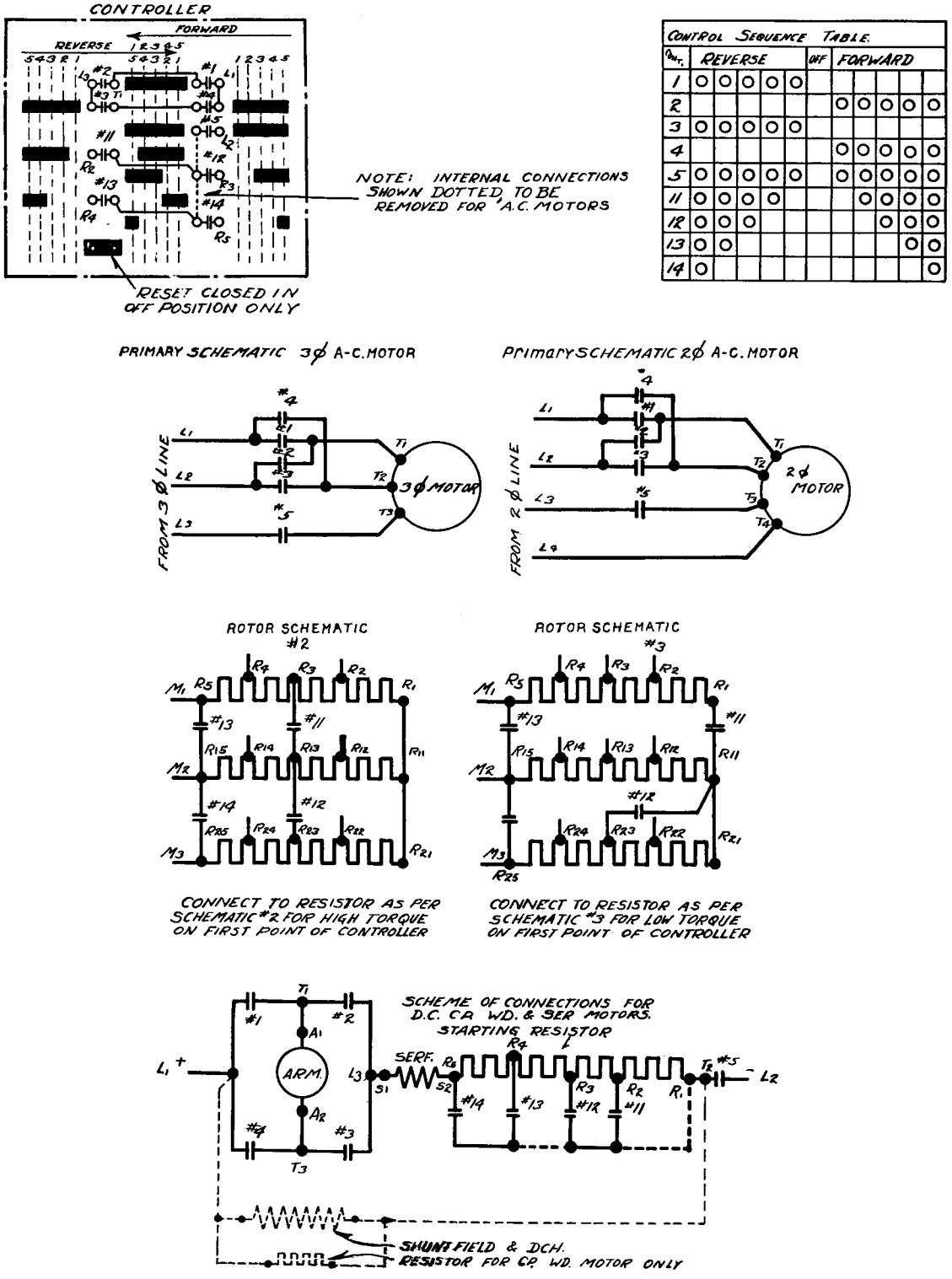


Fig. 23—Diagram of Connections for No. 40 and No. 50 Reversing Controllers.

Outline of controller is marked by dot and dash lines; all connections crossing this line must be made by customer. The sequence of contactor's table indicates, by circles in the squares under each controller point, the contactors that are closed on that point of the controller.

Standard controllers are arranged for six points of speed control in each direction of operation.

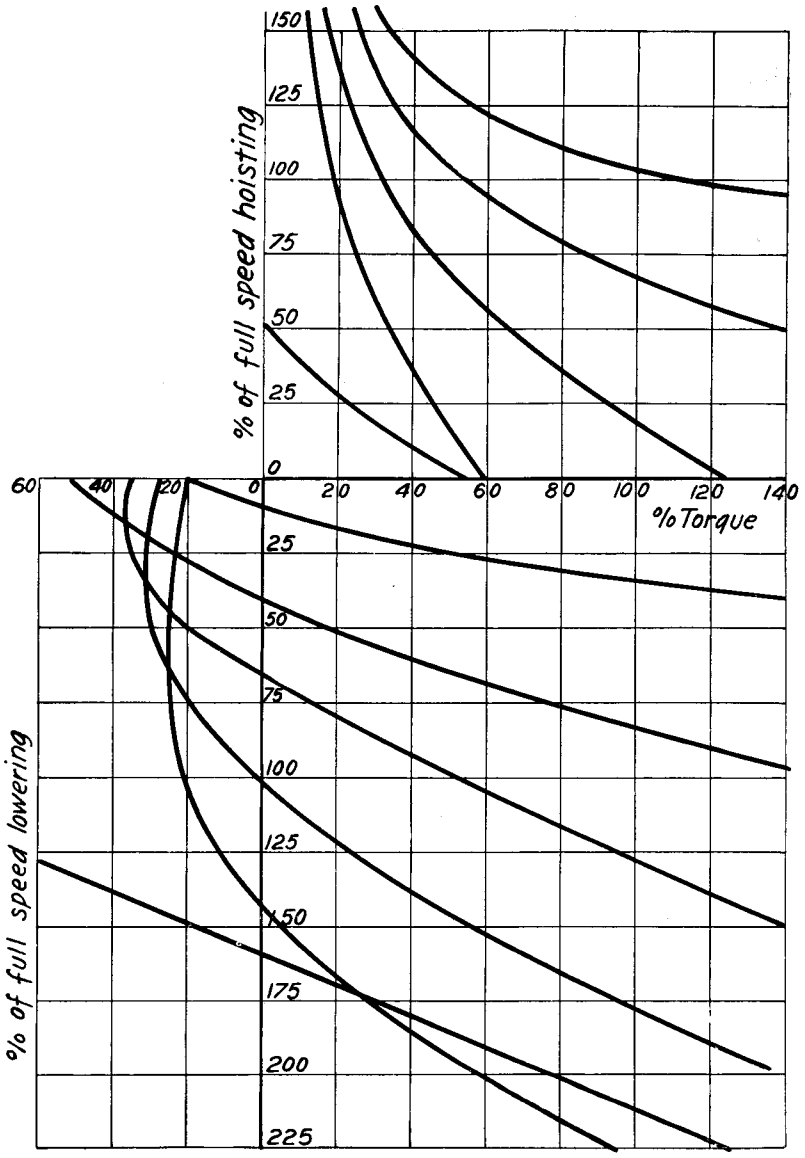


Fig. 24—Speed Torque Curve of Standard Hoisting Controllers

The speed torque curves given above are plotted for a series motor. They will differ slightly in detail for each size of motor but the general shape and proportions will be the same for all controllers of the No. 30, 40 and 50 sizes. The curves for the No. 20 size will be slightly different.

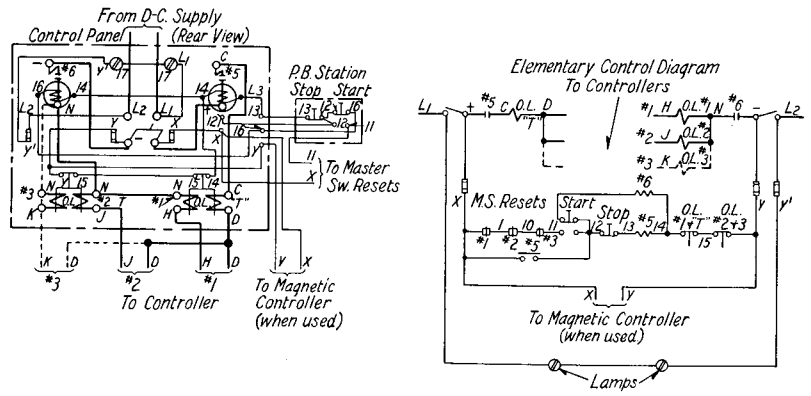


Fig. 25—Diagram of Connections for Protective Panel of the Type Shown in figure 17, May Be Used for One or Two Motors

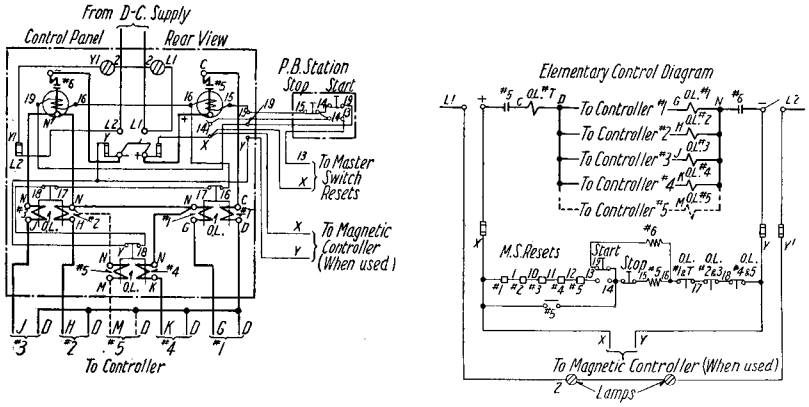


Fig. 26—Diagram of Connections for Protective Panel of the Type Shown in figure 17, May Be Used for Three or Four Motors

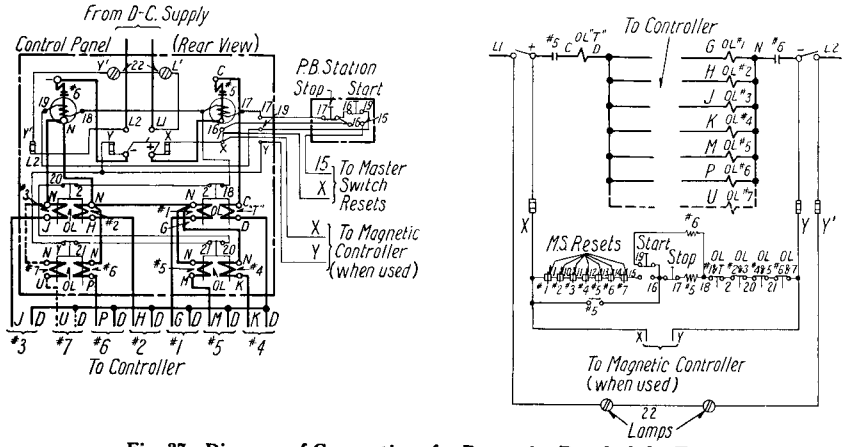


Fig. 27—Diagram of Connections for Protective Panel of the Type Shown in figure 17, May Be Used with Five, Six or Seven Motors