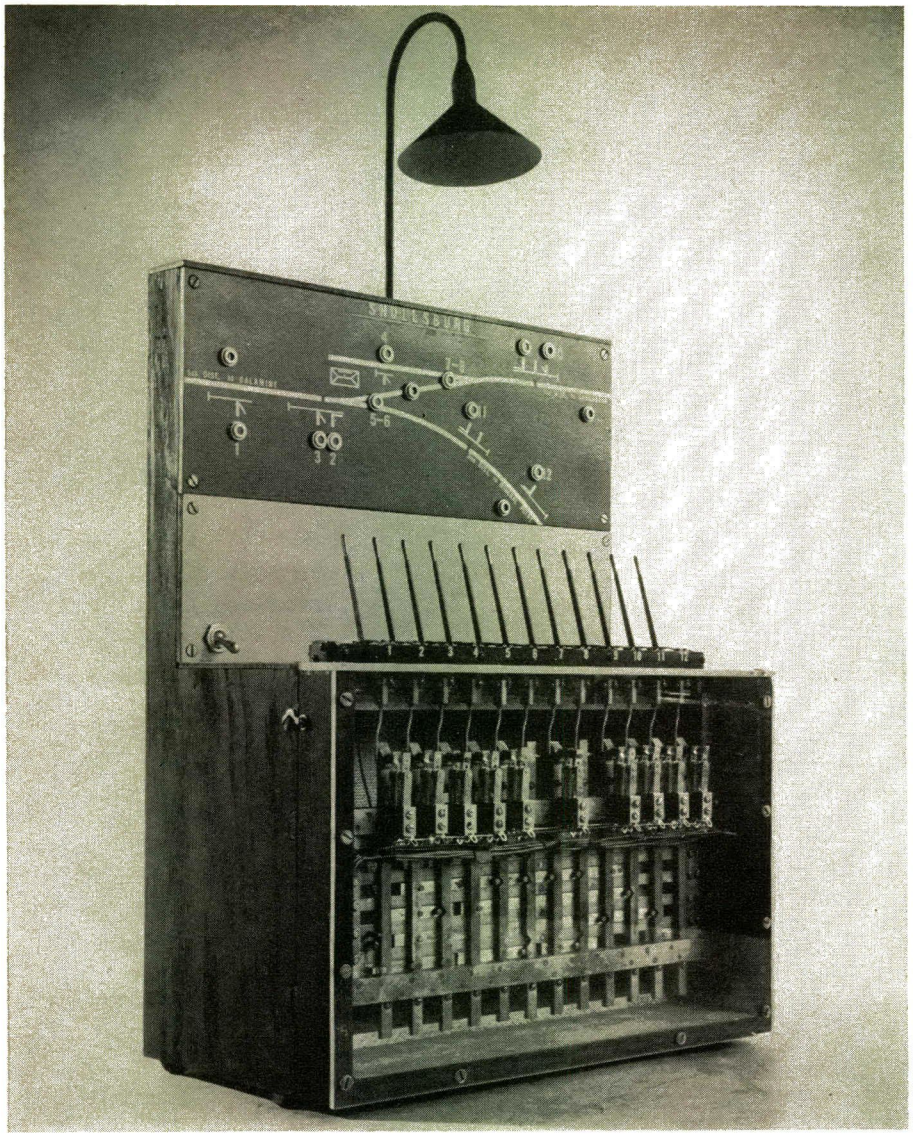


At left is the completed interlocking machine ready for installation. In this photo, all of the levers are in their "normal" position. The levers are numbered along front of the frame.

Mechanical Interlocking and Signaling: 3

Track diagram and interlocking cabinet

Including wiring for switch machines, signals and panel indicator lamps

By Paul Larson and Gordon Odegard

THE cabinet we built to house the interlocking frame is a compact unit that includes the track diagram (with indicator lights) and terminal strips for the wiring. The diagram is typical of the type used in a prototype interlocking tower. As in most older prototype installations, the signal indication, turnout and track occupancy lights go out when a lever is pulled or a train moves into a block. The diagram includes the position of the tower as related to the track, and also the signals and their possible indications. The normal red indication is shown by a heavy horizontal bar that represents the semaphore arm, the "clear" aspect by a lighter line.

You'll note by studying the diagram that not all the signals "clear" to green. Two — the branch to Mineral Point and the "call on" that lets an engineer into the spur — clear to yellow or caution only. Coming onto the branch, the yellow aspect is used because of a sharp curve. And, of course, the use of the spur is strictly a low-speed operation, hence the restrictive aspect.

Cabinet construction

The cabinet illustrated in these pages was made of ⅛" Masonite hard pressed wood and ½" plywood of a good grade. If you wish to have the locking mechanism visible, as we did, make two panels of ⅛" Plexiglas. The drawings show the dimensions. We fastened the wood parts together with 1" wood screws and glue and used ½" No. 5 flathead brass wood screws in other places. Panels "A" and "B" were made removable so we could get at the wiring and lamps. We also provided for removing the tappets, but this was unnecessary as they have required no maintenance.

Note that the front edges of the side panels are notched to receive the frame. The cover was arranged to swing down with two 1"-wide cabinet hinges, and a cabinet hook was arranged to clasp over a small roundhead screw, size 4 or 5. See Fig. 11.

Track diagram

The track diagram panel is first painted white, then the lines are applied with masking tape. After repainting the panel black, the tape is pulled off, revealing white lines against a black surface. Spray painting will produce a better finish but brushing will do if you don't let the wet paint crawl under the tape. This means pushing the tape down tightly.

We used masking tape and a material made by American Chart Service which is available in art supply stores for about 50 cents a roll. Use ⅛" masking tape for track lines, and 1/16" and 1/32" ACS tape for signals and structures. Cut the tape with a razor or model knife. Tweezers help in placing it on the panel. As a guide, make a full-size drawing and trace it on the panel with carbon paper.

We drilled 5/16" holes to take "Eagle Eye" panel lamps with 18-volt aircraft bulbs which are sold by Baumgarten's, 220 Anacapa St., Santa Barbara, Calif. Green was used to indicate turnouts, red for signals, and yellow (amber) for track occupancy. Lights were lit for normal switch or signal, going out on reverse position. (Signals are normally red anyway in an interlocking.)

Lettering was added next with white condensed gothic decals ⅛" and ¼" high. Ours came from Wm. K. Walthers, Inc., 1245 N. Water St., Milwaukee 2, Wis. Clear dull-finish lacquer was then sprayed over the entire panel to kill the gloss and protect the decals.

The insides of the cabinet were painted aluminum and a 5" aluminum stripe was also run across the bottom of the back of the cabinet. The rest of the cabinet

was black except for panels "A" and "B" and the topmost panel, which were gray.

Line work where the tape was pulled off was retouched with a fine brush.

The interlocking frame was held to the cabinet with 1" No. 8 roundhead wood screws. Be sure the top edges of the interlocking frame are parallel with the top edge of the cabinet.

Wiring

We mounted two Jones 20-contact* screw type barrier terminal strips to the rear lower edge of the cabinet, centering them in the area previously painted aluminum. We suggest you use 6-32 nuts and bolts and space the strips at least ½" apart. Drill about five ½" holes between the two strips for wire outlets. The terminal strips may also be mounted on the bottom edge if you wish. Now letter black identification marks adjacent to the terminals. See Fig. 13.

The contact wiring can be done conveniently with No. 22 solid wire. Use either a liquid or paste rosin flux, or a rosin core solder, to affix the wires. Acid flux will cause corrosion.

Fig. 14 shows the typical wiring for all levers. Levers 5 and 7 use turnout wiring, 6 and 8 have no wiring, and all wiring levers use signal wiring. Once this interior wiring is finished almost any circuit or combination of circuits can be accomplished by making connections to the terminal strip only.

To produce a neat wiring job, solder a length of No. 22 solid wire to each contact used and identify it with a tape tag on the end. When all contacts have been wired, bundle the wires into cables with Scotch electrical tape, running an equal number of wires each way from the center to the ends of the frame, along the edges and back through the ½" holes to the terminals. See photo on page 56.

Select one row of sp-dt contacts for the panel lights and run a common wire to each of the center contacts from the panel light plus terminal. Now run a wire from the normally closed contact of each lever to its respective terminal number. (Closed contact, lever 1 to panel light terminal 1.)

*If you plan to have occupancy lights on the panel you will need five extra terminals.

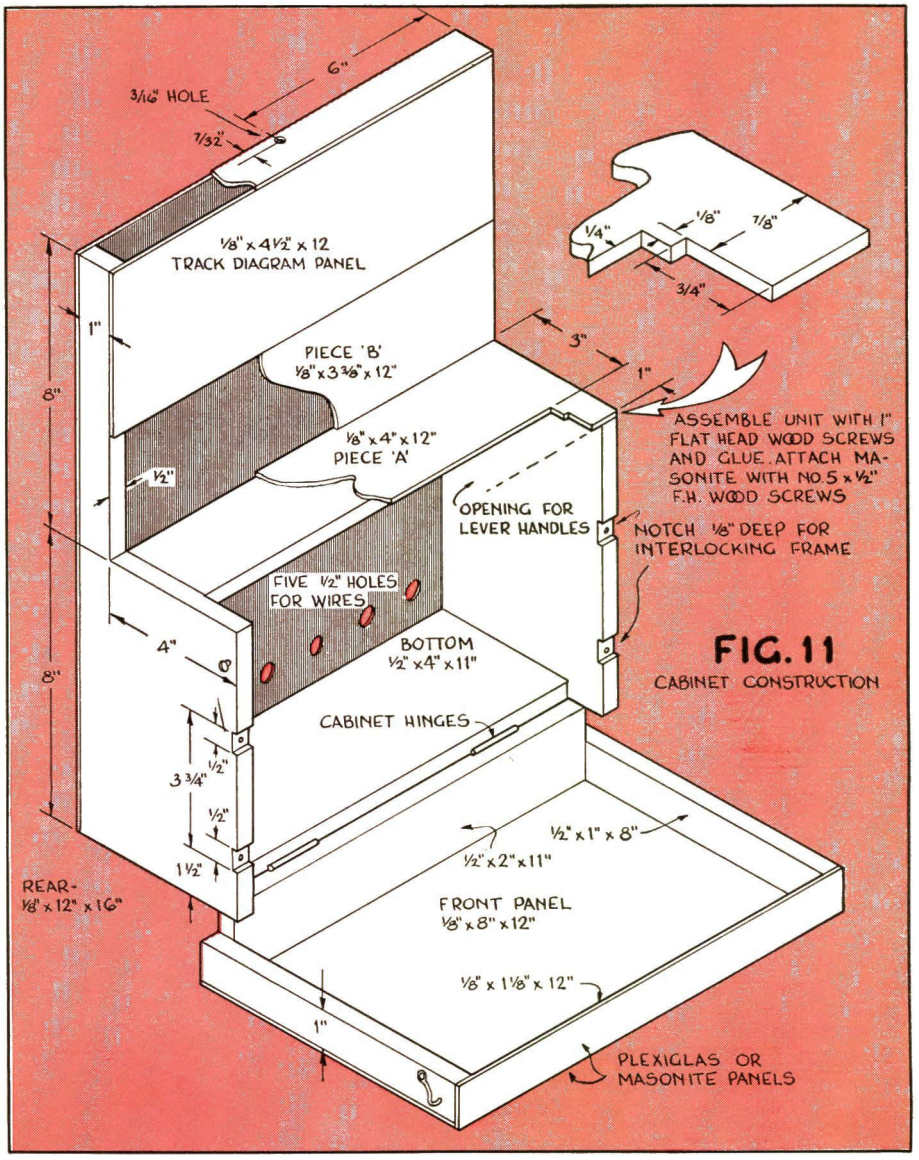


FIG. 11
CABINET CONSTRUCTION

Remove the light panel and solder a common wire to each signal and turnout light. Solder an 18" length of stranded No. 22 wire to this ground and tag it "panel light ground." Solder an 18" length of stranded wire to the center terminal of each light and identify it with a little tag. Cable the wires together with electrical tape. Replace the panel and run the wires out through the ½" holes to their respective terminals. Leave a little slack in the cable so the panel may be removed for service.

Connect a power supply, preferably

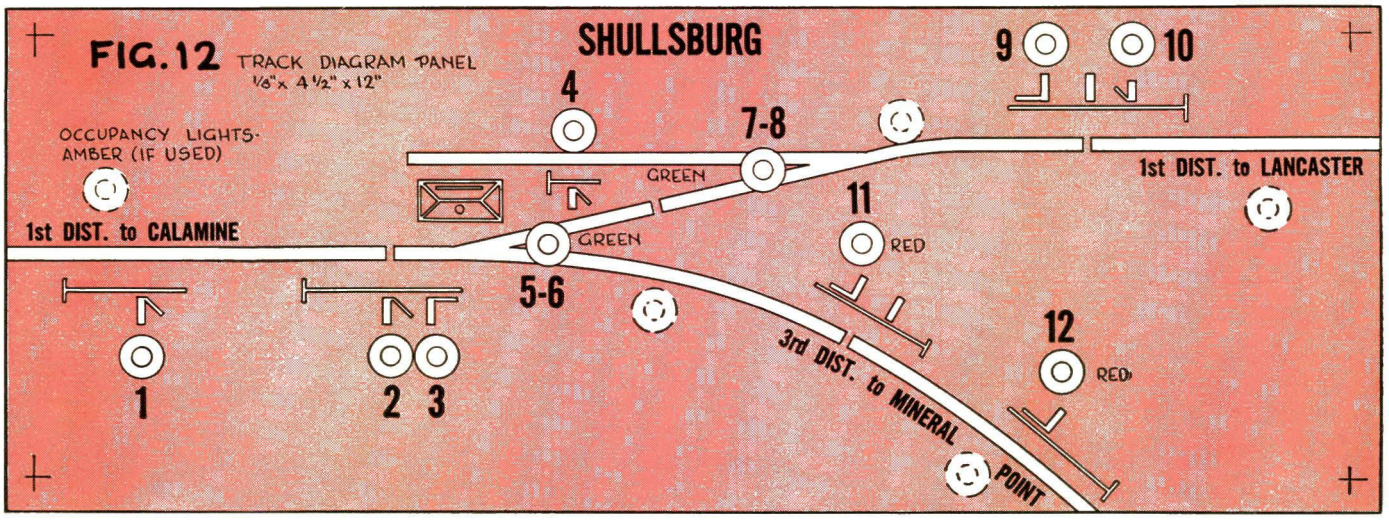
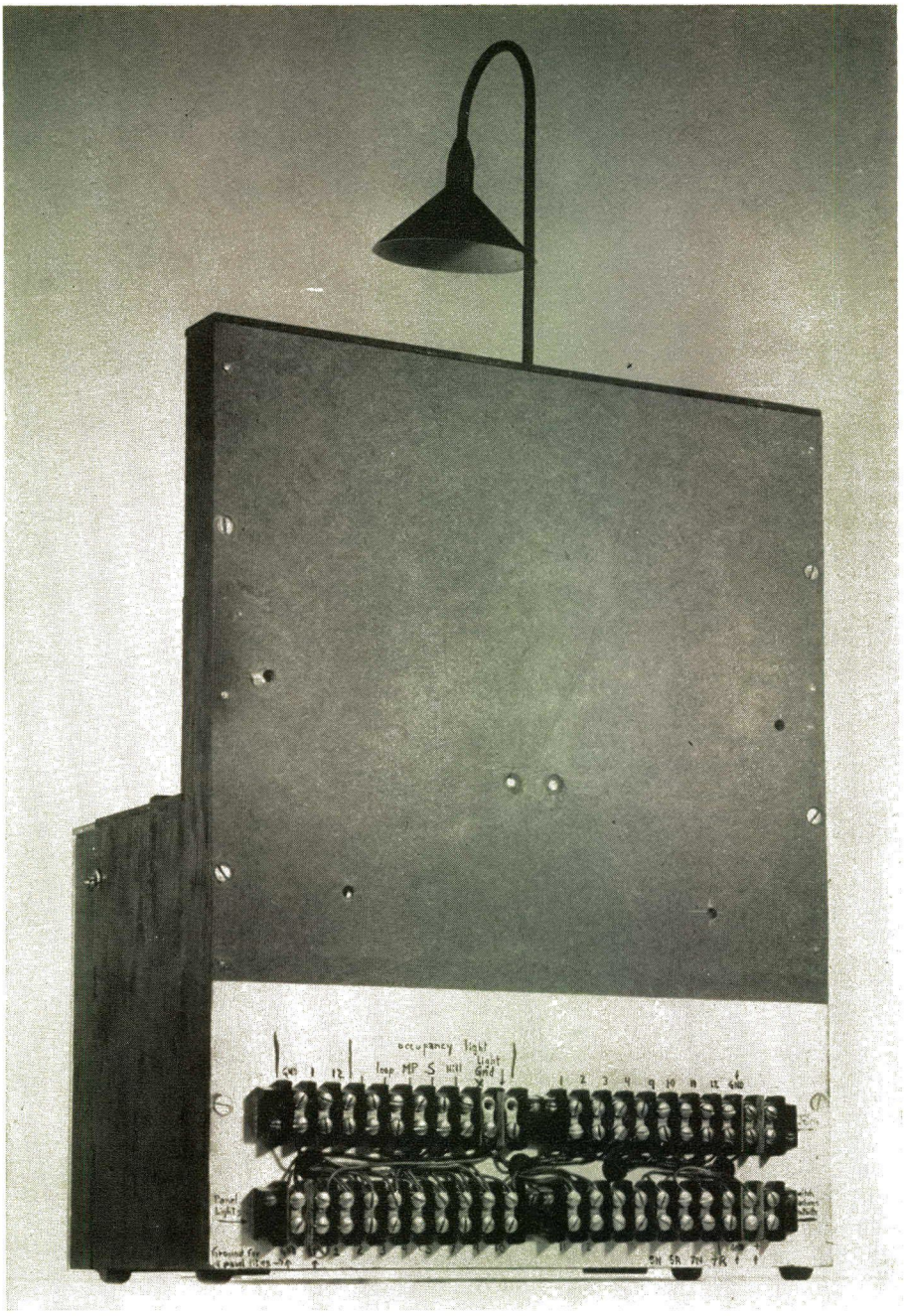
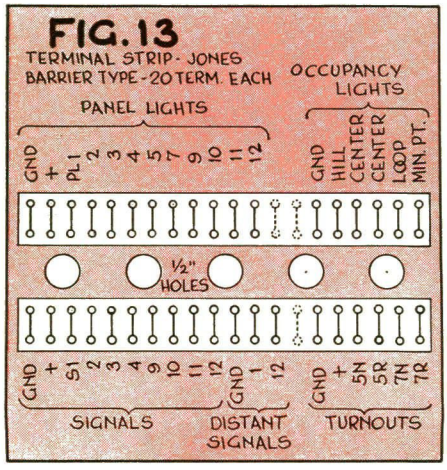


FIG. 12 TRACK DIAGRAM PANEL
1/8" x 4½" x 12"



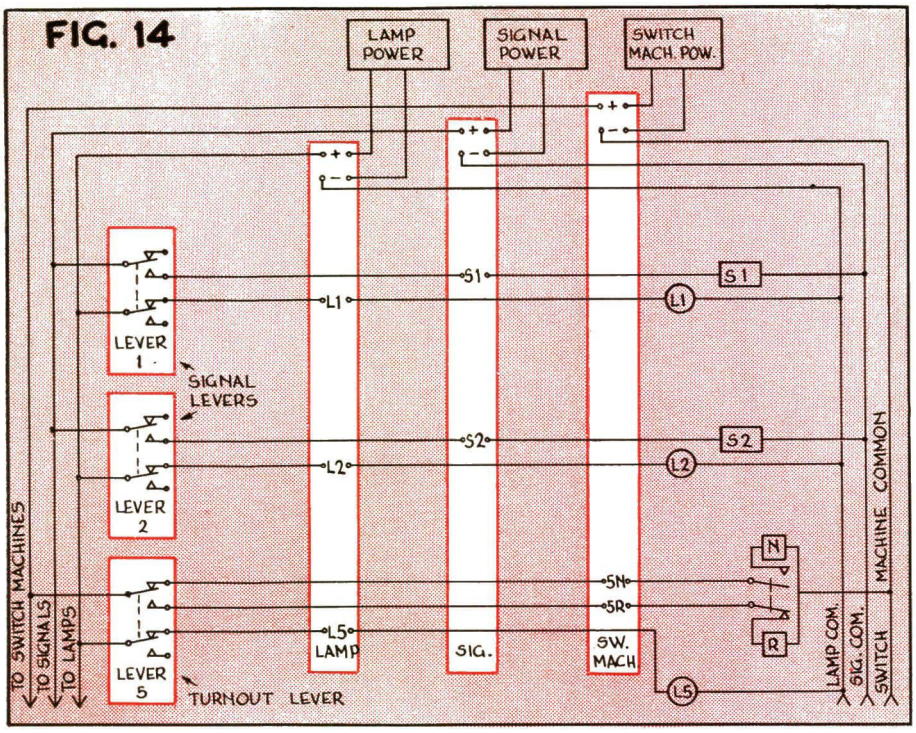
Rear of cabinet is a Masonite panel. Four holes in unpainted part of panel are for screws that hold cabinet to layout benchwork. Jones terminal strips are mounted next to wire lead-out holes.



with a voltage about half the rated voltage of your panel bulbs (18-volt bulbs, 9-volt supply), to the ground and plus terminals. This will increase the life of the bulbs considerably. Each light should be lit when the lever is in normal position and out when it is in reverse. If one isn't, check its contacts to see that they are actuating properly.

Turnout levers 5 and 7 are wired as shown. You will use all the contacts of an sp-dt assembly if you use double-coil switch machines. Such machines should also be provided with "cutoff contacts" so they break their own circuits after operating in order to prevent overheating.

Again, the center contacts of those devoted to switch machines on the interlocking frame are bussed together and



connected to the plus terminal of the switch machine supply.

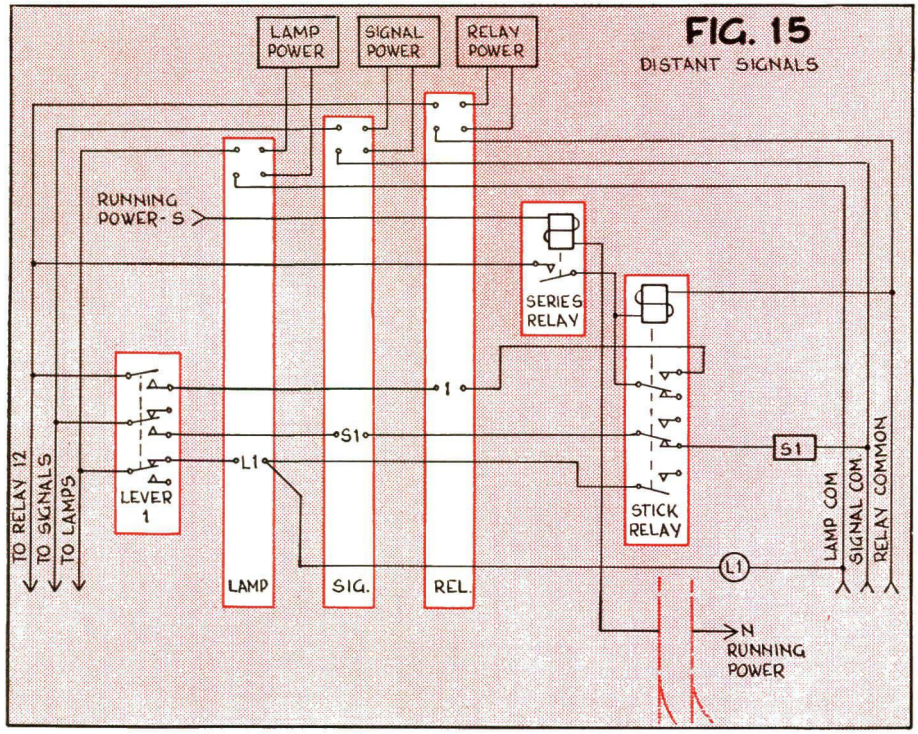
The center contacts of signal contacts are also connected in common and run to the plus terminal of their power supply. Whether these are all the same supply or different depends on whether you want to use the same or different voltages for lamps, switch machines and signals.

The signal circuit should conduct current when the lever is reversed. The signals we will use will be semaphores operated by Nichrome wire. A two-color light signal could be operated by adding another wire to the signal assembly, using normal position for the red light and the reverse contact for green or yellow. Refer to Fig. 14. The break connection would be for the red and the make contact for the green or yellow. This completes all the interior wiring.

Cabinet lamp

We decided to have a lamp above the control panel for possible night operation. The components and dimensions are given in Fig. 17.

The shade is fashioned from .010" sheet



"I COULD NOT WORK WITHOUT IT"

"For forty years I've been a Hobbyist, making models of everything imaginable, from tiny automobiles to railroad locomotives. My biggest handicap was eye fatigue until I ran across the MAGNI-FOCUSER that a fellow Hobbyist was using. The MAGNI-FOCUSER is a binocular magnifying eye shade that gives magnified 3-D vision and helps to relieve eye strain. It is worn like an eye shade and acts like one, too, cutting out all overhead and side glare and at the same time greatly magnifies whatever I am working on. You will find it excellent for all kinds of fine detail work. It is so much better than the old fashioned magnifying glass because it leaves both my hands free to work. I consider it the most valuable tool in my workshop. I do not know how I ever got along without it. My wife uses it too, nearly as often as I do, for needle work, removing splinters and many other uses around the house where magnification helps. She especially likes it because she can wear it over her regular eye glasses. You can buy the MAGNI-FOCUSER from EDROY PRODUCTS CO., Dept. R, 480 Lexington Ave., New York 17, N. Y. Costs only $10.50 and they will refund your money if you do not think it is the best tool you ever bought."

So says Mr. M. A. Thomas of New York City, an expert model maker for 40 years.

brass, cut and filed to shape and formed into a cone. Small shim-stock tabs are soldered across the joint to strengthen it. Bend a 15" length of 3/16" heavy-wall copper tubing to the shape shown. Fill it with fine sand during this operation so the tube walls will not collapse. Now slit a piece of ½" o.d. brass tubing and compress the end to fit around the 3/16" tube. Solder the sleeve to the tube. Next solder the shade in place.

We used a 12-volt miniature screw-base bulb and socket which are available from Scale Lite, Box 8687, Chicago 80, Ill. The bulb number is 1446 and the socket 117-H-SA-1. Cut off the portion of the terminal which extends past the outside diameter of the socket so it will not short against the side of the sleeve. Run a 24" length of No. 22 wire through the tube and solder to the center terminal of the socket. Tape this with electrical tape, position and solder to the shade.

Paint the inside of the shade white and the outside and the stem a dark green.

To mount the lamp drill a 3/16" hole in the cabinet's topmost panel at the center and 5/32" from the rear edge. Insert the lamp and solder a length of No. 22 wire about 1" from the end. Fashion a small block of wood to the dimensions shown in Fig. 17 for use as a bottom support. Position the lamp so the shade is about 2½" to 3" above the top of the cabinet and the stem is vertical. The wood block fits over the end of the tube and holds the lamp assembly in position. Attach the block to the rear of the cabinet with 2-56 flathead screws.

Usually the power supply for lamps and bias resistors can be the same unit in this circuit.

Mount an sp-st toggle in the lower left corner of the vertical panel below the light panel (see photo, page 54) and connect wires as shown in Fig. 17. The power connections need not be separate, but can be attached to the ground and plus panel-light terminals.

Mounting the cabinet

We mounted our cabinet directly to the benchwork of the layout. Four No. 19 clearance holes for No. 8 x 1" roundhead wood screws were drilled in the back panel of the cabinet. The positions of these will depend upon the width and spacing of your layout side members. Place a washer under the head of each screw and attach to the benchwork from the inside of the cabinet.

Distant signal circuits

Distant signals such as Nos. 1 and 12 usually return to normal or red indication as the train passes them, thus preventing a possible second train from passing a misleading clear board and crashing into the rear of the first train. In prototype this return to red was originally accomplished with an electromechanical "slot," a device connected in the rodding, generally mounted on the signal mast. See Fig. 15. After the signal was cleared by the towerman, a track detection circuit operated by the train tripped this slot, causing the signal to drop to normal. To

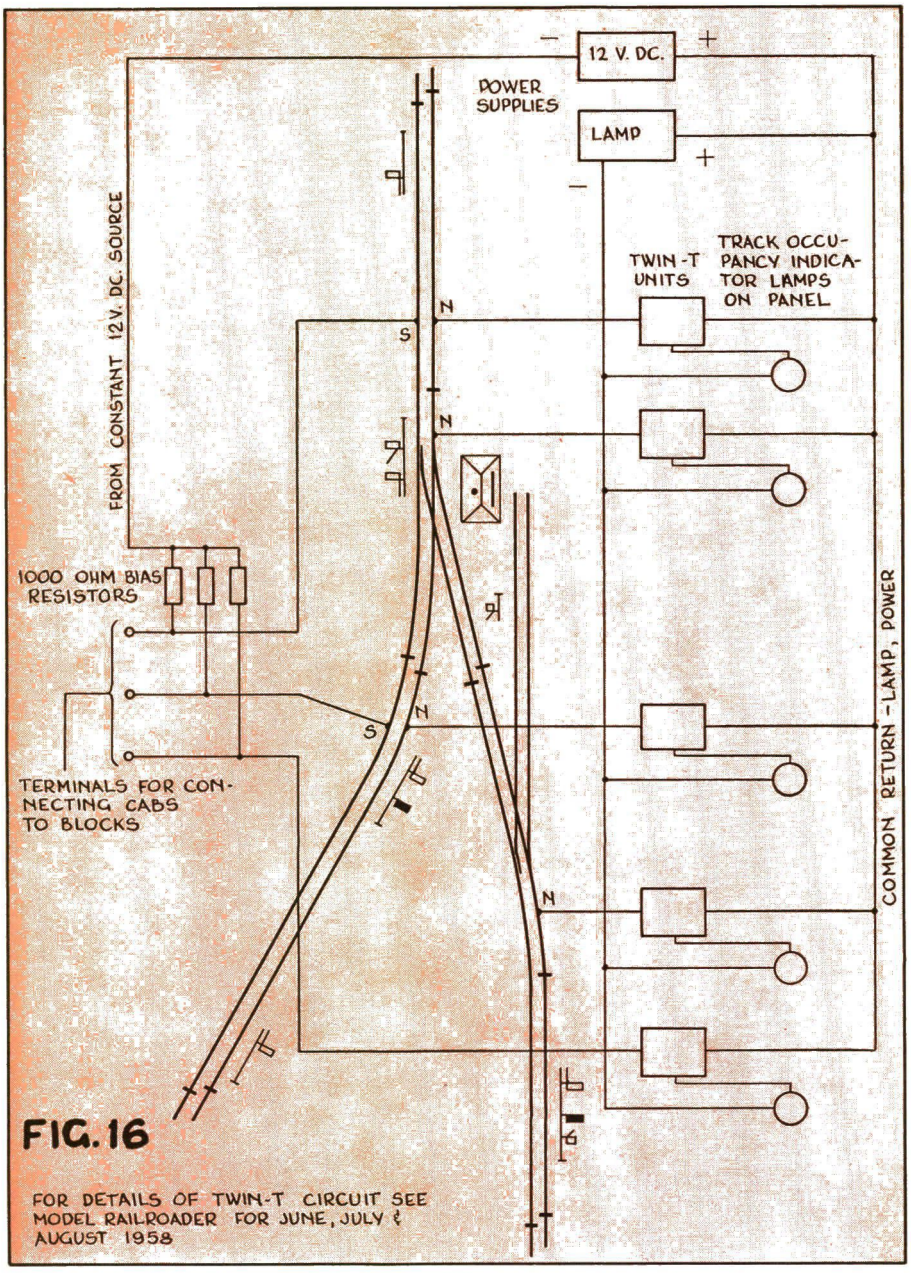
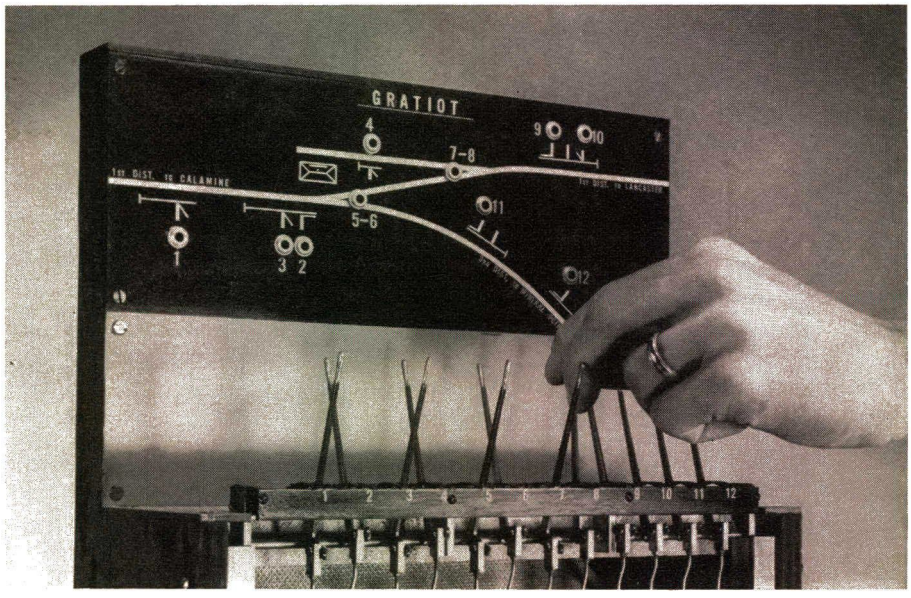
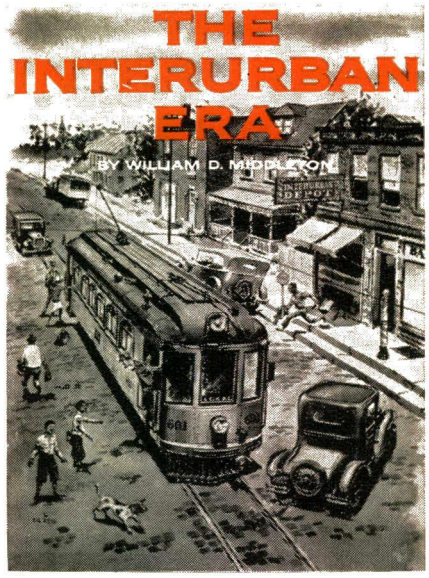


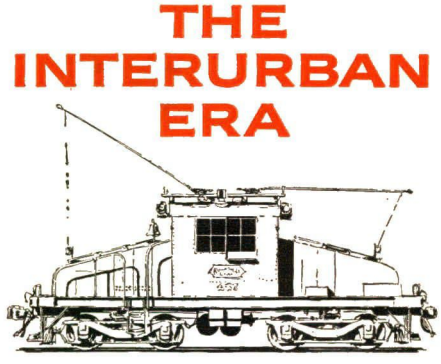
FIG. 16

FOR DETAILS OF TWIN-T CIRCUIT SEE MODEL RAILROADER FOR JUNE, JULY & AUGUST 1958





IT'S no secret that traction is enjoying rising popularity with model railroaders. It's also no secret that re-creating the interurban in miniature requires extraordinary prototype data. For today the big orange cars and carbarns, and steeplecab motors are gone, with just a crumbling abutment or an exposed piece of rail in the street to mark their going. Hence the value of *The Interurban Era,* Kalmbach's next *big* book. Just imagine a volume of more than 400 pages devoted exclusively to traction. Imagine, too, the fact of 560 photos which detail the interurban from coast to coast and from Canada to the tropics. Of course, William D. Middleton's new book is made for easy-chair reading, but we'll bet it winds up on your work bench. So we suggest you watch MR next month for your money-saving invitation to own *The Interurban Era* — another *big* book coming from Kalmbach Publishing, Milwaukee.



Prepublication offer coming!

clear the signal the controlling lever had to be returned to normal and reversed again.

We found we could create the same slot effect electrically by using two relays. The first is a series relay of 1 or 2 ohms coil rating such as Tru-Scale markets. This should be adjusted by spring tension so it operates on about ½ volt. The other relay can be any common type equipped with sufficient contacts such as a 12- to 24-volt relay with a coil rating of 200 ohms or so.

Briefly, here is what happens. When lever 1 is reversed, power is directed to signal 1 and it moves to green or "proceed" aspect and the respective panel light goes out. Neither relay is energized at this point. When a locomotive enters the block, the series relay is energized. This in turn energizes the stick relay. This returns the signal to red and illuminates the panel lamp. The stick circuit will keep this relay energized even after the train has left the block. It can be released only by returning lever 1 to normal position. This also prevents the signal from being cleared as long as a locomotive is moving in the block.

For complete protection, the series relay can be replaced by a Twin-T or similar detection circuit. The Twin-T circuit (see June, July and August 1958 MR) will keep the signal at red as long as the train is in the block, whether it's moving or not.

You may want to have occupancy lights on your track panel. Fig. 16 shows the basic wiring for our plant using the Twin-T circuit. See MR for June, July and August 1958 and April 1960 for detailed data concerning this circuit and its application.

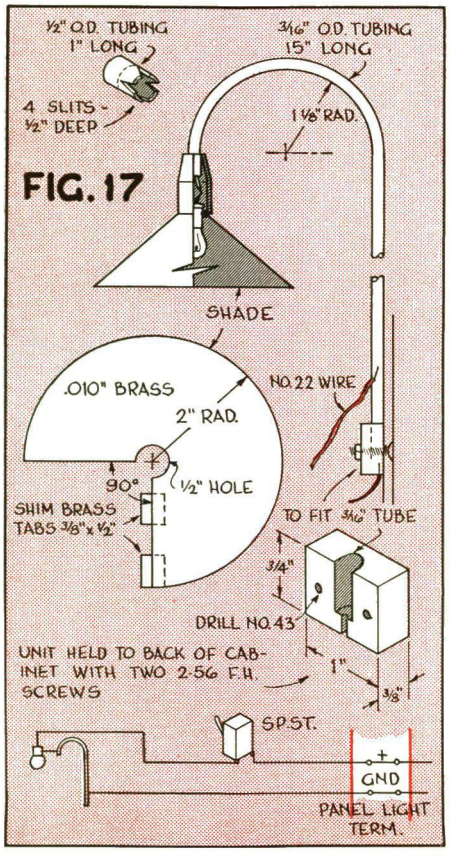


FIG. 17