The progress diagram shown in Fig. 19 is of interest in that it shows the progress of the work for each month during the entire installation.

This form is used in making the monthly progress report to the chief engineer. The vertical column at the left shows the stations in their proper order; the second column, the miles of track; the third column, the miles of pole line or miles of road; the fourth column, the number of signals between the respective stations; and the other columns, the proportion of work completed from time to time under the different classifications, the latter being shown in horizontal lines at the head of the figure. Symbols or colors are used on this form to show the progress made during each month of the construction period.

A study of the report will show that foundation and concrete work, erecting and trunking, drilling, bonding, and line work were completed as nearly as possible before severe cold weather set in, and that the work was carried forward throughout the winter without intermission. It will be noted that 232 signals, 151.3 miles, were placed in service during the severe part of the winter, 53 signals, covering 36.7 miles, being placed in service in January; 118 signals, or 74.5 miles, in February, and 61 signals, covering 40.1 miles, during 17 days in March, the work having been completed on March 17.

The rules governing the operation of trains on single track require that a train finding the signal in stop position shall send out a flag immediately, and after waiting five minutes shall proceed through the block under control prepared to stop short of any obstruction—expecting to find an opposing or preceding train, broken rail, open switch or other obstruction. This rule is modified somewhat so that trains having "meet" orders at a station passing track, may, after making a full stop, proceed within the limits of the passing track, under control, prepared to stop short of any obstruction in the block.

On double track, trains finding a signal in the stop position are required to make a full stop, and then proceed under control, expecting to find an open switch, broken rail or other obstruction.

During the time from April 1 to April 12, inclusive, 272,544 signal movements were made without failures of any kind having occurred. The operation of trains under this system of signaling has been very successful, and this installation with the numerous other improvements now completed, including splendid equipment and improved roadway, presents in the Chicago Great Western the best and safest in both passenger and freight service.

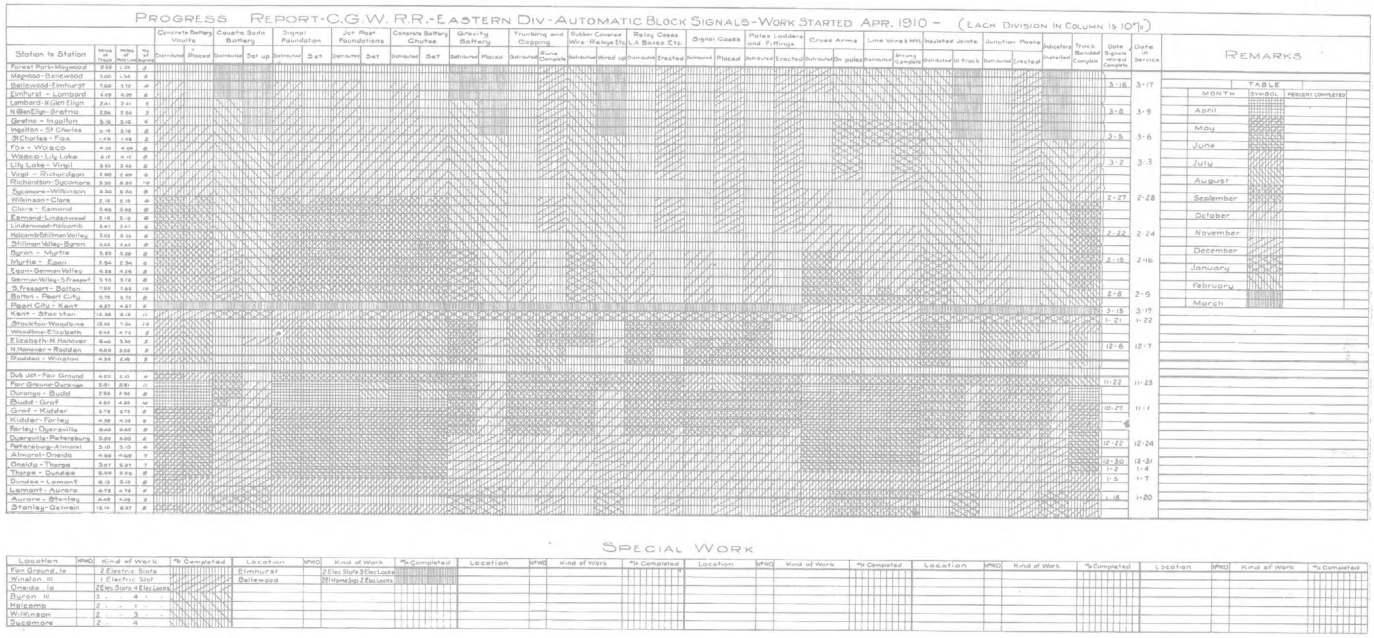

Fig. 19. Automatic Signal Progress Report.

SYMBOLS AND NOMENCLATURE FOR WRITTEN CIRCUITS.

BY F L. DODGSON AND S. N. WIGHT.*

The time-honored method of drawing up circuit plans for signal installations of various kinds is to start with a track plan, more or less to scale, and on it show the symbols for the various pieces of apparatus. These are, in a general way, placed in their proper relative positions. This being done, lines representing wires are drawn to connect those points that should be electrically connected.

While this method has been of great value in the past and remains so at present for typical circuit plans and plans for smaller installations, it has become apparent that it is too cumbersome and entirely inadequate for the large installations of to-day. The plans run into such sizes that they become prohibitive. The wires, as shown on the plan, have to take such indirect courses that they are difficult to follow.

The fact is that the engineer, in designing a circuit of this kind, starts with some simple sketches, probably using symbols of his own invention. He draws straight lines representing wires and introduces into them the necessary circuit controllers. After he has checked his circuit over carefully and assured himself that he is right, he laboriously converts it into the form described above. When the man who is to install or maintain the installation receives the plan he must again reduce it to simple sketches. The question naturally arises—why not systematize these simple sketches so that the engineer in the office and the man in the field will understand each other and obviate the elaborate form heretofore used merely as a carrier?

Simplified circuits made up along this line, we have termed "Written Circuits." A set of plans in accordance with this method involves:

A location plan, showing the location of all apparatus and giving a name to it;

Typical plans of special circuits, showing what it is proposed to accomplish in route locking, etc., drawn up in the usual form, or in "written" form;

Typical plans of signals, circuits, switch circuits, etc.;

Special circuits, made up on "written" form.

These special circuits are separated so that circuits not connected together are kept entirely disconnected from each other, and even, in many cases, on separate sheets.

To accomplish this successfully it is necessary to use a

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nomenclature for the apparatus and adopt symbols for writing the circuits. The following key to the system has been divided into two heads: Nomenclature of operated units; and nomenclature of circuits. This nomenclature must, necessarily, be somewhat arbitrary, and yet it will be noted that, in many ways, it is highly suggestive.

The method commends itself, not only to the designer and the man who checks his work, but also to the one who must read it.

NOMENCLATURE OF OPERATED UNITS.

A—Approach Relay or Indicator—With number as prefix, indicating number of principal signal up to which the approach section controliing same leads, as 10 A.

B—Positive Battery Wire—Used alone where only one battery voltage is in use. When used with H as a suffix (BH) indicates 110-volt battery. When used with L as a suffix (BL) indicates low-voltage battery. When more than one low-voltage battery is used with different voltage, use number indicating voltage as suffix, as BL-10, indicating 10-volt battery.

C—Common Wire—Used alone when only one common is in use. When used with H as a suffix (CH) indicates 110-volt common. When used with L as a suffix (CL) indicates low-voltage common. When more than one high-voltage or low-voltage common is used, use numbers as further suffixes. (CH-1, CH-2, CL-1, etc.)

D—Relay or Indicator Controlling the 90-Deg. Position or Distant Function of a Signal—With prefix indicating the number of principal signal which it controls, as 10 D, indicating relay or indicator controlling the 90-deg. position of signal No. 10, or signal No. 10 if it is a distant signal in two-position signaling.

E—Special Relay or Indicator (other than T, D, H, E or F relays and indicators)—With number as prefix indicating number of principal unit entering into its control, or indicating principal unit which it controls.

F—Relay or Indicator Repeating a Track Relay or Signal—With number as prefix indicating number of relay or signal which it repeats, as 10 F.

FP—Floor Push.

G—Switch Indicator—With number of signal governing through block in which switch is located as prefix, as 10 G.

H—Relay or Indicator Controlling 45-Deg. Position or Home Function of a Signal—With prefix indicating the number of principal signal which it controls, as 10H, indicating relay or indicator controlling the 45-deg. position of signal No. 10 if it is a home signal in two-position signaling.

J—Junction Box or Terminal Board—With arbitrary number as prefix, as 10 J.

K—Lock Relay—Used in connection with route or detector locking for interrupting the current supply to switch and derail machines, etc., with number as a prefix, indicating track section affected by it, as 10 K.

K—Knife Switch.

L—Lever Lock—With prefix indicating number of lever which it locks, as 10 L, meaning lock on lever 10.

LA—Lightning Arrester.

LC—Latch Contact—With prefix indicating number of lever, as 10 LC.

M—Manhole—With arbitrary number as prefix, as 10 M.

PB—Push Button or Strap Key.

S—Stick Relay—Used in connection with route locking. With number as prefix, as 10 S, meaning stick relay locking route of signal 10, or locking operated units in track section 10 T, if separate stick relays are used for each track section.

T—Track Circuit—With numbers as prefix indicating number of track circuits, as 10 T, which is also the name of the track relay for track circuit 10 T. The number for the track circuit is taken from the following in the order given: Movable Point frog, or switch, or derail, or arbitrary numbers 01, 02, 03, etc.

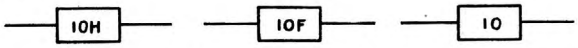
TL—Traffic Lock—With prefix indicating number of lever which it controls, as 10 TL.

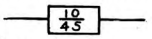
TR—Time Release—With number as prefix indicating principal unit which it releases, as 10 TR.

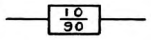
V—Electric Slot—With number of signal as prefix, as 10 V.

NOMENCLATURE OF CIRCUITS.

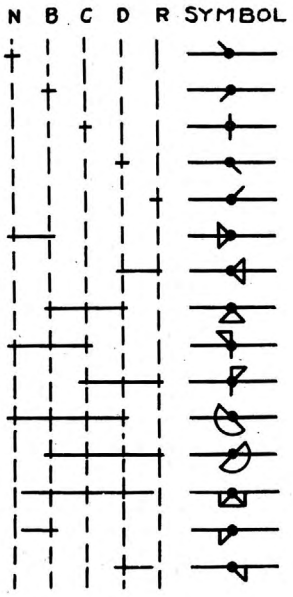
Operated Units (signal, relay, indicator, etc.) are represented by a rectangle with the number and letter of the relay, signal, etc., inside, thus:



The 45-deg. mechanism of a 3-position signal is indicated thus: 

The 90-deg. thus: 

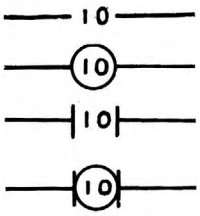
Circuit Controllers Operated by Levers.



H—Full normal position of lever.
B—Normal indication position.
C—Intermediate position.
D—Reverse indication position.
R—Full reverse position.

Heavy horizontal lines indicate position of cycle of lever through which circuit is closed.

Circuit Controllers Operated by Switch Point.



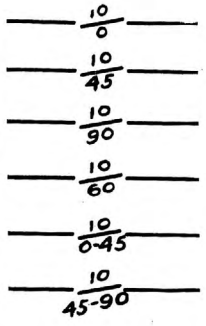
Closed when switch is normal.

Closed when switch is reverse.

Closed when switch is normal and locked in position.

Closed when switch is reverse and locked in position.

Circuit Controllers Operated by Signals.



Closed at 0 deg. only.

Closed at 45 deg. only.

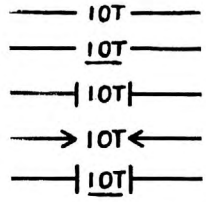
Closed at 90 deg. only.

Closed at 60 deg. only.

Closed between 0 deg. and 45 deg.

Closed between 45 deg. and 90 deg.

Relay and Indicator Contacts.



Neutral front contact.

Neutral back contact.

Normal polarized contact.

Reverse polarized contact.

Intermediate contact on three-position relay; closed when relay is de-energized.

Time Release Contact.

Normally closed. 10TR

Normally open. 10TR

Latch Contact.

Normally closed. 10LC

Normally open. 10LC

Push Button or Strap Key.

Normally closed. PB

Normally open. PB

Knife Switch.

Normally closed. KS

Normally open. KS

Terminal.

10J

Meaning terminal in junction box No. 10 or on terminal board No. 10.

Small numbers written as exponents to the right and above relay numbers, lever numbers, etc., indicate contact numbers. Relay or indicator contacts are numbered from left to right to one facing the relay.

Controller contacts operated by levers are numbered as specified.

NOMENCLATURE OF WIRES.

The matter of primary importance in naming wires is to have a different name for each wire, and have it so shown on both the plan and suitable tags attached to the wires; this in order that a wire on the ground may be quickly identified on the plan.

At the same time it is highly desirable to have a wire nomenclature system that is suggestive so as to reduce, as far as possible, the necessity for reference to plans.

On account of the multitude of circuit combinations possible, a system must be rather elastic. With all of the above taken into consideration, the following is submitted as a practical system of wire nomenclature. Names of wires are shown on plans in brackets, thus: [10 D.] Number of cable containing a wire may be written above and at right angles to the wire, thus: $\frac{0}{10}$

LL—Lighting Wire.

N—Normal Control Wire—With number of operated unit which it controls as prefix, as 10 N.

P—Ninety-Degree Control Wire—With number of signal as prefix, as 10 P.

R—Reverse Control Wire—With number of operated unit which it controls as prefix, as 10 R. If 10 is a three-position signal, 10 R is the name of the 45-deg. control wire.

V—Slot Wire—With number of signal as prefix, as 10 V.

X—Wire going to positive battery through circuit controller on a signal closed in 0-deg. position only, with the number of the signal as prefix, as 10 X.

Y—Wire going to positive battery through a circuit controller on a signal closed from 0 deg. to 45 deg. only, with the number of the signal as a prefix, as 10 Y.

Z—Wire going to positive battery through a circuit controller on a signal closed in clear position if the signal is a two-position signal, or closed from 45 deg. to 90 deg. if the signal is a three-position signal, with the number of the signal as a prefix, as 10 Z.

Wires not covered by the above are named as follows:

A wire leading from the operating coil of a unit toward battery positive takes the name of this unit, as 10 H, meaning the wire from the coil of home control relay for signal 10 leading to positive. After passing through a circuit controller, it takes the number 1 as a suffix, as 10 H 1. This suffix number increases by one as the wire successively breaks through additional controllers.

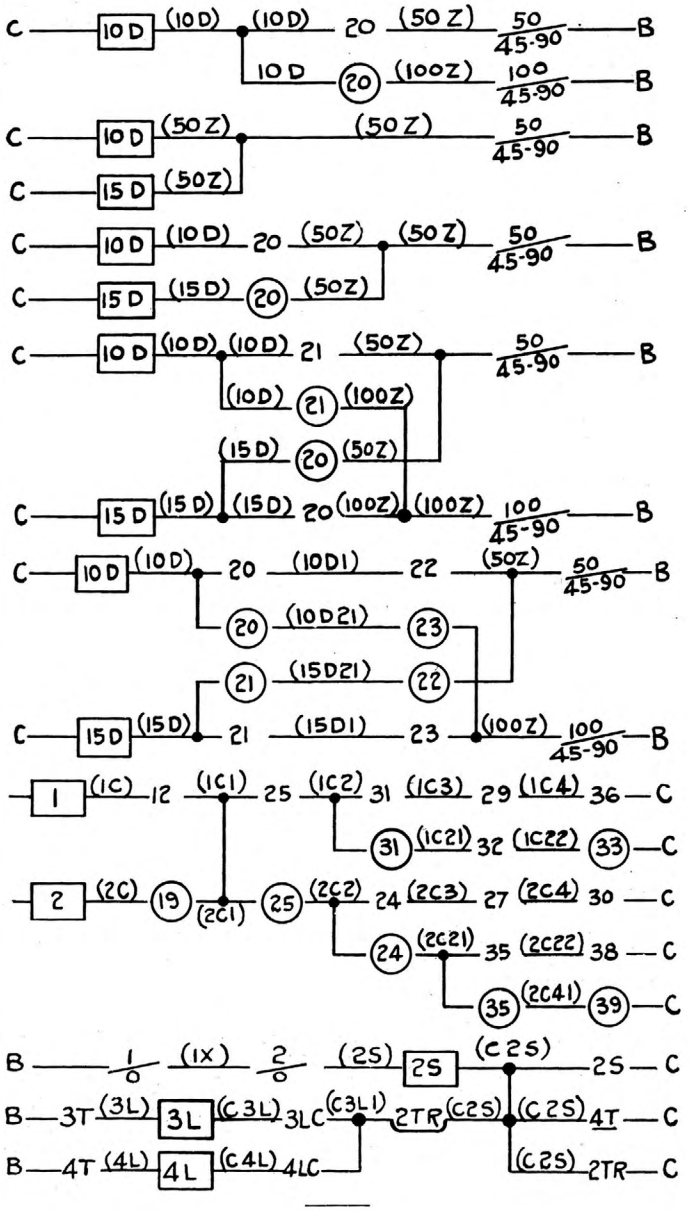
The wire leading from the operating coil to battery negative takes the name of the unit with the letter C as a prefix, as C10H, and after breaking through successive controllers is written C10H2, etc.

The above method applies directly to simple circuits having no branches, thus:

C —16F (C10H1) 18F (C10H) 10H (10H) 17F (10H1) 14F— B

In cases of branch wiring this method is applied directly to the principal circuit—circuit for superior route. The first branch from this circuit takes the suffixes 21, 22, etc., instead of 1, 2, etc. The second branch 41, 42, etc., thus continuing, allowing 20 numbers for each branch.

Following are some examples showing the above named method applied to different kinds of branch circuits:



THE FOLLOWING FACTS concerning the substance known as Bakelite, which has been widely applied for the insulation of signaling apparatus, are extracted from an address on the "Manufacture and Uses of Bakelite," by W. P. Cohoe, presented to the Toronto branch of the Canadian Society of Civil Engineers. The chemical name of Bakelite is oxybenzylmethylenglycolanhydride. The substance is formed by the chemical reaction of carbolic acid and formaldehyde under certain conditions. It is infusible, will resist temperatures of 300 deg. C., is insoluble in all solvents, and withstands strong chemicals, oil, hot water, and steam. In liquid form it is sometimes used to impregnate wood.