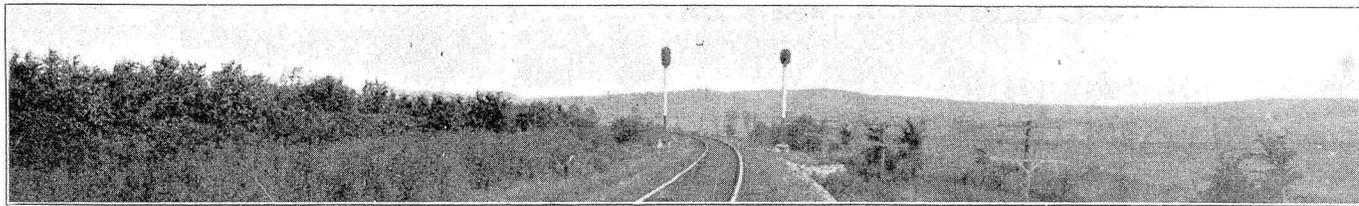


C. B. & Q. Installs New Light Signals

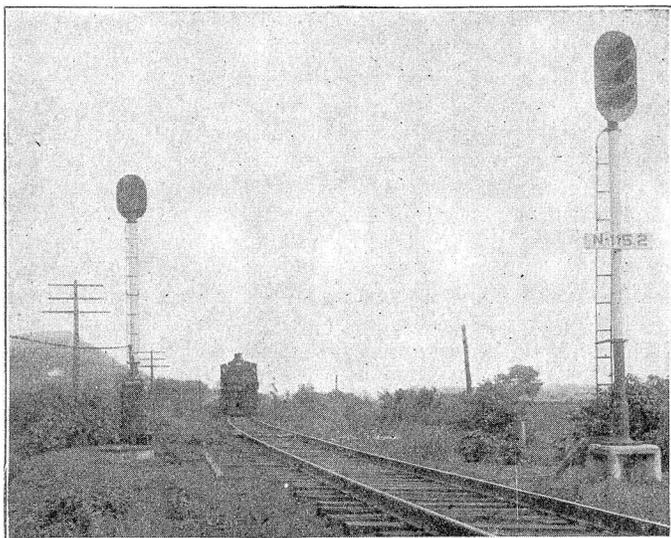
Burlington Standard System of Home and Distant Indications Carried Out With Colored Lights



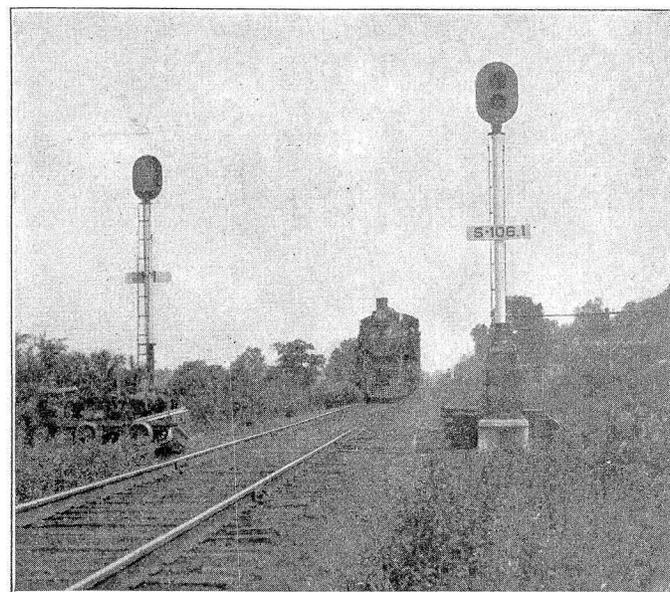
AN installation of color light automatic block signals has just been completed on 26 miles of single track on the Chicago, Burlington & Quincy between Hannibal, Mo., and Louisiana. This is the first installation of light signals to be placed in service on this road, although three other stretches are under con-

struction at this time. Storage batteries, charged by vibrating rectifiers, are used as a source of energy. and at Louisiana, at the south end of the installation, and the same facilities are located at the intervening stations of Saverton, Reading and Ashburn; there is also a passing siding at Hope. The comparatively long spacing of block offices was an additional cause of delay, and an added incentive for the installation of automatic signals.

According to the usual practice on the C. B. & Q., the locations for these signals were selected carefully by the signal department in conjunction with the operating department. They were first laid out on a plan giving the alignment and profile, after which these locations were marked on the ground, and a trip was made over the territory by a representative of the signal department,



Train Leaving a Siding, Accepting an Absolute Head-Block Signal



Double Location Intermediate Home Signal

struction at this time. Storage batteries, charged by vibrating rectifiers, are used as a source of energy.

This 26 miles of single track is a very busy section of the main line from St. Louis to the north and west. Twenty-three carded trains, and from 8 to 10 extras are operated over this section daily, and, during the heavy traffic season, approximately 35 freights and 14 passenger trains have been handled. This traffic caused considerable congestion, and it was decided to install automatic signals in order to increase the track capacity. The section from Hannibal to Louisiana was chosen for the first installation on this division, because an extra train serving several large industries, is operated between these points. This line is built at river grade throughout, but in following the river there is a continual succession of sharp curves with the view shut off frequently by the bluffs. Therefore, in addition to the increased track capacity gained by permitting closer headway of following trains, the signal installation also introduces greater safety of train operation.

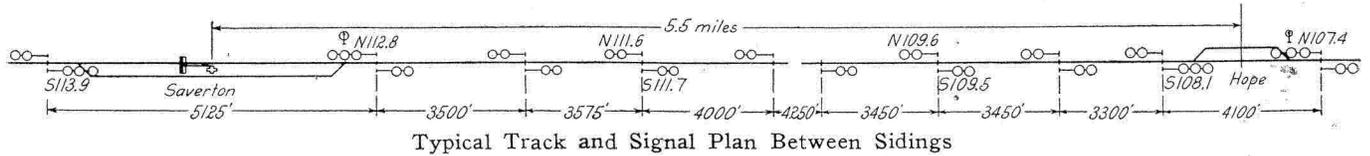
There are sidings and manual block stations with lock and block instruments at both Hannibal, at the north,

with the division superintendent. If, in the opinion of the latter, any changes were advisable in the locations, they were made at that time, and then the final plans were made.

The C. B. & Q. has been installing A. P. B. automatic block signals on single track lines since 1912, and is fully convinced that their use increases the capacity of the line at least 25 per cent. Some of the most obvious advantages that have been demonstrated from their use are that passenger trains are allowed to follow each other with a space interval of practically half that under the manual block system; that freight trains are allowed to follow passenger trains when the latter have gone half

way between stations instead of waiting until the next station in advance is passed, and that trains waiting at meeting points are, by the action of the starting signal ahead of them, advised as soon as the trains which they are to meet have passed the next station in advance. This gives the crews advance information and enables them to pre-

approximately 3,000 ft. from every home signal, is a distant signal with a green light to indicate "proceed" which conveys the meaning that the home signal is at "proceed," and a yellow light for "caution," conveying the meaning that the home signal is at "stop." Only one light is shown at any signal at one time. A green light at either



pare to start and be ready to pull out just as soon as the opposing trains pass. The amount of time saved in this way is considerable.

Again, the dispatchers like the signals, because they are able to get more accurate information about the movement of trains from the operators. For instance, if one station is closed, the dispatcher asks the operator at the adjacent open station to watch the starting signal, and advise him when it goes to block. This feature is found so convenient that it is the practice to put indicators in the offices of the operators at stations where the starting signals cannot be seen to repeat the position of the starting signals.

Home and Distant Indications Continued with Light Signals

The introduction of light signals on the Burlington is of special interest due to the fact that all of the automatic block signaling installed previously uses the separate home and distant signals with separate two-position semaphore arms operating in the lower quadrant for each indication. This same principle of home and distant arms is carried out with the new color light signals. The night indications of the semaphore signals and the new light signals, are the same; the light signals simply carrying the former night indications throughout the day also. Therefore, no new operating rules are necessary for the movement of trains with the new signals.

The absolute permissive block system for single track

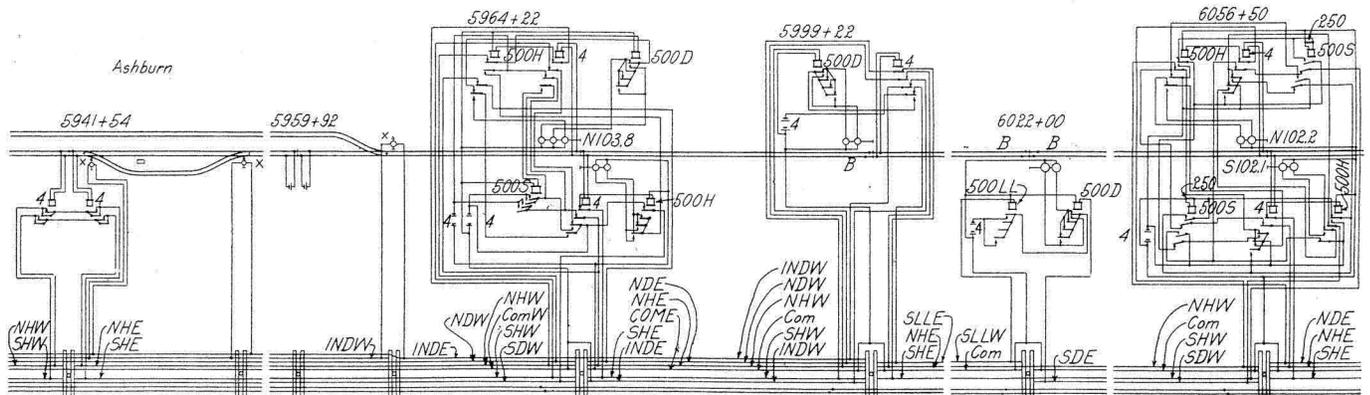
the distant or the home signal is a "proceed" indication. A yellow light is shown only at a distant signal and indicates "approach home signal with caution." A red light is shown only at a home signal and indicates "stop."

It should be noted that where two home signals governing movements in the same direction are relatively close together, as, for instance, at the entrance to, and exit from a station, the distant indication for the second signal is given by a third light on the preceding home signal, i. e., the yellow indication is given by a third light unit, while if the block is clear, the green indication of the first home signal may be considered as a clear distant indication for the next signal also. On all two-light signals, the green light is above the red light, but on the three-light signals, the yellow is on top, the red in the center, and the green on the bottom. This order allows separation of the green and the yellow by a position distinction.

The underlying principle of this home and distant system of signal indications is that the distant signal is located at the proper point at which, providing the distant indication is caution, the engineer must take action immediately in order to control his train for a normal train stop at the home automatic signal, thus eliminating the chance of his overrunning the home signal through forgetfulness.

Light Signals on Unusual Supports

The installation includes 45 two-unit light signals and 18 three-unit light signals. The signals are the Federal



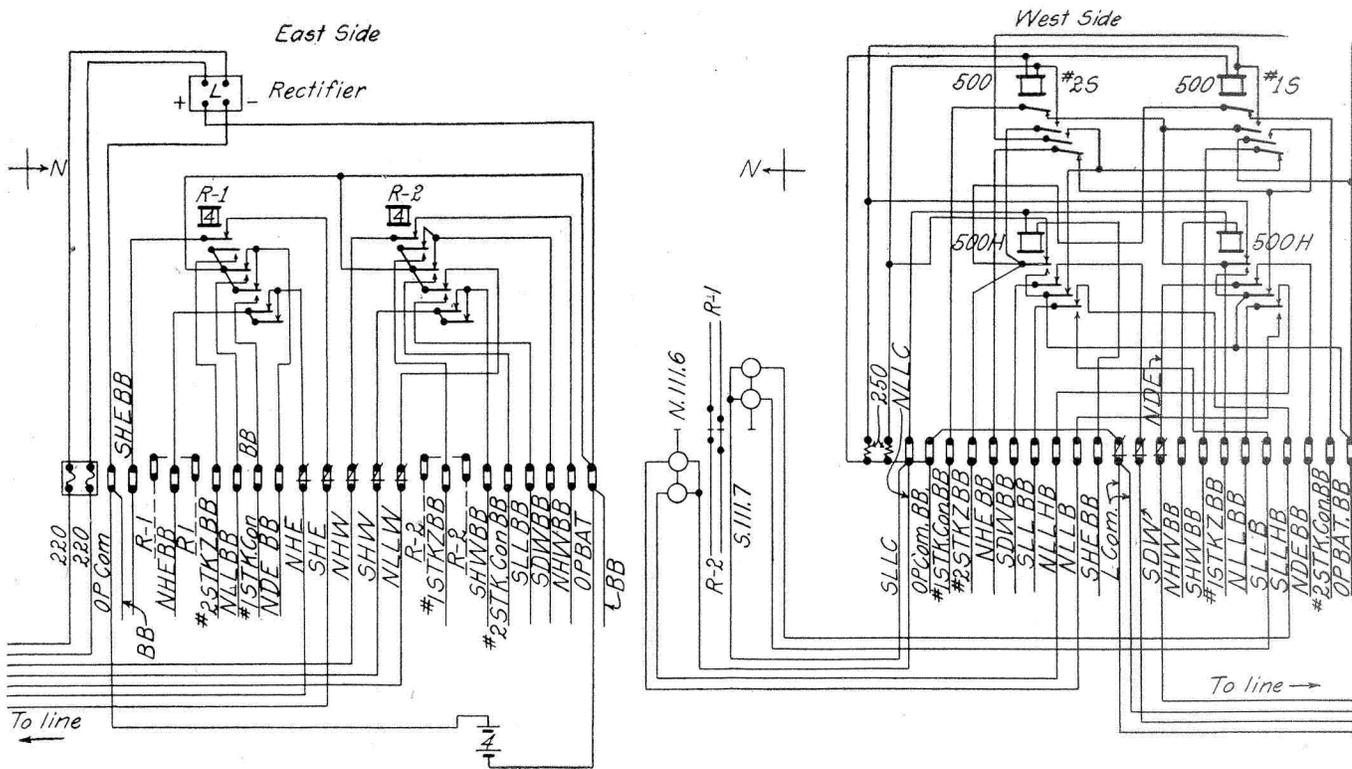
Complete Detail Circuit Plan of All Circuits

provides for an absolute stop indication for opposing moves between sidings and a permissive indication for following train movements. The signals, at the leaving ends of stations, governing the entrance to a block, are absolute stop signals and carry no number plates, but the intermediate permissive automatic signals carry number plates.

The absolute signals, and also the intermediate home automatic signals, have a red light to indicate "stop" and a green light for the "proceed" indication. Located

color-light Type E, each light unit being in a separate compartment with a separate door, however, the units are all in one cast iron case which fits over the top of the 5-in. pipe signal pole. The signal has a sighting device which together with a set of adjustable bolts allows the entire light signal to be aligned at one setting.

Each unit has an inner 5 1/2-in. inverted colored lens and an outer 8 3/8-in. clear lens. One bayonet base 18-watt, 8-volt, double-filament lamp is used in each unit. These filaments are so made that when one burns out



Wiring for the Two Separate Sides of Instrument Case at Double Location

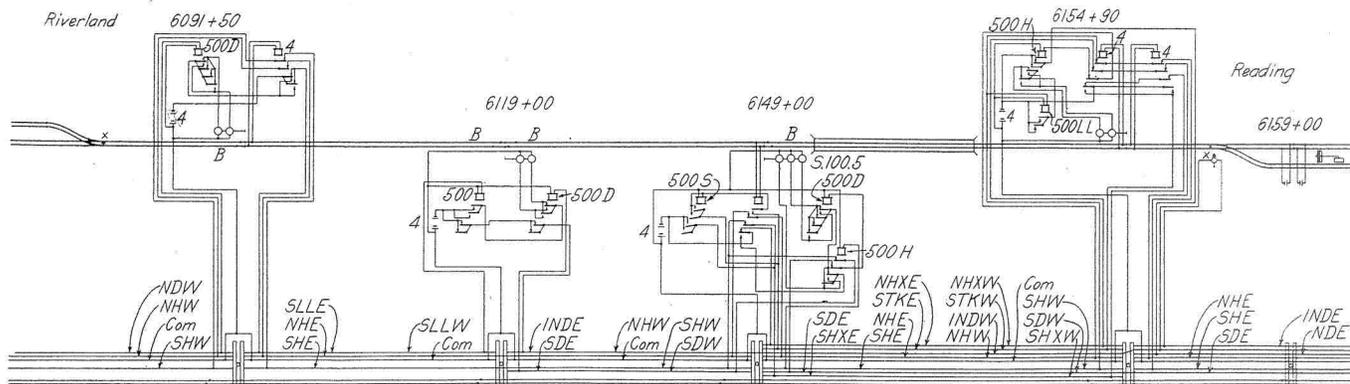
the other will continue the indication, only at a reduced brilliancy until the maintainer has an opportunity to change out the lamp. The sockets for these lamps are floated and set in sulphur at the factory at a perfect focal adjustment and the lamps are all based to coincide with the adjustment. Therefore the renewal of a lamp should require no adjustment, as the lamps are controlled by approach lighting circuits, the lamps will burn approximately an hour a day with average traffic.

Signals on the pole line side are mounted on standard signal cases which are used for housing the relays and rectifiers. At the majority of the double locations, these

sign manufactured by the O. S. Flath Co., having a solid top base, but all four sides are void so that a horizontal cross section is shaped like a cross with walls about 4 in. thick. Concrete battery tubs made by the Massey Concrete Products Corp., are used to house the storage battery.

Floating Battery Power Supply

A 220-volt, 60-cycle a. c. circuit extends throughout the installation, being carried on two No. 6 solid copper weatherproof wires placed on the two end pins on the field side of the signal cross-arm. The line control



and Control Apparatus Between Sidings

cases have a door on both sides, the track relays and rectifiers being mounted on the track side, and the line control relays on the field side. Terminals and arresters are mounted in the bottom compartment with jumpers to the various relays. The No. 12 insulated cable wires and the No. 8 track wires terminate on these arresters or terminals. All insulated wire was furnished by the Hazard Manufacturing Co. An 8-ft. 9/16-in. galvanized iron rod is used as a ground.

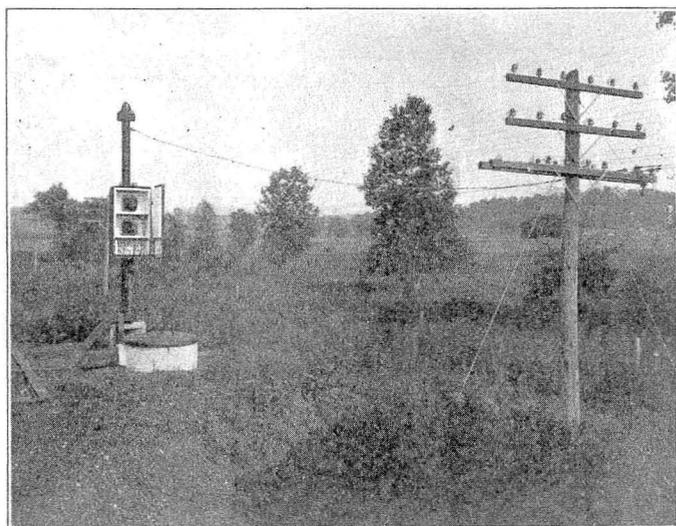
All foundations are pre-cast concrete of a special de-

circuits are No. 8 galvanized iron bare wire. The signal line wires are carried on a new 10-pin cross-arm which was added to the existing telegraph lead, glass insulators being used for all wires, Western Union standards being followed.

Power is purchased at the two end stations, Hannibal and Louisiana, feeding north from Louisiana to La Mott, 12 miles, and south from Hannibal. In order to maintain the line voltage at approximately 220 volts, booster transformers are used at two points on each feed to step up

the voltage. These booster transformers are the General Electric Co.'s air cooled out-door type, being located on the field end of a cross-arm as shown in one of the views.

are used for these rectifiers. The storage cells are the KXH-7 Exide 84 a. h., manufactured by the Electric Storage Battery Company. One cell is used on each track circuit with a fixed resistance of from 2 to 3.5



Double Track Battery Feed Location with Booster Transformer on Cross-Arm

With a 220-volt feed the voltage drops to 208 at the first booster where it is stepped up to 230, and is allowed to drop down to 210 at the second booster, which steps it up to 230, feeding on to the end of the circuit.

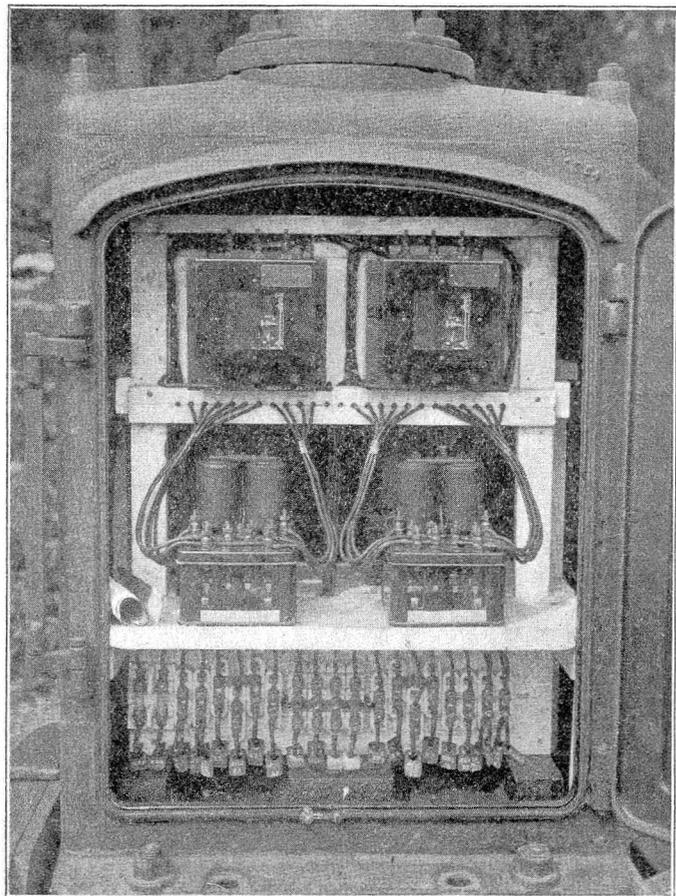
The rectifiers on this installation are the Non-Tune



Storage Batteries Are Housed in Small Concrete Wells

ohms in the negative side and an adjustable resistance of 1.5 ohms in the positive side. Four cells in series form the signal operating battery.

All signal materials were furnished and installed on contract by the Federal Signal Company. The concrete foundations and battery wells were furnished and placed by the railroad. The pole line circuits and track bonding were installed by railroad forces, duplex channel pins being used.



Track Side of Instrument Case at a Double Signal Location

type, manufactured by the Leich Electric Company. At signal locations the rectifiers are housed in the regular cases, while at feed cuts standard cast iron relay boxes

A New Assignment of Duties in I. C. C. Organization

Frank McManamy, who has been manager of the department of equipment in the Division of Liquidation Claims of the Railroad Administration, has assumed his new duties as a member of the Interstate Commerce Commission, effective on July 1, succeeding Winthrop R. Daniels, resigned to become Strathcona professor of transportation at Yale University. Mr. McManamy was assigned to Division 1 of the commission, which has particular charge of matters pertaining to valuation, safety, locomotive inspection, block signals, train control, etc. The Bureau of Locomotive Inspection, of which he was formerly the chief before he left the commission's service to go with the Railroad Administration in 1918, will hereafter report to Division 1 through Commissioner McManamy.

At the same time there was put into effect a reassignment of the functions of the various bureaus which are under Division 1. The Bureau of Safety, of which W. P. Borland is the director, will continue to report to Commissioner McChord, but the newly created section of signals and automatic train control of which W. H. Harland has been appointed chief, reports to Division 1 through Commissioner Esch. Matters pertaining to signals and train control have heretofore been handled in the Bureau of Safety reporting to Commissioners Esch and McChord. Commissioner Lewis is particularly in charge of valuation matters.