Several leads of 10-conductor No. 14 were used for line circuits and switch controls. Through leads of two-conductor No. 9 were installed for the alternating-current power, the high-voltage battery bus, and the low-voltage common.

North of the tower the type of construction used is what might be termed as loose wire cable, supported by a copperweld messenger and cable clips. With this type of cable it is not necessary to have complete plans drawn in order to determine the correct number and sizes of wire, as is required when a manufactured cable is used. For example, there are 125 No. 14 wires running north from the tower junction pole, this amount reducing in number at each junction box, thus avoiding the necessity of running various sizes of cables.

Cross-lead wires from a junction box to a switch, a signal or a track connection are underground armored cable. Number 14 wire is used for all circuits except the 110-volt switch feeds and the track connections, which are No. 9. All the cables to a switch are terminated in the Type-F controller, and the one centrally located in a group of switches serves as a distributing point for the high-voltage battery wire and battery "low."

The type of track circuit bootleg used by the Rock Island is simple and inexpensive. It consists of a piece of two-inch galvanized iron pipe, length two feet six inches, with the bottom end split and flared out four ways to form a base. A soldered joint is made connecting the bootleg wire to the cable wire, taped and pulled back into pipe, which is then filled with petroleum asphaltum. To prevent grounding of the wire on the pipe, a wood plug with a hole in the center for the wire, is driven in the top of the pipe while the sealing compound is warm.

Signal and Train Control Hearing Ends

Railroad representatives contend that issuance of further orders be withheld to permit exercise of individual judgment

WASHINGTON, D. C.

THE hearing before Division 6 of the Interstate Commerce Commission in connection with its investigation of the adequacy of existing installations of automatic block signals and automatic train-control devices was brought to a close on April 30 after representatives of most of the 168 respondent railroads had urged the commission not to issue orders requiring any further installations at this time.

The large increase in fatalities at highway grade crossings was emphasized by a large proportion of those who testified as presenting a problem requiring large expenditures by the railroads, in contrast with the remarkable improvement that has been brought about in recent years in the safety of train operation. Also the large capital expenditures for general improvements were described as tending to promote safety and the commission was asked to leave the managements free to distribute the expenditure of the available funds in the ways which in their judgment would produce the best results.

While many roads indicated their intention of extending their installations of automatic block signals or to experiment further with the use of cab signals, and many said that the automatic train control devices they had installed have been satisfactory, the opinion was generally expressed that there are more pressing needs for the use of the money available in other directions, and several testified that greater results per dollar of expenditure could be obtained by extending their signal installations rather than automatic train-control.

At the conclusion of the hearing R. H. Aishton, chairman of the executive committee of the Association of Railway Executives, presented a statement calling attention to the great progress in safety made during the past eight years, culminating in 1927 in the best record ever established, and recommending that the issuance of any additional formal orders requiring the installation of automatic train-control or other forms of safety appliances be withheld at this time, so as to permit the managements to exercise their own judgment in determining what expenditures can be made that will attain the highest degree of safety. An abstract of Mr. Aishton's statement follows:

"Despite the hundreds of millions of persons who ride on the railroads each year, only 10 were killed in train accidents in 1927, a new low record for any one year and a decrease of 69 under 1926. An improvement in safety among employees was also reported in 1927.

"When it is taken into consideration that during the past eight years freight speed between terminals increased 19 per cent, freight car miles per day increased 20 per cent, and gross ton-miles per freight train-hour increased 47.5 per cent, the results obtained in safety to those using the service, or employed in the operation of trains are a growing indication that the efforts of the railways in directing expenditures to those things which will produce the greatest measure of safety have been productive of a commendable result, and need no further justification as to their having been made in directions best promoting the public interest."

Mr. Aishton told the commission that in the past eight years the railroads have expended $323,701,000 of new capital for safety purposes, of which, all except $22,395,000 have been expended voluntarily by the individual managements and without orders from the commission, for various safety devices such as automatic and other signals, interlocking plants, crossing signals, highway grade separation, and the extension of automatic train control beyond the two orders that have already been issued by the commission. Mr. Aishton explained that the $22,395,000 represented the cost of automatic train control devices installed by the various railroads in response to the orders of the Interstate Commerce Commission.

"This statement of capital expenditures," he continued, "is limited to the period January 1, 1920, to January 1, 1928, and therefore does not take into consideration similar capital expenditures for installations prior to 1920. The figures so far presented take account only of the capital cost of physical installations, and have no reference to annual charges for operation, maintenance, and retirements. Annual expenditures for

*For a report of earlier sessions of this hearing see *Railway Signaling* for May, page 177.

the items enumerated above, including the operation, maintenance and retirements of safety appliances installed prior to 1920 as well as those installed since 1920 are estimated at $89,663,000 for the year 1927.

"Attention is also directed to the large capital expenditures by the carriers for improvements and betterments which have had their effect both in the character of service afforded the public and also in the degree of safety with which that service is performed. This information is brought before the Commission only for the extent to which recognition has been given by the various railroad managements to their responsibility for providing the most effective available method of insuring safety of railroad operation in all of its phases. It presents concrete and tangible evidence that the railroads generally, as their best judgment and a full sense of their responsibility dictates, are seeking and installing such methods and devices, and are initiating and supporting such policies and practices, as will give the best safety results from available expenditures.

"The duty of the railroads is not confined alone to that portion of the public using its rails. There is also a direct responsibility to that portion of the public who are subject to hazards incident to train or engine operation at grade crossings. In the past eight years the mileage of improved highway has increased 34.3 per cent in the United States, while there has been an increase of more than 150 per cent in the number of automobiles in operation. The number of highway grade crossings has increased 7,858 or 3.5 per cent. Fatalities as a result of highway grade crossing accidents in 1927 totaled 2,371, or an increase of 32.4 per cent compared with the number in 1920. It is interesting to note that the record of safety at highway grade crossings shows a much lower percentage of increase in both fatal and non-fatal casualties at highway crossings than those factors which indicate increasing hazards.

"The Association of Railway Executives unanimously recommends that the issuance of any additional formal orders which require the installation of automatic train control, or of other forms of safety appliances, be withheld at this time, so as to afford to the management of the railroads of this country a free opportunity to determine, from their direct and intimate knowledge of individual operating conditions and with full recognition of their responsibility in progressive safety work, in what direction expenditures can be made that will attain the highest degree of safety for employees and the public and generally increase safety in train operation."

Presentation of Railroad Representatives

The testimony during the first three days of the hearing was briefly reported in last month's issue. Representatives of the roads took the stand generally in alphabetical order and some of them made extended statements regarding their expenditures for improvements, and the results on their accident records. Many of them were questioned at length by Commissioners Eastman, Esch and McManamy, who with Examiner Mullens conducted the hearing, regarding their experience and the functioning of the various devices tried. Some of the roads, although they had asked to be relieved of any order, were asked which parts of their lines should be selected for installations if the commission should decide to issue an order.

A. F. Blaess, chief engineer, *Illinois Central,* told of the large expenditures made in recent years for block signals and other improvements which tend to promote safety and requested the commission not to issue any order at this time requiring further installations, saying that the present installations of train control and block signals are adequate to meet the requirements of safety. In view of the small number of accidents in recent years in block signal territory he expressed the opinion that further expenditures at this time for such devices would not be warranted. In the five years 1922 to 1926 the system has expended $1,898,628 for automatic block signals, $1,381,504 for interlocking installations, and $9,275,717 for reconstructing 130 highway, street and railroad crossings.

Mr. Blaess described the company's use of cab signals without wayside signals and said that the fact that the cab light signals are in plain view of the engineman at all times, regardless of weather condtions, is of more value than all other features of automatic train control. E. E. Von Bergen, general air brake inspector, was also asked about the results with cab signals and introduced affidavits signed by 59 enginemen of experience on the two divisions on which the cab signals have been installed in connection with automatic train control. The typical statement was that they had found the system safer and to facilitate the movement of trains to a greater degree than the system using wayside signals because the cab signal is always in plain view but it is not necessary to watch it continuously and also because the signal change indicates when conditions change on the track ahead. They said there is no necessity for wayside signals other than interlocking home signals and on single track head block signals at the leaving end of sidings

J. E. Hutchinson, vice-president, *St. Louis-San Francisco,* said that the 1928 budget includes $320,000 for automatic block signals on 120 miles. He did not believe that the results of automatic train control installation had justified the expense. The net result to date is a first cost of $243,658 and about $22,440 a year maintenance cost from which he could see no benefit or added safety except in such remote ways as to be almost negligible.

H. E. McGee, vice-president, *Missouri-Kansas-Texas,* requested that this company be relieved from any order on the ground that conditions do not justify a further requirement at this time. A comprehensive estimate of the company's capital needs for the ten years 1927 to 1936 includes $51,000,000 for road and $26,000,000 for equipment and includes automatic signals for 500 miles. Thirty per cent of the main line is now provided with automatic signals and the program would bring the total up to over 60 per cent.

F. G. Nicholson, vice-president and general manager of the *Chicago & Eastern Illinois,* described this company's experience with the Miller train-control, saying that 19.6 per cent of its passenger mileage and 56.4 per cent of its road locomotives are equipped with automatic train-control. Considering the depressed condition of traffic and the relative freedom from train accidents, he expressed the opinion that this installation is entirely adequate.

Charles E. Smith, vice-president of the *New York, New Haven & Hartford,* said that while it is not opposed to train control, it is of the opinion that expenditures on its system for other purposes will provide a greater measure of safety than can be secured by equivalent expenditures for train-control. It has no record that train control has prevented an accident. Fatal accidents on the New Haven were 70 per cent less in 1927 than in 1913. No passengers have been killed in train accidents since 1916.

H. E. Stevens, chief engineer of the *Northern Pacific,* said the company feels that its investment in automatic block signals, which totals approximately $5,430,000, with an annual maintenance cost of approximately $500,000, has been money well expended, but that this system furnishes all of the protection of this character justified on a road of the average train density of the Northern Pacific and that to increase the cost of the existing installation by approximately 35 per cent merely for the purpose of insuring that the signal instructions are obeyed is an unjustified expenditure.

F. W. Green, vice-president of the *St. Louis-Southwestern,* expressed the opinion that no part of its lines has reached a stage of development that would require or justify the expenditure necessary to install automatic train-control.

W. D. Faucette, chief engineer of the *Seaboard Air Line,* said this company has installed 500 miles of automatic block signals since 1924 at a cost of $3,205,000, and has under consideration the extension of the system between Hamlet, N. C., and Monroe, about 60 miles, and for about 20 miles in the vicinity of Tampa, Fla. A requirement that it install automatic train-control would make it impossible to extend the signal

system and the company asked to be exempted from the order of January 14, 1924, which was suspended.

W. J. Eck, assistant to vice-president of the *Southern,* said the system now has 3,048 miles of road equipped with automatic block signals and 2,718 miles of road and 868 locomotives equipped with automatic train-control. In 1925, 1926 and 1927 it has expended $10,482,398 for automatic signals and train-control and the voluntary installations of train-control are equal to approximately 17 locomotive divisions. What has been done voluntarily, he said, should serve to warrant the conclusion that the management will provide adequately for installations on additional sections of line as the development of traffic, use, and train density may seem hereafter to require.

W. E. Boland, signal engineer of the *Southern Pacific,* said the Pacific Lines of the Southern Pacific system have 3,891 miles of road protected by automatic block signals, a greater mileage than any other line in the country. During 1926 and 1927, additional capital investment in automatic train-control, interlocking and block signals totaled $3,167,608, adding 369 miles of automatic block signals and for 1928 work has been started on projects which call for an additional capital investment of $850,000 for interlocking and block signals on 220 additional miles. It is the judgment of the officers that no section of its lines has yet reached a stage of traffic density and character such as to justify an installation of automatic train-control.

E. F. Mitchell, chief engineer of the *Texas & Pacific,* said that its budget for 1928 includes installation of additional automatic block signals between Mile Post 9 and Livonia, La., 104.8 miles, between Longview Junction and Dallas, Tex., 120 miles, and between Fort Worth and Toyah, Tex., 416 miles, which will increase the percentage of its main line so equipped to 71.9. It also includes installation of automatic block signals on 20.4 miles of second main track to be built between a point 12 miles west of Dallas and Forth Worth. The estimated cost for 1928 is $2,067,470. In view of the extensive program and heavy expenditures to equip the principal main lines with safety appliances, the company requested that the commission impose no order upon it.

S. E. Cotter, vice-president and general manager of the *Wabash,* said that it is the company's policy to install automatic block signals on those sections of its road where the traffic density is greatest and its program for 1928 includes the installation of automatic block signals on 19.4 additional miles of double track, but that under existing traffic conditions, the large sums which would have to be expended for automatic train-control installation would not produce commensurate results in the reduction of casualties as if expended for other safety measures.

Sidney Smith, general attorney, *Louisville & Nashville,* said that in the last 20 years this company has expended over $100,000,000 in rebuilding and improving its lines and that in the past five years it had expended approximately $3,800,562 for purposes which directly result in safer operation, including $2,667,593 for automatic block signals, automatic train-control, interlocking plants and signals. Automatic block signals have been installed on 46 per cent of its main line mileage and the company definitely contemplates the installation of additional block signals, but feels that the expense of automatic train-control superimposed upon automatic block signals is not justified by the results. Any compulsory installations beyond those now authorized would compel the diversion of funds from projects of greater importance and would be contrary to the best judgment of the management in the premises. An analysis of all reported train accidents on the L. & N. since 1920 showed that only 5.3 could have been prevented by the perfect observance of automatic block signal indications and the perfect operation of automatic train-control or train-stop devices, and Mr. Smith expressed the opinion that the safety attributable to automatic train-control in addition to that obtainable from automatic block signals is negligible and not justified by the cost and that a greater degree of operating efficiency and safety per dollar of investment can be obtained by the expenditure of available funds for automatic block signals.

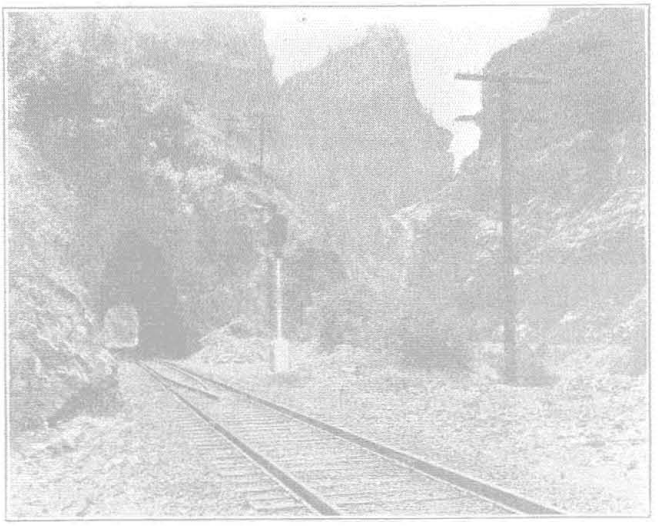
The present program contemplates the installation of automatic block signals from Anchorage, Ky., to Lexington, 69 miles; from Etowah, Tenn., to Junta, Ga., 88 miles; between Nashville, Tenn. and Decatur Junction, Ala., 114 miles; between Maunie, Ill., and East St. Louis, 132 miles, and between Lebanon Junction, Ky., and Sinks, 107 miles. The first installation is to be completed this year and the others are to follow in due course. Since 1.55 miles of road could be protected by automatic block signals for the same expenditure necessary to construct one mile of automatic train-stop or train-control, and 1.85 miles of road equipped with automatic signals could be maintained for the expenditure necessary to maintain one mile of road equipped with automatic signals supplemented by train-stop or train-control, Mr. Smith said, there is nothing in the situation which justifies the management in concluding that train-stop or train-control installations are either necessary or desirable at this time.

A. H. McKeen, system signal engineer, *Union Pacific,* said the total investment of the system in automatic block signals is $7,951,980, in interlocking plants, $1,498,000, and in automatic train-control $1,018,000. For 1928 the installation of block signals on 126 miles of secondary main track has been authorized. All of the main lines are equipped with automatic block signals and the company is working toward equipping the secondary lines as conditions justify. He expressed the opinion that the program is more comprehensive than any order the commission might reasonably make and said that when traffic conditions justify it, the Union Pacific is willing to go ahead voluntarily with the installation of automatic train-control. Meanwhile, it is gaining valuable experience with the present installations, which are not needed at the present time, and the cost of which has delayed the automatic signal program.

W. J. Jenks, operating vice-president, *Norfolk & Western,* said that 72 per cent of the track mileage and 90 per cent of the passenger mileage is protected with automatic block signals and he asked that the company be permitted to exercise its best judgment as to expenditures.

P. S. Lewis, superintendent of the Atlantic City division, *Reading,* urged the desirability of postponing any further requirement as to automatic train-control until more experience has been had with the various types as to interchangeability, saying that the Reading is so situated that any extension would require it to equip a large portion of its locomotives.

Alfred P. Thom, general counsel of the Association of Railway Executives, made a brief concluding statement, urging the commission not to issue any order at this time. C. A. McHenry, representing the Hudson Automatic Train-Stop and Train-Control Corporation, and J. F. Webb, secretary-treasurer of the International Signal Company, described the operation of their devices in test installations on the Richmond, Fredericksburg & Potomac and the Erie, respectively. Frank J. Sprague and other representatives of train-control companies were authorized to file written statements and the hearings were declared closed, unless the commission desires to have additional evidence.



Color-light signal location on D. & R. G. W.