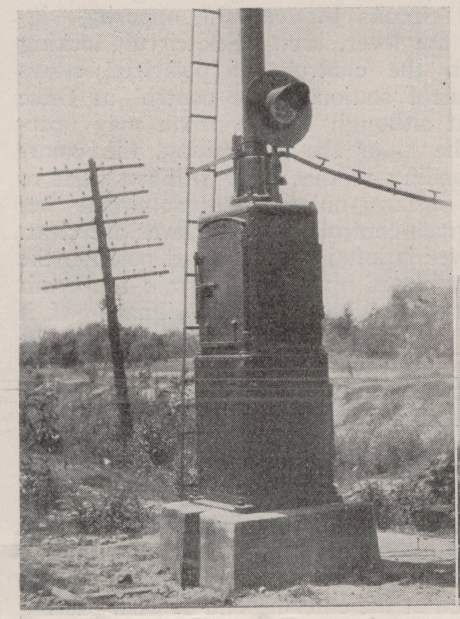
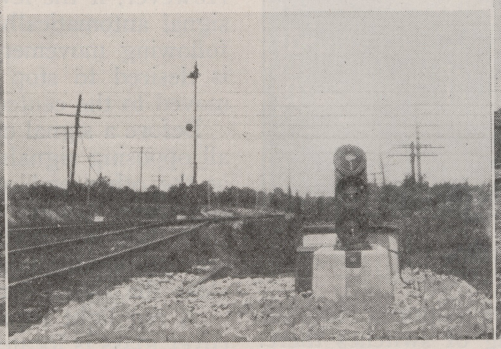
Train Movements Directed by Signal Indication on C. of Ga.

Elimination of written orders permits quick change in meeting points on busy 25-mile section of single track



Take-Siding Signal



Leave-Siding Signal

West End of Byron

THE Central of Georgia has recently placed in service a unique signaling system on a 25-mile section of busy single track between Terra Cotta, near Macon, Ga., and Carman, near Fort Valley, in which train movements are directed entirely by signal indication, no rights being given to any train by direction or class. The 28.6-mile section from Ft. Valley to Macon handles the most important and dense traffic on the Central of Georgia. Short sections from Macon to Terra Cotta junction, 3.1 miles, and from Ft. Valley to Carman, 2 miles, are double-tracked while the intervening distance from Terra Cotta to Carman, 23.6 miles, is single track. It is on this section that the special signaling is used. Lap sidings are provided at four intermediate stations, Rutland, Echeconnee, Byron and Powersville. The line traverses a rolling country with a maximum grade of one per cent in each direction.

During the Florida tourist season, from November to April 15, five through Florida trains are handled each way daily by the Central of Georgia between Atlanta, Ga., and Albany via Macon and Ft. Valley. These include the Flamingo, the Southland, the Dixie Limited, the Dixie Flyer, and the Dixie Express. In addition there are five Central of Georgia passenger trains each way daily, making a total of ten passenger trains each way per day over this 25-mile section of single track, in the winter season. In the summer about eight passenger trains are operated each way daily.

The freight traffic normally requires about five or six through trains each way daily and one local, excepting Sunday. The major portion of the famous Georgia peach belt is served by the Central of Georgia and its traffic is handled northbound between Ft. Valley and Macon. During the crest of the peach season from June 1 to July 15, as many as 20 perishable freight trains are moved northbound in 24 hours.

In 1914 automatic block signals were installed on this division to promote safety and to increase the track capacity by reducing the spacing between following trains. With this protection, form "19" train orders only were used to direct train movements, which increased the flexibility of operation and reduced the number of train stops. However, with the growth of passenger traffic, especially the through Florida business and the increased movement of peaches, further track capacity was required.

While consideration had been given to building a second track, the signal department, at the suggestion of the division superintendent, submitted a proposal for a system of signaling to direct train movements by signal indication. Such a system had been used since March, 1924, on a 4.5-mile section of single track from Macon to Paynes on the Atlanta division. All movements to and from this territory, including several industrial spurs, were controlled by signal indication, eliminating numerous train orders. In other words, the interlocking limits were virtually extended to include this 4.5 miles of single track.

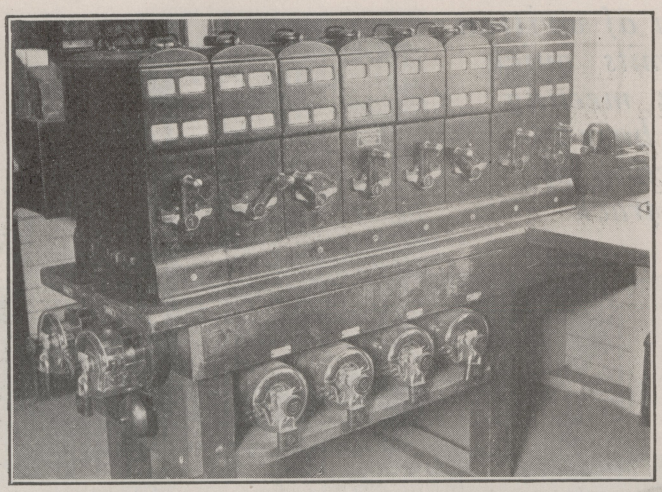
Standard Principles Used

On this same basis it was decided that the 25 miles of single track from Terra Cotta to Carman could be considered as interlocking territory, insofar as signal indications were concerned. All circuits were based on standard interlocking practice, although a few unique ideas were used to utilize line wires for certain circuits which at a particular cycle of operation were not otherwise in use.

The ideal arrangement would have provided for the operation of all of the switches by power-operated remote control switch machines; however, it was desired to hold expenditures to a minimum and, therefore, only two power switches were installed, both at strategic points where the elimination of train stops is of special advan-

tage to trains entering or leaving sidings on account of grades. A spring switch at the end of the double track at Carman eliminates the necessity of trains stopping at that point.

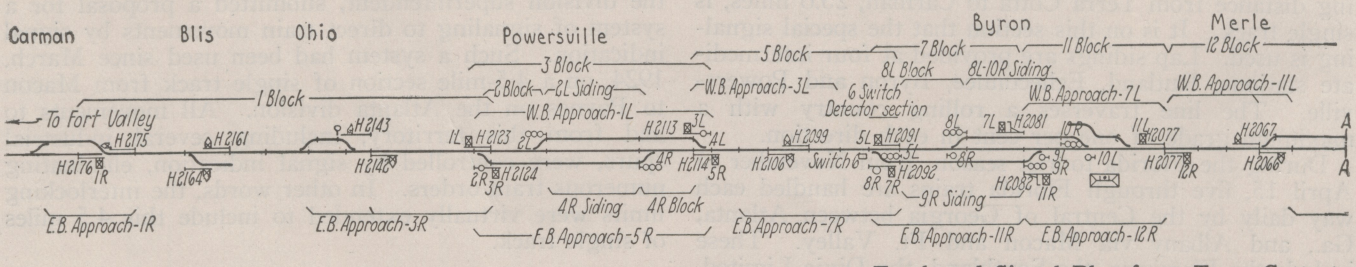
The signaling is controlled by two operators, one at Byron and another at Terra Cotta. As Terra Cotta is at the end of the yard and at the end of double



Desk Levers at Byron

track, operators have always been required for the handling of trains and the throwing of switches there. It was, therefore, considered essential to retain operators at this point and the installation was arranged so that the Terra Cotta operator controls the signals from the eastbound signal *8R* at the leaving end of Echeconnee to Terra Cotta. An operator located at Byron (the center of the remaining distance) handles all the signaling from signal *18L* opposing signal *8R* to Carman.

Absolute signals (designated by square-end blades) are located at each end of every block, the limits of each block being indicated by brackets and numbered as shown in the diagram. The entering signals for the two ends of each block are controlled by one lever, which, when thrown to the right, clears the eastbound signal and when thrown to the left, the westbound signal, provided



Track and Signal Plan from Terra Cotta to

in each case that the block is not occupied by a train moving in the opposite direction.

If, for example, an eastbound train is to be moved straight through, the operator at Byron throws levers 1, 3, 5, 7, 11, 12, 14, and 18 to the right, which causes the corresponding signals to go to the clear position, provided all the track is clear. At the same time the operator at Terra Cotta moves his levers 8, 4, 2, and 1 to the right which gives the train clear signals all the way from Carman to Terra Cotta. For a westbound movement these levers are thrown to the left, which drops all eastbound signals to stop and clears the corresponding westbound signals. As it is impossible to throw one lever both ways at one time it is impossible to clear two signals for opposing trains to enter any section of track. The signal levers are provided with approach locking only, which is released by time releases or back contacts of repeater relays for the track circuits ahead of the signals. The function of indication locking usually provided on the signal lever lock circuits is accomplished by inter-control of the control relays of opposing signals. Instead of locking the signal levers through the track circuits between the opposing signals controlled by the lever, such track circuit locking is accomplished in the controls of polarized relays located in the control station. The control of these relays is such that although the leverman may operate his lever to the L or the R position, the polarized relay corresponding to that lever will not shift to the corresponding position unless all track circuits between opposing signals controlled by the lever are clear. However, if the lever is left in the original position the signal automatically clears up behind a train to permit following movements as with automatic signals. If it is desired to stop a following train the lever can be moved to the center position.

Before a signal clears an automatic check is made that all opposing signals to and including the absolute signal at the other end of the block are in the stop position. Approach locking is used throughout so that once a train has accepted the distant signal to a block the operator cannot take the block away from that train and clear the signal for an opposing or conflicting move.

A red light signal unit with a black letter *S* on the cover glass is located at the entering end of each passing track to indicate to an approaching train that it must take the siding.

To indicate to the crew of a train on a siding that they may line the switch and head out, a dwarf light signal is located near the fouling point. This dwarf signal has a frosted white unit with a white letter *S* and yellow and red units. The dwarf light signal is both lever and track circuit controlled. The white letter *S* indicates that the main line switch may be thrown, after which if the lever is still in the proper position and the track unoccupied the red and *S* lights go out and the yellow light is displayed, authorizing the train to proceed out on the main line and to the next signal.

Telephone booths are located at the leaving end of all passing tracks with connection to both dispatchers' and operators' wires, so that train crews can communicate with the dispatcher as well as the operator.

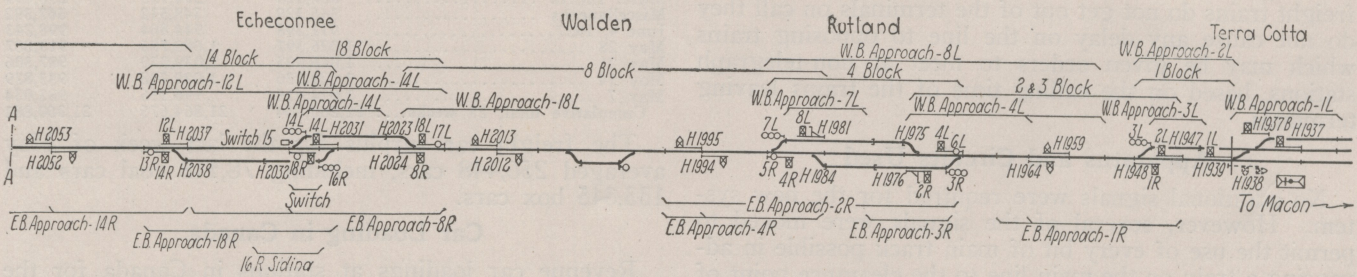
Train Movement for a Meet

Indicators on the desk lever machine in the operator's office show the location of all trains in the territory and the dispatcher is in constant communication with the operators by loud speaking telephones so that he knows where each train is at any moment. For example, an eastbound freight may be out of Ft. Valley and a passenger out of Terra Cotta and the dispatcher may have decided originally to let the freight take siding at Byron for the meet. When the freight passes the end of double

track at Carman the operator informs the dispatcher, who may find that it, for some reason, has lost time and may decide to change the meet to Powersville, in which case he so directs the operator at Byron, who then places levers 11, 7, 5 and 3 to the left, causing signal *3R* to go to stop and then moves lever 2 to the right, which lights up the take-siding light signal on signal *H2124* so that when the freight arrives at intermediate signal *H1242* the engineman will receive a caution indication and when approaching signal *H2124* will see that the arm is at stop and that the take-siding signal is displayed. The brakeman then throws the switch and the train pulls in the clear, the movement at the same time being indicated to the operator, who then throws lever 1 to the left, allowing the passenger train to proceed through Byron and on through to Carman without a stop. As no train orders have been issued, the engineman on the passenger train had no knowledge of the original line-up for the meet nor did he know of the change; all he had to do was to proceed as long as he had clear signals.

As soon as the passenger train passes Powersville the operator at Byron is informed of this by his indicator and he, by throwing lever 4 to the right, can change the indication in the leave-siding signal *4R* from red to white with the letter "S" illuminated. The brakemen then throws the switch and the letter "S" and the red indication are eliminated; the engineman pulls out (which is again indicated to the operator) and, in the meantime, the operator clears signal *5R* and the train proceeds, stopping, of course, to allow the rear flagman to close the switch. Where power switch machines are used, such as at the eastbound entering siding at Byron, a lower yellow light signal *8R* indicates that the switch is lined up for the approaching train to take siding, eliminating the need of a train stop. By means of his indicators the operator can tell accurately which of two trains approaching a meeting point will reach there first and so determine which shall take the siding.

The characteristic feature of this system is that the order for each train movement is given in the form of a signal indication *at the point* where any change is required. These signal indications need not be given until a short time before the train approaches the caution signal. Therefore, the train dispatcher has an opportunity to arrange meeting points with the greatest degree of flexibility so as to result in the least delay to trains.



Carman, Showing Limits of Each Block

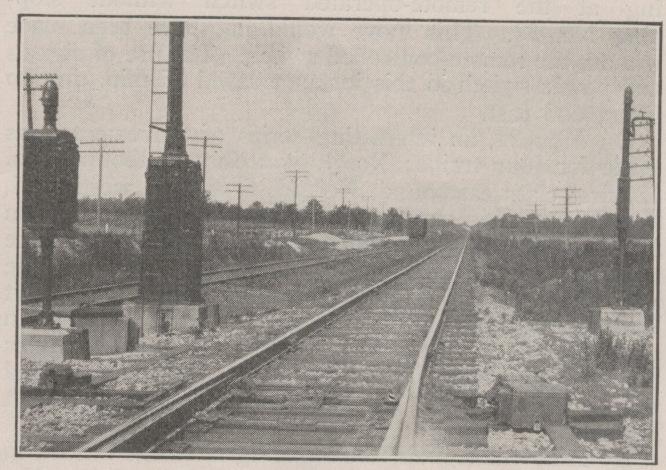
Why Such a System Is Required

Especially during the winter season when the through passsenger trains sometimes run behind schedule it is difficult for the dispatcher to get enough information from connecting lines to show within 30 min. when these trains will be handed over to his division. It is, therefore, impossible in such cases to arrange meets without causing other trains to lose an excessive amount of time. Even with operators at four points between Terra Cotta and Ft. Valley, the orders could not be changed quickly enough to take advantage of any delays less than 30 to 45 min.

Likewise in the peach season irregular train movements are so frequent that many trains would be needlessly delayed on account of not knowing beforehand the exact time that other trains are to leave terminals.

Examples of Operation

On May 16 train No. 43, a westbound second class freight train, left Terra Cotta on time and if the operation had been governed by train orders and time table, the logical meeting point (as it would have been determined by the dispatcher) would have been Powersville for eastbound first class train No. 94. As No. 43 was not required to respect schedule time, it made good time from Terra Cotta to Byron, the next open telegraph office, and when the operator and dispatcher became



A Remote Control Switch

aware of this condition the signals, which had been set originally for No. 43 to take siding at Powersville, were cleared and No. 43 was allowed to run to Carman, the station at the end of double track, 5.4 miles beyond Powersville. This saved No. 43 from being delayed 25 min. and also saved at least one ton of coal, for when leaving the passing track at Powersville the engineman would have had to start his train on a steep ascending grade.

On May 16, a freight, Extra 663 east, if running under time table and train orders, would have been given an order to meet No. 43 (the westbound second class freight) at Byron and this extra would have taken siding about one mile before reaching the Byron telegraph office. However, this train made good time to Byron and as the operator was checking its progress by indicators the train was run through Byron to Echeconnee, 5 miles east to Byron, and through the passing track by signal indication. The two trains met at Echeconnee without stopping No. 43, Extra 663 being delayed only about five minutes while running through the siding.

This saved Extra 663 east about 30 minutes of time.

On May 17, if trains had been handled by time table and train orders it would have been proper to have held Extra 663 east, at Fort Valley to meet No. 33, a first class eastbound train. The time involved would have made it possible to run this train to Powersville to meet No. 33; but Extra 663 had full tonnage and if it had been run to Powersville it would not have reached the station east of the point (Byron) any earlier than it did and would have consumed considerably more coal on account of the heavy grade eastbound when pulling out of the siding at Powersville. Knowing that Extra 663 east could be put in the siding at Powersville if it did not make good time it was run east out of Carman. However, the indicators showed that it was making time as anticipated, and hence this extra was run east through Powersville to Byron where it was headed into the siding at the remote-operated switch without stopping No. 33. This move would not have been made without the remote-controlled switch. The use of signals and power switch in this instance saved 35 min. time to Extra 663 east.

On May 21, an interesting series of movements was made for four trains; No. 4, first class eastbound, No. 12, first class eastbound, No. 33, first class westbound, and Extra 664, eastbound, perishable freight. Train No. 4 entered the controlled territory at Carman three minutes late and if trains had been operated with time table and orders, it would have received an order at Fort Valley (West of Carman) to meet No. 33, which train would have been stopped and delayed at least ten minutes (partly on account of a grade) at Echeconnee and would delay No. 12 ten minutes on a meet order at Byron.

By using the signals, No. 4, being late, was headed in at Byron, five miles west of Echeconnee, and met No. 33 there instead of at Echeconnee. This delayed No. 4 ten minutes but avoided delays to No. 33 and No. 12, both heavy trains, and at the same time permitted Extra 664 east, a perishable train, which was in the siding at Echeconnee, to proceed east to Macon ahead of No. 4 and No. 12. This saved Extra 664, 30 min. delay as well as the time saved on 33 and 12. Train No. 4 made up the lost time before reaching the terminal.

One great advantage of operation by signals is that if freight trains do not get out of the terminals on call they do not cause any delay on the line to opposing trains which may be given orders to meet at non-telegraph stations, based on the calling time of the trains leaving terminals.

Apparatus and Circuits Used

No additional signals were required for the new system. However, several of the signals were moved to permit the use of every bit of main track possible in advancing a train on the main line to the clearance point of the switch which might be used by a train taking siding. The control equipment consists of a set of standard Union Switch & Signal Company desk type lever units, which are mechanically interlocked to prevent conflicting movements as between the sidings and the main line.

The line control circuits for the automatic signals were carried on a lower cross-arm added to the existing telegraph pole line. With the change over to the new method of using the signals, several more line wires were required, especially near the control stations. Therefore, it was decided to build a separate pole line on the opposite side of the track for use exclusively for the signal line control circuits.

Southern pine poles treated full length with creosote were spaced 35 to the mile. For ordinary line away from towns or highway crossings the poles are Class B about 30 ft. long. Creosoted cross-arms, steel pins, and porcelain insulators were used with No. 10 solid hard-drawn, weatherproof line wire. The cables from the line poles to the relay cases are made up of single conductor No. 12 solid insulated wires with a 3/16 in. stranded messenger with a strain insulator about midway of the length of the cable. The poles are guyed from ways at each signal location and also at each half-mile point.

The development of this method of operation has been sponsored by H. Baldwin, division superintendent, and S. G. Brannon, trainmaster, and was designed and installed by the signal department under the direction of E. B. DeMeritt, signal engineer.

Freight Car Loading

WASHINGTON, D. C.

REVENUE freight car loading in the week ended June 4, which included the Memorial Day holiday, amounted to 911,298 cars, a decrease of 33,566 cars as compared with the corresponding week of last year and of 86,945 cars as compared with 1925. All districts showed decreases as compared with last year except the Pocahontas, and all classes of commodities except livestock, which showed an increase of 3,106 cars. The cumulative total for 23 weeks of 1926 amounts to 22,263,864 cars, as compared with 21,864,675 cars in the corresponding period of last year. The summary, as compiled by the Car Service Division of the American Railway Association, follows:

Revenue Freight Car Loading

WEEK ENDED SATURDAY, JUNE 4, 1927

Districts	1927	1926	1925
Eastern	204,489	218,107	234,715
Allegheny	187,355	191,328	199,178
Pocahontas	55,878	54,969	51,808
Southern	135,733	140,391	144,198
Northwestern	145,484	147,292	160,178
Central Western	117,674	124,824	133,271
Southwestern	64,685	67,953	74,895
Total Western districts	327,843	340,069	368,344
Total all roads	911,298	944,864	998,243
Commodities			
Grain and grain products	36,418	36,836	38,163
Live stock	28,665	25,559	27,317
Coal	139,572	154,550	153,217
Coke	10,371	11,548	9,214
Forest products	64,420	70,860	77,809
Ore	58,013	62,544	66,237
Mdse. L.C.L.	227,510	234,455	258,894
Miscellaneous	346,329	348,512	367,392
June 4, 1927	911,298	944,864	998,243
May 28	1,026,397	1,080,786	913,087
May 21	1,016,803	1,039,070	987,306
May 14	1,029,126	1,029,748	985,879
May 7	1,024,416	996,216	983,034
Cumulative total, 23 weeks	22,263,864	21,864,675	21,360,861

The freight car surplus for the last week of May averaged 256,448 cars, including 78,148 coal cars and 133,345 box cars.

Car Loading in Canada

Revenue car loadings at stations in Canada for the week ended June 4 totaled 62,099 cars, an increase over the same week last year of 502 cars, and an increase of 8,185 cars over the previous week, the holiday in the previous week being a factor.

	Total for Canada			Cumulative totals to date	
Commodities	June 4, 1927	May 28, 1927	June 5, 1926	1927	1926
Grain and grain products	5,171	5,407	7,215	167,753	155,322
Live stock	1,778	1,550	1,792	43,554	44,290
Coal	7,308	5,164	5,902	137,514	100,760
Coke	161	185	299	7,289	9,359
Lumber	4,535	3,982	3,916	76,219	75,363
Pulpwood	2,220	1,792	1,943	91,288	69,716
Pulp and paper	2,277	2,274	2,388	49,062	56,285
Other forest products	3,221	2,724	3,245	70,847	74,577
Ore	1,583	1,446	1,882	32,028	33,366
Merchandise, l. c. l.	17,651	15,393	16,780	367,120	344,328
Miscellaneous	16,194	13,997	16,235	284,430	275,148
Total cars loaded	62,099	53,914	61,597	1,327.104	1,238,514
Total cars received from connections	34,581	37,801	34,361	856,841	822,560