More Automation in Signaling for 1957

More compact control machines, faster operation of code line circuits, and new selective automatic controls are used to extend CTC controls or interlocking consolidations—Faster computers and more exacting control of retarders are new in automatic control of retarders

USING NEW TECHNIQUES, extensive installations of signaling will be made in 1957, the principal purpose of which will be to: improve train and yard operations; and to reduce operating expenses by: (1) securing better utilization of locomotives; (2) removing main tracks not needed; and (3) eliminating numerous levermen, telephone operators, crossing watchmen and retarder operators. Circumstances vary, but, on the average, wages for one leverman on duty three tricks every day, based on 40-hour week, and including vacation time, will total approximately $20,000 annually. On the same time basis the annual wage cost for a gateman round-the-clock every day at a single crossing totals about $16,000.

In the new projects for 1957, the signals, switch machines and retarders will look the same as before, but devices in wayside housings and in control offices can be decidedly different. Research in factories and on railroads is bringing much new electronic equipment into signaling, such as radio, microwave, radar, carrier and tuned coils. Objectives are to control more extensive territories from one machine; or to convert to automatic controls where possible. Another objective is to modify signaling systems in accordance with requirements in light traffic lines or in small yards; and, by this modification, reduce first costs and maintenance expenses. Thus centralized traffic control can be made to be practicable on thousands of miles of single track not now so equipped; and power switches and retarders will be justified in many smaller yards; and numerous interlockings, on extensive terminal areas, can be consolidated under one control.

More Compact Control Machines

The present trend in control office equipment for centralized traffic control and consolidation of interlockings is towards smaller, more compact control facilities to enable one dispatcher to handle extensive territories. Conventional control panels, with the track diagram, control levers, and indicating lights on a single machine, become cumbersome as the area of control increases.

In 1956, the Burlington solved this problem by consolidating all controls on a machine about the size of the console of a pipe organ. A single dispatcher now has direct control of 14 sizable interlockings in the 35.4 miles of the Chicago terminal territory—mostly 3 tracks—handling 122 scheduled trains daily plus numerous switching moves. The control buttons, operating on the entrance-exit principle, are arranged in vertical rows 1½ in. apart. Thus each interlocking is controlled from a panel only 4½ in. wide. A separate track diagram, mounted on pedestals, is arranged in a semicircle in front of and about 8 ft. from the control console. Lamps on this diagram indicate track occupancy, switch position and signal clear or stop. Such an arrangement of control office equipment, coupled with

SIGNAL CONSTRUCTION INSTALLED 1952-1956

	1956	1955	1954	1953	1952
Automatic block signals	864	754	678	967	1,318
Interlocking construction					
Signals and switches					
At new plants and added in plants rebuilt	1,303	1,433	1,153	1,832	1,372
At automatic plants	269	147	156	151	133
Spring switches					
Spring buffer mechanisms	147	107	140	162	177
Mechanical facing-poing locks	41	35	49	84	70
Signals at spring switches	268	183	203	256	317
Centralized traffic control					
Power switch machines	819	305	548	680	597
Lever-controlled signals	1,948	885	1,496	1,845	1,512
Intermediate signals in CTC territory	1,453	483	967	956	852
Classification yards					
Car retarders	69	54	40	30	57
Power switch machines	254	247	165	156	304
Highway crossing protection					
Number of crossings at which new installations were made in year	1,320	1,146	1,362	1,491	1,435
TOTALS	8,755	5,779	6,967	8,610	8,144

CAR RETARDERS INSTALLED IN 1956

Railroad & Location	Retarders	Rail Feet of Retarder	Power Switches	Classification Tracks	Manufacturer
B&M					
Mechanicville, N.Y.	2	rebuilt			GRS
C&O					
Newport News, Va.	2	137	10	12	Union
CMStP&P					
St. Paul, Minn.	8	1,149	41	38	Union
GN					
Gavin Yard, N.D.	10	990	48	40	GRS
JCL					
Jersey City, N.J.	5	1,047	4	14	Union
Nat'l. of Mexico					
Valle de Mexico	19	1,320	47	48	GRS
NYC					
Buffalo, N.Y.	9	973	65	63	GRS
N&W					
Lamberts Point, Va.	7	539	20	18	GRS
Southern					
Hayne, S.C.	4	132	4	-	GRS
SP					
Eugene, Ore.	3	300	15	16	Union
TOTALS	69	6,587	254		

high-speed coding systems, enables interlocking consolidation heretofore considered to be impractical.

In the field of centralized traffic control, similar console-type machines have been developed. In one type, conventional control levers are used, double-stacked on the control console. The track diagram, double stacked on a separate track diagram board mounted in front of the console, displays the indications of field conditions. A sub-miniature track diagram is located directly above the control levers on the console for ready reference.

The latest type of control office equipment, called the traffic master system, is now being constructed for three major installations scheduled for completion in 1957. A separate track diagram board is also used with this system for displaying indications of field conditions, but the control console goes a step further in consolidation of controls. The console is kidney-shaped, and equipped with pushbuttons rather than conventional levers. A group of buttons are used for location selection, other buttons are for control of switches and signals.

On the separate track diagram, switches and signals at each location are numbered in arithmetical sequence beginning with 1. Thus, at all locations having one switch and associated signals, the number 1 is assigned. When more than one set of switches and signals is involved, the second set is numbered 2, the next is 3, and so on for as many as may be required.

On the console there is a location pushbutton for each location in the controlled territory. There are also on the console a number of pushbutton panels, each 2 in. by 7 in., numbered in sequence, beginning with 1. Distinctively colored switch and signal pushbuttons, on each of these panels, control the like numbered functions at any station previously selected by a location button. That is, panel 1 carries buttons for controlling all switches 1 and signals 1 in the system. Two buttons on each panel, one marked N (normal) and the other R (reverse) control switch open. Three buttons, E (east), W (west), and S (stop) provide signal control.

When the operator wishes to set up a route, he pushes the location button for the location desired. A miniature track diagram applicable to the selected location appears illuminated on an automatic display screen located on the console. Switch and signal numbers for the location are clearly indicated on the illuminated screen. The operator then presses the corresponding numbered switch and signal buttons to line up the desired route, and presses a code start button to send out controls. Transmission of the control cancels the location selection and the display on the automatic display screen is extinguished. Another location can then be selected by the operator. In the meantime, indications come in and are displayed on the separate track diagram to show the change in field conditions.

By thus combining the controls of duplicate location layouts, the dispatcher's panel can be very compact. With a separate track diagram, the length of territory and number of controlled locations no longer dictate the size of the control machine, and one-man operation of extensive installations is readily obtained.

AUTOMATIC BLOCK SIGNALING INSTALLED IN 1956

Railroad & Location	Miles of Road	Number of Signals	Manufacturer
B&M			
Worcester, Mass.-Garden Street	0.6d	2	GRS
Swampscott, Mass.		1	GRS
Wedgemere, Mass.-Winchester	1.0d	2	GRS
CN			
Dorval, P.Q.		1	Union
Capreol, Ont. - Yard	5.0s	5	Union
Sarnia, Ont. - Port Huron	1.3s	-	-
Blue River, B.C.-Kamloops, Jct.	137.8s	186	GRS
CP			
Pointe au Baril, Ont.-Rutter	40.4s	61	Union
Wetaskiwin, Alta.-Edmonton	42.3s	61	GRS
Douglas, Man.-Chater	4.0s	2	GRS
Raith, Ont.-Buda	15.2s	5	GRS
Portage La Prairie, Man.	3.6s	2	GRS
Pasqua, Sask.	1.7s	1	GRS
C&O			
Ronceverte, W.Va.-Alderson	12.3s	3	Union
C&NW			
Baraboo, Wis. - Elroy	48.0s	63	GRS
Lewiston, Minn.-Stockton	8.0s	6	GRS
CSS&SB			
System	5.2d	7	Union
DL&W			
E. Lancaster, N.Y.-Cheektowaga	3.9d	4	Union
Fargo, N.Y.-Lancaster	5.9d	6	Union
Scranton, Pa.-Elmhurst	9.3s	5	Union
L&NE			
Lansford, Pa.-Hauto	1.2s	4	GRS
NYC Tr			
Flushing Line			
Rawson St.-Maine	4.7d	138	Union
Rockaway Div.			
Liberty Ave.-No.Bridge	2.3d	69	GRS
Bridge - Rockaway Pen.	6.1d	72	Union
Culver Line			
North 18th - Church Ave.	0.2d	2	GRS
NYO&W			
Luzon, N.Y.-Liberty	10.2s	8	Union
N&W			
Matewan, W.Va.	0.9s	2	Union
NP			
Silver Bow, Mont.-Hackney		2	GRS
Coon Creek, Minn.		2	GRS
ON			
Bushnell, Ont.-Tomiko	20.0s	22	GRS
PRR			
Chatfield, Ohio - Carrothers	2.9d	4	Union
Southern			
MP R-0.5-6.0	5.5s	6	GRS
SP&S			
Dalles, Wash.-Avery	14.0s	18	GRS
T&P			
Lucas, La.-Texmo Jct.	112.3s	88	GRS
WM			
Sabillasville, Md.-Thurmont	7.0s	4	Union
TOTALS	500.0s 32.8d	864	

Selective Automatic Route Controls

In a system known as automatic electronic train identification, each train carries an inert tuned coil. As the train passes the wayside location the train-carried coil passes through the field of a wayside fixed coil. Using this equipment, the Chicago Transit Authority installed an automatic selective control of facing-point junction switches in a power interlocking thus dispensing with the services of a leverman. Such a system is being installed on the Flushing line of the New York City Transit Authority. Trains will automatically line up their own routes as they approach each interlocking. The identity of each train, as well as the occupancy of track routes, is to be transmitted to a "monitor" control machine for the entire area. Thus, quite possibly, one man can effectively have charge of several large and busy interlockings with a possible reduction in train delays that may now be caused by the time required to change routes in manually-controlled plants. For these same reasons, this or similar train identification systems for automatic control of switches and signals, may well be applied on some trunk lines in 1957.

Faster CTC Controls

One factor which contributes to the practicability of consolidating the control of interlockings, or extending the length of CTC controlled by one machine, is to develop a system that can handle numerous outgoing controls and incoming indications simultaneously, without interference, on one two-wire line circuit.

The double-track CTC installed in 1956 on the New York Central between Buffalo and Cleveland includes the new Syncroscan electronic system by means of which information on the control machine, concerning position of switches, aspects displayed by signals and locations of trains, is given by a continuous scanning of field stations, with a maximum delay of 4 seconds after a change. Controls are sent in 1½ seconds. Different frequencies of current are used so that controls and indications are transmitted simultaneously.

On the 1956 Burlington project of consolidating the control of 14 interlockings, carrier frequencies were used to a greater extent than previously in a system known as Quikode. Controls to any or all interlockings go out simultaneously in a maximum of 2.5 sec. and indications come in simultaneously in 1.26 seconds. For all practical purposes, this is as good as instantaneous circuits. Thus by using carrier systems, operations of line circuits has been eliminated as factor in limiting the length of a territory or number of switches and signals that can be controlled from one machine. Therefore hundreds of miles of main line including interlockings can be controlled from a single office.

Modified CTC for Light Traffic

In the years up to Jan. 1, 1957, centralized traffic control had been installed on about 15,000 miles of single track, most of which can be classed as heavy traffic territories. Therefore, most all of this CTC is of the conventional type, including power switch machines and complete arrangements of dispatcher-controlled signals at both ends of the sidings. Railroads should continue to install this complete system on heavy-traffic single-track lines at the rate of 1,000 to 2,000 miles annually. For example the Northern Pacific, in 1957, is to install CTC on 123 miles between Livingston and Helena, Mont. In addition, there is a demand for a modified form of CTC, on more than 30,000 miles of light traffic single track, that should be installed at the rate of upwards of 2,000 miles annually during the next decade.

As applying to these single-track lines handling lighter traffic, of 6 to 8 trains daily, the problem, as viewed by many railroads, is to modify the signaling to reduce the cost, so that CTC can be justified. Interest in this subject was renewed in 1956 by: (1) publicity by manufacturers; and (2) a Panel Discussion at the Annual Meeting of the Signal Section, AAR.

Back in 1945 the Wabash installed a system called manual-block, remote-control, including hand-throw stands on the passing track switches, and signals to authorize all train movements. This system on 210 miles of single track used exclusively by freight trains, has served its purpose well.

About five years ago the Burlington and the Canadian National made installations on complete sub-divisions, using a power switch at one end of each siding and a spring switch at the other. Reports indicated that this arrangement reduces the cost about 35 per

CENTRALIZED TRAFFIC CONTROL INSTALLED IN 1956

Railroad & Location	Miles of Road	Number of Power Switches	Lever-Controlled Signals	Intermediate Automatic Signals	Manufacturer
AT&SF					
Fresno, Calif.-Mormon	121.9s	36	104	100	Union
Dalton Jct. Tex-Saginaw	32.8s	6	20	14	Union
ACL					
Pyne Ga.-Shocco, Ala.	81.6s	18	58	36	Union
Walthourville, Ga-Jesup	3.0s	16	26	13	Union
B&LE	15.4d				
Filer, Pa.-No. Bessemer	31.3s	17	43	37	Union
	35.0d				
B&M					
Winchester, Mass.	1.0d	5	5	2	GRS
CN					
GTW					
Belsay, Mich.-Lapeer	10.4s	6	18	30	Union
Imlay City, Mich-Tappan	24.6s				
CP					
Edmonton, Alta.	2.0s	--	3	--	GRS
C&O					
Ronceverte, W.Va.-Alderson	12.3s	--	--	4	Union
Mt. Morris, Mich.-Grand Blank	14.9s	8	25	6	GRS
CB&Q					
Galesburg, Ill.-Waterman	3.0s	--	2	2	
Guernsey, Wyo.-Wendover	6.5s	--	2	6	
Chicago-LaVergne, Ill.	7.0t	70	107	30	GRS
CMStP&P					
Manilla, Ia.-Bouton	31.0s	8	37	60	Union
	36.0d				
Bensenville, Ill.-Elgin	18.0d	7	26	20	Union
Marion, Ia.-Indian Creek	2.0d	4	7	2	Union
D&H					
Albany, N.Y.-Maiden Lane	0.4d	8	8	--	GRS
Scranton, Pa.-Minooka Jct.	4.8s	4	6	2	GRS
D&RGW					
Lynn, Utah-Kyune	3.0d	1	13	6	GRS
E.Grand Jct. Colo.-W. Grand Jct.	2.0d	2	10	--	GRS
DT&I					
Flat Rock, Mich.-Allen Park	7.7s	--	7	1	Union
DM&IR					
Wolf, Minn.-Largo Jct.	2.9s	3	9	2	Union
Erie					
Newburgh Jct. N.Y.-Greycourt	7.4s	1	3	4	GRS
Newburgh Jct.-Moodna Cr.	9.7s	--	3	5	GRS
Akron, Ind.-Pershing	12.9s	4	10	6	Union
GN					
Schley, Minn.-Cass Lake	8.3s	--	3	--	GRS
Willmar, Minn.-Breckenridge	88.2s	40	88	121	GRS
	22.6d				
Williston, N.D.-Bainville, Mont.	40.1s	23	45	30	GRS
JCL					
Nesquehoning Jct. Pa-Whitehaven	20.0s	9	18	14	GRS
	3.0d				
KCS					
Blanchard, La.-Shreveport	6.0s	10	22	6	GRS
	3.7d				
L&N					
Corbin, Ky.-Loyall	63.8s	21	73	31	Union
Tunnel Hill, Ky.-Bowling Green	72.7s	18	62	40	GRS
MeC					
Pittsfield, Me.-Hermon Center	27.3s	6	22	10	GRS
MP					
Bald Knob, Ark.-Holland	39.0d	14	16	68	GRS
Chester, Ill.- Yards	--	1	2	--	GRS
Gale, Ill. - Yards	--	1	2	--	GRS
NYC					
Bay View, N.Y.-Nottingham Ohio	162.8d	169	225	201	GRS
P&LE					
Wylie, Pa.-E. California	21.8s	4	22	6	Union
N&W					
Phoebe, Va.-Appomattox	6.2s	2	5	2	Union
Falls Mills, Va.-Bluestone W.Va.	4.1d	4	4	10	Union
Clift Yd. W.Va.-Giatto	11.7s	2	7	4	Union
Roderfield, W.Va. Yover	--	4	4	--	Union
White, W.Va.-Matewan	1.3s	3	5	1	Union
Naugatuck, W.Va.	0.5d	2	4	--	Union
Star Yd., Ohio-OS Intrl.	3.6s	4	12	1	Union
"GS" Portsmouth, O.-"KM"	1.4d	20	22	1	Union
NP					
Logan, Mont.-Bozeman	26.0s	9	25	16	GRS
PRR					
Jamesburg, N.J.-Monmouth Jct.	5.2s	--	2	--	Union
York, Pa.-Loucks	1.3s	--	2	--	Union
Colsan, Ohio-Chatfield	10.8s	2	9	--	Union
E.Claire, O.-Loveland	15.2s-	--	8	--	Union
QNS&L					
Canatiche, Que.-New Siding in CTC		2	6	2	GRS
Ross Bay, Que.- " " " "		2	6	2	GRS
Cavanagh, Que.- " " " "		2	6	2	GRS
Six locations-New Power Switch		6	12	--	GRS
Reading					
Flat Rock Tunnel	0.4s	2	4	--	GRS
Reading, Pa.-Belt Jct.	2.3d	--	--	4	GRS
Pike St.-Blandon, Pa.	7.3s	1	3	2	GRS
StL-SF					
Blytheville, Ark.-Turrell	46.1s	4	24	20	Union
StL-SW					
Tyler, Tex.-Corsicana	74.0s	10	30	34	Union
Southern					
Greenville, S.C.-Armour, Ga.	62.2s	72	210	140	GRS
	90.4d				
SP					
Thermal, Calif.-Yuma, Ariz	113.9s	45	111	121	Union
	6.1d				
Hearne, Tex-Seger	3.6s	2	7	2	Union
UP					
Granger, Wyo.-Montpeiler, Ida.	108.0s	48	176	102	Union
	7.0d				
Pocatello, Ida.-McCammon	22.0d	9	28	36	Union
Wabash					
Salisbury, Mo.-Carrollton	44.8s	12	41	24	Union
Bement, Ill.-Lodge	13.1s	8	15	10	Union
	1.9d				
WM					
No. Branch, Md.-Maryland Jct.	5.4s	--	4	2	Union
TOTALS	1,329.4s	819	1,948	1,453	
	479.6d				
	7.0t				

cent at sidings, as compared with power switches and a full complement of signals at both ends. The most recent installation of this modified CTC on the Burlington is explained in an article in the December issue of this magazine. The CN project was discussed in an article in the issue of April, 1953. Three forms of CTC as used on the Seaboard were discussed in an article in the November issue of Railway Signaling & Communications. Thus, much has already been done to pioneer modified CTC.

Fewer Tracks With CTC

By using modern locomotives, trains are fewer and are operated at higher speed. Therefore, in some sections of multiple track, these trains can now be operated effectively on fewer tracks. According to AAR reports, the annual track maintenance expense, in 1954, averaged $2,802 per mile of main track; the maximum being $9,850 and the minimum $1,488. A good time to change to fewer tracks is when extended mileages of old rail is due for renewal. Capacity to operate present-day traffic without delays is secured by installing centralized traffic control on the remaining track or tracks.

Projects completed in 1956 or now underway, to remove one track of previous double track, include 40 miles on the Wabash; 80 miles on the Grand Trunk Western; 60 miles on the Bessemer & Lake Erie; 60 miles on the Louisville & Nashville; and 150 miles on the Southern. On various parts of the New York Cen-

NEW INTERLOCKINGS CONSTRUCTED IN 1956

Railroad & Location	Home Signals	Power Switches	Manu-facturer
ACL			
Bradenton, Fla.	2	1	Union
B&O			
Butler, Pa.	10	4	Union
Baltimore, Md.	4	2	GRS
CN			
Parkdale, Ont.	5	2	GRS
Sarnia, Ont.	5	3	GRS
C&O			
Frazier, W.Va.	6	-	Union
Walbridge, Ohio	7	5	Union
CMStP&P			
Rand, Minn.	7	4	Union
Cedar, Minn.	6	4	Union
Garden, Minn.	10	-	Union
CTA			
Chicago, Lake St.	4	4	Union
DL&W			
MP 132, Pa.	2	-	Union
Elmhurst, Pa.	5	3	Union
Scranton, Pa.	2	-	Union
Erie			
Croxton, N.J.	6	4	Union
Youngstown, Ohio	6	3	Union
GN			
Sioux City, Ia.	5	-	GRS
Minot, N.D.	10	6	GRS
Minot Yard	3	1	GRS
Edmonds, Wash.	6	2	GRS
JCL			
Dunnellen, N.J.	9	6	Union
L&N			
New Orleans, La.	15	7	GRS
Baxter, Ky.	5	2	GRS
Louisville, Ky.	7	5	GRS
Lebanon Jct., Ky.	6	6	GRS
NYC Tr			
Howard Beach	28	18	GRS
Rockaway Park	20	14	Union
Hammels Wye	20	8	Union
Ditmas Ave.	16	11	GRS
Liberty Jct.	21	19	GRS
NYNH&H			
New Haven, Conn.	65	38	Union
N&W			
Norton, Va.	3	2	Union
NP			
Pasco, Wash. Yard	8	4	GRS
Pasco, Wash.	20	20	GRS
PRR			
Bucyrus, O. "Benson"	3	1	Union
Bucyrus, O. "Holmes"	3	1	Union
E. Clare	3	1	Union
RF&P			
Potomac Yard, Va.	2	10	Union
Southern			
Sheffield, Ala.	11	4	GRS
Charlotte, Jct. N.C.	11	5	GRS
Anniston, Ala	4	2	GRS
Chattabooche, Gal.	6	4	GRS
AGS			
Wauhatchie, Tenn.	12	2	GRS
Woodward, Ala.	6	1	GRS
NOT			
New Orleans, La.	2	1	GRS
SP			
Mojave, Calif.	6	8	Union
TRRStL			
St. Louis	34	16	Union
TOTALS	457	266	

INTERLOCKINGS REBUILT IN 1956
EQUIPMENT ADDED

Railroad & Location	Home Signals	Power Switches	Manu-facturer
AT&SF			
Holliday, Kan.	1	2	Union
Lebo, Kan.	5	4	Union
B&O			
West Cumbo, W.Va.	10	--	GRS
Blaser, W.Va.	6	4	GRS
Piedmont, W. Va.	4	6	GRS
CN			
Coteau, Ont.	13	15	SGE
Sarnia, Ont.	5	5	GRS
C&O			
Alderson, W. Va.	--	6	Union
C&EI			
Yard Center, Ill.	10	8	Union
C&NW			
North Line, Wis.	5	3	GRS
Clinton, Ia.	19	--	GRS
Arion, Ia.	17	--	GRS
DL&W			
Paterson Jct. N.J.	6	5	Union
Bergen Tunnel, N.J.	14	12	Union
DT&I			
Detroit, Mich.	2	--	Union
Erie			
Kearny, N.J.	10	--	GRS
GN			
Allouez, Wis.	5	3	GRS
Surrey, N.D.	11	3	GRS
GM&O			
Brighton, Ill.	7	--	GRS
Louisiana Br. Ill.	2	--	GRS
LV			
Easton, Pa.	10	21	
Coxton, Pa.	17	19	
LI			
Hicksville, N.Y.	5	2	--
Mineola, N.Y.	5	4	--
Hall, N.Y.	6	6	Union
Jay, N.Y.	3	2	Union
L&N			
Rigolet Drawbridge	2	4	--
Pearl River Drawbridge	2	4	GRS
Elizabethtown	6	8	--
NYC			
P&LE			
"DU" Pittsburgh, Pa.	--	4	Union
NY City TR			
111th St. Flushing Line	50	36	Union
Maine St. Flushing Line	3	8	Union
Petkin Yard	13	9	GRS
Lefferts Ave.	8	7	GRS
Grand Central	1	3	Union
N&W			
Roanoke, Va.	8	5	Union
Devon, W.Va.	4	4	Union
PE			
Amoco, Calif.	8	--	Union
PRR			
Sunbury, Pa.	3	1	Union
Kiskiminetas Jct. Pa.	4	11	Union
Chatfield, Ohio	3	--	Union
Aynes, Ind.	1	1	Union
Ridgeville, Ind.	2	2	Union
PRSL			
Woodbury, N.J.	12	5	Union
Reading			
Phoenixville, Pa.	4	6	Union
TOTALS	332	248	

tral lines, including the sections previously known as the Michigan Central, Big Four and Boston & Albany, projects are authorized or proposed to change double track to single track on more than 1,000 miles. Various other roads are planning or considering such projects.

Also in 1956 the NYC completed a project including the removal of two tracks on 167 miles of four-track between Buffalo and Cleveland. Capacity to operate about 85 trains daily on two tracks has been secured by installing CTC with signals for train operation either way on each track. Power-operated crossovers, spaced an average of 7.3 miles, are used to divert trains from one track to the other, so that faster trains can run around slower ones.

An important advantage of such an installation as proved on other railroads such as the C&O, is that during certain hours, all trains can be operated on one track between any two crossover layouts—perhaps 7 to 10 miles—thus allowing "on track" power track maintenance equipment to be operated without interruption for a full working day.

As part of a 1956 overall project on 35 miles of three-track terminal territory between Chicago and Aurora, the Burlington installed CTC signaling for train movements in either direction on all three tracks. This territory handles 32 passenger trains, 66 suburban trains, about 24 through freights, and about 100 switching and transfer moves daily. The signaling and interlockings thus increase the track capacity so that construction of a fourth main track is not necessary.

Snow Melters

In areas where snow may interfere with operation of powerswitch machines, numerous railroads are installing snow melters or snow blowers on CTC territories. Some roads, such as the NYC and the B&LE are using electric snow melters, other roads such as the Boston & Maine and the Southern Pacific use gas-fired snow melters. Still other roads such as the Great Northern, are installing blowers, powered by air compressors, to blow the snow out of switches. All of these three types of snow melters or blowers are controlled remotely by the man in charge of the CTC machine.

Automation in Yards

By employing radar, automatic computers and other electronic devices, the power switches and retarders in modern gravity classification yards are being controlled automatically. Advantages of automatic control are: (1) less damage to lading and cars; (2) reduction in operating costs because no retarder operators, except one man as monitor, are required. In addition to four yards equipped previously, this automatic system was placed in service during 1956 in a yard on the Great Northern, and is being installed in new yards being constructed on the Frisco, New York Central and Missouri Pacific.

Using equipment from another manufacturer, the Union Pacific, 1956, applied automatic controls in a previously existing yard at North Platte, Neb. New features of this project are that the automatic switching is controlled by a unique machine in which ½-in. metal balls, rolling down through an arrangement of selectors, accomplish automatic control of the switches, whereas previous installations use relays for this purpose. Another feature in the UP yard is that the extent to which each classification track is occupied by cars is shown by a "track fullness" indicator and this factor is included in the operations of the computer which determines the speed at which a car is released from the last retarder in its route. Information concerning the fullness of each track is determined in two ways: (1) a stepper switch is advanced when each car is routed to its track; and (2) an electrical instrument, controlled by electrical circuits, indicates, in feet and in car-lengths, the distance from the clearance point on a yard track to the near end of the last car that was routed to this track.

New Computer Gives Answer Instantly

Equipment for yards now being built in Chicago by the Burlington and near Pittsburgh on the Pennsylvania, include new concepts with respect to automatic controls for retarders. Rather than requiring several seconds to operate, the new type electronic computers in this new system operate instantly to determine the speed at which the final retarder is to release a car. The new system, including the new instantaneous computers, will quite likely be used in yards proposed or under construction on the NC&StL at Atlanta; on the C&O at Russell, Ky., on the Santa Fe near Chicago, and on the P&LE at Youngstown. Also the new yards on the Burlington and Pennsylvania are to include "programmed switching" in which the switch list is punched in paper tape that is fed through a device to initiate the automatic switching control of the power switch machines that route the cars from the hump to their respective yard tracks.

New Crossing Protection Controls

New developments in the controls of automatic highway crossing protection, brought forth in 1956, dealt primarily with methods for preventing unnecessary delay to highway traffic when train movements over a crossing are not imminent. These controls cut out crossing signals and raise gates when trains stop after entering approach control sections, and place the protection in operation again when the train is ready to proceed toward the crossing again.

Because of the increased wage costs, the railroads in 1956 planned and installed numerous crossing protection projects including automatically controlled gates to replace watchmen or gatemen. Because of the improved protection provided by automatically con-

AUTOMATIC INTERLOCKINGS INSTALLED IN 1956

Railroad & Location	Home Signals	Manufacturer
AT&SF		
Erie, Kan.	3	Union
Osage City, Kan.	8	Union
ACL		
Talladega, Ala.	4	Union
Milldale, Fla.	4	Union
F & J Jct. Fla.	4	Union
Tifton, Ga.	4	Union
CN		
Petrel, Man.	4	GRS
Conquest, Sask.	4	GRS
Regina, Sask. MP 115	6	GRS
Regina, Sask. MP 91	4	GRS
Glenco, Ont.	4	--
CP		
Watson, Sask.	4	GRS
Young, Sask.	4	GRS
C&O		
Kewanna, Ind.	4	--
Thompsonville, Mich.	4	--
Michigan City, Ind.	6	--
C&EI		
Arthur, Ill.	4	--
Sullivan, Ill.	4	--
C&NW		
Elberon, Ia.	4	GRS
CB&Q		
Christopher, Ill.	6	--
Woodlawn, Ill.	6	--
CSS&SB		
E. Chicago, Ind.	6	Union
D&RGW		
Pueblo, Colo.	9	GRS
DSS&S		
Negaunee, Mich.	4	GRS
Erie		
Shohola, Pa.	4 2*	Union
Amasa, Pa.	5	Union
GM&O		
Jacksonville, Ill.	4	GRS
Maplesville, Ala.	4	GRS
IC		
Lincoln, Ill.	4	--
Tamaroa, Ill.	6	--
Coulterville, Ill.	6	--
L&N		
New Orleans, La.	6	--
Nashville, Ill.	4	--
NYC&StL		
So. Wanath, Ind.	3 1*	Union
NY City TR.		
Mott Ave.	4 4*	Union
149th St.	7 4*	Union
NP		
Breckenridge, Minn.	8 6*	GRS
PE		
Claremont, Calif.	5 2*	Union
PRR		
Kewanna, Ind.	4	Union
Hanna, Ind.	6	Union
Reed City, Mich.	4	Union
SAL		
Jacksonville, Fla.	7 3*	Union
Milldale Jct. Fla.	6	Union
Southern		
Chickasaw, Ala.	4	GRS
Tifton, Ga.	8	GRS
Stratton, Ga.	4	GRS
New Orleans, La.	4	GRS
Wabash		
New Paris, Ind.	4	Union
WP		
Stockton, Calif.	6	Union
San Francisco, Calif.	10	Union
TOTALS	269	

* Power Switches

trolled gates with flashing lights at the principal street crossings in a town, other previous crossings have been closed, for example as discussed in the article "Centralia Has Protection at All Crossings" in the April 1956 issue.

In signal construction work the trend is to reduce the amount of hard work involved, by using power driven pole-hole diggers, trench digging machines, and power derricks for lifting and setting all heavy objects, such as precast foundations, signal masts and instrument cases or housings. The wiring of instrument ,cases and houses is being done in the factory or in shops at central locations on large projects, thus producing uniformly good wiring, as well as saving much time that was previously lost in travel when cases were wired in place on the road. Where highways are available and local terrain permits, many railroads are using highway trucks for transporting light-weight materials and men on signal construction projects. Some of these trucks are equipped with "A" frames at the rear, and with power winches, so that cases, switch machines and other heavy equipment can be handled easily.

HIGHWAY-RAILROAD GRADE CROSSING PROTECTION INSTALLED IN 1956

Railroad	Number of Crossings Protected by New Installations: Crossings At Which Flashing-Light Signals Only Were Installed	Crossings Electrically Operated Gates and Flashing-Light Signals Were Installed	Source of Funds Based on Number of Crossings: Railroad	Public Funds (Any Source)	Joint Railroad and Public Funds
AT&SF	104	25	87	3	39
A&StAB	1	--	--	--	1
A&WP	1	1	--	--	2
ACL	31	13	11	1	32
B&O	19	4	9	2	12
BAR	5	--	--	--	5
B&LE	1	1	2	--	--
B&M	11	4	5	6	4
CN	71	12	5	6	72
CP	26	5	--	3	28
CofG	5	3	3	--	5
C&WC	1	1	--	1	1
C&O	25	3	4	--	24
C&EI	3	--	2	--	1
C&IM	2	--	--	2	--
C&NW	22	16	13	--	25
CB&Q	14	4	2	--	16
CGW	-	-	3	1	2
CMStP&P	35	3	6	--	32
CNS&M	--	8	2	--	6
CRI&P	23	4	15	--	11
CSS&SB	--	1	1	--	--
CTA	--	4	4	--	--
Clinchfield	1	--	--	--	1
C&S	2	--	--	--	2
D&H	2	17	19	--	--
DL&W	1	3	4	--	--
D&RGW	2	--	--	1	1
DT&I	1	1	--	1	1
DM&IR	1	1	--	--	2
DSS&A	1	--	--	--	1
EJ&E	2	1	1	1	1
Erie	1	14	14	--	1
FEC	5	20	14	2	9
Ft.W&D	2	--	2	--	--
Georgia	1	--	--	--	1
GN	17	12	11	1	17
GB&W	1	1	--	1	1
GM&O	12	4	4	2	10
IC	9	4	2	4	17
IT	3	1	--	--	4
JCL	3	11	13	--	1
KCS	15	--	4	1	10
K&IT	3	--	3	--	--
L&NE	2	--	2	--	
LV	5	--	2	3	
LI	2	9	11	--	
L&N	6	2	3	2	3
MeC	3	--	2	--	1
PT	2	--	1	--	1
M&StL	3	--	1	--	2
MP	42	4	19	2	25
Monon	3	--	2	--	1
NC&StL	1	--	1	--	--
NYC	32	11	22	6	15
P&LE	3	--	3	--	--
NYC&StL	16	3	15	1	3
NYNH&H	13	2	9	6	--
NYO&W	--	2	2	--	--
NS	2	--	--	1	1
N&W	17	4	14	--	7
NP	21	3	8	4	12
ONL	1	--	--	--	1
PE	16	--	1	9	6
PRR	24	18	21	8	13
PRSL	7	2	9	--	--
P&PU	5	--	--	--	5
QC	2	--	--	--	2
QNS&L	2	1	3	--	--
Reading	7	10	17	--	--
SAL	26	15	14	6	21
StL-SF	15	1	3	1	12
StLSW	8	--	1	--	7
Soo Line	6	4	3	--	7
Southern	22	11	10	--	23
SP	73	23	11	10	75
T&NO	19	1	15	--	5
SP&S	12	--	6	3	3
TRRStL	--	1	--	--	1
T&P	18	--	11	1	6
TP&W	6	--	--	--	6
TH&B	2	--	--	1	1
UP	24	3	14	1	12
Virginian	--	1	--	--	1
Wabash	4	1	3	1	1
WM	--	1	1	--	--
WP	7	--	1	--	6
WRyAla	4	1	--	--	5
TOTALS	984	336	526	105	688

SPRING SWITCHES INSTALLED IN 1956

Railroad	Number of Spring Switches Installed	Equipped With Facing-Point Lock	Numbers of Signals
AT&SF	6s	-	7
	1y		
B&O	1s	-	5
	1d		
CN	9s	-	28
	3y		
C&NW	3d	2	4
	1j		
CMStP&P	1y	-	1
CNS&M	1d	-	-
	1y		
CTA	2x	-	-
CSS&SB	1s	-	1
Clinchfield	1y	-	-
DT&I	1s	-	10
	3d		
	2y		
DM&IR	1d	1	2
DSS&A	1d	-	-
Erie	2s	3	10
	1d		
GN	4s	7	24
	2d		
	1y		
IC	5s	-	23
	6y		
JCL	2y	-	-
L&NE	1d	-	1
LV	1s	1	3
NYC			
P&LE	3d	3	9
N&W	4y	-	2
PE	2d	-	6
PRR	2s	2	4
StL-SF	1s	-	2
Soo Line	2s	2	6
Southern	8s	-	9
	4y		
	1j		
SP	14s	11	31
	1d		
	6y		
T&NO	6s	6	-
T&P	24s	-	68
UP	1s	1	8
	1d		
Wabash	2s	2	6
TOTALS	147	41	268

A trend which gained momentum in 1956 was to do away with so-called "outfit cars," including kitchen, dining, sleeping and tool cars, and, instead, to adopt one of̧ two practices:

1) Use highway trucks with crews headquartered at a central point on a territory of up to about 50 to 60 miles. If some or all of the men do not have their homes at the headquarter town, highway trailers are provided by the railroads as living quarters.

2) On new signaling projects extending over considerable mileage of 100 miles or more, establish construction headquarters in an empty roundhouse or other railroad building, where a headquarters crew does all the case wiring and other preparatory work, and road crews, using trucks and highway trailers, move their headquarters from place to place as the work progresses.

In conclusion, the signaling on railroads is never finished, but must be changed constantly, not only to secure the advantages of up-to-date equipment but also to install modern systems of signaling which will meet tomorrow's need for increased safety, more efficient utilization of locomotive cars and tracks, as well as reduced operating expenses. For these reasons the volume of signaling purchased by the railways will continue at a high level during 1957.