

Automatic Signals on the Pennsylvania

A Resume of the Automatic Block Signal Installations on This Railroad During 1912 and 1913

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During the years 1912-13 the Pennsylvania Railroad completed the installation of automatic signals on its main lines between New York and Pittsburgh and Philadelphia and Washington, except a section of 50 miles of the line between New York and Pittsburgh, the installation of which is well under way and will be completed during 1914. (Fig. 1 shows that

installed by the Pennsylvania, it was estimated that the cost of operation and maintenance will be much lower as the power for operating the signals, track circuits and signal lights is all

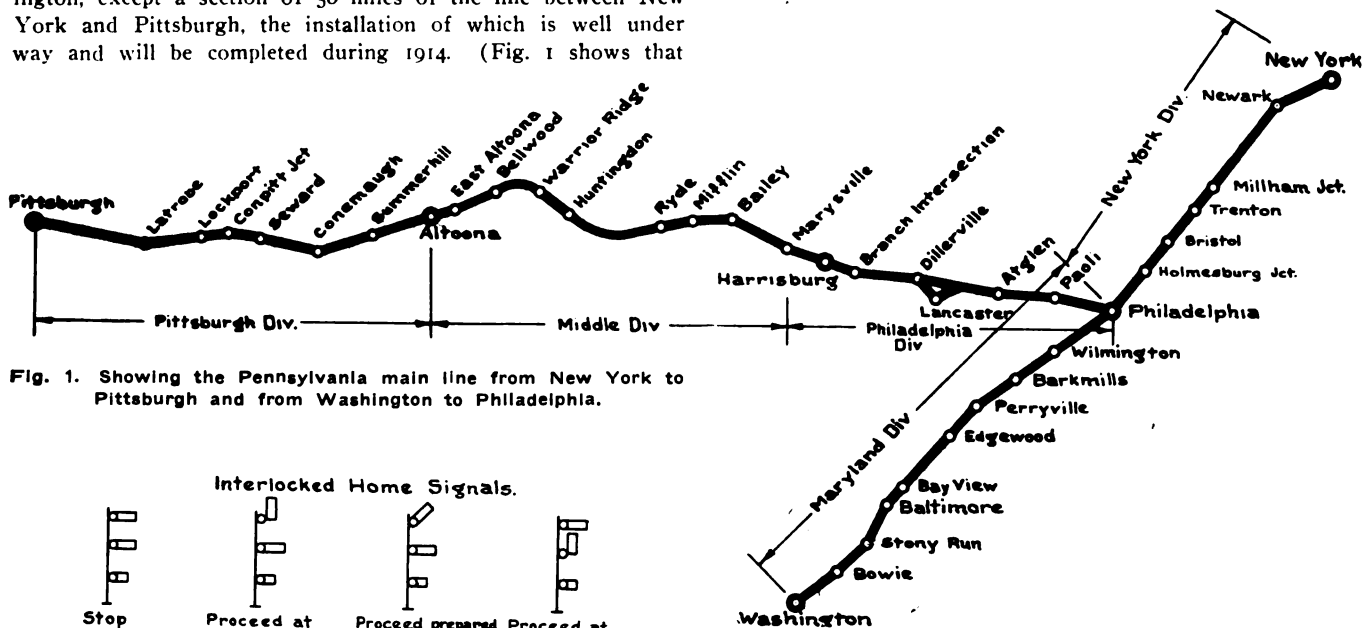


Fig. 1. Showing the Pennsylvania main line from New York to Pittsburgh and from Washington to Philadelphia.

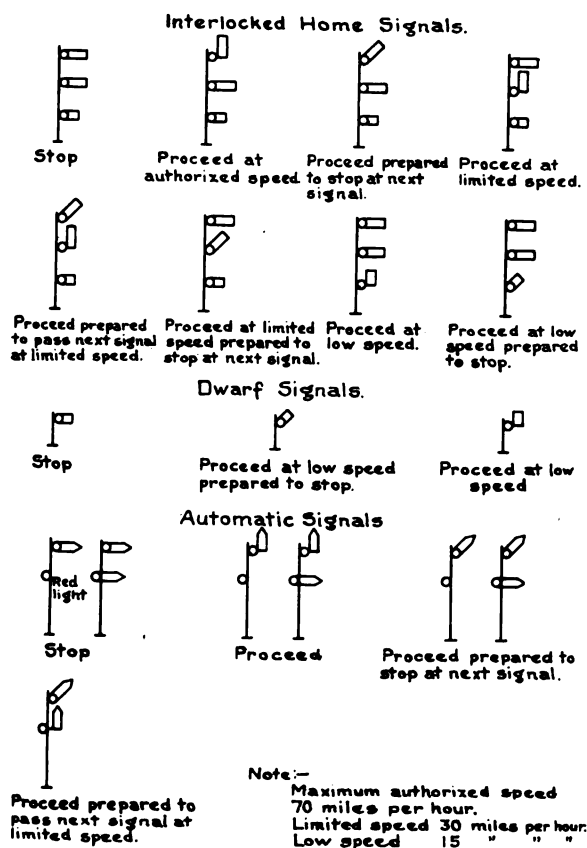


Fig. 2. Signal Aspects.

part of the Pennsylvania Railroad on which the signals were installed).

After a careful investigation of different systems of signals by the signal department, it was decided that alternating current would be the safest and most economical power to use for the operation of automatic signal systems. While the cost of installation of the system is higher than that of previous systems

obtained from the same power line. No signal batteries, track batteries or oil lights are required; and the service of battery-men and lampmen has been disposed of.

The signals installed are the Union Switch & Signal Com-

LOCATION	Call	Type of Machine	Working Levers	Spare Levers	Total Levers	Vane Relay Sections	Poly. Relay Sections	Trk. Layout Changes
Atglen	"NI"	Mechanical	32	12	44	10	8	None
Gap	"G"	Electro Mechanical	7 Mechanical 17 Electric	1	8	11	4	"
Leamon Place	"MA"	Mechanical	24	8	32	8	4	"
Bird-in-Hand	"NZ"	"	31	5	36	8	4	"
Conestoga	"ES"	"	21	7	28	5	3	"
Conestoga	"CG"	"	24	0	24	6	3	"
Landisville	"NV"	"	20	8	28	4	2	"
Rheems	"KU"	"	12	4	16	2	2	"
Branch Int's	"MB"	"	28	0	28	7	5	"
Highspire	"DF"	"	22	2	24	4	6	"
Dock St., Harrisburg	"DO"	Electro Mechanical	24 Mechanical 7 Electric	0	24	10	5	"
Marysville	"PR"	Mechanical	6	2	8	3	2	"

Fig. 3. Philadelphia Division Interlockings Revised.

pany's Style T-2; the automatic signals operated by alternating current induction motors at 110-volts and are held in the proceed

position by induction holding device. The interlocking signals are operated by low voltage direct current motors. The track relays in the automatic signal sections are the radial polyphase

railroad company's power plants located at convenient points.

All the interlockings in the automatic signal territory were changed to conform to the Pennsylvania standard speed signaling.

The interlocking home signals are of the three-arm type and the automatic signals of the one and two-arm types. Fig.

LOCATION	Call	Type of Machine	Working Levers	Spare Levers	Total Levers	Vane Relay Sections	Poly. Relay Sections	
Marysville.....	"NC"	Electro Mechanical	Mechanical 11 Electric 16	1	12	16	5	*
Duncannon.....	"JO"	"	Mechanical 9 Electric 13	3	12	8	4	*
Iroquois.....	"BD"	"	Mechanical 7 Electric 12	1	8	8	4	*
Newport.....	"MS"	"	Mechanical 7 Electric 11	1	8	8	4	*
Millerstown.....	"RK"	Mechanical	24	16	40	8	4	*
Van Dyke.....	"VE"	Electro Mechanical	Mechanical 6 Electric 10	2	8	8	4	New
Mifflin.....	"M"	"	Mechanical 11 Electric 18	1	12	10	4	*
Huntingdon.....	"HM"	Mechanical	29	11	40	9	2	
Petersburg.....	"PG"	"	38	14	52	8	4	
Spruce Creek.....	"SC"	"	20	12	32	10	6	
Union Furnace.....	"QY"	"	27	13	40	10	6	*
Tyrone.....	"FR"	"	33	11	44	9	5	*
Tyrone.....	"RM"	"	32	12	44	8	4	
Bellwood.....	"BQ"	Electro Mechanical	Mechanical 10 Electric 13	2	12	13	4	*
Bellwood.....	"DI"	Electro Pneu.	20	3	23	12	4	
East Altoona.....	"EF"	"	14	9	23	8	2	

*Indicates change in track layout.

Fig. 4. Middle Division Interlockings Revised for the Automatics.

type and in the interlocking sections are of the vane type. The tower indicators, electric locks and local relays are of the low-voltage direct current type. The power transmission line was placed underground. The power is generated at the



Fig. 6. A Signal Location on a Curve.

LOCATION	Call	Type of Machine	Working Levers	Spare Levers	Total Levers	Vane Relay Sections	Poly. Relay Sections	Galv. Relay Sections	
Iatrobe.....	"KR"	Mechanical Electro Pneu.	34 4	6 2	40 6	2	3	9	
Bradenville.....	"BV"	Mechanical	32	12	44	0	5	14	
Hillside.....	"HM"	Electro Mechanical	Mechanical 7 Electric 11	5 13	12 24	4	4	4	New
Blairsville Int's.....	"BH"	Mechanical	24	20	44	0	4	7	
Conpitt Jct.....	"JD"	Electro Pneu.	19	4	23	0	4	21	
Seward.....	"NR"	Mechanical	16	8	24	0	4	8	
Sang Hollow.....	"SQ"	"	8	8	16	0	3	2	
Sheridan.....	"SG"	"	45	7	52	0	4	13	
Bridge No. 6.....	"AO"	"	27	13	40	0	4	8	
South Fork.....	"SO"	Electro Mechanical	Mechanical 6 Electric 14	2 2	8 16	9	7	0	New

Fig. 5. Pittsburgh Division Interlockings Revised for the Automatics.

2 shows the signal aspects. All high and medium speed arms at interlockings were made semi-automatic. The bottom arm is three-position semi-automatic where it governs in the normal directions of traffic; it is also used as a calling-on arm to admit trains into an occupied block.

Approach and advance locking was installed at the interlockings and an electric indication was added to the interlocked switches to insure that the switch points and the lever operating them correspond in position.

The interlocking and automatic signal layout plans, the circuit plans, the locking and dog sheets and the material plans were all made by the signal engineer's force and the installation was made by the division forces under the directions of the division supervisor of signals.

On the Philadelphia division automatic signals were installed between Atglen and Marysville, a distance of 64 miles.



Fig. 7. A Four-track Signal Bridge.

From Atglen to Dillerville, 21.7 miles, the road is a four-track line operated for both passenger and freight. From Dillerville to Branch Intersection, 24.4 miles, the road is a two-track line used for passenger and high class freight, the slow freight being run over a low grade line between these points. From Branch Intersection to Harrisburg, 9.9 miles, the road is a four-track line for both passenger and freight. From Harrisburg to

LOCATION	Call	Type of Machine	Working Levers	Spare Levers	Total Levers	Vane Relay Sections	Poly. Relay Sections	
Eighth Ave., Wilmington.....	"WA"	Electro Mechanical	Mechanical 5 Electric 11	3 5	8 16	6	5	*
Shellpot Jet.....	"PJ"	Mechanical	24	12	36	3	3	*
Newark.....	"NY"	Electro Mechanical	Mechanical 8 Electric 19	4 5	12 24	9	6	*
Iron Hill.....	"SK"	Mechanical	11	9	20	2	3	
Elkton.....	"BJ"	"	6	2	8	1	3	
Elkton.....	"KI"	"	20	8	28	4	4	
Bacon Hill.....	"BC"	"	28	0	28	5	4	
North East.....	"NH"	"	23	5	28	6	5	
Principio.....	"PN"	"	24	4	28	3	5	
Perryville.....	"V"	Electric	30	5	35	19	4	
Susquehanna Draw.....		Mechanical	6	0	6	0	2	
Havre De Grace.....	"GC"	Electric	6	11	17	2	4	
Oakington.....	"GO"	Mechanical	19	10	29	2	4	
Perryman.....	"PY"	"	20	8	28	2	3	
Bush River.....	"BU"	Electro Mechanical	Mechanical 4 Electric 4	0 4	4 8	2	4	New
Edgewood.....	"DA"	Mechanical	19	1	20	4	5	
Magnolia.....	"M"	"	15	1	16	3	5	
Bengies.....	"MS"	"	17	3	20	0	4	
Fulton Jet.....	"FN"	"	32	0	32	5	7	*
Gwynns Run.....	"VN"	"	24	0	24	6	3	*
Louden Park.....	"SA"	"	21	19	40	2	5	
Winans.....	"NA"	"	12	4	16	0	6	
Stony Run.....	"SY"	"	5	3	8	1	3	
Severn.....	"SV"	"	15	9	24	1	4	
Odenton.....	"Z"	"	10	2	12	2	5	
Patuxent.....	"AU"	"	12	4	16	1	6	
Bowie.....	"P"	"	17	11	28	4	4	
Seabrook.....	"BO"	"	15	9	24	2	3	
Landover.....	"W"	"	23	1	24	8	4	*

*Indicates change in track layout.

Fig. 8. Maryland Division Interlocking Revised.

Marysville, 7.2 miles, the two main passenger tracks only were signaled. The interlockings between these points except those at the Harrisburg passenger station were revised and equipped with alternating current track circuits and power-operated home signals. This installation required 138 one-arm automatic signals, 43 two-arm automatic signals, 36 three-arm interlocked signals, 139 polyphase track relays and 78 vane track relays. A summary of the interlockings on the Philadelphia division which were revised is given in Fig. 3.

The Middle division installations were from Marysville to Mifflin, 40.29 miles of four-track line, and from Huntingdon to East Altoona, 28.3 miles—21.5 miles of four-track and 6.8 miles of three-track line. Controlled manual block was installed on the middle track of the three-track section over which traffic is run in both directions. This installation required 238 one-

arm automatic signals, 63 two-arm automatic signals, 68 three-arm interlocked signals, 64 dwarf signals, 298 polyphase track relays and 154 vane track relays. A summary of the interlockings on the Middle division which were installed or revised is given in Fig. 4.

The installation on the Pittsburgh division was from Summerhill to Latrobe, a distance of 48 miles of four-track road. Between Seward and Sonpitt Junction, a distance of seven miles, where traffic is dense and maximum speed maintained, the signals give three-block indication; i. e., a signal in the proceed position indicates three blocks are clear. The Pittsburgh division installation required 146 one-arm automatic signals, 62 two-arm automatic signals, 53 three-arm interlocked signals, 12 dwarf signals, 167 polyphase relays, 86 galvanometer relays and 15 vane relays. Of the signals in this section, 90 are of the

LOCATION	Call	Type of Machine	Working Levers	Spare Levers	Total Levers	Vane Relay Sections	Poly. Relay Sections	Galv. Relay Sections
Brunswick St., Jersey City.....	"RU"	Electro Pneu.	14	3	17	7	1	2
Fourth St., Harrison.....		Mechanical Electro Pneu.	1 2	0 0	1 2	2	0	0
Monmouth Jet.....	"MK"	Electro Mechanical	Mechanical 14 Electric 27	2 4	16 31	13	0	0
Monmouth St., Trenton.....	"DO"	"	Mechanical 22 Electric 28	6 28	28 56	20	1	0
Clinton St., Trenton.....	"D"	Electro Pneu.	6	0	6	5	1	0
Morrisville.....	"SV"	Mechanical	23	1	24	5	2	0
Cornwells.....	"CO"	"	25	7	32	9	0	0

*Indicates change in track layout.

Fig. 9. New York Division Interlockings Revised for Automatic Signals.

electro-pneumatic type. The ones operated automatically are controlled by alternating current magnets of the jaw type. A summary of the interlockings installed or revised on the Pittsburgh division is given in Fig. 5.

In Fig. 6 a five-track signal bridge located between two interlocking plants, on the Pittsburgh division, is shown. At this point there are four main tracks and one pull-out track from a yard. The signal on the right with two fish-tail blades is a distant to an interlocked home signal; it does not indicate the condition of the block in advance. Fig. 7 shows a four-track signal bridge; the two tracks on the left are signaled for three-block indication and the other two for two-block indication.

The Maryland division (P. B. & W. R. R.) was completely equipped with automatic signals from Wilmington, Del., to Washington, D. C., 97.8 miles, of which 57.2 is two-track, 22.8 three-track and 17.8 four-track road. Between Bowie and Washington the signals are of the three-block indication type. This installation required 167 one-arm automatic signals, 88 two-arm automatic signals, 81 three-arm interlocked signals, 21 dwarf signals, 298 polyphase track relays and 105 vane track relays. A summary of interlockings installed and revised on the Maryland division is given in Fig. 8.

On the New York division between Millham Junction and Holmesburg Junction, a distance of 22.8 miles, the signals were changed from electro-pneumatic lower-quadrant type to the new upper-quadrant type. This installation required 77 one-arm automatic signals, 22 two-arm automatic signals, 37 three-arm interlocked signals, 35 dwarf signals, 98 polyphase track relays, 61 vane track relays and 5 galvanometer relays. The interlockings in this section were revised. A summary of the interlockings is given in Fig. 9.