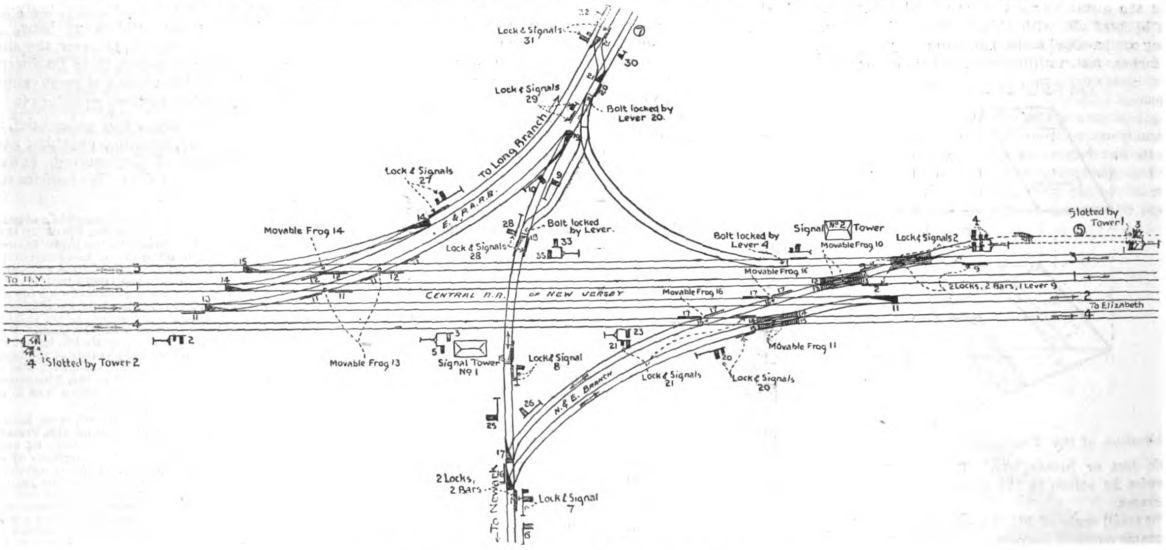
The Elizabethport Switch Signal Station.

The statement is frequently made that it is absolutely impossible for those in charge of a modern interlocking switch and signal plant, whether from carelessness, ignorance, or malice, to so arrange the switches and signals as to cause a collision. The purpose in the following description of the mechanical appliances employed in this arrangement, is to demonstrate the truthfulness of this statement; and we have selected the Elizabethport station on the New Jersey Central, recently put in by the Union Switch & Signal Co.



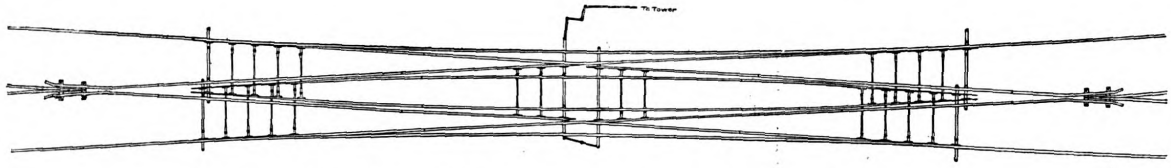
Elizabethport Switch Signal Station; General Plan.

At Elizabethport the Long Branch and Newark branches leave the main line. In addition there is one right angle crossing connecting the Newark and Long Branch lines and a curve connecting the main line with the Long Branch. A yard now being laid out further complicates matters. The main line has four tracks, the Long Branch two, and the Newark one.

All signals when in their normal position with the arms horizontal signify danger, and a train must not pass the signal until the arm is dropped at an angle of about 60°. This is the fundamental principle of the system, since the arm cannot be dropped to permit the train to approach unless the switches in that particular track are in their proper position. For instance, a through train on the main line approaching the Long Branch turnout from the east cannot be signalled properly if the switch is set for the Branch; neither will a train for the Branch receive its own signal to approach unless the switch is set for it. With the main line open, the signal for the Branch train cannot be displayed, neither can the latter be displayed until the turnout is open. It is not in the power of the operator to falsely signal trains, for the simple reason that the opening of a switch locks all signals in their danger position, except the one informing the engineer that that switch is open, and when that switch is closed its signal is locked in the normal position. The devices by means of which this is accomplished are extremely simple in construction, although the system as a whole appears confusing merely from the multiplicity of like parts,

The switches and locks are operated by levers in the tower through the medium of 1-in. gas pipe and bell-crank levers; the signals are set by a lever pulling a wire, and are returned to danger position by a back wire. All movements are performed by either a direct pull or push, no reliance whatever being placed upon either spring or gravity arrangements.

The levers in the two towers, the location of which is shown on the accompaning map of the tracks, are numbered to correspond with the switches and signals they control. The tracks are also numbered, the west-bound bearing even and the east-bound uneven numerals. Flagmen stationed beyond or outside of the system notify the operator by a bell code of the approach of a train, the track it is on and the track it is destined for. When the operator receives the signal 2.7, he knows the train is from the east on the main line and is going to Long Branch on track 7, he then sets the switches and signals accordingly. Should he fail to distinguish the taps distinctly, he can ask for their repetition or can refuse to do anything, when the train will be stopped by the danger position of the first red signal met.



Elizabethport Signal Station; Arrangement and Movement for Double Slip Point Switch.

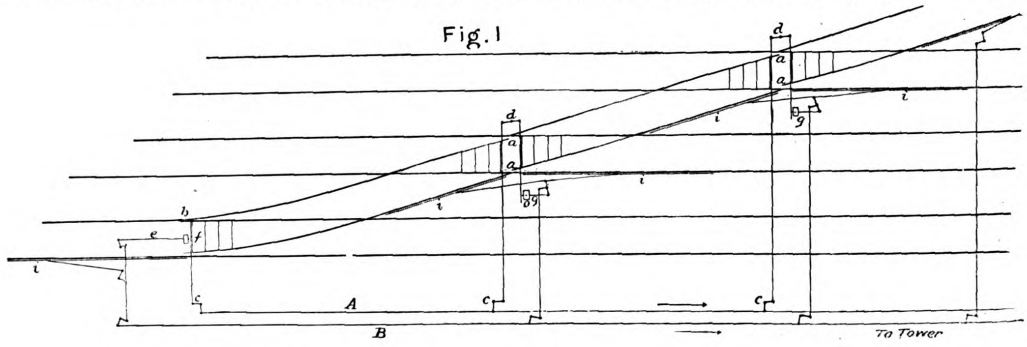


Fig. 1. Arrangement of Tracks. Long Branch Turnout.

To alter the position of the switches and signals, an unchangeable order must be followed. The switch is first shifted; then the detector bars and locks are moved (both by one lever); and finally the signals indicating the change in the track is dis-

played by pulling a third lever. To return the track to its original position this order is reversed, the signal being first brought to its normal or danger position. Should the operator pull off the signal and neglect to replace the switch, no harm

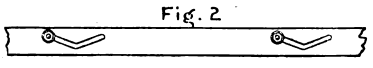


Fig. 2. Detector Bar.

could be done, as it would be impossible to drop any other signal except the one showing that the switch is open.

Fig. 1 shows one track of the Long Branch turnout and its connections. The movement of the rod *A* in the direction of the arrow will open the switch *b*, and the movable frogs *a a* through the bell crank levers *cc* and the cross bars *dd*. The movement of the rod *B* in the direction of its arrow will lock the switch by the rod *e*, connected with the front rod *f* of the switch, and will also lock the movable frogs by means of the bars *gg*, and will shift the detector bars *ii*. The detector bar, Fig. 2 is a flat piece of iron movably bolted to the outside of the rail adjoining the switch by bolts passing through angular slots. The top of the detector bar is flush with the top of the rail. It is apparent that, by reason of the form and position of the slots, the detector bar cannot be moved while a train is passing over the switch, and as the detector bar is longer than the distance between the trucks of the longest passenger car it cannot be moved between the wheels. As the rod *A* is locked by the movement of the rod *B* it is plain that the switch cannot be shifted during the passage of a train.

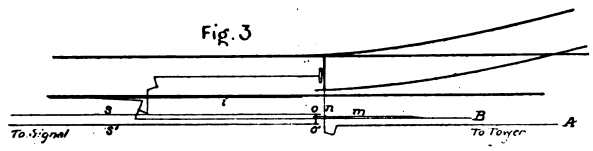
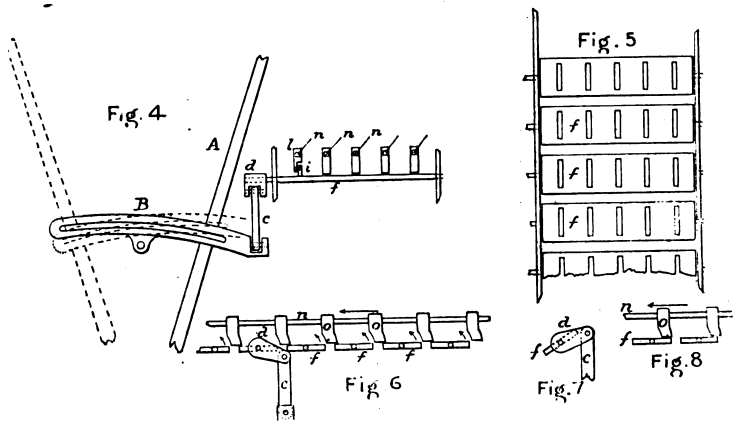


Fig. 3. Hook-Gear.

The hook gear, Fig. 3, serves to select the proper signal according to the position of the switch. The rod *A* operates the switch and the rod *B* locks the switch and moves the detector bar *i*. United to the rod *B* is the rod *m* which is joined near its free end to the switch rod *n* so that it will move as the switch is moved. The extremity of the rod *m* is formed into a loop adapted to engage either of hooks *o o'* on the signal rods *s s'*. As the switch is placed in the drawing, the movement of the rod *A* would, by the hook *o* entering the loop, display the signal indicating that the main line is clear. The opening of the switch would engage the loop with the hook *o'* when the signal for that route would be displayed.

The operating levers are divided nearly equally between two towers, one situated nearly opposite the depot and the other about 100 yds. west on the opposite side of the track. Here we find the interlocking apparatus by which one lever locks one, or several others. The most important details of the gear are shown in the drawing. A stud projecting from the lever enters the slot in the rocker link *B*, which is so mounted as to be rocked by the movement of the lever. One end of the link is prolonged a short distance beyond the slot and is formed with a recess to receive the lower end of a connecting rod *c*, whose upper end joins the pin of the crank *d*. The two joints of the connecting rod are universal. The crank is rigidly secured to the extended shaft of the so-called "flop" *f*, which is a rectangular casting formed with slots as shown in the plan view Fig. 5. The flops are journaled in a suitable frame. When the lever is moved to the position indicated by the dotted lines in Fig. 4, the crank *d* and its flop *f* will be in the position shown in Fig. 7. Upon that side of the flop which moves upward is a projection *i* engaging with a lug *l* on the driving rod *n*, the connection being so formed that the turning of the flop will move the locking bar *n* longitudinally. On the locking bars are bolted the dogs *o o* which of course move with it. When the dogs are in the position shown in Fig. 6 any of the levers can be thrown as the dogs will not interfere with the turning of the flops. But when the locking bars are removed so that the dogs rest directly over the upward moving sides of the flops, as in Fig. 8, the levers cannot be thrown as the flops are held by the dogs. The operation of the gear and purposes it serves are now evident. The dogs can be so adjusted that the throwing of one lever and the movement of its flops will lock any desired levers. The various combinations required by the switches, locks and signals can be easily secured.

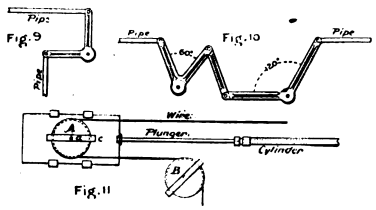


Figs. 4, 5, 6, 7, 8. Operating Levers, Etc.

On the main line each way from the towers are "home" and "distant" signals. The latter are only used for main line or straight running to aid fast running, and cannot be displayed unless the line is clear throughout. The home signals inform the engineer of the condition of the track. The distant signals must of necessity be operated from *both* towers, the lever in either one of which may be thrown first. The wire setting the distant signal passes through both towers and in each is connected with a lever. Neither lever alone will remove the signal owing to the slack in the wire which is taken up by the first lever moved, thereby allowing the second lever to do the work. This construction insures the safety of the track as far as both towers are concerned because the levers are locked by any open switches and the signal cannot then be displayed. It also prevents confusion and danger as either operator can hold the train should his part of the track not be ready.

In the right angle crossing, at each side of the main track, is a derailing switch designed to derail a train should it approach the crossing while the signals are at danger. Alongside of the main line at the crossing is a signal, working with the switch, which cannot be set clear unless the switch is closed.

In long lines of pipes, such as those here used, it is essential to provide means for taking up expansion and contraction. The compensator shown in Fig. 9 will do this when (and only when) it can be placed in the middle of the line. It consists of a right angle bell crank lever having arms of equal length, to the ends of which the pipe is joined. This device will only act as a compensator when arranged as shown in the drawing. A compensator or lazy jack which can be used in any part of the line is shown in Fig. 10. It is composed of two equal armed bell-cranks, one of 60° and the other of 120°. The adjoining arms are united by a connecting link while the pipe is joined to the other arms. Undue slack in the wires is taken up by turn-buckles in the towers. Expansion and contraction are compensated for by the device represented in Fig. 11. The wires pass around a nest of wheels *A* mounted on a common shaft held by a bracket *a* to the plate *c* which is free to move in guides. The wire then passes around a second nest of wheels *B* held in an immovable bracket. To the plate *c* is secured a plunger which passes through a stuffing box and enters a cylinder filled with petroleum or glycerine. The different rates of expansion and contraction of the wire line and the liquid act to counterbalance each other.



Figs. 9, 10, 11. Compensator.

The Chilian Railway Concession.

We are indebted to Col. S. H. LOCKETT, with Col. N. B. LORD, one of the commission on the part of the American syndicate to negotiate this concession, for the following notes on surrounding conditions and for an abstract of the terms of the concession itself :—

Col. LOCKETT says that after some time spent in ineffectual efforts with the Minister of Public Works, Col. LORD, the Chief of Commission, adopted the policy of dealing strictly with the President of the Republic, Senor BALMACEDA, with the results already made public. The President is described as a man of broad information, and strong character and possessing a quick, keen and clear insight into business matters. The negotiations progressed favorably from the beginning, but with annoying delays resulting from the closing events of a busy session of Congress, and particularly from the national holiday of Sept. 10—the Fourth of July of the Chilinos—which is as patriotically celebrated as is the corresponding event in North America. But as already announced, the contract was finally approved at an extra session of Congress on Oct. 19.

This contract is for the construction of all the lines of railway mentioned in the list published in ENG. NEWS of Nov. 10, except No. 3, namely, the line from Tomé to Cauquenes and Parral. The survey of this line was not yet completed, or rather a change in the line had made a new survey necessary. It will undoubtedly be included in the work to be done by the North and South America Construction Co, as will be in all probability several other projected lines, also several other important works of internal improvement contemplated by the Government. Of those, however more anon.

The principal points of the contract between the Chilian Government and the North and South American Construction Company are as follows: The construction of the ten lines of railroad com-