

The New Terminal, Jacksonville, Fla.

New Interlockings at Jacksonville Terminal

Developments in the Construction of a Large Electro-Pneumatic and Two Electro-Mechanical Plants With Inter-Connecting Circuits

By C. J. KELLOWAY

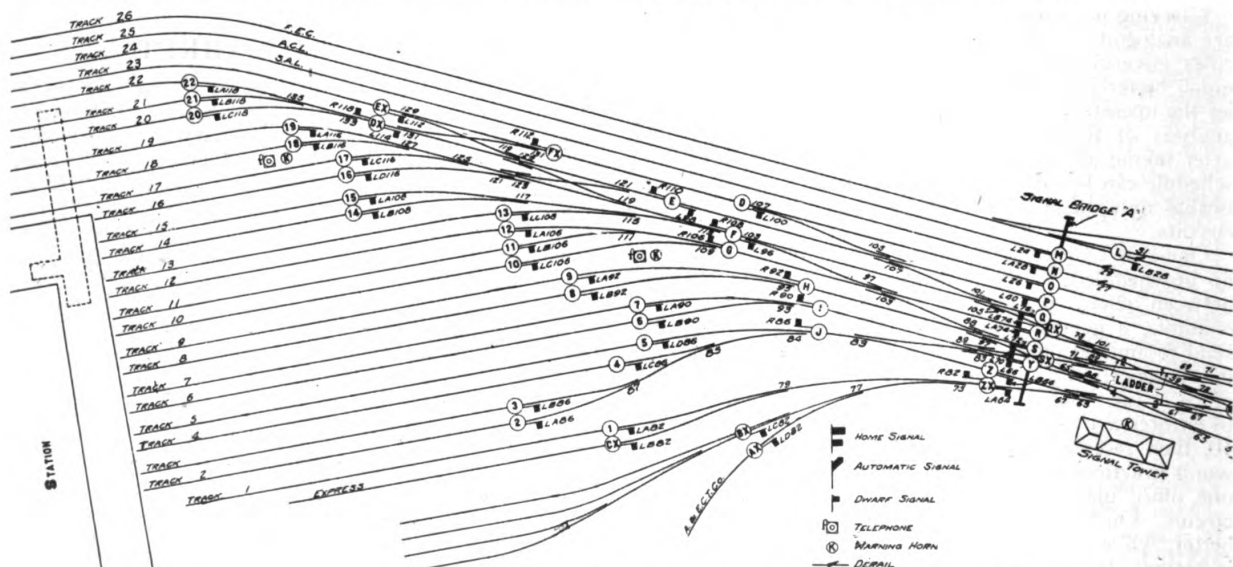
Signal Engineer, Jacksonville Terminal Company

THE location at Jacksonville with respect to the railroads in Florida is peculiar and comparable to the neck of the hour-glass, because all passenger traffic to and from Florida must pass through Jacksonville. The majority of the traffic handled at this terminal is between the hours of 8 and 10 a. m. and between 8 and 10 p. m., during which time it is one of the busiest places in the country. A greater amount of mail, baggage and express is handled at Jacksonville than at many other large terminals, all of which is transferred, except solid carload shipments of express. In the past 10 years the traffic has increased many times and was the heaviest in the history of the terminal during the past season, 1920-1921. On account of the new track and signal facilities it was handled with practically no delay, greater ease and less terminal engine-hours than ever before. The former layout was handled by switchmen on the ground and this resulted

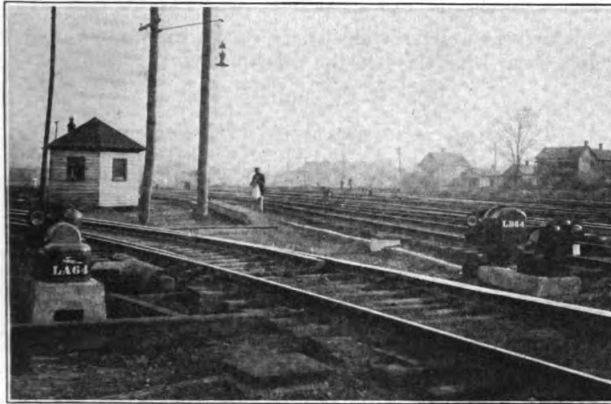
in numerous delays, it being impossible to handle the traffic with any degree of dispatch during the rush hours.

The Atlantic Coast Line, Southern and Georgia Southern & Florida operate to and from the north on tracks 28 and 29; the Seaboard Air Line operates to and from the north over track 27; the Atlantic Coast Line to and from South Florida on track 33; the Seaboard Air Line to and from South Florida over track 32; and the Florida East Coast trains operate over through tracks 17 to 22, inclusive. The majority of the trains from the north and those from South Florida (except Florida East Coast trains) which terminate at Jacksonville are handled on tracks 1 to 16, inclusive. Trains which are operated solid between the north and South Florida and those which are made up into through trains are generally handled on tracks 17 to 22, inclusive.

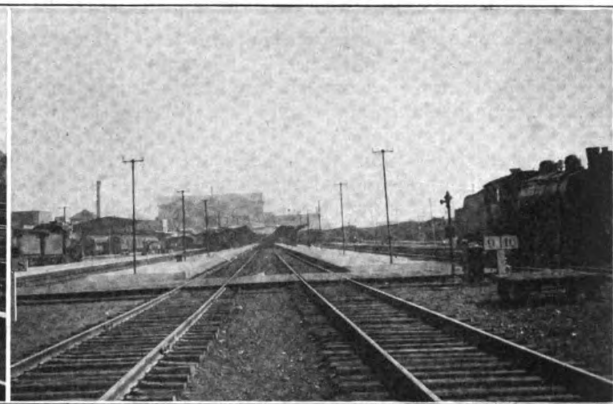
The signaling of the terminal consists of three interlocking plants, Tower A, Lee street, electro-mechanical;



Track and Signal Diagram, Tower B, Jacksonville Terminal Company, Showing the



Dwarf Signal Locations



View of the Yards

Tower B, Myrtle avenue, electro-pneumatic; and Tower C, Enterprise street, electro-mechanical. Tower B, Myrtle avenue, is the main interlocking, which controls all movements to and from the terminating tracks and over tracks 17 to 23, inclusive.

Interlocking Machine, Tower "B"

The interlocking machine is the Union Switch & Signal Company Model 14 and consists of the following levers:

- 39 levers for 97 signals.
72 levers for 43 switches, 21 derrails, 1 m.p.f. and
24 double-slips with m.p.f.'s.
7 levers for checking locking between towers 1
and 2.
1 lever for detector circuit release.
-
- 119 working levers.
9 spare levers.
7 spare spaces.
-
- 135 lever frame.

The machine is equipped with lever lights under both switch and signal levers. The light under a signal lever indicates whether or not the route lined up for a signal is clear, while the light under a switch lever indicates whether or not the track circuit or circuits which enter into the control of the initial movement of the switch lever are clear. Standard x and y springs and latch circuit controllers are used in connection with the section route locking.

The machine is enclosed in a steel case provided with panels which can be unlocked and removed to permit of easy access to contacts, magnets and the terminal board.

Switch Operation

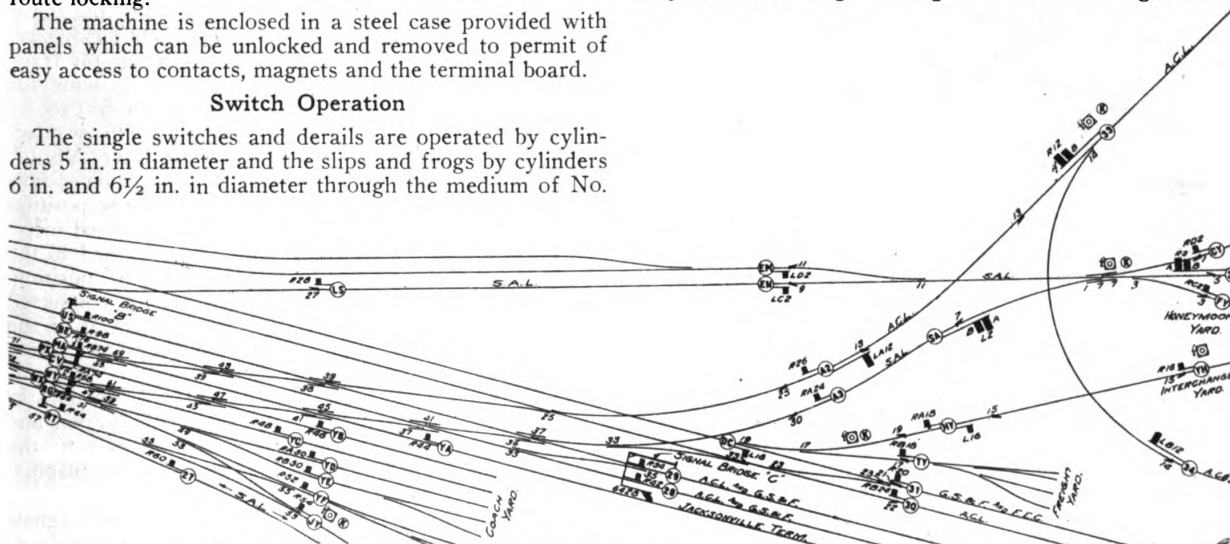
The single switches and derails are operated by cylinders 5 in. in diameter and the slips and frogs by cylinders 6 in. and 6½ in. in diameter through the medium of No.

18 universal switch and lock movements. The movement used for this purpose is similar to the No. 14 movement except that it has a different spacing between the crank and lock rod to permit the use of the same type of movement for both switches and lift-type derricks.

The switch valves are of the Style "C" cut-off type attached to the cylinder. When not in operation, pressure from the air line to the switch cylinder is entirely cut off, thus eliminating the loss of compressed air through the valves and operating cylinder piston of the switch operating mechanism. Automatic means are provided for restoring the switch and lock movement to the full normal or reverse locked positions if for any abnormal reason the switch movement should be dislodged from its extreme locked position. This automatic restoring feature is brought into play before the switch movement is operated sufficiently to unlock the switch. Polarized indication circuit controllers are provided on all switch movements for controlling the KR relays for the SS control of all signals. The switch fittings are in accordance with the recommendations of Committee II—Mechanical Interlocking (R. S. A.). Stiles flat type front rods and Type "C" adjustable rail braces are used.

Signal Operation

The signals used throughout are upper quadrant and consist mostly of dwarfs, either placed on the ground or suspended from signal bridges. The dwarf signals are



Tracks, Signals, Derails, Tower, Telephone and Warning Horns

3-position electro-pneumatic; the second, or 45 degree position, is non-automatic, and the third, or 90 degree position, is semi-automatic stick. The signal control is so arranged that the second position, or "Caution" indication, can be displayed at any time, regardless of whether the track is clear or not. The third position, or "Clear" indication, depends upon the track being unoccupied to the second signal ahead and the next signal in advance being at "Caution" or "Clear." The high signals are of the electro-pneumatic type with valves and cylinder at the base of the pole. The top arms of these signals have semi-automatic stick control, while the bottom arms are non-automatic.

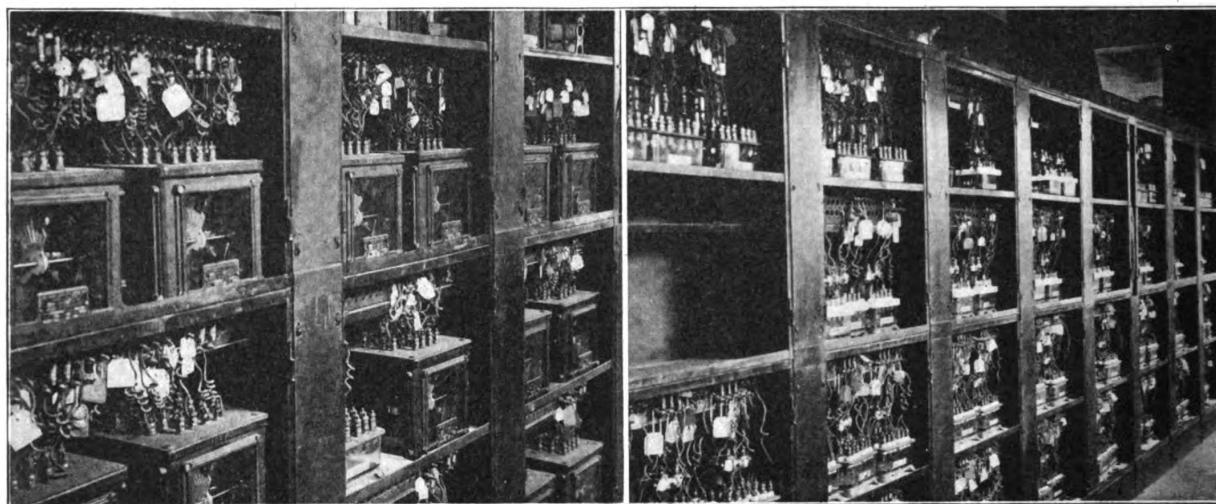
Track Model

The track model is of the spot light type, manufactured by the T. Geo. Stiles Company. It is 3 ft. 10 in. high, 11 ft. 10 in. long and 6 in. deep, of metallic and asbestos board construction. The rear of the frame is in the form

the wires from the terminal board to the relays, from the relays in one section to the relays in another section and from the relays to the machine.

Circuits

All track relays are a.c. Model 15, 2-element, 2-position type, manufactured by the U. S. & S. Co. All neutral and polarized relays are Style A-6 or A-15, manufactured by the United Electric Appliance Company. No. 16 wire in cable, is used for all relay leads on track relays within the home signal limits and No. 14 wire for those relay leads from the train shed, tracks 1 to 22. This small wire is run from the tower to a terminal box near the track circuit, from whence it is run to the rail as No. 9 wire. The three 3,000 ft. approach track circuits on tracks 27, 32 and 33 are operated by direct current to avoid running an alternating current supply out to the extremity of these circuits. Individual transformers with registers are located in relay boxes distributed at con-



Two Different Sections of the Relay Cabinet With the Doors Removed

of doors which permit access to the interior. Tracks, signals and switches, with their numbers, are painted on the front of the model and the track sections are shown by distinctive colors. The spot lights are 6 volt bayonet socket tungsten lamps with a special flattened globe, and are divided as follows:

- 83 spot lights repeating 83 track circuits.
- 23 spot lights for 23 train starting annunciators.
- 4 spot lights for 4 approach annunciators.
- 14 spot lights with 14 direction arrows on the 7 through tracks between Towers A and B.

The track section lights are frosted and the train starting and direction arrow lights are green. The model is mounted on 3 in. pipe supports behind and above the interlocking machine, which constitute the conduits for the wires leading to the model.

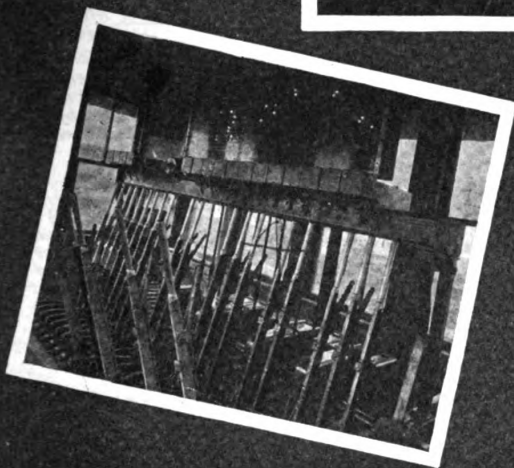
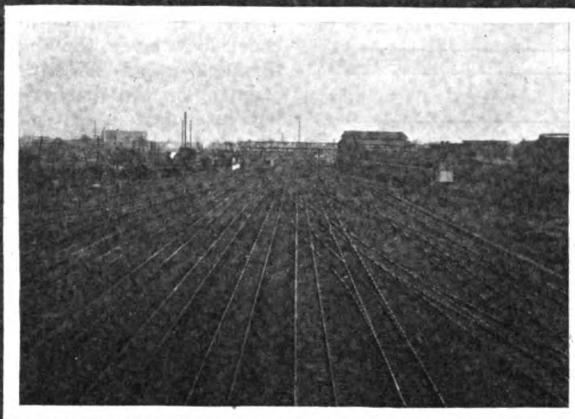
Relay Housing

All of the 83 a.c. track relays, in addition to route locking, repeating and train starting relays, are housed in a metal multiple-unit case with glass doors, located on the first floor of the tower directly underneath the interlocking machine. This case is built up of 52 sections, comprising 50 relay and 2 main terminal sections. These are placed in 2 rows, back to back, each row being 13 sections long and 2 sections high, each compartment holding 3 d.c. or 2 a.c. relays, or 213 terminals. A wire chase is provided between each 2 sections for running

venient points throughout the interlocking and are used for all track circuits.

Sectional route locking in combination with signal route locking is used; that is, the signal lock circuit is carried through the first track section ahead of the signal wherever possible in order to eliminate route locking relays. On account of using alternating current for track circuit energy, it was deemed necessary to provide for an emergency detector locking release for use in case of a failure of the alternating current supply. This was accomplished by the use of a master release lever, No. 62, in the following manner: In case of an a.c. power failure, the master release lever No. 62 is thrown to position "C," where it is necessary to wait a predetermined interval, governed by a mercury time release attached to the lever, before the lever can be placed in the "R" position. With the lever in the "R" position, battery is connected to the detector circuit of all switches just ahead of the latch circuit controllers. As many switches as desired may be thrown while the master lever is in the "R" position, but before indication can be received, the master release lever must be returned to the "N" position and battery will then flow through the "N" contact of the "KR" relay, "B" or "D" spring to the indication magnet. The signals can then be cleared.

The mechanical locking is so arranged that all signals must be placed at "Stop" before the master release lever can be reversed. This prevents the trains being operated



General View Tower B

Machine Tower A
Tower B

View of Approach

Electro-Pneumatic Machine

Machine Tower C
Dwarf Signal Locations

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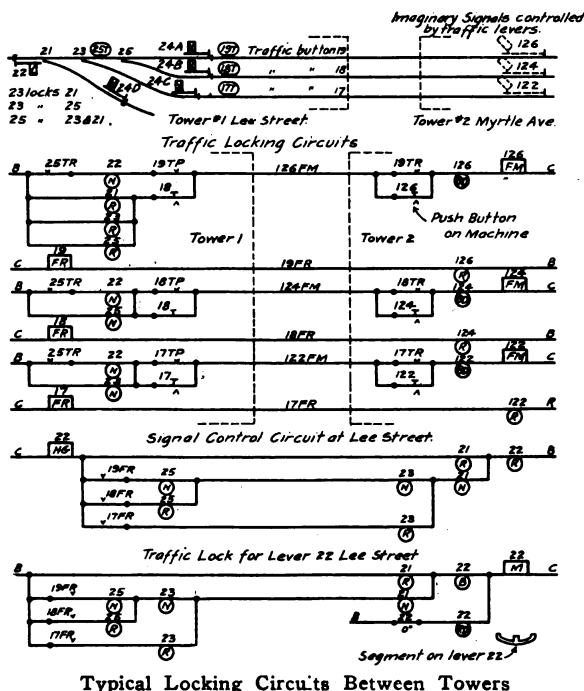
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over switches by signal indications when the switches are released. Where a signal lock circuit is carried over the first track circuit ahead of a signal, a special mechanical locking is provided which allows the master release lever No. 62 to be put to the "D" (reverse indication) position after the signal lever has been returned to the indication position. This "D" contact on the master release lever, bridges the relay contact of the track section ahead of the particular signal having the route locking and allows the

the respective relay for that track. The operation of the conductors' push button picks up the contacts of the particular relay for the track occupied by the train. This in turn illuminates the light on the track model and in the push button controller case, notifying the towerman that the train is ready to start, and the conductor that the tower has received his signal. These lights remain illuminated due to the relay being stuck up over its own contact and the starting signal lever contact until this signal has been reversed. The clearing of the signal automatically restores the train starting system to its normal condition for that particular track.

Locking Between Towers "A" and "B"

The locking between the towers is accomplished by the use of traffic levers at Tower "B," none being used at Tower "A." The arrangement is as follows: The traffic is normally set up for moves from Tower "B" to Tower "A." When a train desires to move from Tower "A" to Tower "B," the towerman at Tower "B" reverses the check-lock lever for the particular track involved and this picks up an "FR" (traffic) relay at Tower "A." The segment on the check-lock lever is cut so that the lever will be locked in either the normal or reversed position,



signal lever to be placed in the full normal position. This releases the master release lever held by the mechanical locking, which can now be thrown full reverse for the release of the switch detector circuit.

Seven Klaxon horns are located at various points and are controlled by push buttons located in certain lever-light spaces on the machine. These horns are blown either separately by individual push buttons or collectively by a master button, and are used for the signaling of trains and calling of repairmen or yardmen to the telephone and to the tower.

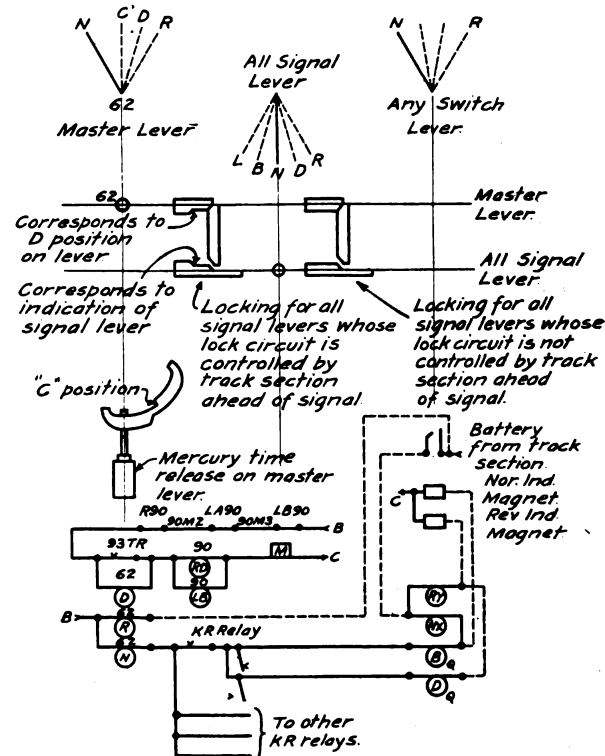
Six weather-proof telephones are located at convenient points throughout the interlocking and one desk phone is located in the leverman's room. Jacks for the connection of portable telephones are located back of the machine, in the relay cabinet and all instrument cases so that the maintainers and others can get into telephone communication with the tower.

All signals are lighted by $2\frac{1}{2}$ -watt, 12-volt bulbs, incased in cast iron lamps. Fifty-watt transformers are used and are capable of feeding 10 signal lamps.

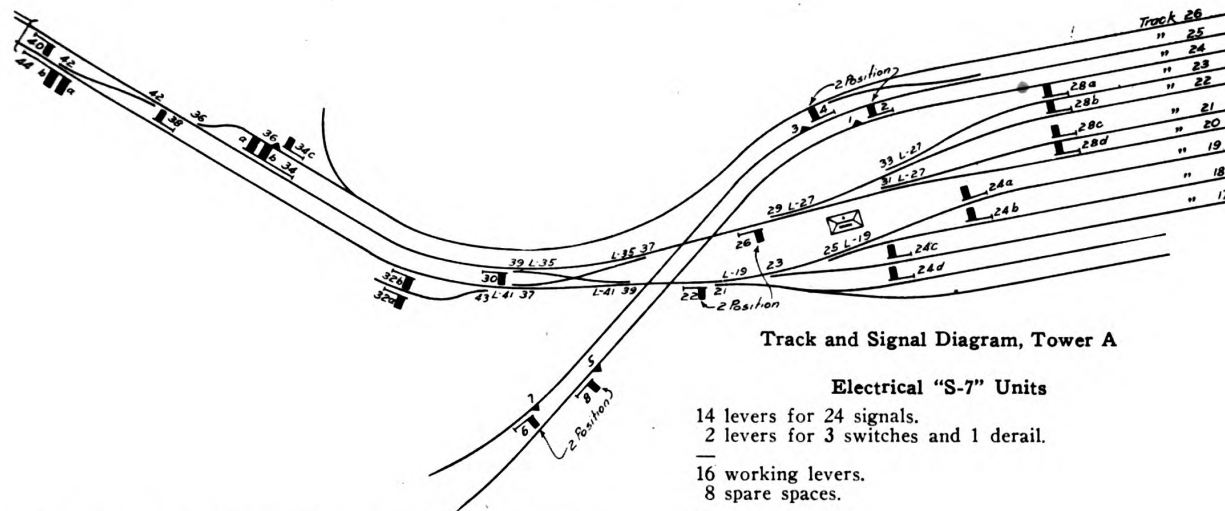
Train Starting

The conductors' push button circuit controllers are mounted on the end columns supporting the platform sheds of the terminating tracks and on the end and middle columns supporting the platform sheds of through tracks.

A relay is provided for each of the 23 tracks, these being normally de-energized. A light on the track model for each track and in the conductors' push button circuit controller case, is controlled over a front contact on



so that before the check-lock lever can be reversed, it is necessary that all track circuits be clear between signal 22 at Tower "A" and the outbound signals at Tower "B." The picking up of the "FR" relay closes the control contact for signal 22 at Tower "A," thus allowing it to clear and permit a train to move between Towers "A" and "B." As an extra precaution, the locking of signal lever 22 is controlled by this "FR" relay so that the lever cannot be reversed until the "FR" relay is energized. When movement is desired from Tower "B" to Tower "A," the towerman must get a release from Tower "A" before the check-lock lever can be placed normal. In



Track and Signal Diagram, Tower A

Electrical "S-7" Units

- 14 levers for 24 signals.
- 2 levers for 3 switches and 1 derail.
- 16 working levers.
- 8 spare spaces.
- 24 lever frame.

turn, this releases the signal governing that particular track.

Power House Apparatus

The power house apparatus consists of two motor compressors, two motor-generators and two sets of storage battery, all of which is located in one end of the building. Conduit is run from this apparatus to the switch-board and then through a chase in the floor to the relay rack.

Towers "A" and "C"

These interlockings are of the electro-mechanical type. Tower "A" governs movements from the Florida East Coast Railway into the terminal over the seven connecting tracks, numbers 17 to 23, inclusive; the machine scheme being as follows:

Mechanical

- 13 levers for 11 switches and 4 derails.
- 4 levers for 11 facing point locks.
- 17 working levers.
- 7 spare levers.
- 24 lever frame.

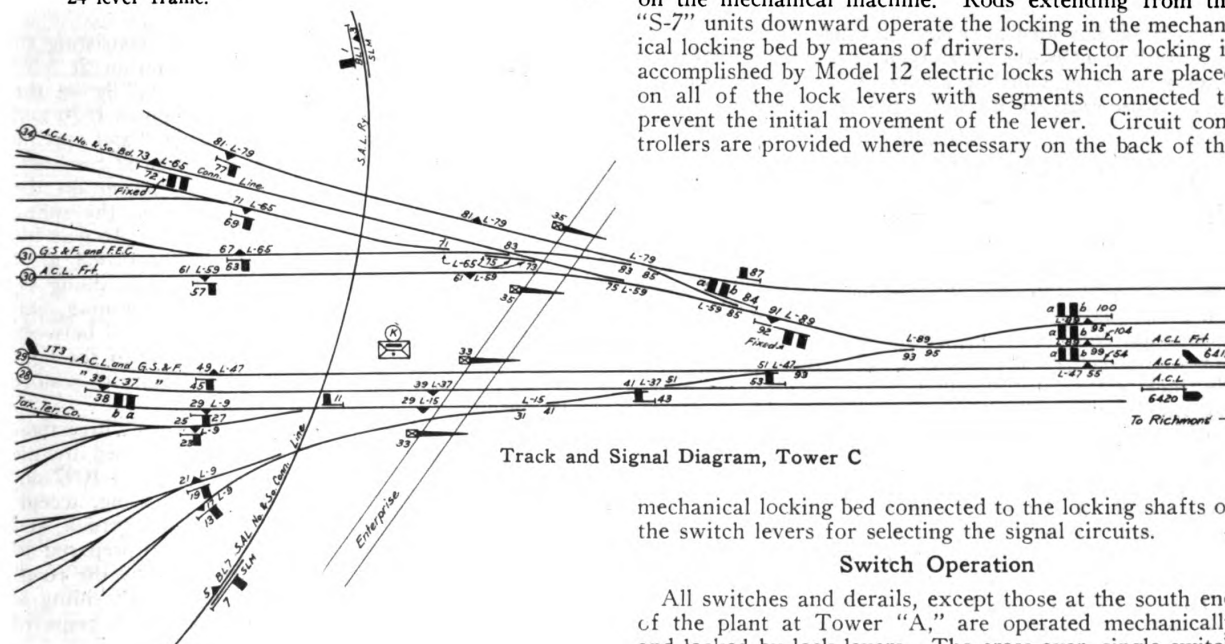
Mechanical

- 14 levers for 14 signals.
- 24 levers for 15 switches, 20 derails and 1 single slip with m.p.f.
- 8 levers for 36 facing point locks.
- 46 working levers.
- 6 spare levers.
- 52 lever frame.

Electrical

- 8 unites for 12 signals.

The electrical lever units at Towers "A" and "C" are of the U. S. & S. Co. "S-7" type, mounted on channel irons, supported by cast iron legs, which are mounted on the mechanical machine. Rods extending from the "S-7" units downward operate the locking in the mechanical locking bed by means of drivers. Detector locking is accomplished by Model 12 electric locks which are placed on all of the lock levers with segments connected to prevent the initial movement of the lever. Circuit controllers are provided where necessary on the back of the



Track and Signal Diagram, Tower C

mechanical locking bed connected to the locking shafts of the switch levers for selecting the signal circuits.

Switch Operation

All switches and derails, except those at the south end of the plant at Tower "A," are operated mechanically and locked by lock levers. The cross-over, single switch

and derail at the south end of the plant at Tower "A" are operated by air with the same style of movement as installed for the operation of the switches at the terminal. These switch and lock movements are controlled by the "S-7" units. The derails on the Seaboard Air Line at Tower "C" are operated by switch and lock movements with the signals bolt-locked through the derail.

Signal Operation

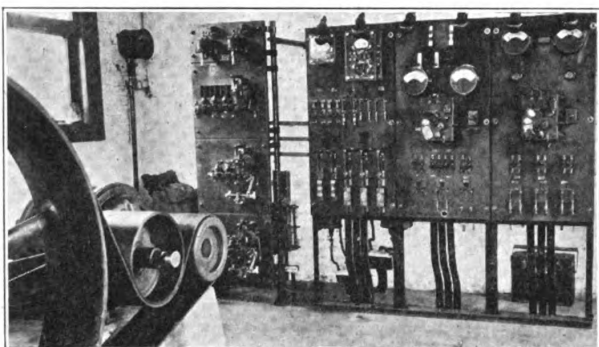
All dwarf signals at Tower "A" are of the electro-pneumatic type, both two and three position being used, and are controlled by the "S-7" units. All of the dwarf signals at Tower "C" are mechanically pipe-connected. All high signals are of the low voltage Style "S" type, with double cases for housing the relays and transformers.

Track Model

The track model at Tower "A" is of the same type and manufacture as used at the terminal and repeats the following:

- 1 approach indication.
- 10 track circuits within the home signal limits.
- 7 track circuits for through track 7 to 23, inclusive.
- 14 direction arrow lights indicating in which direction traffic between Towers "A" and "B" is set up.

At Tower "C" a track model is not used, tower indi-



Power Switchboard Apparatus

cators being provided to repeat the track circuits. All relays are housed in the same type of metal multiple unit cases as those provided at Tower "B." A main terminal board is provided for terminating all outside wires.

Circuits

Detector locking is provided for the mechanically operated switches through the medium of an electric lock placed on each lock lever. For the electro-pneumatic switches at Tower "A" this detector locking is accomplished by locking a switch lever, which controls the operation of the switch in the same manner as is done at Tower "B." Approach locking is provided and is effective after a train has entered the approach section. Route locking is accomplished by carrying the signal lock circuit over the track relays controlled by the sections ahead of a signal, thus preventing the operation of any switch levers until the signal levers have been released. Track circuit release in case of a.c. power failure is accomplished by means of a clock-work time-release, which shunts around the contacts on the track relays. Plunger circuit controllers are provided for all facing main line switches and derails at Tower "C," the signal circuits being completed through these controllers.

The signal towers are of the Mission style of architecture, which is carried out in the walls, which are faced with rough texture pressed brick, rake joint with mortar

to match the cornice projections, which are covered with Spanish tile. The foundations are of concrete, the floors are of reinforced concrete, those in the operating rooms being covered with wood finish. The roofs are reinforced concrete, with built-up roof finish.

The building of the terminal and the rearrangement of the yard was commenced early in 1917 and completed in November, 1920. The signal construction work was started in March, 1919, and consumed about one year. The signal work was designed and installed under the general supervision of C. J. Kelloway, signal engineer, of the Jacksonville Terminal Company, and the direct supervision of the construction was handled by C. G. McCaulley, engineer of construction.

ACCIDENT NEAR SUNBURY, PA.

A REAR end collision occurred between a freight train and two light engines on the Pennsylvania Railroad near Sunbury, Pa., on October 7, 1921, which caused the death of one employee and the injury of two others. The accident occurred on the Williamsport division, this territory consisting of a double track line over which trains are operated by time table, train orders and an automatic block system. The accident occurred $\frac{3}{4}$ mi. west of Sunbury, within the yard limit and on a track known as the middle siding; this siding extends between DY and P block offices, a distance of about 2,600 ft., and it is located between the two main tracks.

An eastbound two-arm interlocking signal is located about 400 ft. west of DY block station. The upper arm of this signal is fixed, while the lower arm in its 45-degree position governs movements to all routes and the 90-degree position gives the distant indication for an eastbound automatic signal located approximately 700 ft. east of the block station. This automatic signal is of the position-light type and governs the eastbound train movements over the eastbound main track in the block extending to P block station. When this block is clear, the signal displays a caution or permissive indication, but when occupied the indication is "stop and proceed." Eastbound trains entering the middle siding receive no switch or signal indication other than the all-route home interlocking signal. The weather was very foggy and the accident occurred at 5:40 a. m.

The eastbound freight train extra 994, consisting of 51 cars and caboose, passed DY block station at 5:22 a. m., entered the siding and stopped. While on the siding its rear end was struck by light engines 1676 and 1097, which were coupled, both headed west and moving backwards, en route to the passenger station at Sunbury.

The operator on duty at DY block station on the morning of the accident lined the switch at the siding just before the arrival of the freight train. It was his duty to return the switch and signals to normal after the freight train entered the siding; instead of doing so, he was occupied for a few minutes in telephoning, and although a period of five or six minutes ensued between the time he finished this duty and the arrival of the light engines, which afforded him ample opportunity to restore the switch to normal, he failed to do so.

The Interstate Commerce Commission in its investigation of the accident, stated that it was caused by the engineman in charge of light engines 1676 and 1097 not knowing on what track the engines were moving, accepting the signal indication displayed for another track, and failing to operate his engine on the siding prepared to stop within his range of vision as required by the rules. Had the operator restored the west switch of siding to normal position after extra 994 had passed, as required by rules, the accident would have been prevented.