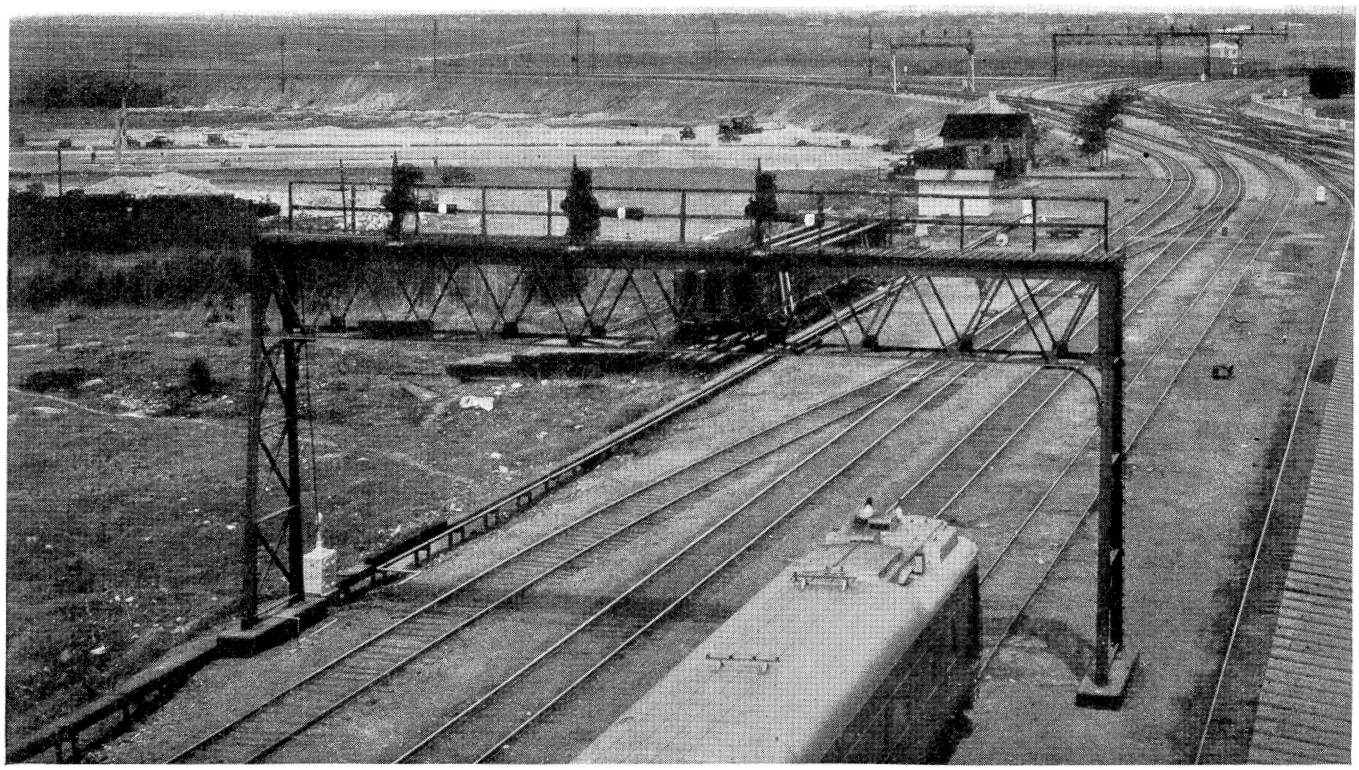
Reconstruction of Interlocking



Relocation of tracks throughout throat at north end of station necessitates such extensive reconstruction as to be equivalent of new plant

IN ORDER to make room for the approaches to a $1,000,000 underpass, constructed by the city of Dallas, Tex., where three thoroughfares converge near the passenger station, it was necessary to relocate practically the entire north end of the Dallas Union Terminal track and signal facilities at corresponding points approximately 100 ft. west of the former layout. This included moving and rearranging all tracks and the interlocking plant which serves the north end of the station. Only the tower remains in the old location, the reconstruction of the tracks and signals involving new air lines and wiring distribution being so extensive as to represent practically a new interlocking. The grade separation now involves Commerce, Elm and Main streets on the east, these three merging to form one wide thoroughfare on the west side of the tracks. The work was performed under the direction of the state highway department as a part of the main project, which was financed by federal, state and city unemployment relief funds.

The original electro-pneumatic interlocking was installed in 1916. It served all passenger trains entering or leaving the north end of the Union station and also through freight traffic of four trunk line railroad connections from the north and west. By means of traffic locking, this interlocking was connected with another plant which serves the south end of the station. The new layout follows the same general scheme, except that several new crossovers, additional tracks and switching signals have been added, making the interlocking more flexible.

At the north end of the plant, there are three separate approaches —namely, that connecting with the Chicago, Rock Island & Gulf for the use of trains of that road, the Ft. Worth & Denver City, freight trains of the St. Louis-San Francisco and passenger trains of the

at the Dallas Union Terminal

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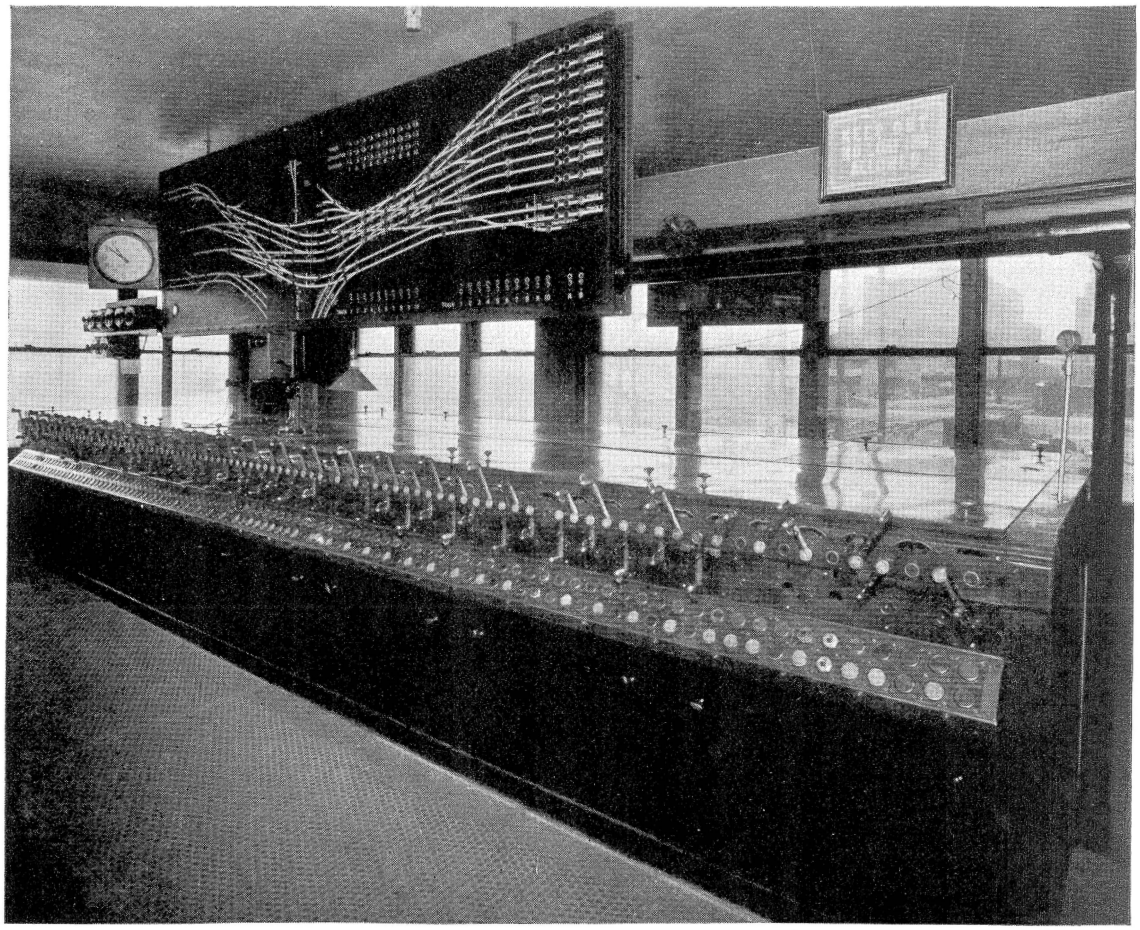
Texas & New Orleans; a connection with the St. Louis Southwestern; and a connection with the Missouri-Kansas-Texas. A fourth approach, almost in the middle of the layout, is provided for the Texas & Pacific to the west for use of the trains of that road and passenger trains of the Gulf, Colorado & Santa Fe. In addition to these connections, the old main line of the Texas & Pacific, now used as an industrial track, crosses the plant almost in the center. Ten station tracks, 1 storage track and 2 freight mains extend southward, all of which connect up with the plant located south of the station, with the exception of the storage track.

The switches and signals governing the north end of the 10 station tracks, storage tracks, through freight mains, the north throat of the terminal, and the connections to the north and west are included in the new layout, and are controlled from the interlocking machine located in the original tower at North Junction.

Interlocking Facilities

The interlocking is the Union Switch & Signal Company's electro-pneumatic type, the control machine having a 103-lever frame, using 91 working levers. The present arrangement of signals and interlocking equipment consists of 65 signals, 50 single switches, 15 double slips, 1 single slip, 2 derails and 2 levers for traffic. Included in the plant are 20 semaphore bridge signals, 13 color-light bridge signals, 3 color-light ground high signals, 5 color-light dwarf signals, 3 semaphore ground high signals and 21 semaphore dwarf signals. The color-light bridge signals and the color-light ground high signals are of the General Railway Signal Company Type-D, having 8⅜-in. lenses and using 8-volt, 18-watt lamps. The color-light dwarf signals are of the Union Style N-2 and G.R.S. Type-F. The bridge signals require two 2-track signal bridges, two 3-track bridges, one 4-track bridge, one 6-track bridge and one 7-track bridge. A total of 101 additional new relays, including d-c. and a-c. types, were used on the new layout. A complete train-starting system with necessary indicators, push buttons, etc., for use



Left — Looking north from the station toward the tower and the new highway underpass

Right—The new track layout is shown by the illuminated diagram above the machine

by conductors, gatemen and the train director is also a part of the signal system.

Track Circuits

The 87 track circuits within the plant area are operated by alternating current, the transformers and relays all being housed in metal instrument cases conveniently located in the field. The new track relays are Union Model-15 vane relays, and the new transformers are the Style W-10. Most of the old relays, which were reused, are of the single-element vane type.

On account of the numerous slip-switch layouts, principally in the throat, and so many diagonal crossings, single-rail track circuits are used in these areas, but double-rail track circuits are used wherever possible. The rail joints are bonded with two 42-in., No. 8 Copperweld bond wires with ⅜-in. duplex channel pins. Cast-steel bootlegs furnished by the Western Railroad Supply Company are used. The track cable is single-conductor, No. 9 stranded parkway, having oil-base compound insulation, steel-band armor and jute finish, furnished by the General Electric Company. Connections to the rail are made by extending this braided conductor through a fibre bushing, placed in the side of the bootleg top, out to the rail where it is connected to the rail with a Raco rail terminal. The end of the cable inside the bootleg is properly sealed with compound. Insulated rail joints are the four-bolt continuous type for 90-lb. or 110-lb. rail.

Power Supply and Cables

The a-c. power is furnished by the power house of the Terminal Company, located south of the Union Station. The power is transmitted at 2,300 volts, three-phase, to a bank of three 7½-kv.a. transformers located in a transformer room adjoining the main tower. The 2,300-volt power cable consists of a three-conductor, No. 6 lead-covered cable furnished by the Hazard division of the Okonite Company. This cable is run in 3-in. fibre duct in concrete, except where it passes through the steel structure over the underpass; here it is in 3-in. steel conduit which terminates in a manhole at each end of the structure. The a-c. power for feeding the track circuits and signal lights is distributed over the plant at 220 volts, using a six-conductor steel-taped parkway cable. Two conductors in this cable are used for the 12-volt d-c. supply. One 10-conductor cable carrying the telephone, telautograph and clock circuits extending from the station to the tower is lead-covered, steel-taped parkway made up according to A.A.R. specifications by the Okonite Company, while all other parkway cable used is General Electric railway signal cable with oil-base compound, steel-band armor and jute finish.

The parkway cable was placed in sand-bottom trenches 30 in. in depth. The cables were laid side by side in the trenches and so arranged that at no place does one cable cross over in contact with another. Cables ranging in size from 10 to 37 conductor are used from the tower to the instrument cases. Smaller cables extend from the cases to switch machines, signals, etc. Approximately 800,000 conductor-feet of new parkway cable was installed during the recent reconstruction program.

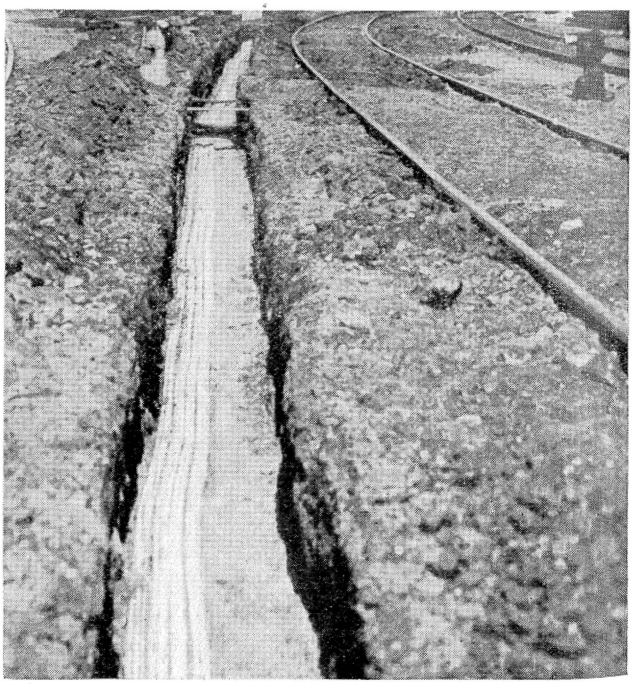
The 12-volt d-c. power for the switch-repeater and track-repeater relays and the lock magnets is furnished by two storage batteries, each set consisting of eight Type-A6H Edison storage cells. Each set is on floating charge by a Union copper-oxide rectifier. A four-pole, make-before-break, double-throw knife switch, located on the main power control board is used to cut-in either set of battery or the two sets in multiple, if necessary. A fully equipped power board is located on the first floor of the tower with convenient switches for necessary cut-overs, cycle charging, lights, etc.

The two fireproof relay racks are located on the first floor of the tower. These are 24 ft. long and 10 ft. high; an aisle 3 ft. wide provides access to the wire space between the back of the two racks. A terminal board, located at the bottom of each rack, extends the full length of the rack, and is equipped with two rows of A.A.R. terminals. Each terminal has a movable link extending between the two posts for convenience in testing. The wires between the relay racks are run in overhead chases made of 4-in. by 4-in. square steel duct having hinged covers.

Relay Racks and Wiring

The wires connecting to the relays are made up in cable form, loosely held together by a small strip of tape and so arranged that the relay can be lifted and turned completely around for inspection without disarranging the wiring in any way. Approximately 60,000 ft. of No. 14, single-conductor, 2/64-in. wall, single-braid, lacquered Pullman special wire was used inside the tower.

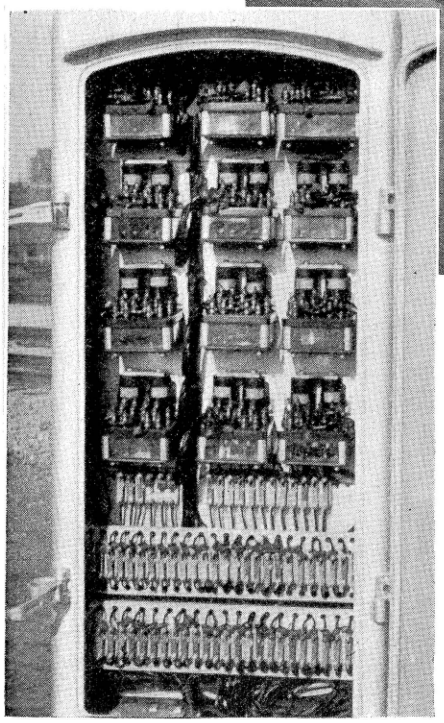
The parkway cables enter the tower through a sealed manhole at each end, where they enter a covered concrete race extending through the tower between the two relay racks. The cables are placed on racks in the race and so arranged that no cable crosses over another one in reaching its location on the terminal board. Each cable is equipped with a metal tag having an identification number stamped on it. The number of the cable always corresponds with the number of the instrument case which it serves. Each



One of the heavy cable runs from the tower—The trenches were floored with sand

Right—Relays and terminals are easily accessible in tower

Below—Typical outside relay housing showing cable terminals below



cable is run direct to its position at the terminal board, where each conductor is run through a separate hole in the board to a terminal, the terminals for each cable being in one group.

The concrete instrument-case foundations, which were poured in the field, were specially designed to accommodate the large amount of cable entering them. A 9-in. by 12-in. opening, 24 in. below the ground line, extends through the foundation and an opening of the same dimensions intersects it in the center and extends to the top. Of the 21 instrument cases in the new layout, fourteen are of the Union two-door, low type, which were taken from the old plant and reused, four cases are of the G.R.S. two-door, low welded type and three are of the G.R.S. two-door, high welded type. In using the old cases, it was necessary to equip them with a new lining and to provide for the mounting of wall type relays. Specially designed spring steel brackets were made for mounting the old shelf-type relays on the wall.

Each housing is equipped with the necessary terminal boards with A. A.R. porcelain terminals and fuse blocks neatly arranged. In addition to the signal circuits, each case is provided with a telephone connection for use in testing. The cases are wired with No. 14, 2/64-in. wall, lacquered Pullman special wire, the wires being made up in open cable form and supported by enameled bridle rings. The control and locking circuits employed on this plant are in accordance with the generally accepted practice.

Switches and Air Supply

The switch fittings are of the latest designs, including 1-in. by 7-in. gage plates securely bolted to the ties and adjustable rail braces, fastened to the gage plates with 1-in. cap screws. The 9-in. by 10-in. creosoted switch ties were used at all power switches, as were the 1-in. head rods.

The compressed air for the operation of the electro-pneumatic switch machines is furnished from the air compressors in the power house of the Terminal Company. The main air line, a 2-in. pipe, is extended down one side of the track layout, being supported every 12 ft. on a standard concrete pipe-carrier foundation. Two-inch branch mains are provided wherever required. The branch lines extending to the switches are ¾ in., not more than two machines being fed from one branch line.

Organization and Construction Procedure

When a study was made as to what would be the best construction procedure in order to avoid traffic delays and at the same time make the changeover as economically as possible, it was found that the plant could be divided into three sections or zones. Then by following the "steps" as laid out by the track department, one zone could be taken out of service at a time and placed back in service in the same manner.

Since only unemployed labor could be used, it was necessary to form a complete new organization, selecting men from the ranks of the unemployed over the country. The

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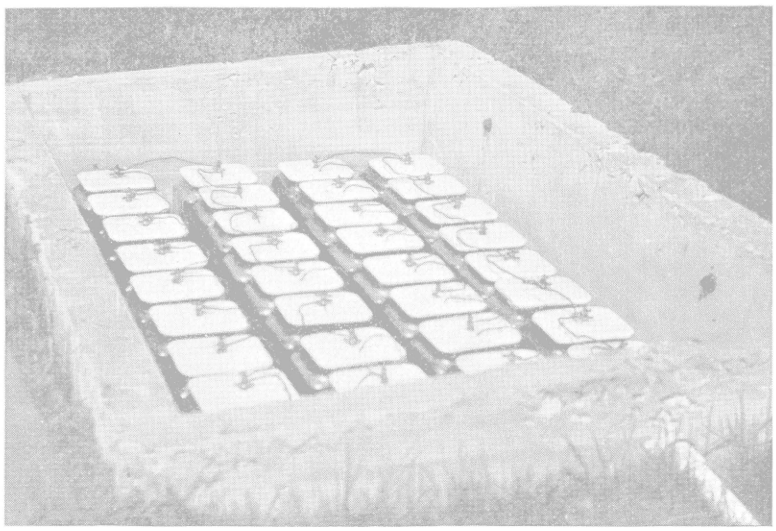
strument case. Cable, manufactured by American Steel & Wire Company for this class of service, is used for runs between the battery, instrument case and signals. Cables crossing the highway are carried overhead instead of underground.

The automatic track-circuit control is arranged so that the signals will operate with trains moving in either direction on the single track. The circuits are of sufficient length to provide at least 25 seconds warning prior to the arrival of the fastest train at the crossing. Provision has also been made for proper operation of the signals until the rear of a train clears the crossing and also in case switching movements or backing up fouls the crossing. A battery consisting of three Edison M-1000 a.h. cells feed each track circuit and these are located in separate concrete housings alongside the track.

After nearly two years in service, the primary cells show no signs of approaching exhaustion, either on the signal circuit or track circuits. In the meantime, no maintenance has been necessary other than visual inspection of the equipment. The installation has proved entirely satisfactory in every way. Similar installations are planned at two more crossings as soon as funds are appropriated by the state.



Primary battery for operation of the flashing-light signals

Dallas Interlocking Reconstruction

(Continued from page 467)

organization was formed under the direction of the chief engineer of the Texas & Pacific and the state highway department, the supervisory forces consisting of one superintendent, one electrical signal foreman, one mechanical signal foreman, one assistant electrical foreman and one assistant mechanical foreman. The necessary tools were provided by a contracting company and by the state highway department. The signal department of the Terminal Company being small, it was necessary that the superintendent, electrical foreman and mechanical foreman be recruited from the signal department of the Texas & Pacific.

In order to prevent traffic delay and to avoid connecting temporary hand-throw switch stands during this complicated changeover, a scheme was decided upon and carried out whereby the switch machines were installed in place as soon as each new switch layout was completed. Power and air were then connected and a temporary double-throw, two-pole knife switch was installed and so connected that each switch could be operated by hand simply by operating the knife switch. The knife switch was mounted on a wooden block which was fastened in the top of the permanent machine bootleg. The plant was divided into six sections and a switch tender was assigned to handle all switches in each section. A temporary cabin was constructed for each section and a complete telephone system was installed, connecting each cabin with the train director in the tower.

Operation During Construction

Either permanent or temporary signals were installed at the entrance to each section for through traffic and these signals were set to display the stop indication at all times. Unemployed switchmen were selected as switch tenders, most of them being local yardmen who were familiar with the conditions. All traffic, consisting of an average of about 1,200 switching moves and 200 through moves each 24 hr., was handled in this manner during the entire time the tracks and plant were being moved and rebuilt, with practically no serious delays of any kind.

This work was begun on Sept. 1, 1935, and the last group of the new layout was placed in service on Jan. 22, 1936. A total of 36,970 man-hours was used in its construction, exclusive of supervision and switch tending. The total cost of signal labor was $27,055.49.

Switch Machines Overhauled

The electro-pneumatic switch machines were taken up, put through a temporary machine shop and completely overhauled before being placed in their new locations. A temporary relay repair shop was set up, and all relays on the old plant were cleaned and completely overhauled before being installed in the new layout. The new locking required for the control machine was furnished by the Union Switch & Signal Company and installed in the interlocking machine by railroad forces. A new track model of the latest design was also installed. The straight-line circuit drawings were prepared by the Union Company in the Swissvale, Pa., office, while the detail wiring plans for terminal boards and field instrument cases were prepared by railway forces.

The interlocking was grouped with the general construction features of the project and came directly under the charge of the chief engineer of the Texas & Pacific. The signal engineering and construction was handled under the general direction of E. P. Weatherby, signal engineer of the Texas & Pacific, with A. J. Yarrell, general signal inspector, in direct responsible charge on the ground.