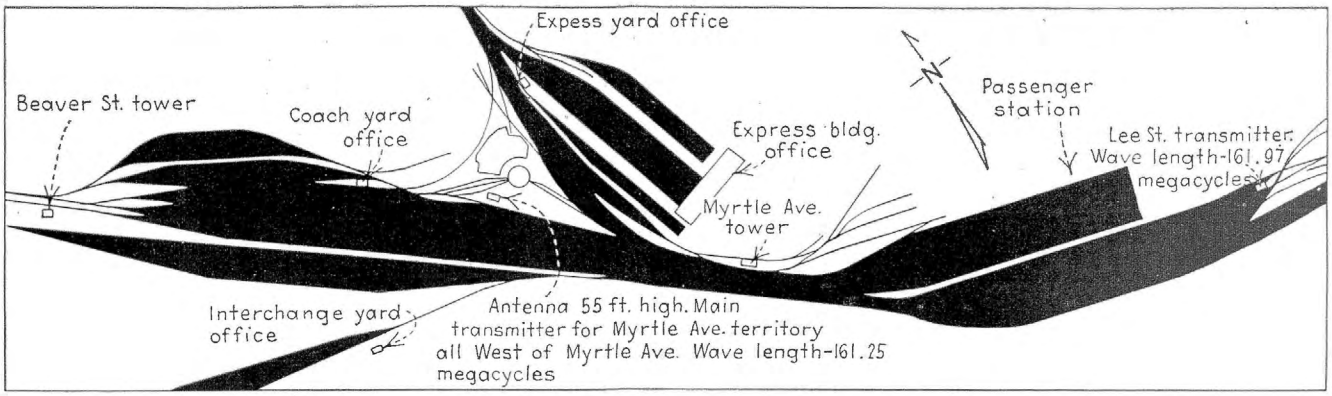


Diagram showing layout of terminal area at Jacksonville, served by radio system

Two-Way Radio

Speeds Busy Terminal Operation

$16,000 dual-channel FM installation on the Jacksonville Terminal Company, in Florida, includes two fixed and 12 mobile stations, one remote control and four dispatch points

By J. L. Wilkes

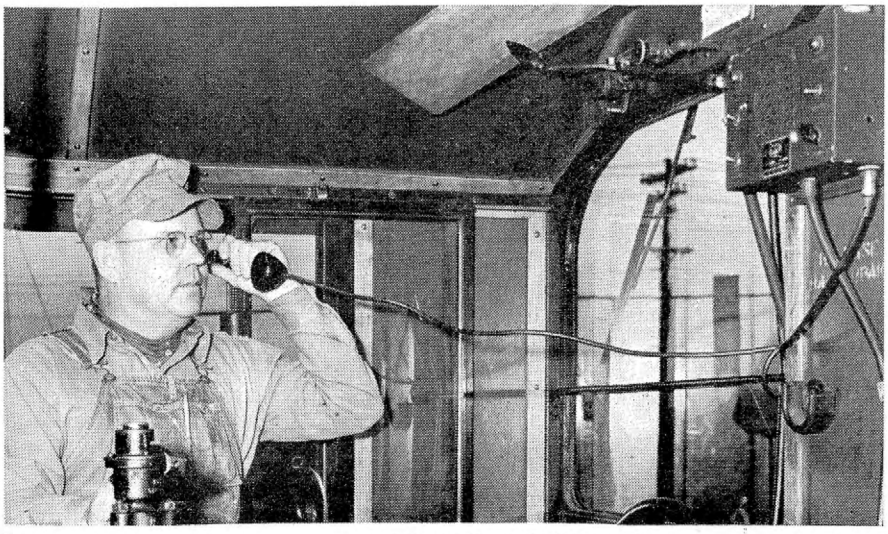
President & General Manager
Jacksonville Terminal Company
Jacksonville, Fla.

THE Jacksonville (Fla.) Terminal is one of the largest switching operations of occupied passenger cars in the nation, being the switching center for five trunk lines which serve practically all of Florida. It has been recognized for many years as one of the fastest switching operations, especially for occupied passenger cars, in the nation. The management conceived the idea, as far back as 1935, that space radio would greatly help in the handling of this highly congested and fast switching operation, and efforts were made to find suitable equipment, but without avail, prior to the beginning of World War II. In 1945 tests were run with one of the larger radio manufacturers using VHF AM aircraft equipment and it proved unsatisfactory. When FM came into its own, it proved to be the ideal system for space radio purposes in railroad work.

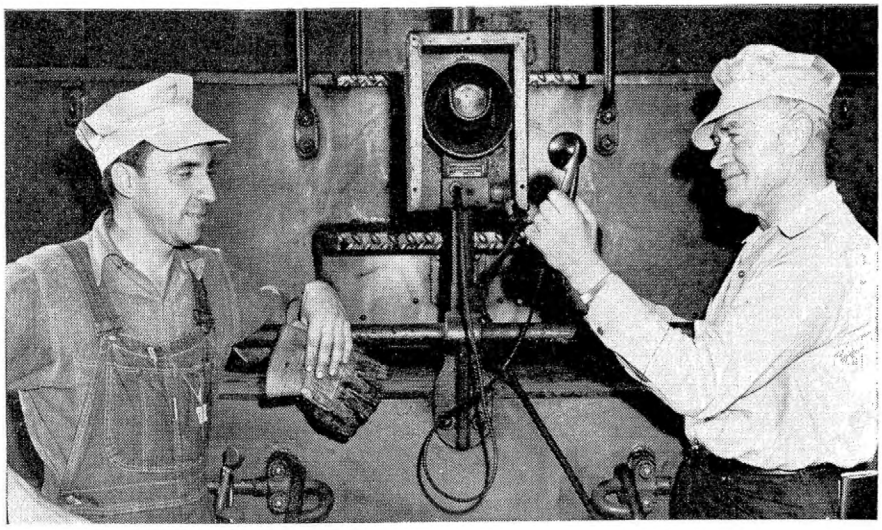
After careful and exhaustive tests, the Jacksonville Terminal decided to purchase FM equipment, and its engines and towers were completely equipped early in 1946, with the result that it has now had considerable experience with the equipment. So far as we are advised, this was the first complete 158-162 mc. FM installation in the United States to be installed by a large passenger terminal and, in many respects, it was a pioneering project.

Two Frequencies Required

The transportation operation on the Jacksonville Terminal is highly congested between 6 a.m. and 10 a.m., and between 6 p.m. and midnight. The work requires switching on trains at each end of the station simultaneously. Therefore, we realized one frequency would be too congested, and an ideal setup would require separate frequencies. The operations at the west end of the station are controlled by a 165-lever interlocking plant, known as Myrtle Avenue, and the operations at the east end of the station are controlled by a similar, but smaller, plant known as Lee Street. In conjunction with the work at Myrtle Avenue, we have the largest express plant in the United States immediately adjacent to the interlocking plant on the north, and large freight interchange yards and coach yards to the west. All of this is immediately ad-



Engineman in cab of a Diesel-electric switch engine using the radio to talk to yardmaster



In addition to equipment in the cab of each locomotive, a remote-control loudspeaker and hand-set on the foot board of the tender is for the use of the switch foreman of the crew

jacent to the plant, and the freight yards are of an interchange character where cars are moved in and out largely in solid cuts. The solution to the problem was to create a system which was flexible enough to accommodate all of our switching locomotives, regardless of which end of the station territory or yards that they may be working. This was solved very efficiently by equipping both the Myrtle Avenue and Lee Street tower operations with equipment carrying both frequencies. Each switching locomotive was similarly equipped, so that if the engine was working in the Myrtle Avenue territory the engineer would turn his frequency selector switch to Myrtle Avenue and, if the engine left that territory and went into Lee Street territory, the selector would be turned to the Lee Street tower. In this way, each tower could work simultaneously with the engines in its territory and not jam the circuits or otherwise conflict with each other.

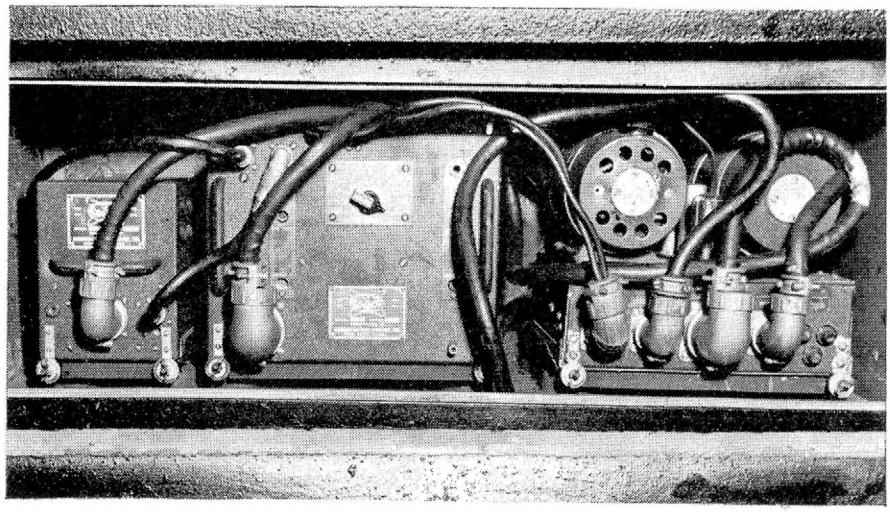
Another unique feature was to arrange the rolling equipment so that it would work with minimum inconvenience to the crews. This was met by installing the main apparatus in the locomotive cab at a convenient location for the engineman, and extending a remote control box, consisting of a loudspeaker and handset, to the switch engine foreman who operates from the rear footboard on the tender. In actual operation, the switching foreman is ordinarily with his crew somewhere in the vicinity of the engine, especially in passenger car switching. Should the train directors desire to contact the foreman, they can call the locomotive engineer and he in turn notifies the foreman. The foreman then comes to the footboard of the tender where he talks by radio with the train director. It is found in actual operations that the enginemen can deliver messages for the train director to the engine foreman through radio dispatch, even though their work may take them some distance from the train.

Remote Control Points

While the above was flexible, it was realized that we still would not have 100 per cent communication, because we had another tower at Beaver Street, 0.5 mi. west of Myrtle Avenue, where engines frequently worked under the direction of that towerman. In addition to that, we had yardmasters in our coach yard, interchange yard and in the express plant who, from time to time, desired to talk direct to an engine in that territory. The problem then was to also provide communication for these yardmasters at Beaver Street tower, so they could talk to the engines over the radio circuit and avoid the necessity of relaying through Lee Street or Myrtle Avenue towers, as the train directors in those towers are very busy during the rush periods.

This problem was met successfully by putting remote control units in the Beaver Street tower, the yardmaster's offices at the coach yard, interchange yard and express plant. This equipment controls the Myrtle Avenue transmitter and frequency, as these particular points have no occasion to talk to Lee Street or to give instructions in the vicinity of Lee Street tower.

We found that supplementing the radio with inter-office communication completely covered the needs of the Jacksonville Terminal. This feature was included in the radio equipment furnished those four locations, with the result that the yardmasters at either of these locations, or the towerman at Beaver Street tower could merely flip a lever and throw his intercommunication into service, and thus handle practically all of the operating information which is necessary between these different offices. The advantage of this was to relieve the telephones in these places, save time and to reserve them strictly for outside purposes. The inter-communication equipment added the final touch to make the system on the Jacksonville Terminal a complete and 100 per cent satisfactory installation.



Radio equipment on a locomotive

Complete Radio Coverage

Summing up, our equipment might be called a yard and terminal FM VHF (152-162 mc. band) dual-channel installation. It has two fixed stations, 12 mobile stations, one remote control point and four dispatch points. It has complete coverage of all condi-

tions at our maximum reach of operations, which is 5 mi. Tests have shown, however, that we can be picked up 22 mi. from our station.

The land-station equipment is located in the approximate center of our terminal area in the radio maintenance shop. The equipment used consists of a Communications Company Model 172-T 15 watt transmitter, two Model 189-R receivers to provide simultaneous dual-frequency standby, remote control amplifier, speaker, control panel and handset. A Model 244-P broad-band, high-gain antenna has recently been installed. The remote control and dispatch point utilize Model 206 combination intercom and radio controls. This equipment is the same at remote control locations and dispatch locations. The train director's office is classified by the F.C.C. as "remote control point" and the yardmaster's office as "dispatch point."

Each mobile equipment consists of a Model 172/173 transmitter-receiver unit, with a 32-volt d.c. power supply which operates from a 32-volt 1,000-watt steam driven headlight generator on the steam engines. The same equipment with a 64-volt power supply is used on the Diesels. An additional control unit with speaker and handset is mounted on the rear of the tender for use by the conductor and switchmen. A simple quarter-wave, whip-type, ground-plane antenna is used on all of our mobile equipment and has been found to be equal to or better than some of the more elaborate types tried.

Many Advantages

The features of this particular installation are instant communication between train director, switch engine crews and yardmasters, and other towers. This steps up the speed in switching and eliminates the time wasted in walking to the nearest telephone, and gives better over-all efficiency and service to the public. However, the Jacksonville Terminal considers the safety feature one of the most important. In our operations serious oversights such as running signals, or other possible accidents, can be largely controlled by the train directors who can instantly direct the engineer to stop, or he can otherwise control his movements in an emergency by radio. In case of personal injury, or other emergency, the crew can immediately talk to the train directors and yardmasters and protect things such as split switches, broken rails and obstructions. In fog, haze or other bad operating conditions, the tower can keep the engineer completely posted so that practically no time is lost from normal speed in doing the work. Since the information is broadcast to all engines who are operating on that particular frequency, all of the crews are posted as to what is going on, especially if it is something out of the usual.

This installation paid for itself during the first 12 months of operation on the Jacksonville Terminal, amortized the complete investment in payroll savings and enabled the terminal to operate with one less switch engine per day because of savings in time, and the other features mentioned above. The total cost of the project was $16,000, the major items of radio communication equipment having been furnished by the Communications Company.

Automatic Block on Soo Line

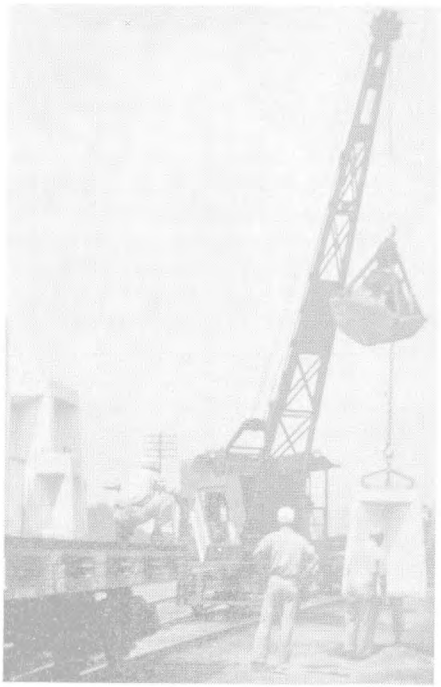
(*Continued from page 670*)

construction headquarters were at Stevens Point, and on the 92 mi. between Neenah and Waukesha, the construction headquarters were at Shops near Fondulac. The signal relay and battery cases are the sheet-metal type. These cases were wired complete with relays, rectifiers, transformers and arresters in place. This work was done by a Soo Line signal crew working in a shop at Minneapolis. In the meantime, other crews were doing the line work, and the bonding, and were assembling other materials. For example, at Fondulac a crew assembled the signals, ladders and masts as shown in one of the accompanying pictures. The cases were shipped from the shop at Minneapolis in gondola cars. When such a shipment arrived at field construction headquarters, a work train was made up to include cars of pre-cast concrete foundations and battery boxes, also a Burro crane mounted on a railed flat car.

When this train arrived at a proposed signal location, the clam-shell on the Burro crane was used to excavate for the signal foundations. Then the crane was used to set the concrete signal foundations in place and backfill them. Under favorable conditions, a foundation at a signal location could be completed in from 7 to 12 min.

A second work train distributed and set instrument cases, signals, cable post, relay boxes. Also this train distributed switch boxes, parkway outlets and insulated rail joints. Signals and instrument cases were loaded in proper order on flat cars and gondolas. The Burro crane on a railed flat car was placed between a car of signals and a car of cases. Cars were so loaded that both signal and case cars were emptied simultaneously at a time and place where one switching operation of the work train could set out the empties and place the next cars in proper position in the work train. The same plan was followed on the foundation and battery box work train. Signal masts were assembled completed with ladders, mechanism housing, conduit, etc., in the material yard, and then loaded onto the work train. In one day all the cases, signals, etc., were distributed and put in place between Spencer and Stevens Point—8½ hr.

After operating the work trains, the signal crews installed the underground cables and the aerial cables, and connected these wires to terminals



Crane used to set foundations

or arresters in the cases, and signals. The switch circuit controllers are the Model 7, and were installed with ¾ in. by 5-in. galvanized lag screws. All this work was coordinated with the bonding and line work so the signaling as a whole would be completed about the same time on extended section. Then the circuits were tested and the signal was placed in service.

This signaling project was planned and installed by company forces under the jurisdiction of B. F. McGowan, superintendent of signals, with C. R. Holmberg, assistant superintendent of signals in charge of construction in the field. The major items of signaling equipment were furnished by the General Railway Signal Company, the instrument cases, battery boxes and concrete foundations being furnished by the Griswold Signal Company.