Above — Conductor in caboose using the train telephone to talk to engineman in the cab Right—L. L. White, vice-president-operations, using telephone in a Diesel locomotive

North Western Tests Train Radio

Trials made in yard service at Milwaukee and on freight trains on the 486 miles between Chicago and Council Bluffs shows benefits to be derived

THE Chicago & North Western has completed a two-months program of testing radio telephone equipment for communication in yard service at Milwaukee, Wis., and on through freight trains on 486 miles between Chicago, Ill., and Council Bluffs, Iowa. The purposes of these tests were to determine whether the equipment was adaptable to the territories involved, and to assemble information concerning the benefits in expediting yard operations and train movements.

Yard Tests at Milwaukee

Within a radius of 12 miles of downtown Milwaukee, the North Western has several yards, and certain locomotives with crews are assigned to handle cars between these yards and between the yards and numerous industries in this area. Radio equipment was installed on four of these locomotives, and in the yardmaster's office near National Avenue. The aerial for this office equipment was located on top of an office building in the downtown business district 1 mile from the yardmaster's office. The aerial was about 250 ft. above the general level of the tracks.

This system provided two-way telephone conversation between the yardmaster's office and any of the four locomotives, or between any of the locomotives. With this telephone service, the conductors of the crews could keep the yardmaster informed concerning progress being made on various assignments, and receive directions from the yardmaster concerning other work to be done in the general location where they were. As an aid to the crews and yardmaster in utilizing the locomotives more effectively and in giving shippers prompt service in moving cars, the communication system was quite satisfactory.

In Road Freight Service

Following the tests in the yards at Milwaukee, the radio apparatus was used for road freight train service tests on 486 miles between Chicago and Council Bluffs. One Diesel locomotive and one car for rear-end service were equipped. At Clinton, Iowa, radio apparatus was installed in the yard office, with the aerial on top of the bridge over the Mississippi river at a height of about 85 ft. above the

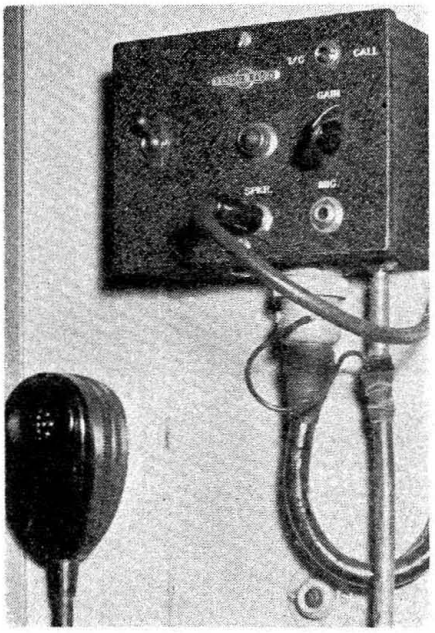
tracks. The tests included five round trips between Chicago and Council Bluffs and a one-way trip between Chicago and Clinton.

Two-way telephone conversation was available between the locomotive and the caboose on these road trips. When within 12 miles of Clinton, communication was maintained between the yard office and either the locomotive or caboose of the train.

A Record of the Uses for Train Communication

On several of these road trips, an accurate record was kept of the instances in which the telephone train communication was used. On July 10, train No. 251 left Proviso yard in Chicago at 11:45 a.m. with 108 cars, 5,300 tons, and arrived at Council Bluffs at 10:30 a.m., July 11.

When preparing to start the train, the conductor used the train telephone to advise the engineman when the air



Transmitter and control panel

line was pumped up at the caboose, and all were on board ready to go. This saved about 5 minutes as compared with passing hand signals. At Elburn, Ill., where the train was run on the "wrong" main for a short distance on account of steel changes on the normal-direction track, the conductor used the train telephone to tell the engineman when the rear of the train had passed the crossover, so that the train could be accelerated at once rather than dragging along at slow speed for considerable distance. This saved some time.

At De Kalb, Ill., when the train was ready to start, the telephone was used by the conductor to tell the engineman that the flagman had returned to the caboose. This saved 5 minutes. When passing Nashua, Ill., the operator gave the conductor a sign to indicate that something was defective in the train. The conductor used the telephone to tell the engineman to stop the train, otherwise the conductor would have pulled the air at the caboose which might have caused the train to part. The trouble was that a door on a gondola had opened so that chunks of ore were falling on the track, and the door was in a position so that it might drag. While correcting the defect and getting the train under way, the time saved by the use of the train telephone was about 20 minutes.

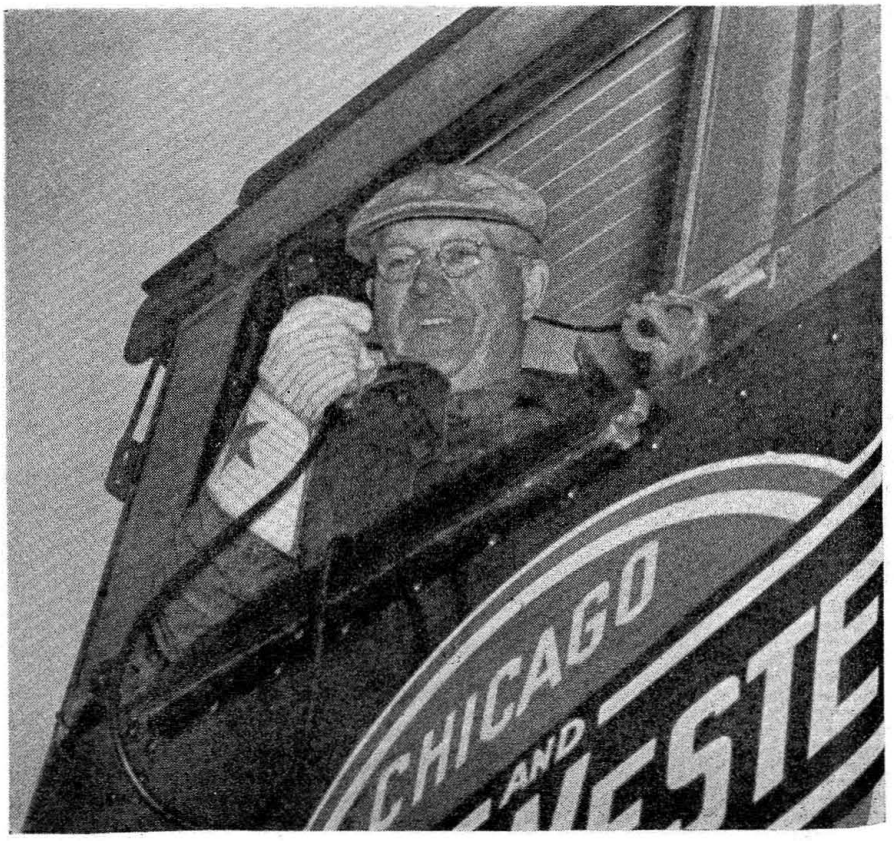
While in the yard at Clinton, and while preparing to depart, the telephone was used to save about 10 minutes. At Beverly, Iowa, the engineman wanted to stop the train for inspection, and he communicated with the conductor so that the train could be stopped with rear just clear of the crossover. This saved 5 minutes. When ready to depart, the telephone was used to inform the engineman when the flagman was on the caboose, thus saving 5 minutes more.

When approaching Tama, Iowa, the conductor and engineman used the train telephone to discuss where they would clear the main track for certain westward passenger trains. The train was stopped, and the conductor used a wayside telephone to talk with the dispatcher who stated that the passenger trains were 20 minutes late. Then the conductor and engineman used the train telephone to arrive at the decision that time was available to go on from Tama to Marshalltown, 18 miles, ahead of the passenger trains. In addition to being able to go to Marshalltown, at least 10 minutes were saved at Tama.

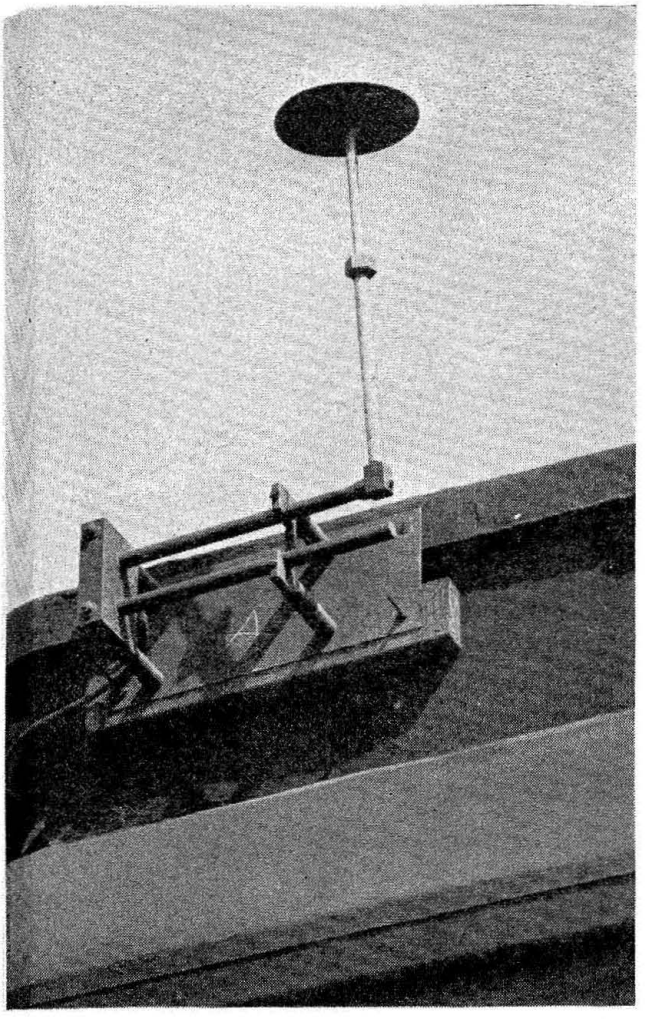
At Marshalltown, when crossing over to the eastward main track to let the passenger trains by, the conductor used the train telephone to tell the engineman when the caboose was past the crossover, and when to back the train again. This saved 10 minutes. At Boone, Iowa, the conductor told the engineman when the caboose was in the clear, thus saving 5 minutes.

About 3:00 a.m. when passing Grand Junction, Iowa, the operator gave the conductor the hot-box sign, and the conductor used the telephone to tell the engineman to stop the train. The hot box was located near the center of the train. Returning to the caboose at 3:17 a.m., the conductor used the telephone to tell the engineman to back up so that the car could be set out at Grand Junction. The time saved by the train telephone was estimated at 30 minutes.

At Carroll, Iowa, the siding was not long enough to hold the entire train, but a short spur off the east end of the siding would hold the



Engineman in cab of switcher locomotive in Milwaukee



Aerial mounted on roof of car as used in the tests on trains

excess cars. By using the telephone between the conductor and engineman, the train pulled in the siding and backed part way on the spur. As compared with the best that could have been done without the telephone, a saving of 20 minutes was made.

When passing Logan, Iowa, the agent flagged the train. The conductor found a car with a load of pipe which had shifted. By using the train telephone to decide to run slowly to Missouri Valley and set the car out there, a saving of 20 minutes was made.

Thus on this one 486-mile run between Chicago and Council Bluffs, a total estimated saving of 145 minutes in delays was made by means of using the radio train telephone system between the head end and the rear end of the freight train. In a report made by the railroad officers in charge of the tests, certain conclusions were offered as follows:

Telephone communication between the head end and rear end of freight trains can make a substantial saving in train time. Considering the records of the five round trips, it appears that an average saving of time in long freight trains between Chicago and Council Bluffs might be approximately an average of 1 hour 15 minutes each direction. The use of wayside radio telephone stations, operating in the same system with the equipment on the locomotives and cabooses, would help considerably. If the conductor had a walkie-talkie, and if there had been radio stations in operation at several wayside stations in addition to the one at Clinton, it is estimated that an additional saving of 70 minutes train time could have been saved on the trip discussed previously.

Radio Equipment Used on Tests

The radio telephone equipment used on these tests on the North Western was furnished by the Bendix Radio Division of the Bendix Aviation Corporation. This apparatus operated on 156.5 megacycles. The output of the transmitter is 8 watts. The antennae is a modified J type. On the locomotive, the power for operating the radio was taken from the power available. For the set on the rear end of the train, power was taken from a storage battery on an old club car which was connected ahead of the caboose.

The radio set requires power at 300 volts for the plates, at —150 for the bias, and at +13 for the filaments and controls. These voltages are generated by a rotary converter which can be designed to operate from power available. On the club car the converter was operated at 28 volts from the battery, and at this voltage it takes about 11 amp.

Yardmaster using telephone to talk to engineman of switch locomotive twelve miles away