Radio Communication on Trains

By J. A. DOWIE, Chief Instructor, Member I. R. E.

Recently, a large group of railroad officials and radio engineers witnessed a successful public test on radio communication using a 110 car freight train running from New York to Utica, over the New York Central lines. This test showed that there was constant communication maintained between the caboose and the locomotive cab. Over the 95-mile trip, both conductor and engine man, separated by more than a mile of intervening freight cars, were in oral communication at will, and without any aerial interruptions whatever, or interference with their customary duties. Both these factors were taken as an indication by observers of the great economic value of railroad equipment speeding up freight train movement because of its dependability and simplicity.

During this trial trip, communication was established between conductor and engine man on the moving train, and the signal car at South Schenectady, when the train was 8 miles away. The communication is afforded by small, compact, low-power radio transmitters and receivers operating in the 109-130 meter band. At this wavelength, the equipment on the train demonstrated that its use set up no interference with outside broadcasting or public radio reception, and in turn it was noted that other broadcasting service in no way interfered with the train communication.

One of the principal features noted by the observers aboard the train was the simple and easy manner in which communication was interchanged. Pushing a button in the caboose caused a piercing whistle to issue from the powerful loud speaker located in the cab of the locomotive over the signalman's head.

The engine man had only to pick up a familiar type of hand telephone to establish the connection and the conversation between himself and the conductor in the caboose was carried on as easily and clearly as an everyday telephone conversation in the factory, office or home.

This easy method of talking between the extreme ends of a long freight train, if put into general use, will serve to reduce to a minimum hitherto unavoidable delays in the movement of this class of train. These delays arose because of the distance intervening between the locomotive and the caboose, which limited the carrying on of communication by hand and light signals or the dispatching of messages on foot by members of the crew. All three of these methods were normally slow and have proved for years great consumers of time. In the case of radio conversation, a communication was instantly with all train movements promptly made and at a considerable saving of time as compared with present practices.

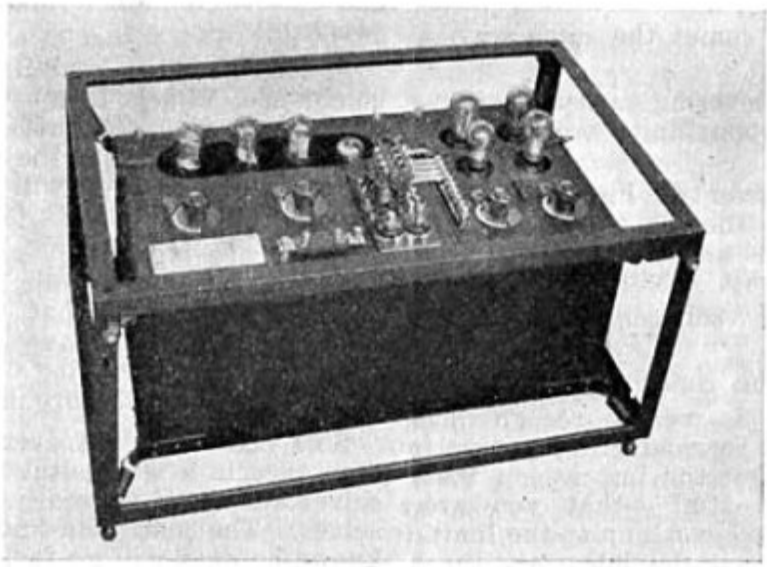

Photo showing transmitter and receiver unit used for radio train communication. Courtesy of General Electric Co.

Note: Details of exact circuits used in this transmitter and receiver is not available.

By the general use of this radio equipment, the railroad observers pointed out, there would be a material cutting down of delays to freight trains, that result from occasional incidents such as the parting of an air hose, the development of a hot box, or the necessity of setting up cars on side tracks between terminals.

Another feature of the simplicity in the use of this equipment is that it is adjusted and tuned to the particular wavelength desired, at terminal points. The entire apparatus is then locked up and no attention is required by the train crew during a trip. The starting and stopping of the transmitter is all automatically performed by the simple action of picking up the telephone.

Photo showing engine man using a microphone of radio equipment used for radio communication on train. (Courtesy of General Electric Co.)

The equipment used on both locomotive and caboose set was designed by the General Electric Company of Schenectady, and it is comparatively of simple structure and compact. On the locomotive, a metal box holds the transmitter and receiver. It is made up of steel boiler plates, welded together, and is installed on the deck of the tender. It is completely weather-tight, being made to exclude water or other foreign material. The entire assembly is supported by eight springs, and in addition a system of snubbers is provided to prevent excessive oscillation.

The transmitting compartment contains three 50-watt tubes and one 7½-watt tube. Four of the latter size tubes are used in the receiver. The 7½-watt tubes are of the standard train controlled type, the reliability of which has already been proved by extensive use in Signal Department service. The 50-watt tube is a standard design used for aircraft and marine applications for a number of years.

The power unit for the equipment, which contains the necessary dynamotors, filter condensers, reactors, etc., is also housed in a metal container. Two dynamotors are utilized. The larger one operates only when transmission is taking place and supplies plate voltage at 1000 volts, direct current, to the transmitter. The smaller machine runs at all times when the equipment is on the road and delivers plate voltage and bias voltage for the radio receiver. The use of this small machine permits the elimination of all batteries in the set.

Power on the locomotive is supplied from the headlight generator, no storage battery being required. On the caboose, a standard generator, driven by a belt from the axle, is used to charge a 32-volt storage battery. This battery supplies all the power required for transmitting and receiving. The total amount of power drawn by the equipment when transmitting is approximately 30 amperes at 32 volts, direct current, while in receiving, the current is approximately 5 amperes. This is the current required by the receiver dynamotor and the receiver filaments.

The loud speaker used in both engine and caboose is of a special type capable of producing a maximum amount of voice volume, and designed especially for these train sets. One loud speaker is bolted to the roof of the cab over the engine man's head. The other is mounted to the roof inside of the caboose. The opening for the sound is protected by means of a heavy wire screen so that an accidental blow will not damage the sound producing unit inside.

The antenna on the locomotive consists of a brass pipe mounted around the water tank of the tender. It is supported on insulators about 12 inches above the metal framework and is so low that it does not interfere with taking on water and coal. On the caboose, a simple wire antenna is provided.

Other routine communication intricate to the operation of the train which would have otherwise required considerable time to relay between the cab and the caboose, was speedily carried out on this trip with any delay completely eliminated by the use of the radio equipment.