BELL CALLS ATTENDANT WHEN STATIONS BROADCAST

New Signaling Device Will Operate a Bell, Horn, or Lamp at Receiving Station—Will Play Important Part in Ship-to-Shore Radiophone Service

WHEN the telephone was being developed back in the '70s one of the first advances was the provision of a bell to call the subscriber. In radio communication a bell has not been important in the past because operators have been required by law to stand watch at commercial stations.

There are, however, many possible applications of radio telephony where a continuous watch may not be necessary for the safety of the public, and here a bell to call the attendant would be of decided advantage. For instance, a mining company might install a radio telephone system for point-to-point communication between its workings, where the rough country will not permit the erection of wire lines. Then there is the ship-to-shore telephone system, in which a reliable signaling device would be of great convenience, enabling the service to be handled by the same operating methods used in wire telephony. A practical method of ringing a bell over a radio link has been developed by C. S. Demarest and M. L. Almquist of the American Telephone and Telegraph Company and L. M. Clement of the Western Electric Company.

The use of standard train dispatching equipment enables the system to call any or all of a number of stations from a central point. For instance, the control operator, by turning a key marked with the name of a particular station, can send out electrical impulses which will operate selector switches at the receiving stations. Each switch is arranged like the combination on a safe, to close its contacts and ring its bell only when a certain combination of impulses is sent out. This apparatus allows as many as seventy-eight stations on one wave length to be signaled separately.

The same apparatus can also be arranged so that at each one of the seventy-eight stations four supplementary stations can be signaled individually. For example, if a marine radio telephone system is involved, the pilot house, the Captain's quarters, the purser and the engine room on each of seventy-eight boats could be signaled separately. In addition, it is possible to signal all of the receiving stations at the same time, with a further slight modification in apparatus. It is possible to extend the system to signal all or any one out of more than 200 stations.

How the System Works.

This is how the new signaling system works: In the transmitting radio station is a vibrating interrupter, operated by direct current, which delivers an alternating current at 135 cycles per second. This alternating current is used to modulate the radio oscillations just as speech currents are used. At the receiving station the incoming signal is demodulated and the 135-cycle current, after amplification, flows through a relay tuned mechanically to that frequency. When this relay begins to vibrate it makes a second relay close positively, and this relay will operate any electrical device, such as a bell, horn, lamp or selector switch.

The essential unity of radio and wire communication is well illustrated in the use of 135-cycle current. This system has been used for some time in ringing over long-distance telephone lines, and the apparatus has been developed to a high degree. The new use was simply a matter of fitting it into new circuit associations.

Many radio followers are familiar with the direct current buzzer used for adjusting crystal detectors. The high frequency interrupter used with the signaling system is essentially a buzzer designed to operate accurately at a uniform rate. The electrical output of the vibrator is passed through a filter which suppresses harmonics of the fundamental frequency.

Accurate mechanical tuning is essential for both the vibrator at the sending end and the relay at the receiving end. So closely can the relay be tuned that a difference of five cycles a second will double the current required to operate it. This insures that static telegraph signals and voice currents will have relatively little effect on it. The way it operates the next relay is a further protection against false signals. The vibrating relay may close its contacts for only one five-thousandth of a second at each stroke, and all the electrical energy to pull up and hold another relay must be passed while the contacts are closed. Into a relay of workable size energy flows too slowly for enough of it to be stored in the form of magnetism during such a short time. But electrical energy flows rapidly into a condenser, and so the circuit is arranged to charge a one microforad condenser during the one five-thousandth of a second interval. During the time that the vibrating relay contacts are open, the condenser discharges slowly through the second relay, and this current is still flowing when the contacts close again to recharge the condenser. Thus a continuous pulsating current flows through the second relay and operates it to close its contacts. These contacts will in turn operate any electrical device, such as a bell or a signal lamp.

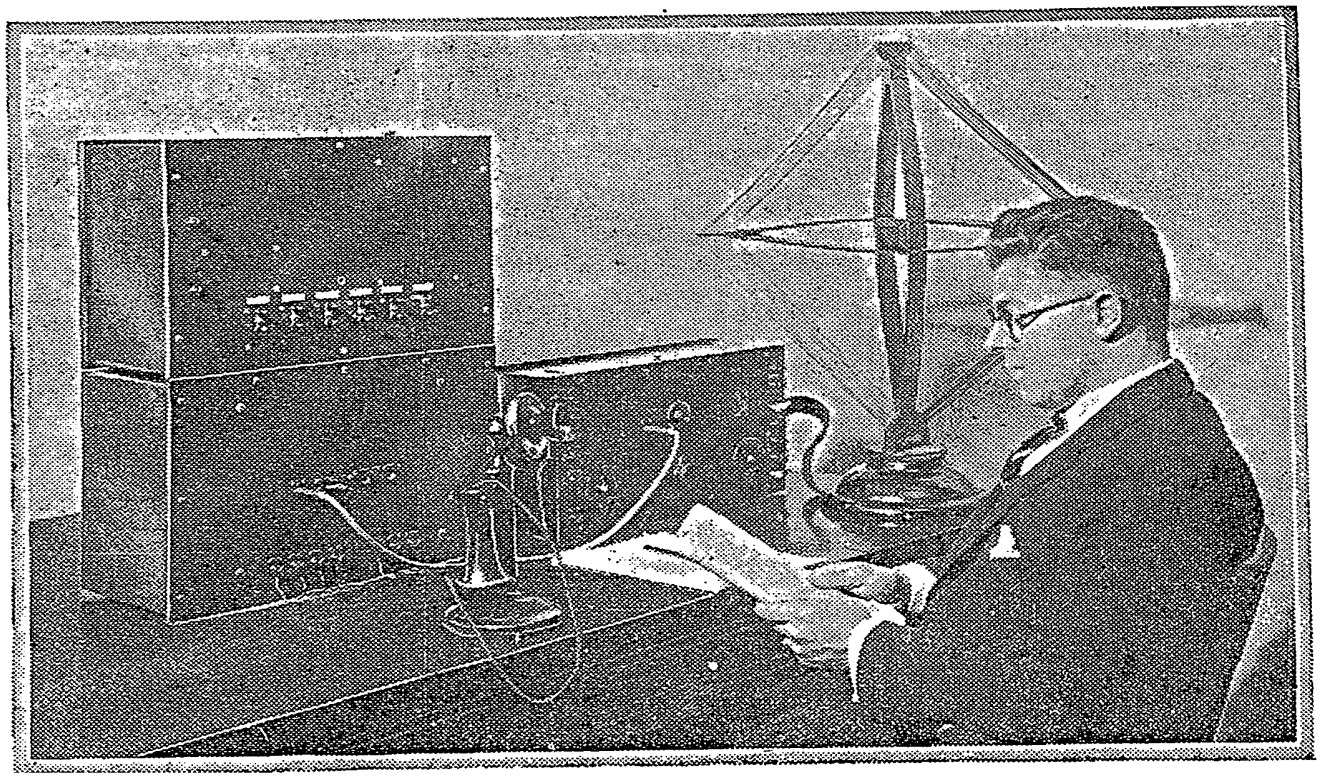
Low Operating Cost.

While this signaling system will be of decided importance in many applications of radio telephony and telegraphy, curiously enough it is not based on any new discoveries, but rather represents the adaptation to radio of certain apparatus that is well known in wire telephony. The 135-cycle input is fed into the audio-frequency input amplifier at a point appropriate to its energy level. In small transmitters it may be applied directly to the modulator tube. At the receiving end the output of the detector tube of the regular radio receiver is connected through a special one stage amplifier to the vibrating relay. Five vacuum tubes must be kept lighted continuously while the station is to be ready for incoming calls, but the current consumption is so small that it is a negligible part of operating costs. Considering the value of an attendant's time, the use of tubes and power in this way makes possible a substantial saving.

As to the effect of interference, tests show that the electrical and mechanical tuning of the receiving circuits and apparatus is so effective that radio telegraph signals similar to those from an interrupted continuous wave or spark transmitter would render speech unintelligible long before they would make the signaling system fail.

This system gives no privacy to conversation. Any station, or for that matter any receiving set, within the transmitting range can overhear what is going on. For some purposes, where all stations are more or less concerned in what is being done by others, this is a decided advantage. The system in its operating features is the radio replica of the train dispatcher's circuit where any station can be rung without interfering with others and where any station can talk to any other as well as to the dispatcher.

This signaling system is not only an asset to commercial wireless stations, but it is believed by some that it will be developed so that radio users can leave their sets and be notified through distinctive signals when various stations are "on the air."



AUTOMATIC SIGNALING DEVICE CALLS OPERATOR.

Relays in the lower cabinet respond to incoming calls and ring a bell to call the attendant, as in the case of an ordinary telephone. Any of six stations can be called by turning any of the keys in the upper box.