

THE TELEPHONE WITH SMALL RECEIVER.

SOME very remarkable experiments, which seem destined to signalise the beginning of a new era in telephony, were recently conducted in Paris. About a hundred guests, assembled in the garden of the official residence of the Under-Secretary of State for Posts and Telegraphs, were enabled to hear songs and speeches transmitted by telephone from a room one hundred and fifty yards away, the voices being reproduced without any perceptible loss of volume. This remarkable result was obtained with a telephone invented by M. Germain, an official of the Department. This invention is considered likely to effect such a revolution in telephone communication that the French authorities have ordered an exhaustive trial of the new instrument, with a view to its general adoption.

The loud-speaking telephone, as everyone knows, is no novelty. Edison, many years ago, invented one which gave good results under favourable conditions, but was impracticable for general use. In this apparatus a chalk cylinder, in contact with the microphone, had to be kept in constant motion, either by clockwork or by turning a crank. Large numbers of these instruments were imported into England, but it was found that the damp climate affected the chalk cylinders and rendered them useless. Other loud-speaking telephones patented from time to time proved unsatisfactory by reason of their cost or uncertainty of working. The Germain telephone, on the other hand, is simple, and consequently cheap. It differs from its predecessors in several important particulars. In the ordinary telephone the receiver is highly sensitive to sound, while the microphone, or transmitter, is comparatively insensitive, and the electric current employed is very feeble. In the Germain

## THE TELEPHONE OF THE FUTURE.

By G. A. RAPER.

apparatus these conditions are reversed, the microphone being highly sensitive, the receiver insensitive, and the current much more intense, although the same battery is employed in both cases. It is this utilisation of stronger currents which forms the great feature of the new telephone. Hitherto it has been found impossible to employ such currents, owing to their destructive effect on the carbon diaphragms. This, in fact, has always been the great obstacle in the path of long-distance telephony. M. Germain overcame the difficulty in a very ingenious way. He observed that with the existing microphone only about fifteen per cent. of the current was utilised on the wires, the remaining eighty-five per cent. being taken up in overcoming the inertia of the carbon or wooden diaphragm of the microphone. M. Germain accordingly set himself to discover a microphone of much greater sensitiveness which should offer the least possible resistance to the sound waves. After several years of experimenting, he obtained what he required by a combination of silica with other bodies, the result being a substance outwardly resembling glass, but possessing a certain amount of elasticity. This compound, it was found, was far more active



M. GERMAIN, THE INVENTOR.

when heated than when at a normal temperature. It then became a question how the required heat was to be supplied, and the manner in which the problem was solved is one of the most noteworthy features of the invention. In its perfected form the new microphone consists of two sheets of the silicate above

mentioned, having between them a small quantity of metalloid powder. The passage of the sound-waves, in incessantly varying degrees of force, through the sensitive microphone, throws the particles of powder into a state of violent activity, the resultant heat maintaining the diaphragm at the necessary temperature while the instrument remains in use. This employment of comparatively high tension is in one respect a disadvantage, on account of the induction which would be set up in neighbouring wires. Consequently the high and low tension systems could not be used together over the same set of circuits.

The new system, however, possesses such manifest advantages for long-distance communications that its general adoption can only be a matter of time. The day is not far distant when the Manchester manufacturer

the voice was clearly audible in every part of a large room. With a tubular receiver eight feet long, passing through the wall of the house, the voice was distinctly audible fifteen yards from the mouth of the receiver in the open air. After so severe a test as this, there is nothing incredible in M. Germain's claim to be able to transmit sound of any kind, and reproduce it two hundred and fifty miles away before an audience of two thousand people assembled in any hall of first class acoustic properties.

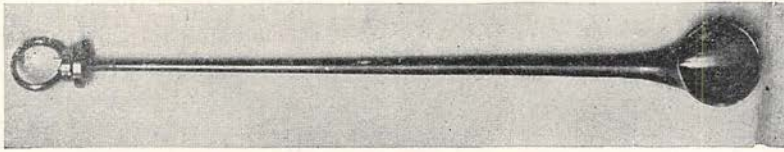


MONSIEUR GERMAIN AND HIS TELEPHONE.

will be able to converse with his agent in Berlin as easily as the Capel Court operator now gives his orders to his broker on the Paris Bourse. Theoretically, the use of powerful currents should make it possible to establish telephone communication between Europe and America, but the difficulty and expense attendant on laying a suitable cable stand in the way. M. Germain, however, by no means despairs of overcoming the obstacle. His microphone has already given birth to a "micro-transmitter" which acts as a loud-speaking telephone over 2,500 miles.

Early in 1899 the writer was present at some experiments with the Germain telephone on an artificial circuit having the same resistance (1,600 ohms) as the telephone line between London and Paris. With the small desk-receiver shown in Fig. 1

One of the most striking applications of the Germain telephone is in connection with the phonograph and the cinematograph or biograph. As everyone knows, the phonograph cannot register sounds not produced in close proximity to the receiver, and specially directed into it. If we desire to record the actual stage delivery of a famous actor, for instance, the phonograph gives us no help. The loud-speaking telephone here steps in and supplies the missing link. A large metal frame containing a considerable number of microphones—thirty-six are required for the Paris Opéra—is suspended near the stage. In an adjoining room is the receiver, placed immediately above the phonograph, to which the telephone conveys every sound from the auditorium. By a combination of the three instruments it is thus



THE RECEIVER WITH ATTACHMENT FOR USE IN LARGE HALLS.

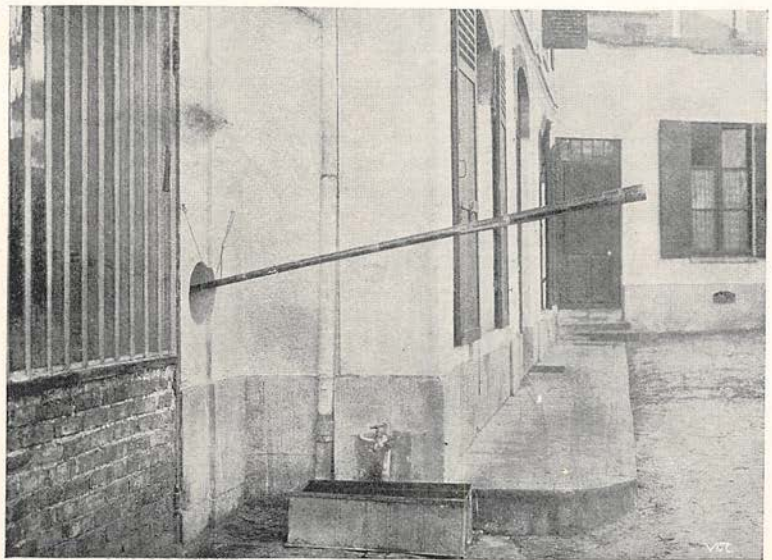
practicable to record and reproduce a scene, with the actors' every word. Sir Henry Irving and other public favourites will live and move and have their being long after they themselves have gone the way of all flesh. Before long a biograph theatre, with the best actors and vocalists of the day at its command, will form an indispensable part of every well-regulated ocean liner.

In combination with the phonograph, the loud-speaking telephone is destined to be of great service in recording the debates of public assemblies. These two instruments will turn out a verbatim report, the accuracy of which cannot be disputed; and if we go a step further and cause the phonograph to dictate to an expert operator on a typesetting machine, we shall produce a verbatim report without writing a line! Obviously, however, this feat would be of the nature of a *tour de force*. The gentlemen of the Press in the gallery of the House of Commons have nothing to fear. They can "condense," which the telephone and phonograph cannot do. It is, nevertheless, by no means improbable that the two instruments may some day provide Hansard with a model stenographer who never tires and never makes a mistake. Automatic Parliamentary reporting! Shade of Dr. Johnson!

Telephone communication between a moving train and a station is another interesting application of M. Germain's invention. In the guard's van is a telephone connected with one hundred and fifty yards of copper wire arranged in a spiral on the side of the van. When the guard desires to report any occurrence, such as an accident to the

train, a case of sudden illness, or a disturbance among the passengers, he can call up the nearest station either up or down the line by using either the positive or negative pole of his battery. The current excited in the van acts by induction on an iron wire fixed to the telegraph posts at a distance of about eighteen inches above the ground, and deflects an indicator in the office of the station with which it is desired to communicate. The station operator then unhooks his receiver and converses with the guard exactly as on an ordinary telephone. In the same way a station-master can open communication with a train fitted with the necessary apparatus.

The loud-speaking telephone is by no means the only fruit of M. Germain's inventiveness. He may, in fact, be called without exaggeration a French Edison. A process for deoxidising the gutta-percha of old submarine cables and rendering it fit for use again; a process for depositing aluminium on other metals by electrical fusion; an electric accumulator containing, within the compass of two volumes of the *Encyclopædia Britannica*, sufficient power to propel a motorcycle; an improved telephone battery adopted by the French Post Office in preference to the Leclanché—these are M. Germain's principal achievements.



OPEN AIR RECEIVER.