Little use has so far been made of the system in the United Kingdom, by reason of the fact that its comparatively short interurban distances, combined with the development of underground cables with intermediate repeater stations between its principal centres, rendered this system to a large extent unnecessary. In the United States, on the other hand, the comparatively large distances linked by aerial-wire lines have furnished a valuable field for the development of such methods of multiplying the usefulness of existing aerial circuits. A somewhat similar condition exists between the principal centres of population in our neighbouring Commonwealth of Australia, where already use has been made of the system between Sydney and Melbourne, and extensions are under way for increasing telephone and telegraph facilities between other centres.

Up to the present our New Zealand telephonic, toll, and telegraph needs have been well met by the existing aerial telephone circuits. The time is rapidly approaching, however, when these facilities will be overtaxed, and when recourse to the latest method of increasing the utility of existing channels of communication may prove to be a sounder economical proposition than multiplying the wire channels. The application of carrier current to a submarine telephone-cable of the type crossing Cook Strait has not so far been effected anywhere in practice. In view of developments in New Zealand, considerable attention was paid by me to such possibilities, and all available data collected that would serve to guide the Department in determining its future policy with respect to this comparatively new development.

It is unlikely that New Zealand—by reason of its much lower population density—will, for many years to come, require to follow the course adopted in the United Kingdom and elsewhere of laying long underground toll cables between its principal centres of population. It is therefore probable that the carrier-current method will shortly form a useful stepping-stone to the ultimate adoption of interurban repeatered underground-cable systems, which are no doubt an admirable means of giving telephone communication under the conditions already referred to.

The practical evolution of the carrier-current method has undergone considerable development during recent years, but inquiry showed that it has now become standardized in all essential elements of design.

A modified application of the single-channel system which I was enabled to inspect is now nearing the mass-production stage, and by reason of its lower cost will more easily " prove in " under conditions of lower traffic-density and shorter distances than would be possible with the original multi-channel system. There are two main possibilities for the application of carrier current in New Zealand: (1) By furnishing, from existing circuits, needed telephone channels of communication at a lower cost than would be possible by the erection of additional circuits; and (2) by the economic multiplication of existing channels with a view to the encouragement of traffic between points where existing rates are to some extent hampering the development of the toll service.

Power-line Carrier Current.

Although not of direct interest to this Department, data was obtained as to the latest application of " power-line carrier "—*i.e.*, the superimposing of telephone speech by radio-frequency methods on electrical-power-transmission lines. This subject was discussed with experts responsible for its development, and interesting information obtained thereupon. The relative merits of power-line carrier and wireless methods of maintaining communication between the distant points of power-transmission lines were also reviewed.

Voice-frequency Telegraphs.

A development of the " carrier " system is that known as " voice-frequency telegraphs," by means of which the frequency spectrum usually employed in the transmission of telephone conversation is divided up among a number of telegraph circuits which are able to operate simultaneously upon the same line. In the absence of underground interurban circuits between New Zealand centres little use could at present be found for such a system. There is, however, a possible field of application in connection with the submarine telegraph-cables serving as a link between the two Islands. When the capacity of these cables is reached, it is not improbable that the system could be applied to them, thus multiplying the telegraph channels available and avoiding the laying of additional submarine telegraph-cables between the Islands. Some experimental work requires to be done before it can be determined to what extent such systems can be applied to conditions of this nature, but, with the experimental and testing apparatus now being obtained, and referred to elsewhere in this report, it will be a comparatively simple matter to carry on such investigations as may pave the way for ultimate economies.

The opportunity of discussing these radio-frequency developments with Engineers responsible for their successful design and application was naturally much appreciated, and enabled me to become acquainted with many practical features which will have to be borne in mind in the application of such systems to our New Zealand conditions.

FIELD ENGINEERING.

Scope of Inquiries.

Apart from such important matters as automatic telephony, radio telegraphy and telephony, and machine-printing telegraphs, the subject on which most time was spent was that of field engineering. It is here that the methods of different countries vary most markedly, and upon which the major part of telegraph and telephone expenditure is incurred. It is therefore in this direction that there appears to be the greatest possibilities of savings by improvements in organization and practice, and by the judicious use of labour-saving construction and maintenance methods.