

circumstances calls for no alteration, whereas full automatic would probably give rise to much confusion and oblige an entire review of the whole system of charges, which might have far-reaching consequences.

It must be understood that even with full automatic installed attendants may not entirely be eliminated. In large and even moderate-sized places where there are private branch exchanges it is necessary to have operators for the conduct of that class of business. In large hotels in the States there are usually telephones in every bedroom. The occupants of these are continually changing, and it would be impracticable for subscribers to seek such occupants automatically, as they would not know what number to call up. That class of work is usually taken care of by placing a girl at a manual switchboard. She is provided with a list, which is corrected from hour to hour or day to day, of the different occupants, and on any call coming in for any of these persons she can, of course, easily connect the caller to the right person.

Pay-stations, farmers' lines, and toll circuits require to be worked by an attendant similar to private branch exchanges. This is the method that is adopted at present for working those classes of service when associated with general manual operation. It would be quite practicable for the occupants of bedrooms to "ring out" automatically.

Toll circuits have been arranged so that the originating exchange, after having provided for charges, can ring direct to automatic subscribers at a distant exchange without any attendant at that exchange being required to handle the call. This saves half the attendant labour.

In large warehouses it is practicable to do the private branch exchange work manually, as hitherto, or to install automatics, as with the latter you can "ring out" from or "ring in" to any branch. To get particular persons in a branch is not usually so necessary. If there was much demand for that class of service manual would probably be found most suitable. There are other features that will be brought out when some of the automatic exchanges are being specially referred to.

The engineers of the British Post Office are giving close attention to the progress of automatic telephone systems, and are confident that some form of automatic mechanism will engraft itself on telephone practice as a permanent feature.

It is generally considered in America amongst automatic engineers that about 500 lines is the minimum number for which it would be economical to introduce automatics.

The German Post Office favours full automatics, and has several exchanges working which will be enumerated later. It considers that for small exchanges, up to, say, 200 subscribers, where an all-night service is required, it is more economical to install automatic than manual, because with the latter attendants are necessary both day and night. For larger exchanges, from about 3,500 subscribers upwards, again that office favours automatics as being more economical. The intermediate-size exchanges, at the prices it has paid, are considered to be more economical if handled manually. Apparently the prices to the German Post Office have been very high. It cannot introduce automatics at present into Berlin and some other large cities until the law is changed. Subscribers, as the law stands, have several alternative ways of getting and paying for service, and may change from one way and rate to another frequently. This is unsatisfactory, and until altered the Post Office says it would be impracticable to introduce automatics. There was talk of an effort to get an Act passed to meet the difficulty, but it was doubted if the attempt would be made until a following year.

At Munich, in Bavaria, there are two full automatic exchanges of 3,000 and 2,000 lines working well. The cost of these per line was stated to have been very high. The system used there, and wherever automatics have been installed in Germany, is the Siemens-Halske, which is the Strowger system modified. There is reason to believe that the price paid for automatics per line throughout Germany has not been lower than for the Munich exchanges. It is thus explained how the German Administration does not appear to find economy in automatic exchanges intermediate in size between those of 200 and 3,500 lines. The engineers at Munich stated that they expected in 1917 to have 45,000 automatic telephones in operation, and to be effecting a saving of 1,000,000 marks or £50,000 per annum as compared with operating by manual methods. There is no question at all with them of the suitability of automatics for giving telephone service.

Approximate prices quoted to me for this system of automatics show that it is very much cheaper now. In Austria, in the Graz Exchange, there are 1,500 full automatic lines. These are stated to have cost fully three times what such equipments can be obtained for to-day. At such a capital cost as this and that said to have been paid in Germany, it seems incredible that if economic considerations were at all regarded any automatic installations could have been undertaken. It is, however, the intention to equip Vienna with automatics which will run into at least 20,000 lines. It is stated that this is for the purpose of dispensing with girls, and that the telephonic development of other parts of the Empire will be backward as a consequence. Some explanation of the situation appears, however, when it is stated that the manual practice has been to allow $3\frac{1}{2}$ operators to each position. As each operator is paid about £37 10s. a year this amounts to £125 per position per annum. With this has to be considered the fact that the women remain long in the service and are entitled to pensions, so that it is not surprising that relief is sought from such a situation even by the use of high-priced automatics.

In Germany the position is much the same as in Austria so far as length of service and pensions of women are concerned, consequently in the former country, too, there is a special incentive to use automatics. It may be expected that in Germany the prices for further installations of automatics and for additions to existing installations will be much lower than have prevailed hitherto.

In observing automatic exchanges in all places where they were met with on my travels, the striking feature was the limited number of persons that were engaged on them as compared with the numbers in evidence, principally, of course, as operators, in manual exchanges. Several automatic exchanges were quite unattended, and the quality of the service that was being given was such as was