

### Development of the National System

The inventions of many people in many countries have since contributed to the advancement of telephony and Canada has remained in the forefront in applying these inventions.

In 1900, the common battery system was introduced and began to replace the older magneto systems and also made possible the development of smaller, more attractive and efficient telephone sets. Several automatic switching systems were introduced around the turn of the century with limited success. However, it was not until the early 1920s that satisfactory systems for large offices were installed using the Strowger Step-by-Step system—first invented in 1886. This system became the workhorse of the world and even today serves more subscribers than any other system. But Step-by-Step has its limitations and these became apparent as the Continent moved toward Direct Distance Dialing. The planning of an economical long-distance network entails a choice of routes for a call. There is usually a most direct route, which will be the first choice, backed up by one or more less-direct routes in case the preferred route is busy. In Step-by-Step systems, the digits dialed by the subscriber are used up as fast as he dials them and if the caller ends up being connected to a busy circuit, these digits cannot be retrieved and used to select an alternate route. Another disadvantage with Step-by-Step is that the heavy sliding contacts tend to be noisy, even with the best of maintenance, and the noise level builds up and becomes objectionable as circuits become longer and more switches are added.

In 1950, a new and completely different type of switching system, called Crossbar, was introduced in North America. Instead of the subscriber having direct control over the switches that set up the talking path as in Step-by-Step, the digits dialed by the subscriber are routed to a temporary memory that is a part of the control equipment. This information is retained while other parts of the control equipment search up to five alternate routes to complete a call. The system derives its name from the Crossbar switches used in the talking path. These switches require almost no maintenance and are not as noisy as the older Step-by-Step switches. There is another significant difference—when the call is completed, the information is removed from the temporary memory and the control equipment is ready to serve another subscriber. The control equipment is available to all subscribers and hence Crossbar systems are said to use the "common control" principle.

Crossbar systems were first introduced to Canada for operator-dialing of long-distance calls in 1955 and for subscriber-dialed local calls in 1956 and now have found general application across the country for all sizes of offices. It is undoubtedly true that, without this switching development, Direct Distance Dialing by subscribers across the whole of the Continent could never have become what it is today.

It is equally true, of course, that gigantic strides had to be taken in the development of transmission equipment. Less than 10 years after the first demonstration of the telephone at Brantford, some 3,000 miles of "long-distance" telephone lines were in service and double that mileage in the following five years. This rapid early growth was the result of technological developments which today may seem elementary. New and better telephone transmitters had been developed by 1885 and the same year copper wire was first used instead of iron wire on long-distance lines. A new industry, made possible by intensive research, was being created.

In 1890 the single-wire circuit with ground return was replaced by two-wire circuits and in the following few years the Loading Coil and the Phantom Circuit increased the range and capacity of long-distance networks.

Telephone calls over unlimited distances were made possible only by the invention of the electron tube. In 1915 the first commercial application was made on a transcontinental telephone line in the United States and the same year a combination of telephone and radio facilities was used to transmit speech across the Atlantic. The following year, 1916, the first telephone call between Montreal and Vancouver was made over a combination of Canadian and United States lines. On the Diamond Jubilee of Canada's Confederation in