process, so that it may be some time yet before electric motive power comes into general use on even those portions of our existing railroads which could adopt it to their great advantage.

On some short portions of large railroad systems the change to electric motive power has been made and the line operated with considerable success. The New Haven road operates such a short line in this way, and now the New York Central contemplates equipping electrically the line between Buffalo and Niagara, making use of the power from the Falls.

In all these projects of power transmission over long distances we must look to the alternating current. The application of the direct or continuous current naturally came first as its problems are all easier of solution; but the limit of development in that line seems to have been reached, and its field is comparatively small. For further development in by far the greater number of cases the alternating current is essential. The telephone depends for its operation upon the alternations and variations of current; and with the telephone may be classed such devices as that for reproducing handwriting. For electric welding, although it can be done by a continuous current, the alternating current is best adapted; and the possibilities of electric lighting by alternations of very great rapidity appear marvelous.

Electric welding can be accomplished in two ways. The pieces to be welded may be placed in a powerful electric arc, which thus simply takes the place of the forge; or the parts may be heated by causing the current to pass directly through them. The first process of heating is seldom used for welding, but is largely used in smelting refractory substances, as a very intense heat can be obtained in this way. The second, or Thomson welding process has not grown so rapidly into use of late years as when first developed, and its present use is chiefly in the manufacture of projectiles. A new application of this process has recently been developed, however, which may give some indication of its possibilities. Armor plates which have been subjected to the Harvey process have an extremely hard shell of steel on the surface. To place these plates in position they must be drilled at certain points for the bolts; and to do this it is necessary to soften the hard steel surface at those points. It has been very difficult to accomplish this softening by ordinary processes, and almost impossible to avoid softening a greater portion of the plate than is desirable. By applying the terminals from the welding machine at suitable points it is found that the plate can be softened just at the parts where it must be drilled. The current passing through the hard surface coating of steel heats it sufficiently and because of the great mass of metal behind the hard surface, the softening of adjacent parts is avoided.

In telephony, we can scarcely hope for development very much beyond the limits indicated by what has already been accomplished. Some new discoveries may, of course, be made which will make it possible to talk across the Atlantic; but so far as we can tell from our present knowledge, improvements in apparatus will serve only to extend slightly the distance over which conversation can be carried on. Talking through an Atlantic cable is such a different thing, and so far beyond the present limits, that it can scarcely be hoped for. In the same line of development, however, as it is now possible to transmit speech and handwriting, there seems to be no inherent reason why it should not some time be possible to see at great distances by analogous means. —*The Citizen.*