

## THE APPLICATIONS OF ELECTRICITY.

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THE past twenty years has been a period of rapid advance in the application of electrical science to industrial purposes. Twenty years ago we had no telephone; the electric light was scarcely more than a scientific curiosity; and electric traction in its present sense had not been thought of. Now, when we can talk with our friends a thousand miles away as easily as if they were in the same room, and when the electric cars hurry past our windows every minute or so, it is not easy to recall, with any real appreciation of the facts, the condition of things before the beginning of this last era.

We had then become familiar with the land telegraph and the submarine cable, although the cable even then was not older than the telephone is now, and various applications in the arts had attained a considerable degree of perfection. The real commercial development of electric lighting was made possible by the discovery of the method of making hard carbons from what would otherwise be but a waste product. Indeed, it is perhaps not too much to say that commercial development in any branch of industry is due to the discovery of methods of utilizing waste products, and the perfection of cheap methods of production. Such discoveries are likely to be accidental. The useful thing or the cheap process is found in the search for something else. This was the case with the Bessemer process for the production of steel, and it may be that a process of producing an illuminating gas of great efficiency has just been discovered in a similar way.

The hard carbon, which can be moulded in any desired shape, seem-

ingly an unimportant thing in itself, possesses properties which cause it to play a very important part in most of our electrical industries. In a particular form, as the result of manufacture from a natural fibre, or from paper, it makes a success of the incandescent lamp. The street-car motor passed through many trials, —periods of trial to its promoters also,—before the hard carbon brush made its commercial success an assured fact. The telephone transmitter, which enables us to talk with ease over a thousand miles of wire, depends for its action upon the little particles of hard carbon, prepared with considerable care and contained within its case.

It is only about seven years since the introduction on any large scale of electric street cars. The mechanism by which the power is applied, although it has passed through many stages of development since then, remains to-day practically unchanged in general design; but the method of supplying the power to this machine has been the subject of much experiment. The first successful method, used in 1883, was in principle exactly the same as that used now, the overhead wire, with which an under-running trolley, attached to the car, made contact. The objection of the public to the use of overhead wires, however, has always been so great that there have been many attempts to use other methods. Placing the supply wires in an underground conduit is a desirable substitution. The first trial in Boston furnished amusement for one winter to the street boys who d-lighted in dropping wires and nails into the slot to see the sparks fly; and the peaceful citizen derived some