There are two classes of persons whose influence is always detrimental to the inventor; the mossback and the enthusiast. While mossbackism has in some degree retarded electrical progress, I believe that the crank with his wild hallucinations and fanciful theories has even more prevented its legitimate development.

When, with the year 1834, the Vermont blacksmith, Thomas Davenport, brought out his electric motor and a year later when the electric boat of Jacobi stemmed the waters of the Neva; it was claimed that steam was to be displaced and the "silent intangible something we call electricity" was to relieve man of the major portion of his work. It was even announced by Joule that power thus produced from a battery would be <u>cheaper</u> than steam power. The craze subsided and the application of the motor to practical work was attempted. At once it was seen that the substitution of zinc, a fuel only one-sixth as efficient and fifty times as costly, for coal could never be economical. This discovery that the supposed world conquerer was fit only for the labratory caused the public to

lose all interest in the matter. Many scientists, pioneers in the electrical field, still believed, however, in the ultimate success of electrical transmission of energy and it is to them, Page, Farmer and others, that we owe the subsequent rapid development of this means of transferring power. The invention of the dynamo and the discovery of its reversibility (that is that a dynamo will work as a motor if a current be passed through it) placed the question on quite a different footing. Yet much remained to be done before the motor found its first application to practical life.

Then, as now, the subject of rapid transit in cities was an all-important one and here, in 1879, Dr. Werner Siemens of Berlin demonstrated the success of electricity as a motive power. Since then Daft, Sprague and Edison have invented and improved until from an electrical point of view little remains to be done. At present two things form the burden of the labor of electricians working in this line; a lower speed of rotation of the armature in order to do away with gearing, and a better means of transmitting the current to the motor, by storage battery or underground

conduits. That, despite these defects, electric locomotion is cheap and popular is evidenced by the growth from 100 miles of electric street railway in January 1888 to 2000 miles at present.

The success of the motor in other industries is no less remarkable. A few years ago almost unknown; to-day, furnishing millions of H.P. to the 900 industries it serves. Unlike the electric car it does not compete with wind broken horses but with steam engines improved to the highest degree of perfection.

In one field the dynamo and motor are largely replacing the wire rope and shafting of ten years ago. In transmission of natural power electricity finds work peculiarly its own and except for very short distances or where appearance and convenience are no object, will soon be used exclusively. Compressed air constitutes an efficient but costly competitor in city postal work. Electricity offers an equal efficiency and can be obtained at any desired place with much greater ease and celerity. One circuit in Germany carries a current of 10000 V and furnishes

hundreds of H.P. fifteen miles distant.

Where the power has first to be generated by a steam engine, changed into electrical power and at its place of use again transformed into mechanical energy, it is a serious question whether the 30 to 40 % loss, necessary in the present status of electrical transmission, can be profitably incurred. In some sections of cities where engines would not be tolerated or where lack of room would prevent their use, the motor has already taken possession. But to decide whether it is better to substitute the motor for the engine in other cases is more difficult.

The apparent loss of power will be 30 to 40 %; the real loss much less.

First, because a large steam plant is much more economical than a number of smallones. (a) The first cost will be less. (b) The management will be less costly since about two-thirds of the working force can be dispensed with; a competent engineer can be hired and hence the stoking will cost less, the machinery last longer, having better care, and would inevitably give better satisfaction. (c) a saving of from 10 to 15 % would be

made by the compounding possible only with large engines, and many other devices too expensive for small plants can be used.
④ The plant can be located near a railroad or water course where little or no transfer of fuel is necessary and therfore immense cartage charges are saved.
It is true that the cost of the electrical installation would probably overbalance the advantages just enumerated, but it should be remembered that the nominal H.P. of such a plant is only about 3/4 its real capacity. That is, a company with 1000 H.P. might safely contract to deliver 1800 since the power is seldom desired continuously.
Second it is a more pleasant and convenient motive power. all the heat, dirt, noise and vibration caused by an engine is done away with and the swift, silent running motor substituted. The motor needs to be run only when desired and, when not in motion, no power is wasted. It occupies almost no space, can be hung on the wall if desired. The improved motor has the property of adjusting itself to the load imposed upon it; most manufacturers

claiming a variation in speed of less than 2% with the doubling of the load. Machinery sometimes breaks down. With an engine this means at least a weeks delay. In Chicago, recently, a 20 H.P. steam plant blew up one afternoon. The next morning things were running as usual; a motor having been installed in the intervening time. You would hear no more of the smoke nuisance, and a more perfect immunity from fire would be secured.
On the whole it may be said that where the power desired does not exceed 600 H.P., electricity will inevitably replace steam; but in heavy rolling mills, or steamers &c. we can expect no such change.

In mining, electricity finds a broad field. By utilizing the cataract and mountain stream, hitherto inaccessible mines can be worked successfully, and the thousands of H.P. now going to waste will drive the drill, light the mine, carry the ore, pump water, work the hoist and do a dozen other tasks now laboriously done by hand or by an expensive steam plant. One of the largest mining companies in Montana

uses electrical power exclusively.

On the modern war ship, the electric motor handles the artillery, lights the ship, operates the pump, propels the launch or the torpeds and acts as general elevator man for the whole crew.

The printing press, the mill tramway, the elevator, the fan, all move at its dictation; even the church is invaded and the organ boy relieved of his task, while the phonograph runs, too, by a motor catches the sermon as it falls from the speaker's lips.

I will not attempt to prophesy what electric transmission of power will accomplish but only ask you to look at what has been done; in that will you find its future written.

A. E. Martin