dynamo will generate electricity if power is applied to the driving pulley. If electricity is applied at the binding posts, power will be given off at the driving pulley; but the reason that electricity causes the armature and shaft to revolve is because a conductor conveying electricity is subject to the attractions and repulsions of magnetism. This is best illustrated by an incandescent lamp whose filament is absolutely inert to magnetic attraction when the lamp is not illuminated; but if a current of electricity is passed through a filament, raising it to incandescence, it can be easily bent to and fro by a magnet. A single suspended wire of copper conveying an electric current, in like manner responds to magnetic attractions, although inert when there is no electricity in the wire. The armature of a direct-current motor consists of insulated copper wires coiled lengthwise and radially in groups parallel to the line of the armature shaft; and when one of these loops conveying electricity comes within the range of the magnets it is pulled by magnetic attraction to a closer positive. But on reaching there it would stop if the electricity was not removed from that coil, which becomes for the time being as useless as a squeezed lemon. And at the same time the electricity is passed into the next coil, and in this manner, step by step, the magnet always reaching after the unattainable, like a shadow chasing a phantom, the armature is caused to revolve, the magnetism attracting the several electrified coils on the armature, step by step, as in a treadmill. In short, by these magnetic attractions cars move, factories are driven and the whole great application of electric power, which now exceeds 200,000 h.p. in the United States, is moved by magnetic attraction as truly as when a small magnet moves a nail or other piece of iron.

The characteristics of electric currents in their applications to the transmission of power can be very widely changed to conform to any purpose which may be desired. As in the case of belting and pulleys by which speed can be increased or diminished with the inverse effect upon the power, so the electrical pressure can be raised or lowered in inverse ratio to the amount of the current transmitted. It may be sent at a continual pressure, or in waves following and superimposing on each other, and the various methods of application of these complicated electrical problems has, however, fortunately resulted in relatively simple machinery, whose management can be readily undertaken after a very short instruction, and is certainly as simple as that of electric lighting. In the general type of motors operated by wavelike currents, the operation is quite different from that of the direct current motor, to which reference was just made, and for the present purpose it may be referred to as an arrangement by which the magnetism resulting from waves of electricity in the wires upon the magnets causes the magnetism to travel around a large circular magnet, comparable to a hat rim, and by the same stretch of the imagination let the hat band represent the electric wire causing the magnetism. The electrical conditions which caused this magnetic motion in the iron, also produce by their inductive effect, currents in the armature, which during operation has no electrical connection with the outer wires; and this may be compared to a ball of twine held within the center of the hat rim.

Whenever the magnetism revolves through this iron, the attraction draws the electrified wires in the armature, which are rendered susceptible to attraction by the electricity produced in them by induction; and therefore, the armature revolves, following the magnetic field, and this rotary motion in a synchronous motor gives a speed as uniform as that of the generator from which it obtains the current, the armature turning in unison with the rotation of the magnetism which attracts it. There are other motors which operate in a reverse manner, by the current from the generator upon the armature circuit, and thence causing currents by induction in the wires upon the magnets; and there are still further modifications of the two extreme types. But this is no place to follow the details of these types of motors. But it should be said that these organizations of plants installed during the last few years are well constructed, more simple in management than steam motive plants; are economical in operation, and, in short, are practical tools in the service of man.

The relative cost of electric and mechanical transmission is practically a question of distance, because with the increase of distance the additional expense is merely that due to increased cost of carrying the copper wires to a greater distance. The question of attendance, however, is such that it is doubtful whether great advantages are gained for power plants of under 100 h.p. The elasticity of the system is such that it can be extended for other power uses, of which comparatively little application is made in mills, among which may be considered the use of elevators, traveling cranes in storehouses, and also electric railways for transportation around the mill yard into the building and off to the railway station or wharf. There is a great distinction to be made in the advantage of electric transmission to new or to old plants. In a mill newly constructed and designed with the purpose that the power shall be transmitted by electricity, this forms one of the many advantages that such a plant might possess; but in an existing mill the mere substitution of an electric transmission for belts in a single building may or may not furnish advantageous conditions of manufacturing, but if the method enabled the introduction of a cheaper power the advantage would be apparent to those who pay the bills. The methods by which electric transmission is to be applied to existing mills need careful study in each case to determine the point of greatest economy in the abandonment of existing shafting, and the rental value of added floor space furnished in many instances by the removal of belt porches. The value of a method of transmitting power is not to be measured entirely by its first cost or expense of maintenance, but rather by its relation to the production of the mill. For example, electric lighting costs more than gas and gas more than kerosene oil for mill lighting; yet the value of electric illumination has made its use general, largely on account of the reduced percentage of seconds manufactured under artificial light. It is a well-known fact that a few years ago summer-made goods of standard lines of textiles were preferred to winter-made goods because on account of the larger proportion of artificial light there were more imperfections in the winter-made goods.

The question of skilled attendance is one which is natural, but the concensus of opinion appears to be that the grade of skill is no higher, and certainly less elaborate, than in the case of electric railways, where the motorman is trained for his duties in a very short time, the greater part of which is devoted to learning the signals and rules of the road. A power transmission requires less attendance than an equivalent electric lighting plant. The hazard of a breakdown appears to be less than that of steam motive plants. Some types of motors cannot burn their armatures, all of them have protective devices against overload; which is the cause of such accidents. The fact that motors perform their work beneath street cars, indicates under what extremes of jar and exposure they will operate.

In summary of the advantages of electric transmission of power worthy of your consideration as woolen manufacturers, it may be said in partial repetition of what has been already submitted: The organization of a new mill plant may be designed independently and without reference to the transmission of power to each room, except to provide for the conducting wires. In any mill property a steam power plant may be concentrated. The speed may be uniform and positive, and the creeping and