SCIENCE

FRIDAY, MARCH 1, 1889.

THE ELECTRIC MOTOR IN FACTORIES.

ON Feb. 6 a visit was made to the factory of the C. & C. Electric Motor Company by the New York Electrical Society, accompanied by some of the members of the American Institute of Electrical Engineers. The arrangements for power transmission were explained by Mr. Harvey L. Lufkin, of the company.

The engine in the engine-room is belted direct to a 50,000 watt Edison compound wound dynamo, which furnishes light to the building, as well as the current for driving the motors connected with the shafting. Instead of belting from floor to floor, wires run up, connecting directly with motors suspended from the ceilings.

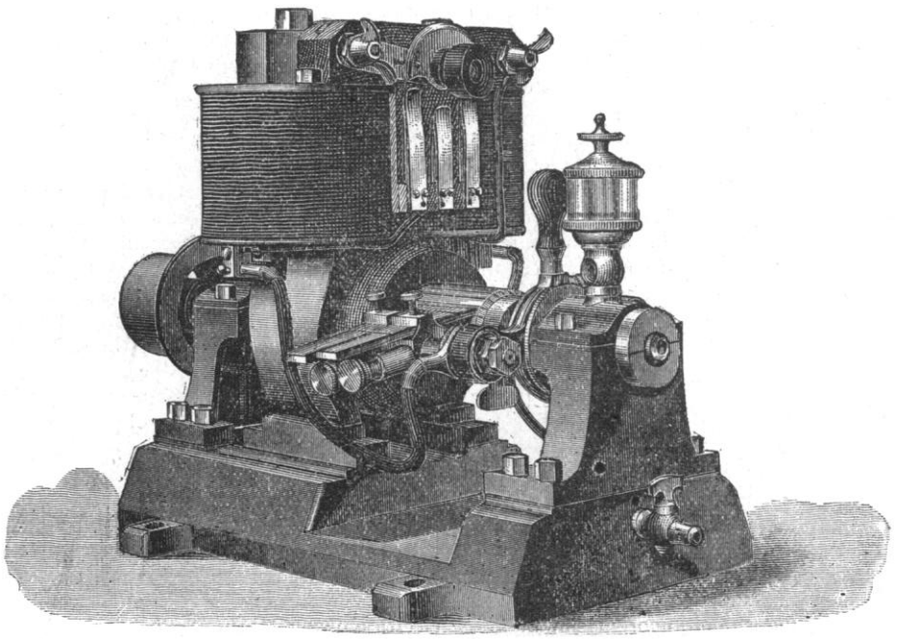

FIG. 1. — NEW TYPE OF C. & C. MOTOR.

On the floor working the heavy machinery, such as lathes, planers, drill-presses, milling-machines, on which are some thirty machines, four motors, connected to separate lines of shafting, do the work. Two of these are only of 3.5 horse-power, and two of 1 horse-power each. The small amount of power required is remarkable.

To one looking at the shop in operation, it seems hardly credible that machines of such small power should be capable of doing the work which is actually accomplished; but when we consider the fact that each machine individually is in operation only for a short time, even in the busiest times of work, the sum total of the power consumed at any one time is but a fraction of that required to drive all the machines simultaneously.

Fig. 2, for which we are indebted to the *Electrical World*, gives the ampères delivered by the dynamo during the whole run of the factory for one day, the diagram shown being one selected from a number which did not differ materially in outline, so that an average run is there illustrated. As will be seen, the electrical horse-power delivered by the dynamo even with the heaviest load, due in great measure to the current furnished to the incandescent lamps, never exceeded 18 horse-power; and at times of the day when little light was in demand, such as between 10 and 3 o'clock, the load averaged no more than 12 horse-power.

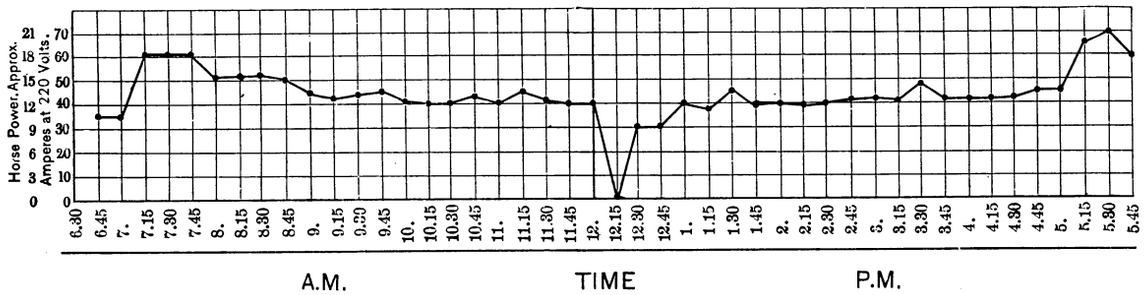

FIG. 2. — DIAGRAM OF CURRENT-DELIVERY.

The average load on the dynamo is about 40 ampères, or about 12 electrical horse-power, which covers both light and power. The friction load on the engine is 6.4 horse-power, giving us a total of about 20 to 22 horse-power on the engine. The power which would be required to operate the factory in the usual way, by belting through the floors, was estimated to be between 30 and 50 horse-power, without considering the power required for lights, amounting to an additional 15 horse-power.

Every operator in the factory who has charge of a machine, be it a milling-machine or drill-press, a lathe or planer, has a certain and absolute direct and instantaneous control over the automatic valve-gear on the engine in the basement, through the medium of the belt-shifter on his machine. Suppose he is using a milling-machine. The piece being milled has finished its travel, and the machine is stopped by shifting the belt on to a loose pulley. A horse-power of duty has been taken off of the electric motor driving that machine: the tension on the motor belt relaxes to exactly that extent; the counter electro motive force in the armature of the motor instantly increases; and the horse-power of current, which is no longer called for in the motor, the dynamo in the engine-room ceases to generate; and the automatic valve-gear on the engine immediately adjusts itself to a shorter cut-off.

Another great feature in this method of factory construction is the independence of each department. A break-down in one, or a stoppage from any cause, has no effect on the other departments. Each floor is connected directly to the engine-room.

The accompanying illustration (Fig. 1) shows the improved form of motor now manufactured by the company. The motor is wound for 110 volt constant potential circuits, and is started by simply turning on the switch fastened to the front of the yoke, and stopped by turning it back again. The mechanical construction of these motors is excellent, the machine being interchangeable in every part. Every hole in each part of the machine is so drilled, even in the large bed-plate, that it is impossible for the workman to get a hole a hundredth of an inch out of the way; so that, when the machines are assembled, it is only necessary to take each piece indiscriminately out of a pile of finished parts, and bolt them together.

CONVENTION OF THE NATIONAL ELECTRIC LIGHT ASSOCIATION.

THE ninth semi-annual convention of the National Electric Light Association was held at the Exposition building, Chicago, Feb. 19–21. The attendance was large, the electric light and power interests of all parts of the country being well represented. A large number of electrical exhibits, including all kinds of electric light and motor apparatus, from insulating tape to an electric street-car in operation, added much to the interest and importance of the occasion. The building was, as might naturally be expected, handsomely decorated, and brilliantly illuminated, when necessary, by numerous constellations of incandescent lamps, many of them being effectively grouped in ornamental designs.

On Tuesday, the 19th, the convention was called to order by the president of the association, S. A. Duncan, who introduced the city electrician, Professor Barrett, representing the mayor of the city, who was unavoidably absent. It may be mentioned here, incidentally, that a city electrician is an official undreamed of until recently, when electric light and power matters have assumed an importance approaching that of the water-supply or public works department.

After the usual courtesies of the city had been extended to the members of the association by Professor Barrett in the name of the mayor, President Duncan, after duly acknowledging the hospitalities tendered by the authorities, delivered the opening address, a brief abstract of which we give. Mr. Duncan said, in effect, —

"But few of the gentlemen of this country who are commercially connected with the manufacture and distribution of electric light and power are aware that five years ago this month a handful of men met in Chicago, and organized a movement which has grown into the organization which is in session at the present time. The industry of electric lighting at that time was carried on with all the enthusiasm which comes with a new undertaking, and with the mistakes which are sure to arise in the commercial introduction of any great industrial agency. The gentlemen engaged therein, strangers to one another, working independently, with no attempt at harmony, with but little knowledge of one another's methods of business, with no established custom or precedent to guide them, came together for the purpose of deriving those benefits which invariably result from the deliberate discussion of those questions which are common to the experience of all electric-light men. To even enumerate the topics which have been discussed at the various conventions of this association would consume more time than your president feels at liberty to take. Fortunately, the association is in possession of a complete set of published proceedings, and these volumes testify to the steady and rapid growth of the industry, and the increased information on the part of the whole electrical fraternity on the general subject of electric light and power.

"In the early days of this association the chief question was the question of arc lighting. The incandescent light had scarcely come into commercial use. No sooner had the questions involved in arc lighting been solved than the complicated questions involved in the distribution of incandescent lighting absorbed the attention of the fraternity. Following closely upon the problems involved in incandescent lighting came the question of electrical distribution of power, first for stationary motor purposes, and afterward for the purpose of electrical locomotion. This question is, perhaps, the most important one before us. To say that electrical power is not a success would be to reflect upon the scores of electrical railways in successful operation in this country, and upon the thousands of electrical motors that are commercially serving the wants of man.

"We may here profitably consider some figures indicating the growth of the electric lighting and power industry, the increase in the number of central stations, arc and incandescent lamps, electric motors and electric railways, now in operation. At the meeting of this association one year ago, it was estimated that there were not less than 4,000 central-station and isolated plants in operation in the United States: the number of central-station and isolated plants at the present time is 5,747. This shows an increase during the year of 2,067 plants, or, in other words, of 45.8 per cent. A year ago there were 175,000 arc lamps in daily use in the United States: at present there are 219,924, — an increase of 62,625, or a total gain of arc lamps for the year of 34.3 per cent. A year ago there were 1,750,000 incandescent lamps in use in the United States: at the present time there are no less than 2,504,490, making a gain of 754,990 incandescent lamps, — 49 per cent increase. The increase in capitalization in electric-light companies of the United States during the year has been $69,397,734.

"It is interesting to note some comparative figures upon the electric-railway industry. Six months ago there were 34 electric railroads in operation in the United States: during the last six months there has been an increase of 19, making at the present time a total of 53. Six months ago there were 83 roads in process of construction: there are 39 less at the present time, making the number of roads now under construction, not finished, 44. Six months ago there were 39 electric roads incorporated in the United States upon which construction had not yet begun: at the present time there are 42. Six months ago there were 225 electric cars in operation: since that time, 155 have been put into commission, making, at the present time, 379 cars in operation. Six months ago there were 244 cars under contract, but not in operation: this number has increased by 185 during the last six months, making a total of 339 electric cars at present under contract, but not running. Six months ago there were 138 miles of single track in operation: during the past six months there has been an increase of 157.5 miles, making a total at the present time of 294.5 miles of single track in operation. Six months ago there were 189.5 miles of single track under contract, but not in operation: at the present time there are 273.75 miles of single track under contract, but not in operation. It would be profitless to draw elaborate deductions from these figures: they tell for themselves the story of prosperity and rapid growth throughout every department of the electric light and power industry.

"We are gathered not only for the purpose of seeing an exhibit of the latest forms of electrical apparatus and supplies, but primarily for the purpose of listening to papers and discussions upon all important electrical questions. Some of the subjects deserve special mention. Petroleum for fuel first received attention from this body at its last meeting. At this meeting several papers will be presented upon the subject. The question of the materials of underground conduits in relation to the insulating materials of cables will also be treated. The question of static charge on un-