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APPLICATION OF DYNAMO-ELECTRIC MACHINES TO TELEGRAPHY.

The telegraph, in its importance as a factor in commercial intercourse, in the wonderful rapidity of its development, and in the perfection of its details, rivals anything recorded in the annals of invention. Within the last decade not only have improvements been made which increase the capacity of land lines fourfold, but the cost of working has been greatly reduced. In 1873 the Western Union Telegraph Company sent 14,456,832 messages, at a cost of $6,575,055. In 1879 they sent 23,070,106 messages, at a cost of $6,160,200—considerably less than the first-named sum, while the number of messages sent was nearly double. In 1869 the cost of battery per mile of wire was 117 1-10 cents. By the adoption of improved forms of battery and by various other improvements, the Company has reduced this sum year by year until, in 1879, the cost of battery per mile of wire was only 34 1-10 cents, and now, although this is high economy, the present cost of supplying the electric current is to be reduced 50 per cent by dispensing with batteries and using electric machines.

There are at present on the top floor of the Western Union building 14,300 gravity battery elements, and in an adjoining building there are 4,600 bichromate of potash elements, all of which are to be replaced by electric machines, and the electric current will be generated by the consumption of coal instead of zinc and acid. It is not a new idea to use machines for this purpose, but experiments in this direction, until quite recently, have not proved entirely successful. The new system of current supply, which has been adopted by the Western Union Company, has for the last few months been thoroughly tested in San Francisco, to the satisfaction of telegraph engineers and operators, and recently a set of machines have been put on trial in the battery room of the Western Union Building with satisfactory results. The apparatus consists simply of a number of Siemens machines connected in series, and having their field magnets excited by a current supplied by a single Siemens dynamo-electric machine.

All efforts formerly made in this direction sought to accomplish the object by using a single high tension machine. The potential is now obtained by connecting one commutator brush of one machine with the brush of opposite polarity of the next, and so on, and a current of any desired potential may be had by taking it off from the different machines in the series. A current taken from the first machine in the series will have a low tension; that taken from the second machine will have a higher tension, and so on.

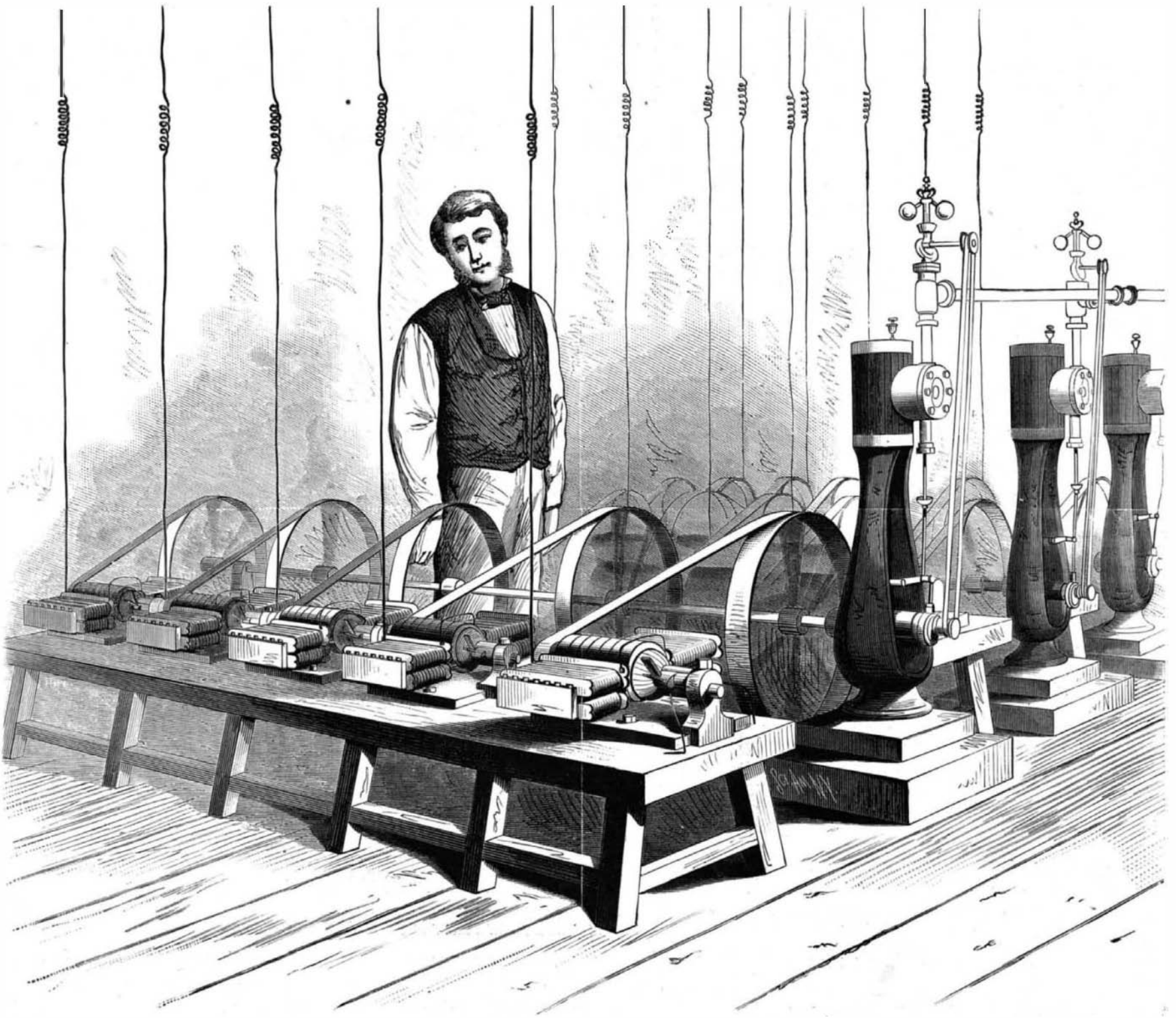
The electromotive force of the first machine in the series is 50 volts; in the second, 100 volts; in the third, 150 volts; in the fourth, 250 volts.

There are three sets of the machines and engines—two sets for working the 360 wires radiating from the Western Union Building, and the cables of the Gold and Stock Telegraph, and one for reserve. The current is equally well adapted to the quadruplex and to the printers of the Gold and Stock Telegraph. These machines and their engines will not occupy a tenth of the room now devoted to batteries, and a single engineer can attend them all.

When this system is thoroughly inaugurated, the batteries will all be removed, relieving the battery room floor of a weight of 60 tons, that being the difference between the weight of the batteries and that of the new plant. The current generated by the machines is to be used for all of the purposes for which battery power is now used, such as annunciators, call bells, small motors, etc., besides working the main lines and local circuits, and in addition to this the Western Union Building is to be illuminated by electricity at an early day.

The Siemens machine is preferred to any other. In its construction it is compact and simple.

The armature consists of a hollow soft iron cylinder provided with brass heads and mounted on the shaft carrying the driving pulley. Around this cylinder a few layers of iron wire are wound circumferentially, and over this are wound longitudinally the insulated wires forming the conductors. There are 56 strands of wire, each of which is



DYNAMO-ELECTRIC MACHINES APPLIED TO TELEGRAPHY.—WESTERN UNION BUILDING, NEW YORK CITY.

wrapped seven times around the iron core, having their termini soldered to bars on diametrically opposite sides of the commutator cylinder. The armature thus formed revolves between the poles of the field magnet, and its commutator cylinder is touched on opposite sides by brushes which take off the current. In the dynamo machine the armature and field magnets are in the same circuit. In the magneto machines which furnish the current to the lines the armatures are in the telegraphic circuit, while the wires of the field magnets are connected with the exciting dynamo.

The application of mechanical generators of electricity to telegraphy must be regarded as a great stride in the march of improvement, as it not only economizes space and means, but it supplies a known quantity in place of an unknown quantity. It replaces the subtile and variable acid and zinc, with the constant and positive power of steam. Without doubt the day is near when batteries will not be found in large telegraphic centers. They will probably be used in local circuits in small offices, but so far as working lines and large central offices are concerned there appears no reason why the machines should not speedily come into general use.

THE WORLD'S FAIR OF 1883.

A meeting to further the movement for a world's fair in this city in 1883, was held in Chickering Hall, January 14. A considerable number of capitalists and other influential gentlemen were present, and letters and telegrams of approval from many prominent statesmen, business men, and others, were read. Addresses were made by Hugh J. Jewett, President of the Erie R. R., Gen'l Joseph R. Hawley, of Connecticut, Senator Windom, of Minnesota, General Chas. E. Hooker, of Mississippi, and others. Considerable enthusiasm was manifest, but no positive action was taken further than to adopt a resolution asking Congress to take measures to give the proposed fair "official sanction and aid commensurate to its importance."

In the course of his remarks Gen'l Hawley said of our patent laws: "They may not be perfect, but they have done more than anything else perhaps to stimulate the ingenuity of the nation. In all the manufactories, a mechanic knows that if he invents something to save time and labor he can get a patent for it and be protected. Of course in carrying out these inventions a great many are shipwrecked, but on the other hand a great many are victorious, and this protection to ingenuity is making us an inventive nation. Another reason is that we are not cursed by the worst features of trades-unionism, which enslaves and cramps the mechanic himself. The unions forbid him to make anything more than his own particular part, and keep down the number of apprentices. These features weigh down with all their force upon enterprise and ingenuity. But you cannot control a Yankee shop in that fashion. If there be an invention the mechanic will be protected, and a manufacturer will run it in his shop if it breaks up all the other places in the land."

ELECTRIC MACHINES IN TELEGRAPHY.

The new and remarkable departure in the art of telegraphy, which we this week chronicle, to wit, the substitution of dynamo machines in place of galvanic cells for generating the electric current, is due to the genius and perseverance of Mr. Stephen D. Field, of San Francisco, Cal.

Various efforts have been made during past years to do away with the cells and their concomitant troubles and expense. Many of the most eminent electricians have turned their attention to the problem, but one and all have heretofore failed to attain the coveted success. The account we give this week of the great change which is now going on within the walls of that great palace of electrity, the Western Union Telegraph Building, shows that Mr. Field's discovery is one of vast importance, for which he is entitled to most generous rewards. His invention has made a complete revolution in the economies of telegraphy, and before a twelvemonth closes it will doubtless be in general use throughout the world. We heartily congratulate Mr. Field upon his splendid achievement. It is one of those brilliant discoveries that is far-reaching in its results and confers a direct, lasting benefit upon mankind.

Good Times for Mechanics.

The Baldwin Locomotive Works are now employing over a thousand more workmen than a year ago, though the last year's work showed the largest production of any year except 1873, when 423 locomotives were built. During 1879 there were built 398, of which 84 were for export, going to Australia, Brazil, Cuba, Norway, Mexico, Guatemala, Peru, Sandwich Islands, and West Indies. The large number of large orders now in hand keep the force employed full time. In every other line of mechanical production the same evidences of prosperity are observable.

Manganese Bronze.

In Prussia there has recently been introduced a new alloy of manganese and copper, which promises to be of considerable importance. "Mangankupfer," as the new bronze is called, consists of 70 per cent of copper and 30 of manganese, and is employed in small quantities to improve common brass, bronze, bell-metal, and the like, rendering them, it is stated, more compact, hard, and ductile.

THE late Leonard Case, of Cleveland, left property valued at $1,500,000 for a school of Applied Science in that city.

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 218,

For the Week ending January 31, 1880.

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THE FUTURE OF ELECTRICITY.

Marvelous as have been the applications of electricity during recent years as a message bearer, light giver, health restorer, and otherwise, it requires no prophetic vision other than that which knowledge gives to foresee an extension of the uses of electricity in the immediate future infinitely beyond anything that the multitude now anticipate. The truth is, men have but barely begun to suspect the capacity of electricity to serve their kind. However numerous the means devised for harnessing the subtle power or great the social changes brought about by its employment, as in the telegraph and the telephone, the vast field for the application of electricity to human affairs has hardly been entered upon.

The best proof of this truth is seen in the varied lines of electric investigation and invention developed during the years just past, each with infinite possibilities, and all marked by surprising discoveries and practical utilizations at almost every step in advance. These lines of research point every way; and it is hard to name a direction of thought or a sphere of practical effort toward which, or into which, electrical investigation is not working or holding out promises of great reward to such as will enter boldly, intelligently, and perseveringly upon the quest.

Men of middle age have witnessed the more remarkable of the stages of social revolution which the utilization of steam has brought about during the past fifty years. Ten years ago it did not seem possible that any power could ever again enable men to repeat the giant strides of progress which steam, in our factories and on the highways of commerce, by sea and by land, had made possible. To-day even greater and more rapid revolutions are impending from the utilization of electricity, and men now living will probably see them brought about.

A few weeks ago we had occasion to speak of the great changes in social and business affairs already effected, and the greater in immediate prospect, through the development of the telephonic exchanges. In every important town such exchanges are in process of development, bringing into vocal communication not only the separate members of widely-extended communities, but also still more widely-separated communities.

Since then a novel and important improvement in a special field of telephonic use has been reported from London. Our readers are familiar with the principle of Mr. Edison's electromotograph or loud-speaking telephone. By employing his small electric motor to turn the chalk cylinder the telephone is made automatic. Instruments of this sort have been placed in, and a large number more are in preparation for, the London *Times* newspaper office; and the reporters of the paper, say in Parliament, instead of reading their shorthand notes to copyists, and transmitting the longhand copy to the printer, as heretofore, now read them directly to the telephone, thus saving the time of copying and carrying the report. In the printing office the compositor sits at a typesetting machine, and, as the report is delivered to him by the automotic telephone, he sets the type as one would play a tune upon a piano. Having no copy to decipher, his whole attention is given to the setting of the type, and another great saving of time is effected. The indications are that by the use of autographic and automatic telegraphy (in conjunction perhaps with stenographic typewriters) reports of public meetings will soon be almost instantly transmitted through long distances and at a fraction of expense which such work now involves. By the same process drawings as well as writings will be transmissible quickly and economically. Such inventions open up lines of progress too far reaching for the boldest imagination to follow.

In this issue of the SCIENTIFIC AMERICAN an account is given of an invention which, in quite a different direction, promises to work great changes in telegraphy. By substituting dynamo machines for batteries in developing the currents used in telegraphing, not only is a great economy effected in the working of the wires, but the larger part of the valuable space now occupied by the batteries is wholly saved. In the central building of the Western Union Telegraph Company in this city twelve tons of machinery take the place of seventy-two tons of battery cells.

The magnitude of the interests affected by an invention like this will be appreciated when we call to mind the fact that the Western Union Company alone requires something near 200,000 miles of wire for its connections in this country. The telegraph lines of all Europe will aggregate something like half a million miles. It must not be forgotten that for every mile of real wire employed in telegraphing the introduction of the quadruplex system gives three miles of "phantom" wire. In other words, the system makes every wire so used equivalent to four wires under the old system; and no one can say how far improvement in this direction is or is not possible.

The future of electricity in the sphere of light giving is daily becoming more apparent. The impossibilities of last year are the achievements of this year; and even if we were compelled to say that hitherto the electric light has not passed beyond the experimental stage, the positive gains made during the past few months are a guarantee that in several directions practical success is assured.

Our readers are already familiar with what Mr. Edison has accomplished. Many other more or less successful inventors are at work upon one or other of the various and very promising systems of electric lighting, both in this country and in Europe. In London a steady and remarkable progress is reported in the working of the Jablochkoff