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THE FUTURE OF THE TELEPHONE.

There is nothing more characteristic of the present age than the avidity with which it seizes upon and puts to prac tical use the discoveries of science and the infinite marvels of invention. To-day the experimental student wrests from system, or to attempt to forecast the social and commercial the secret treasures of the universe a new truth, a new law, a changes which the annihilation of time and trouble, and the new manifestation of force. To morrow a countless host of printing presses spread a knowledge of the discovery to the earth's remotest bounds. Directly it is made a working factor in the world's best thought and action, in a little while some practical mind puts the harness of utility upon the new truth, and straightway the world is the richer by another useful invention. What would formerly have taken centuries to accomplish—or what the most fearless minds would scarcely have dared to dream of undertaking-is now done in a day. The invention is achieved, and finds a world pre disposed to receive it with gladness, even though its adop tion should necessitate many and radical changes in the whole range of national and social customs. It took the steam engine centuries to pass from the stage of science un applied to that of practical utility. The telegraph was not so many years in rising from the level of scientific experiment to that of a useful factor in the daily affairs of nations. What the telegraph accomplished in years the telephone has done in months. One year it was a scientific toy, with infinite possibilities of practical use; the next it was the basis of a system of communication the most rapidly expanding, intricate, and convenient that the world has known.

One of the most notable occurrences of our Centennial year was a little gathering of scientific men from various parts of the world to test the performance of a new scientific invention of which wonderful stories had begun to be told, especially with regard to what it was going to do. To the astonishment of all it did do marvelous things. A little disk of metal could be made to speak; still more, the operator might be miles away, and exerting power only through his vocal organs. With a couple of magnetic cups and a slen- people. der wire spoken messages were transmitted through considerable distances and delivered in tones so like those of the from perfect, the speaking telephone was an assured fact, and a new era in social and business communication had dawned. was in the hands of progressive men in every part of the

It was tried as a means of uniting more or less widely defactory. The next step was to form little clusters of telenumerous its membership the greater was found to be the phonic exchange, or central office, was a natural and necessary result.

Thus a new business sprang into existence almost in a day, with no end of scientific and practical problems to solve. The machinery and working methods of the telephonic exportion of this issue of the Scientific American. With for its practical success. the information there given one can form some idea of the present and prospective development of the system. From the little room figured, as many as six hundred lines (with an aggregate mileage of 650 miles) reach out to the offices and homes of as many subscribers in various parts of New York, Brooklyn, Jersey City, Newark, Orange, and connections are making or in immediate prospect with all other ad jacent towns of any size. New lines are being added at the rate of five a day, and every new wire widens the range and increases the value of every other wire in the system. Very soon the Philadelphia exchange will be connected with that of New York, and then any subscriber in either city or its suburbs will be able to communicate directly with any sub scriber in the other. Already from four to five thousand calls are made upon the exchange daily, during business hours, and the system has scarcely begun to occupy the vast field that lies open for occupation as rapidly as telephones and connecting wires can be set up.

Soan. The cleates. Friction. Compression. Blood-letting. Punch.

Chestly. A few thoughts on its nature and treatment. Conditions and sauses. Diet. Exercise. Medication.

The Distinctions between Croup and Diphtheria.

Effects of Tea on the Nervous System.

Motor Functions of the Brain. By Dr. Francois-Franck. The essential points in debate by scientific men. Prospects of a clinical solution of the problems involved.

The Distinctions between the widely separated transact the inventor's confident assurance of victory.

Ight is exactly what the world wants to see; and if it tions mean five thousand miles of travel saved for somebody.

And the time gained by the saving of those five thousand miles of travel means not less than a thousand hours of the Problems involved.

At this point it is proper to note the extreme simpli

distanced the expectation of the most sanguine, and its final proof of a great invention.

utility as well as its capacity for further development increases with every new wire, more especially with every new connecting link between central stations. Who, then, can have courage to predict even the immediate future of the doing away with the mediation of forgetful or erring servants, will bring in their train? Soon it will be the rule and not the exception for business houses, indeed for the dwellings of all well-to-do people as well, to be interlocked by means of the telephone exchange, not merely in our cities, but in all outlying regions. The result can be nothing less than a new organization of society—a state of things in which every individual, however secluded, will have at call every other individual in the community, to the saving of no end of social and business complications, of needless goings to and fro, of disappointments, delays, and a countless host of those great and little evils and annoyances which go so far under present conditions to make life laborious and unsatisfactory. The time is close at hand when the scattered members of civilized communities will be as closely united, so far as instant telephonic communication is concerned, as the various members of the body now are by the nervous system.

PROGRESS OF ARTIFICIAL ILLUMINATION.

The new year opens with unusual promise in regard to the future lighting of our homesand places of entertainment and business. Two noveland radically distinct systems of interior illumination are now before the public, both agreeing in offering strong assurances that relief from the inconvenience and imperfection of illumination by means of kerosene and gas is not very far away. Whether either or both will fulfill the promise of the day only time can tell. Both display a high degree of experimental success; but it is a different matter to meet successfully the more exacting requirements of every day use at the hands of all sorts of

One system is based on the division of light, however generated, the other on the division of the electric current and speaker that his personality could be detected by the sound its conversion into light by incandescence. The first is the of his voice, if it had ever been heard before. Though far system experimentally developed by Messrs. Molera & Cebrian, of San Francisco, and illustrated in these pages some months ago. These gentlemen undertake to distribute Scores of active minds at once set to work upon the probradiant light, not the means of making light, such as gas or lems to which the telephone gave rise, and hundreds soon electricity. The system involves a central generator, whence joined them. In a little while the telephone in various forms, light is transmitted in parallel beams through tubes to the places to be illuminated, and there thrown out by prismatic reflectors, and dispersed by proper lenses. In this way, the inventors claim to be able to disseminate the radiant energy tached portions of business houses, as the salesroom and the of light with no greater loss of power than is experienced manufactory, and proved a great success. As a means of when the electric current is divided or when gas or oil is social and professional communication it was equally satis. burned in separate lamps or jets. The system has been tried in San Francisco, and is said to work well. The inventors phonic communicants; the wider and more varied the busi- propose to light city streets and houses, as well as isolated ness callings of the members of the group and the more dwellings, shops, churches, and the like, and are sanguine of success. To our mind, however, the system seems likely utility of the system. But it soon outgrew manageable pro. to exhibit its highest utility and economy in places where portions without some system of centralization. The tele- a single building is to be illuminated, and no facilities are offered for the economical employment of incandescent electric lights; this, of course, under the assumption that what is possible in laboratory experiments is practicable on a large scale and under the varying conditions of every day use. The sanitary and other advantages offered by this method of change are sufficiently explained and illustrated in another distributing light are such as to justify the strongest wishes

The other promising system of domestic illumination is that just brought forward by Mr. Edison, as described and illustrated on another page of this paper. To all appearances, Mr. Edison has got the lamp he has so long been searching for, and curiously it is not at all what he thought it would be a few weeks ago. In other words, the light is generated in a strip of carbonized paper and not in a spiral of platinum or other refractory metal. The light produced is perfect; the lamp is inexpensive and apparently durable; the economy of the general system in which it is used is tolerably clear; and all its details seem to have been worked out with Mr. Edison's usual cleverness and practical skill. The only question that remains undetermined at this writing is whether the lamp will stand the test of time. It seems almost incredible that a slender thread of carbon can withstand the intense heat of the lamp, even in a perfect vacuum, without volatilization or fracture; but the lamps are stated to have stood action of the current, both in ordinary and The limits of our space forbid any attempt even to sum- in extraordinary strength, long enough already to upset all and discussion thereon by the members of the Physical society, Lon. don.

The Illumination of Cavities by Geissler's Tubes. By H. R. Rigg.

The Illumination of Cavities by Geissler's Tubes. By H. R. Rigg.

Optics. A valuable paper on (1) methods of illumination by reflected and refracted light, 10 figures; (2) the anatomy, physiology, and natural list of vision. It figures, (2) the anatomy, physiology, and natural is the range of communication possible between men. Any for time to determine what the ultimate issue will be. The Novel Surgical Instruments. Design for illuminating dark cavities of the body and making them visible. another, any instruction he may wish to give to a distant have sooner or later come to grief is the chief, if not the subordinate, any message that a boy can carry, and that may only one, compelling a suspension of judgment in the present be written, falls within its province. Even at the low ave case. We sincerely hope that no hidden flaw may discounrage of a mile for the distance between the widely separated tenance the inventor's confident assurance of victory. The subscribers in this city the five thousand daily communica- light is exactly what the world wants to see; and if it will tions mean five thousand miles of travel saved for somebody. only wear long enough to pay for itself, both the inventor

miles of travel means not less than a thousand hours of the At this point it is proper to note the extreme simplicity most valuable portion of the day, an average of over an hour of the new lamp and the lack of any startling novelty in its and a half daily to each subscriber. The increase of busi-materials or construction. If the lamp justifies present exness efficiency due to such savings of time and trouble is pectation, it will have but one radical peculiarity, and that is success. And success, in a field beset with so many diffi-In its infancy, with the inertia of custom to overcome, culties which men of science and practical experience have the system has developed a capacity for growth that has pronounced insurmountable, is the highest as well as the