ROENTGEN'S DISCOVERY.

During the last week innumerable reports of work in X ray photography have appeared in the columns of the various journals, scientific and otherwise, but with comparatively little new matter in them. It still appears that Prof. Roentgen gave the matter so thorough a treatment before publishing his results that it has taken the rest of the scientific world a month to catch up with him. It is said that photographs taken by him are better than the majority of those taken by other experimenters. His modest paper on the subject of his discovery has not been exceeded in interest, clearness of statement, and precision of deductions, by all which has been published since.

Prof. Roentgen's discovery is shown in that paper, given in our SUPPLEMENT, No. 1050, to have been developed from experiments with a fluorescent surface. Such a surface he found was rendered luminous by the X rays after they had passed through an opaque screen. To go from a phosphorescent surface to the sensitized photographic plate was quite natural. Now we hear of an investigator retracing this step and returning to the phosphorescent plate with the most interesting results.

Prof. Salvioni, of Perugia, on Saturday, February 8, read a paper before the Rome Medical Society, describing an apparatus of his own invention which enables the eye to see the Roentgen effect. As imperfectly described in a cable from Rome, a tube is employed and the shadow produced by the X rays is cast upon a fluorescent surface, the object to be examined having been placed between the observation tube and the Crookes tube. A perfect shadow is thus procured, and the outer end of the tube is provided with a lens by which the image may be intensified for purposes of examination. It is a substitution of the retina of the eye for the photographic surface, with this difference, that to produce a visible effect the Roentgen rays have first to produce true light rays. This they are made to do by a fluorescent surface. It will be seen that this is merely a reproduction and development of Roentgen's first experiments, for if the rays can render a fluorescent surface luminous, the possibility of the production of shadows upon such a surface almost necessarily follows. Prof. Salvioni calls his highly interesting apparatus the cryptoscope. When the stethoscope was first invented, it was hailed as a great achievement in revealing to the auscultator the secrets of the operations of the human system. But if the cryptoscope can be sufficiently developed, it will place a more powerful instrument of research in the physician's hands, by which he will be able to see the shadows of the bony framework of the animal system without an appeal to photography.

We present our readers with a portrait of Prof. Roentgen, and the following notes of his biography will be of interest.

Wilhelm Conrad Roentgen was born in 1845 in Holland. He graduated at the University of Zurich, taking his doctor's degree at the age of twenty-five. At this university he was the favorite disciple of Prof. Kundt. When the latter left Zurich for Würzburg, Roentgen went with him, and the two next received appointments in Strasburg University as professor and assistant respectively. This was in 1873. In 1875 he held the chair of mathematics and physics at the Agricultural Academy of Hohenheim in the kingdom of Württemberg.

Hohenheim is a hamlet some four miles south-southeast of Stuttgart, little known except for its school of agriculture. He returned a year later to Strasburg, and in 1879 was professor in and director of the University and Institute of Physics in the old university town of Giessen, a city rendered illustrious before this time by the labors of the great Liebig. In 1888 he returned to his old college at Würzburg, where he now holds his professorship. His published papers began to appear in 1873. The isothermal surfaces of crystals and calorimetry of the sun, using an ice calorimeter; electrically produced dust figures and transmission of the electric discharge through gases; diathermacy, a new aneroid barometer, flame sounds, and the telephone are typical subjects of his original investigations.

His essays may be found in Poggendorff and Wiedmann's Annalen, the Zeitschrift für Kristallographie, the reports of the Vienna Academy of Sciences, of the Gesellschaft der Wissenschaften of Göttingen, as well as in those of the Gesellschaft fur Natur und Heilkunde of Upper Hesse and of the Physico-Medical Society of Würzburg.

We are indebted to L'Illustration for the portrait of Prof. Roentgen which we reproduce with this article.

WILHELM CONRAD ROENTGEN.

THE COMPARATIVE ECONOMY OF THE ELECTRIC AND THE CABLE CAR SYSTEMS.

Writing under the title, "The doom of the cable in San Francisco," Mr. S. L. Foster, in a communication to the Street Railway Journal, gives an account of the recent change of a San Francisco road from the cable to the electric system.

The writer's deductions are based upon the experience of the Market Street Railway Company, which owns both electric and cable roads, and "has been making data for itself."

The conditions for the test were excellent, for the reason that the climate is favorable to cable traction, there being no snow or ice to prejudice the results against the cable; and, further, that the original construction and present working condition of the San Francisco cable roads is unsurpassed. As the result of its experience with the two systems, "the Market Street Company has become convinced that the people prefer to ride on the electric cars, and that the electric cars carry the people more cheaply then does the cable. These results were not obtained from a few electric cars run on level lines and at high rates of speed, but from the operation of upward of 150 cars at from 1½ to 2½ minutes headway at times, and on lines having grades as high as 14½ per cent. Most of these cars are subject to frequent interference from the heavy wagon traffic on the downtown streets, and all of them are governed by the rule ordering a reduction of speed at the crossing of each intersecting street."

The first experiments of the company in electric traction consisted in the electric equipment of its old horse car lines. Next, a route for which $30,000 worth of cable had already been purchased was similarly equipped; and the continued success of the experiment led to a general order that electric roads should be laid down on all new franchises. The most startling decision of all, however, was that which ordered the abandonment of the cable on Ellis Street, and the substitution of electricity; for not only was this particular line paying well at the time, but it is a line with many long and heavy grades—conditions which are generally supposed to be unfavorable to electric, and calling specially for cable traction. The superior economy of the system is thus summed up by Mr. Foster: Every time a cable power house can be dispensed with and the lines operated by electricity, that power house's item "labor" is wiped out, and the item "fuel" is reduced both on account of the less fuel required per car mile for an electric road as against a cable road and because the cable houses are usually run non-condensing, whereas in the electric power house the engines are run condensing. The original Ellis Street cable line was 9,600 feet long; and of this, 6,750 feet was changed to single track and 2,900 to double track electric road.

The cable road was 3½ feet gage and 11½ feet centers, and the electric single track was laid between the two cable tracks. In changing the 3½ feet gage to 4 feet 8½ inches on the 2,750 of electric double track, ties were laid, as before, between the two tracks, and the inside rail of each track moved out onto the center ties. The yokes and the concrete tube were left untouched. The cable also was left in the tubes, and will be utilized for the return circuit.

In addition to the above important change, the Oak Street line, whose cable is 26.000 feet long, is being reconstructed as an electric road, and as soon as this has been done, the two large power houses, which have run this and the Ellis Street cable, will be closed.

San Francisco may be called the cradle of the cable road system. It was in 1873, or over 22 years ago, that the Clay Street cable, the first street railway of this kind in the world, was built; and the object of the use of the cable was to overcome the grades of from 10 to 16 per cent that exist on that street.

To any one who is acquainted with San Francisco and has ridden over the precipitous grades of its cable roads, this substitution of electrical traction will be very significant, and we feel the full force of Mr. Foster's conclusions: "When we consider the daily spectacle of electric cars, unaided, climbing 14½ per cent grades in San Francisco and 15 per cent grades in Oakland, and by means of a simple auxiliary device ascending a 25 per cent grade in San Francisco, where no cable grip could be made to hold, the impregnability of any cable proposition is open to question."

Trees Fired by Electric Wires.

Citizens of Brooklyn, N. Y. were treated to an unusual exhibition of pyrotechnics on the evening of January 24, when three big trees became charged with electricity and sparked and crackled so that the neighborhood was illuminated and finally the firemen were brought to the scene. An arc light wire passed through the branches of the big trees and it is thought that the high wind of the day had caused the insulators to become worn, so that enough electricity escaped from the electric light wires to cause the display. At one time it looked as though houses in the neighborhood would be set on fire. The police were summoned and finally the firemen. After two hours' work the firemen succeeded in extinguishing the flames. The adjoining trees on the block then began to throw out sparks from their branches and the firemen were kept busy throwing water on the streams of fire, until the electric light company were ordered by the fire department to switch off their dynamos. A gang of linemen were then sent to string a new wire. Property in the neighborhood was damaged to the extent of $1,500.

A New Tunneling Machine.

An inventor is having built a machine by which he proposes to revolutionize the present methods of tunneling, the capacity of the device for "sawing out a tunnel," as claimed, being at the rate of twenty-three feet a day. The apparatus is described as being twelve feet long, four feet wide, and six feet high, and, with the fourteen horse power engine which runs it, weighs some 6,300 pounds. The principle is that of a circular saw. Sixty drill points attached to each of two wheels, four feet in diameter and eight inches wide, make 600 revolutions per minute. The points are one-half an inch apart, every revolution feeding one-eighth of an inch, and the enthusiastic inventor declares that it will cut twenty feet of a six by eight tunnel in a day in the hardest rock. The latter, being crushed as fine as wheat grains, is carried to the rear and dumped in a car. The drill points weigh one-fourth of a pound each, last four days, and are kept cool by means of a steady stream of water. Three men are required to run the machine.

The New Photograph.

The new photography has moved the English heart to poetry. The following verses are not by the new Poet Laureate, but they shed new light upon the future uses to which the shadow pnotograph may be put. Our thanks are due to London Punch, to whom we are indebted:

O Roentgen, then the news is true,
And not a trick of idle rumor,
That bids us each beware of you
And of your grim and graveyard humor.

We do not want, like Dr. Swift,
To take our flesh off and to pose in
Our bones, or show each little rift
And joint for you to poke your nose in.

We only crave to contemplate
Each other's usual full dress photo;
Your worse than "altogether" state
Of portraiture we bar in toto!

The fondest swain would scarcely prize
A picture of his lady's framework;
To gaze on this with yearning eyes
Would probably be voted tame work.

No, keep them for your epitaph,
These tombstone souvenirs unpleasant;
Or go away and photograph
Mahatmas, spooks, and Mrs. Besant.