Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

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NEW YORK, SATURDAY, JUNE 12, 1880.

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 282,

For the Week ending June 12, 1880.

Price 10 cents. For sale by all newsdealers.

THE FUTURE OF THE ELECTRIC RAILWAY.

It is now nearly forty years since Professor Page's discoveries in electricity suggested to him the possibility of an electric railway; but in those days the costly galvanic battery was the only source of electricity available for such purposes, and his experimental electric locomotive was a practical failure. His power cost too much, and his machine labored under the disadvantage of having to carry a considerable load of battery cells, the action of which was materially interfered with by the jarring and oscillation of the train when its speed approached three or four miles an hour.

The development of dynamo-electric machines during recent years has so lessened the cost of electricity as a motive power as to remove the most serious obstacle to the success of Professor Page's experiments. During the same time the transmission of powerful currents of cheaply generated electricity, through conductors of considerable length, and the re-conversion of such currents into working force by economical motors, have become a matter of every day occurrence. It is quite natural and appropriate therefore that the problem of electrical propulsion should again come to the front, this time with every prospect of a speedy solution.

The problem had so long been in abeyance that when Dr. Siemens set up his electrical merry-go-round in Berlin last year, most men were disposed to look upon him as the propounder of a radically novel idea, and the electric railway as the product of the latest speculative thought in this direction. And when Mr. Edison adopted the system for practical use not a few people thought that he had switched off from the line of practical work to play with a novel toy, the outcome purely of his experiments in electric lighting.

The electric railway, however, is not a plaything. It is a practical reality, though just now entering upon the stage of useful and economical development. It opens a field of invention and improvement as wide and profitable probably as was opened up by the first steam locomotive; and we have no doubt that during the next fifty years it may work as great changes in the processes and economies of life as steam railways have during the half century just past.

On the little electric railway set up by Dr. Siemens in Berlin, the locomotive obtained its power from a special electric conductor running between the car rails, the current being returned through the rails. Mr. Edison has simplified matters by throwing out the central cable as a needless expense. He makes the track itself the conductor, sending the current up one rail and down the other, the locomotive being operated by the current forming a circuit through it when proper connections are made, as described in the SCIENTIFIC AMERICAN last week.

For readers unfamiliar with electrical motors it may be necessary to say that the power for the running of the electric locomotive is generated by a stationary boiler and engine, and transformed into electricity by an electric generator at the central station. As was suggested by the elderly lady fearful of boiler explosions, the water is boiled at home, and that source of danger is removed from the list of traveler's risks. And as the efficiency of a stationary engine is several times greater than that of a locomotive engine, it is possible to convert the power of a stationary engine into electricity, transmit it to the locomotive upon the track, and there reconvert it into working force as economically as (if not much more economically than) power can be directly evolved by the combustion of coal in a locomotive furnace.

In the present stage of his experimental apparatus, Mr. Edison claims that he can realize in his locomotives seventy per cent. of the power applied to the electrical generator. The track is spiked to ties, as in the construction of an ordinary railway, and the loss of electricity in transmission is not more than five per cent., even when the track is wet. If there is no error in these figures, and we see no reason to suspect them, the economy of the electric railway is established. Its apparent advantages over steam roads are numerous. In the first place, the locomotive is light, comparatively inexpensive, and does not require a fireman or a skilled engineer to run it. The lightness of the locomotive greatly relieves the track, which need not be nearly so strong and heavy for a given service. The wheels of the locomotive can be given any desired traction upon the rails, so that a light engine can pull a train up grades which are entirely impracticable with the ordinary locomotive. The track may therefore follow any ordinary road; and when the road is used purely for freighting, as in conveying ores from mines, the road may run where other roads would be quite impracticable.

For city use, the electric railway promises to be exceptionally useful, both for the conveyance of passengers and for carrying packages. Cars propelled and governed by electricity might supersede horse cars on the surface roads; and, even if no cheaper, the sanitary advantages of the electric road, resulting from the disuse of horses, would be considerable. Indeed, it is not impossible that the city of the future may dispense with horses entirely for general trucking as well as for passenger traffic, the roadways being laid with numerous lines of flat rails transmitting the power required for propelling carriages of every sort. The absence of noise, dust, friction, and the inevitable filth attending the use of horses, promises in the new dynamo-electric period a wonderful mitigation of the present evils of city life. On the elevated roads the lighter electric engines would be comparatively noiseless, and, unlike steam locomotives, would not be constantly pouring into the air sparks, cinders, and other offensive products of combustion; and the same power which propelled the cars would light them.

But, without attempting to forecast the distant future, it is easy to foresee abundant immediate applications of the new, silent, wholesome, and economical method of transmitting and applying energy. The mining regions of the West, as well as our Eastern coal mines, present unlimited opportunities for its employment in hauling ores out of the mines along the mountain ravines and over their precipitous sides. The experiment of plowing by electricity transmitted from a central generator was tried last year with encouraging success. The same plant would answer for the operation of cultivators and harvesters; and with a light, movable railway track, the same power would suffice to do the heavy hauling incident to farm work; and one of the great advantages of electric carriage would be shown here, as elsewhere, in the facility with which it can be operated from a distance. The wagon, loaded or empty, would need no driver, and could be trusted alone to pursue an even course between stations. By means of suspended cable-tracks the roughest regions could thus be safely and economically traversed either by small passenger cars, mail bags, or freight carriers; and the constant flow of evenly distributed small loads along such a line would aggregate as large a tonnage as is now transported over solid and costly roads in long but widely separated trains.

We have already experienced in the telegraph and the telephone the advantages of electricity as a carrier of thoughts and sounds. Who can tell but, when its capacities as a carrier of men and things have been fully developed, the electric telegraph and the telephone will be eclipsed in scope and utility by the electric road? Its possibilities are infinite; and it is the disposition of the men of these days to crowd the possible in every direction.

DEEP MINES IN NEVADA.

The depth attained is as follows: The Utah 1,980 feet, the Sierra Nevada 2,500, the Union Consolidated, Mexican, and Ophir, each 2,500, Consolidated Virginia and California 3,300 each. Best and Belcher 2,000, Gould and Curry 2,200, Hale and Norcross and Savage 2,400, Chollar 2,400, Ward vertical shaft, 2,168, Combination shaft 2,440, Yellow Jacket 3,000, Belcher 3,000, Crown Point 2,800, Overman and Caledonia each 1,900, Alta and Benton each 1,950, Silver Hill 1,300, Consolidated Imperial 2,800, Bullion 2,300 feet.

FOOD ADULTERATION.

The Chicago *Inter-Ocean* introduces an official report of an examination of the vinegar sold in that city, with the startling headlines: "*Adulterated Vinegar. Results of Analyses of Twenty-four Samples by the Health Department Chemist. Discovery of Foreign and Unwholesome Ingredients Wholly Unfit for Food.*"

Nothing short of wholesale and dangerous adulterations could be looked for under such a heading; an expectation, we are happy to say, not at all justified by the report which it covered. After a number of preliminary statements with regard to the specific gravity, color, odor, etc., of vinegar, the chemist says:

"Vinegar should contain at least three per cent. of acetic acid. Three samples, Nos. 9, 10, and 22, do not come up to this standard, and should therefore be looked upon as adulterated.

"Here, again, I find sample No. 22 has been adulterated by the addition of hydrochloric (muriatic) acid, and its use should not be permitted. The vegetable acids, as I have termed them, are not necessarily hurtful.

"The examination for the poisonous metals, lead and copper, was made in the acid solution of the ash of the vinegar. It has been exceedingly carefully conducted, as it is well known that the habitual use of any food or drink, containing even very minute quantities of these metals, has a very deleterious effect upon the human system. Sample No. 17 is the only one containing a dangerous metal, namely, copper, and its sale should at once be prevented.

"Looking at these samples of vinegar as a whole, they are very good, and will compare very favorably with the general run of vinegars. No objection can be taken to any but those that I have already individually mentioned, namely, Nos., 9, 10, 22, and 17."

That there should be four objectionable samples of vinegar out of twenty-four, is certainly to be deplored; still more that one of the four should contain a trace of copper, due probably to the use of improper utensils in making or handling the vinegar. But is it not even more deplorable that a reputable newspaper will cater to popular ignorance and prejudice, and intensify them, by such misleading displays of lying type?

We are much inclined to believe that, in the majority of cases, the general adulteration of food-stuffs by grocers and manufacturers, as charged by certain uncritical writers, will be found to rest upon as small a basis of fact as the *Inter-Ocean's* alleged "war upon vinegar venders" by the Chicago Board of Health.

THE AMERICAN CHEMICAL SOCIETY.

The May Conversazione of the society was held at the University building, Washington Square, on Thursday evening, May 20. Among a number of very interesting exhibits, the following are worthy of notice:

Dr. Arno Behr exhibited a solution of copper sulphate,