THE THORENBERG ELECTRIC PLANT.

Although the transmission of motive power, and the utilization of natural forces styled gratuitous, to a great distance, have not as yet been as extensively developed as some physicists had hoped that they would be, it must not be concluded from this that the question is forever lost. If we are to judge from their results, the most modest are also sometimes the most meritorious. From this point of view, the electric plant of Thorenberg, which we had an opportunity of visiting a few months ago, merits special mention, since it combines the (at present) most practical processes of utilizing natural motive forces at a distance. We believe it of interest to describe it.

Thorenberg is a point on the line from Lucerne to Berne, near the Litau station, about three miles distant from Lucerne. Here there is a waterfall 25 feet in height, derived from Emmen River. This fall, which already represents an important motive force, will become a greater one still when the work now in progress shall have carried the height of the fall to fifty feet.

Mr. Troller, owner of a steam flour mill located at three miles from the fall, conceived the happy idea of utilizing the latter and establishing there a genuine electric plant of a peculiar character. This plant, which is represented as a whole in Fig. 1, and of which Fig. 2 shows the interior arrangements, produces electric energy which is applied to two essentially distinct services, as well by the nature of the currents obtained as by the utilization of the same. To this effect, a turbine actuates a large shaft which extends along the entire length of the works, and runs two series of generators, viz. : (1) Alternating current generators, serving for the lighting of a part of the city of Lucerne ; and (2) a continuous current machine, of which the current actuates, at a distance of three miles, an electric motor that runs Mr. Troller's mill.

We shall say but a few words concerning the lighting arrangement, reserving a detailed description of it for a special article. This service is performed with the aid of two Zipernowsky alternating current machines of 150 horse power, which supply a certain number of transformers distributed through Lucerne at the centers of the chief points of consumption. When running normally, each machine is capable of producing 1,800 volts at the terminals, and 40 amperes. The general principle of distribution by transformers on derived circuits has already been described here ; so it is useless to revert to it. Let us merely recall the fact that the object of transformers is to reduce the high potential of conveyance to a feebler potential of distribution ; and, consequently, one more easily utilized and presenting no danger. The transmission is aerial, and is formed of a double conductor consisting of two copper wires ¼ inch in diameter.

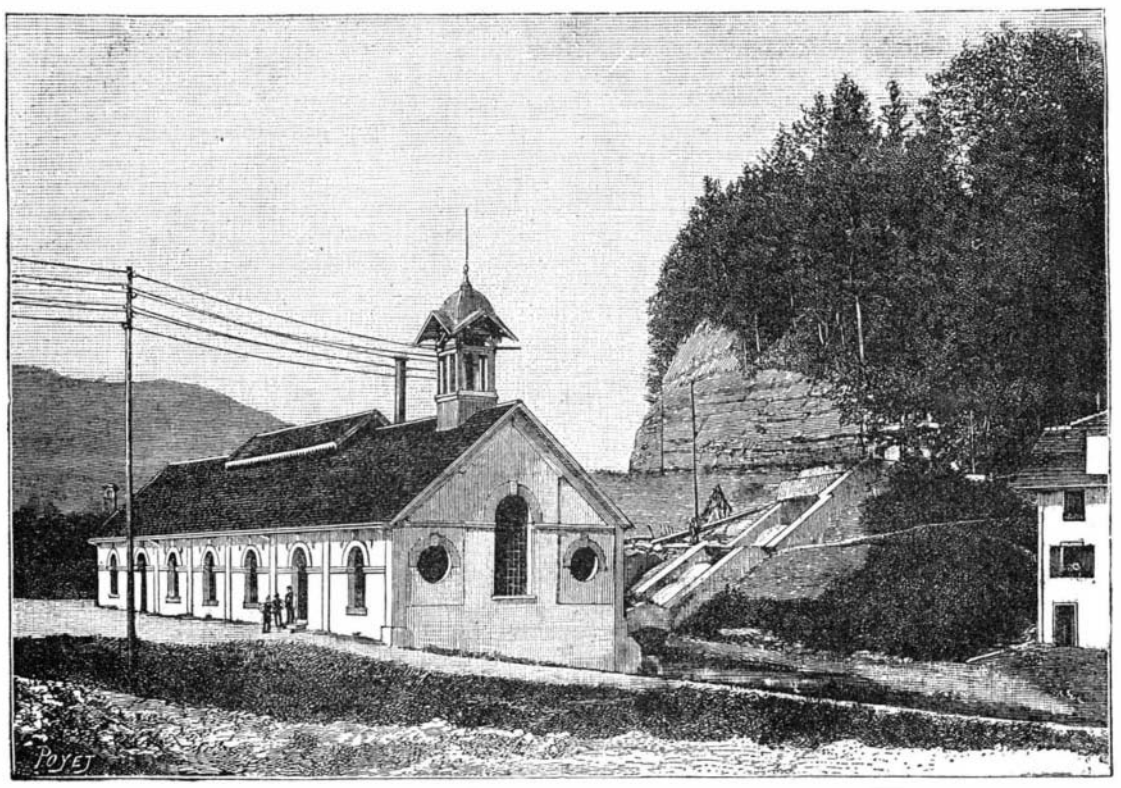


Fig. 1.—THE THORENBERG ELECTRIC PLANT.

The distribution at Lucerne presents the special character of a bouquet system ; that is to say, all the lamps are distributed in quite a limited space, and at quite a great distance from the plant, the conductors from the latter constituting as it were the stem of the bouquet. It is a question, then, of keeping the potential constant, not at the terminals of the machine in the works, but toward the central point of bifurcation of the derivations that supply the transformers. The result is that the electromotive force of the generating machines must vary with the discharge, that is to say, with the number of lamps supplied at every instant, and be so much the greater in proportion as the discharge is greater, in order to compensate for the losses due to the resistance of the from five to six mile line. This result is obtained by means of an ingenious combination of compensators, whose principle we shall describe. The compensator is an apparatus designed, as its name indicates, to compensate by its operation for the effect of a detrimental action. It is a small transformer whose inductive circuit is mounted in the general circuit of the system of distribution, and is traversed by the total current of the machine, while the induced current is connected with the excitation of the machine. The excitation itself forms a special circuit, and is produced by one of the twenty induced bobbins of the machine, the nineteen others serving to produce the main current.

The excitation current is therefore due to the sum of the two electromotive forces that provoke it, one resulting from the rotation of the machine itself, fixed and constant for a given velocity, and the other derived from the transformer and variable with the discharge. It is unnecessary to say that the alternating excitation current is made continuous by a special commutator before reaching the movable inductors of the machine.

Under such conditions, the excitation, and consequently the electromotive power, of the machine increases automatically with the discharge by a purely physical regulation, without the intervention of any special mechanism. Resistances interposed in the excitation circuit permit, moreover, of putting the regulation in equilibrium according to the velocity adopted and to the variations that the latter may undergo.

The works themselves are lighted by fifteen lamps, supplied by a special transformer, but as this latter is branched at the start, nearly at the terminals of the machine, the lamps that it supplies would vary in luster with the discharge were not the variations com-

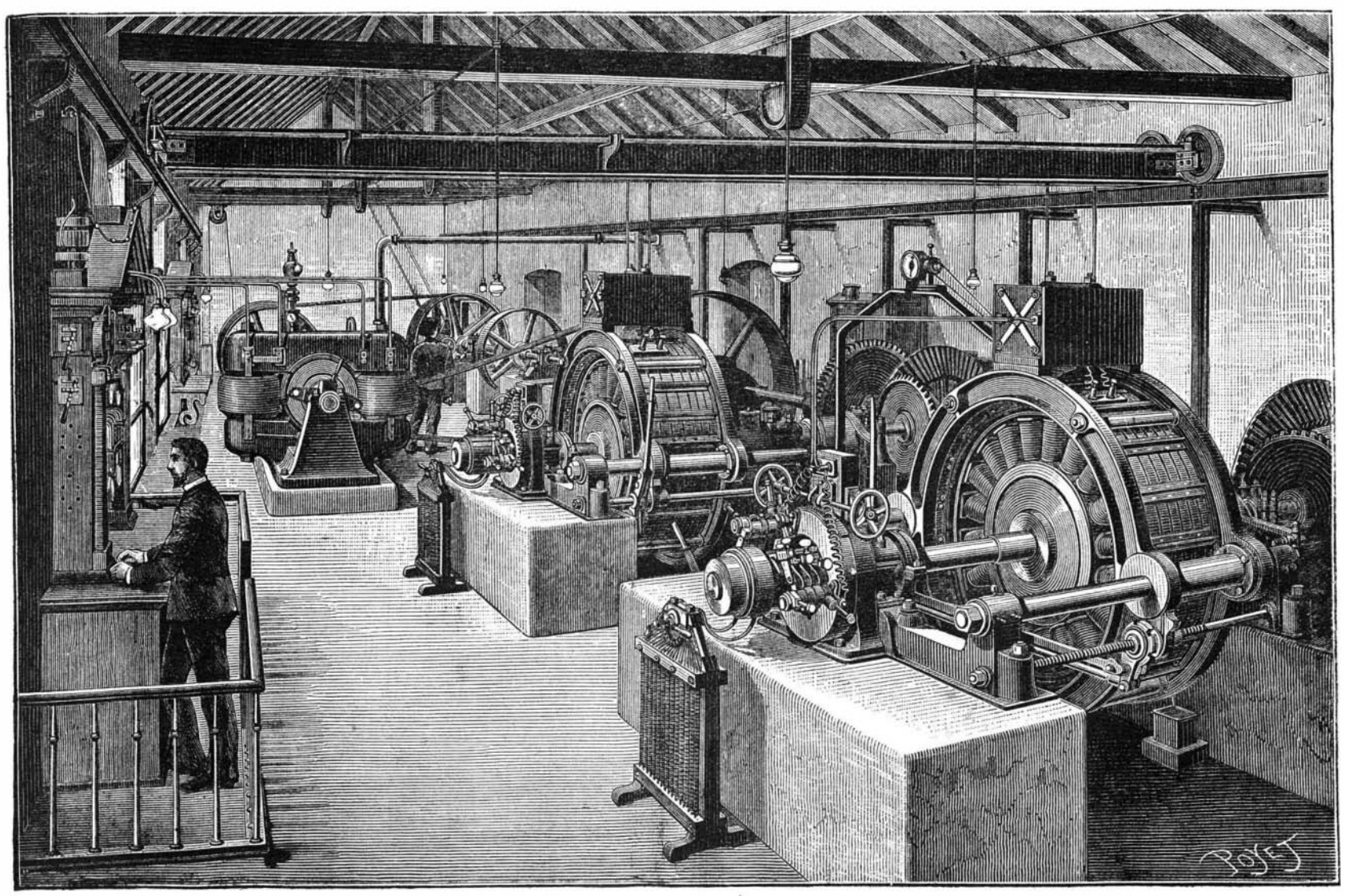


Fig. 2.—INTERIOR VIEW OF THE WORKS.

pensated for by a special transformer. Finally, there are other transformers that serve to reduce the initial potential in a sufficient proportion to permit of the measurement of it by means of the apparatus in current use.

The Thorenberg installation is now supplying 3,500 Swan incandescent lamps of 10 candle power (35 watts), but, as all these are not lighted at the same time, a single machine suffices to perform the service. The light is paid for by contract, at the price of $4 per lamp per year.

The lighting has been done for nearly two years and a half, and has always given entire satisfaction.—*La Nature.*

Cedar for Paving.

The popularity of round block wood paving is steadily on the increase. A company has been formed at Mobile, Ala., with A. C. Danner, the well known lumberman, at its head, to put in machinery for making sapless blocks to pave the streets of that city, using juniper, cypress, and cedar. Cypress has been used more or less, juniper is said to be similar to the white cedar of the North, and the red cedar is thought to be better than the Northern white cedar Wood paving can be put down at Mobile for $1.50 a yard, as compared with $3.50 to $3.75 for asphaltum.

Before it was decided to go into the paving business, extensive correspondence was had with residents of cities where wood paving is in use, the replies being uniformly favorable. Fred. A. Tromley, secretary of the Board of Public Works, Grand Rapids, Mich., wrote that for ten years the city had used only yellow cedar for wood pavements, and for the past few years only the sapless cedar blocks, the duration of the paving being from seven to ten years, also that wood pavements which are sprinkled during the summer last the longest. David P. Hadden, president of the Memphis, Tenn., taxing district, reported thirteen miles of cypress pavement in use. It was green, and of the Nicholson style, lasting ten or twelve years with good care. He advised putting down nothing but round blocks of red cedar. John Torrent, mayor of Muskegon, Mich., wrote that during the past two years about eighteen miles of cedar block paving had been laid in that city, its life being from ten to twelve years. He believes it the most practical wood paving of any now in use. H. R. Wagar, president of the Wagar Lumber Company, Ionia, Mich., said that the round cedar blocks had made an elegant, durable paving, especially where the traffic was light or moderate. R. R. Blacker, of the State Lumber Company, Manistee, Mich., considered cedar the best material to use for street paving, and said that its life depended upon the amount of traffic to which a street was subjected. E. J. Senseney, merchant, East St. Louis, Ill., favored wood paving, largely because it made no noise, and was free from dust, while asphaltum was very dusty, and, being impervious to water, caused shade trees to languish. For heavy traffic, he regarded granite the best.—*Lumberman.*

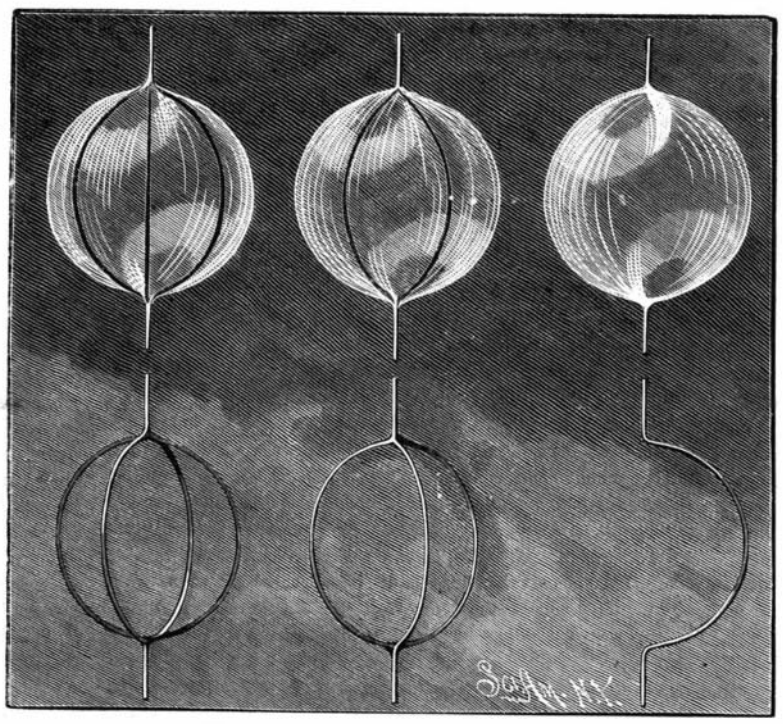
A GREAT STONE.

There was recently cut out from the Pilkington Quarry, Horwich, in one piece, without crack or flaw, a large stone, weighing upward of 35 tons. The dimensions are 14½ feet in length, 6 feet high, and 5 feet 3 inches wide. The removal of this mass from the quarry to its destination, a bleach works in Bolton, a distance of seven miles, over a rough, hilly road, was successfully accomplished, as shown above, by the Phœnix Steam Boiler Company, Bolton, under the direction of Mr. H. W. Rushton. The London *Engineer* remarks, it is said to be the largest stone ever quarried in England.

IT is a fact not well known that native sulphate of baryta is an active poison to rats, mice, and dogs. It is not easy to explain its action, considering its extreme insolubility, but mixed with lard it is readily eaten by them. This being the case, the question suggests itself, whether it might not replace the more dangerous poisons now so much used for this purpose, and do away with the risk attending them.—*Pharm. Jour.*

CURIOUS OPTICAL ILLUSION.

The engraving illustrates an interesting illusion observed by Mr. J. Rapieff, the well known electrician. The apparatus consists of semicircular and circular wire loops, provided with axles, by which they may be twirled between the thumbs and fingers. The lower row of figures shows some of the loops used in the experiment, while the upper figures represent the effects produced. The wire has a polished surface. When



CURIOUS OPTICAL ILLUSION.

the single semicircular loop is twirled, the only effect is to produce a gauzy glimmer of spherical form, as shown in the upper right hand figure. When three of the loops are joined together, each extending from the other at an angle of 120°, the figure produced is similar to that already described, but with two perfectly distinct curved black lines extending from one axle to the other, as shown in the upper central figure. When four loops are joined at right angles to each other, three jet black lines are shown, as indicated in the upper left hand figure. A circular loop shows a single black line.

This curious effect is produced by holding the apparatus so that the light is reflected as much as possible from the inner surface of the wire. The result is due to the eclipsing of the bright surface by the shaded portion of the upper loop as it passes between the eye and the lower loop. The whole of the loop is not eclipsed at the same instant, but persistence of vision causes the entire eclipse to be seen at once.

Success in this experiment depends upon holding the loops in the right position relative to the light, as well as the provision of the proper background. The loops should be held over a dark ground, with the axles parallel with the plane of vision. G. M. H.

WITHIN a radius of forty miles of Rochester there are more than 1,500 fruit evaporators, giving employment during the autumn and winter to about 30,000 hands. Last season the production of these evaporators was about 30,000,000 pounds, worth at first cost about $2,000,000. A large proportion of the product is exported.

A GREAT STONE.

Fecundity of the Eel.

Mr. Fred Mather, the well known fish culturist, has been estimating the number of eggs in a six-pound eel in November (in what is known to fishermen as "eel fat," but which are really the ovaries), and credits that eel with fully 9,000,000. Under the microscope he found that they measured 80 to the linear inch, and taking one ovary and dividing it by means of the most delicate scales known to science, he halved, quartered, and further divided the mass seventeen times, until he had a section small enough to count the eggs in it. This section represented 1-131,072 of the total number, and three sections were laboriously counted under the microscope. One of the sections contained 68 eggs, making the total 8,912,896 eggs. The second held 77 eggs, or 10,092,544 in the whole. The third section consisted of 71, from which it would appear that there were 9,306,112 eggs in the eel. Taking the last as the medium number, Mr. Mather figures, in round numbers, that that six-pound eel contained 9,000,000 eggs.

There have been many theories about the reproduction of the eel, some of them being wildly absurd, such as their being hatched by fresh water mussels, or that the lamprey was the female and the so-called silver eel the male, etc. The fact is that the lamprey, miscalled "lamper eel," is a form of life lower than that of the true fishes, to which the eel belongs, and is a vertebrate with a cartilagenous skeleton instead of a bony one, has its skull imperfectly developed, and has no lower jaw. Superficially it appears like an eel, but is not nearly related to it.—*N. Y. Sun.*

Cleaning Furs.

Now that the season has arrived for getting out fur garments, some of our readers will doubtless be glad to hear how such garments are cleaned and renovated in Russia, the country of furs.

Some rye flour is put into a pot and heated upon a stove, with constant stirring as long as the hand can bear the heat. The flour is then spread over the fur and rubbed into it. After this, the fur is brushed with a very clean brush, or, better, is gently beaten until all the flour is removed. The fur thus resumes its natural luster and appears absolutely as if new.—*La Science Illustre.*

Transmutation of Cotton Seed.

Was there ever, says *Banker's Monthly*, such a history as that of the cotton seed? For seventy years despised as a nuisance, and burned or dumped as garbage, then discovered to be the very food for which the soil was hungering, and reluctantly admitted to the rank of utilities, shortly afterward found to be nutritious food for beast as well as for soil, and thereupon treated with something like respect. Once admitted to the circle of farm industries, it was found to hold thirty-five gallons of pure oil to the ton, worth in its crude state $14 to the ton, or $40,000,000 for the whole crop of seed. But then a system was devised for refining the oil up to a value of $1 a gallon, and the frugal Italians placed a cask of it at the root of every olive tree and then defied the Borean breath of the Alps. And then experience showed that the ton of cotton seed was a better fertilizer and a better stock when robbed of its thirty-five gallons of oil than before, and that the hulls of the seed made the best of fuel for feeding the oil mill engine, and that the ashes of the hulls scooped from the engine's draught had the highest commercial value as potash, and that the "refuse" of the whole made the best and purest soap stock, to carry to the toilet the perfumes of Lubin or Colgate.

Sure Death to Buffalo Moths.

Of the vast number of remedies tried for exterminating that most troublesome pest, the buffalo moth, the following is said to accomplish the object:

Take strips of red or blue flannel (as these colors are particularly attractive to them), dip in liquid arsenic, and lay around the edges of carpets, or wherever the pests are troublesome. They will soon eat a desired amount and collapse, to the entire satisfaction of the housewife, without the least injury to her carpets.