THE ELECTRICAL WORLD

MAKES ITS OWN LIGHT.

A Complete Electric Plant on a Locomotive's Back.

Observers of modern locomotives have probably noticed a device attached to the top of the boiler, as shown in the illustration. This device, which is a complete electric plant, is usually attached between

Steam Turbine for Train Illumination.

the stack and the sand box, but is sometimes placed back of the sand box. It consists of a small steam turbine, direct-connected to a very compact two-pole generator, and has all electrical connections and moving parts carefully protected from the weather.

This apparatus, says Popular Mechanics, is the survival of several other appliances for train illumination, among which were storage batteries, generators driven from the car axles, and small reciprocating steam plants in baggage cars, all of which proved inferior to the steam turbine for efficiency and reliability.

Watching the Experiment.

It is reported that the Canadian Pacific company has decided to await the outcome of experiments by the New York Central and New York, New Haven & Hartford Railway companies before taking steps for the electrification of any part of its system. Both the latter railways are spending enormous sums upon experiments, the faormer with a direct and the latter with a single-phase alternating current.

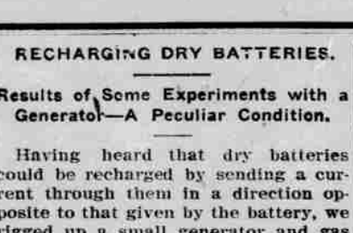
Cheapening Electric Light Bulbs.

The blowing of electric light bulbs at the present time is done by hand, and the operation is therefore slow; but a piece of machinery to do this work has been recently patented by a mechinical engineers of Toledo, O.

RECHARGING DRY BATTERIES.

Results of Some Experiments with a Generator—A Peculiar Condition.

Having heard that dry batteries could be recharged by sending a current through them in a direction opposite to that given by the battery, we rigged up a small generator and gas engine, as shown in the sketch, and connected the batteries in series with the motor. After running a few minutes we stopped the engine and disconnected the batteries, which then gave a fairly strong current. Thinking to increase the charge, we connected the batteries exactly as they were the first time, and started the engine in the same direction as before, and let the outfit run several hours. On returning we found the zincs all corroded and the batteries completely run down. Desiring to learn the cause of this seemingly peculiar behavior, we connected a new lot of batteries and proceeded as before. The engine was then stopped and the belt was removed from the generator, thus allowing the current of the batteries to run the generator as a motor. We expected the generator to run in a direction opposite to that used in charging, but were surprised to see it continue running in the same direction. The explanation is that the current from the batteries



Recharging Dry Batteries.

reversed the field, and also the armature, thus making two reverses, which is the same as none at all. Then when the generator was run again by the engine the current was reversed, because the poles of the field had been changed by the batteries.

We concluded from these experiments, says the correspondent of Popular Mechanics, that in charging batteries in this way it is necessary to either change the connections on the battery, or reverse the rotation of the engine each time it is started. As the engine was two-cycle, it was more easily reversed than the battery connections, and in this way, the batteries were recharged without any difficulty. A stronger charge may be given to batteries in which a quantity of water has been poured in holes drilled through the top.

TEST STEAM VALVES

MOST PERILOUS OF ALL RAILROAD OCCUPATIONS.

Riding on the Extreme Front of the Locomotive, These Men Have No Chance for Escape in Case of Accident.

Riding upon the front of an engine going 60 miles an hour, protected from the rush of the wind by the flimsiest of wind shields, where the slightest mishap or obstacle thrown up by the cowcatcher would mean instant death, the young men who are engaged in the work of testing the steam valves on locomotive cylinders may truthfully be said to have the most perilous occupation in the world.

Those of you who have ridden about the roller coasters and the loop the loops at the summer resorts have some conception of the speed made by one of the up-to-date overland limited trains. It takes away the breath of one who is unaccustomed to it on his first experience. But conceive yourself on the front of an engine where this rate of speed is kept up mile after mile and you will have some idea of the daily experience of a locomotive valve tester.

If there is a wreck and their engine collides with another, or perchance goes plunging through an embankment or through a bridge into a river, the young men on the front end would be caught like rats in a trap. There would be no escape. There would not be one chance in 1,000 of their escaping alive.

The crew engaged in this test numbers three. These are in addition to the regular crew of engineer and fireman. The latter have nothing to do with the test, and look after their regular duties, regardless of and perhaps indifferent to the presence of the testers. In fact, if the truth is told, the enginemen would rather the testers would select some other engine. The space within the cab is naturally limited, and a third person, in the engineer of the test, who has charge of the collection of records and who keeps his position in the cab, is not welcomed. Then, again, the engineers are averse to the presence of the young men on the front end, with the constant danger of their being killed.

Nearly every big railroad employs these valve testers, but, like many other vocations connected with a railroad, they are not known to the general public. If you ever happen to notice a big engine flying along at a lightning speed, with a big box covering the front just above the cowcatcher, you may know that the box covers two young men who are attempting to discover whether the valves are working right and to locate the fault if they are not.

When the engine runs into an open switch or collides with a box car or some obstacle on the track, the fireman and engineer, although their jobs are regarded as the most perilous of any of the members of the train crew, have at least a fighting chance for their lives. They can usually tell a moment or two before anything happens, which would give them time to jump if they were so disposed. Not so the valve testers on the front of the engine. If anything should happen to them they would never live to know what it was. Having no opportunity to jump or save themselves, they would be the first to meet death. But, although this work has been going on for several years on most of the big roads, so far as is known, no accident of any importance has ever happened to the young men who daily take their lives in their hands.

The Adam of Railway Cars.

The photograph shows what a correspondent believes to be the first railway carriage—the very Adam of such cars; but whether he is accurate in his surmise we cannot say. The

carriage is preserved at the old Soho Works, Shildon, where many of the first engines for the Stockton & Darlington railway were built.—London Sketch.

Tree Planting by Canadian Railway.

The Canadian Pacific Railway company has begun tree planting on quite an extensive scale along its western lines. A contract has been let for a small acreage of breaking near Wolseley on which it is the intention to experiment with tamarack for ties.

A piece of ground is also to be planted at Medicine Hat with jack pine and tamarack for the same purpose. Over 100 miles of trees are to be planted between Winnipeg and Calgary, for snow breaks, and at several stations trees are to be planted around the station grounds, and prizes are to be offered the section foreman who makes the best showing.

Tramway "Feeder" for Railroad.

The Midland is the first British railway to possess an electric tramway, which extends from Burton to Ashby, a distance of 11½ miles, all of which runs along the public highway with the exception of three-quarters of a mile. This recently inaugurated tramway is already proving a valuable feeder for the Midland.

Among the most curious names of American railway stations are Accident, Kiss Me, Beef Hide, Hat Off, U Bet, and A B C.

NEW POWER IS EMPLOYED.

"Balloon-Railway" Up Mountain Is the Latest.

The "balloon-railway," for ascending precipitous mountains, is the invention of an Austrian engineer. The principle of it is explained by the picture.

A large captive balloon it attached by a stout wire cable to a steel rail, that, from point to point, is fastened to the steep mountain-side right up to the summit. The cable travels along the rail; and, with some dozen passengers in the car, the balloon,

by its own lifting power, passes up the rail to the mountain-top.

How about descending again?

At a little station on the summit is a water-reservoir, and from this a water-tank attached to the car is filled with a sufficient weight of water to bring the balloon, still guided by the cable and rail, gently down again. A speed regulator is provided in the form of a brake acting upon the rail.

"Balloon-railway" riding is described as affording a most enjoyable sensation, and is expected to become popular with mountain tourists.

RAILROAD'S TOLL OF DEATH.

Chinese Line Proves Fatal to Many Who Built It.

A recent report concerning railways in China says, according to the New York Herald: "The construction of the railway between Laoki and Yunnanfu (the great enterprise to which all well wishers of Yuannan look forward as one of the means of permitting this province to take her proper place in the markets of the world) has been perseveringly pushed forward in the face of great difficulties, both climatic and economic. The vile climate of the Namati valley has levied a heavy toll on those who have dared to open up its primeval jungles and gullies. The death rate among the coolies imported from various parts of the empire and put to work in this dreaded valley may, without exaggeration, be estimated at 5,000, or 70 per cent. of the total number employed on that particular section of the line. The company has made praiseworthy efforts to counteract the evils of the climate in this valley.

"Instead of attempting to carry on the work in the Namati valley all the year through, the work is suspended almost entirely during the summer rains, and the coolies are moved up to the works on the high and healthier plateau. This measure, while it economizes the life of that most important individual in the building of any railway—namely, the coolie—must considerably delay the completion of the line, and we must, therefore, wait until 1910 at least for that great desideratum, the linking up of Yunnanfu with Haliphong.

"The year under review marks an important epoch in the history of French railway enterprise in Indo-China. On Christmas day the first locomotive reached Laokai, on the Tonking-Yunnan border, and it is hoped that the coming spring will see the commencement of a through railway service between Haliphong and Laokai."

British Railways in 1905.

A blue book issued in London shows that the gross receipts from passenger and freight traffic last year on the British railways were $625,000,000, an increase of only 1.3 per cent. These earnings include those of the electrified Metropolitan and Metropolitan District railways of London, the Liverpool overhead railway and other other lines of similar character in other cities.

The average dividends paid by the British railways were three and one-fourth per cent. on the common, three and one-half on the preferred, and four per cent. on the guaranteed stocks. On the loans four per cent. was paid and three and one-half on the debenture stock.

The number of first-class passengers increased by 1.1 per cent., and third class by 0.8 per cent., while second class decreased by 6.5 per cent., leaving a considerable net general decrease.

The receipts from excess luggage, mails, parcels, etc., show an increase of $705,000. The total net earnings were $213,300,000 on the $6,415,000,000 capital, or 3.39 per cent. against 3.36 in 1904.

Temporary Color Blindness.

Firemen and engineers are rendered temporarily color-blind by looking into their hot fires. To them then all lights appear white, and, according to experts, many railway accidents are accounted for by this fact.

R ward for "Lost" Trucks.

One of the most important of the Italian railways has offered a reward for the recovery of each of 60 trucks, which are laconically described as "lost."

FAMOUS PARIS BEEHIVE.

PLACE WHERE ARTISTS FIND A CHEERFUL REFUGE.

Home Which Was Formed and Has Flourished Under Patronage of Boucher, the Sculptor.

The Paris philanstery known as the Beehive is situated in a remote suburb near the gate of Versailles. There is nothing particularly attractive about the neighborhood; but here for six years have lived more than 90 artists, painters, sculptors, designers and musicians, grouped under the benevolent patronage of Alfred Boucher, a master of contemporaneous sculpture, and the founder of the Beehive.

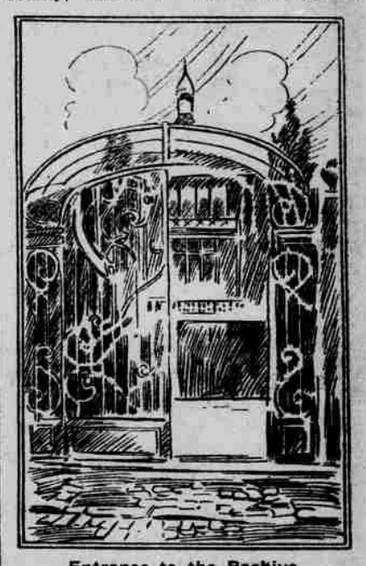
In the insect kingdom, the bees while busy with their own tasks are interested in those of all the others. They hasten to the common abode bringing their booty, and before long the delicious and odorous honey appears to show how combined labors, minute but continuous, are effective in producing a solid return, useful to all and profitable to each.

The Beehive had its foundation in a philanthropic idea concerning artistic solidarity; one of those generous impulses which do so much to soften the asperities of lives of struggle. Before achieving celebrity Alfred Boucher, like other artists without fortune, was obliged to undergo perpetual effort, not only to produce the beautiful and powerful works he was conceiving, but to obtain the right to live.

After achieving success Boucher, if not arrived at fortune, had at least attained easy circumstances, and while others more selfish would only have thought of enjoying a position acquired by dint of desperately hard work, Alfred Boucher resolved to devote his earnings to the erection of a large dwelling where a number of young artists without means could find for a modest sum—only $30 a year!—not alone a comfortable abode, but a study hall of the most favorable description, specially designed for night work, with gratuitous living models.

From five to seven p. m. the bees work in common in the study hall. While the model takes and keeps the attitude on the pedestal placed in the center, the painter with his canvas, the sculptor with his mount, each to his task, tastes art and pure art. The fine example of union in the work which the real bees offer humanity is fully appreciated by the inhabitants of the Hive. They throw off the anxieties brought on by the necessities of modern existence, for in order to procure the wherewithal to live the Bees are obliged to devote themslvs to utilitarian labors.

Some are employed as scene painters at theaters, dashing off wings and drops for fairy pieces, or touching up faded prosceniums; others furnish designs for illustrated periodicals; others work with manufacturers of wallpapers, and others—everywhere in the domain of industrial design. The sculptors are employed in studios where they advance the work of celebrated statuaries; the engravers are in demand for the fashionable designs which the great stores use so profusely in their illustrated catalogue. All are impelled by the cry of Cicero: "One must live." Yes, one must earn one's bread before he can yield to his tastes for art and beauty, before he can work as he



Entrance to the Beehive.

likes, feel himself free to give himself up to his imagination; to realize his hopes and satisfy his desires.

It is to spare young artists of modest means the thousand and one difficulties of the start, to assist them to practice their art, that Boucher thought of offering them a shelter, a roof, or rather a "comb" where the working bee can quietly produce his honey of art and beauty. By its structural form the Beehive recalls the habitation of the diligent little workers. With its bulbous roof, which vaguely recalls the shape of a big bell, the great circular pavilion constitutes the principal part of the establishment. On all sides are doors leading to the combs, and all these combs are occupied by young persons having their dreams and their ambitions, and with everything at their command necessary for translation on the canvas or to model in the moist clay the theory of their conceptions.

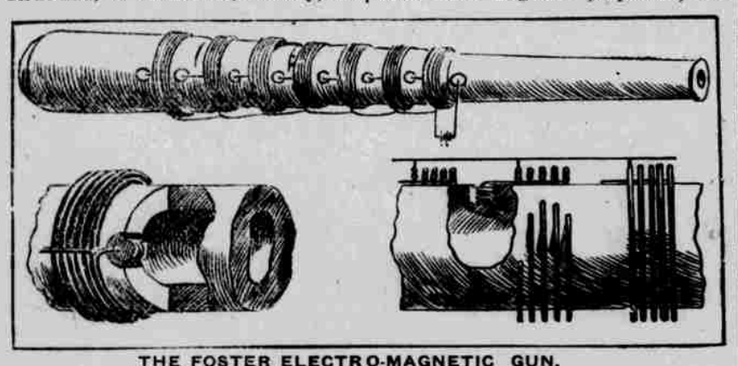
An Electric Powderless and Soundless Gun

While but two patents have been issued by the United States patent office for electro-magnetic guns, and these within the past two years, yet it appears that scientific men gave this problem their attention a number of years ago.

An advance sheet of consular reports, dated February 27, 1902, contains an account of an electro-magnetic cannon in Sweden, as given in a report by Consul-General Bordewich, under date of "Christiana, January 25, 1902."

"Prof. Birkeland (who two years ago was sent by the government to northern Norway to study magnetism, the aurora borealis, and cloud formations) is engaged in the construction of a cannon with electro-magnetism as the motive power in place of explosives. A small model of the invention throws projectiles weighing a pound with great force."

A patent was issued to Kristen Birkeland, of Christiana, Norway, for



THE FOSTER ELECTRO-MAGNETIC GUN.

The Projectile Is Impelled by the Magnetic Action of a Solenoid, the Sectional Coils of Which Are Supplied With Current Through Devices Actuated By the Projectile Itself.

the invention above referred to, March 15, 1904, No. 754,637, and this was the first patent issued by the United States patent office for an invention of this class.

The application of Birkeland was filed January 2, 1902, and Samuel T. Foster, Jr., a native of this country, residing at Victoria, Tamaulipas, Mexico, having read the account of the Birkeland invention, as referred to in the consular report, filed an application for letters patent December 10, 1902, but owing to the difference in the construction of the guns disclosed in the two co-pending applications, no interference was declared.

The broad claims originally filed by Mr. Foster were held to be anticipated by the Journal article above referred to, but a patent was finally allowed and issued to him February 6, 1906, for an electric gun, No. 811,913, the second patent issued in the United States for an invention of this class. One of the practical difficulties encountered in the construction of a practical electro-magnetic gun arises from the fact that the modern methods of electrical calculation would indicate that in order to obtain service velocities with service projectiles an enormous number of windings would be required, thus involving the use of a barrel whose length would be prohibitory.

Another difficulty arises from the fact that in order to give the projectile a service velocity, without an enormous number of windings, an abnormally heavy current—that is to say, a current beyond the safe carrying capacity of the solenoid—is required, and hence the temperature of the solenoid will be raised to a point sufficient to destroy it.

Prof. Birkeland attempts to overcome these difficulties by supplying an abnormally heavy current to a coil and then cutting off the current from the coil before the temperature of the coil has reached such a point as to injure or destroy it, claiming that the rate of increase of the temperature depends upon a number of factors other than the current.

Mr. Foster says, in the specification of his patent:

"All projectiles used in this gun must have magnetic properties, and projectiles of iron or containing large portions of iron are preferable. That projectile having the greatest magnetic permeability is most suitable for this gun." The Foster gun is very simple and comprises a barrel surrounded by a series of coils or helices, a series of openings arranged along the barrel and provided with insulated walls, a series of connector-plugs mounted in said openings and normally adapted to be engaged by the projectile, a series of springs mounted in said openings and adapted normally to hold the connector-plugs in contact with the insulated walls, and an electric generator connected with said helices and barrel.

In this way, explains Ored C. Billman in Scientific American, means are provided for energizing and de-energizing the coils or helices in regular sequential order by the projectile completing and breaking their circuits and for automatically keeping the center of their electro-magnetic field just ahead of the projectile until it has reached the center of the last electro-magnetic field, means are also provided for opening the battery circuit and releasing the projectile of all further electro-magnetic action of the gun.

Vast Wealth in Iron.

Billions of Dollars of Metal Under the Crust of Old Mother Earth in the Mesaba Range.

The greatest ore deal in the world was that in which J. J. Hill transferred the rignt to mine the Hill properties in the Mesaba range to the United States Steel corporation. Few realized when they read the news item announcing the transaction what was involved.

It is believed by conservative judges that the United States Steel corporation now has in its possession the largest individual reserve deposit to be found in the world. It has been estimated that there is beneath the relatively shallow blanket of turf covering the ore on the Mesaba range and in the Michigan beds just across the head of Lake Superior, about 2,200,000,000 tons of ore. Of this the steel trust controlled before it secured the right to delve in Mr. Hill's iron pile about 1,250,000,000 tons of ore, an asset on the basis of one dollar a ton, which exceeds the entire capital stock of the trust—$1,100,000,000. Now it can draw on a total deposit of 1,750,000,000 tons, an asset of as many dollars. On this valuation it would require approximately two-thirds of the entire money supply of the country to pay cash for this deposit.

How big a pile of ore is it that the trust now controls and how long will it last? A ton of ore does not always occupy the same space. Some ore weighs more to the cubic foot than other ore. The average contents of a ton are between nine and ten cubic feet. Say nine cubic feet. Then the trust has secured from Mr. Hill and allied interests a pile 100 feet deep, a mile wide and a mile and three-fifths long.

How long will this giant heap of iron wealth keep the steel trust supplied with ore? Last year the trust took away from its mines in the Lake Superior region 19,251,872 tons. This was 56 per cent., or a little more than half, of the entire shipment of ore from that region. It is believed that the trust will not take less than 22,000,000 tons this year. At the latter rate its ore supply will last just 79 years and 6 months. It is not beyond the range of possibility, however, that other deposits than those of which there is now knowledge will be brought to light on the property it has leased from Mr. Hill. Of the iron ore produced in the world in 1903, which amounted to 101,785,000 tons, more than a third was mined in the United States, a fifth in Germany, and 13.5 per cent. in Great Britain. From the soil of two states alone, Minnesota and Michigan, nearly 26,000,000 tons was brought forth from the mines, or about 6,000,000 more than the industrious inhabitants of the German empire took out of their part of the earth's crust. All of this ore came from the mines about the western end of the greatest of the great lakes. While iron ore was mined in 20 other states and two territories that year, only one—Alabama—produced over a million tons. Its product was 3,648,960 tons. The steel trust has reached into the future and has assured itself of a supply of the essential raw material sufficient to last more than two generations.

In order to make sure of a 20 years supply, in addition to the 50 or 60 years' stock on hand, it has agreed to pay the highest royalties ever paid for the right to mine iron ore. The steel trust will pay to Mr. Hill's companies a royalty of 85 cents a ton for hauling it to the upper lake piers, with an increase of 3.4 cents a ton each succeeding year. It has agreed to take out 750,000 tons in 1907, and to increase the amount each year by 750,000 tons, until the amount reaches 8,250,000 tons. That means that in 1917 the trust will take the maximum amount of ore, and pay $1.19 a ton royalty for it. Mr. Hill's road will make about 50 cents a ton hauling this ore.

At the Reception.

Maude—Mr. Huggins looks unusually happy this evening.

Elsie—Yes; he proposed to me less than an hour ago.

Maude—Ah, I see—and you refused him.—Chicago News.

When He Got His.

"Does your wife lecture you when you go to the club?"

"No; when I come from the club."—Houston Post.

Accounted For.

Bacon—How does it happen that your friend can afford to smoke such expensive cigars?

Egbert—Oh, he's got an economical wife.—Yonkers Statesman.

Plenty.

"A Boston belle says, 'The marriage bells will ring, but I do not know when.'"

"There are lots of Boston girls in her fix."—Houston Post.