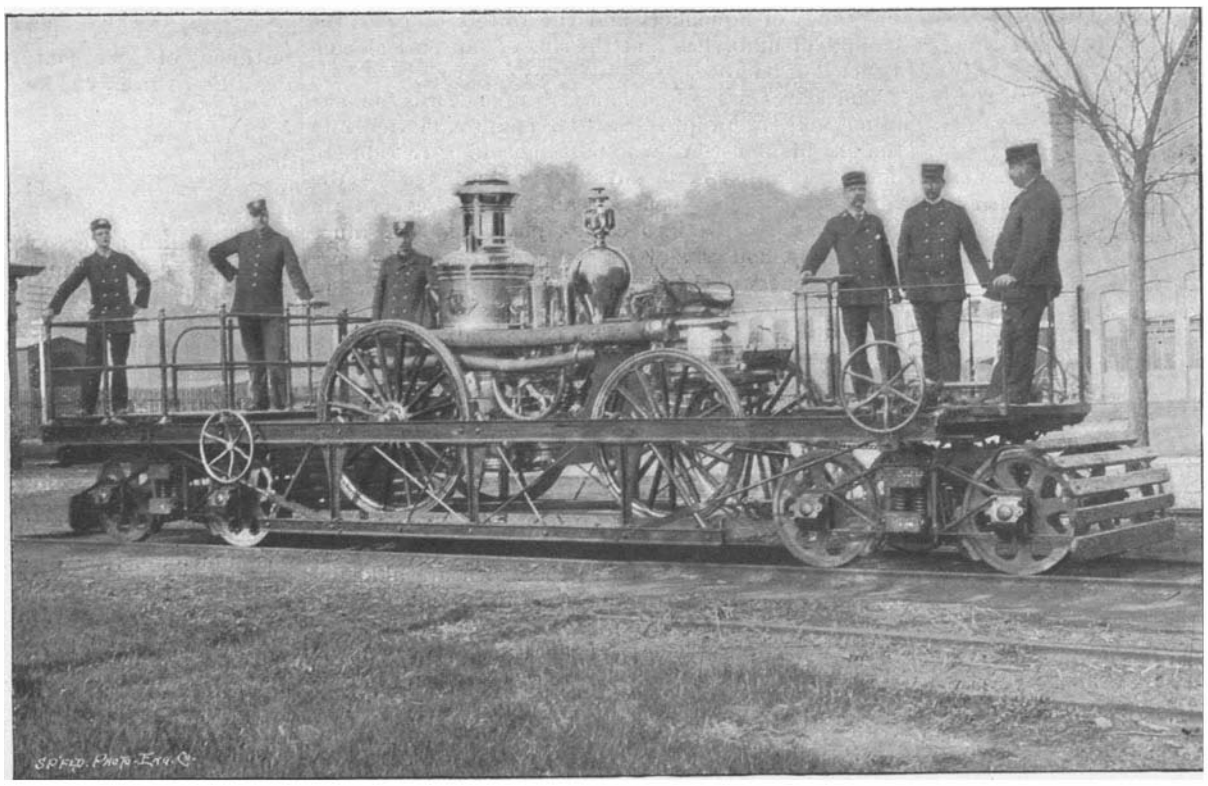
A FIRE ENGINE CAR.

With the enormous extension of the trolley road it has been rendered possible to furnish fire protection to outlying districts without the maintenance of expensive fire companies in the immediate neighborhood. Several cases have lately occurred in which the trolley has enabled fire apparatus to be quickly transferred to the scene of the conflagration.

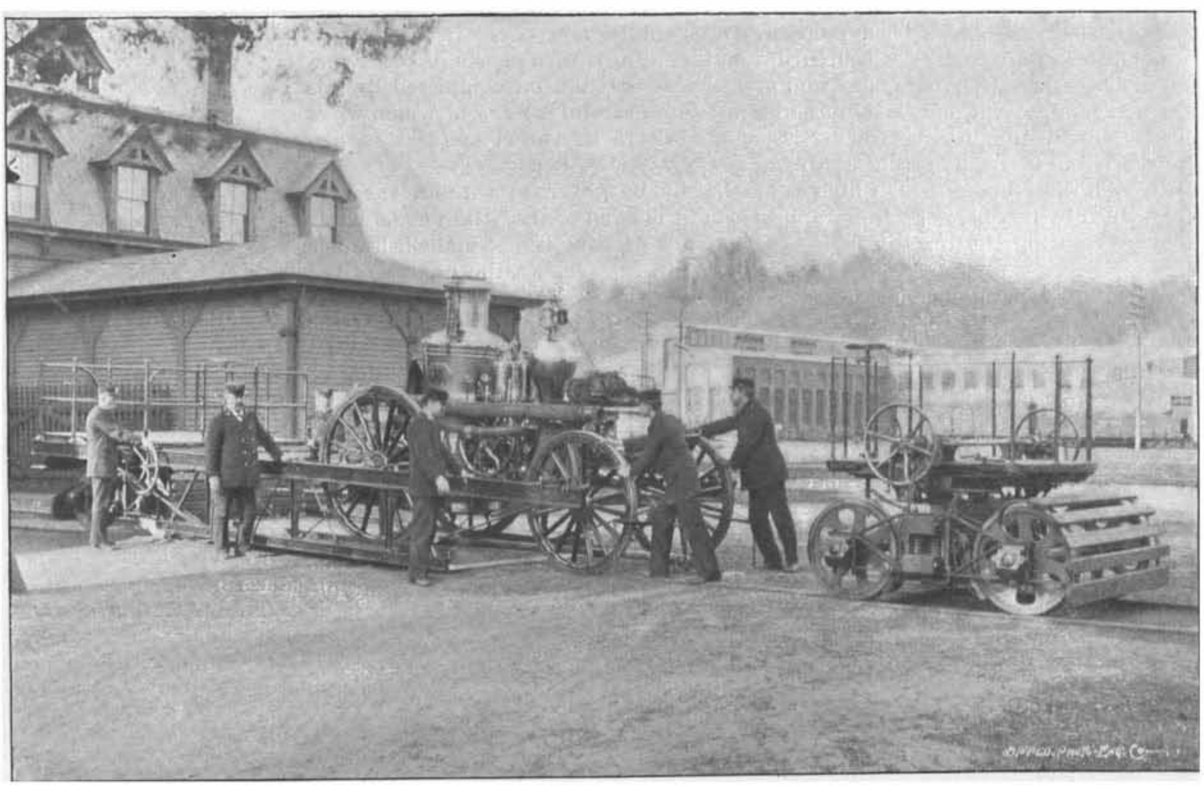
The electric engine truck which we illustrate is intended for this purpose, and is made by the Wason Manufacturing Company, of Springfield, Mass. It consists of two trucks, surmounted by platforms, on which men can ride with hose, tools and other equipments. To the rear truck is attached a platform which connects the two trucks upon which the fire engine is carried. The length over the platform railings is 28 feet 8 inches. The extreme length from the edge of the footboard to the fender is 30 feet 10½ inches. The height from the rail to the top of the engine platform is 9½ inches, the length and width of the engine platform is 13 feet 9 inches by 6 feet 11 inches. The width of the car over the channel beams is 7 feet 10 inches. The extreme width over the hoisting wheels is 8 feet 6½ inches. The weight of the car is 14,000 pounds. The electric motor can be attached directly to the axle of either truck or the car propelled or drawn by electric locomotive or snow plow.

To load the engine, the platform is lowered to the rail, the front truck is disconnected, and is run far enough away to admit of the engine being backed into position, when, by means of a winch attached to the rear truck, the engine is easily and readily drawn into place. The front truck is then brought back, and, by means of chain hoists operated by right and left screws, the front end of the platform is raised and the side girders securely locked into place, thus making both trucks and platform practically one piece. At a recent test by fire department officials, a steam fire engine was loaded in two and one-quarter minutes from the time the car was run into position until its being ready for service. In unloading, the front truck was detached in forty-five seconds, and the horses were attached and ready for starting off in one minute and one-quarter.

The great extension of the trolley and third rail roads in connecting widely separated towns will enable such fire trucks to be used with great effect, as, in case of a serious fire, engines from a number of towns may be brought into action in a very few minutes, and will enable small hamlets and isolated houses to receive fire protection which they could not get in any other way.



AN ELECTRIC FIRE ENGINE TRUCK.



LOADING THE TRUCK WITH A FIRE ENGINE.

The Creep of Rails.

A valuable paper upon the above subject was presented recently before the railway section of the Austrian Society of Engineers, by Inspector Von Engerth, and is now printed in full, with diagrams, in the Zeitschr. d. Oesterr. Ing. u. Arch. Vereines for January 22 and 29, says the Engineering Magazine. The fact that rails do creep has long been observed, but this shifting of position appears to be a final resultant of so many different causes that its full investigation is voluminous. Inspector v. Engerth has collected data from a number of the Continental railways, and from these he studies the problem. Especially is he indebted to M. Couard, of the Paris-Lyons-Mediterranée railway, and to the report of Herr Ast upon Austrian railways.

In most of the roads investigated the creep was in the direction of the travel of trains, and also down the grades, as might be expected. The greatest creep observed was that on the Kaiser Ferdinands Nordbahn, where the maximum was 260 millimeters in one year, but this was exceptional, as on the same road the total creep for seven years was 420 millimeters. The creep, however, takes place on straight, level sections of the road, and, furthermore, is not alike for both rails, the left rail almost invariably showing the greater creep.

Careful measurements were made upon about 500 miles of the Austro-Hungarian state railways, of which more than 300 miles are double track, and data were obtained upon the following points: nature of ballasting, relative level of rails, width of embankments, character of rail fastenings, length of time in which no creep occurred, and other special points that presented themselves.

M. Couard in his investigations found that in double track roads the creep was in the direction of train motion, and explains this action as follows:

When the engine wheels approach the end of a rail, the weight of the engine causes the rail to spring down a little lower than the end of the next rail, which has as yet none of the weight upon it. This causes the wheel to strike a blow upon the end of the rail which is being approached, and the horizontal component of this blow acts to drive the rail along in the direction of the motion of the engine. The greater creep of the left rail he explains by the fact that on the Paris-Lyons-Mediterranée road, on which the trains keep to the left, the outer rail, being further away from the center of the roadbed, is not so well supported as the inner rail, and hence suffers greater deflection. For single track sections, the creep appears to be in the direction of the swiftest trains or the heaviest loads, thus bearing out the same theory.

The investigations in Austria, however, did not altogether support this view. Herr Spitz, who assisted in making the examinations, found that the greater creep of the left rail also appeared on the Hungarian roads, on which the trains keep to the right, the left rail being in the middle portion of the roadbed, showing that some other cause must be found to explain the inequality. Local conditions, such as difference in ramming the ballast, unequal depth, etc., were found to cause unequal creep, and in some instances the creep was less down steep grades than on portions more nearly level.

Herr Spitz, to whom the credit for the second portion of the paper is due, thinks that the true cause of the unequal creep of the rails is the action of the forces in the engines; he contributes an elaborate discussion of the successive impulses tending to produce blows upon the rails. Taking each side separately, he plotted the successive phases, and then, combining them into one diagram, showed the resultant to be in accordance with the observed facts.

It would be interesting to apply the same analysis to the observations made in this country, and thus obtain a confirmation or refutation of this result.

Gila Monsters Venomous.

Prof. John Van Denburg delivered an interesting lecture at the Academy of Sciences, San Francisco, recently upon the Gila monster. He says:

"It has become a common supposition for years," said the lecturer, "that the bite of a Gila monster was as poisonous as that of a rattlesnake, but many of the scientists denied this. Numerous eminent scientific men stated that from actual experience they had demonstrated that the bite was harmless. One of these (Dr. Schufert) had himself been bitten by one of the reptiles, and, besides the pain occasioned by the ordinary bite of an animal, no ill results followed."

The lecturer then stated, says the San Francisco Call, that he had demonstrated that the saliva of the Gila monster was poisonous. Its bite would in almost every case cause death, if the teeth of the lower jaw penetrated the skin. It was the upper jaw of the reptile which sank into the flesh of Dr. Schufert, and as the secretion of the glands of the upper jaw was harmless, the doctor lived.

The speaker said that he had injected the saliva of both the upper and lower glands into pigeons, and in every case where that from the lower jaw was injected the victim had died in a short time. He showed why so many animals which are bitten by the poisonous reptile live. The ducts which lead from the glands to the mouth open between the lower lip and the gum. For the saliva to enter a wound it must be forced up from the lip to the teeth, and thence into the wound. Thus it is hard for the poisonous fluid to reach the blood, even if the victim is bitten by the lower teeth.

ON the occasion of its 150th anniversary the Aberdeen Journal boasts that it was founded by a fellow apprentice of Benjamin Franklin. The first number contained an account of the battle of Culloden. The Journal was a weekly till 1876, when it became a Conservative daily.

Natural History Notes.

Radiography of Flower and Fruit Buds.—In a recent number of the Gardeners' Chronicle, Mr. G. J. Burch contributes an interesting article, accompanied with figures, upon the use of the X rays for photographing flower and fruit buds. Mr. Burch and his assistants began by exposing plates of glass of different colors to the action of the rays. The violet glass showed itself much more opaque than that of other colors. It contained alumina and cobalt in addition to the ordinary elements. An experiment was afterward made with a violet colored hyacinth, and, as had been anticipated, the flower gave different results from those given by the glass. It was much more transparent. The sensitized plate, after development, showed that the contour of the petals, the veins, and the internal form of the ovary were well represented. For taking such radiographs Mr. Burch advises the use of tubes that give very little light, and that, for example, would scarcely give the contour of the hard parts of the hand. The aeriferous tissues are very transparent to the X rays. The more water the tissues contain, the more opaque they are. Dry fruits and flower buds give excellent radiographs. The seeds are very distinctly seen, as are also the different parts of the flower.

The Color and Sleep of Fish.—Prof. A. E. Verrill recently communicated to the American Journal of Science a valuable article on the subject of the color that fish assume while asleep. In most cases the change consists in an intensification of the colors. The markings have a darker appearance, and such modification is of a nature to better conceal the animal and render it less visible during the night. In certain of the species observed by Prof. Verrill the changes were more complicated. For example, the Stenotomus chrysops while awake and in a state of activity was silvery white, with iridescent plays of color. At night it was of a dark bronze color, and from this ground stood out six transverse black bands. If it chanced to be awakened from its sleep at night, in an aquarium, by the sudden turning on of the gas, so that the light was bright, the color was instantly modified, and the normal tints of the awakened animal exhibited themselves immediately. Here again the protective role of the coloration of the sleeping state is evident, since the animal sleeps among algæ and the black bands are confused with the thalli and fronds, while the bronze color closely resembles the greenish yellow color common to many seaweeds.

In the monacanthus also the nocturnal color is very different. The animal is brown and greenish when it is awake, while when it is asleep its body assumes a grayish color, which protects it amid rocks and plants. In the cephalopods, too, in the loligo especially, the nocturnal color is darker, and, in a general way, it may be said that the animal is less easily distinguished when asleep upon the rocky bottoms that it frequents than when awake. It is evidently well that this is so, since an animal too easily distinguished by its colors or markings would become an easy prey during the torpidity of sleep.

The Preservation of Animals.—In a recent number of Natural Science there is given a summary of the observations of Mr. Amyrald Haly, director of the Museum of Colombo, upon the value of formaline as an agent for preserving zoological specimens. According to Mr. Haly, who has been using this material for the last two years, a 1½ or 2 per cent solution suffices to preserve the invertebrates in general. For the vertebrates it requires a 3 or 3½ per cent solution. Formaline preserves the medusæ admirably, their colors and transparency remaining unchanged. Mr. Haly confesses, however, that formaline is not of universal application, for sometimes it fails. For fish of bright colors it is better to use gum and glycerine, and the same is the case with crustacea; but perhaps gum and formaline mixed might be used with advantage.

The Age of Trees.—It is a widespread idea that the rings of the section of a tree give data as to its age, the concentric rings being of the same number as the years that have passed. It is known, however, that the data thus furnished are only approximately exact. Can any other information be obtained from them? An English botanist has recently caused some surprise by calling attention to a peculiarity of a tree of which a section exists in the British Museum. This section is that of a Douglas fir which was felled in 1885, and was more than five hundred years old. An examination of the specimen shows that a part of the annual rings, corresponding to the end of the first century of the tree's existence, presents an abnormal appearance. Twenty of these rings are very close together and form a zone of special aspect, and widely separated from the external and internal zones. It is evident that these layers have formed during twenty years under defective conditions, or at least abnormal ones. What were these conditions?

The gentleman above mentioned is inclined to seek them in numerous cataclysms—earthquakes, inundations, drought, etc., with pernicious vapors coming from thousands of abysses, and such as preceded the great epidemic known in the fourteenth century as the black plague, which was attributed to such cataclysms.

Economic Uses of the Bamboo.—The bamboo may well be called useful, since it is applied by the Chinese to so vast a variety of purposes that they are puzzled to get along without it when they emigrate to a place where it does not grow. The tender, but tasteless, shoots are cut for food, and are either boiled, pickled, or comfited. The seeds furnish a farina suitable for cakes. The gnarled roots are carved into fantastic images of men, birds, monkeys, or monstrous perversions of animated nature; cut into lantern handles or canes, known in commerce as "whangus;" or turned by the lathe into oval sticks for worshipers to divine whether the gods will hear or refuse their petitions. The tapering culms are used for all purposes that poles can be applied to in carrying, supporting, propelling, and measuring, by the porter, the carpenter, and the boatman, in all cases where strength, lightness, and length are requisite. The joists of houses and the ribs of sails, the shafts of spears and the wattles of handles, the tubes of aqueducts and the rafters of roofs, the handles of umbrellas and the ribs of fans, are all constructed of bamboo.

The leaves are sewed in layers upon cords to make rain cloaks, swept into heaps for manure, matted into thatches, and used as wrappers in cooking rice dumplings. Cut into splints and slivers of various sizes, the wood is worked into baskets and trays of every form and fancy, twisted into cables, plaited into awnings over boats, houses, and streets, and woven into mats for the scenery of the theater, the roofs of houses, and the casing of goods. The shavings are even picked into oakum and mixed with those of rattan to be stuffed into mattresses. The bamboo furnishes material for the bed and the lounge, chopsticks for use in eating, pipes for smoking, flutes to aid in singing, curtains to hang in the doorway and brooms to sweep around it, besides screens, stools, coops, stands, and other articles of convenience and luxury in the house too numerous and trifling to mention. The mattress to lie upon, the chair to sit upon, the table to dine from, food to eat, and fuel to cook with are alike derived from it. The ferule to correct the pupil and the book he studies both originate here. The tapering tubes of the native organ and the dreaded instrument of the lictor, the skewer to pin the hair and the hat to screen the head, the paper to write upon, the pencil to write with, and the cup to hold the pencils; the rule to measure lengths, the cup to gage quantities, and the bucket to draw water; the bellows to blow the fire, and the tube to hold the match; the bird cage and the crab net, the life preserver and the children's buoy, the fish pole, the water wheel and eaves trough, sedan, wheelbarrow, and hand cart, with scores of other machines and utensils, are one and all completed by this magnificent grass, the graceful beauty of which when growing is comparable to its varied usefulness when cut down.

China could hardly be governed without the constant application of the bamboo, nor the people carry on their daily pursuits without it. It embellishes the garden of the patrician and shades the hamlet of the peasant; it composes the hedge that separates the grounds of the latter, assists in the construction of the implements to work their lands, and feeds the cattle that labor on them. The boatman, dyer, and weaver find its slender poles indispensable in their trades, while there is nothing that the artists paint so well on wares and embroideries. The tabashur found in the internodes has its uses in native pharmacy, and the silicious cuticle furnishes the engraver a good surface for carving and polishing.

The Boreal Fauna.—The intense cold of the regions near the north pole seems to form an insurmountable barrier to animals.

The sailors of the Fram, who proceeded as far as to the 85th degree of latitude, met with no whales, seals, mooses, or bears beyond the 83d degree. On the contrary, they observed dog fishes (Scymnus glacialis) as far as to the 85th degree.

The bear proved a valuable resource to them. Its flesh, cooked or raw, and its fat, served as food, while its skin furnished clothing. During the three years that the voyage lasted, the crew of the Fram killed twenty-nine of these animals.

Trees as Habitations.—Man, like certain animals, has sometimes availed himself of trees as a dwelling or a home. Lucinius Mutianus, an ex-consul of Lycia, took special pleasure in feasting twenty-one guests in a hollow plane tree; and modern travelers tell us of a gigantic baobab in Senegambia, the interior of which is used as a public hall for national meetings, while its portals are ornamented with rude, quaint sculptures cut out of the still living wood. The fig tree of India is worshiped as sacred, and the lazy, helpless bonze builds himself a hut, not unlike a bird cage, in its branches, where he spends his life dreaming in contemplative indolence under its cool, pleasant shade. Whole nations live in the branches of trees. There is a race of natives west of the mouth of the Orinoco, in South America, the Guaranis, who have never yet been completely subdued, thanks mainly to their curious habitations. Humboldt tells us that they twine most skillfully the leaf stalks of the Mauritius palm into cords and weave them with great care into mats. These they suspend high in the air, from branch to branch, and cover them with clay. Here they dwell, and on a dark night the bewildered traveler may see the fires of their dwellings high in the tops of lofty trees.

More civilized countries even have not left us without similar, though isolated, instances of men who have found a dwelling in the trees of the forest. Evelyn tells us of the huge trunk of an oak in Oxfordshire which long served as a prison for felons; and he who lived in the shades of old Selborne mentions an elm on Blechington Green which for months gave reception and shelter to a poor woman whom the inhospitable people would not receive into their houses.

How Our Ancestors Regarded Water Drinking.

Water was in no great favor as a beverage in the sixteenth and seventeenth centuries. The Hospital says: "It needed a very bold man to resist the medical testimony of three centuries ago against water drinking. Few writers can be found to say a good word for it. One or two only are concerned to maintain that 'when begun in early life, it may be pretty freely drunk with impunity,' and they quote the curious instance given by Sir Thomas Elyot in his 'Castle of Health,' 1541, of the Cornish men, 'many of the poorest sort, which never, or very seldom, drink any other drink, be notwithstanding strong of body, and like and live well until they be of great age.' Thomas Cogan, the medical schoolmaster of Manchester fame, confessed in his 'Haven of Health,' 1589, designed for the use of the students, that he knew some who drink cold water at night or fasting in the morning without hurt; and Dr. James Hart, writing about fifty years later, could even claim among his acquaintances 'some honorable and worshipful ladies who drink little other drink, and yet enjoy more perfect health than most of them that drink of the strongest.' The phenomenon was undeniable, but the natural inference was none the less to be resisted. Sir Thomas Elyot himself is very certain, in spite of the Cornish men, that there be in water causes of divers diseases, as of swelling of the spleen and liver. He complains oddly also that 'it flitteth and swimmeth,' and concludes that 'to young men, and them that be of hot complexion, it does less harm, and sometimes it profiteth, but to them that are feeble, old and melancholy, it is not convenient.' 'Water is not wholesome cool by itself for an Englishman,' was the verdict of Andrew Borde—monk, physician, bishop, ambassador and writer on sanitation—as the result of a life's experience. . . . But the most formal indictment against water is that of Venner, who, writing in 1622, ponderously pronounces to dwellers in cold countries it doth very greatly deject their appetites, destroy the natural heat and overthrow the strength of the stomach, and consequently confounding the concoction is the cause of crudities, fluctuations, and windiness in the body."

The Washington Monument's Seismoscope.

The largest seismoscope in the world hangs through the center of gravity in that great obelisk which was erected at Washington, D. C., in honor of our nation's first ruler.

This instrument consists of a copper wire 174 feet long which holds a plummet suspended from its lower extremity into a vessel of water. Two transits arranged at right angles to each other are focused upon the wire just above the plummet, and by means of these little telescopes the slightest vibration of this great mass of stone is indicated upon a graduated scale.

The expansion of the monument's south face, on a hot summer day, sometimes shifts the apex northward a few hundredths of an inch, and high winds frequently cause a slight variation from the normal position of the wire. Occasionally the plummet swings violently when the weather is calm and cool, its motion under such circumstances being ascribed to vibration of the earth itself.

The custodian of the monument takes a daily statement of the transits and prepares a monthly chart of the same, which is filed in the War Department. An examination of these records discloses the interesting fact that no permanent change has been effected in the position of the monument, the plummet having always leaned toward its normal resting place when the causes of disturbance subsided.

On Aconcagua's Summit.

A dispatch from Buenos Ayres, dated May 15, 1897, states that another member of the Fitzgerald expedition, Mr. Stewart Vines, has reached the summit of Aconcagua. It is said to be the highest mountain in the Western Hemisphere. This makes the second person who has ever made the ascent, the first being Zurbriggen, a Swiss guide, also a member of the Fitzgerald expedition, who made the ascent on January 14 of the present year. Mr. Vines reports having made several geological discoveries of great importance. Mr. Fitzgerald, the head of the expedition, is now preparing to make the ascent.

Artificial Light: Modern Methods Compared: Electric, Incandescent, Welsbach, Acetylene.*

BY PROF. D. S. JACOBUS, STEVENS INSTITUTE OF TECHNOLOGY, HOBOKEN, N. J.

Experiments were made showing the appearance of colors when viewed under the various lights. Some colors were shown more perfectly under one light and some more perfectly under another. The Welsbach lamp failed in showing delicate shades of pink, and an experiment was made to show that it tended to give a yellow tinge to the complexion, whereas the acetylene light gave an effect much more life-like than the Welsbach lamp.

To show the appearance of various colors when viewed by the different lights, two surfaces of the same color were held up at an angle between two sets of light, each set containing eight lamps or burners. The two sets of lights to be compared were placed at a distance of about six feet from each other on the lecture table. Screens were placed in front of the burners to shield the eyes of the audience from the direct glare of the lamps. In the space between the lamps colors were shown on large pieces of cardboard, doubled over at the middle so that the two sides could be held at an angle to each other. This allowed one surface to be illuminated by one set of lamps and one by the other. The audience could observe each surface at the same time and thus compare the colors as they appeared to the eye.

Similar experiments were made before the lecture, in which the various lights were compared directly with daylight. These also showed that the Welsbach lamp failed in bringing out delicate shades of pink.

A second series of experiments consisted in viewing colors of a slightly different hue, which would appear of nearly the same hue when held in one position between two sets of lamps, and of a widely different hue when the colors were reversed so as to be lighted by the opposite set of lamps.

The relative rates of consumption of gas for a given candle power was next discussed, together with the heat produced and the contamination of the atmosphere by the products of combustion. The Welsbach was shown to save 70 per cent of the gas used by an ordinary flat flame burner for an equal amount of illumination. Acetylene gas was shown to be ten times as powerful an illuminant as ordinary water gas, or a burner using one cubic foot per hour would produce forty candle power.

The explosive properties of acetylene were discussed, and numerous instances were cited where acetylene compressed in tanks under a heavy pressure, so as to become a liquid, had exploded with fatal results. An instance was also cited where a machine generating acetylene at atmospheric pressure had exploded, killing two persons. In the case of the liquefied acetylene under a heavy pressure the explosion is similar to that of dynamite or ordinary gunpowder; that is, the elements will decompose without the presence of air. If the acetylene is not at a pressure greater than that of the atmosphere, however, such decomposition is impossible, and the acetylene must be mingled with air before there can be an explosion. Experiments were made in which acetylene and ordinary illuminating gas were exploded when mingled with air. The gas was allowed to escape from a burner into a partly confined space. The explosion produced by the acetylene was much more severe than that produced by the illuminating gas.

Calculations of the relative costs, in the city of New York, for equal illumination were presented. The incandescent electric light cost one cent per lamp of 16 candle power per hour. Ordinary illuminating gas at $1.25 per 1,000 cubic feet cost 0·5 cent, and the same burned in a Welsbach burner 0·17 cent. The cost of replacing the mantles of the Welsbach burners was included in the estimates. The difference of cost in favor of the Welsbach will disappear, to a great extent, in practice, for if ordinary gas burners are replaced by the Welsbach, the total amount of illumination, as a rule, becomes greater, and if three times as much, the cost of gas to the consumer per month would be the same with the Welsbach as it was with the ordinary gas burner. To compete with ordinary illuminating gas selling at $1.25 per 1,000 cubic feet in municipal distribution, calcium carbide, the commercial source of acetylene, would have to be sold to the gas company and converted into gas for $40 per ton to net the gas company the same profit, and to be as economical to the consumer as ordinary water gas burned in flat flame burners. To be as economical to the consumer as ordinary gas burned in Welsbach burners it would have to be furnished to the gas companies and converted into acetylene gas for $19.50 per ton. The ordinary mains now used for transmitting illuminating gas would not be suitable for acetylene on account of the leakage. If one-tenth the amount of acetylene were used, as with the ordinary gas, the percentage of leakage, based on the amount of gas used by the consumers, would be increased about ten-fold, or if the percentage of leakage in a system had been 5 per cent with ordinary gas, it would be about 50 per cent with acetylene of the gas used by the consumers, or 33 per cent of the gas stored in the holder.

It was further shown that to be as cheap as kerosene in domestic lighting the calcium carbide would have to be supplied to the consumer at $45 per ton, and the compressed liquid acetylene would have to be supplied at 6½ cents a pound.

It would not be profitable, as has been suggested in some literature on the subject, to convert electric lighting plants into plants for producing calcium carbide, the gas from which could be used for lighting, because the light given by the carbide so produced will be but one-half that obtainable by using the electricity directly in incandescent lamps.

The cost figures show that for an equal illumination the electric incandescent light costs twice as much as gas when the latter is burned in flat flame burners. The incandescent electric light has, however, held its own against the gaslight on account of its superior qualities, which are its brilliancy, cleanliness and adaptability. The electric light is also preferable on account of the fact that it does not vitiate the atmosphere with carbonic acid gas, and that it produces a less heating effect than ordinary illuminating gas. It also eliminates the danger of asphyxiation through an accidental leakage of gas. That the incandescent electric light has held its own at a higher cost to the consumer for a given candle power is a proof that other elements enter into the problem of artificial lighting as strongly as the cost of a given amount of light. From this standpoint it may be argued that acetylene, producing as it does a more brilliant light than any now used for interior lighting, and having the quality of showing the complexion in life-like tints, will have its own field, even should it be the most costly system of illumination.

Again, acetylene is now used in place of the calcium light for lantern projections, etc. Were it not for the explosive character of the compressed acetylene, it would be useful for cases of isolated lighting, such as for beacons and light buoys.

The figures of cost for equal illumination also show that the Welsbach lamp produces about three times the illumination for a given cost as ordinary illuminating gas burned in a flat flame burner. As has been already stated, however, the Welsbach lamp is deficient in showing the complexion in life-like tints. For most classes of work this defect is not of great enough importance to outweigh the advantage derived from its great economy.

The whole situation may be summed up by saying that each system of lighting has its own field of usefulness on account of properties peculiar to itself, which make it more desirable than the others for certain classes of work.

The lecture will appear in full in the next number of the Journal of the Franklin Institute.

* Abstract of lecture delivered at Franklin Institute, March 12, 1897.—From the Progressive Age.

Horseless Wagon in 1861.

It may be interesting to know that one of the earliest successful self-propelling carriages made in this country was owned and used in Newark in 1861 or 1862.

Mr. Joseph E. Ralph, of the Atlantic Highlands, remembers this carriage, and, in fact, during the years mentioned he says he was permitted to run it up and down Orchard street a number of times, although he was only a lad at the time. The carriage, says the New York Sun, belonged to the late Joseph Battin, well known as a hydraulic engineer. He built the waterworks in Elizabeth, N. J., and a large part of the stock of the water company there belonged to him when he died. He lived in Broad street and his property ran through to Orchard street. His stable faced Orchard street, and Mr. Ralph's family lived upon Orchard street, about a block away. Mr. Ralph says that at this time Mr. Battin had got rid of the horses which he had been accustomed to use and had replaced them with a carriage driven by steam. This was what might be called a light wagon, although it was of necessity much heavier than a light driving wagon. It had two seats, and the engineer, who always went out with the machine, occupied the rear seat. The front seat was for the owner, and he did the steering with a round hand wheel in front, something like the grip wheel on a Broadway cable car. The wheel had below it a cogwheel, and this engaged with a toothed half circle segment that was bolted to the fifth wheel of the front axle.

Mr. Ralph says he remembers the steering gear very well, because it took several turns of the steering wheel to bring the wheels around enough to turn a sharp corner, and it required lively work to get the wheels back again in line quickly enough to straighten the course of the carriage before it ran up on the sidewalk. This peculiarity was apt to make a new hand at steering the carriage lose his head.

On the other hand, he remembers very little of the driving engine and gear. The engineer attended to these, and it was through a boyish acquaintance with the engineer that he was permitted at times to mount the driving seat and steer. That Mr. Battin got a great deal of service out of the carriage Mr. Ralph is certain. Mr. Battin went out in it often, and frequently stayed away with it for several days. At these times it was understood by the neighbors that he was engaged up in the hills or about Elizabeth in superintending work on the waterworks or dams that he was building. If this was true and the wagon was capable of traveling over the sticky roads which that country had in bad weather in those days, the carriage must have been unusually strong and useful.

Carbons for Electrolysis.

The extension of electrolytic processes in industrial chemistry has created a demand for terminals which shall be inexpensive and permanent, and numerous patents in this line have been taken out, especially in connection with the electrolytic production of the alkaline chlorides.

Gas carbon is not available in large sheets, such as are commercially required, and hence these have been made of powdered coke, baked with a cementing material in the same manner as electric light carbons are made. Such carbon plates, however, are not permanent, but soon become disintegrated by the action of the solutions, and especially by the action of the liberated gases.

Dr. Alber Lessing, in the Elektrochemische Zeitschrift, claims to have solved the problem by producing carbon sheets entirely homogeneous and free from cracks, by a fusing process which not only insures the permanence of the sheet, but also increases its conductivity. The new product is said to be harder than steel, readily scratching glass, and proof against the emery wheel, and possesses a metallic ring which testifies to its homogeneity. If these claims are maintained, and the prepared carbon can be produced at a reasonable price, it should soon be on the market for many other uses as well as the one for which it was originally produced.

American Brooms.

American brooms are exported in large numbers to many countries, says the New York Sun. Our exportations of brooms to some countries have within recent years, owing to natural causes, decreased; but our aggregate exports are nevertheless now larger than ever and still increasing. We send brooms to Central America, South America, and South Africa, to the United Kingdom, and to France and Germany. We sent many brooms to Australia; now we send few brooms there, but we send large quantities of broom corn, and we send there, too, broom-making machinery. American broom-making machinery is sent also to other foreign countries. At one time many American brooms were sold in the Argentine Republic, but now they are raising broom corn on the Plate River, and making brooms down there too. We send now and then a little lot of brooms to China, but we send none or practically none to other Asiatic countries, and our exports to China are so small as to be of no consideration whatever in the account.

The climate of this country is favorable to the growth of broom corn, and here broom corn is cultivated with the greatest skill and with the best results. Considerable quantities of broom corn are raised in Italy, but it is of a poorer quality and it is commonly permitted to ripen too much, until it is red, and lifeless and brittle. The Italian corn is made into brooms in Germany, where the labor is much cheaper than here; but that cheapness is offset by the effective use of machinery here. In this country even the corn itself is harvested and sorted by machines. American brooms of the lower grades are put down in Germany at prices that are very close to those of the poorer German brooms. The higher grades of American brooms cost more, but they are the best brooms in the world. They excel in durability and in all other good qualities. Some brooms are packed for export in boxes; but there are countries in which import duties are levied on gross weight, where a packing box would be too costly a tare; and brooms for export are commonly packed in burlaps, handles and all being completely covered.

We send no whisk brooms to Europe; there they still cling to the old-fashioned clothes brush. But to all other countries to which we send brooms we send whisk brooms, too.

The Victoria Bridge at Montreal.

The active work of enlarging the Victoria Bridge at Montreal will be begun within the next month and will be completed in eleven or twelve months. It is expected that more than one and a half millions of dollars will be spent on the work and employment given to hundreds of men. The work of reconstruction will be done without interfering in any way with the operation of trains over the bridge. The contract for the reconstruction of the bridge has been let jointly to the Dominion Bridge Company, of Montreal, which contracted for the full capacity of its works, and the Detroit Iron and Bridge Company, which takes the remainder of the work. The bridge when completed will be an open truss steel structure with double steel tracks and facilities for foot passengers, vehicles and electric railways.