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NEW YORK, SATURDAY, MARCH 24. 1894.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF SCIENTIFIC AMERICAN SUPPLEMENT No. 951.

For the Week Ending March 24, 1894.

Price 10 cents. For sale by all newsdealers

REMARKABLE BOAT SPEED—32½ MILES PER HOUR.

The breath of brag in which some of our boat builders have indulged concerning certain American vessels is cut short by the performances of some of the new torpedo boats recently constructed for the British navy. The latest vessel of this class, the Hornet, on a recent trial trip, attained the remarkable speed of 28·33 knots, or over 32½ miles per hour.

This vessel is 180 feet long and 18½ feet wide, has eight boilers, and four funnels. Displacement, 220 tons; greatest draught, 7 feet 6 inches; estimated horse power, 6,248. The trial took place on February 23, on the Maplin mile. Six runs were made, the mean speed being 28·02, and the best pair of runs being 28·333 knots. The bunker capacity is 60 tons, and on this supply, at 10 knots, the boat would have a radius of action of 4,000 miles. Her armament consists of one 12 pounder, two 6 pounders, and three torpedo tubes, 18 inches. The Hornet is a sister boat to the Havock, which was illustrated and described in the SCIENTIFIC AMERICAN of January 13 last.

The Havock made a speed of 27·56 knots. Some forty of these boats are being built in England. Remarkable as is the speed of the Hornet, a boat which is expected to go still faster is now being constructed in France.

The following are particulars of the sea-going torpedo boat Forban, which is now being built at Havre by MM. Augustin Normand & Co., and which is designed to attain the extraordinary speed of 30 knots or 34½ statute miles an hour. Length, 144 feet 3 inches; beam, 15 feet 3 inches; draught, 10 feet; displacement, 130 tons; indicated horse power, 3,200. The vessel will have twin screws, and will carry two torpedo ejectors and two 1·46 inch guns. The Forban will be by far the fastest craft afloat. The Chevalier, a torpedo boat of the same length, but of only 2,700 indicated horse power, was recently delivered by MM. Normand, and has attained a speed of 27·22 knots. The boilers which give these striking results are a specialty of the firm of Normand, and are, it is understood, to be adopted for the new British torpedo boat destroyers Janus, Porcupine, and Lightning, under construction by Messrs. Palmer & Co., of Jarrow, and for the Rocket, Shark, and Surly, under construction by Messrs. J. & G. Thomson, of Clydebank.

In view of these new advances in naval construction, it is to be hoped Congress will wake up to the necessity of ordering a few vessels of equal speeds to the foregoing. At present we believe the fastest craft in the American navy is between eight and ten miles an hour slower than these new vessels of the Royal navy.

THE IMPERFECTIONS OF THE OVERHEAD TROLLEY SYSTEM.

At the recent convention of the National Electric Light Association, some very suggestive topics were treated in the papers read before the assembly. One which has attracted most attention was written by Mr. J. H. Vail on the trolley system, with reference to the harm incident to the present system of construction of the return or ground circuit. As is generally known, the trolley system uses an aerial conducting system of bare copper wire, often including a feeder and trolley line running parallel with each other. This system connects with one of the generator station bus rods or terminals, while the other bus rod or terminal connects with the rails and perhaps with a bare wire laid in the earth alongside of them. At the joints the rails are connected by one or two short wires, which prevent dangerous heating at these points. The car motors operate in parallel with each other, the trolley connections bridging the interval between rail and trolley wire, the car wheels acting as conductors to the rails. Mr. Vail's paper went to show that this system was a bad one and produced ill effects besides being uneconomical.

The earth treated as a conductor has long been taken as of no resistance. But like many other things in electricity, this appears better in statement than it proves in realization. For while we may take the statement as correct regarding the earth proper, the problem to be solved is how to secure contact with the earth. A zero resistance of the earth proper may be supplemented by any number of ohms of resistance at the earth plates or other grounding device employed.

The essence of economy in a parallel arc system, such as the electric railroad, is the approximate uniformity of potential at all parts of the line; if a railroad, the potential should not drop greatly, even when the cars are running. This approach to uniformity is a factor which, in a railroad, must become less satisfactory as more cars are used. It is also militated against by high line resistance. With the disappearance of the old-time zero resistance of the earth, the return circuit appears as an important element in the construction. Mr. Vail detailed the result of tests made by him in which a station pressure of 500 to 550 volts was reduced on the line to 300 to 325 volts. This means a loss of nearly one-half the energy supplied—a loss sufficient to seriously affect the running expenses, as well as to involve higher capitalization at the stations. This loss, of course, brings about the necessity for a larger generating plant than would be otherwise necessary.

This is not the most striking part of the subject, however. The return circuit through the rails and parallel wire being in contact with the earth, branch currents go off in all directions, and neighboring water and gas pipes take up a share of the work of the return conductors. The story is told of a person in Boston or its vicinity who got current enough from his water or gas pipe in his house to run a motor. Whether correct or not, the story is a good one. But the current, in going through the moist soil from rail or wire to gas or water pipe, and in its return, is accompanied by electrolysis of the moisture of the soil, which brings about the corrosion of one of the electrodes, which, of course, are the pipes and wires.

Some very remarkable results were cited by Mr. Vail. In one case a pipe was quite destroyed. This goes to show that the trolley system as at present installed not only menaces life, but also property. The electrolyzing of a pipe, bringing about a gas or water leak, may involve a very large amount of damage.

The remedy, as suggested by the writer of the paper referred to, is to use one or more low resistance metal insulated return wires, laid in parallel with the rails and connected at frequent intervals thereto. The rail joints he also would have adequately connected, not as at present with thin wire of relatively small capacity. The heavy wires parallel with the tracks would represent feeders.

The saving of copper on an electric supply line is very poor economy. It is obvious that the improvement suggested by Mr. Vail would cost a good deal; but the ultimate saving in running expenses would justify the improvement in many cases. It also is wrong to permit the maintenance of a system so imperfect as to involve injury to other property.

The paper is a very suggestive one, and emphasizes the lesson which experience has so slowly taught electric engineers—the importance of good installation. The trolley system has gone through years of tribulation because it was, in its early examples, too cheaply erected. To-day its success is measured by and due to the good quality of its installation. It is to be hoped that the next improvement, and it may cost more, will be the introduction of a practical underground conduit for electric car propulsion.

The California Midwinter Fair.

The success of the Fair is now assured. The first week's attendance was 124,282; second week, 60,459; third week, 61,192; and the fourth week, 122,743. A feature of the Fair is special days. On February 23 was children's day, when 55,871 persons passed the turnstiles, the second largest single day attendance since the Fair opened. On February 22 the awards for fruit were made, representing the southern counties of California. The County of San Bernardino had the best fruit and made the finest exhibit. We believe it shared well also in the California exhibit at the Chicago Fair. One of the important features of the Fair is a representative mining camp, arranged just as it appeared when the forty-niners created such an excitement. There is a Manufacturers' building, Machinery Hall, Art building, Horticultural Hall, an ostrich farm, street in Cairo, Esquimaux and Indian villages, the Firth wheel, and numerous other side attractions, which are interesting to see. The foreign exhibits, except in the Chinese and Japanese line, are not extensive.

Draining of Lake Copais.

The draining of Lake Copais has led to discoveries far beyond what was at first anticipated. Not only has an elaborate system of aqueducts been laid bare, of which we hope later to give full particulars, but in the bed of the lake traces of an ancient settlement have been found, and according to the *Berliner Philologische Wochenschrift* the ground plan of a palace has been made out, which in main outline corresponds to that of Tiryns. Thus it seems that the myth of the flooding of the plain by Herakles corresponded to some actual fact. From the bed of the lake we may hope to recover traces of that ancient civilization to which we attach the name of the hitherto fabulous Minyae. To this race belonged the Argonauts, and, if recent theory be correct, the women hosts of the Amazons. This buried city has been kept intact from the chance marauder by the waters of the lake; we may, therefore, reasonably hope it will yield a rich treasure to the scientific explorer.

The Congress of American Physicians and Surgeons.

This congress is to meet in Washington on May 29, 30, and 31, and on June 1 next, under the presidency of Dr. Alfred L. Loomis, of New York. The congress is a conjoint triennial meeting at Washington of certain national medical societies, so arranged that while each society preserves its autonomy and has its own meetings, papers, and discussions, the members of all the societies meet together at stated hours to carry out the objects of the congress.

Planet Notes for April.

H. C. WILSON.

Mercury will be "morning star" during April, and will be at greatest elongation, west from the sun 27° 40′, on the tenth of the month. Mercury will be in conjunction with the moon April 3, at 5 h. 37 m. P. M. central time.

Venus is also "morning star," and is nearing greatest elongation west from the sun. The greatest distance from the sun, 46° 10′, will be reached on the morning of April 27. This will be a favorable month, so far as position is concerned, for the study of the surface markings of Venus, although the fact that she is only visible in the morning will be a drawback to all but the most enthusiastic amateurs. On the morning of April 5 Venus will be near the star α Aquarii, conjunction in right ascension occurring at 2 h. 17 m. A. M. central time. Venus will then be 19′ south of the star. The illuminated portion of her disk will increase during the month from one-third to one-half, while her brilliancy will decrease in the ratio of 195 to 139.

Mars improves a little in position during April, but it will not yet pay to spend much time in trying to observe this planet. He will move eastward and northward through the center of the constellation Capricornus. As he is brighter than any of the stars in the constellation, it would not be difficult to identify him without the ruddy color which makes him so conspicuous. Mars will be in conjunction with the moon April 29, at 1 A. M.

Jupiter will be pretty low in the west during the observing hours of April, but some satisfactory views may yet be obtained. He is moving slowly eastward south of the Pleiades. Jupiter will be in conjunction with the moon, 5° south, April 9, at 5 A. M.

Saturn and *Spica* (α Virginis) make a fine pair in the south in the morning. They are nearly equal in brilliancy but differ a little in color, Saturn having a golden hue while Spica is bluish-white. Saturn is retrograding, that is moving westward, and at the end of April will be almost directly north of Spica. He will be at opposition April 11, at noon. The moon will pass by Saturn, 4° to the south, April 10, at 9 h. 28 m. P. M.

Uranus is toward the southeast from Saturn in the constellation Libra. On the morning of the 27th, at 7 h. 11 m., he will be in conjunction with the second magnitude star α Libræ, being only 4′ north of the brighter component of that star, which is a wide double. The motion of Uranus is so slow that he will be in the vicinity of the star for several days, so that this will be an excellent opportunity for the amateur to be sure that he has seen this planet. Note the green color and the visibility of a definite disk.

Neptune may be observed in the early evening, but has passed the most favorable position. He is about half way between ι and ε in the constellation Taurus.

There will be an annular eclipse of the sun, April 5, 1894, not visible in the United States. The path of the annular eclipse passes from a point in the Persian Gulf across Hindostan and China, along the east coast of Siberia, ending in Alaska. It will be visible as a partial eclipse throughout Asia, northeastern Europe, and parts of the Indian and Pacific Oceans.

CIRCUMSTANCES OF THE ECLIPSE.

	Greenwich time.		Long. from Greenwich.		Latitude.	
	h.	m.	Deg.	Min.	Deg.	Min.
Eclipse begins April 5,	13	15·9	72	24·2 E.	6	33·6 S.
Central eclipse begins	14	24·0	53	51·8 E.	6	47·4 N.
Central eclipse at noon	16	27·7	113	42·5 E.	47	22·3 N.
Central eclipse ends	17	23·3	157	30·7 W.	62	47·5 N.
Eclipse ends	18	31·5	179	34·2 W.	49	44·5 N.

—*Popular Astronomy.*

The Washington Meeting of the National Electric Light Association.

The seventeenth convention of this association was held in Washington, D. C., on February 27 and 28 and March 1 and 2. The officers, as elected at the meeting, included the following: President, Mr. M. J. Francisco, of Rutland, Vt.; First Vice-President, Mr. C. H. Wilmerding, of Chicago, Ill.; Second Vice-President, Mr. Frederic Nichols, of Toronto, Can. Some very excellent papers were read. One by Mr. Charles F. Scott, on the polyphase system of transmission and utilization of electric energy, attracted many encomiums. The author showed that by specially designed converters a two-phase alternating current could be converted into a three-phase, or *vice versa*. Thus two and three phase apparatus could be included in the same system. Prof. Rowland stated that he considered that Mr. Scott's paper marked a new era in polyphase transmission—certainly a very high compliment.

"Arc Lights on Incandescent Circuits," "Meters vs. Flat Rates," the Howard incandescent lamp, and the subject of municipal ownership are examples of the topics treated and discussed.

Among the committee reports, one, on the rating of arc lamps, presented by Prof. Anthony, recommended the defining of the present 2,000 candle power lamp as a 450 watt lamp, and favored the abandonment of the attempt to rate lamps by any direct expression of candle power. A very exhaustive report by the committee on the National Electric Light Association's standard rules for electrical construction and operation was read. This reiterated the necessity of good installation. Another report was on coal consumption in generating electricity. It showed a wide variation in results, the figures from reports of a number of different works ranging from 25 up to 208 watt hours per pound of coal—an average of 91·7 watt hours or over seven pounds of coal per electric horse power per hour, which was not considered a very satisfactory showing.

Professor T. C. Mendenhall was introduced to the convention, before which he presented a plea for its aid in securing the passage of an act legalizing the electric units as adopted at Chicago. The convention at once took the action requested.

What is Chemistry?

Everybody who thinks must be impressed by the great variety of things found on this earth, and the question, What does the earth consist of? must often suggest itself. Among the important results reached in studying the things around us is this, that notwithstanding their great variety they are made of simple things and these in turn of still simpler—that there are in fact only about seventy distinct kinds of matter, and that all the complex things around us are made up of these seventy elements. The solid crust of the earth as far as it has been possible to investigate it, all living things, both animals and plants, the air and water, consist essentially of twelve elements. The elements do not, as a rule, occur as elements. They are generally found in combination with one another. Oxygen and nitrogen are, to be sure, found in the air as elements, uncombined; but such familiar substances as water, salt, and quartz consist of elements in combination. Thus water consists of hydrogen and oxygen. Hydrogen, the element, is a colorless, tasteless, inodorous, and very light gas that burns readily. Oxygen, the element, is also a colorless, tasteless, inodorous gas. It does not burn, but burning things burn with much increased brilliancy in it. When hydrogen and oxygen are mixed together in a vessel under ordinary conditions, no action takes place. They mix thoroughly, forming a mixture that is also a colorless, tasteless, inodorous gas. If a spark is applied to this mixture, a violent explosion occurs, and this is the signal of a great change. The two gases have entered into chemical combination; they are no longer the gases hydrogen and oxygen; they have entered into combination and now form the liquid water, a substance with properties entirely different from those possessed by the constituents.

Again, chlorine, the element, is a greenish-yellow gas that acts violently upon other things and causes changes in them. Inhaled even in small quantity it gives rise to distressing symptoms, and in larger quantity it causes death. Its odor is extremely disagreeable. Sodium, the element, is an active substance, that has the power to decompose water and set hydrogen free. When chlorine gas is brought together with sodium, the two combine chemically and form the well known compound salt, or, as the chemist calls it, sodium chloride. From this, the elements chlorine and sodium can be obtained by the chemist. These two examples serve to show what is meant by chemical combination and by a chemical compound. Chemical compounds are generally found mixed with other compounds. This is shown, for example, in many of the varieties of rocks, as granite, which consists of three different chemical compounds. It is shown much more strikingly in living things, all of which are made up of a large number of chemical compounds, mixed, to be sure, not in a haphazard way, but beautifully adjusted and working together in wonderful harmony.

Just as elements combine chemically to form compounds, so elements act upon compounds and cause changes in their composition. Thus, oxygen is constantly acting upon other things, sometimes slowly, but, in the case of fire, rapidly and with tremendous energy. It is commonly said that fire destroys things. In fact, it changes their composition, and the principal products of the change are gases. This kind of chemical change is the most familiar that is brought about by the action of an element upon compounds. Compounds, too, act upon compounds, and cause an infinite number of changes in composition. Thus the food we partake of consists of chemical compounds. In the body these compounds find others and they act upon one another so as to repair the wasted tissues and cause growth. The gas known as carbonic acid, that is contained in the air, acts upon the compounds in the leaves of plants and causes changes that are absolutely essential to the life and growth of the plant.

Look, then, in any direction and you will see evidence of changes in composition that are constantly taking place, and that are essential to the existence of the world as it is. These changes in composition and the compounds themselves that are involved in the changes form the subject of chemistry. In the light of what has been said it is clear that chemistry must be a very broad science. Remembering that chemical action is the cause of the formation of chemical compounds, that without chemical action the compounds would cease to exist and would be resolved into their elements, it is impressive to think what would take place if chemical action should cease. Most of the things familiar to us could not exist. The solid portions of the earth would to a large extent be replaced by the element silicon, something like charcoal, and by oxygen and a few metals such as sodium, potassium, and aluminum. Water would be resolved into the two gases hydrogen and oxygen. All living things would fall to pieces, and in their place we should have the gases hydrogen, oxygen, and nitrogen, and the solid element carbon, most familiar to us in the form of charcoal. Life would, therefore, be impossible.—*Prof. Ira Remsen, in the Chautauquan.*

Electric Heating.

From an interesting article in the *Electrical Engineer* we take the following, by W. S. Hedaway, Jr.:

A well designed central station of moderate size produces a horse power hour by the combustion of about 3 pounds of good coal. The electrical horse power hour developed by this coal has 2,565 heat units; we have to balance these 2,565 heat units in the concentrated form against 42,000 heat units existent in the three pounds of coal in a more diffused state and determine whether, for heat purposes, the difference in the form of the energy, with its enormous attendant losses, compensates for the energy lost in bringing the heat units of coal into the higher form of energy capable of economical transmission to a distance.

It is found in practice that the commercial efficiency of the coal cooking range is somewhere between 3 and 6 per cent; these limits are stated by Tyndall. In a recent discussion before the London Society of Engineers, November 6, 1893, Mr. Beaumont gives the efficiency of the cooking range from experiments of his own as 3·7 per cent, or roughly 4 per cent, indicating, that of every 27 pounds of coal burned, 26 pounds are thrown away. We have seen that the heat efficiency of the average moderate size central station is about 6 per cent. There is sufficient margin between a heat efficiency of 3·7 per cent and one of 6 per cent to warrant the use of electricity as a source of heat in domestic life, and a further extension with apparatus of larger size and higher working economy would give a still greater margin between coal burned under the boiler and that used in the firepot of the range. Thus with the use of only 1¼ pounds of coal per horse power hour he would secure a commercial efficiency of 12·2 per cent or 3·3 times the efficiency of the range.

At the outset, of course, the cost of electrical energy as fuel under average conditions at the power rate will be greater than fuel directly burned. But there are compensating advantages gained which more than offset the additional cost. This has been abundantly proved in actual practice. The saving of attendance, and of time, freedom from dirt, coolness of the kitchen, absolute uniformity of heat and ability to regulate it, appeal at once to the householder. There is merit aside from novelty in such practice.

In industrial work wherever flames are used to secure localized heat, electricity can be advantageously employed. It is more easily regulated than flame, there are no unhealthy products of combustion, the mean temperature of the shop is lowered, the temperatures are constant, the work is more uniform and the entire system cleaner and more complete. For factory use it is the most desirable form of fuel. In laundries, clothing manufactories, hat factories, silk and all textile fabric mills, shirt factories, rubber goods manufactories, furniture factories, etc., are good fields for the use of electricity for heating. In domestic life no source of heat offers so many elements of value as the use of electricity for cooking and laundry work. There is no discomfort, no noxious gases from combustion, and the temperatures attained are constant, so that the question of the discretion of the cook is eliminated and better results obtained than can possibly be reached from the approximate temperatures of surfaces heated by combustion. It may be fairly stated that people who could afford to do their lighting by electricity could afford to do their cooking and ironing by the same means.

Electricity for heating will be found of the same value to central station electric lighting companies as the use of gas for fuel purposes has proved to the gas lighting companies. Its value lies largely in ability to localize the heat, and it will not be found desirable to use it on a large scale where diffused heat is wanted. High temperatures and small quantities are the proper uses for electricity for fuel.

THE body of James Lick, the founder of the Lick Observatory, is buried under the great 36 inch equatorial. On an old oaken work bench is a German silver plate engraved, "This work bench was brought from South America to San Francisco in 1847 by James Lick —the foundation of his large fortune and the source of his power to confer great and lasting benefits upon his fellow citizens and mankind was honest and faithful labor."

Improved Steam Pipes.

To obviate the risks of careless brazing, and enable the thickness of sheet copper forming the pipe to be reduced to a minimum, at the same time that full advantage of wire winding is secured, a patented system of manufacturing steam pipes is at the present time being experimented with by a West of Scotland firm. It forms even a closer analogy to the wire gun than the present system of wire winding, and consists in using copper of the thinnest practical gauge, to form the interior or core of the pipe, the body of the pipe proper being composed of steel wire wound closely round the core, and the interstices between the coils being filled in solid with copper by a patented system of copper electro-deposition. Pending this and other possible improvements on copper pipes, one result of past experience with these is to give an impetus to the use of lap-welded wrought iron pipes. In the new Cunard steamers, Campania and Lucania, the main steam pipes are of this type, and experience with these so far bears out the contention of some engineers, that for modern high pressures they are, on the whole, the best that can be used.

TO SET FIRE TO A PILE OF SNOW.

When you go out in winter while there is snow on the ground, says *La Science en Famille* to its boy readers, do not forget to put a few bits of camphor in your pocket. They will prove useful to you for playing an innocent little trick that will surprise your companions, whom you have previously told that you are going to set a pile of snow on fire.

SETTING FIRE TO A PILE OF SNOW.

After gathering a small quantity of snow and arranging it in a conical pile, place in the summit of it the few pieces of camphor in question, the color of which will sufficiently conceal them, and which will pass unperceived unless a very close-by observation is made.

Now apply a lighted match to the camphor and the latter will immediately take fire and burn with a beautiful flame, to the great surprise of spectators who are not in the secret.

The Colossal Passenger.

An account is given in the *Daily Telegraph* of a cattle dealer from the department of the Seine et Marne, a phenomenally stout man, who had driven into Paris, and as his horse was taken ill during his stay in the metropolis, resolved to leave the animal and return home by rail. He bought a ticket at the Vincennes station, but all his efforts to effect an entrance into a compartment proved abortive. The company's employes went to his assistance, and he was pushed and squeezed, almost denuded of his garments, but all to no purpose. The train was soon to start, and the scene had been watched with no little amusement by a number of passengers. "Well," said the cattle dealer to the station master, "the regulations have not settled the dimensions of the travelers. I have my ticket and you must take me." The distracted official now proposed that the colossal passenger should make the journey in a luggage van. The offer was accepted and soon afterward the train was speeding on its way with the cattle dealer seated on a big box in the van, which had been covered for his special behoof with a comfortable cushion.

PROF. ZUNTZ has made experiments with a Pettenkofer respiration apparatus at Gottingen, on the respiration by the skin and intestine of the horse. He first of all found that the total output of carbon dioxide in twenty-four hours was 4,200 grm. Excluding that from the lungs, the remainder due to the skin and intestine amounted together to 145 grm., and an additional 22 grm. from volatile hydrocarbons. The latter can only be methane, and hence come from the intestine. Now since the gases of the intestine have a constant composition as regards methane, carbon dioxide and hydrogen, it became at once possible to calculate how much carbon dioxide comes from the skin and how much from the intestine.

Lightning Photography.

An ingenious method of photographing the spectrum of lightning is proposed, says *Nature*, in the current number of *Wiedemann's Annalen*, by G. Meyer. The difficulty of directing the slit of the spectroscope upon the flash is got over by substituting a diffraction grating for the prism. A grating ruled on glass is placed in front of the object glass of the apparatus, the object glass being focused for infinite distances. Under these circumstances several images of the flash are obtained, a central image produced by the undiffracted rays, and images of the first and higher orders belonging to the diffraction spectra. The number of images of each order corresponds to the number of lines in the spectrum of the lightning. The arrangement was tested during a night thunderstorm. Two plates were exposed in a camera with a landscape lens of 10 cm. focal length, provided with a grating with 40 lines to the mm. One of the plates showed two flashes with their diffraction images of the first order, but representing one line only. The other showed a number of flashes, and one very strong one, passing apparently between two chimney pots, with its diffraction images well marked. A calculation of the wave length of the light producing these images gave 382 $\mu\mu$. The measurement was not sufficiently accurate to warrant an identification of this line with a known wave length, but it is certain that a radiation of about this wave length must be added to the lines determined by Schuster and Vogel. It is probable that with better apparatus the method may be made to considerably increase our knowledge of the ultra-violet spectrum of lightning.

NEW PIER FOR THE AMERICAN LINE.

The recently completed pier for the American Line steamers Paris and New York, sailing between New York and Southampton, shown in our illustration, is said to be the most perfectly equipped as well as the largest pier in this country. It is on the west side of the city, between Dey and Vesey Streets, and extends 720 feet into the river, with a uniform width of 125 feet. It has been leased from the city for ten years at an annual rental of $50,000, and the company has built upon it an enormous two-storied "shed," so called—a masterpiece of light but solid iron work—for the convenience of passengers and the handling of freight. The building is the full width of the pier and extends to within 125 feet of the river end. The second floor will be wholly given up to cabin passengers, who will reach it directly from the main decks of the steamers and avoid the nuisance and discomfort of being indiscriminately mixed up with baggage, freight, cabs, trucks, etc. At the eastern end is the grand stairway, leading by low, wide steps from the floor below, and a passenger elevator. Here, also, are the waiting rooms and offices, finished in hard natural wood and fitted with all the modern conveniences that one sees in well appointed railway depots. The lower floor, at the street level, is given over to freight and the offices of the shipping department. The whole cost of the building and fixtures is over $300,000. It has a Sturtevant hot blast apparatus for heating and ventilating the offices, and the electric plant comprises two dynamos of 400 sixteen candle power lamps each and two 50 arc light dynamos.

For our illustration we are indebted to the *Electrical Engineer*, New York.

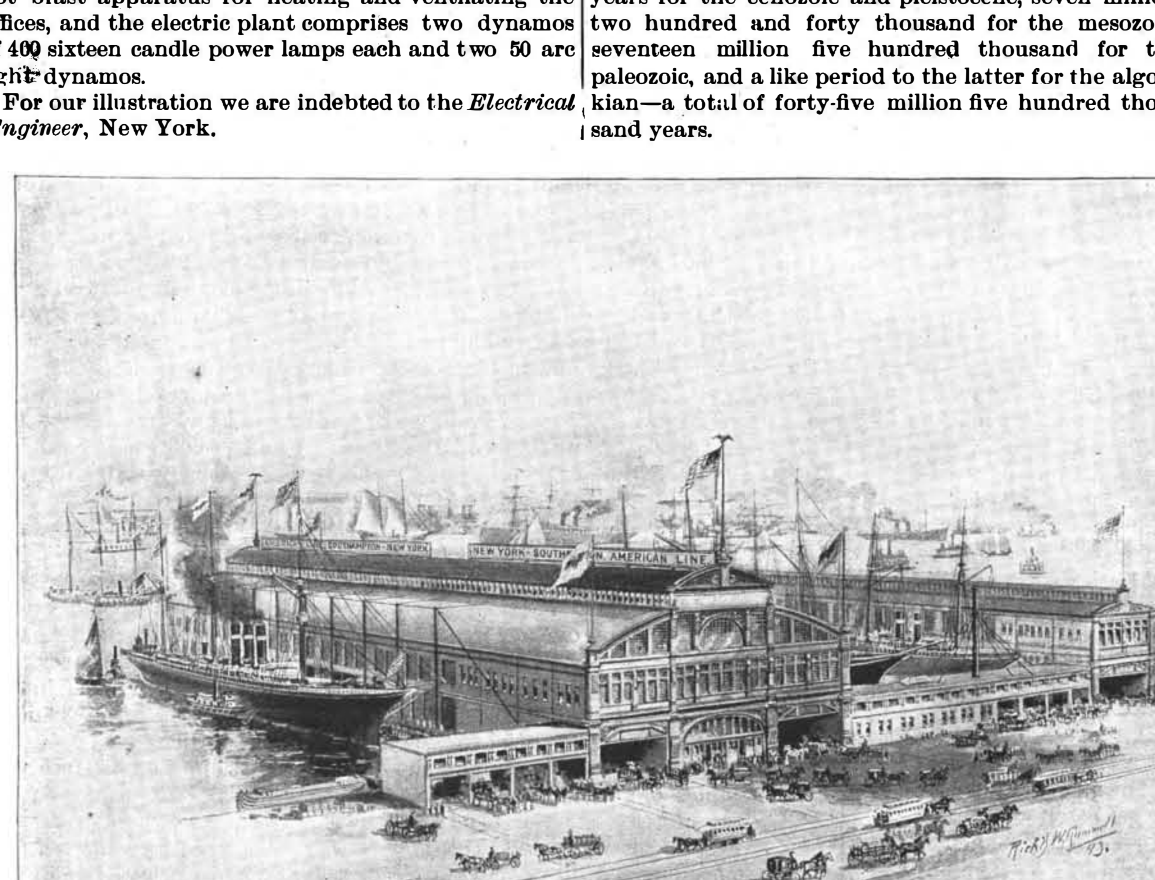
A MIRROR ATTACHMENT FOR BICYCLES.

A device to enable bicycle riders to observe vehicles, etc., approaching from the rear, without being obliged to turn and look back, is shown in the accompanying illustration, and has been patented by Mr. K. F. Bucherer, No. 411 East Ninth Street, New York City. The attachment consists of a yoke-shape or arch bar fastened onto the handle bar of the bicycle by means of two clamps, and supporting a mirror, which is hinged to a V shaped keeper, so that it can be moved up or down the standard bar by pressing the two ends of the keeper together, and releasing at the desired height. The mirror itself may be placed at the inclination desired for distance or nearby observation by simply pressing it in the desired position, where it will be held by pawls catching into the toothed keeper. The adjusting of the mirror to the proper place can be done with one hand only while riding. All the parts of this bicycle attachment are very simple and not liable to get out of order.

BUCHERER'S BICYCLE MIRROR.

The Geologic Age of the World.

Prof. C. D. Walcott expresses the opinion—contrary to that entertained by some scientists—that geologic time is not to be measured by hundreds of millions of years, but simply by tens of millions. This is widely different from the conclusion arrived at by Sir Charles Lyell, who, basing his estimate on modifications of certain specimens of marine life, assigned two hundred and forty millions of years as the required geologic period; Darwin claimed two hundred million years; Crowell, about seventy-two millions; Geikie, from seventy-three million upward; Alexander Winchell, but three million; while McGee, Upham, and other recent authorities claim from one hundred million up to six hundred and eighty million. The data presented by Dr. Walcott, showing the distribution of geologic time, or the different periods of sedimentary rocks, give two million nine hundred thousand years for the cenozoic and pleistocene, seven million two hundred and forty thousand for the mesozoic, seventeen million five hundred thousand for the paleozoic, and a like period to the latter for the algonkian—a total of forty-five million five hundred thousand years.



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