SCIENTIFIC AMERICAN

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A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXXV.—No. 9. ESTABLISHED 1845. NEW YORK, AUGUST 29, 1896. [$3.00 A YEAR. WEEKLY.

THE JEROME PARK RESERVOIR, NEW YORK CITY.

The Aqueduct Commissioners of the city of New York have now in active progress of construction two important works to increase the water supply of New York City. One is the new Croton dam, designed to increase the size of the present Croton Lake and thereby impound a greatly increased water supply for the city at large.

From the present Croton Lake two aqueducts, the old one of 1840, the other the new one completed in 1890, run to the city, delivering their water directly into the reservoirs in Central Park. The city of New York has had one policy as to its water supply; it has always worked on the lines of an increase of reservoir capacity by addition, the old reservoirs being preserved. This conservative method has been so fixed that to-day the proposals to destroy the original reservoir at Fifth Avenue and Forty-second Street are opposed, and we find that for the immediate supply of New York City, in addition to this reservoir, the lower and more recently built reservoir in Central Park has annexed to it the upper reservoir of still more recent construction, and further to the north and west auxiliary reservoirs for the supply of specific districts; but as the case now stands the lower portion of New York City depends upon the Central Park reservoir capacity. If the bottom of this reservoir was high enough when the water was exhausted to its lowest level, a billion of gallons would be available, but, owing to the low level of the reservoir, it can only be exhausted to about three-quarters of its capacity before the pressure fails, and the water left ceases to be of further avail, so that the city can only depend upon this reservoir for three-fourths of its capacity, or three days' supply. While it is not probable that any accident would occur to interfere with the aqueduct service, yet there is always such a possibility, and therefore the Central Park reservoir is to be kept filled; an accident or cutting off of the aqueduct's delivery would leave New York provided with only three days' supply of water.

To provide for additional storage capacity for direct use in the city, construction operations are now in progress on what is known as Jerome Park reservoir, in Fordham, in the annexed district.

Here Jerome Park, with its famous old race course on which so many celebrated horses have been ridden to defeat or victory, with a quantity of adjacent territory, has been selected for a reservoir. The ground offers fair advantages in point of elevation and configuration; its vicinity to the city and its situation in the heart of the annexed district make it peculiarly available for the purpose. The area of about 5,800 feet long and 2,800

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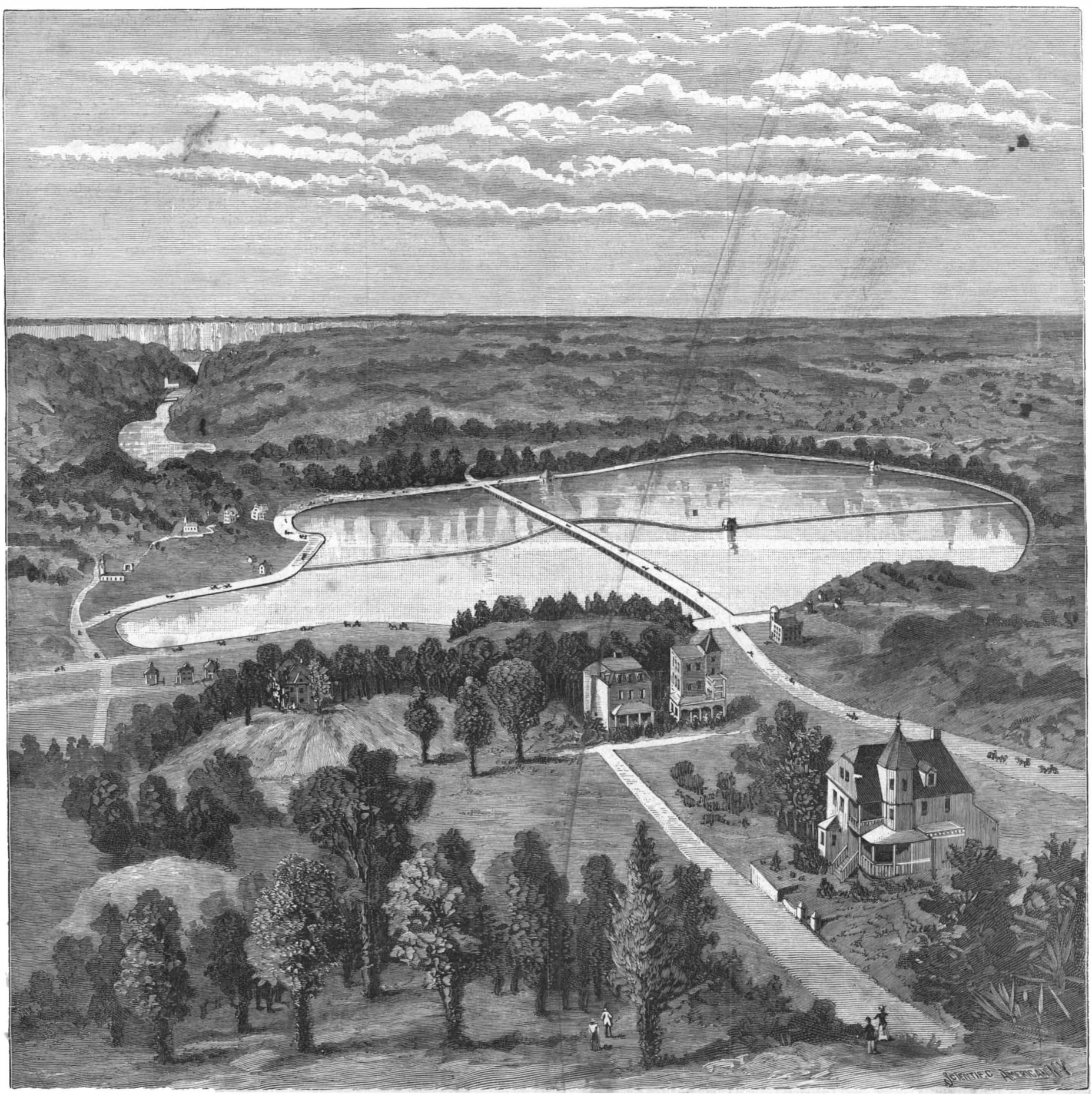

THE JEROME PARK RESERVOIR, NEW YORK CITY.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

TERMS FOR THE SCIENTIFIC AMERICAN.
(Established 1845.)

One copy, one year, for the U. S., Canada or Mexico.....$3 00
One copy, six months, for the U. S., Canada or Mexico..... 1 50
One copy, one year, to any foreign country belonging to Postal Union 4 00

Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

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(Established 1876.)

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, for the U. S., Canada or Mexico. $6.00 a year to foreign countries belonging to the Postal Union. Single copies 10 cents. Sold by all newsdealers throughout the country. See prospectus, last page.

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NEW YORK, SATURDAY, AUGUST 29, 1896.

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(Illustrated articles are marked with an asterisk.)

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For the Week Ending August 29, 1896.

Price 10 cents. For sale by all newsdealers

THE RECENT FAILURES OF ARCTIC EXPEDITIONS.

It is hard to believe that the resources of mankind are unequal to traversing the few hundred miles of ice or water which intervene between the most northerly point reached by Nansen and the north pole. The lesson of the day is that man's powers are constantly on the increase, and that new fields of achievement are opened up to him by the greater extension of mechanical and scientific operations. It is not only in the invention and discovery of the new, but it is in the extension of the old and in the joining of resources that this increase of power lies. Fifty years ago a great mechanical or engineering structure was the work of an individual, and its design and execution were properly attributed to its engineer. At the present time, if the business man finds that a great bridge is needed, a dozen contracting firms are ready to supply him with a bridge of almost any desired span. The consequence of the existence of many great engineering establishments of every class is, that the facility for extraordinary works is increased. The giant bridges of other days would to-day be considered small. The Bunker Hill monument is far overtopped by numbers of modern office buildings, yet in its day the monument in question was one of the tallest structures of the world.

The general feeling is that man can make almost anything if the means in the shape of money are provided. It seems impossible that his powers in other directions than that of mere construction should not also be increased by the improved appliances at his command.

It is a fair assumption that even twenty or thirty years ago it would have been pronounced a more difficult task to bridge the Forth in a single span than to reach the north pole. The laying of the first short-lived Atlantic cable was thought a great feat, while to-day a new transatlantic cable receives but a passing notice from the press. Yet, while a mere contractor stands ready to build a bridge of a half mile span, to lay a three thousand mile cable, to penetrate a hundred feet through quicksand for a foundation, or to erect a building so tall that the greatest monuments of the earth would serve only for its columns, the north pole seems absolutely isolated from mankind by a few hundred miles of untraversable distance.

The tendency of the day is to attack the world's problems on new lines of united effort rather than of individual action. One of Stockton's clever stories tells of the great war syndicate, which waged a war by contract. In view of the fact that so much can be done by association, polar expeditions are open to criticism as being carried on upon the old principle of individual effort. This system makes man too much the subject of atmospheric conditions. On the snow cap his progress is fast or slow according to the weather. When we hear of Peary's 1892 journey of 1,300 miles in seventy-nine days, and compare it with his 1894 journey of 250 miles in forty-five days, we realize that a rational effort to reach the pole should be free from such uncertainty. It is hard to believe that the same powers of man which have created the engineering triumphs of the day, and relegated the former wonders of the world to the region of the commonplace, cannot find a way across the unexplored polar area.

The open polar sea theory was a great reliance with those interested in Arctic work some years ago. Man has a taste for the paradoxical, and there were pretty good grounds for believing that there might be a polar ocean free or nearly free from ice. The theory, however, has been pretty generally abandoned. The long drift of the unfortunate Jeannette in the sea north of Siberia shows that ice is there, and one of the possibilities foreseen by the Nansen expedition, and actually carried out, was the abandonment of the vessel and taking to the ice.

When the Jeannette was abandoned and the journey to the south was begun, the northward current for the first ten days was so strong that seven miles were absolutely lost, observations showing at the expiration of that period that while the party traveled due south the current had carried them to the north faster than their rate of progress.

Nansen, in his specially constructed vessel, with his crew of selected men, relied on getting into such a current to be swept across the pole, but failed. The dreariness of the work in the light of the experience of others is great. The wretched two years' drifting of the Jeannette, during which time but six degrees of northing were made, and the long drift of the Fram, open up a vista far from alluring for those who work upon similar lines. The abandonment of ship and crew to the current by placing the ship in an ice pack whence she can never stir until released by Nature's hand includes the voluntary abandonment of man's own resources. It is like Andrée's proposed ascension in his balloon, depending on a favorable wind to blow him and his coadjutors across the north pole.

The Arctic expeditions generally are conducted on very primitive lines. Peary's party of ten men, Nansen's party of twelve men, Andrée's party of three men, go bravely to the north, relying on personal and individual effort for success. The smallness of the expeditions and their limited appliances at least suggest that greater possibilities might follow upon a better equipped organization. If the work were undertaken with adequate capital and resources to back it, a better chance would be presented.

If, by the definite location of the exact limits of land in the north, and by the demonstration of the impossibility of reaching the north pole, these expeditions could be stopped, some good would be done. There seems to be a fascination in Arctic research which would cease were the region explored and mapped. But, until this is done, explorer after explorer will go north and seek for the unknown. Already the Antarctic region is being looked to, and in a few years we will have south pole expeditions working in rivalry with north pole ones. But it seems a pity that the business of polar discovery cannot be pursued under better auspices than those of the expeditions of the present time. It is pitiable to hear that Nansen might have succeeded had he had more dogs and sleds. With adequate backing, a chain of relief stations of ships might be established along the meridian, and bases of supply carried along close in rear of the advance party. Then, when the properly supported explorers stood over the earth's axis and had, in a sense, the earth rotating about their feet, the deed would be done and the penultimate secret of the earth's surface would be solved.

The meeting of Stanley and Livingstone in equatorial Africa is recalled by the equally romantic meeting of Nansen and the Jackson party an earth's quadrant distant in the icy north. In our columns we have given full accounts of Nansen's work. It is to be hoped that before the century is over the north pole may be reached by the intrepid Scandinavian or by some equally endowed explorer. Under present methods the man determines the result of these expeditions. It is a pity that the methods and appliances cannot be made to insure their success.

Phosphorescence and X Rays in the Geissler and Crookes Tubes.*

We have communicated to the Acc. di. Sc. fit. e mat. di Napoli (February 25, 1896), that a spark introduced into the circuit of a Ruhmkorff coil and of a Crookes tube modifies the action of X rays.

We call positive air spark the spark introduced between the positive pole and the tube, and negative air spark the spark introduced between the negative pole and the tube.

With rigorous experiments we have found that a positive air spark increases the effect of X rays and a negative air spark diminishes it.

By means of various arrangements, we have also obtained the Crookes phosphorescence and the X rays from the Geissler tube.

The following arrangement (bipolar inductive) gives the best results:

On the outside of a Geissler tube are glued two pieces of tinfoil, which are connected to the poles of an induction coil. These are also in communication with a graduated spark stand. When the coil acts, at every spark passing between the balls of the spark stand, a discharge passes through the tube and illuminates it. Contemporarily on the wall opposite to the positive tinfoil appears the Crookes phosphorescence, which is accompanied by the X rays. The Geissler tube in this side is transformed, momentarily, in a Crookes tube, while it maintains in the other regions the properties of the low vacuum tubes. In this arrangement the phosphorescence and the effect of the X rays depend upon the length of the air spark. There is a determined length, which produces the greatest action. When it is unnecessary to employ Crookes tubes to obtain X rays, the Roentgen phenomena may be produced by using low vacuum tubes without electrodes. Our arrangements are besides used to concentrate the cathodic rays, and consequently the phosphorescence and the X rays, in a restricted side of a Crookes tube. The concentration was also obtained by employing a magnetic field.

J. D. Whitney.

Josiah Dwight Whitney, professor of geology at Harvard University, died in New London, N. H., on August 19, at the age of 77 years. He was graduated from Yale in 1839, and the following year he made a survey of New Hampshire. A geological exploration of the Lake Superior region, made by him in 1843, was followed by a survey of the mining regions of all the States east of the Mississippi. He was appointed State chemist and professor in the Iowa State University in 1855. Five years later he was made State geologist of California. In 1860 he became professor of geology at Harvard, a post he occupied until his death. Many years ago he made a proposition to the university to give his geological library to the Museum of Natural History if a salary of $5,000 a year should be guaranteed to him as long as he should live. The proposition was accepted. Prof. Whitney never became incapacitated. Yale gave him a degree of LL.D. in 1870. He was a member of many foreign as well as American scientific societies.

*By F. Campanile and E. Stromei, in the English Electrical Review.

The Colossal Cavern of Kentucky.

BY HORACE C. HOVEY.

The announcement of a new Kentucky cavern ought to cease to cause surprise. There are literally thousands of caves and grottoes in the Ohio Valley, few of which have been thoroughly explored. Each has its own peculiarities, and the time will come when what the French call the science of "speleologie" will not only have its isolated devotees, but its organized and endowed societies. Why not have an American Cavern Club as well as an Alpine Club? No field would more richly reward systematic and elaborate investigation. I am, and always have been, an enthusiastic admirer of the Mammoth Cave, and still regard it as without a rival or a peer. Yet that is no reason for not exploring and admiring other remarkable underground regions. The Diamond Cave, and Dixon's, White's, Proctor's, Salts, and Grand Avenue caves, and many others that are found in the vicinity of the Mammoth Cave, would be regarded as wonderful were it not for their more famous neighbor.

The latest discovery, and one that is attracting many visitors, was made July 16, 1895, by Mr. Pike Chapman, and has been named "The Colossal Cavern." Its wonders have only been partly opened up as yet, and great disclosures are expected from the judicious use of dynamite. Meanwhile what has already been made accessible to the public is worthy of description in these columns. From my intelligent guide, Mr. John Nelson, I obtained many facts to be added to my own observations and inquiries during a hurried visit to the region, supplemented by the notes taken by the distinguished cave photographer, Mr. Ben Hains, of New Albany, Indiana, although I regret to say that no views have as yet been taken that are suitable for purposes of illustration.

In order to reach this new wonder of Kentucky, the tourist stops at Proctor's station on the Mammoth Cave short line railway, where he finds a comfortable hotel, with the usual display of stalagmites and other fantastic cave ornaments piled in profusion in the door yard and elsewhere. A fairly good road has been constructed, leading for three miles to the foot of the hill in which the cave described is located. The entrance is half way up the hillside, and it is unique in that access is gained through the tip of a subterranean dome, laid open by the washing down of the eminence, and that is made accessible by a series of steep ladders whereby we climb down for 66 feet to the floor of the dome, which at the bottom is 15 feet in diameter.

A winding path from the north side of this dome continues for several hundred feet and is made picturesque by numerous curious niches and small pits. This passage finally brings us abruptly against the perpendicular wall of Quinque Dome, whose floor is visible about 36 feet below where we stand. Two ladders lead down to the floor, and on descending them we note the five rocky projections that have suggested the peculiar name of this dome. The walls between these five sections are very thin and have been carved by the water into strange and fantastic shapes. Standing on the floor of Quinque Dome, we are more than 100 feet lower than the entrance to the cavern, and most of this descent, as has been remarked, is made by the use of ladders. The exit from Quinque Dome is by a low passage enlarged by blasting so as to obviate the necessity of crawling. After going along for about 200 yards the greatest feature of the cavern is reached, namely, the Colossal Dome. Our path leads directly across the very tip of the dome, planks being laid for the purpose for fully 50 feet; by lifting one of which we may peer down into the dark abyss that measures by the plumb line fully 137 feet. Dropping a fire ball through this crevice, the corrugated sides of the dome below us are lighted up, and we watch the flaring mass of flame as it slowly circles around, until after many gyrations it touches the distant floor.

Following the passageway for 150 feet further, we are confronted by an opening into what the guide tells us is the "main cave," which is about 40 feet high and 60 feet wide. Again availing ourselves of the aid of a ladder, we reach the floor and then turn to the right and descend a steep slope to a great gateway, 20 feet wide and 60 feet high, flanked by enormous pillars formed by erosion, and springing aloft in majestic proportions. The slope of debris continues beyond the gateway, while the walls around us tower to an immense height; and presently the fact dawns upon us that we are now within the vast dome of which we had obtained a glimpse by lifting the plank in the bridge overhead. At every step, as we advance, the subterranean scenery grows more and more wild and imposing. At length we find ourselves on the edge of an inner pit, like a cistern, whose bottom is the true floor of the dome. Descending into it by a ladder, we stand at the very lowest level of the cavern, which is really the third tier or level, 240 feet vertically below the entrance. It will also be noticed that in order to reach this we have descended successively into three pits or domes—the terms being used according to the point of observation. By burning magnesium we follow with the eye the fluted walls until we are barely able to see the snow-white fungus growing on the under side of the bridge over which it seems strange that we had dared to go. Large drops fall like shot from the apex of the dome to the floor, adding by their music to the majestic impression made on the mind; and we try to imagine how it would seem to have a winter cascade fall thundering down for 137 feet on the rocks where we stand, as it is said to do in the rainy season.

The visitor returns by the ascending path by means of which he had previously descended. In doing so he has a better opportunity to examine the peculiar formations that offer their attractions to his gaze. A digression is made through what is termed "the short route," in order to inspect a fine group of stalactites, which do not elsewhere abound in this cavern. After passing the mouth of a broad pit that nearly fills the pathway and that is 86 feet deep, we come to a small body of water called the "Pearly Pool." This is a depression lined with tufts and sprigs of alabaster crystals, and the edge is crested with the same material. The water being exquisitely clear, the general effect is very fine. Around the pool are stalactites and stalagmites uniting to form pillars 20 feet high. The roof for many yards is hung with countless smaller stalactites. Beyond this spot the cavern is occluded by debris, and we retrace our steps to the regular path which we had left for this excursion into fairyland.

The main cave continues to the north for several "cave miles," to explore which takes two full hours of continuous walking, sometimes over rough rocks and again over a sandy floor or some bank of clay. The avenue varies from 40 to 80 feet in width and from 20 to 40 feet in height. The special objects of interest here are the gypsum crusts and flowers (oulopholites), which being fresh and uninjured by the smoke of lamps and fire balls, sparkle with dazzling whiteness. Sections a yard square often hang down for six inches from the roof, ready to drop on the floor when jarred. Here and there large clusters of cave flowers may be seen. This crystal gallery is several hundred feet long. Interspersed amid extremely delicate lacelike formations are enormous rosettes of gypsum, and beyond these for a long distance the roof is covered by broad crystals of selenite. There are also patches of fibrous gypsum, the single spikes often being many inches long. What is called the "Bear's Robe" is of these fibrous crystals, softly tinted with gray instead of pure white. Staglike branches of crystals occasionally stand out from the wall for a foot without any support.

Here the cave divides into two branches around an "island," and at the farther end a broad passageway is piled with enormous rocks, one of which is 6 feet thick, 20 feet wide, and 60 feet long. Some distance on we pass by two very deep and symmetrical pits into which the water incessantly drops. From here on the cavern is wild and highly diversified in its appearance, until at the farthest point of exploration we find a recently discovered dome that is entered from the side by climbing down a mass of debris to the bottom. Its symmetry is surpassingly beautiful, the wavy walls rising to the height of perhaps 120 feet, as if cut from a seamless mass of stone. This is really one of the finest things in the cave.

On returning to the entrance our attention is directed to an opening to the left, said to lead four miles to a considerable underground river. But this region has not yet been opened for visitors. Indeed, there seems to be a good deal of mystery about certain explorations, the conjecture being that the Colossal Cavern is connected with two others that have long been known, namely, the "Bed-quilt Cave" and the "Salts Cave." It would evidently be to the advantage of the managers if they could find some way of obviating the necessity of climbing down and up again those long, steep, and somewhat dangerous ladders. But even as the cavern now stands it is worthy of being mentioned amid the wonders of America.

Big Machinery Export.

An entire locomotive making plant will be taken soon to St. Petersburg from Philadelphia on the British steamship Laleham, which has been chartered for the purpose. The plant is to be erected at Nijni-Novgorod, the commercial metropolis of the interior of the Russian empire. Contracts for machinery for the plant amounting to over $500,000 were awarded to American manufacturers, most of them going to Philadelphia firms.

The plant is to be built for the Sarmova Works, an extensive establishment engaged in manufacturing cars, steamboats, steam boilers, and employing 5,000 hands. The locomotive plant will have a capacity for building 200 engines a year, and will employ about 1,000 hands. All of the foremen and engineers will be Americans. The buildings have been completed and are now ready to receive the machinery.

The Czar has given valuable encouragement to the enterprise. Nearly 85 per cent of the railways in the empire are operated by the government, and the new company will get a great share of the work for them. The company will be known as the Russian-American Manufacturing Company. The consignment will aggregate over 3,000 tons.

Roller Ship Launched.

In the presence of numerous foreign engineers and a large crowd of onlookers the so-called "roller steamer," the invention of M. Bazin, a well-known marine engineer, was launched August 19 at the Cail dock yards, at St. Denis, France. The vessel will traverse the Seine, cross the English Channel, and go to London.

The boat is a large rectangular iron box about 120 feet in length, 40 feet wide, and 5 feet high. It is mounted on six lenticular disks or rollers 30 feet in diameter and sunk in the water 10 feet, while the lower floor of the box is at an equal distance from the level of the water. In the sides of the box is the machinery, which is of 750 horse power. This sets in motion a screw and the rollers. In the upper part of the vessel, between the disks, which pierce the box and extend beyond it about seven feet, are comfortable cabins. This strange looking vessel has a displacement of 280 tons.

M. Bazin's first experiments were made with a small model, the rollers of which were moved by clockwork, the propeller being replaced by a weight, which was attached by a string passing over a pulley to the front of the boat. When the rollers were not working the miniature boat took 22 seconds to cross from one side of the large vessel in which it was placed to the other side. When they were working it took only 11 seconds. As the power necessary to keep the rollers at work is only one-quarter of the power that is required to keep the screw going, the mathematical result is that the speed of the vessel is doubled by an extra expenditure of power which amounts to only one-quarter. But a vast increase of speed is not the only advantage claimed for these rolling steamers. It is pointed out that when they shall be used the length of voyages will be diminished, the consumption of coal will be lessened, and, as a natural result, passengers and freight will be transported at far less expense than heretofore. Moreover, experts assert that the stability of the rolling boats will be far greater than that of the steam vessels at present in use. It is also asserted that the catastrophes at sea would practically cease by the use of rollers. In case of a collision or other accident, though some of the rollers might be damaged, some would almost certainly escape damage, and two would suffice to keep the vessel afloat and take her into port.

M. Bazin expects the boat to make from 45 to 50 kilometers an hour while crossing the channel. The theory of the inventor is that boats should roll over the water instead of cutting through it.

He has designed a large steamer on the same principle, which he estimates will make the voyage from Havre to New York in four days, but of course this speed is largely problematical.

Recent High Balloon Ascensions.

In the Comptes Rendus of the Paris Academy of Sciences for April, 1896, vol. cxxii, page 849, Messrs. Hermite and Besancon give the principal results of the last scientific balloon ascension, which started at 11:30 A.M., March 22, after consulting the weather predictions of the Central Meteorological Bureau. The small balloon with its apparatus weighed 32 kilogrammes (70 pounds), and started with a vertical pull of 106 kilogrammes (235 pounds); consequently the balloon rose perpendicularly for three or four minutes with a steadily increasing velocity. For nearly half an hour the balloon scarcely moved from the vertical, so that the velocity of ascent certainly exceeded 5 or 6 meters (16 to 20 feet) per second. After three and a half hours the balloon descended near Cambray. The self-registers show that it attained a maximum height of 14,000 meters (42,933 feet) within about forty-five minutes after starting, and a minimum temperature of —63° C. (—81·4° F.) The temperature at the surface of the earth beneath the balloon at that moment was +14° C. (+57·2° F.) Consequently the average rate of decrease was 1° C. (1·8° F.) for 182 meters (597 feet). This value does not much exceed that found in their voyage of October 20, 1895, when the aerostate at an altitude of 15,500 meters (50,854 feet) experienced a temperature of —70° C. (—94·0° F.), while the temperature at the surface of the ground was +11° C. (+51·8° F.) The registering thermometer has been tested in a very cold inclosure, and records properly down to —80° C. (—112·0° F).—Monthly Weather Report.

The Majestic Beats Her 'Best Record.

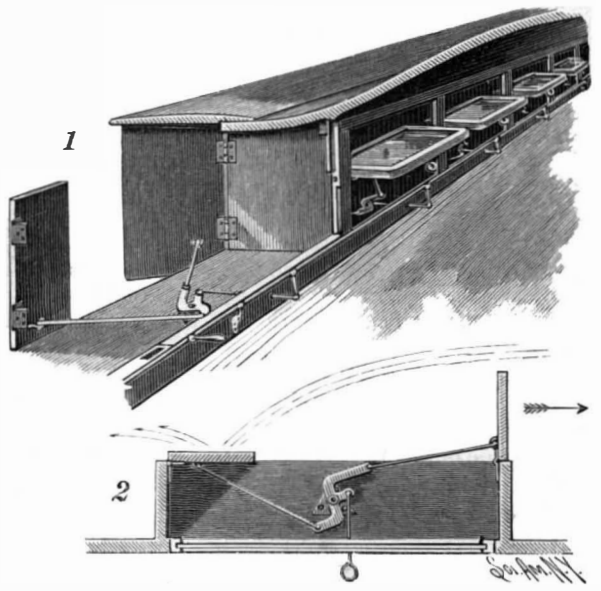
The White Star steamship Majestic clipped 12 minutes from her own record on the voyage she finished August 19 from Queenstown. Her time was 5 days, 17 hours, and 56 minutes. From Daunt's Rock to Sandy Hook Lightship the seas were unruffled and the air was almost flawless.

College Laboratory Burned.

The chemical laboratory building at the University of Illinois was destroyed by fire August 17. It is supposed to have been struck by lightning. The building was three stories high above the basement and contained five laboratories. It was one of the largest and best of its kind in the country and was erected at a cost of $40,000. The fittings, apparatus, and supplies are estimated to have brought the entire value to $75,000.

A NOVEL CAR AWNING VENTILATOR.

To insure the improved ventilation of a railway passenger car, and prevent the entry of cinders and dust, as well as to prevent draught blowing through the ventilators down upon the passengers, the improvement shown in the accompanying illustration has been devised and patented by Charles A. Bennett, of No. 32 West Hamilton Place, Jersey City, N. J. Fig. 1 represents the application of the improvement on a portion of one side of a car roof, there being two deflecting wings hinged on the ends of the window casings, and these wings being pivotally connected by links on their inner faces with the arms of a lever fulcrumed on



BENNETT'S CAR AWNING VENTILATOR.

a plate set in the window casing. An arm of this lever is engaged by a handle sliding in the sill, and the outer end of the handle may be moved by means of a rod extending along under the windows, whereby all of the wings on one side of a car may be turned simultaneously, the three-armed levers thus actuated causing the wings on one side of each window to swing outward, while its opposite wing swings inward, longitudinally of the car, closing part of the window casing. Thus, as will be seen by Fig. 2, when the car is moving as indicated by the arrow, the wing that is swung outward deflects the strong air currents over upon the opposite closed wing, and prevents cinders, dust, and an objectionable draught from passing in at the window.

TO RING A BELL WITHOUT SWINGING IT.

The illustration represents an improvement whereby bells on churches, schools, etc., may be rung without causing special strain of the tower, belfry, or any part of the structure by which the bell is supported. The improvement has been patented by Rev. John H. Strain, of Gentryville, Ind. The bell is rigidly secured at its top in the usual belfry or tower, so that the bell will remain stationary instead of swinging when rung. On the under side of the clapper is an eye connected with the ends of oppositely extending chains which are connected at their other ends with the ends of a curved

STRAIN'S BELL RINGING MECHANISM.

arm attached at its middle to a shaft journaled in bearings immediately below. One end of the curved arm is weighted, to hold it when at rest in the position shown in the illustration, and the other end of the arm is connected with a downwardly extending rope, by pulling upon and releasing which the clapper strikes and sounds the bell alternately on opposite sides. As will be seen, a proper and full sounding of the bell is insured by this mechanism, which imparts a swinging motion to the clapper, and the building is not injured by jarring, as so frequently happens with heavy bells.

A HOTEL at Nice, France, advertises a special race track for the exclusive use of its cycling patrons.

Correspondence.

A Simple Method of Regulating the Vacuum in X Ray Tubes.

To the Editor of the SCIENTIFIC AMERICAN:

A little point which I have found out about focusing Crookes tubes may be of interest, as I have not seen it in print. In use, the vacuum of the tube runs up, necessitating increasing the power of the coil to get the same results, and after this increase becomes impracticable, heating the tube is resorted to. This is apt to destroy the tube by cracking it, unless very carefully done, and, even if safely done, it soon loses its power to restore the tube. It occurred to me that the increase of vacuum was due to the absorption of gases by the platinum anode, and, knowing that the negative pole threw off gas, reversed the polarity of the tube. After working it in this way for half an hour, the tube was restored to full power, and I have practiced this process for the past two months with perfect success and without injury to the tube. After an hour's run with the X rays I reverse it as above, and it is ready for another hour's run. The coil should be cut down in power when reversed, as there is danger of disintegrating the platinum and depositing it on the glass. I cut out half the battery power. The tube makers recommend that very high vacuum tubes be sent them to have air admitted and repumped, but my method appears preferable, and, besides, saves their charge of three dollars and the time. RALPH MCNEILL.

New York, August 19, 1896.

Modern Practice in Interior Wiring.

In the course of his paper on the "Evolution of Interior Conduits from the Electrical Standpoint," before the National Electric Light Association at New York, recently, Luther Stieringer made the following statement:

The best experience of the past fifteen years in interior wiring has demonstrated the following facts:

First—Indiscriminate wiring with staples is universally condemned.

Second—Cleat wiring is admissible in exposed work where the circumstances admit, but not in any concealed work.

Third—Wires embedded in plaster, depending on the insulation only for protection, are condemned.

Fourth—Lead covered wires are also condemned, except where protected in a conduit.

Fifth—Wires in mouldings do not afford mechanical or chemical protection, and are only admissible in surface work.

Sixth—Wires carried in plaster, and covered with split or zinc tubes to prevent injury by trowels, are condemned.

Seventh—Glass or porcelain insulators can only be utilized in special cases of exposed work.

Eighth—Paper tubes do not afford absolute mechanical and chemical protection.

Ninth—Insulated tubes covered with a thin coating of brass or other metals do not afford absolute mechanical and chemical protection, but, in exposed work, they are, to a certain extent, admissible.

Tenth—Woven fabric conduit does not afford absolute chemical and mechanical protection.

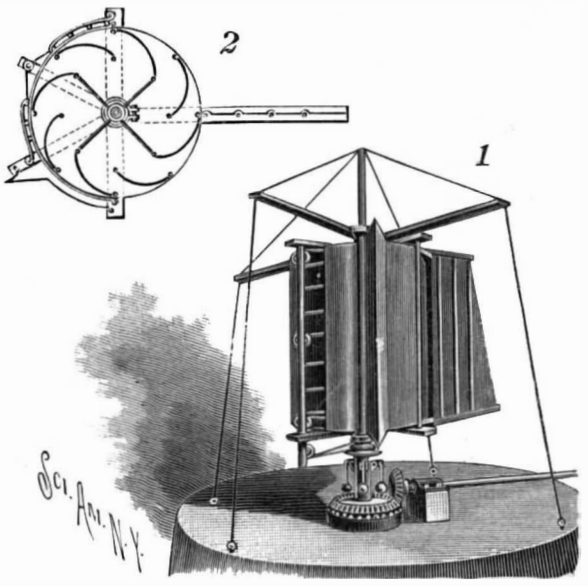
Eleventh—Heavy insulating covering, integral with the insulation, offers no absolute protection against mechanical and chemical injury, and is analogous to rubber tubing for gas distribution installed throughout a building.

Twelfth—Concentric wiring is practiced in England with satisfactory results, but it is not in use in the United States. It offers many possibilities in the direction of a solid and fixed system.

Thirteenth—Paper lined iron or steel pipes, known as "iron armored conduit," "builders' tube," "armorite," "Clifton," and plain iron or steel pipe, are the only conduits that can afford absolute security against mechanical and chemical injury and assure permanence.

A NEW SELF-REGULATING WIND WHEEL.

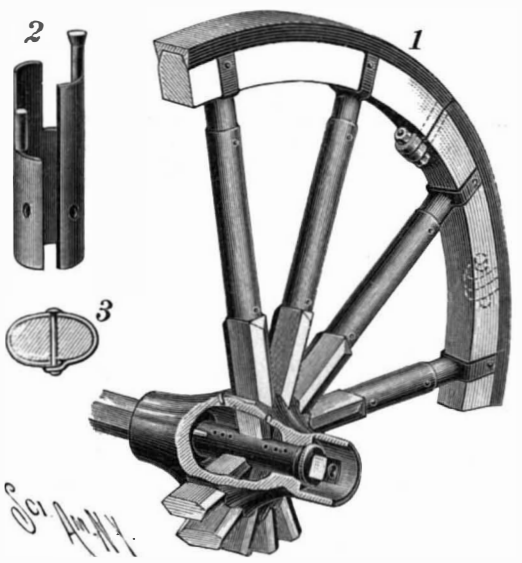
The wind wheel shown in the illustration is designed to quickly adapt itself to the variations of force and direction of the wind, and maintain a practically even speed and power under great changes in wind velocity. It has been patented by John T. Shilling, of Fisher's, N. Y. Fig. 1 is a front view of the wheel, portions being broken away to show its construction, and Fig. 2 a horizontal section. The upper end of the central shaft is braced by guy lines and cross arms, and rotating on this shaft is a tubular shaft whose lower end rotates on ball bearings and has an annular beveled gear by means of which the power of the wheel may be utilized by means of another similar gear on a horizontal shaft. Upon the tubular shaft are upper and lower disks between which are held sails, blades, and supplemental blades, attached to vertical rods, and all of canvas or other flexible material. Rotating upon the tubular shaft, and having a bearing upon the central shaft, is an auxiliary frame carrying bars which extend beyond the circumference of the wheel, as shown in Fig. 2, and support a vane. On the opposite end of this frame, supported by stay rods and horizontally curved bars, are held damper curtains adapted to be automatically moved toward and from each other, to more or less restrict the opening for the passage of wind to the wheel. The rear edges of the curtains are attached to spring rollers and their adjacent free edges to ropes which extend over pulleys and down a hollow standard to connections with a drum below, mounted loosely on the tubular shaft. There are pivoted weighted arms on this drum, and, as they swing outward with the increased velocity of the wind, the drum is drawn into frictional contact with a collar, and is rotated to pull upon the ropes and draw the damper curtains toward each other, thus cutting off some of the wind from the wheel, the spring rollers separating the curtains more or less as the frictional contact of the drum with the collar is reduced, whereby the speed of the wind wheel will be kept practically uniform.



SHILLING'S WIND WHEEL.

AN IMPROVED VEHICLE WHEEL.

The illustration represents an improved construction of the tire, hub, axle box and spokes of a vehicle wheel, by which it is designed that the tire may be tightened should the rim or felly shrink, and the spoke will be protected from injury by collisions, while the hub will be rendered stronger and more durable than usual, and a ready means is afforded for lubricating the axle spindle The improvement has been patented by John S. Court, of Springdale, Tenn. Fig. 1 represents a portion of a wheel made according to this invention, a part of the hub being broken away, Fig. 2 showing a form of spoke sleeve especially designed for repairing, and Fig. 3 showing how the sleeve is attached to the spoke. The tire is flanged and beveled, and fits over a felly which is exteriorly beveled, corresponding to the inner bevel of the tire. The ends of the tire have inwardly extending lugs which abut and are fastened together by nuts and bolts, whereby the tire may be tightened should the felly shrink. The hub is of metal in one piece and at its central



COURT'S VEHICLE WHEEL.

portion is a series of tubular or hollow arms which form a central support for the axle box, there being perforations to admit oil to the axle spindle, and the chamber surrounding it containing cotton waste. The spokes are fastened in the tubular arms of the hub, and the outer end of each spoke is mortised in the felly, the outer end of the spoke being surrounded by a metal sleeve with ears to engage the front and back of the felly and the flange of the tire. A second sleeve also surrounds each spoke, being attached at one end to the outer end of the tubular hub arm from which the spoke extends and at the other end to the outer sleeve. A longitudinally split sleeve, as shown in Fig. 2, is used at the outer end of the spoke for repairing purposes.

Tesla Says Roentgen Rays are Streams of Very Small Missiles.

According to statements recently published, the Roentgen rays are now declared, by Nikola Tesla, to be material particles. Mr. Tesla states that the electrical conditions within the tube from which the rays issue produce absolute particles. He further says he can feel the effects of these particles striking against his eye, and has noted the sensation produced when they come in contact with his brain. He says:

"There is little doubt now that a cathodic stream within a bulb is composed of small particles of matter thrown off at great velocity from the electrode. The velocity probably obtained can be estimated, and fully accounts for the mechanical and heating effects produced by the impact against the wall or obstacle opposed to the bulb. It is furthermore an accepted view that the projected lumps of matter act as inelastic bodies, like innumerable infinitesimal bullets. It can be shown that the velocity of the stream may be as much as 100 kilometers a second, or even more. But matter moving with such great velocity must surely penetrate great thicknesses of the obstruction in its path, if the laws of mechanical impact are at all applicable to a cathodic stream.

"I have so much familiarized myself with this view that, if I had no experimental evidence, I would not doubt that some matter is projected through the thin wall of a vacuum tube. The exit from the latter is, however, the more likely to occur, as the lumps of matter must be shattered into still much smaller particles by the impact. From my experiments it appears that the lumps or molecules are indeed shattered into fragments or constituents so small as to make them lose entirely some physical properties possessed before the impact.

"The matter composing the cathode stream is," continues Mr. Tesla in his letter, "reduced to matter of some primary form heretofore not known, as such velocities and such violent impacts have probably never been studied or even attained before these extraordinary manifestations were observed. The important fact pointed out early by Roentgen and confirmed by subsequent researches, namely, that a body is the more opaque to the rays the denser it is, cannot be explained as satisfactorily by any other assumption than that of the rays being streams of matter, in which case such simple relation between opacity and density would necessarily exist.

"This relation is the more important in its bearing upon the nature of the rays, as it does not at all exist in light-giving vibrations, and should consequently not be found to so marked a degree and under all conditions with vibrations presumably similar to and approximating in frequency the light vibrations. An almost crucial test of the existence of material streams is afforded by the formation of shadows in space at a distance from the bulb. Such shadows could not be formed under the conditions described except by streams of matter."

Music and Baldness.

An English statistician has recently been engaged in an original task, that of studying the influence of music on the hair. The investigator establishes, in the first place, that the proportion of bald persons is 11 per cent for the liberal professions in general, with the exception of physicians, who appear to hold the record for baldness, which is 30 per cent. Musical composers do not form an exception to the rule, and baldness is as frequent among them as in the other professions. But it is with instrumental performers that the influence of music makes itself felt, and in two opposing directions. Thus, while stringed instruments prevent and check the falling out of the hair, brass instruments have the most injurious effects upon it. The piano and the violin, especially the piano, have an undoubted preserving influence. The violoncello, the harp, and the double bass participate in the hair-preserving qualities of the piano. But the hautboy, the clarinet, and the flute have only a very feeble effect. Their action is not more than a fiftieth part as strong. On the contrary, the brass instruments have results that are deplorable. . . . The cornet-a-piston and the French horn act with surprising surety and rapidity; but the trombone is the depilatory instrument par excellence. It will clear the hair from one's head in five years. This is what the author calls "baldness of the fanfares," which rages with special violence among regimental bands.

THE MODERN REVOLVER—THE EVOLUTION OF A TYPICAL INVENTION.

BY E. J. PRINDLE.

There is a popular impression that many inventions are produced in a complete and perfect state by one supreme effort of some genius. But, on inquiring into the history of even the most simple device which has been contrived for the use or pleasure of mankind, it will almost invariably be found that it had a most elemental and simple beginning, and that its growth from that state was by a series of short steps, each effected only after prolonged efforts and many failures,

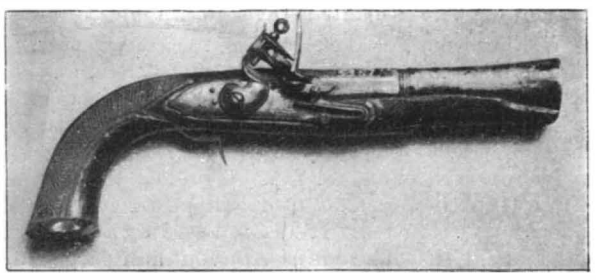


Fig. 1.—OLD FLINT LOCK PISTOL FOUND ON BATTLEFIELD OF NEW ORLEANS.

and that in many cases there were intervals of centuries between the steps.

The origin of the plow, for instance, is lost in antiquity, and, as far back as history goes, the Egyptians dragged the forked stick to till the earth and find a lodgment for the seed, and at best it was only a scratch that was produced. In spite of all the thought which was spent on the subject, it was not until the present century that the iron plow was created, and of such strength and form that it would dig down and overturn the sod and stand the blows of the rocks in its path.

Before the Christian era machinery operated by steam was used to open the doors of temples and even to propel a deity on his throne along the ground. But it was two thousand years before the steam engine was produced in a sufficiently practical form to be generally used.

One of the clearest examples of this law of evolution in inventions is the principal part of the modern revolver; namely, the cylinder which carries the cartridges. Without reference to the other features of the revolver, notice how clearly the steps can be traced between the five forms ending in the modern revolver cylinder.

In Fig. 1 is shown the old single barrel, muzzle loading pistol. With this form but one shot could be fired without reloading, and a man after one shot was, in case of a failure, at the mercy of his enemy. The engraving represents a pistol found on the battlefield of New Orleans and now in the United States National Museum, Washington. The first step from this form produced that shown in Fig. 2, in which several barrels in the same plane were discharged in succession by a firing pin which was struck by the hammer and which was pointed at each cap in succession. But it was evident that a very cumbersome weapon would be produced if more than two or three barrels were used. To obviate this difficulty the barrels were grouped around a center and the hammer made to rotate around the circle step by step as each barrel was fired. This form is shown in Fig. 3.

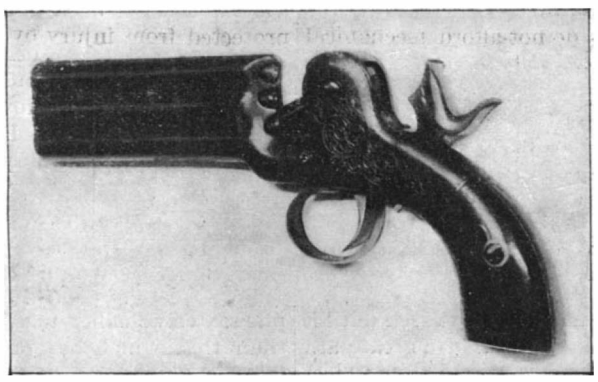


Fig. 2.—MARSTON PISTOL IN UNITED STATES PATENT OFFICE.

Fig. 4.—ALLEN "PEPPERBOX" (CAP SHIELD DISPLACED).

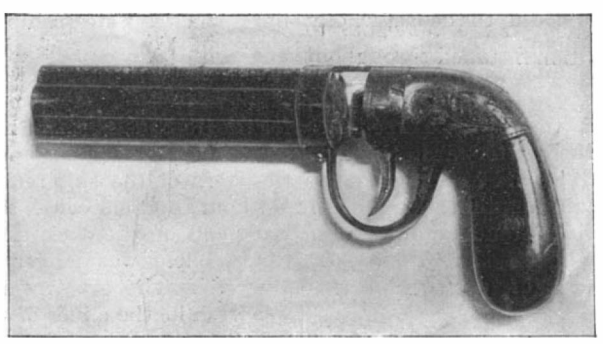


Fig. 3.—LEONARD REVOLVER IN THE UNITED STATES PATENT OFFICE.

Fig. 5.—COLT'S ARMY REVOLVER.

Use, however, developed disadvantages in this form. It was difficult to put the caps on the nipples, and the hammer was necessarily of awkward and weak construction. Efforts to remove these defects resulted in the form of a revolver shown in Fig. 4. The barrels, still grouped around a center, were caused to revolve while the hammer remained stationary. This construction, however, was still unsatisfactory. The whole structure was necessarily weak, and there were six barrels extending the whole length of the pistol from the hammer forward.

Further efforts produced the modern revolver shown in Fig. 5, in which a rotatable cylinder carries the cartridges and is only of sufficient length to accommodate them. A single barrel carries the balls after they leave the cylinder, and the revolver is reduced to its highest, strongest and simplest form.

How infinitely greater would the chances be in favor of a man armed with the latest form of revolver compared with those of a man defending himself with the earliest type of pistol! With the latter but one shot was possible, and it was not at all certain that the charge would be fired when the trigger was pulled; while with the former six practically certain shots could be fired in most rapid succession.

Hundreds of inventors have striven for more than four centuries to produce a weapon having the advantages of the revolver in its present form, and each has added his mite to the final result. A full realization of the difficulties and labor with which each new fact is wrested from the unknown darkness and brought out into the light where it can be used, leads us to honor that perseverance and wisdom which puts us in the possession of any new thing.

Aphasia in Polyglots.

In a recent number of the Revue de Medecine, Dr. Pitres details a number of interesting observations with reference to the peculiarities of aphasia as it occurs among patients who were able to speak fluently more than one language. It appears that such patients do not become aphasic in the same degree for all the languages which they speak. At first, as a rule, there is general aphasia, then, as improvement occurs, the patient is able to understand and then to speak that language which he has known longest and with which he was most familiar. The capacity for use of the other less familiar languages was acquired later. Such a conclusion does not of course imply the existence of different centers for the different languages, but is merely an illustration of the fact that qualities and capabilities which are acquired latest are most easily lost or impaired by any condition which interferes with the nervous structures which underlie them.—Lancet.

Prof. Andrée to Return.

Prof. S. A. Andrée, according to reports received at Christiania on August 21, told Capt. Sverdrup, of the Fram, who visited the aeronaut, that it was now too late to make the proposed ascent, and that he would probably soon return to Spitzbergen, and make another effort to reach the North Pole in a balloon next April. This confirms the Berlin dispatches of August 18, which state that Sir William Conway met Andrée on August 10, and that he was doubtful of success even then.

DR. J. WALTER FEWKES will again conduct explorations for the Smithsonian Institution among the Pueblos of Arizona. He left Washington for a three months' expedition, on May 30, accompanied by Dr. Walter Hough, of the National Museum.

THE JEROME PARK RESERVOIR, NEW YORK CITY.

(Continued from first page.)

feet wide is to be surrounded by an embankment and the bottom is to be excavated until good surface is reached, so as to establish an available depth of 33 feet 6 inches. This will involve a very large amount of excavating; the engineers calculating that there will be nearly seven million of cubic yards of excavation to be made, of which 3,165,000 will be in solid rock.

The reservoir will be bounded on the west by Sedgwick Avenue, on the east by Jerome Avenue, north by Van Cortlandt Park and south by Kingsbridge Road. One of our cuts is designed to show the general plan as contrasted with the race course so familiar to many. The embankment is made in earth and laid in the well known method adopted by the Aqueduct Commissioners, in six inch layers, worked down and rolled with a heavy grooved roller and rammed at points which the roller cannot reach.

Throughout the center of the embankment a core wall of rubble masonry is carried, which rises above the water level and descends well below the bottom of the reservoir, in many cases having its foot deeply embedded in rock. Thus the strength of the embankment will consist in the earth, and the dam will be absolutely impervious, which imperviousness will partly be due to the earth embankment; but in case of a deficiency in any place in the earthwork, the slightly battered core wall, three feet thick at the top, will be present, and present an absolutely impervious diaphragm. It is so well known as to be obvious that the smallest leakage through earth is subject to constant increase, and it is such leakage which the core wall is designed to prevent. The embankment will be 20 feet wide at its top. On both sides it slopes 2½ to 1, and is sodded on the out slope, and on the in slope is paved and concreted.

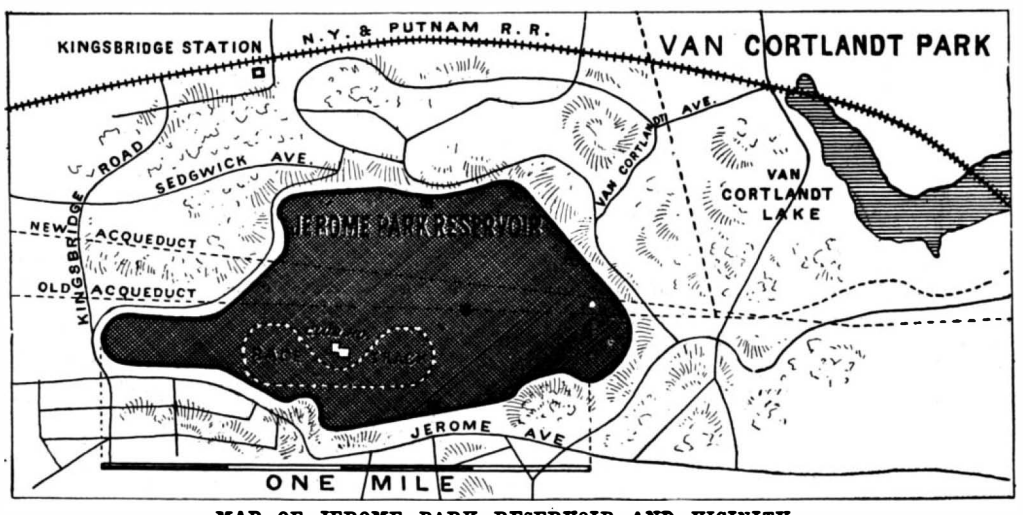
It will be seen that it forms a very perfect type of embankment, and a reservoir so made cannot but be impervious as regards its sides. The nature of the country is such that no trouble can be anticipated from bottom leakage, and wherever any weak spots occur concrete laid upon broken stone is to be used to secure absolute imperviousness.

Running approximately north and south, the reservoir has a masonry structure or dividing wall through which the old aqueduct passes. The old aqueduct is caused to diverge from its course so as to follow the somewhat sinuous line of this structure, and from a mile to the north a branch is taken from the new aqueduct, which is carried to the above masonry structure and follows it to an outlet near the southern end. A little to the north of the center of the reservoir, on the line of this structure, is established a gate house, and near this is a vertical shaft connecting with the new aqueduct (of 1890) and built at the same time. This shaft connection with the new aqueduct of 1890 becomes an important adjunct in providing the requisite connections. From this gate house six lines of 48 inch pipe radiate; two approximately northwest, two approximately west and two approximately east. In the gate house a very elaborate system of connections is provided, so that water may be taken from either right or left hand divisions of the reservoir or aqueducts and distributed to any of the six lines of pipes. Both new and old aqueducts have outlets into the reservoir also controlled from this central gate house, so that the new reservoir virtually supplies two reservoirs of the most perfect possible description, which can be operated entirely independent of each other. As regards capacity, about two billion of gallons will be contained, and taking into consideration the level of the annexed district, practically all the water in the reservoir can be advantageously withdrawn for the supply of the city. The delivery from the six 48 inch pipes will be utilized by the Department of Public Works, who control the city distribution.

One plan suggested is to carry a line from the six 48 inch pipes down across the Harlem River to the city, connecting with its princ pal mains, which in their turn run to the Central Park reservoirs. This would provide for interruption in the supply of the portions of the aqueducts crossing the Harlem River, one over High Bridge and the other by inverted siphon. In addition to the central gate house, which will be a complicated structure, smaller gate houses will be provided where the 48 inch lines emerge from the embankment, and at the point 5,000 feet to the north, where the branch is taken from the new aqueduct, a fifth gate house will be established. For the construction of this branch matters have been so arranged that only twenty-four hours' interruption of water supply will be required to complete the connection between the branch and the original aqueduct, which operation in itself may rank as a minor triumph of engineering.

As the new aqueduct is only partially filled with water, its crown will be broken into and the gate house will be built about it in the rock. The branch will be carried up to the aqueduct's sides and connected thereto; the sides of the aqueduct being reinforced where exposed by temporary masonry laid up against the outside. When all is ready for the connection there will be nothing to be done but to break down these walls and the sides, when the brickwork will be finished at the corners, all of which will be a comparatively small operation.

The line of the aqueduct structure and the place for the location of the gate houses were all indicated by the nature of the ground. The high level of the water will be five feet below the top of the embankment. On the completion of this reservoir, New York will have about three weeks' supply of water available in it and in the present Central Park reservoirs.



MAP OF JEROME PARK RESERVOIR AND VICINITY.

The Seismic Wave in Japan.

Writing from Tokio on June 26, the correspondent of the London Times gives an interesting though melancholy account of the great wave disaster in Japan, by which in five minutes 30,000 people were killed and 12,000 houses were destroyed.

There was nothing (he says) to presage the disaster. From 11 in the forenoon until half past 4 in the afternoon heavy rain fell. It was followed by a fine evening and a dark, calm night. At about half past 7 three or four shocks of earthquake were felt; not violent shocks, though of the vertical kind that people in Japan have learned to dread. The barometer gave at the time no indication of anything unusual. Some 20 or 25 minutes later a booming sound became audible from the direction of the sea. It appears to have been variously interpreted. Only a very few suspected the real significance of the sound, and fled inland at the top of their speed. Rapidly the noise increased until it assumed the volume and deafening din of a great park of artillery, and then, in a moment, waves from 20 feet to 30 feet high were thundering against the shore.

Kamaishi is a little seaside town, situated at the head of a rocky inlet two miles deep, and directly facing the Pacific Ocean. Behind it is a precipitous hill. The inhabitants seem to have remained until the last wholly unconscious of what was pending. Suddenly a mountain of sea was observed piling itself up at the mouth of the inlet, and in a moment, with a thunderous roar, waves 30 feet high swept over the town. Three times these avalanches of water rushed forward, the first incomparably the most terrible, and in less than two minutes the town was virtually annihilated. Out of 1,223 dwellings only 143 remained standing, and out of a population of 6,557 death had overtaken 4,700 and 500 lay wounded. In completeness of destruction this record heads the list.

There were some remarkable escapes. Men swept out to sea from one side of a bay were thrown up alive on the opposite beach, and in one case several persons were deposited on an island nearly three miles from the town whence the wave had torn them. A few saved their lives by clinging to balks of timber, and several, getting wedged among the wooden debris of wrecked buildings, were preserved until the wave receded. At an inn in O-ura a traveler, apparently the only man in the house, was grasped by four terrified women, and the combined weight of the five furnished a steady point. But such bright incidents were rare, whereas of inexpressibly sad happenings there are numbers. The parents of six children caused the little ones to throw their arms round a beam of the house. There they clung, the water reaching up to their shoulders. The smallest child, losing its hold, was swept away, and its mother, springing after it, shared its fate. Presently the father, trying to fend off some floating debris that threatened to strike the children, was carried off, and the five orphans alone remained. In another family of ten, one child of eight drifted to a rock and was saved; in another family of the same number, the father having carried a baby to a hill, and found that none of the others followed, set down the baby and ran back, only to perish with the rest. The story of a retired soldier is worth repeating. His experiences in the recent war had taught him to apprehend the raiding of Japan's coasts by a hostile fleet. Thus, when the cannon-like roar of the advancing waters and the cries of the people reached him, he threw on his tunic and ran shoreward, sword in hand. Next morning his corpse was found, much battered, but not separated from the sword.

Along the beach the timbers of wrecked houses lie piled upon each other; moss covered roofs of thatch that sheltered happy families a few days ago in quiet country nooks are strewn pell-mell on the sands; here, houses that have had their walls torn away, stand, mere skeletons; there, others have been wrenched from their foundations, telescoped into each other, tumbled upside down, or heaped together in shattered confusion. Horses and cattle lie wedged among the rocks, and men and women wander about, stupefied and helpless, looking as though their minds and energies had been numbed. Numerous corpses are still buried under the debris of ruined buildings, or under heaps of mud and sand thrown up by the waves, and often when a body is disinterred no friend or relative remains alive to identify it. The government is, of course, adopting vigorous measures of relief, and liberal subscriptions are pouring into the newspaper offices, both vernacular and foreign, for when calamity overtakes Japanese, the benevolence of the foreign community is invariably large handed.

As to the cause of the disaster opinions are still divided. At first it was supposed that the disturbance had its origin in a sudden collapse of the sides of a subterranean crater. On the other hand, considering that the advent of the great wave was immediately preceded by earthquake shocks whose vertical character precludes the hypothesis that they were due to the stupendous rolling of the wave itself, the most reasonable conclusion appears to be that a submarine volcanic eruption took place. That the water had been thrown up from great depths to swell the bulk of the colossal billow is proved by the fact that deep sea shell fish were found in the hills visited by the wave. It may be added here that since the catastrophe the fish seem to have deserted the upper waters; a few can be caught now only by using the deepest seines, the great bulk having apparently gone down to inaccessible depths.

Ever since the ninth century Japan has suffered cruelly from earthquake waves. The very district now devastated was momentarily buried under the sea in 869 A. D., and the loss of a thousand lives is recorded, a catastrophe scarcely smaller under the conditions of the time than that which has just occurred. But in no case did the destruction of life attain dimensions such as have now to be recorded.

Big Dry Dock Settles.

The 550 foot dry dock at Erie Basin, with the Hamburg-American steamship Phœnicia in it, settled two feet August 19 from causes that have not been explained. The Phœnicia is a big twin screw freighter and immigrant carrier. She had been docked for painting and for the readjustment of her propeller blades. At 8:30 o'clock fifty machinists and helpers were at work about the stern of the ship removing one of the propellers. Without apparent cause, and without warning, the forward end of the dock gave a lurch and settled two feet. There was danger that the dock gates might give way. The accident at the Brooklyn Navy Yard was fresh in the minds of the workmen, and they fled for their lives, clambering helter skelter up the steep steplike sides of the dock. The gates creaked and groaned, but held fast.

Then the dock was flooded and the gates were opened. It was found that the Phœnicia was stuck fast. The Phœnicia was afterward floated. The dock was not materially injured.

Headaches from Eye Strain.

Dr. S. Weir Mitchell, in Medical News, says there are many headaches which are due directly to disorders of the refractive or accommodative apparatus of the eyes. In some instances the brain symptom is often the most prominent, and sometimes the sole prominent symptom of the eye troubles, so that while there may be no pain or sense of fatigue in the eye, the strain with which it is used may be interpreted solely by occipital or frontal headache. The long continuance of eye troubles may be the unsuspected source of insomnia, vertigo, nausea, and general failure of health. In many cases the eye trouble becomes suddenly mischievous, owing to some failure of the general health, or to increased sensitiveness of the brain from moral or mental causes.

THE FARTHEST NORTH.

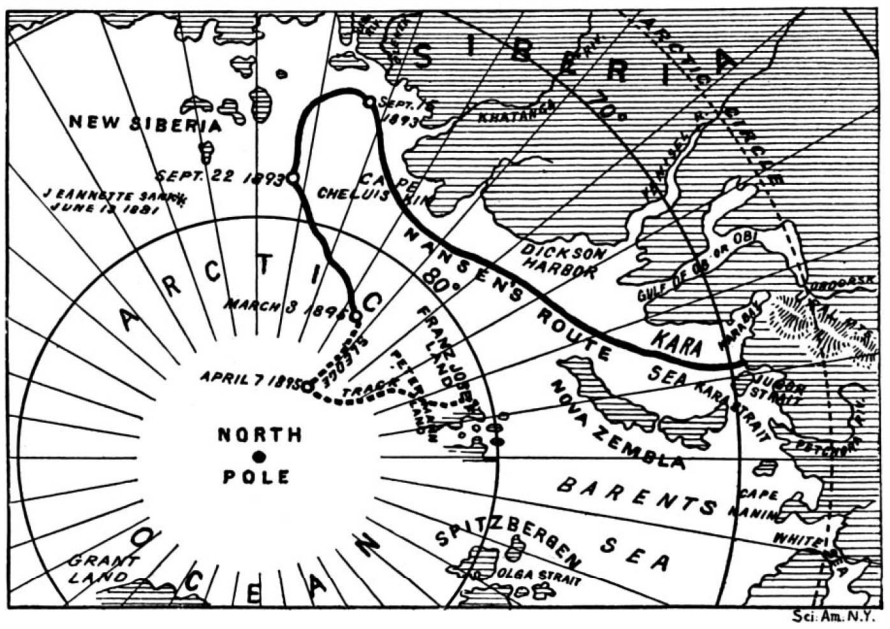
Lockwood and Brainard, of the Greely expedition, on May 13, 1882, reached a higher latitude than had ever before been attained in that quest to reach the pole which has tempted ambitious explorers for over three hundred years. Since that time their record, 83 degrees 24 minutes, has stood as the nearest approach to the pole yet made by man. Now Dr. Fridjof Nansen, a Norwegian, has attained the higher latitude of 86 degrees 14 minutes. Most of the details of this last expedition were given in last week's SCIENTIFIC AMERICAN, but we are now able to add some further particulars, together with a map showing the explorer's route. In a signed statement published in the London Chronicle Dr. Nansen says:

"On March 3 we reached 84 degrees 4 minutes north. Johansen and I left the Fram on March 14, 1895, at 83 degrees 59 minutes north and 102 degrees 27 minutes east. Our purpose was to explore the sea to the north and reach the highest latitude possible, and then to go to Spitzbergen via Franz Josef Land, where we felt certain to find the ship. We had twenty-eight dogs, two sledges and two kayaks for possible open water. The dog food was calculated for thirty days and our provisions for one hundred days. We found the ice in the beginning tolerably good traveling, and so made good distances, and the ice did not appear drifting much. On March 22 we were at 85 degrees 10 minutes north. Although the dogs were less enduring than we hoped, still they were tolerably good. The ice now became rougher and the drift contrary. On March 25 we had only reached 85 degrees 19 minutes north, and on March 29, 85 degrees 30 minutes. We were now evidently drifting fast toward the south. Our progress was very slow. It was fatiguing to work our way and carry our sledges over the high hummocks constantly being built up by the floes grinding against each other. The ice was in strong movement and the ice pressure was heard in all directions.

"On April 3 we were at 85 degrees 50 minutes north, constantly hoping to meet smoother ice. On April 4 we reached 86 degrees 3 minutes north, but the ice became rougher, until on April 7 it got so bad that I considered it unwise to continue our march in a northerly direction. We were then at 86 degrees 14 minutes north. We then made an excursion on skis further northward in order to examine as to the possibility of a further advance. But we could see nothing but ice of the same description, hummock beyond hummock to the horizon, looking like a sea of frozen breakers. We had had low temperature and during nearly three weeks it was in the neighborhood of 40 degrees below zero. On April 1 it rose to 8 degrees below zero, but soon sank again to —38. When a wind was blowing in this temperature we did not feel comfortable in our too thin woolen clothing. To save weight we had left our fur suits on board ship. The minimum temperature in March was —49 and the maximum was —24. In April the minimum was —38 and the maximum —20 degrees. We saw no sign of land in any direction. In fact, the floe of ice seemed to move so freely before the wind that there could not have been anything in the way of land to stop it for a long distance off. We were now drifting rapidly northward. On April 8 we began our march toward Franz Josef Land. On April 12 our watches ran down, owing to the unusual length of the day's march. After that date we were uncertain as to our longitude, but hoped that our dead reckoning was fairly correct. As we came south we met many cracks, which greatly retarded our progress. The provisions were rapidly decreasing. The dogs were killed one after the other to feed the rest.

"On May 31 we were in 82 degrees 21 minutes north and on June 4 in 82 degrees 18 minutes north, but on June 15 we had been drifted to the northwest to 82 degrees 26 minutes north. On July 22 we continued our journey over tolerably good snow. On July 24, when about 82 degrees north, we sighted unknown land at last, but the ice was everywhere broken into small floes, the water between being filled with crushed ice in which the use of the kayaks was impossible. We therefore had to make our way by balancing from one ice piece to another, and we did not reach land until August 6, at 81:38 north and 63 degrees east longitude.

"On August 26 we reached a spot in 81:13 north and 65 east, evidently well suited to wintering, and as it was now too late for the voyage to Spitzbergen, I considered it wisest to stop and prepare for winter. We shot bears and walruses and built a hut of stones, earth and moss, making the roof of walrus hide tied down with rope and covered with snow. We used the blubber for cooking, light and heat. The bear meat and the blubber were our only food for ten months. The bear skins formed our beds and sleeping bag. The winter, however, passed well, and we were both in perfect health. Spring came with sunshine and with much open water to the southwest. We hoped to have an easy voyage to Spitzbergen over the floe of ice and the open water. We were obliged to manufacture new clothes from blankets and a new sleeping bag of bear skin. Our provisions were raw meat and blubber. On May 19 we were at last ready to start. We came to open water on May 23, in 81:05 north, but were retarded by storms until June 3. A little south of 81 degrees we found land extending westward and open water which reached west-northwest along its north coast. But we preferred to travel southward over the ice through a broad sound. We came on June 12 to the south side of the island and found much open water trending westward. We sailed and paddled in this direction in order to proceed across to Spitzbergen from the most westward cape, but Payer's map was misleading." Dr. Nansen's account concludes as follows:



MAP SHOWING ROUTE OF NANSEN'S POLAR EXPEDITION.

September 15, 1893—Where Nansen was to have received a supply of dogs, but decided not to lose time by stopping.
September 22, 1893—The Fram was closed in by the ice at this point, and began her drift northward.
March 3, 1895—Where Nansen and Johansen left the Fram for their sledge journey.
April 7, 1895—Nansen's farthest north, 86 degrees, 14 minutes.

"We left Franz Josef Land in the steamer Windward on August 7 and had a short and very pleasant passage, thanks to the masterly way in which Captain Brown brought his ship through the ice, and thence in the open sea to Vardoe."

On August 20 word was received of the safe arrival of the Fram at Skjervoe, near the North Cape. After Dr. Nansen left her she drifted nearly two degrees northward, to 85° 57′. The deepest sounding taken by the Fram was 2,185 fathoms, and the lowest temperature recorded was 52° below zero. It is stated that on August 14 the Fram called at Danes Island, where a visit was made to M. Andrée, who is attempting to reach the pole by means of a balloon, but who had not yet made his ascension.

CYCLE TELEGRAPHS IN WAR.

As is well known, electrical communication plays an important part in the warfare of to-day, a part that emphasizes the necessity of developing it to the highest degree of efficiency for armies operating upon a base apart from a commercial telegraph system. Special attention has been given by the Signal Corps of the United States Army to provisions for temporary telegraphic or telephonic intercommunication. Flying telegraph trains equipped with the most modern appliances are located at several government stations in the West. Among pending experiments are those pertaining to insulators, wire, batteries and the most important one of the naked wire telephone.

The question of the reeling out and recovering of wire and outpost cable by bicycle, automatically, has come in for a considerable share of attention, and the results have been very satisfactory. The Signal Corps has now a bicycle equipped with an automatic reel that works perfectly. The attachment was made in San Antonio, Texas, under the supervision of its inventor, Captain R. E. Thompson, of the Signal Corps. The line was laid out and recovered at a moderate rate on the day of the first test. The speed was gradually increased, and it was found that the wire was paid out quickly. After dismounting for a moment to reverse the action, the officer began a return trip, keeping in the middle of the road and riding hard. The recovery was perfectly made, the wire being spooled evenly and the tension was at no time troublesome, although the course of the line was occasionally departed from by many feet, showing that the problem of compensating for increased speed of the recovery due to increasing bulk of the spool has been solved. The time occupied in running out and then picking up the reel of wire was two minutes, the reel holding about one-third of a mile of cable. Practical use has been made of the equipment in sending messages at other times than on the trial trip.

We present an engraving of a device for the same purpose which has been invented by a German who is at present living in London, Mr. Leo Kamm. This is a cycle for laying wires for military purposes. It consists of an ordinary pneumatic tired safety provided with two or three drums of wire of about four inches in diameter. On each of the spools is wound a twisted wire composed of fine steel threads. Each reel carries a mile of wire. The wire passes over a wheel connected with a telegraph receiver. As the rider travels, the rotation of the bicycle unwinds the wire from the drum, leaving it on the ground. The bell rings before the wire is entirely paid out from the drum. When it is desired to send a message to the starting point, the rider dismounts and fixes in the ground an earth rod which is carried for that purpose. The apparatus for laying the wire weighs 7 lb., and each mile of wire weighs 10 lb. This machine was actually employed at the recent Aldershot maneuvers. It was also shown at the military tournament at Agricultural Hall.

TELEGRAPH LAYING CYCLE.

The Storing of Dry Plates.

Ever since the dry plate has been commercially used, defects or deterioration due to the packing of plates have become known. It was found chemicals in the paper separator strips, combined with the moisture of the atmosphere, acted on the film, producing a developable fog. Mr. A. L. Henderson, in a paper lately read before the London and Provincial Photographic Association, described a series of experiments he had made, and came to the conclusion that paper was unsafe as a receptacle for holding plates. His recommendation is that plates be separated by strips of tinfoil and stored in metal boxes, a suggestion which seems feasible in view of the facility which the X rays have of passing through paper. There appears to be a phosphorescent action from paper on the film, as well as chemical, according to the results of his experiments.

THIS year's recruits for the Russian army numbered 270,000, which is considerably more than the whole British army.

More About Strange Explosive Sounds.

BY A. S. HOOKER.

The recent article in the SCIENTIFIC AMERICAN on "Barisal Guns and Mist Pouffers" is worthy of the journal that, since my boyhood, has given so many interesting articles on the mysterious and unexplained things in nature, to the delight and wonderment of thousands of readers. These curious explosive sounds, called "guns," while not all of the same origin, take strong hold on the superstition and the wonderment of mankind. That beautiful sheet of water, Seneca Lake, in the State of New York, has achieved quite a local reputation for its mysterious "lake gun." A writer in Mrs. Stephen's Monthly, in 1857, speaks thus: "The lake gun is a mystery. It is a sound resembling the explosion of a heavy piece of artillery, that can be accounted for by none of the known laws of nature. The report is deep, hollow, distant, and imposing. The lake seems to be speaking to the surrounding hills, which send back the echoes of its voice in accurate reply. No satisfactory theory has ever been broached to explain these noises."

In my work on "Great Earthquakes," it is related, page 123, that long after the earthquake of "November 16, 1827, in New Granada, subterranean detonations were heard in the whole valley of Cauca during twenty or thirty seconds, without any perceptible vibration."

"One of the most remarkable of these 'earth bellowings' is that described by Humboldt as occurring in the elevated Mexican plateaux, called by the inhabitants the 'roaring and subterranean thunder (bramidos y truenos subterraneos) of Guanaxuato.' Far from any active volcano, the noise began about midnight of January 9, 1784, continuing for a month.

"From the 13th to the 16th of January it seemed to the inhabitants as if heavy clouds lay beneath their feet, from which issued alternate slow rolling sounds and short, quick claps of thunder. The noise abated as gradually as it had begun."

At Moodus, near East Haddam, near the mouth of the Connecticut River, every few years a succession of explosive sounds are heard, which have received the name of "Moodus noises," and are noted as far back as 1728 and as recently as two years ago. In the former year, Rev. Mr. Prince said: "I have myself heard eight or ten sounds successively, and imitating small arms, in the space of five minutes. Oftentimes I have observed them coming from the north, imitating slow thunder, until the sound came near or right under, and then there seemed to be a breaking, like the noise of a cannon shot, or severe thunder, which shakes the houses and all the people that is in them."

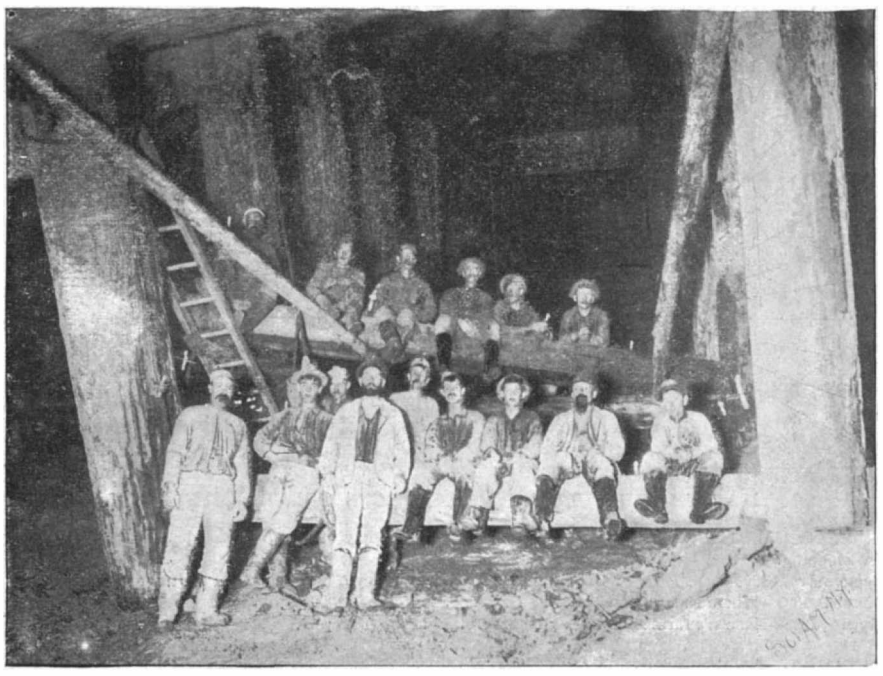
C. Barrington Brown, in his explorations in British Guiana, 1868–72, says: "As we were on the point of leaving the landing to descend the Issano, we were all startled by a heavy booming sound, resembling the distant discharge of a heavy piece of artillery. The sun shone brightly at the time, and not a cloud was to be seen in the sky. On making inquiries, I learned from the Indians that these sounds were frequently heard at this place, and are supposed to have their origin in the mountains to the south."

In 1874, Bald Mountain, in North Carolina, gave forth a series of sounds of a startling nature, loud and explosive, seemingly from its interior, and succeeded by shakings of the earth, and the inhabitants thought it was about to break forth into a volcano.

"Four years later, about May 25, 1878, the residents of the mountain, especially a section of the 'Bald' about four miles away from the first manifestation, were startled by sudden movements of the earth, and loud rumbling and crackling noises, with sudden movements in the mountains, and the wildest reports were spread abroad by telegraph and rumor. The newspapers announced, with startling headlines, that Bald Mountain had suddenly become a volcano, and it was some time before the 'volcano' was resolved into ordinary forest fires, and the noises into subterranean sounds, produced by the sliding and breakage of the tilted-up strata of the mountain, near where, a century before, there had been an extensive slide, when a portion of the mountain a quarter mile wide had moved down 500 feet. Now violent explosive sounds, crashing and rumbling noises, and shakings of the earth occurred. Fissures opened in various directions, splitting the steep wall of the mountain in various places. One of these large fissures extended along the 'Bald,' almost at the top, for over 300 feet southeasterly, then turned south and ended a hundred feet farther. The surface opening is from 2 to 6 feet wide, and is entered by two funnel shaped holes, and extends downward in some places 70 feet. The sides are of gray granite, with nowhere a greater width than 8 feet. New cracks were discovered almost every week, running through sections of solid granite."—Great Earthquakes, pages 127, 128.

A cave of large size was discovered under the mountain, and a writer for the New York Herald described the tilted-up and almost perpendicular strata as "large flakes of rock 80 feet high by 50 feet wide and 10 inches thick," and thinks the fall and sliding of these rocks the cause.

DR. LUDWIG MOND, of London, has given to the Royal Institution the freehold of No. 20 Albemarle Street, adjoining the building of the Royal Institution in London, and has also equipped and endowed it to be known as the "Davy-Faraday Research Laboratory of the Royal Institution." It is to be freely open to a limited number of persons who have already done original scientific work or are fitted to do it, without reference to nationality or sex. The laboratory is one of the finest in the world, and Dr. Mond's generosity cannot fail to result in the facilitation of important researches. The directors are Lord Rayleigh and Professor Dewar.



IN THE HOMESTAKE MINES, LEAD CITY, SOUTH DAKOTA.

THE HOMESTAKE GOLD MINES AND STAMP MILLS, SOUTH DAKOTA.

In the native state gold is found crystallized, more commonly in the form of the cube or in plates, ramifications or nodules, commonly known as nuggets. It is generally alloyed with silver and sometimes with tellurium, bismuth, lead, etc. It very frequently occurs in small quantities in metallic sulphides, as in iron, galena and copper pyrites. The alloys, or its combinations with other metals, are very numerous, those with copper and mercury being the more numerous and most important. Gold and copper are found combined in all proportions without materially affecting the color of the former, except that it is somewhat redder. The density of the compound is much less than that of gold, but the hardness is greater and it is more fusible. The extraction of gold is effected more by mechanical than by chemical process.

In its compact state gold possesses a characteristic yellow color of high metallic luster, is nearly as soft as lead, and is the most malleable of all metals. It can be beaten into leaves of a thickness not exceeding $\frac{1}{200000}$, or according to some estimates $\frac{1}{280000}$ of an inch, through which light passes with a green tint. One grain may thus be distributed over 56 square inches of surface. The supreme ductility of the metal is such that the same quantity may be drawn out into 500 feet of wire.

It fuses at 2,016 degrees, and when in this state is of a bluish green color. It is not at all volatile in the heat of the furnace, but by a powerful electric discharge, by the concentration of the sun's rays by a powerful sun glass, or by the oxyhydrogen jet, it is dispersed into purple vapors. Gold has little if any affinity for oxygen.

It undergoes no change on exposure to the atmosphere, and is not affected by hydrochloric, sulphuric or nitric acid, or by any simple acid except selenic acid; nor do the alkalies affect it. It is however dissolved by any mixture which liberates chlorine. Its usual solvent is aqua regia, which is prepared by mixing one part of nitric acid with four parts of hydrochloric acid. For heat and electricity gold has been found to be one of the most perfect conductors.

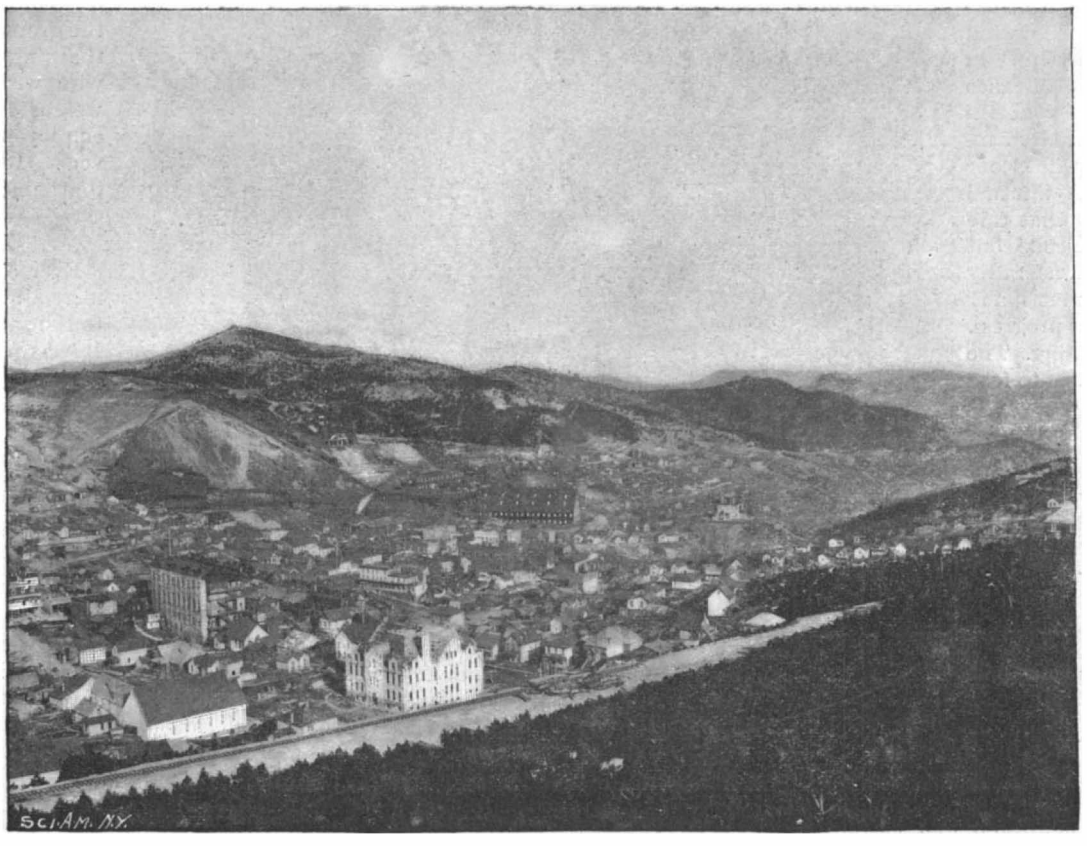
The specific gravity of this metal is less than that of iridium or platinum, ranging from 19·2 to 19·4.

One kind of gold crushing is done by means of large cast iron rollers, which break the auriferous quartz as it passes between them. The more common form of crusher is the stamp mill, with iron-shod piles of wood, worked by an axle with projecting cams after the fashion of the flint mill. The ore pounded by the stamp is washed, and for doing this there is an endless variety of contrivances. In one of the richest quartz districts of Dakota, it is carried by a steady current of water over coarse woolen blankets laid on inclined boards. By this means the lighter particles of quartz are carried away and the gold, which of course is the heaviest, becomes entangled in the fibers of the wool. The blankets are changed and washed each day.

The gold contained in these drifts and in the stamped quartz is recovered by amalgamation, and the mercury is afterward distilled off in a retort, leaving the gold chemically pure.

At Lead City, Dakota, are the celebrated gold mines known as Homestake, which form the subject of the accompanying illustrations. The ore bodies mined here have an average width of from two hundred and fifty to four hundred feet, and penetrate into the bowels of the earth to an unknown depth. Six hundred stamps, crushing 20,000 cubic feet of ore every twenty-four hours, drop incessantly day and night in the six mills without intermission, even Sundays.

The Black Hills, Dakota, are seamed with veins of ore-bearing rock which will return $35 to $175 in gold to the ton of ore stamped. But unfortunately the ore is refractory, and cannot be treated by the ordinary process of amalgamation. Only recently it has been discovered that by a process



LEAD CITY, SOUTH DAKOTA.

known as lixiviation the precious metal can be cheaply separated from the auriferous vein rock. Following this discovery, leaching works of one and two hundred tons capacity were constructed at Deadwood, Dakota, and gold which was formerly proof against amalgamation on the battery plate or in the pan is now readily recovered in the leaching vats.

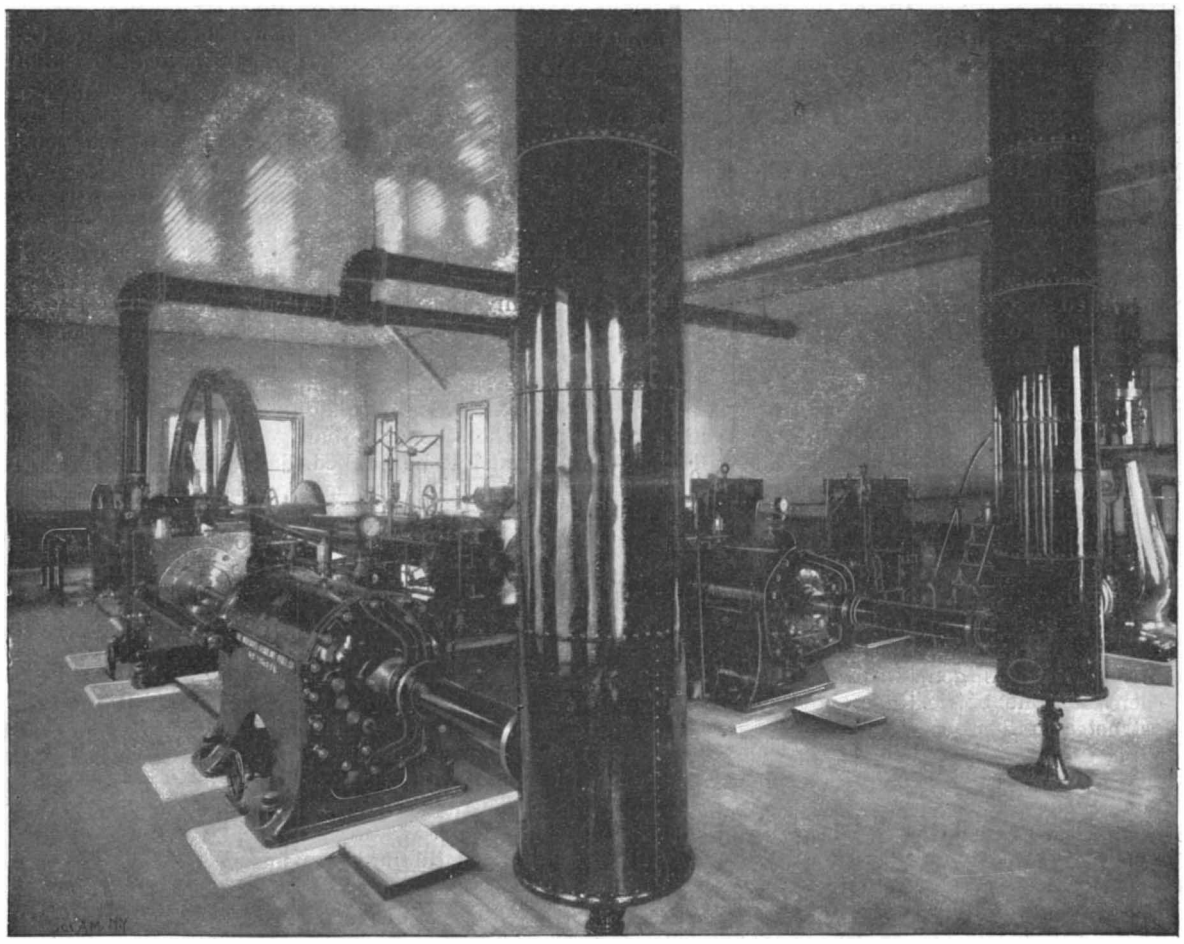
A Swiss Mountain Railroad.

An interesting description has lately been given of the Stanserhorn Railroad, one of the most recently opened of the Swiss mountain railroads, says the Railway Review. It consists of a series of inclines, each of which is operated by cables driven by independent electric hoisting engines. The current is generated by dynamos driven by turbines actuated by a mountain torrent some five miles distant. This plant also supplies current for lighting the village and hotel, and also for the search lights on the mountain tops. The road is constructed in three parts, each at an angle with the other, the gradients being in some instances as high as 60 degrees. The passengers are required to dismount twice in each ascent of about 5,000 feet.

Two cars are attached to the ends of a pair of wire cables, and are provided with automatic safety devices consisting of rail grippers on one rail. These are thrown into operation by a worm operated by a pair of bevel gears, the driver of which is loose on the axle and is driven thereby by means of a conical friction disk or pulley which is pressed against its counterpart as soon as the tension on the hoisting rope is released.

Should the rope break or the strain be released, the friction disk grips, and beginning to revolve, drives the worm, which spreads the longer ends of the two levers, the short ends of which are wide and flat, and immediately bears against the web of the rail; less than two revolutions of the axles hold the cars in place without chance of slip. This device also prevents the wheels from rising from the rails, as the jaws of the grippers are directly under the heads of the rails.

The conductor is supplied with an "electric whip" by which he can immediately communicate with the engineer at the terminal and intermediate stations. This "electric whip" is a brass rod provided with a wooden handle; two insulated wires passing through it connect at all times with the telephone and signals. Thus the car can be stopped instantly by the engineer on signal in case of need, even when out of sight. This mountain road is built on solid masonry from end to end, and in no case is there any possibility of shifting of roadbed. The hillsides are "palisaded" where the earth is not solid or where forests have been felled, and there are masonry gutters on each side. Numerous paths are carried over and under these roads by stone arches, provisions which, of course, add materially to the first cost. It should be mentioned that, in order to keep the safety device in perfect working order, tests are made regularly every fortnight. SCIENTIFIC AMERICAN SUPPLEMENT, No. 1077, contains a fully illustrated article descriptive of the Rigi, Brunig, Pilatus and other celebrated mountain railways.



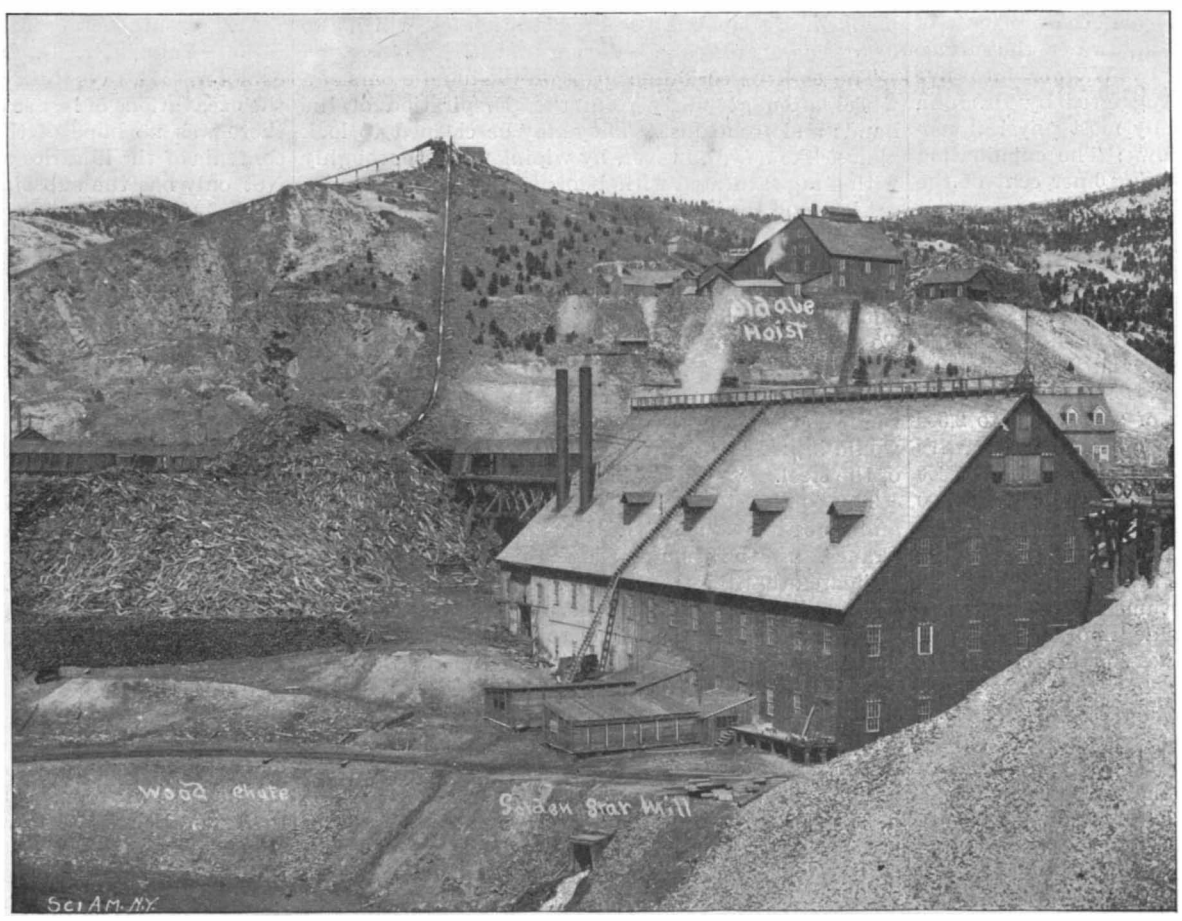
AIR COMPRESSOR AND ELECTRIC PLANT, HOMESTAKE MINE, LEAD CITY.

The Text of the Iliad.

Mr. Grenfell, who has been exploring in Egypt last winter, brought recently to Dublin the many fragments he had discovered and transcribed, and among them are several passages in iambics, one in anapests, and some in prose, which he has not yet been able to assign to any known Greek author. There is one prose passage so like Plato in style that it seems hardly possible it can belong to any one else. But we have not yet identified it. These fragments are in very old hands, as old as the classical fragments in the Petrie papyri, and therefore dating from early in the third century B. C., perhaps even earlier. Every syllable we can recover of Greek writing so ancient as this has, at any rate, a great palæographical interest. But there are a good many of these fragments representing an early copy of some books of the Iliad—I hesitate to say the whole Iliad, from the size of the writing. For the professional book hands of this date are (so far as we know) much smaller. The fragments in Mr. Grenfell's possession amount to about eighty lines or parts of lines, and come from various books, iv, viii, xxi, xxii, and xxiii. There is no doubt whatever that the writing is of the earliest kind we know, and thus undoubtedly dates from before the days of the Alexandrian critics. To me, therefore, who published the first scrap of such a text in the Petrie papyri, it was naturally of the highest interest to learn whether the newly discovered text presented the same peculiarities.

It will be remembered that the former scrap from the eleventh book showed beginnings and endings of lines not in our texts, and this so frequently as to amount to a surplus of one-sixth. Mr. Grenfell had already examined his fragments from this point of view, and showed me that, out of about eighty lines, thirteen are not to be found in our vulgate. The conclusion, therefore, which I had drawn, that before the recension by the Alexandrian critics the Iliad presented a very different appearance, is hereby confirmed, in spite of the adverse criticism of some learned Germans. They held that the Petrie text was an accidentally bad and slovenly copy, with many variations from the texts received even in that day. In the face of the new discovery I am disposed to maintain my original conclusion, and now prophesy that whatever new texts of the Iliad, in handwriting of this great age, are hereafter found, the additional lines will amount to fifteen per cent. I may not be right in every case, for in the present group of fragments those from the twenty-first book show hardly any departures from our text, but the general result will, I believe, corroborate the facts now ascertained. When Mr. Grenfell publishes these fragments, the critics will have ample opportunity of examining this interesting question.

We already possess a very large number of specimens of the Iliad from the second to the fourth century A. D. Every year adds to them. But they all represent (discounting mere blunders) the vulgate text of our printed editions. The solitary exception is the Genevan fragment published by Prof. Nicole. This has many additional lines like the old texts, but a glance at the writing will show any palæographer that it must have been written (in the second century A. D.) three or four hundred years after the pre-Alexandrine fragments. The considerable variants in this fragment show that the old, perhaps loose and prolix, text still survived. It affords us, at all events, a third witness to the fact, and makes it well-nigh impossible to deny that the labors of Aristarchus and his great predecessors were not so conservative as has usually been assumed. — Prof. J. P. Mahaffy, in London Athenæum.



HOMESTAKE STAMP MILLS, LEAD CITY, SOUTH DAKOTA.

DAMAGE by lightning is unmistakably increasing, according to the director of the statistical office of Berlin. Various causes are assigned, such as the employment of electricity in various industries, the continual change of form of the earth's surface by deforestation, drainage, etc., and the impurities introduced into the atmosphere by the growing consumption of coal. Professor Von Bezold some time ago showed that for Bavaria the fires due to lightning increased from a yearly average of 32 in 1833 to 1843 to 132 in 1880 to 1882, while the number of persons struck by lightning and of those killed rose from 134 and 73 respectively in 1855 to 186 and 161 in 1885. An interesting fact noted is that persons struck generally perceive neither lightning nor thunder, but receive the impression of being enveloped by fire.—Public Opinion.

Science Notes.

Underground Ireland is almost unknown. M. Martel, the French cave explorer, proposes to hunt for Irish caves and to examine those he finds thoroughly. He has devised a system of portable ladders, telephones, and electric lights for cave exploration.

The result of recent analyses show that the loss of weight suffered by coal from exposure to the weather is considerable. In some cases it reached 33·08 per cent, while the deterioration in quality for purposes of fuel or gas making reached a still higher figure.

Vesuvius is an interesting sight just now. One stream of lava flowing down from the center is a hundred feet wide and from seven to fourteen feet deep, while a hundred other smaller streams are running down the cave and a big column of black smoke rises into the sky.

Sir William Macgregor receives the Royal Geographical Society's gold medal this year for his explorations in British New Guinea, and Mr. St. George Littledale the patron's medal for his Pamir journeys. The Labrador explorers, Messrs. Low and Tyrell, receive grants of money.

Friedrich August Kekule, professor of chemistry at the University of Bonn, who has just died at the age of 77 years, by the discovery of the fouratomic character of carbon established the basis for the modern theory of chemical combinations. The paper describing this discovery and Kekule's later paper on the theory of benzole are the most important speculative works in chemistry of this generation.

Messrs. Read, Campbell & Company submitted to the Royal Society of London small receptacles (capsules), of pear shape, about 16 millimeters diameter, containing liquid carbonic acid under a pressure of 60 atmospheres. Each capsule weighs less than 10 grammes. Five thousand may be packed into a box 30 centimeters in each direction. For making "mineral" waters and carbonated beverages generally, one capsule being sufficient for one bottle. Each capsule has a peculiarly constructed hard rubber stopper, which is broken off after placing the capsule on the mouth of the bottle.

An official report on the death of Prof. Langerhaus' child, which was the occasion of an attack on the antidiphtheritic serum last winter, has at last been published in Berlin. The professor injected the serum into his healthy boy himself to inoculate him against croup; the child died almost immediately, when his father published a violent attack on the serum. The whole stock of anti-toxin, from which the portion used on the child was taken, has been traced, analyzed chemically and microscopically, and found to be of normal quality. The doctors who made the post mortem examination found that the child died of suffocation. He had eaten his dinner just before the injection and had some milk and cake with it; this he threw up, and being faint on account of the pain from the injection, could not get rid of the matter, but drew it into his larynx, where it choked him. The injection was justified by the present state of medical knowledge. This statement the Lancet reproduces from the Berliner Klinische Wochenschrift.

In a recent paper on "The Relief of the Earth's Crust," by Professor Hermann Wagner, of Gottingen, an abstract of which, by Mr. Hugh Robert Mill, is given in Nature, some interesting figures are given. By means of the hypsographic curve connecting elevations and percentages of area derived from measurements of height, depth, and area of land and water, the surface of the lithosphere is divided by Wagner into five regions, in place of the three suggested by Dr. John Murray, and hitherto accepted by most physical geographers. The five are as follows: The culminating area of the earth's crust, occupying 6 per cent of the surface, and lying altogether above 1,000 meters, with a mean height of 2,200 meters, or 7,200 feet above the sea. The continental plateau, occupying all the surface from the 1,000 meter contour line of elevation to the 200 meter contour line of depth, i. e., to the margin of the shallow sea border or continental shelf. It comprises 28·3 per cent of the surface, and has a mean elevation of 250 meters, or 800 feet, above the sea. The continental slope, from a depth of 200 meters to 2,300 meters below sea level, covers 9 per cent of the earth's surface, and has a mean depth of 1,300 meters, or 4,300 feet. The oceanic plateau, between the depths of 2,300 meters and 5,000 meters, occupies no less than 53·7 per cent of the surface, and has a mean depth of 4,100 meters, or 13,500 feet. Finally, the depressed area, deeper than 5,000 meters, is assumed to occupy 3 per cent of the surface, with a mean depth of 6,000 meters, say 20,000 feet. In this classification of regions the coast line is ignored, the abrupt change of slope at 200 meters—or rather the familiar 100 fathom line of our charts—being rightly given the greatest weight in a hypsographic study. The mean level of the surface of the earth's crust is placed by these calculations at a depth of 2,300 meters, or 7,500 feet below actual sea level. The area of the continental block, or region above the mean level of the crust, is found to be 43·3 per cent of the surface, leaving 56·7 per cent for the deeper region.

Cycle Notes.

Copenhagen has 30,000 cyclists.

Yokohama now has its bicycle school.

President Kruger now rides a bicycle.

The Salvation Army in England uses bicycles to some extent.

The charge for carrying a bicycle to Europe and return is $7, and it must be crated.

Parisian cabmen claim the telephone and the bicycle have destroyed their business.

According to reports lately made, says the Bicycling World, there have been 14,006 bicycles stolen this year up to the week ending July 11. Here is an object lesson the very reverse to being attractive. The bicycle thief is more numerous than we had dreamed.

A bicycle rack for baggage cars has been designed by S. J. Collins, general superintendent of the Wisconsin Central lines, to avoid the liability to injury by chafing and swinging which bicycles are subjected to if hung from the roof of the car. The rack is on one side of the car, and the bicycles stand on the floor at an angle of 45 degrees to the side. The space thus reserved is inclosed at the sides and covered by a shelf for baggage.

For seven months in the year, only, is it possible to ride a wheel in the open air in Moscow, says The Wheel. During the remaining five months wheelmen are allowed to ride two days each week in the great military hall. This hall is so large that a five-lap track is easily laid out in it. The only drawback to the scheme is that the authorities will not allow the track to be banked. Despite the vastness of this hall, there is not a single pillar or support to obstruct either the onlookers' view or the racers' comfort.

In Paris a special duty, called the octroi, is levied at the gates on eatables, wines, kerosene, etc. This of course tends to make smuggling profitable. A short time ago a fat man was run over by a wheelman. He was very much flattened out and attempted to run off. The people who had come to his aid found a pool of oil where he fell. The octroi officers arrested the punctured man and found that he was padded with rubber sacks containing liquids. In this country bicycle tires have been used to transport illicitly distilled whisky.

It will interest cyclists to learn, on the authority of M. Bouny, who recently presented a memoir to the Paris Academy of Sciences on the measurement of the work expended in driving a bicycle, that to double the velocity required triple work, and more. He measured the work done by a pedal of special construction, containing two dynamometers, arranged so as to register the force exerted in two directions at right angles to each other, and also so as to take into account the effect produced by the deviations of the pedal from the horizontal plane.

A cone made from good tool steel and properly hardened will run from 20,000 to 25,000 miles in ordinary use, says the Industrial World. They have been tested with 100 pound weight on each cone, which is equivalent to 400 pounds on a bicycle, and under this load they will run 5,000 miles before beginning to show wear.

While strange, it is nevertheless a fact that in England it is possible to send a bicycle by mail if it does not tip the scales at over twenty pounds. The rules of the English parcel post system have been so revised that it is possible to send by mail any article, no matter what it may be, provided it weighs no more than twenty pounds and is valued at not more than $100, by the payment of a small toll and registration fee, which also insures against breakage during transit.

The cork or corkaline grips on the handle bars of a wheel often get dirty from the perspiration of the hands and from dust. They may be cleaned to look almost like new, however, by wiping them thoroughly with a rag saturated with benzine. Should the grips get loose on the bars and twist or come off, they may be replaced by giving the interior of the handle a coating of shellac for about three inches from the end. Then force the handle on to the bar as far as possible and allow the shellac to dry thoroughly before using. To remove a broken or injured handle, heat the bar about four inches from the handle. This will soften the cement or shellac, and allow the handle to slip off. Care should be used not to get the bar too hot, which would injure the nickel finish and take the temper out of the steel.

The commissioners of indirect taxes have published an interesting return giving the number of bicycles in France. At the time of the exhibition of 1889, it was estimated that they numbered about 50,000, but it was not until 1892 that a tax was levied upon them, and there were then 119,000. The total went up to 132,000 in 1893, while at the end of last year the tax was paid upon nearly 160,000, this being at the rate of four for every 1,000 inhabitants. But the proportion is not, of course, uniform throughout France, and while in Corsica there are only seven bicycles for every 100,000 inhabitants, and only one for every 1,000 inhabitants in several of the mountainous departments, there are nearly 900 to every 100,000 inhabitants in two or three of the departments around Paris, in which there are about 25,000 bicycles. It is stated, too, that about 1 in 20 (or 8,000 in all) of the bicycles belong to women.

Recent Archæological News.

A remarkable discovery was recently made in the Assiot necropolis in Egypt. Among the objects found was a whole company of wooden soldiers fifteen inches in height. The soldiers carry lances and give a good idea of their equipment in the Pharaohs' time.

Recent investigations not far from Sebastopol have yielded some interesting finds. Near the French cemetery the discovery was made of what must have been the site of a very large Byzantine city, and objects of classical Greek art of great beauty have been brought to light.

The excavations among the ancient Greek ruins at Eretria have been carried on some years by the American School of Classical Studies at Athens. The gymnasium and other buildings which have been uncovered are probably part of the buildings on each side of the ancient street laid bare last year between the theater and the naval school of King Otho. When the houses found last year were cleared, a floor of cement and pebbles was discovered about a yard below the surface.

In the course of further excavations in the island of Melos, by the director and students of the British School of Athens, one of the most important discoveries has been that of a mosaic which is believed to be the finest yet found in Greece. It seems originally to have been about 40 meters long, and to have consisted of five panels, three of which are ornamented with geometric patterns and the other two with figure subjects, very beautiful both in design and color. On one of them are represented two vines with leaves and grapes, among which birds and animals are grouped, the other panel, with a circular design, consisting of a series of different fish, while each of the angles holds a tragic mask, very finely treated. The finer details of color are represented with glass tesseræ, while portions of the black are laid in gleaming obsidian, so that the whole has a most brilliant effect. More recently the excavators have come upon a series of graves of the sixth century B.C., in one of which was found a number of ornaments in gold and silver. In another (Roman) tomb was found a series of gold leaves from a wreath, and a gold ring was a fine subject in cameo.

The trained workmen who have for some years been making excavations in order to explore the remains of the Roman city of Calleva, at Silchester, have very recently opened up several additional buildings, one of them with a very interesting hypocaust showing some unusual features, while others are believed to have been used as dyers' workshops. One or two good specimens of Samian ware are among the latest "finds" in the ruins, says the Pottery Gazette. They have been removed to Silchester Museum, at Reading, established specially for the reception of antiquities discovered in the course of the excavations. Perhaps the most important of these was an earthenware pot containing 253 silver denarii, ranging in date from B.C. 40 to A.D. 211, though there have been also many objects in gold, bronze, metal, bone, and glass, much pottery, and a fine slab of Purbeck marble. The Calleva remains are a mile and a quarter in circumference. Some of the walls are nearly 12 feet high, and the pavements are considered very fine examples. The previous discovery of numerous wells, stone hand mills, furnaces, etc., seems, in connection with the buildings disclosed by the latest excavations, to leave no doubt that extensive dye works were once carried on in the buried city.

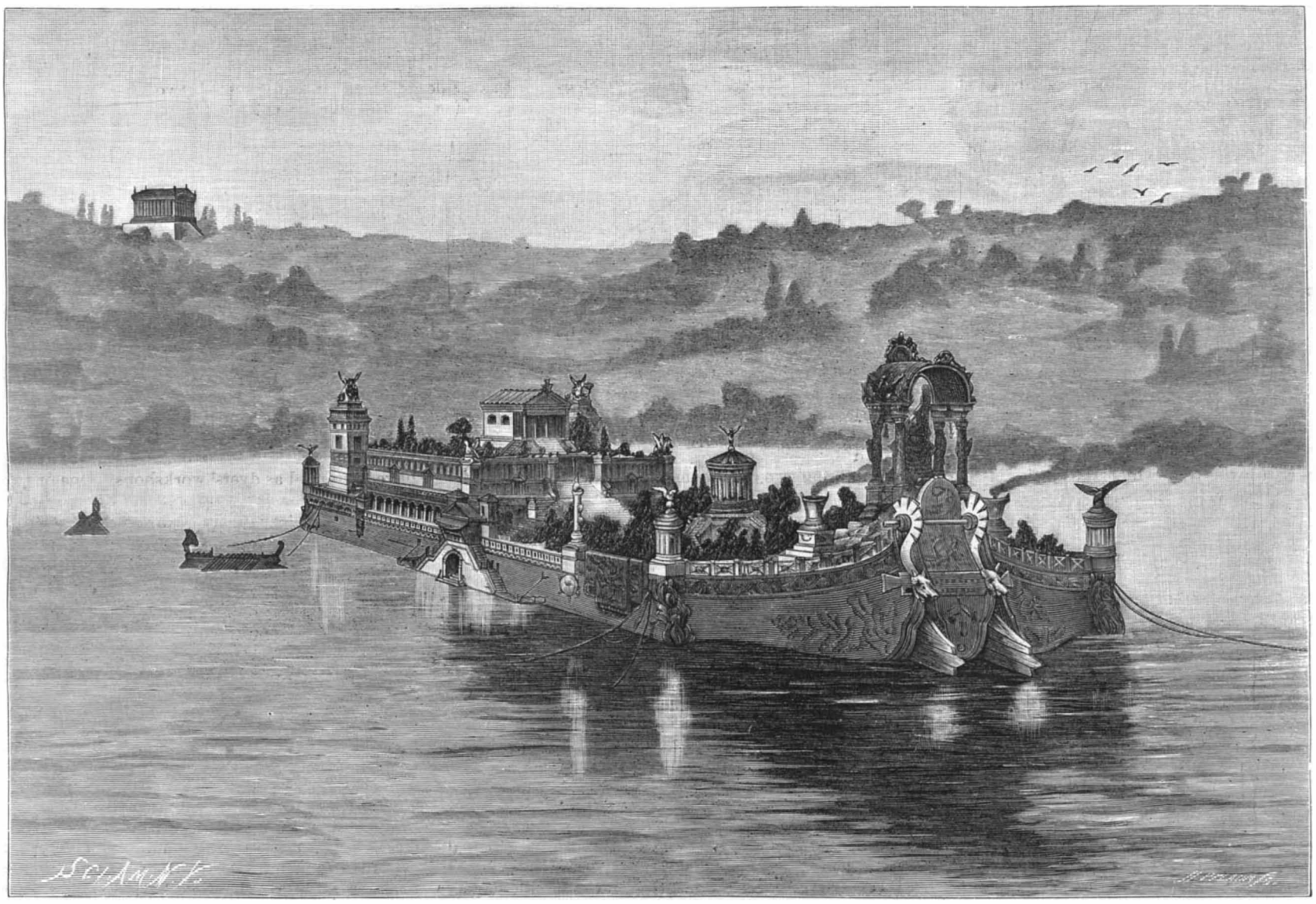
At a recent meeting in London of the Egypt Exploration Fund, Mr. D. G. Hogarth, the well-known explorer, said, says the New York Evening Post, that the excavations of last season had convinced him that there was no hope of the preservation of any of the contents of the libraries of Alexandria within the city. Not only has the subsoil water risen generally above the Roman level, but, even where the water does not reach, there is a great deal of damp sucked up by capillary attraction, so that there is no chance, even if any papyri were found in Alexandria, of their being legible at the present day. Mr. Hogarth emphatically expressed his conviction that, whether the great libraries were totally destroyed or not, there are not under the houses of Alexandria at this day literary remains of any one of them. One of the main reasons for stopping the work at Alexandria was that even below the water level everything was found to be in the utmost state of ruin; walls knocked down, pavements ripped up, everything as it would be left after the most awful sack and pillage. This had been the experience of every excavator there. The explanation of this fact could only be sought, he thought, in the history of Alexandria, and he suspected that the Arabs were more responsible for it than even the early Christians or the Roman mob. After the Arab conquest, any of the books which remained would naturally drift from Alexandria to Cairo. It is not, however, in the rainy delta that they must be sought, he declared, but higher up the Nile, where man has been less active. It is only to Egypt, he said, that we can look with any confidence, to the Fayum and to the dry upper valley of the Nile, for the best classics—perhaps for Sappho and Menander—and for the missing early Christian literature.

TRAJAN'S SHIP OF STATE.

The excavations and discoveries made during the last two decades in all parts of what was formerly the civilized world have prepared us for all kinds of surprises, but we certainly could never have expected what has happened. The sea has given up a victim that it has hidden and—we hope—preserved for two thousand years. Near Rome, and not far from Genzano, in a craterlike hollow lies Lake Nemi, whose blue waters have long attracted artists and lovers of nature. The ancients knew how to appreciate the quiet beauty of the place. In a thick grove, near the Spring of Egeria, stood a temple of Diana—now in ruins—and, on account of the placidity of its surface, the lake was called "Diana's Mirror."

According to an old tradition an elegantly fitted ship of either the Emperor Trajan or the Emperor Tiberius was once sunk in this lake, and the tradition seems to be confirmed by the fact that a beam with bronze decorations was found when the lake was being searched for other purposes, in 1535. This beam is still preserved in a museum at Rome. A few weeks ago the hearts of all antiquaries were stirred by the news that these researches which had been suspended for so many years were to be continued by divers who had been set to work at the suggestion of Prince Orsini, the owner of the lake. The Italian papers announce that the sunken vessel—they fail to state whether the builder of it was Tiberius or Trajan—has been discovered at a depth of 80 or 90 feet, being completely covered with mud. After much trouble the divers succeeded in bringing up a bronze lion, a wolf of the same metal, besides various other objects. The Italian department of education and the learned men of the country have united as much as possible in the attempt to raise the treasure. The result is anxiously watched for.

In its original form the vessel must have been a splendid affair, provided with all the luxuries and comforts to which the rulers of that time were accustomed, and entirely in accord with its idyllic surroundings. The idea of having a little palace on the water was not original with the Romans, but, like much in their art and literature, was merely an echo of the civilization of other nations. The Greek historian Athenæus gives us accounts of the splendors of the vessels of Heron II of Syracuse and Ptolemy IV which show that they must have been very like the Roman one that was lost in Lake Nemi. If Trajan had anything to do with this vessel, it will be safe to assume that it was designed by the renowned architect, Apollodorus of Damascus. The accompanying illustration, for which, with the foregoing particulars, we are indebted to Illustrirte Zeitung, represents a reconstruction, actual size, of Trajan's ship of state, from remains found on Lake Nemi, the work having been done by the architect, Rainero Arcaini.



TRAJAN'S SHIP FOUND IN LAKE NEMI—A RECONSTRUCTION.

Lamson's Kite—Trial of a Kite Carrying One Hundred and Fifty Pounds.

We have in past issues of our journals illustrated various tailless kites. The sport of kite flying has recently been taken up seriously as an adjunct to meteorology and aeronautics. Hargraves, Eddy, Lamson and others have done excellent work, especially at the Blue Hill Observatory, near Boston, Mass. Valuable experiments have been carried on. The SCIENTIFIC AMERICAN, vol. 71, No. 11, and volume 74, No. 11, and SCIENTIFIC AMERICAN SUPPLEMENT, 1070, may be referred to for illustrated articles on the subject of advanced kite flying. On August 20, Mr. Charles H. Lamson, using a cellular or box kite built somewhat on the Hargraves model, attained a new and valuable result. He succeeded in lifting with his kite a weight of 150 pounds, designed to represent a man, to a height, as reported, of 600 feet.

The kite was started from the ground with a length of 400 feet of rope paid out. It then, as released, rose steadily without any jerking until, as the altitude of 600 feet was reached, the rope parted. The kite floated off about half a mile down the wind, and is said to have reached the surface so gently that, had a real man been carried by it, he would not have been injured.

The kite includes a number of features that distinguish it from any other. The relations of the cells to each other can be changed by manipulating a lever, and if a passenger were carried by it, this and other means enable him to materially change the course and the position of the kite and also to direct its descent. The continuation of these experiments will be watched for with much interest. The fact that the kite carrying so large a weight descended gently to the earth is in itself a most valuable result of the experiment.

The Educational Value of Russia's Great Exposition.

The Pan-Russian exposition at Nijni Novgorod, nominally opened by the minister of finance on June 9, is now in full progress, says the New York Sun, and the multitude visiting it is swollen by the crowds of merchants and traders that annually attend the famous fair at the same place. The exposition is a government undertaking, upon which a great deal of money has been lavished, with the object of promoting trade within the empire. It is the 16th industrial exposition of all the Russias since 1829, three having been held in Warsaw, and the others in Moscow and St. Petersburg. The last was in Moscow in 1882. Since that date there has been a remarkable development of Russia's manufactures. It is evidenced by the present exposition in a most convincing way that Russia has ceased to be an exclusively agricultural country, and must be ranked with manufacturing countries of the first class. There are samples and specimens of everything, showing the wide range of Russian industry. There is not much, perhaps, that is new and original in the purely European exhibits, but in respect of things which the West does not produce there is extraordinary diversity and abundance. The peculiarities of Russia's various races and the products of her provinces from the Arctic Circle to Central Asia are admirably displayed.

The exposition covers an area of 200 acres, near the confluence of the rivers Oka and Volga, beyond the Fair. The place is 260 miles east of Moscow, from which city it was expected there would be many visitors at the conclusion of the coronation festivities. With a view to this, numerous immense hotels were erected along the new avenue extending from the railway terminus to the main entrance of the exposition. These palaces, with the floating hotels on the Oka, have failed till very recently to obtain many guests, though the government has made great efforts to render the place attractive to foreigners. The exposition buildings consist of a large number of separate pavilions, interspersed with restaurants, refreshment kiosks, and flower gardens, grouped around a circular gallery, which forms the center. One of the most interesting sections is that of Central Asia. The people, their industries, their residences and mode of life, are fully reproduced. The varied productions of Siberia are well displayed. Among the rest, the 197½ tons of gold worth $140,000,000, obtained in the last 64 years from the mines of the Czar, are represented by two large globes. The exhibit of minerals, furs, etc., is very rich. Photographs of Siberian convicts disclose the queer circumstance that most of them are punished for "concealing their avocation and family origin."

Agriculture makes a poor showing, reflecting, it is supposed, the condition of this industry, which is depressed in Russia as in other parts of the world. The rural and domestic industries, apart from farming, make, however, a large display. Whole villages, it seems, are turning to the manufacture of useful articles to the neglect of agricultural pursuits. Spinning and basket work occupy great numbers. The largest progress in the past 20 years has been in mining and metallurgy, but much has been done in textile fabrics, cotton goods, silks, etc. Electrical contrivances obtain, of course, a marked prominence. The Machinery Hall has 147,000 square feet of space and is a fine affair. The art display is poor. The exposition was brought to Nijni this year, it is said, to revive the prosperity of this trade center, which has been declining. It is hoped that the great Siberian railway, when completed, will produce the same results. Expert opinion is, however, adverse to this view. The increased railway communication must, it is held, tend to develop other distributing centers.

RECENTLY PATENTED INVENTIONS.

Railway Appliances.

STOCK CAR.—Robert C. Burke and Reuben P. Wissler, Brady Island, Neb. This invention provides for supplying an ordinary stock car with a double deck or floor, in such a way that the car may be used either with a single or a double deck, the second deck being both secure and effective, and, when folded, allowing the car to be loaded with large animals or other material. The upper deck is preferably formed of six sections, each hinged at about the middle and adapted to fold down against the side of the car, or to be supported in the position of a deck or second floor by means of folding legs. These auxiliary floor sections may also be swung up directly beneath the roof of the car.

RAILWAY CROSSING SIGNAL.—Judson Shoecraft, Harveyville, Kansas. This signal, which may be a bell or gong, is operated by a motor, an electromagnet having an armature arranged to hold the motor out of operation, and an electric circuit including the magnet and a generator. Two circuit breakers are located on the track on opposite sides of the crossing, and adapted to be operated by trains passing in either direction. The signal is operated electrically on a broken circuit, so that should the battery or other generator in the circuit run down, or the connections become impaired, the alarm will be continuously sounded.

TIE PLATE.—Charles J. Schenck, Gila Bend, Arizona. This tie plate comprises a male and a female member arranged for interlocking engagement, each member having a spring-bearing surface engaging opposite sides of the rail, such surfaces facing one another when the members are assembled, and a flange on one plate being engaged by a flange on the other plate. Portions of the gripping surface of the tie plates may be extended upward to engage with the head of the rail at one or both sides, forming a superior brace for the rails, especially at their outer sides on a curve. This tie plate is also designed to entirely prevent creeping.

COUPLING.—Melvin T. Miles, Cherokee, Iowa. For conducting air, steam, etc., from one railway car to another, this inventor has devised a simple and durable automatic coupling, arranged to effect a positive connection without danger of leakage, and adapted to set the brakes in case the train breaks in two. The invention consists principally of a spring-pressed valve having a hollow body, and with a head and stem having a longitudinal groove adapted to extend through the valve seat when a coupling is made.

Mechanical.

NUT LOCK.—Andrew J. Bennett, Bridgewater, Iowa. According to the improvement, a groove is made across the threads of the bolt, and the nut has a groove across its threads, and a threaded key bar is slidable in the groove of the bolt when the groove in the nut is over the key bar, there being on the outer end of the latter a spring limb to lock it from sliding. The invention affords simple and effective means for releasably holding a nut on a bolt, and one also available for holding the nut of a vehicle axle spindle from accidental displacement.

FLUE CUTTER.—Jeremiah Fitzpatrick, Raton, New Mexico. This device has a tubular body adapted to enter a flue, a collar fitting against the outer end of the flue, and there being in the body a transverse opening in which slides a carrier holding a revolving cutter, adapted to cut the flue from the inside. The carrier is forced outward, to bring the cutter into engagement with the inside of the flue, by a wedge, driven in by a feed screw at whose outer end is a handle, and on the tubular body, outside of the collar, is a ratchet wheel engaged by a spring-pressed pawl held in a handle fulcrumed on the body. By means of the latter handle the body is turned in the flue, and the cutter rotated to cut it.

TOOL FOR OIL WELLS.—Harold G. Durnell, Bolivar, N. Y. To remove worn or damaged valves from oil wells, where the wells are of great depth, this inventor has devised a special tool in which a tap attached to the sucker rod, when it touches the thread in the standing valve, will be screwed into the thread by the weight of the sucker rod, instead of having to turn the rod at the top of the well. The tap thus engaging the valve, the latter can be readily withdrawn, the work being easier and surer than by the methods and tools heretofore used.

WELL TUBING SUPPORT.—Emmett R. Curtin, St. Mary's, Ohio. An improved device adapted to automatically catch and temporarily support the tubing or rods while pulling them up or letting them down into the well is provided by this inventor. In a casing through which the tube or rod passes are arranged toothed and wedge-shaped jaws, whose teeth permit the tube or rod to be pulled up, but securely hold them when the pull is released. These jaws are held away from the tubing or drill rods when they are to be lowered into the well, by means of a spring-pressed lever, but when the operator releases the lever, in case a part of the mechanism should break, the jaws move inwardly to bring their teeth into engagement with the tubing or rods to firmly grip and hold them in place.

MACHINE FOR MAKING BOOK COVERS.—Henry J. Brauer, New Orleans, La. This is an automatic machine for placing cloth, paper, or similar material, on paper board used as book covers, the machine having certain parts adjustable to accommodate it to different sizes of covers. Novel means are employed for applying an adhesive to the cloth or paper and carrying them forward, cutting in the desired places, affixing on the bare boards, and finally ejecting the product in a finished condition. The machine may be attended and operated by one person, the feeding of the stiffening boards being done manually, and all the rest of the work being automatic. The cloth is evenly glued, and brushes turn the edges down more firmly than can be done by hand, the machine being designed to turn out a better and more finished cover than is produced by hand work.

Bicycles, etc.

PEDAL.—Charles Otis, New York City. The pedal designed by this inventor has a strap for the insertion of the foot of the rider, to hold the foot on the pedal at all times and also to enable the rider to pull upward on the pedals when desired for speeding or heavy riding. The strap normally lies at the lower side of the pedal, so that it is not liable to be stepped upon by the rider, and provision is made for reversing the pedal to bring the strap uppermost and in position to permit the rider to enter his foot beneath it.

LOCK FOR BICYCLES.—Albert W. Nutz, Wallace, Kansas. This lock has but few parts and is strong and inexpensive. It is designed to lock the handle bar in any desired position, and thus prevent the use of the wheel until it is unlocked with a key. The casing of the lock is bolted or riveted to the head, and a bolt sliding through the casing from front to rear enters an opening made in the head, there being in the handle bar one or more openings, circumferentially arranged, either of them adapted to register with the openings in the head. The locking is effected when the handle bar has been placed in proper position, by simply pressing the bolt inward.

CAP FOR BICYCLE VALVES.—David Basch, New York City. This is a cap designed to be held in place by suctional engagement with the rim of the wheel, thus preventing leakage from the valve and also preventing the loss of the metal valve cap, which sometimes happens when the bicycle is in motion. The cap is preferably made of rubber, and is in one piece, having a tubular body portion adapted to cover the exposed portion of the valve, and a cup section to be forced to a contact with the inner face of the rim around the valve. The cap is readily put on or removed, and efficiently protects all parts of the valve.

Agricultural.

CHURN.—Ben Walker, Jr., Austin, Texas. The body of this churn has at its base a circular chamber at the center of which is journaled a tubular shaft carrying a fan or agitator, the lower end of the shaft having openings, and, in the operation of the churn, drawing in a current of air which is discharged to pass upward through the cream. The churn is adapted to be operated by either hand or power, and is so constructed that it may be readily taken apart for cleaning after each churning is finished, and easily put together again.

PRESERVING MILK OR CREAM.—Frederick Casse, Copenhagen, Denmark. This inventor has devised a method of preserving milk or cream unaltered for a considerable length of time by keeping them as nearly as possible at the temperature of melted frozen milk, this method also preventing the formation of butter during the conveyance of the milk. The entire body of milk is first cooled to near the freezing point, and a portion of the milk is then taken out and separately frozen, when the frozen pieces are placed back in the milk.

Miscellaneous.

LIFE BOAT.—Robert D. Mayo, Frankfort, Mich. Two patents have been granted this inventor for a boat which will be able to float in any kind of weather, and either on its top or bottom, while air will be supplied to the interior, no matter in what position the boat may be, except when entirely submerged, means for signaling by means of rockets being also provided. There are strong bulkheads at each end of the boat, and inner bulkheads form airtight compartments, between which is the living compartment, in which is a cage or carriage where persons may be seated and be unaffected by the movement of the hull. Means are provided for automatically closing the air inlet temporarily when the boat passes below the surface, the admission of air being automatically effected the moment any portion of the vessel is above the surface. The cage or car within the boat moves on ball bearings, the cage being capable of having the hull rotate around it, and an air tube axially coincident to the hull is passed from the cage into a compartment having atmospheric communication.

WOVEN FABRIC.—John Bister, Brooklyn, N. Y. This is a fabric more especially designed for umbrella covering, the face of the fabric having a silky appearance. It consists of interwoven cotton weft and warp threads and a series of silk warp threads, each overlying a cotton warp thread, the silk threads being arranged alternately with a series of the cotton warp threads and bound in at intervals by the weft threads, whereby the silk threads will be floated on the face of the fabric.

WINDOW FRAME.—Alexander Erklin, New York City. According to this improvement, friction rollers are placed in the sash grooves of the frame, the rollers having a yielding or spring support and constantly bearing on the sashes whether the latter are in a lower or upper position. Tension devices are provided for each window sash at each of its sides, to prevent the sashes from having a rattling movement, the device comprising a face plate having openings at each side of its center through which extend portions of the peripheries of friction rollers.

SASH FASTENER.—Richard A. Griffin, Nashville, Tenn. A strong and easily operated sash lock is provided by this inventor, consisting of rack bars arranged transversely of the window frame on each side of a toothed wheel, each bar having an inner toothed edge designed to engage the wheel, and the bars moving in opposite directions. The bars have projecting clamps, to bind the outer and inner sides of the upper and lower sashes and the bars are arranged to be operated so as not to interfere with the curtains or drapery.

WINDOW CLEANING CHAIR.—James S. Lynch, Brooklyn, N. Y. This invention provides a chair seat having a good back, and adapted to be conveniently secured on the outside of a window sill, to enable an occupant of the chair to conveniently clean a window on the outside. On each of the front uprights connecting the seat with the top rail of the back is a sliding angular arm, through an eye on the inner end of which extends a horizontal adjusting screw, with cushioned head forming a clamp by which the chair may be firmly held in position, the cushioned head of the screw bearing against the inner wall.

PANEL DECORATION FOR POTTERY.—William T. Murphy, New York City. To fit in a recess in the face of a similar article, this inventor provides a metal tray conforming to the shape and curvature of the recess, and adapted to receive a picture and a transparent covering for it, a clamping head extending around the edge of the tray. The invention affords a means for placing pictures, chromos, or photographs on vases, flasks, etc., in such manner that the pictures may be removed or changed at will, without marring the picture or injuring the article to which it is applied.

WAGON END-GATE FASTENER.—Thomas B. Pell, Lewisport, Ky. This is a fastening device for end gates, particularly of wagons in which the rear ends of the side boards have a vertical upper portion, and a lower outwardly and downwardly curved portion, the device drawing together the side boards as the end gate is clamped in position. Near the top of each side board at the rear is a slot and facing plate, a rod screw threaded on one end fitting in the slots, by means of which, with the aid of a clamping arm, the sides of the body may be drawn firmly against the end gate.

HAND PAD FOR WRITING PURPOSES.—William T. Martin, Dayton, Washington. This is a cradlelike device, made of any suitable material and in sizes to fit different hands, and has on its under face a bearing surface and its upper face being dished to receive portions of the inside of the hand, providing proper support near the wrist and giving freedom of motion to the hand in writing. A palm projection of the pad enables one to hold the pad on the hand while lifting the hand from its support, and the device is designed to facilitate rapid writing and render it less laborious

HARDENING BITUMINOUS SUBSTANCES.—Edwin T. Dumble, Austin, Texas. This invention is for a process for hardening or partly solidifying viscid bitumens, tars, or asphaltums, natural or artificial, by mixing them with bituminous coal or analogous material, and subjecting the mixture to a temperature below the boiling point of the liquid substance, thereby softening and dissolving the solid substance and uniting it with the liquid, the temperature then being gradually increased to the boiling point of the compound.

WEIGHING AND COMPUTING SCALES.—Thomas A. Killman and Herschel A. Bratten, Liberty, Tenn. According to this invention, a frame rigid with the scale beam carries an upwardly projecting arm operating a pointer, a second arm pivoted between its ends in the frame operating a pointer, and there being an adjustable fulcrum for the second arm. The invention provides simple means for ascertaining the price of an article being weighed, and is designed to be particularly useful for millers or dealers in grain, etc. The improvement may be applied to an old pair of scales by removing the old post and substituting the one employed in the invention.

TROUSERS STRETCHER.—Harrison Keane, Douglas, and Michael Guider, Cork, Ireland. For distending riding and other breeches these inventors provide a collapsible, breeches shaped, airtight bag, preferably made of vulcanized sheet caoutchouc, with an inlet valve and adapted to be inflated, a waistband brace preventing undue distension at that portion, and buttonhole tabs being attached to the brace buttons of the breeches. The device is light and portable and self-adapting to the shape of the breeches, facilitates their cleaning and pipe-claying, and prevents shrinkage in drying.

BOTTLE TOP.—Jacob A. Moller, Jr., New York City. A bottle provided with this improvement has a threaded neck with which the top is threaded to interlock, a hinge in slidably connected sections having one section pivoted to the neck and the other so connected to the top that the latter can rotate independently of the sliding hinge member, the pivoted hinge member having a projection engaging the thread of the top. The cap or cover, after unscrewing, remains connected with the bottle, thus avoiding the possibility of its being lost, and the device permits of better expansion for the cork than is usual. But little sealing is necessary with a bottle provided with this improvement, and as all the parts are readily made by machinery, the top is quite inexpensive.

NECKTIE.—Gustav Kraus, New York City. This invention relates to neckties known as "four-in-hands," and provides a tie which is reversible and may be made without waste of material. The tie is made of two pieces which have their inner wedge-shaped ends sewed together to overlap and form a continuous strip, the strip being doubled lengthwise and its edges sewed together. The tie may be made for about the same price as the ordinary necktie now made, owing to the saving of material by the special cutting and sewing.

LAP BOARD.—Sophia M. Rivers, New York City. A device especially adapted to facilitate basting waists has been devised by this inventor, the board having a curved or substantially cylindrical outer face and being adapted to fit the lap of a person. The outside of the board is pliable to admit of pinning to it the material tightly stretched, preparatory to basting the lining to the goods, there being no difficulty in taking the proper stitches on the rounded surface.

TOBACCO PIPE ATTACHMENT.—Henry Seidler, Fort Benton, Montana. This attachment has spring arms to engage the sides of a pipe bowl, with longitudinal slots forming a central spring and side portions to which a cover is pivotally connected, the cover being held normally closed by engagement with the spring. The device may be readily applied to or removed from pipes of various kinds and sizes, and is very inexpensive.

GAME APPARATUS.—Joseph B. Sargent, Worcester, Mass. This is an apparatus for a game designed to resemble croquet, a shallow box with a glass top having miniature wickets and stakes, as in that game, and the balls being rolled through the wickets by the operator tilting the box in the right direction. If the balls goes through the wrong wicket, or through any wicket in the wrong direction, the player must return the ball to the starting point and begin again.

CHILD'S TOY WAGON.—John G. Weber, Brooklyn, N. Y. This is a novel convertible wagon, sleigh and cabinet, simple attachments affording means for its quick and convenient conversion into either of the articles named, and the cabinet having a door hung on hinges. The body portion may be made in different forms and a two-wheeled vehicle may be converted into a sleigh or closed cabinet as readily as can a four-wheeled wagon.

TOY BASE BALL.—John W. Weaver, Richmond, Va. This invention is for an apparatus for mechanically playing base ball, the apparatus being contained in a box of two hinged and folding sections, representing the inner and outer fields. The game comprises a pitching apparatus, a batting apparatus, a series of tilting bases to be operated by the weight of a batted ball to release a base runner, and channel runways between the bases. The game is played with eighteen numbered marbles, nine of one color and nine of another.

Designs.

BICYCLE COVER.—Gaston E. Constantin, Brooklyn, N. Y. This cover in general contour approximates the shape of a liberty cap and is designed to afford a neat looking, inexpensive, and efficient protective covering for a wheel when it is not in use.

SPOOL HOLDER.—Russell Fraser, New York City. This design is for an article having a main longitudinal surface, at right angles to which are circular ends to clasp the ends of a spool, there being an angled extension from the longitudinal surface.

INHALER.—Clarence W. McKee, Phœnix, Arizona. This device has two oval and tapering members, with perforated ends, the members being joined at their larger ends by a spring loop.

A HANDLED VESSEL.—Thomas B. Brown, Noroton, Conn. This design is applicable to all kinds of handled vessels, such as loving cups, mugs, pitchers, etc., and has one or more stag handles extending from its sides, the ends of each handle terminating in raised ornaments on the exterior of the vessel.

SPOON.—Augustus F. Shriver, Newcastle, Cal. This spoon has a straight round handle having cross sections of different diameters, the largest section being outermost.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 10 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

LINCOLN'S CAMPAIGN; OR, THE POLITICAL REVOLUTION OF 1860. By Osborn H. Oldroyd. Illustrated. Chicago: Laird & Lee. Pp. vi, 241. Price 75 cents.

This volume gives most interesting reading describing the old time political campaign preceding the war. A very commendable portion of it consists in the reproduction of cartoons and of campaign literature of the period, the whole forming a very interesting contribution to the history of the epoch on which strange events depended. In a concluding chapter the presidential possibilities for 1896 are considered, over ten in number, of which one has come true as far as the nomination is concerned.

THE NUT CULTURIST. A treatise on the propagation, planting, and cultivation of nut-bearing trees and shrubs adapted to the climate of the United States, with the scientific and common names of the fruits known in commerce as edible or otherwise useful nuts. By Andrew S. Fuller. Illustrated. New York: Orange Judd Company. 1896. Pp. iv, 289. Price $1.50.

America, with its endless variety of climate, is adapted to almost any class of agriculture or pomology, and in the present volume we find a very acceptable treatise on the cultivation of nuts in America. In it are treated the almond, beech nut, hickory, walnut, and other similar products. In California considerable success has been obtained in the cultivation of almonds, and it is quite possible that Florida may yet be converted into a successful field for nut cultivation. The present book is a plea for the value of this class of tree product. We particularly commend the index.

HANDY ENGLISH PHRASES. Appropriate to bicycling. With table of parts of bicycles, measures, etc., in both languages. By C. C., of L. A. W., No. 70,817. New York: Louis Weiss & Company. Pp. 23. Price 25 cents.

Any one who has made a bicycling tour in France, Belgium, and Switzerland knows with what difficulty even one who is familiar with the French language has in acquiring the bicycle vernacular. The commonest bicycle terms seem strange and unfamiliar and it is only after considerable pains and experience that one acquires the proper outfit in the way of a vocabulary. Our author has produced for the members of the League of American Wheelmen, and for such others as contemplate a European trip, a delightful handbook of French and English conversation, in which all the technical terms relating to the bicycle are skillfully introduced. A vocabulary giving the names of the different parts of the wheel appears at the end of the pamphlet. The frontispiece is adorned with a "Scorcheur" primitif, from an old stained glass window of the church of Stoke Pogis, made famous by Gray's "Elegy."

The Century Company, of New York, issue some very striking posters to announce on news stands the numbers of the Midsummer Century and St. Nicholas Magazines. The Century poster took first prize in a competition in which about 700 designs were submitted, the accepted design being by a Mr. Leyendecker, a young Chicago artist now studying in Paris. It is a most original conception and cannot fail to attract a good deal of attention.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

Buyers wishing to purchase any article not advertised in our columns will be furnished with addresses of houses manufacturing or carrying the same.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(6938) A. E. H. says: Will you please reply through the columns of your paper or otherwise the best and most practical receipt for making gelatine moulds for casting in plaster? A. A good gelatine mould may be made in the following manner: Soak the best white glue in cold water for 24 hours, then drain off all the water. Melt the soaked glue in a water jacketed kettle, then pour the glue upon the object, the latter being incased in a lead or pasteboard box. Let it cool for 12 hours, then separate the cast from the object. If the object be a statuette, a thread should be attached to the back, and extended out of the mould at both ends, so that it may be used for cutting open the mould after it is cooled, to permit of taking out the statuette. A good material for a mould is made in the following way: Dissolve 20 parts of fine gelatine in 100 parts of hot water, and add ½ part of tannin and the same amount of rock candy. It is said that a mould made of gelatine or glue alone may be made more durable by pouring over it a solution of bichromate of potash in water, 1 part of bichromate to 10 parts of water, and afterward exposing it to sunlight. Most objects require oiling slightly before being covered with glue or gelatine.

(6939) E. R. asks how to find the gear of a bicycle. A. Divide the diameter of rear wheel, in inches, by the number of teeth in rear sprocket and multiply by number of teeth in front sprocket.

28 INCH WHEELS.

Teeth in Sprockets.	Gear.	Feet per Revolution.	Revolutions per mile.
16×6	74	19·37	272·59
16×7	64	16·75	315·22
16×8	56	14·66	360·16
17×6	79	20·68	255·41
17×7	68	17·80	296·63
17×8	59	15·44	341·83
18×6	84	21·99	240·10
18×7	72	18·85	280·25
18×8	63	16·49	320·19
20×6	93	24·34	216·92
20×7	80	20·94	252·14
20×8	70	18·32	288·04
22×6	102	26·70	197·75
22×7	88	23·03	229·26
22×8	77	20·16	261·96
24×7	96	25·12	210·19
24×8	84	21·99	240·10

(6940) J. B. says: Please give the formula or process of dissolving or softening the rubber rollers which are used in clothes wringers. I have several rubber rollers of clothes wringers to repair, they having become loose from the shaft that runs through them. I have tried several processes to dissolve or soften the rubber of the rollers, but find none to do it. A. The rubber of the rollers, being vulcanized, is insoluble. To fasten rolls on wringers proceed as follows: 1. Clean shaft thoroughly between the shoulders or washers, where the rubber goes on. 2. Give shaft a coat of copal varnish, between the shoulders, and let it dry. 3. Give shaft coat of varnish and wind shaft tightly as possible with 5 ply jute twine at once, while varnish is green, and let it dry for about six hours. 4. Give shaft over the twine a coat of rubber cement, and let it dry for about six hours. 5. Give shaft over the twine a second coat of rubber cement, and let it dry for about six hours. 6. Remove washer on the short end of shaft, also the cog wheel if the shaft has cogs on both ends. 7. See that the rubber rolls are always longer than the space between the washers where the rubber goes on, as they shrink or take up a little in putting on the shaft. 8. Clean out the hole or inside of roll with benzine, using a small brush or swab. 9. Put the thimble or pointer on the end of shaft that the washer has been removed from, and give shaft over the twine and thimble another coat of cement, and stand same upright in a vise. 10. Give the inside or hole of roll a coat of cement with a small rod or stick. 11. Pull or force the roll on the shaft as quickly as possible with a jerk, then rivet the washer on with a cold chisel. 12. Let roll stand and get dry for two or three days before using same. Cement for use should be so thick that it will run freely; if it gets too thick, thin it with benzine or naphtha.

(6941) W. E. says: Would you please inform me through your columns what chemicals you would use in toning a photograph to produce a dark print which resembles a carbon? A. To Obtain Black Tones on Silver Prints.—Scholzig prints on sensitized albumenized paper under green or dark yellow glass, and tones with borax, 90 grains; uranium nitrate, 4 grains; gold chloride, 3 grains; water, 24 ounces. Teape prints under green glass, and tones with gold chloride, 1 grain; saturated solution of borax, 1 ounce; water, 6 ounces (Phot. N., xxxiv, 623). Slightly washed prints absorb more gold in toning and give more permanent images than well washed prints (ibid., 639). The effects observed when silver printing is carried on under green glass are due to the specific action of the rays transmitted by the glass. Signal green absorbs the greater part of the rays that act on silver chloride, but transmits rays that act upon silver albuminate or silver citrate. When albumenized paper is printed under green glass, the image consists almost entirely of altered silver albuminate, while with gelatino-citrochloride under similar conditions the image consists of altered silver citrate.

(6942) H. B. M. says: Will you kindly answer the following queries in the SCIENTIFIC AMERICAN: 1. What is the safest and best remedy for removing freckles? A. Hydrokinone Wash for the Skin.—

Hydrokinone	gr. xlviii.
Acid phosphoric glac	gr. xxx.
Glycerine	dr. ii.
Aqua dest	oz. vi.

Misce.

This lotion is stated to give excellent results. It is to be applied to the skin of the face, etc., in the usual way at least twice in the course of twenty-four hours, after it has been washed and dried carefully. If the skin be of the nature known as "greasy," a preliminary wash with tepid water containing a few drops sal volatile or liq. ammon. fort. is advisable. 2. Please suggest a remedy for heat breaking out over the body. A. Lotion of Borax.—1. Borax (powdered), 2½ drachms; distilled water, ½ pint. Mix, apply twice a day. Drink plenty of plain carbonated water (plain soda) to which a little sodium bicarbonate is added.

(6943) J. P. M. says: I should be pleased to know some easy way to mark negatives, mark them to show on print. I try to do it by using a sharp point, but the film is roughened too much by it. A. To print the name on the photograph, several methods may be adopted. The simplest is to write the title of the subject on a slip of paper with aniline copying ink or with ordinary copying ink mixed with gamboge or vermilion. Then slightly dampen the surface of the negative near the bottom right or left hand corner in as unobtrusive and unimportant a portion of the picture as possible. Press down the paper with the writing upon it. Leave for a few minutes and then remove the paper, when the writing will be found to have adhered to the negative. When printed the name will print out white. Another way is to write backward on the negative, while another and better plan is to write the name in Indian ink on the surface of the paper before it is printed on. The ink will wash off in the after operations and leave the name in white where the surface of the paper has been protected by the ink.

(6944) Q. T. E. asks: 1. Constructed as directed, which motor will give more power with the same battery power, No. 759 or No. 641, with a drum armature? A. Motor No. 759, we consider the more powerful of the two mentioned. 2. How can I calculate the voltage and amperage necessary to drive a motor? A. The amperage you can calculate from the size of wire used and its carrying capacity, remembering that the armature is wound in parallel. In an approximate way to get at the voltage multiply the amperage by the resistance. In practice the voltage may be much higher, owing to counter electromotive force, and the amperage proportionately less. 3. In a drum armature, (a) which is the best, carriage washers, tin disks, or charcoal iron punchings? (b) Do the disks have to be insulated from the shaft? A. Charcoal iron punchings, if as thin as the others. The thinner the disks are, the better. They need not be insulated from the shaft. 4. Which is the best for the field of motor 641? Laminated field as shown, a cast field, or a wrought iron strip of the required dimensions bent to shape? A. As a motor a solid wrought iron core is best, but cast iron is quite good enough. 5. What battery power does 641 need—759? A. Ten to twenty watts.

(6945) W. S. and others write: Will you inform me where I can get a mineral rod that will locate a hidden treasure? It is gold and copper If you can, inform me if there is such a thing and where I can get one and if it will tell the spot. I have heard of a thing of this kind, but do not know any firm that makes them, but I thought you would. You will greatly oblige me by giving me full particulars, and where I can get one, and the cost of it. A. If there were any such thing as an operative mineral or divining rod, we think the owner would refuse to part with it; certainly no price would be too great for it. Any money spent on a divining rod is wasted; neither gold nor copper will affect the so-called "magnetic" rods, the needle of which turns when passing over beds of iron ore. See the article entitled "Divining Rods, Scientific and Unscientific," in the SCIENTIFIC AMERICAN, No. 8, vol. 67.

(6946) W. O. K. says: Will you kindly let me know how to boil a meerschaum pipe that has been in use some time, so as to color readily? Also how to fix the color in the pipe when it is once there? A. Ordinarily the pipe is boiled for coloring in a preparation of wax which is absorbed, and a thin coating of wax is held on the surface of the pipe, and made to take a high polish. They are first soaked in melted tallow, then in white wax. Under the wax is retained the oil of tobacco, which is absorbed by the pipe, and its hue grows darker in proportion to the tobacco used. A meerschaum pipe at first should be smoked very slowly, and before a second bowlful is lighted the pipe should cool off. This is to keep the wax as far up on the bowl as possible, and rapid smoking will overheat, driving the wax off and leaving the pipe dry and raw. A new pipe should never be smoked outdoors in extremely cold weather. Where the color has once existed it can be brought back by careful heating, which will drive the color out toward the surface.

(6947) P. C. says: Do you know of a remedy which will promote the growth of hair or prevent it falling out? A. Quinine Hair Tonic:

Quinine sulphate	20 grn.
Tincture of cantharides	2 fl. drm.
Fld. ext. of jaborandi	2 " "
Alcohol	2 " oz.
Glycerine	2 " "
Bay rum	6 " "
Rose water—enough to make	15 " "

The quinine is dissolved in the alcoholic liquids by warming slightly, then the other ingredients are added.

(6948) G. P. asks (1) for a remedy for warts upon the hand. A. It is said that the daily application of whale oil to the wart for two or three weeks will cause it to disappear. 2. Also which is the greatest distance, a mile or a knot, and what is the difference in feet? A. The word knot is often used to indicate a nautical mile. The land mile contains 5280 feet. The United States coast survey has adopted as the value of a nautical mile the length of an arc of one minute on a great circle of a sphere whose surface is equal to that of the earth. This gives it a length of 6080·27 feet. The British Admiralty Office have adopted as their hydrographic mile, 6080 feet. The term knot is not universally approved as indicating a mile; it is better to express it as a nautical mile, leaving knot to indicate the divisions of the log line.

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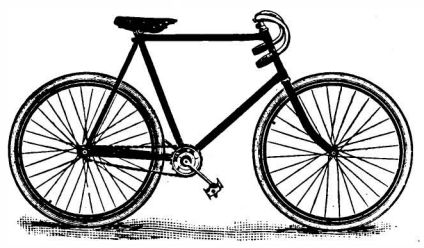

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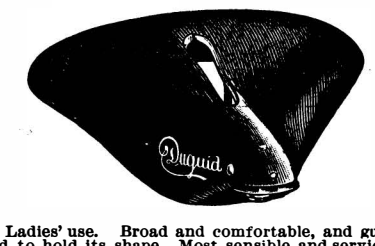

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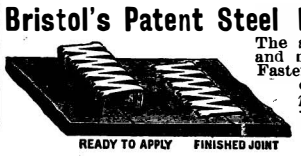

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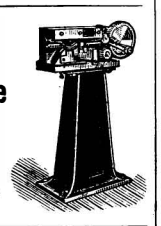

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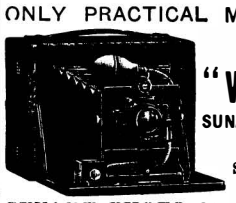

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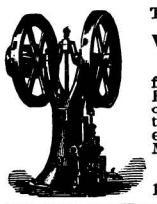

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