SCIENTIFIC AMERICAN

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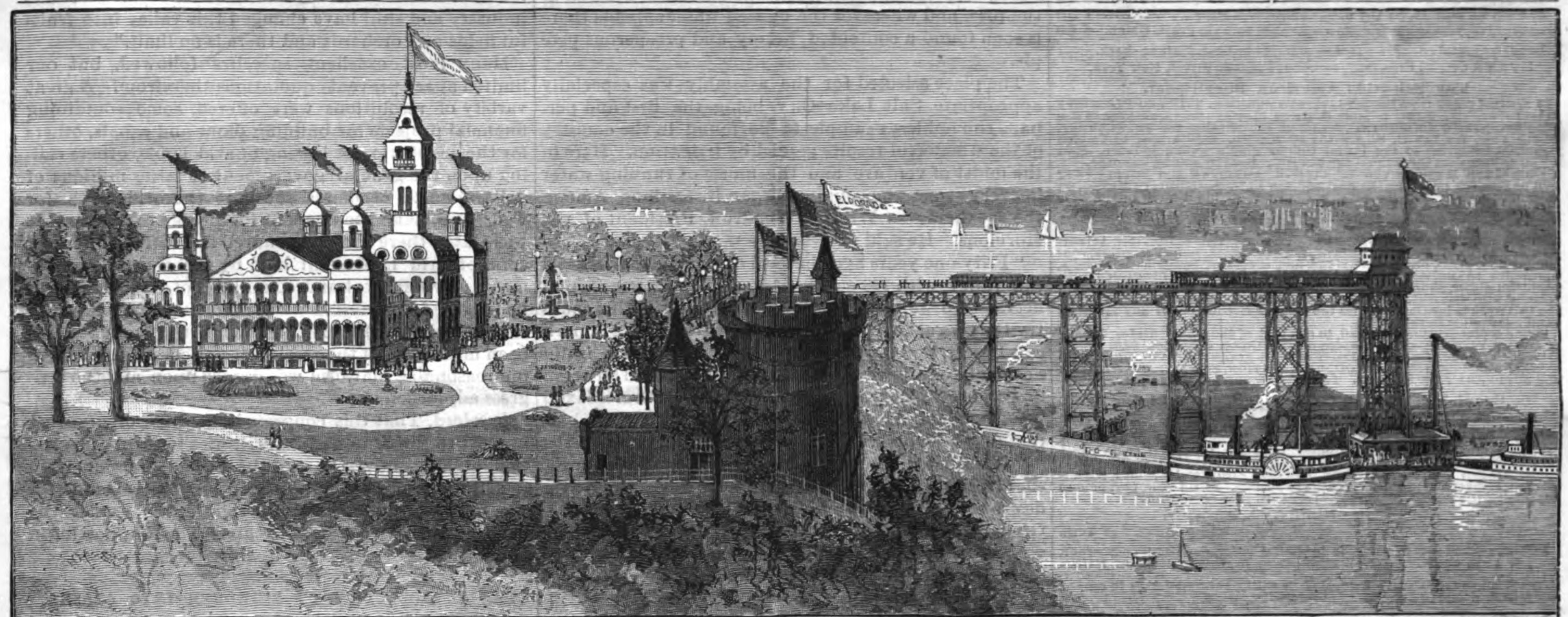

Elevator, viaduct and grounds and buildings of El Dorado.

GIGANTIC PASSENGER ELEVATOR OF THE NORTH HUDSON COUNTY R.R., WEEHAWKEN, N. J., OPPOSITE NEW YORK.—[See page 279.]

Scientific American.

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NEW YORK, SATURDAY, OCTOBER 31, 1891.

Contents.

(Illustrated articles are marked with an asterisk.)

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For the Week Ending October 31, 1891.

Price 10 cents. For sale by all newsdealers.

PROGRESS OF IRRIGATION.

On September 15, a notable gathering of notable men took place at Salt Lake City, being the first meeting of the Irrigation Congress. The membership comprised many eminent persons, chiefly from States west of the Mississippi, their object in meeting being the interchange of views and discussion of the best methods of redeeming to useful purposes the millions of acres of arid lands which now lie drear and abandoned in various sections of the great West.

Of the success of irrigation wherever it has been properly carried out, all the speakers bore enthusiastic testimony. The driest lands are made to blossom as the rose, and wherever the blessed water spreads there is soon found a contented, happy and prosperous people.

The place selected for the assembly was especially appropriate, Salt Lake City being the first and perhaps the noblest example to be found in the country of the wonderful results gained by irrigation. Here in the midst of verdure and the music of running water in every street the congress began its sessions. Among the speakers was Wilford Woodruff, President of the Mormons. He said:

"Fifty-one years ago the 24th of last July, I entered this valley with 143 emigrants, or in other words, pioneers. We were led by President Young. This country that we arrived upon was called the Great American Desert, and certainly as far as we could see it did not deviate from that in the least. We found a barren desert here. There was no mark of the Anglo-Saxon race, no mark of the white man—everything was barren, dry, and desert.

"We pitched our camp a little distance to the southeast from here about 11 o'clock in the day. We had a desire to try the soil to know what it could produce. Of course all this company—nearly the whole of us—were born and raised in the New England States, Vermont, Maine, Massachusetts, Connecticut—had no experience in irrigation.

"You gentlemen come here to-day; you see the city, you go through the country. Here are a thousand miles, I might say, through these mountains filled with cities, towns, villages, gardens, and orchards, and the produce of the earth that sustains the people. Without this water, this irrigation for which you have met here to-day, this country would be as barren as we found it."

He was followed by President Cannon, one of the early settlers, who said: "I took my first lessons in irrigation when a boy, in 1848. I have had but comparatively little practical experience in the business since then, but it has become very familiar to us. We have not had much time to theorize upon it, but practically we have carried out this system throughout the length and breadth of our Territory.

"There is one point that I think of great importance, and I think it worthy the consideration of this body. We have refrained, I was going to say, religiously, from forming great corporations to take possession of the water; we have not been taxed for our water in Utah, but settlements have combined together and by their own labor have taken the water out and have contributed by their labor in forming dams and digging ditches to obtain the necessary supply for their acreage. I think this is a very important feature in this Territory. We have not had to pay for our water; poor men could take land and obtain water by their own labor.

"Another feature of our system has been that we have had small holdings. When we settled this city, the lots were divided out; each lot was an acre and a quarter. The lots were laid out in such a way that the front of one lot faced the side of another. It was designed to be a city of villas and to have plenty of room. You see the breadth of our streets and the amplitude of our lots; this was the original design. Then, next to our city, a tier of five-acre lots was laid out, then a tier of ten-acre lots, then a tier of twenty-acre lots. There were no lots laid out of a larger extent than twenty acres. That there might be perfect fairness, we cast lots for these. The mechanics were expected to want five acres; those who were in better condition it was thought would require ten acres, while the farmers received twenty acres.

"My distinguished friend, President Woodruff, lived and sustained his family upon twenty acres of land, and I may say to his credit there is no better farmer in this country than he has been. He has been noted throughout all our community for his indefatigable industry.

"We have kept from monopolizing the land and been willing to have it distributed in small holdings, so that every man might have a foothold. I believe that I do not overstate the truth when I say that in no part of the United States is there a population containing so many people living on their own lands and owning their own houses as in Utah Territory.

"I believe also in the artesian system. I have been a believer in it always and for a great many years. I believe that we can get large supplies of water from subterranean sources. I have experimented with this, and I believe I have the honor of being the first person to own an artesian well in this valley or in all our valleys. I have sunk a good many wells, and I find them very excellent. I have one now with which I water several acres—a well four hundred feet deep. I think when we get experienced well drivers in this country, we shall find that we can bring large supplies of water to the surface that will aid us in cultivating our lands; for all that we have in this country is water.

"There is no part of Nevada which you travel through, no country, which looked any worse than this valley did nor any more unlikely to be productive than this valley did when it was first settled; but industry and skill have changed this valley into fruitful fields and orchards and there is no limit."

Many most excellent speeches followed, but our limited space prevents quotations therefrom. A great variety of resolutions were offered, some containing financial projects for building dams and canals, others for the acquisition or leasing of arid lands, others calling upon the general government to issue millions of dollars' worth of bonds and bore the arid earths for wells, and make the lands fit for people to live in. It was stated there are six hundred and fifty millions of acres of arid lands still held by the general government, of which five hundred millions of acres require to be irrigated by artesian wells, no other source of water supply being available. When all the speeches had been made and all the resolutions discussed the following reasonable platform was agreed upon and the congress adjourned:

Resolved, That this congress is in favor of granting in trust to the States and Territories needful of irrigation, all lands now a part of the public domain within such States and Territories, excepting mineral lands, for the purpose of developing irrigation to render the lands now arid fertile and capable of supporting a population.

THE INTRODUCTION OF REINDEER INTO ALASKA.

A very interesting experiment in the introduction of reindeer into this country has been commenced. Dr. Sheldon Jackson, the government agent of education in Alaska, has begun the work. During the past season he imported sixteen reindeer from Siberia, which cost about $160. Next year he proposes to establish a herd of reindeer in the neighborhood of Fort Clarence and expects to begin with 100 animals. Siberia has vast numbers of these animals, and in its climate and vegetation resembles greatly Alaska, so that there is no reason to doubt that they will thrive on the eastern side of Behring Straits. The reindeer is useful as a draught animal for sleds, as well as for its milk, its meat, its skin. From the economical point of view the experiment is of the highest degree of interest and it is gratifying to see that the Federal Government recognizes the importance of the work.

Capt. M. A. Healy, of the revenue cutter Bear has reported to the Treasury Department, emphasizing the proposition as the most important question now before the Territory of Alaska. The recent destruction of seals and sea lions has certainly had its effect upon the food supply question of the country and islands in the neighborhood of Behring Straits, and any distress brought about by the destruction of seals may be alleviated by the introduction of the reindeer. In Iceland, where the reindeer was first introduced in 1870, it has increased greatly in number but is said to have relapsed into wildness and is now of little use to the inhabitants. It is to be hoped that better fortune will attend their introduction into Alaska, and that they will be treated as domestic animals, and not share the fate of the buffalo.

DESERTIONS FROM THE NEW NAVY.

The difficulty experienced by the officers of the Bennington to prevent wholesale desertions among the crew while the ship is in port is not by any means a new one in our fleet. The new ships, with perhaps the single exception of the Chicago, seem to be lacking in accommodations for their crews. While in the old-time frigate or line-of-battle ship a crew of 700, or even more, could be comfortably housed, with free circulation of air, it is impossible in the present type of steam vessels to find hammock room for one-third that number without huddling. Close quarters and foul air is now become the regular billet, and a single cruise is enough to dampen the ardor of the most enthusiastic sailor man.

The commander of the Bennington declares that, if the Brooklyn police do not increase their efforts to capture his deserters, he will not have men enough to man his engines, not to mention his deck. Really, he ought to complain against the designer of the ship rather than against the police, for, under a strict interpretation of the navy regulations, it is doubtful if, the men's case being properly set forth, they should be punished for desertion. The regulations provide with painstaking particularity that a ship's crew must be properly housed and fed.

So strict are these rules that it is made a part of the duty of the officer of the deck to taste the men's food before it is served, thus making sure of its wholesomeness, and the duty of the surgeon to examine the men's quarters and report in writing to the captain. In the old days the men did their four hours duty aloft and then retired to the comforts of the roomy gun deck with gun ports open on every hand. Now they haul at tackle and falls or toil before the furnaces and retire into a rat hole under the forward hatches.

In port, with windlasses set and a draught of air below, life in the men's quarters is bearable, but on such a cruise as the Bennington is about to set out upon, the inconvenience and discomforts are intolerable. Those who have inspected the quarters on the new ships will not think it strange that the men desert in gangs at the rumor of a long cruise.

It has been suggested that the designers of these ships be made to take a cruise in them, thus getting practical evidence of their defects as to ventilation and living room.

They have spent their time devising engines and batteries; now they should try and devise a means of keeping men enough aboard to work them.

POSITION OF THE PLANETS IN NOVEMBER.

JUPITER

is evening star. He is still the leader of the starry hosts, but, before the month closes, a powerful rival enters modestly into the field to contest his supremacy. It is plain to every observing eye that our giant brother is departing. He no longer appears above the eastern hills soon after sunset, as he did when in opposition, but is high up toward the meridian when his light pierces the sky depths. He makes his transit at 7 o'clock in the middle of the month, sets soon after midnight, and holds his court in the western sky instead of the eastern. This brilliant planet is passing through the small groups of Aquarius. His retrograde or western movement ends on the 3d, when he becomes stationary, and then moves eastward, or in direct motion, until the end of the year.

The moon is in conjunction with Jupiter the day after the first quarter, on the 10th, at 1 h. 50 m. P. M., being 4° 9' south. Moon and planet will make a pleasing picture when it is dark enough for them to be visible on the evening of the 10th.

The right ascension of Jupiter on the 1st is 22 h. 41 m., his declination is 9° 48' south, his diameter is 42".8, and he is in the constellation Aquarius.

Jupiter sets on the 1st at 1 h. 19 m. A. M. On the 30th, he sets at 11 h. 31 m. P. M.

NEPTUNE

is morning star until the 29th, and then becomes evening star. He is in opposition with the sun on the 29th at 10 h. P. M. This far-away planet then makes his nearest approach, for the sun, the earth and Neptune are in line, with the earth in the middle. Observers endowed with exceptional visual powers can see Neptune with the aid of an opera glass; but the number of such observers is small. He is, however, a beautiful object in a good telescope, appearing as a tiny disk of a delicate blue tint. He will be found a short distance northwest of Aldebaran.

The right ascension of Neptune on the 1st is 4 h. 28 m., his declination is 20° 6' north, his diameter is 2".6, and he is in the constellation Taurus.

Neptune rises on the first at 6 h. 25 m. P. M. On the 30th, he sets at 6 h. 56 m. A. M.

VENUS

is evening star. She sets an hour later than the sun at the close of the month, and keen-eyed observers may possibly find this charming star lingering in the glow of twilight, and giving a foretaste of the brilliancy of her appearance when farther away from the sun. She must be looked for 2¼° south of the sunset point on the 30th.

The one-day-old moon makes a close conjunction with Venus on the 2d, at 2 h. 32 m. P. M., being 13' north, but planet and crescent are too near the sun to be visible.

The right ascension of Venus on the 1st is 15 h. 7 m., her declination is 17° 38' south, her diameter is 10".2, and she is in the constellation Libra.

Venus sets on the 1st at 5 h. 22 m. P. M. On the 30th, she sets at 5 h. 32 m. P. M.

SATURN

is morning star. He is favorably situated for observation, rising nearly four hours before the sun at the commencement of the month, and six hours before the sun at its close. He rises about 2 o'clock on the middle of the month, and may then be seen coming up in the east, a little farther east and 12° farther south than the bright star Denebola.

The moon, two days after the last quarter, is in conjunction with Saturn on the 25th at 8 h. 50 m. A. M., being 2° 40' north.

The right ascension of Saturn on the 1st is 11 h. 49 m., his declination is 3° 20' north, his diameter is 15".4, and he is in the constellation Virgo.

Saturn rises on the 1st at 3 h. 49 m. A. M. On the 30th, he rises at 1 h. 6 m. A. M.

MARS

is morning star. He rises at the close of the month about three hours and a half before the sun, and may be dimly discerned as a small ruddy star, 4° east and a little north of Spica. An opera glass will certainly bring him into the field.

The moon is in conjunction with Mars on the 27th at 11 h. 52 m. A. M., being 2° 3' north.

The right ascension of Mars on the 1st is 13 h. 26 m., his declination is 1° 38' south, his diameter is 4".2, and he is in the constellation Virgo.

Mars rises on the 1st at 3 h. 45 m. A. M. On the 30th, he rises at 3 h. 24 m. A. M.

MERCURY

is evening star. There is nothing noteworthy in his course as he makes his way toward his greatest eastern elongation, setting later and increasing in diameter as the distance widens between him and the sun.

The right ascension of Mercury on the 1st is 14 h. 44 m., his declination is 16° 2' south, his diameter is 4".6, and he is in the constellation Libra.

Mercury sets on the 1st at 4 h. 52 m. P. M. On the 30th, he sets at 5 h. 24 m. P. M.

URANUS

is morning star. He is too near the sun to be visible. His right ascension on the 1st is 14 h. 1 m., his declination is 11° 47' south, his diameter is 3".4, and he is in the constellation Virgo.

Uranus rises on the 1st at 5 h. 52 m. A. M. On the 30th, he rises at 4 h. 6 m. A. M.

Mars, Saturn, and Uranus are morning stars at the close of the month. Mercury, Venus, Jupiter, and Neptune are evening stars.

For an Eiffel Tower at Chicago.

It is reported that arrangements have been about completed by which a tower higher than the Eiffel construction will be erected in close proximity to the World's Fair grounds at Chicago, to be finished by February 1, 1893. The designs contemplate a tower 440 feet in diameter at the base and 1,120 feet high, having three circular platforms or landings, the first 200 feet from the ground and 250 feet in diameter, the second 400 feet from the ground and 150 feet in diameter, and the third 1,000 feet from the ground and 60 feet in diameter. Above the latter will be signal service offices and departments for scientific investigation. Around the outside of the first landing will be a grand colonnade fifteen feet wide, and the numerous restaurants, kiosks and booths to be provided are designed to accommodate many thousands. An offer in writing has been made by a large iron firm to put up the tower in the time stated for the sum of $1,500,000, which is less than the cost of the Eiffel tower, the lower price being made because standard and merchantable sizes of steel can be used in the American construction. The promoters of this enterprise are said to embrace capitalists of Chicago, St. Louis, Cincinnati, Pittsburg and other places.

World's Fair Items.

—The foundation work of the Administration Building is all finished, and the material for the iron work of the edifice itself is being received on the grounds. This building is constructed of material to last but two years, and it will cost $650,000, although it covers a space of but 250 feet square. It is designed to represent in itself one of the noblest achievements of modern architecture, and will occupy the most commanding position on the exposition grounds. The building consists of four pavilions, 84 feet square, one at each of the four angles of the square of the plan, and connected by a great central dome, 120 feet in diameter and 260 feet high.

—Aside from the cost of the great exhibition buildings, which will not be far from $7,000,000, the following are among the sums which have been, or will be, spent in preparation of the exposition grounds: Grading and filling, $450,000; landscape gardening, $323,500; viaducts and bridges, $125,000; piers, $70,000; waterway improvements, $225,000; railways, $500,000; steam plant, $800,000; electric lighting, $1,500,000; statuary, $100,000; vases, lamps, etc., $50,000; lake front adornment, $200,000; water supply and sewerage, $600,000; other expenses, $1,000,000; total, $5,943,500.

—The great extent of the fair can hardly at present be measured, but some idea of its immensity may be gathered from the fact that the space thus far set apart for exposition purposes is three times the area of the Paris exposition grounds, or about the size of Central Park, New York, between 700 and 800 acres.

The Fahrenheit Thermometer.

In a note published in the Proceedings of the Cambridge Philosophical Society, Mr. A. Gamgee investigates the principle according to which Fahrenheit constructed his thermometric scale.

The author remarks, in the first place, that although Fahrenheit's thermometer has for a long time been employed in England and America, and that its use therein is general, technical books have not, up to the present, given any accurate information as to the principles that presided in the establishment of its scale. In his treatise upon heat, Mr. Tait has, it is true, given the opinion, afterward admitted by several scientists, that Fahrenheit divided his scale from 32° to 212° into 180° in order to imitate the division of the arc of a quarter circle. This theory is based upon an incorrect supposition, viz., that, before Fahrenheit, Newton had proposed as the basis of the scale the freezing and boiling points of water, the interval between these two points being divided into equal degrees.

Mr. Gamgee thinks that, in his *Scala graduum calories*, Newton advances nothing that Mr. Tait attributes to him, and, besides that, Fahrenheit fixed the basis of his scale and constructed a large number of thermometers long before Amantons discovered the fact (confirmed and pointed out precisely by Fahrenheit) that the boiling point of water remains constant under a constant pressure.

According to Mr. Gamgee, the first thermometers constructed by Fahrenheit were alcohol ones, and were closed and provided with a scale whose two points were fixed. The zero of the scale, indicating the lowest temperature that it was possible to reach, was obtained by plunging the bulb of the instrument into a mixture of ice and salt, while the highest point of heat was determined by placing the thermometer under the armpit or in the mouth of a healthy man. The interval between these two points was divided into twenty-four parts, each of which corresponded to well marked differences of temperature, and each of these divisions was divided into four. In his later alcohol and mercury thermometers, the twenty-four principal divisions were suppressed, and were replaced by a scale of 96°, from ice to human heat. The 32° of these thermometers was obtained by plunging the bulb in melting ice.

Fahrenheit was led to construct mercurial thermometers on making some researches upon the boiling point of water. With mercury it became necessary to increase the scale above to 600°.

The figure 212, the degree of heat necessary for the boiling of water at a mean atmospheric pressure, was a result that *experiment alone* brought out.

Upon the whole, Mr. Gamgee thinks that Fahrenheit took, as the basis of his thermometric scale, the duodecimal scale, which he was accustomed to use.—*Revue Scientifique.*

Remarkable Test of a Torpedo Boat.

An experiment was made at Plymouth, Eng., October 22, with a boom to check the rushes of torpedo boats. The boom was thickly studded with formidable steel spikes, together with a seven inch steel hawser stretched taut overhead as a balk.

Torpedo Lieutenant Sturdee, who had disapproved the plan, offered to prove the correctness of his assertion that the device would not afford the protection desired. He guaranteed that he would either jump or force the boom, and he finally obtained permission to make the attempt.

A swift torpedo boat was loaned the lieutenant for the experiment. Upon this he built a massive arched superstructure extending from bow to stern, intended to raise and support the overhanging hawser. Four seamen volunteered to accompany the daring lieutenant.

The lives of all concerned were specially insured for the benefit of their families by orders of the Admiralty, whose experts believed that the attempt of Lieutenant Sturdee meant almost certain death. The importance of the experiment as a means of making an actual test of the availability of this means of defense alone justified the risk in the eyes of the officials.

The boom having been adjusted across the mouth of the harbor, the torpedo boat started on its hazardous mission. The start was made half a mile away from the boom, and a high rate of speed was attained as the obstruction was neared. At the last moment the Lieutenant and his men rushed below and fastened down the hatches. An instant later the boat, running at a speed of nineteen knots, struck the boom.

The concussion was terrific, and all the occupants of the craft were thrown so violently against the sides of the boat that they were painfully bruised. It seemed for a moment as though, the expectations of Lieut. Sturdee would be realized and the boat force its way through the boom. She jumped nearly clear, but before she got through, the hawser caught her and pressed her against the big spikes of the boom, which held her like a vise and tore her bottom badly. The boat at once began to make water.

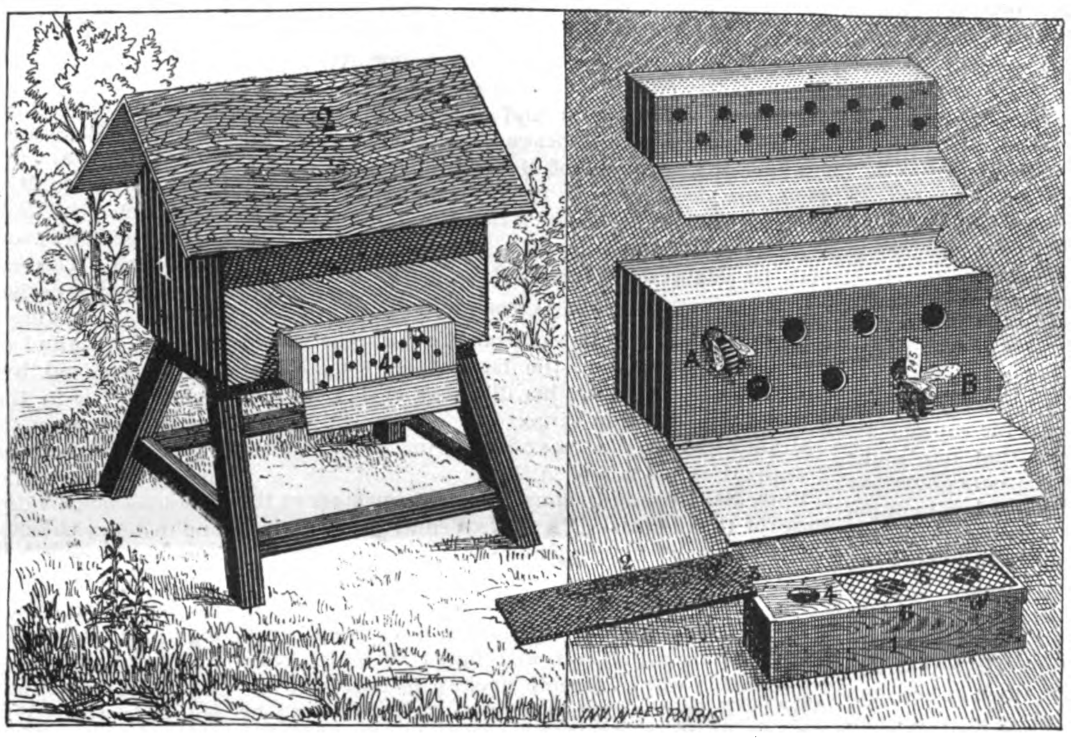
The seamen worked at her some time before she could be got free. Then they started for the beach, but the boat foundered before reaching it, the crew being taken off by the boats from shore. There was much excitement among the spectators, and, though Lieut. Sturdee's views had been disproved, his bravery and that of his companions was highly praised.

THE great bulk of alcohol made in this country is produced at Peoria, Ill. It is made from corn. The price paid there for corn was, until lately, 37½ cents per bushel, but it has now risen to 70 cents.

THE CONVEYANCE OF DISPATCHES BY BEES.

Let not our readers think of a hoax on reading the title of this article. It is a question entirely of asking a new service of the bee—that insect so useful in the country; and it is desired, neither more nor less, to obtain, after it has contributed to increase the national wealth in time of peace, its aid in the common defense when the country shall be threatened. But, what! it will be said, you do not think seriously of replacing the carrier pigeon, which travels immense distances in order to regain its cote, and with a speed equal to, and often greater than, that of our fastest trains, by an insect incapable of guiding itself if the hand of man or the force of the wind carries it to some leagues from its hive, and whose qualities of speed bear no comparison with those of the winged messenger that is called upon to render so great services in time of war. Do not be uneasy, for such is not our thought, and we do not believe, even, it is that of Mr. Teynac, the distinguished bee master of the Gironde, who has conceived the idea of this ingenious innovation. It is a question, for the moment at least, only of some curious and interesting experiments, which are insufficient, however, to permit of prejudging of the services that this new mode of transmitting correspondence may render in the future. However this may be, the results obtained up to the present by the author of this method are so remarkable that we do not fear to lay them before our readers, being certain that they will think, as we do, that we have here the elements of a most interesting study. Numerous experiments, not altogether new, have established the fact irrefutably that, if a swarm of bees be inclosed in a bag and carried to a distance of less than two or three miles from the hive, and the bag then be opened, the bees, after whirling around for a few instants, will quickly take flight in the direction of the hive with that certainty of instinct with which nature seems to have endowed all animals to a greater or less degree. The most active ones will cover the distance within a length of time varying between twenty and twenty-five minutes, which corresponds to a mean speed of seven miles per hour. It was starting from this fact that Mr. Teynac conceived the idea of utilizing the instinct that leads the bee to its home for making a messenger of it, and that he constructed the material represented in our engravings, and the use of which we shall explain.

Let us suppose that the owner of a swarm wishes to establish a system of correspondence with a friend whose residence is 2 or 2½ miles distant from his own. He begins by sending him a small hive constructed as shown in Fig. 1, and well stocked with bees and with food for them. At the end of a few days, the bees will be sufficiently accustomed to their new surroundings to allow experiments to be begun. A certain number of bees are taken from each hive and introduced into a small shipping box (Fig. 2). The greater part of the top of this box is covered with wire gauze, which permits of the entrance of air to the prisoners. The bees are introduced through the orifice, 4, that may be seen to the left of the box, and which is afterward closed by the pivoting cover, 2. In this way, the sending may be easily done by mail. On reaching their destination, the bees are set free in a room in which a saucer containing a little honey has been arranged upon a table. The bee alights on the repast, and this is the moment that the operator must take advantage of to glue to its thorax the previously prepared dispatch. As may be seen in Fig. 3, the extremity of the dispatch (here magnified ten times) is slit with a pair of scissors so as to form two flaps, which are covered with fish glue and quickly applied to the bee held with pinchers. Care must be taken that the glue does not touch either the head or the wings of the insect, which, as soon as it is satiated, takes its flight and steers straight for its hive. But here it meets with an unexpected obstacle. In fact, care has been taken to place before the entrance of each hive a small tin box having apertures in front of just sufficient size to allow of the passage of the males or drones. The opposite side, which is entirely open, is applied exactly against the entrance to the hive, so that, in order to enter or make their exit, all the bees are obliged to pass through these apertures. The little messenger, hampered by the protuberance that the dispatch forms upon its back, exhausts itself in vain efforts to pass through in its turn, and is obliged to wait for some one to free it from the burden that prevents it from entering the hive.



Figs. 1 and 2.—HIVE AND SHIPPING BOX.

Here, then, is the system of correspondence devised by Mr. Teynac. It will be seen that the use of it is as yet not very practical. The difficulty resides in the small extent of the field of operations of the same swarm, and this would, for transmission to a long distance, necessitate a multitude of intermediate stations two or three miles apart. It is true that the establishment of such stations is neither difficult nor costly, since there is no need, as with the other messengers, to trouble one's self with the question of feeding, but, on the contrary, each station would be a source of revenue to its guardian. But, in most cases, for a besieged city, the establishment of a station at a distance of two miles is so evident an impossibility that it is not necessary to dwell upon this point. Moreover, relays so close together would occasion great losses of time. It remains to be seen whether in the immense family of hymenoptera there may not be found a messenger which, through patient training and proper selection, might be able to travel greater distances. It is toward this point that the researches of Mr. Teynac are being directed, and he is now experimenting with the *Bombus hortorum*, domesticated by him.—*Les Inventions Nouvelles.*

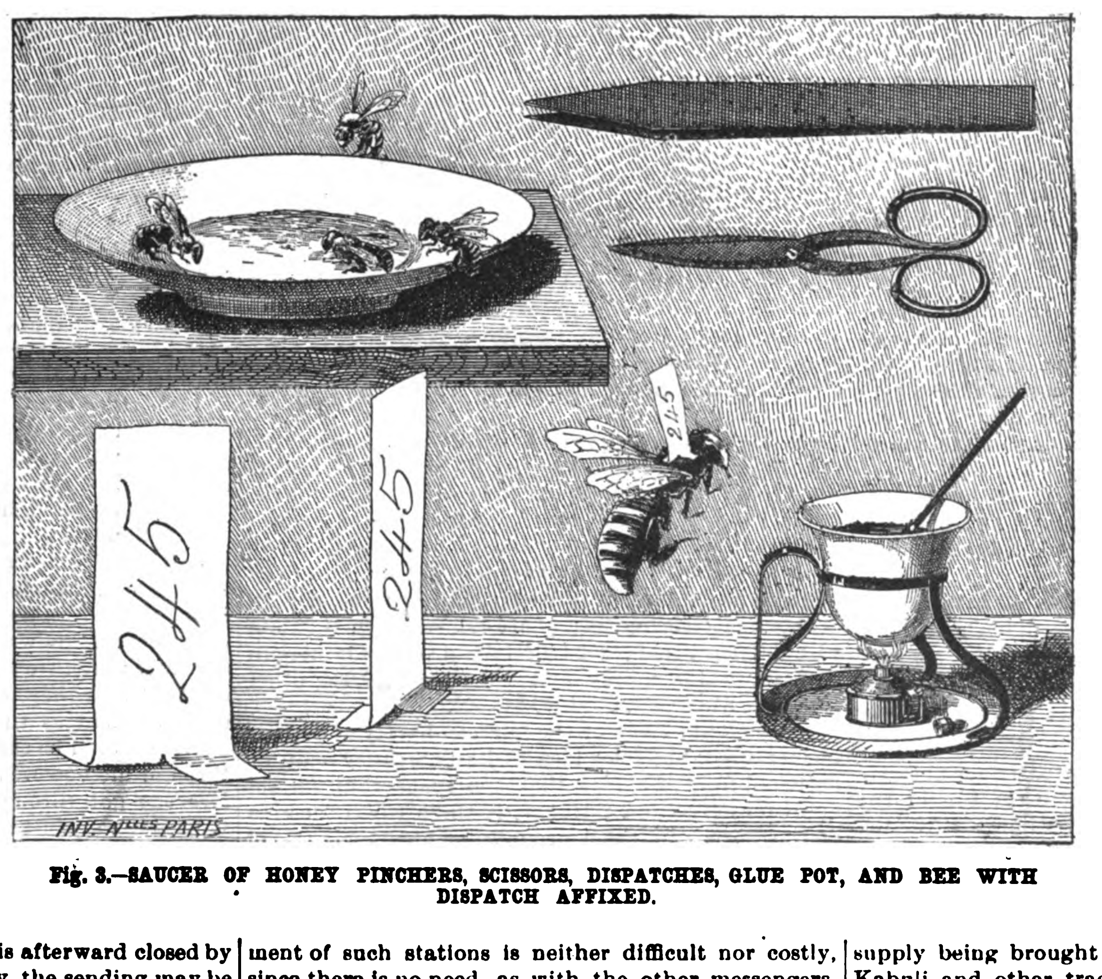


Fig. 3.—SAUCER OF HONEY PINCHERS, SCISSORS, DISPATCHES, GLUE POT, AND BEE WITH DISPATCH AFFIXED.

English Walnuts.

Mr. P. L. Simmonds contributes to a recent issue of the *Gardeners' Chronicle* some interesting information about the so-called English walnuts, from which the following facts are gathered:

There are many varieties of these nuts, such as the oval, round, double, large and small fruited, early and late, tender thin-shelled and hard thick-shelled. An almost huskless variety occurs in the north of China. The larger portion of the walnuts consumed in England are of foreign growth, and average in quantity about 250,000 bushels. The bulk of these come from France and Belgium, and small quantities from Germany, Holland and Italy.

Bordeaux is one of the largest exporting ports in the world, perhaps the largest for walnuts; and small quantities are now sent from Chili to Europe. The culture of the so-called English walnut, which, by the way, is not an English tree at all, but a native of the Orient and of central and eastern Asia, from whence it was early introduced into Europe, is now diffused over Italy, from the Alps to the valleys of Sicily. It is thought, however, that the number of cultivated walnut trees in Italy is diminishing, as the demand for the timber is increasing, being in great demand by the cabinet maker.

Persons with weak digestions will do well to bear in mind Mr. Simmonds' warning that walnuts, as long as the skin can be easily removed from them, are a nutritious and healthy article of diet; but when they become dry, so that they cannot be easily peeled, they are indigestible.

Walnuts in the shell yield about one-third their weight of picked kernels, which are the crumpled cotyledons or seed leaves. In some northern districts, particularly in Piedmont, walnut trees have always been held in high estimation for the production of oil, which, when newly made, has a very agreeable taste, and can be employed in cookery as well as in the preparation of varnish.

The walnut grows abundantly in Kashmir, Nepal and other parts of India, where the fruits are largely used. It forms also an important article of consumption in Japan, quantities being eaten in a raw state. They are also much used for making a kind of confection, by cracking and removing the shell without hurting the kernel, which is afterward coated with white sugar, thus making an attractive and agreeable sweetmeat.

The walnut also furnishes in Japan a bland oil, used for domestic purposes. In China it seems to be pressed for oil, as in some years over 12,000 tons are exported from the port of Tientsin in the year. The walnut is extensively cultivated in the Punjab, among the Himalayas and in Afghanistan, a large annual supply being brought to the plains of India by the Kabuli and other traders from the hills. There are several well known forms of this nut met with, the soft-shelled kind of Kashmir and Chamba being considered the best.

THE picturesque American term "monkey wrench," used to describe an adjustable wrench that seizes the nut on two sides, seems to be unknown in England. There the wrench is called a spanner, because it spans the nut.

Improvement in the Manufacture of Ultramarine.

R. W. E. McIvor has found the following proportions of raw materials to yield excellent results: Sodium sulphide, 42 lb.; sulphur, 20 lb.; kaolin (China clay), 110 lb.; soda (as carbonate), 106 lb.; or caustic soda, 40 lb. These quantities yield about 2 cwt. of ultramarine blue. The clay and soda are first roasted together at a red heat so as to effect partial double decomposition, and the product is ground. "Sulphur liquor" is then made by dissolving flowers of sulphur in a solution of sulphide of sodium to saturation. The ground material is then made into a thick paste with the sulphur liquor, the paste dried in an oven, and the dried mass broken into small pieces is roasted without access of air in a closed earthenware retort first at 250° to 300° C. for an hour, then at a red heat for eight hours, and finally just below dull redness in presence of a slow regulated current of air. The retort must be quite cold before being opened.

Sugar.

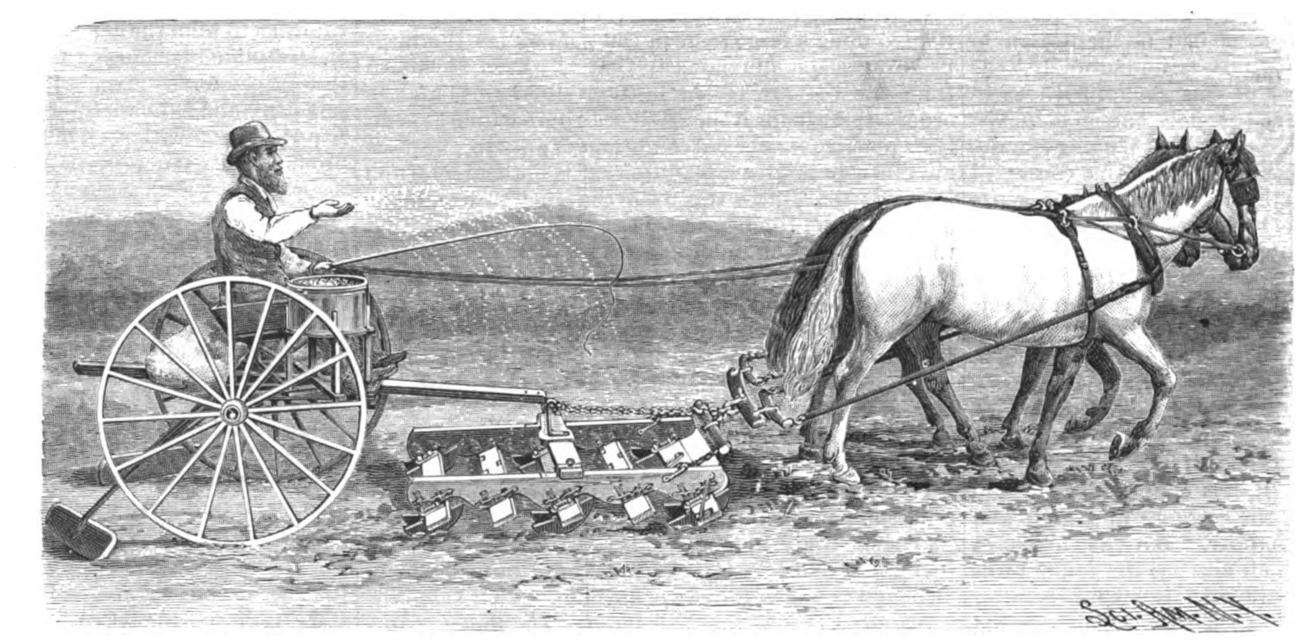
The States now producing sugar and the raw material from which they produce such sugar are as follows:

California	Beets.
Utah	Beets.
Nebraska	Beets.
Pennsylvania	Beets and maple sap.
Virginia	Beets.
Texas	Sugar cane.
Louisiana	Sugar cane.
Florida	Sugar cane.
Kansas	Sorghum.
Missouri	Sorghum.
Minnesota	Sorghum and maple sap.
Michigan	Sorghum and maple sap.
Iowa	Maple sap.
Wisconsin	Maple sap.
Illinois	Maple sap.
Ohio	Maple sap.
West Virginia	Maple sap.
New York	Maple sap.
Maryland	Maple sap.
Massachusetts	Maple sap.
Vermont	Maple sap.
New Hampshire	Maple sap.
Maine	Maple sap.

A PULVERIZING HARROW AND CULTIVATOR.

The improvement shown in the illustration is designed to form a perfect pulverizer, doing the work of a harrow clod crusher and roller combined, while it prepares a perfect seed bed, deep, fine, smooth, and even as a floor, and cleans foul fields of weeds and vines so that they may be plowed under without trouble, the plow not being required at all in many cases. The forward frame of the machine, which carries the pulverizers, is connected by a pole with the axle of a wheeled carriage, and the frame has a series of inclined drag bars, adapting it, when the pulverizer blades are removed, to the smoothing of lawns, roadbeds, etc. The pulverizer blades are preferably of steel, and are attached to a head stock, as shown in the small views, two upwardly extending studs of the stock passing through perforations in the drag bars, to which they are secured by pins or keys. One of the paired cutter blades crosses the path of the other, and presents an acute angle to the ground surface, designed to cut through it readily, and ride upon or cut off small roots, vines, stalks, or similar obstructions, or bury them in the soil, while the shape of the blades is such that the entire device will ride over a rigid obstacle. The edges of the blades are beveled on the outside, to render them self-sharpening as they are drawn through the soil. Extending rearwardly from the wheeled carriage are rods carrying drags, by which the marks made by the wheels are covered. The machine can be taken apart and put together, or changed from one combination to another, without the use of a tool or the exercise of any degree of mechanical skill. It is designed to be inexpensive to manufacture, and not likely to get out of order with severe use, while it can be readily taken apart and packed, except the wheels, in a box about six feet long by ten inches square.

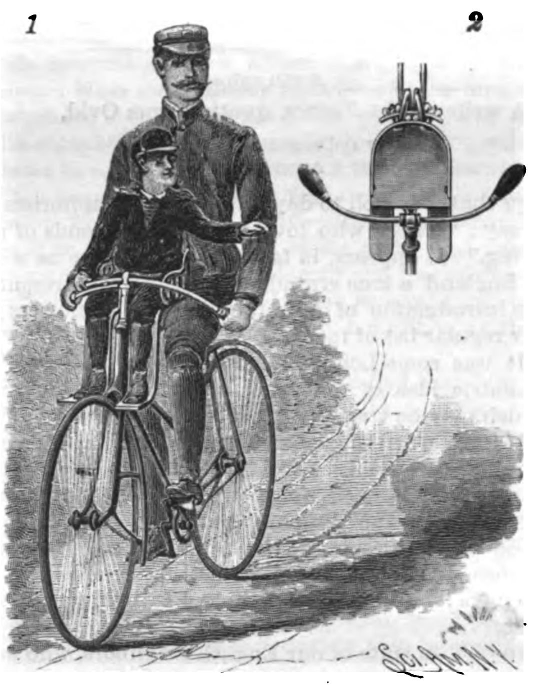
This improvement forms the subject of two patents issued to Mr. John P. L'Homedieu, of Setauket, Suffolk County, N. Y., to whom application may be made for further particulars.



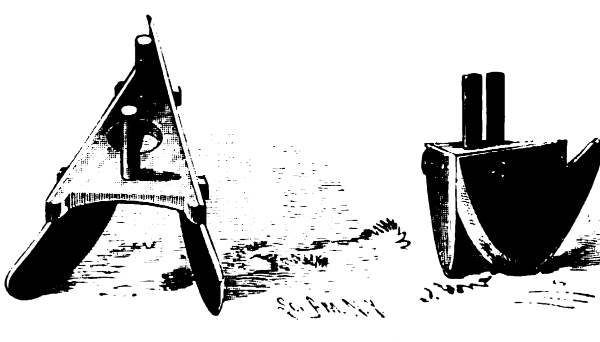
L'HOMEDIEU'S CULTIVATOR AND PULVERIZING ATTACHMENT FOR HARROWS.

A SEAT ATTACHMENT FOR BICYCLES.

The illustration represents an extra seat attachment for bicycles, which may be readily put on or removed, adapting the vehicle to hold a child in front of the rider in such a manner that it cannot fall out and will not unbalance the machine, while it may also be adjusted to suit children of different sizes. This improvement has been patented by Messrs. Louis Rastetter and Crist Siebold, of Fort Wayne, Ind. The child's seat may be placed on any common form of bicycle, being shown attached to a safety of the usual style, and it is supported at the back by the spring of the main seat, a cleat passed through the front coil of the spring being secured to the back of the attached seat, from the lower front portion of which braces extend downward and forward, and are bolted to a support secured to the steering fork and the main frame. Fig. 2 is a plan view of the attached seat and its supports, the foot rests extending in a nearly horizontal position on each side of the fork, and the rear portions of the foot rests being bent upward and clamped to depending hangers, the clamp being adjustable to suit children of different sizes. The handle bar extends around the front of the seat, forming a secure guard to prevent the child from falling out, and when the child is not to ride the seat may be easily removed and the bicycle used in the ordinary way. By this method of attaching the seat, the child has a foot on each side of the fork, and has the same swinging motion as the operator, the weight of both coming together upon the saddle, whereby the child fully partakes in the healthfulness of this form of exercise.



RASTETTER & SIEBOLD'S BICYCLE SEAT.



The Physical Action of Odors.

The direct action of odors on the nervous centers is a subject worthy of careful research and study. Goethe had a strong dislike to the odor of apples; Schiller liked the odor. Some persons are made absolutely ill by the odor of onions that are being cooked; while other persons rather like it. The odor of the lily has a most potent effect in many instances, and I believe there is no person on whom it does not produce a sense of depression and nausea. I have known it cause positive faintness. I am myself always disagreeably affected by the odor of carbolic acid, and can never remain many minutes in a room where a trace of it prevails. In cases where the effect of an odor is instantaneous, it is fair to suppose that the impression made on the olfactory surface is transmitted direct to the olfactory center of the brain; but there must also, in certain examples, be a further transmission to the sympathetic ganglia.

The central seat of the olfactory sense must be very near to the central seat of memory, for it is noticeable that nothing recalls a past event like an odor. A little child was accidentally thrown out of a pony-carriage in a country lane. Near the spot where the fall took place there was a manure heap, which gave forth the peculiar dry ammoniacal odor so often recognizable from such heaps—an odor distinctive yet not altogether unpleasant. The child was stunned by the fall, and on recovering and returning to consciousness smelt this odor powerfully. Over fifty years have elapsed since that little mishap, and yet whenever the person referred to passes, in country lanes, a heap giving out the same odor, the whole scene of the accident recurs with every detail perfect, and sometimes with a recurrence of the giddiness and nausea which were experienced at the moment.

In some of the lower animals memory by odors is often singularly exhibited. In the dog the memory by odor seems a special part of the nature of the animal. The "scent" of the fox-hound and of the stag-hound is of this character. In the trained collie the remembrance of an object hidden, a stick, for instance, may be retained for three-quarters of an hour, so perfectly that the animal will fetch the object at command. But if the object be coated with something giving an odor which the animal is familiar with, the time is infinitely more prolonged.

Some odors lead to sleep, like the odor from dried hops; others lead to wakefulness, like the odor of dead flowers or leaves. Still others allow sleep but provoke the most terrible dreams, like the odors arising from a pillow in which feathers are decomposing.

Habit modifies the effects of odor. Merciless smokers laugh at the "faddery" of women who become faint if a smoker charges the air they breathe in a confined space, a small room or a railway carriage, and are ready to compare the objection of a lady unaccustomed to the odor from the pipe or cigar with the carelessness on the matter shown by another lady who has become accustomed to the effect. But if a smoker gives up smoking and all contact with smoke for a few years, he is astounded at the unpleasantness of an air charged with smoke when he is then inclosed in it. I was once summoned, professionally, to a youth who was temporarily poisoned by inhaling the atmosphere issuing out of a small window of a clubroom in which a number of men were smoking freely. They, in the body of the smoke, were not perceptibly affected. He, partly in the open air, was positively smitten to faintness by the empoisoned current from the room which flowed out of the window, and is still affected whenever he comes within the cloud of a pipe.—*Dr. B. W. Richardson, in the Asclepiad*

To Remove Rust.

To remove rust from iron or steel utensils the following solution is applied by means of a brush, after having removed any grease by rubbing with a clean dry cloth: 100 gm. stannic chloride are dissolved in 1 liter of water; this solution is next added to one containing 2·5 gm. tartaric acid dissolved in 1 liter of water, and, finally, added 20 c.c. indigo solution diluted with two liters of water. After allowing the solution to act for a few seconds, it is rubbed clean with first a moist cloth, later with a dry cloth; to restore the polish, use is made of silver sand and jewelers' rouge.

Aerial Navigation.

To the Editor of the Scientific American:

In the September number of the *Century Magazine* is an interesting article on the Possibility of Mechanical Flight, by Prof. Langley of Smithsonian Institution, and states that the greater the velocity acquired in translating matter in a horizontal direction supported by a plane of slight inclination, the greater weight it will carry and that there will be an increasing economy of power.

Or to use his own words, it requires less and less power to maintain this horizontal position, the faster it goes.

Then, again, the more speed is increased, the less will be the power required to support and advance it. So there will be an increasing economy of power with each higher speed, up to some remote limit not yet attained in experiment. This is in startling contrast to all that we are most familiar with in land and water transportation, where every one knows the direct reverse to be the ordinary case.

Prof. Langley is correct, but we have one instance in mechanics that proves this theory, and that is an engine drawing a train of cars on the level railway, for it takes less power to keep up the required speed after getting into motion. And corresponds with Newton's 2d Law of Motion, that a *constant* force produces a uniform acceleration of velocity in any direction.

Or in other words, let any force with an intensity capable of moving any mass or body, be it ever so slow, be constantly applied, there will be a uniform acceleration, as when a sphere or rolling stock allowed to roll down an incline plane or railway of 1 ft. fall in 16 ft. length, it will pass through the space of 1 ft. in 1st sec., 3 ft. in 2d sec., and so on, increasing at the uniform rate of 2 ft. per second and in one-half minute or 30 seconds it will be moving at the rate of 59 ft. per second. The air is no denser in the same altitude to matter moving in a horizontal direction than in the perpendicular fall.

One horse power has capacity of raising 550 pounds 1 ft. high in one second; let it be constant, the velocity will increase 2 ft. per second toward the zenith.

Again, let gravity be 1 unit, and a force with an intensity representing $1\frac{1}{10}$ units act at an angle of 45° above the horizon; under Newton's 2d Law of Motion, it will move in a direct horizontal line of 16 ft. in the 1st second, 48 ft. in the 2d second, 80 ft. in the 3d, fulfilling the law of falling bodies, or falling in a horizontal direction. FRANK BARNETT.

Keokuk, Iowa, October 16, 1891.

The Albatross.

At one of the meetings of the Wellington Philosophical Society in 1885, Sir Walter Buller, F.R.S., exhibited a series of the so-called wandering albatross, and expressed his belief that there were two species under the common name of *Diomedea exulans*, one of them being highly variable in plumage and the other distinguished by its larger size and by the constancy of its white head and neck. But, although that was his conviction, he did not feel justified in setting up the new species and giving it a distinctive name until he could produce incontestable evidence of its existence. From a paper read by him before the same Society in February last, and published in the new volume of the Transactions of the New Zealand Institute, we learn, says *Nature*, that he had lately had an opportunity of examining sixteen beautiful specimens of both sexes and of all ages, and that as the result of his study of these specimens he had no hesitation in speaking of a new species. "It is undoubtedly," he says, "the noblest member of this group, both as to size and beauty, and I have therefore named it *Diomedea regia*." He exhibited before the Wellington Society a series of both species, and in the course of some remarks on them stated that they keep quite apart from one another on their breeding grounds, and do not commingle "except when sailing and soaring over the mighty deep, where a community of interest and a common pursuit bring many members of this great family together."

In the paper in which he deals with the species called by him *Diomedea regia*, Sir Walter Buller refers to a remarkable characteristic of the wandering albatross—a characteristic which has been carefully studied by Mr. Harris. At a certain time of the year, between February and June—Mr. Harris cannot exactly say when—the old birds leave their young and go to sea, and do not return until October, when they arrive in large numbers. During their absence the young birds never leave the breeding ground. Immediately after the return of the old birds, each pair goes to its old nest, and, after a little fondling of the young one, turns it out, and prepares the nest for the next brood. The deserted young ones are in good condition, and very lively, frequently being seen off their nests exercising their wings; and, when the old birds come back, a young bird will often remain outside the nest and nibble at the head of the old one, until the feathers between the beak and the eye are removed, and the skin made quite sore. The young birds do not go far from land until the following year, when they accompany the old ones to sea. When the young are left in the nest at the close of the breeding season, they are so immensely fat that Sir Walter Buller thinks they can subsist for months without food of any kind. Captain Fairchild has described to Sir Walter from personal observation the coming home of the wandering albatross, and the peremptory manner in which the young bird in possession is ordered to quit the nest, so as to make room for its successor.

Anthophagy.

A writer in *La Nature*, quoting from Ovid,

"Qui amat flores reputatur
Amare puellas,"

says that it is well to-day to modify this aphorism and to say: "Those who love flowers are friends of good living." It appears, in fact, that in France as well as in England a true crusade is going on at present for the introduction of a certain number of flowers into our regular list of foods.

It was some London botanists who conceived this eccentric idea of rendering us *anthophagists*, a word which may be translated "eaters of flowers."

If the learned Englishmen succeed in their enterprise, we shall very soon see the edible flowers of the phog (*Caligonum polygonoides*), of the mahwah (*Bassia latifolia*), of the *Dillenia pentagynia*, etc., appear upon our tables and triumphantly take their place alongside of the violets, jasmins, and rose petals that we have long been receiving from Italy in the form of preserves.

In fact, in spite of our English neighbors, who would like for once to obtain the reputation of being initiators, flowers have been daily eaten by everybody for a long time.

Anthophagy is assuredly one of the commonest of practices; but ordinarily we are anthophagists without knowing it. The experimental proof of this assertion is soon and easily found. Thus, for example, when we eat the artichoke with peppersauce, we are eating the immature flower heads of the plant, and when we partake of a common cauliflower with butter-sauce we are eating flowers.

The cabbages, like the artichoke, are plants of many possibilities.

See, in fact, what we owe to the *Brassica oleracea* alone—the common cabbage—which the housewife daily puts into the soup pot.

In a wild state, the *Brassica oleracea* is a rare plant, at least in France, where it is scarcely ever met with except in the inaccessible parts of the chalky shores of Cape Gris-Nez. In order to develop at its ease, it requires sea air, saline spray, and phosphate of lime. But when man comes to take it under his protection, then, according to the mode of culture applied to it, it furnishes the common cabbage, the turnip cabbage, the cauliflower, Brussels sprouts, etc., according as the leaves, root, or flowers of the plant have been more especially developed. This latter is especially the case of the cauliflower and Brussels sprouts. The cauliflower, in fact, is nothing but the plant's inflorescence which has not reached its complete development, while Brussels sprouts are buds that have not reached perfect maturity. To add again to the list of Brassicas, there is the brocoli, a maritime and wild (or nearly so) variety of the *Brassica oleracea*, and the inflorescence of which, less tufted than that of the common cauliflower, is likewise edible and just as delicate.

In Holland, as well as in Brittany, the brocoli is cultivated upon a large scale in the *polders* (as the large pasturages on alluvial soil that has been reclaimed from the sea are called in the Netherlands), and, in order to secure for it an existence approaching as nearly as possible its normal conditions of growth, the peasants furnish it with a manure that is both mineral and organic; that is, the star-fishes that they gather by the cartload upon the beaches. Let us add, further, that the crop of brocoli inflorescences is placed in casks that have contained the generous wines of France (Burgundy or Bordeaux). This gives it a particularly fine and agreeable aroma, and it is afterward shipped to England, whence we see it finally return to our tables in the form of pickles in vinegar or of chow-chow. So much for the simple cabbage.

As for the artichoke, the *Cynara scolymus* of botanists, that shares, with several other of its near relatives, the property of having a fleshy and succulent floral receptacle. These flower-vegetables of which we have just spoken are in general use as food. Along with them, it is well to mention a number of others, which, although not so well known, are none the less valuable. Thus, for example, the sea kale (*Crambe maritima*), a near relative of the cabbage, belonging, like it, to the great family of Cruciferæ, and which grows naturally and in great abundance at the seaside, in the shingle, upon our Channel coast, produces an inflorescence that is particularly esteemed by connoisseurs. It is a vegetable of which the culture will doubtless be carried on regularly some day.

The most diverse families of plants furnish species having edible flowers. The delicately perfumed, freshly expanded flowers of the yellow pond-lily (*Nymphæa lutra*) are employed in the east of France in the manufacture of certain preserves that possess an exquisite flavor. The white and odoriferous racemes of *Robinia pseudacacia*, dipped in batter are used in some countries for making fritters that are no less savory than those made of sliced apples or peaches. The flowers of the Judas tree (*Cercis siliquastrum*), too, are sometimes made into fritters with butter, or are mixed with salads, and the flower buds are pickled in vinegar. The flowers of the American species (*C. canadensis*) are used in salads and pickles in Canada. The flowers of the nasturtium and borage are used as an addition to salads. We use the flower buds of the caper bush, preserved in vinegar, in certain sauces. The cloves, so much used for flavoring, are merely the unexpanded flower-buds of the clove tree, dried in the sun.

The flowers of *Abutilon esenlentum* are used as a vegetable in Brazil. In India, the flowers of *Agati grandiflora* are used by the natives in their curries. The flowers of the pumpkin vine are cooked and eaten by some of the tribes of North American Indians. This list is far from being complete, and we hope to add to it at some future time.

The Original Cable Road to be Improved.

The Clay Street Hill Railroad Company, San Francisco, has run its last car up through Chinatown, over the Clay Street hill, and with it the oldest cable road in the world is now a thing of the past. No unusual ceremonies attended the final trip, beyond the breaking of a bottle of champagne over the grip and a formal declaration that the business of the pioneer cable road was finished, but after the car and dummy had been turned into the round house many of the officers and men, some of whom had been with the road since its construction was begun, over twenty-five years ago, gathered together and exchanged bits of history concerning the early days of the famous line. Deep regret was expressed by all that it had become necessary to dismantle the road and reconstruct it, that it might be adequate to handle the growing traffic.

Up in the loft of the old engine house, corner of Leavenworth and Clay Streets, are stored parts of the first dummies which astonished the people of San Francisco, together with the original grip car. This is indeed a primitive affair, consisting of a low platform on small car wheels and supporting the grip. A rough railing surrounds it, while the brakes consisted of steel levers, which were pressed against the four wheels. Five men were necessary to run the dummy, one operating the grip and each of the remaining four standing with a steel lever in his hand ready to lock the wheels should the grip break. The trailer was a common "bobtail" horse car, and the trial trip of the first cable train, as thus constituted, forms a most interesting chapter of street railway history.

Early in the '70s, A. S. Hallidie, now president of the California Wire Works, of San Francisco, conceived the idea of propelling street cars by means of an endless, traveling, underground cable. The scheme was at first considered chimerical, but finally three men of means—Joseph Britton, H. L. Davis, and James Moffitt—took the matter up. Then came the almost interminable task of working out the mechanical details of the idea, but it was finally completed, and on August 18, 1873, hundreds of San Franciscans climbed up Clay Street hill to watch the trial trip. As the gripman who was to take the car over the road looked down the steep decline his courage failed, and Mr. Hallidie took the grip. At a given signal the car started off smoothly amid shouts from thousands of throats. The trip was made without a hitch and the innovation was pronounced a success. Soon the line from Kearney Street to Van Ness Avenue was equipped with cable cars, and since then, until the closing of the line on the night of September 9, the road has been in operation, using continuously the same engine and the same roadbed. Arthur S. Chase enjoys the distinction of having collected the first fare, he being the first cable car conductor, and Timothy Phalon was the first gripman. Mr. Chase is now in the furniture business in San Francisco, and Mr. Phalon, after a long service, resigned and is now a factory watchman.

The *Western Electrician* says: It is probable that the now historic train, with its first conductor and gripman, will form a part of California's exhibit at the World's Fair.

Our Walrus-Eating Citizens.

Mr. Ivan Petroff, the United States special census agent, has been engaged in taking the census of the natives of Nunivak Island, in Behring Sea, in 60° N. lat. He found the population to consist of over 600 natives. It was previously supposed that over 300 people occupied the island. There are no white men there, and the natives live in a most primitive style. Their only food is the flesh of the walrus, and their only wealth consists of ivory obtained from the tusks of that animal. There are few land otter, but, apart from these, the natives catch no fur-bearing animals.

Correspondence.

To the Editor of the Scientific American:

In my list of non-venomous serpents appearing in the SCIENTIFIC AMERICAN, issue of October 10, 1891, No. 19 is given as Kirkland's snake, *Regina kirklandi.* It should read Kirtland's snake, *R. kirtlandi.* This little snake has been placed in a new genus, *Tropidoclonium*, which is unnecessary, and certainly not euphonious. As to the largest, or rather longest, species of snakes inhabiting the United States, Prof. Robert Ridgway, the ornithologist, says that in 1854, in the State of Missouri, Dr. Hoy captured a pilot snake, *Coluber obsoletus*, which measured eleven feet in length, and that his (Prof. Ridgway's) father killed one of the same species measuring nine feet eight inches.

C. FEW SEISS.

The Steam Yacht Mascot.

To the Editor of the Scientific American:

I built the Mascot in 1881, and put into it a Colt disk engine, made at the Colt's Patent Firearms Company, Hartford, Conn., and have run it every year during the yachting season, this season closing up the 10th. In 1888 I broke a crank pin, the first and only accident or break of any kind that has happened since the engine was put in motion. Not a dollar's expense for any purpose connected with the engine. Not a moment's delay in all these years for repairs of any kind to the engine. The engine has been managed this season by the son of my former engineer, and is the first engine he ever had charge of. The yacht has made, I think, better time this season than ever before. The Mascot is 65 ft. long and $10\frac{6}{12}$ ft. beam, and being finished inside with mahogany and ten mahogany doors, 600 pounds plate glass in windows and doors, and 400 pounds sash weights, and 500 pounds brass rail, 6,500 pounds boiler, engine 4,500 pounds, two marble washstands, and two Sand's water closets, make the Mascot an unusually heavy boat, and still it is no trouble to make 15 miles an hour with ten or fifty passengers. She has done this this season with fifty on board. The engine is a six-cylinder one, each cylinder being 7 inches diameter and 6 inches stroke, driving a 44 inch wheel, 6 foot pitch, 220 revolutions. GEORGE S. WEAVER.

Keuka Lake, Branchport, N. Y., Oct., 1891.

Rain Making.

To the Editor of the Scientific American:

The whole country, and, in fact, the whole civilized world, has been greatly interested in the recent attempts to coax or drive moisture from the Texas skies. It is of some interest to inquire whether science can favor any such attempts, and also to bring together some of the reports that have been sent out regarding the experiments. It has been thought that a mixing of air strata of different temperatures would produce rain, but a short computation will show how impossible it is to obtain precipitation by mixture. A cubic foot of saturated air at 50° contains 4·09 grains moisture, and at 60°, 5·79 grains; mixing the two we have two cubic feet at 55°, containing 9·85 grains; but two cubic feet at 55° will hold 9·72 grains, and we must allow for the liberation of latent heat, so that there would be no moisture to precipitate, even under those favorable conditions which can occur but rarely in nature. This is the old Huttonian theory of rain, which was abandoned by meteorologists a good many years ago.

In the early part of 1889, the present writer made a few experiments on the formation of rain in dust-free air. These consisted, for the most part, in forcing air into a glass jar and suddenly releasing the pressure, thereby causing quite an explosion or sudden rush of particles in the jar. It was found entirely practicable to form mist in perfectly dust-free air, and it was suggested that possibly the sudden bombardment of the molecules might cause a mechanical aggregation of the mist without the intervention of dust particles as nuclei. (*Science*, June 21, 1889.)

Prof. John Aitken, of Edinburgh, Scotland, had taken rather strong ground that the presence of dust was needful in order that mist or cloud might form, and in a correspondence with him he writes as follows: "I must however remark, and I have pointed it out in one of my papers, that it is possible to produce condensation in dust-free air. It is done by drawing out the air pump very rapidly and accompanying the process with a shock. Condensation then takes place for the same reason that water cooled below 32° immediately solidifies when treated in the same way." "Now it is not so much the amount as the *speed* of expansion and consequent rush of air that produces this 'spontaneous' form of condensation." I had suggested that possibly his failure to obtain mist was due to not making the expansion rapid enough to prevent the heat from outside reaching the air. He says farther, "I have no theory with regard to shocks; I merely stated the fact that shocks tend to assist in producing the spontaneous form of condensation." It seems as though these experiments and Prof. Aitken's suggestions have an important bearing upon the question of the production of rain by concussions of the atmosphere, and they may serve to explain a few of the recent results in Texas.

While it would be unsafe to say, with our present knowledge, that vapor molecules may be made to combine by concussion, yet it is very certain that they may be combined without the intervention of solid dust particles. It is easy to see, however, that if any such effect is to take place it must be at once, and not after an interval of even fifteen minutes after the explosion. With the ordinary theories of rain formation in mind, there seems to be no possible way in which a concussion of the atmosphere, extending with some force to a distance of perhaps 2,000 feet, can produce even a sprinkle except immediately, nor can the concussion be considered as effective at a distance greater than a mile or two. It seems plain that such explosions cannot give mist suddenly and also after an interval, so that it should be decided to accept one or the other as the direct result, and not either, as the case may happen to be.

Turning now to the experiments, we find that it was decided to make the first attempts in a region of undoubted dryness, in order that there might be no doubt thrown upon the results. Now while western Texas, the place chosen, in most seasons of the year has a very dry climate, it is far otherwise in its rainy season, which extends from the middle of June to the middle of September. The dates of natural rainfall in western Texas during these experiments were as follows: August 9, 10, 11, 13, 14, 17, 18, 19, 21, 22, 25, 26, 27, 28, 29, and 30. That is to say, during this interval of twenty-two days there were sixteen on which we would have anticipated a natural rain, as shown by the actual rain which fell over widely extended regions. It is by no means certain that even this represents the whole truth in this case, for there are very few stations in this region, and it might well be that rain fell on other days not noted above.

The first explosions, on August 9, were very few in number, and a rain occurred the next day, but the experimenters decided that this rain was not caused by them. It would seem that this is a most important point in this connection; if this first rain was simply a coincidence, it would require strong proof to show that all other rainfalls in this rainy time were not the same. Again, on the 18th there were more preliminary explosions followed by rain. It was then declared that all arrangements had been completed for the final and decisive tests on the 20th. On the 21st it was announced: "The circumstance of the 20th seemed to favor the experimenters, yet nothing has been improved." This was certainly a singular admission on the part of those so deeply interested.

In a report on these experiments the following expressions occur: "Wherever there has been moisture in the air and they have reached it, rain has followed the explosions. This was to be expected, because no one can produce anything without having material to work upon. After each explosion so far made under proper conditions, there has followed rain." On the other hand, it has been insisted all along that there had been a great drouth in this part of Texas, and the very object of going to this dry region was to try and coax rain to go or fall there. It is gratifying to learn that the attempt has not been made to produce rain in a dry atmosphere, for such an attempt must have inevitably failed.

A most significant fact has also come to light in connection with the later El Paso trials. It had been announced that no rain had fallen at this point for several weeks, but, unfortunately for the experiments, on the very morning, just before the explosions, there was a rain at this point. Notwithstanding these favorable conditions of the atmosphere, a most thorough and long-continued bombardment of the atmosphere produced no rain whatever, and the attempt had to be abandoned. It seems quite plain that, from the reports of the experimenters themselves, viewed in a proper light and with a knowledge of the natural rains in this region during this time, we must think the results have shown the entire impotence of man to bring about any rainfall except a few sprinkles just at the moment and point of the explosion. Certainly the results prove incontestably that money cannot be spent profitably in any such attempts by crude and gross explosions to produce precipitation.

There is no doubt that there is here a most intensely interesting field for research, and it is to be hoped that the present agitation will lead to a few scientific experiments on the condition of the clouds at the time of rain formation and on the condensation of moisture. Such experiments would be invaluable in setting at rest a good many doubtful questions. H. A. HAZEN.

October 9, 1891.

The Artificial Production of Rain.

To the Editor of the Scientific American:

Here in Central Nebraska, during the season of thunderstorms, we often see the commencement of thunder showers and sometimes even of a cyclone.

A thunderstorm always begins to develop here with a sultry, close atmosphere and a low barometer, and generally in the afternoon.

The sky will show a few scattered, fleecy clouds, which begin to draw together into a single mass, parts of which mass slowly roll and tumble upon each other.

Very soon a clap of thunder is heard, and at the same time the rain begins to fall. Am quite sure that I have heard the thunder before we could *see* the rain, but usually we can see the rain before the thunder is heard. Perhaps there were very light flashes in the cloud, the report of which could not be heard before the first fall of rain.

Might it not be that the particles of aqueous vapor were differently electrified, and thus caused to attract each other, in this manner forming a drop of sufficient weight to fall?

Here our heavy thunderstorms nearly always come from the northwest and north, and are preceded almost invariably by a hard wind for a day or two from the south. This south wind always blows up dust, which sometimes extends a mile high. The dust, of course, is very fine, at least that which extends very high up, and it might easily be that this dust, being silicious and hot and dry, might be electrified from friction and thus attract particles of vapor differently electrified, in this way causing an accumulation of cloud and a fall of rain.

It is a fact well known that *a static discharge will settle dust.* This it can only do by disturbing the electric equilibrium of the particles, causing them to adhere, forming a particle heavy enough to fall through the air.

It seems to me that sudden showers are caused by electrical disturbances, even though the disturbances be not great enough to cause lightning flashes.

Perhaps it may some day be demonstrated that the causing of rain is one of the natural uses of electricity.

Palmer, Neb., October 7, 1891. M.

Aluminum Air Ships of the Future.

To the Editor of the Scientific American:

I think it was about 1843 that aluminum was discovered, and for some years the process of separating it from the clay near the earth's surface was very tedious and quite costly, it being sold at about $12 per pound, and for many years French chemists held a monopoly of its product.

At length Yankee genius took hold of the business, and in a few years reduced the price to about $1 per pound, and it being three times lighter than steel and nearly as strong, and no doubt it will still be cheapened, and it has been hinted by some to even five cents per pound, and we dare not dispute this. Be this as it may, we can but hope, and I really expect, that an air ship will yet be constructed principally of this wonderful metal, with buoyant and propelling wheels similar to those of an ocean steamer, driven by electric power, possibly carried in a storage battery, or produced by the air ship itself.

The balloon, so far, has proved a very dangerous means of flying in the air, as well as a very expensive means.

Possibly, some Yankee or French genius may discover a simple method of separating the 20 per cent of oxygen from the atmosphere, which is a supporter of heat, which will assist greatly in solving this difficult problem. Some aerial wizard will spring up, like Edison of Menlo Park, and then accomplishment is certain. At our 1876 centennial an electric light was produced as a mere curiosity. I then did not imagine that I would live to see cities and dwellings illuminated as they now are; but so it is. In my boyhood there was no railroad, no electric telegraph. No steamer had crossed the ocean. Talking with each other by telephone was scarcely thought of. Professor Morse, who, in 1842 I think it was, sent the first message from Washington to Baltimore, lived to stand in Central Park, New York, in front of the bronze statue placed there, and send a message under the ocean and around the globe, and I had the pleasure of being present when this was done; and now, no doubt, a man will soon be able to stand in New York City and talk with a man in London by telephone.

We truly live in the age of possibilities and probabilities. One scientific discovery aids another. And an aerial ship is more probable to-day than a steamship was two hundred years ago. J. E. EMERSON.

Wool Grease Lubricants.

The soap formed by treating wool grease with alkaline lye is dissolved in water and filtered. To this a solution of alum or other alumina salt is added, whereby a brown precipitate is formed, which is called "aluminum lanolate." With this substance, when dried, lubricating oils of any viscosity may be produced by dissolving it in any fluid mineral oil. If dissolved in a small quantity of mineral oil, a gelatinous substance is obtained which may with advantage be mixed with India rubber or gutta percha. Solvents for India rubber are said to be also solvents for "aluminum lanolate." In textile industries this substance may also be used as a scouring agent.—*R. Krause.*

ROMAN AMPHITHEATER AT WEEHAWKEN, N. J.

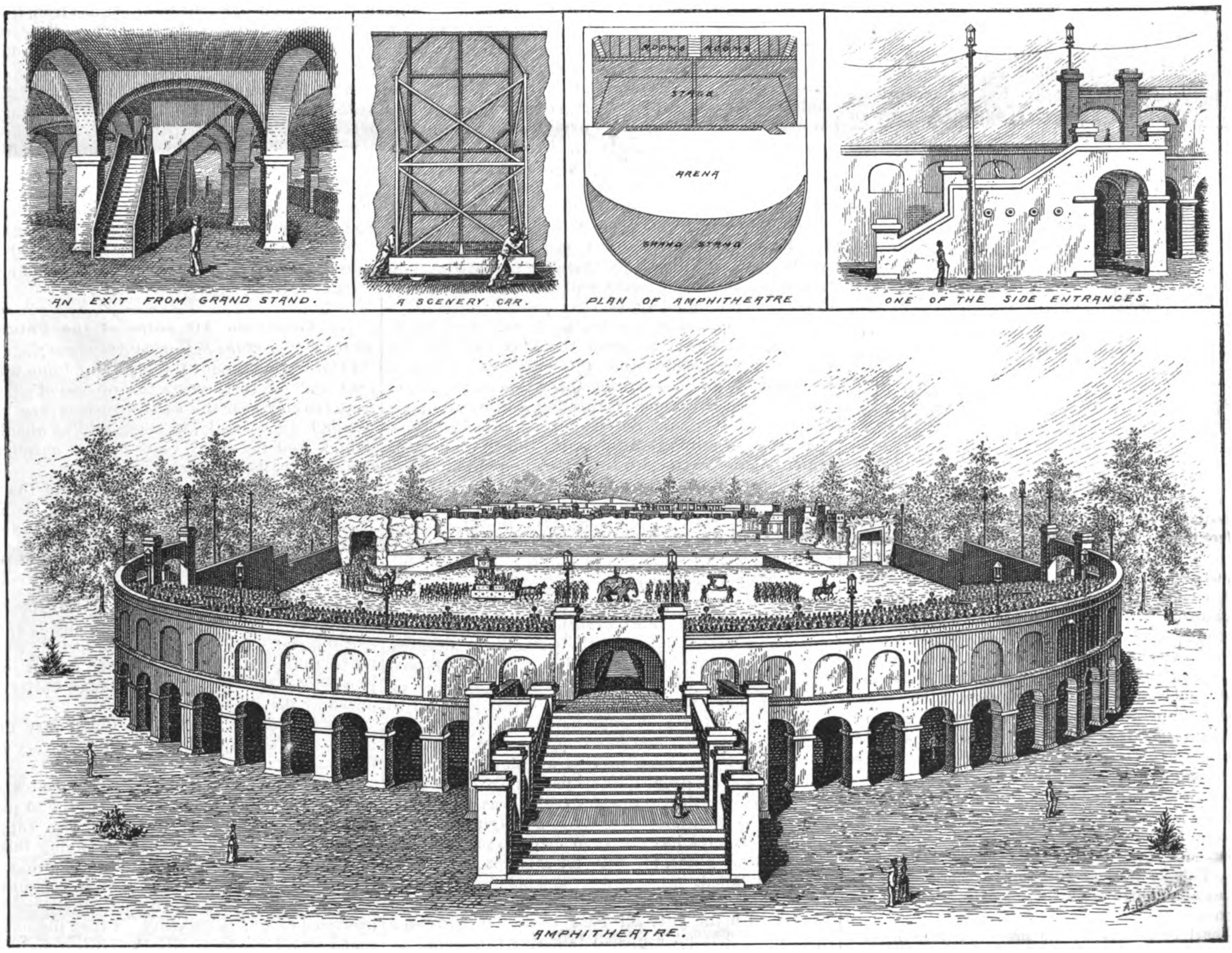
This new amphitheater, situated on the heights of the west bank of the Hudson River, opposite the city of New York, is the first of its kind ever built in this country. The design is taken from the old style Roman amphitheater. The structure is 445 feet in length and 350 feet in width, and is divided into three sections, a grand stand, arena, and stage. The front, or main part of this structure, is built in a half circle, the rest of the inclosure being square. The half moon section, which contains the grand stand, is 30 feet in height, the walls being one foot in thickness above the lower arches, and 350 feet in diameter. The structure is of wood and covered with cement, which gives it the appearance of stone. The upper arches are inclosed, and there are 35 arches in each tier. The upper and lower arches are supported by square columns 3 feet in thickness, and these with 49 inner columns are the upright supports for the grand stand. They are made of 12 by 12 inch timber and boxed around to the required size. Curran's plaster slabs, made of wood fiber and plaster of Paris, are tacked on, and the whole column is then covered with 1½ inches of cement and roughed up in imitation of stone The arches are 14 feet in height, and the columns 7½ feet apart. A space of 60 feet in width running under the full width of the grand stand is fitted up with booths for those desiring to eat or drink.

Between the two rows of the center inner columns leading from the grand stand are thirteen exits, each 4 feet 6 inches in width. The front stairway to the grand stand is 25 ft. in width, and projects out from the main structure about 47 feet. The two side entrances are 8 ft. 6 inches in width and about the same height as the front entrance. The grand stand is 130 feet in width from front to rear, and its lower portion is 7 feet above the arena, rising thence gradually up to within 3 feet of the top of the amphitheater at the rear. It is built in thirty-five steps, each 8 inches in height and 2 feet 6 inches in width, and covered with painted canvas. The stand is fitted up with 5,000 polo chairs screwed down solidly to the flooring. There are also eighty private boxes. These, with the polo chairs, make the seating capacity about 6,000. Around the top of the amphitheater wall are electric lights, which, with numerous calcium lights, furnish light for the spectators to see the performance on the stage.

The arena is 165 feet in width and 350 feet in length. It is prepared ground, on which was first placed 3 inches of sugar house ashes, over which was spread 2 inches of Thomson Cove crushed stone, making it a good ground to throw off water.

The stage is 140 feet in width and 330 feet in length. It stands 5 feet above the arena at the lower front portion, rising gradually up to 12 feet in height from the ground at the rear. From the gateway at each side of the stage there is a passage way 10 feet in width around and outside of the entire stage. To reach the top of the stage from the rear, three passage ways have been built, one on each side and one in the center. The side passages are about 8 feet in width and the center one is 20 feet. There are also twenty apartments built under the rear of the stage, each room being 30 feet in length and 12 feet in height. The separating partitions are sheets of corrugated iron, and the rooms are divided off equally among the performers, ten for the males and ten for the females. Adjoining the rooms is a corrugated iron hallway, about 4 feet in width, running on the inside the full length of the stage. The scenery is shifted about by means of cars running on 5½ foot tracks. These cars are 6 feet 9 inches in width and 8 feet 3 inches in length, and the car itself is about 3 feet in height and made of heavy timber. Four upright pieces about 15 feet in height, of 2 by 4 timber, are fastened to the ends of the car and cross braced. The piece of scenery to be shifted is fastened to this framework to keep it in an upright position, and at the bottom the piece is fastened to the car by means of wrought iron straps. These straps are about 2 feet in length, 2 inches in width and ½ inch in thickness, and they are hook shaped at the bottom. The piece of scenery rests in this hook and is bolted to the side of the car.

The performers number about 1,000, with quite a number of animals, such as horses, donkeys, oxen, and an elephant. The costumes are taken from those supposed to have been used in the time of King Solomon. The amphitheater and fitting out of the grand stand with stage and scenery cost $75,000.



THE ROMAN STYLE AMPHITHEATER, WEEHAWKEN, N. J., OPPOSITE THE CITY OF NEW YORK.

Petroleum Engines.*

When considering oil engines, the fact should not be forgotten that we have an entirely different condition of things from steam or gas motors, because the engine has to gasify the oil for its own use. For instance, a steam engine that will run for a day with good results may be expected to run in a similar manner for a long period. The boiler is relied on to supply dry steam at the desired pressure. The same may be said of the gas engine, where we have simply to turn on the gas cock and rely upon the ingenuity and skill of those who manufacture the gas to make it of such quality as to give equally satisfactory results in the motor cylinder, whether used for a short or longer period. But when we come to the oil engine, we meet with a different state of things as regards supply of the working agent. The oil must be taken direct from its cistern, thoroughly mixed with the right proportion of air, and passed into the cylinder ready for ignition, at the rate, in some engines, of four separate charges per second, so that unless the arrangement for dealing with these heavy oils is correct and works with precision, the tendency to clog in the cylinder and working parts is very great. In fact, to use a homely example, the engine is like a strong-looking man with a poor constitution and suffering from pulmonary troubles; it will run well for a short time, and then, getting choked up, refuses to work. The sphere of usefulness of the oil engine is rapidly extending, because it is found reliable and steady at work, with decided economy of fuel. The only real objection that can be urged is the smell from oil, and this may be reduced by ventilation.

What has undoubtedly to be arrived at in the construction of oil engines is to get economy of oil and the best mechanical results without clogging of the working parts, so that in the hands of the user the engine may run without attention or frequent cleaning and repairs. Clogging is prevented in some engines by thoroughly mixing the oil vapor with a large porportion of clean atmospheric air, so as always to form an explosive mixture, which gives complete combustion and a clean exhaust. It must be pointed out, however, that during the compression of the charge before ignition a portion of the vapor comes into contact with the walls of the cylinder, etc., and, condensing on them, never gets burned. This oil forms, in its heated state, a most excellent lubricant for the piston, thereby dispensing with the need of a more costly oil, and regulating the same without any attention. The perfect state of the piston surface after being months at work affords ample evidence of the advantage gained by this method of self-lubrication with a minimum of trouble.

* Professor William Robinson, M.E., Assoc. M. Inst. C. E., University College, Nottingham.

THE American Pomological Society, at its recent annual meeting in Washington, decided to make an exhibit classified by State and county associations, and also by individuals; and it appointed a World's Fair committee of six to confer with the Horticultural Department, and to perfect arrangements.

GIGANTIC PASSENGER ELEVATOR OF THE NORTH HUDSON COUNTY RAILWAY.

A passenger on one of the ferryboats leading to or from the upper portion of New York, or upon one of the numerous vessels passing up and down the Hudson, will notice on the Jersey shore, adjoining the West Shore Railroad station at Weehawken, a tall tower, communicating by a viaduct with the bluff, a few hundred feet distant. The tower is the passenger elevator of the North Hudson County Railway, and this, together with the viaduct communicating with the railway, will save the people living in Weehawken, Guttenberg, the town of Union, and the residents of the northern portion of Hudson County generally, the laborious ascent of the bluff by stage or on foot. The regular trains of the railway are to run out on the viaduct to the elevator landing so that there will be a direct transfer of passengers from the elevator cars to the trains. This great work adjoins the grounds of El Dorado—the magnificent spectacular summer show—and affords accommodation to the thousands who flock to this place of amusement in the summer season. Our view, by the way, shows the situation of the Roman amphitheater described and illustrated on another page.

The wrought iron work for the tower and viaduct is furnished by the Passaic Rolling Mills, and the elevator machinery and cars are supplied by Otis Brothers, of elevator fame, from designs furnished by Thomas E. Brown, Jr., engineer, under the specifications furnished by Mr. Edward A. Trapp, engineer of the North Hudson County Railroad Company.

The tower has a base of 45 feet 6 inches by 60 feet, measuring from the center of the columns; the top of the tower is 45 feet by 61. In the construction of the viaduct and tower, 2,000 tons of steel were used. The tower reaches to a height of 197 feet above the water level, and the lift of the elevators is 148 feet. There are three independent elevator cars, each 21 feet 6 inches, 12 feet 6 inches, and 10 feet high. Each car is suspended in a steel frame formed of angle and channel iron; the cables, eight in number, are attached to these frames, as are also the safety devices. Each car is provided with eight seven-eighths inch crucible steel cables, six of which are attached to the hoisting machinery and two to the counterbalance weights.

The hydraulic elevator cylinders are 38 inches in diameter and 2 inches thick, provided with flanges 50 inches in diameter, and made in sections of 9 feet in length. The pistons of the hydraulic cylinders are each provided with 2 steel rods 4¼ inches in diameter and 35 feet long. The pistons are geared by means of cables and sheaves in such a manner as to cause the car to move six feet for every foot of the travel of the piston. Each piston is provided with an automatic stopping device, which arrests the motion of the car independently of the conductor when the car has reached the end of its travel.

The car slides on wooden guide strips 6 x 8 inches, formed of three sections of yellow pine, and each car carries a safety device consisting of three pairs of cutters upon each side of the car, arranged to bite into the wooden guide when the car attains a speed above the normal. The arrangement of these cutters is shown in the annexed diagram. The lower cutters are serrated, producing grooves in the wood, and the upper cutters, which are straight, cut off the grooved surface as the car descends, the resistance of these two sets of cutters being sufficient to arrest the car very quickly, but not so suddenly as to cause any shock.

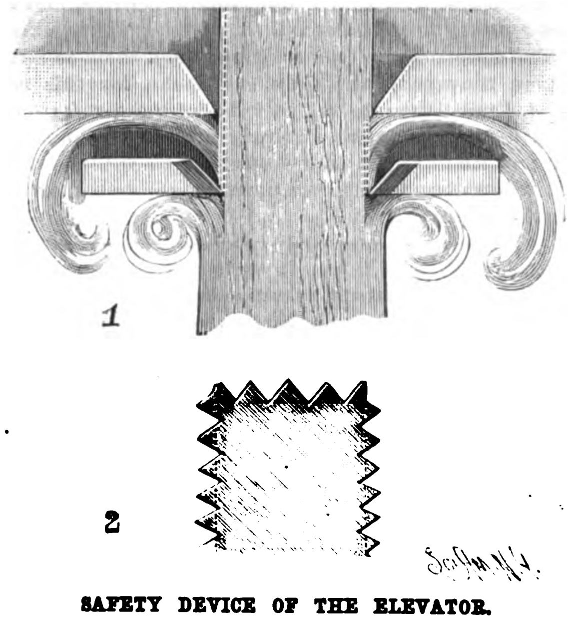
In the test of this safety device a car with a load of 36,000 pounds was released. The safety device arrested the motion of the car during a descent of 2⅞ inches. In another test, where the car was given a 12 inch headway, it was arrested by the safety device before it had fallen 19 inches.

The hydraulic pistons are operated by the combined action of the gravity of water and pressure exerted upon the column of water by an air cushion in the tank at the top of the tower. This tank is cylindrical in form, 78 inches in diameter and 40 feet long. It is made of half inch steel, and has a capacity of 10,000 gallons.

There is an auxiliary tank at the base of the tower, having a capacity of 1,200 gallons, which is 42 inches in diameter and 15 feet long. The auxiliary tank is little more than a huge air chamber. The riser which conveys the water to and from the tank above is 15 inches in diameter. Two Worthington compound pumping engines supply water under pressure to these tanks. The high and low pressure steam cylinders are respectively 16 and 29 inches in diameter; the water cylinders are 12 inches in diameter, and the stroke is 18 inches. These pumping engines each have a capacity of 1,000 gallons a minute. As there is generally a leakage of air from tanks and pipes, an air-pumping attachment is provided for each pump to maintain the air required for the cushion in the tanks. The boilers which supply these pumps are three in number, of the type known as the "Scotch" boiler. They are, in fact, like the boilers used on the ocean steamships, except as to size. They are each 9 feet in diameter and 12 feet long, made of 11/16 inch steel, with 36 inch corrugated steel furnaces. Of the three boilers mentioned, one is a reserve.

The pressure maintained in the upper tank is 100 pounds per square inch; this, added to the pressure due to the height of the column of water, makes a total of about 186 pounds of pressure per square inch exerted on the hydraulic pistons.

Each elevator has a capacity of 20,000 pounds raised 200 feet per minute; each car will carry 135 passengers, or a total of 400 passengers for each trip of the three cars. The average is 100 passengers per minute,



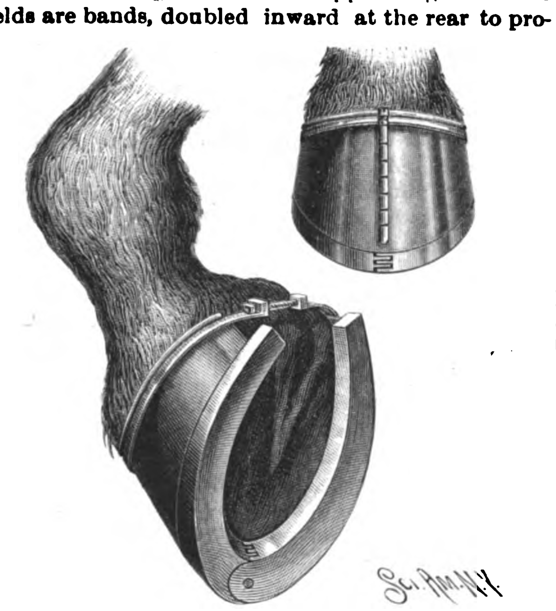
SAFETY DEVICE OF THE ELEVATOR.

or of 60,000 per day of ten hours, almost 150,000 in twenty-four hours.

These elevators are the largest in the world. The Mersey Tunnel passenger elevators are next in size. They have a lift of 70 to 80 feet, and carry about half the number of passengers.

A HORSE SHOE TO BE CLAMPED ON THE HOOF.

A simple form of shoe, which can be quickly clamped upon the hoof of a horse and as quickly removed, without the use of nails, is shown in the accompanying illustration. It has been patented by Mr. Joseph Broonett, No. 369 Nineteenth Street, Brooklyn, N. Y. The shoe is composed of two similar parts each shaped substantially like one-half of a common shoe, the parts being hinged together at the front. Secured to the upper edges of the parts are thin metallic shields, their shape approximating that of a horse's hoof, and formed at their front edges into interlocking knuckles through which a pintle is thrust to form the hinge, the shoe being thus made in two hinged parts which may be easily opened when it is to be placed on the horse's hoof. Extending around the upper edges of the shields are bands, doubled inward at the rear to project behind the heel of a horse, and terminating in flanges adapted to receive a clamping bolt. One of the flanges is screw-threaded, and in attaching the shoe the bolt is passed through one flange and screwed into the opposite flange, the shoe being firmly clamped upon the hoof by tightening the bolt. The hoof should be pared in the ordinary way to bring it to the desired shape before clamping on the shoe, which cannot become accidentally detached.



BROONETT'S HORSE SHOE.

Military Shields.

A committee of the French war office have reported in favor of a buckler of aluminum and copper. They think that a shield could be made out of this combination light enough to be carried without serious difficulty, and strong enough to stop even the modern rifle bullet, except at very close quarters. From a shield to a coat of mail would be but a short step, but it is not likely to be taken just yet. However light the new shield or armor might be, it would either increase the soldier's burden or necessitate the omission of some other part of his equipment, already reduced to the narrowest limits compatible with sustenance and a proper supply of ammunition. Extra weight would result in slower marching, an alternative not to be thought of in these days of rapid evolutions.

Preserving Autumn Leaves.

A few absolutely perfect leaves are better than the scores of common ones that we are tempted to collect. The leaves of the hard maple are always gorgeous in hue and delicate in outline. Those that wear the deepest tints of crimson or yellow are best for our purpose. Oak leaves are shiny and firm, and easily preserved. Nature has always been prodigal to the beech tree, scattering on her boughs the richest, brightest colors. The sumac glows with vivid crimson, and a clear amber shines through the dainty larch and chestnut leaves. Then there are the dull chocolate and mottled red of the blackberry vines, while the poplar and aspen shine out with a silvery white, all speckled over with touches of green. Gather these wild wood beauties, says *Good Housekeeping*, with as much care as would be bestowed upon a bouquet of garden blossoms, and hasten home with them before they begin to dry and curl. Upon reaching home let the first care be to have two hot irons ready. Cover the kitchen table with three or four layers of newspapers, over which fasten smoothly a soft cotton cloth. Have at hand a lump of beeswax, tied in a small bag, and a similar package of resin. Now smooth out a leaf with the hand, rub the beeswax lightly over the iron, letting the hot, smooth surface glide quickly over the leaf, first on the upper and then on the lower side, pressing a little more firmly a third and fourth time, until the leaf is thoroughly dry. The glowing colors will be firmly fixed, and will never fade, unless exposed to the sunshine. Having treated all the leaves in a similar manner, they are ready for the resin, or "the finishing process." With a moderately hot iron, which must be lightly and rapidly rubbed over the bag of resin, go over every leaf, first on the upper and then on the lower side. This gives them a brilliant, hard, glossy finish that makes them almost indestructible. Many persons complain that the glossy appearance is unnatural. While this is true, to some extent, yet the protection given by the coat of resin could be obtained in no other way. To preserve small branches, and boughs with leaves, one must proceed in the same manner, pressing the limbs and twigs with the iron until dry, being careful to avoid the point where the leaf is attached, as too much heat just there will cause it to drop off instantly. To achieve perfect success, be sure to take the leaves when freshly gathered. When the work has been finished, spread a number of newspapers upon the floor of some unused room, and there place the treasures. Give them plenty of space, so that they will not touch, or stick to each other. Cover them entirely with more papers, and let them remain in this cool, dark seclusion until ready to decorate the rooms, or otherwise use them as things of beauty and joy. Reserve a few of the brightest and more perfect specimens for the holiday times, when they will come out of their darkness so beautiful that they who see them will have no longing for summer flowers, but will revel in the unfading glories of the autumn leaves.—*Popular Gardening.*

Pathological Anatomy of Insanity.

Luys (*Jour. de Med. de Paris*, March 1) calls attention to an alteration that he has found in the brains of patients who had for many years been in an excited condition, viz., the hypertrophy of certain special regions of the paracentral lobules. The paracentral lobe is, as is well known, the point of confluence of the psycho-motor convolution of the cortex and one of the special regions where the psycho-motor innervations are specially accumulated. This hypertrophy therefore indicates a focus of continued excitation, absorbing to itself the vitality of the other cerebral regions, which are found more or less notably atrophied. In the extreme cases of excitement, with dementia, in which this condition was observed, he claims the subjects are completely absorbed in the hallucination or delusion connected with this hypertrophied region of the brain. The hypertrophy is usually symmetrical in the two hemispheres, but he presented the brain of a patient in whom there was a visceral hallucination that she was inhabited by a tape worm, which completely possessed her, that it became almost her sole idea. She dwelt constantly upon the coming and going of this parasite in her internal organs. Aside from this idea, when she could be induced to speak of other matters, she was perfectly lucid in her mind. The brain of this patient exhibited very marked hypertrophy of the paracentral lobe in one hemisphere, that of the other remaining perfectly normal. M. Luys explains by this anatomical arrangement the patient's clearness of mind coexisting with the delusion—she was insane with one hemisphere of her brain and rational with the other.—*Am. Jour. of Insanity.*

The Ascent and Discoveries on Mount St. Elias.

Last year it will be remembered that Prof. Isaac C. Russell, under the auspices of the National Geographical Society, with a corps of assistants, attempted to reach the summit of Mount St. Elias, Alaska. The exploring party, after many hardships and perilous adventures, were obliged to abandon their efforts to reach the summit of the mountain, because of the approach of winter. Last spring Prof. Russell, taking with him J. H. Crumback, Thomas P. Stamy, Thomas White, Neil McCarty, and Will C. Moore—men who had done considerable exploring in Olympia—and Frank G. Warner, of Hartford, Conn., started again with the expectation of scaling the St. Elias mountain and reaching its summit. The first four had accompanied the previous expedition.

Some apprehension has been felt latterly about the safety of the exploring party, it not having been heard from for several months, but tidings of their safety and arrival at Seattle are hailed with great rejoicing by the friends of the explorers. A telegram from Seattle to our daily papers gives a synopsis of Prof. Russell's experiences and discoveries in his effort to reach the summit of St. Elias. We are indebted to the New York *Sun* for the following account:

When the party reached Icy Bay and attempted to land, they met their first mishap. It was on June 16, and the waves were so high that one boat was swamped, and Moore, with Lieut. Robinson and four members of the Bear's crew, were drowned. With the exception of this mishap, all has gone well, and every one has been in good health. Some of the provisions and instruments went down with the ill-fated boat, but most of them were washed ashore later. The surf was so high that it took three days to make a landing.

Having reached the shore, the party started for the northern side of Mount St. Elias. One day's marching brought them to the snow line. For two months following they spent their time in the snow and ice, and for at least thirty nights they slept in the snow.

The rest of the time they found beds on the rocks of glacial moraines. Their clothing was woolen, and they were often drenched to the skin and slept without change of garments. Yet, in spite of all that, they never caught cold. Their food was carried in fifty-pound cases. An oil stove was used above the line of vegetation.

The first six weeks were spent in crossing the glaciers on the mountain's northern side, which offers the only possible route for ascent. Their highest camp was pitched 8,000 feet above the sea level, and they waited twelve days, hoping for an opportunity to reach the summit. They made several attempts, but each time were driven back by the snow. On one occasion they reached a point 14,500 feet above sea level, but, after twenty hours of incessant climbing, they had to take refuge again in camp utterly exhausted. At one time a storm came down when Prof. Russell was alone on the highest point, and for four days he was cut off from the rest of the party.

From their high elevation a grand view to the north was obtained over a country upon which human eye has never rested. They could take in a sweep of 300 miles from Mount Fairweather, 150 miles southeast to a point 150 miles northeast. The country in sight was about forty or fifty miles wide.

"It is a scene of utter desolation," said Prof. Russell; "a stretch of snow fields, glaciers, and ice, broken only by ice-capped peaks. The general altitude of the snow fields is some 800 feet above the sea level, and the mountains, which are innumerable, break through to an altitude of 10,000, 12,000, or even 14,000 feet. One of them, a singular table-topped peak fifty miles to the north, was named Bear Mountain, in honor of the government cutter which took us to Icy Bay."

Prof. Russell named several other peaks, but has not yet been able definitely to locate them on map. He made surveys to ascertain the height of Mount St. Elias from a three-mile base line at Icy Bay. He took angles to all the peaks in sight, and he placed the height of St. Elias at between 18,000 and 19,000 feet. He has not yet reduced his calculations so as to give the exact figures.

Considerable time was given to the study of the glaciers, one of the main objects of the trip. Many observations were taken of the great Mataspina glacier, which covers thousands of square miles southeast of St. Elias, between Icy Bay and Yakutat Bay. The St. Elias glaciers are much larger than any in Switzerland. Indeed, this one alone is larger than all the Alpine glaciers put together. The latter flow down through gorges till they reach the snow line, where they melt. Some of the St. Elias glaciers separate into smaller ones, but the great Mataspina glacier is made up by the confluence of four big glaciers and many smaller ones. They flow into it as water into a lake. These glacial streams unite into a vast plain of ice, hard, firm, and clear as ever found in glacier. The Mataspina glacier partly melts on the plain and partly breaking through to the coast and falls into the ocean. The thickness of the ice is estimated at from 1,500 to 2,000 feet.

A belt along the coast of from five to eight miles in width is covered with the moraine of broken and decomposed rocks, and the soil is ground out by glacial action. The outer three or four miles along the coast is overgrown with dense vegetation in which are found trees three feet in diameter. Though the soil is not more than two or three feet thick, there is plenty of moisture to furnish plant life of all kinds.

The party went inland thirty or forty miles, and returned by the same route. When they reached Icy Bay again they marched east 150 miles along the shore to Disenchantment Bay. This they explored and found to run thirty miles further than it is laid down on the maps. After stretching inland it turns, and the head is very near the ocean.

The government steamer Pinta took them to Sitka, where they took the City of Topeka for this city. Prof. Russell says the region is full of interest for scientific men, and work will undoubtedly be continued there. He does not know whether he will go again. He will remain in this city for a week or two, and then start for Washington.

Action of Metals, Salts, Acids, and Oxidizing Agents on India-Rubber.

The method adopted was to take a fine sheet of India-rubber spread on paper and vulcanized by the cold process with a mixture of chloride of sulphur and carbon bisulphide, and to examine the action on this of the various substances; on breaking the paper the fine sheet of caoutchouc was left free, so that its stretching properties could be examined.

Action of Metals.—The various metals whose action was studied were used in the form of filings sprinkled on the rubber. The whole was then kept at a temperature of 60° C. for ten days. Copper was found to have by far the most injurious action. Platinum, palladium, aluminum, and lead have a very slight action, but magnesium, zinc, cadmium, cobalt, nickel, iron, chromium, tin, arsenic, antimony, bismuth, silver, and gold have none.

Action of Metallic Salts and Oxides.—Saturated solutions were made in water and painted on small pieces of the rubber, or in the case of insoluble substances pastes were made with water and painted on, the whole being then allowed to dry. The heating was subsequently carried out as before. The following compounds of copper entirely destroyed the rubber: Sulphate, chloride, nitrate, ferro-cyanide, oxide, sulphide, also arsenic iodide, silver nitrate, strontium chlorate, vanadium chloride, manganese oxides, bismuth chloride. The following had an injurious effect: Ferrous nitrate, sodium nitrate, uranium nitrate, ammonium vanadate. The following had very little action: Lead chromate, ferrous sulphate, zinc acetate, zinc chloride, tin perchloride; while the behavior of about sixty salts having no action whatever was examined.

Exceedingly small quantities of copper salts are injurious to rubber, and it was found that wherever the cloth used in making proofed-cloths contained even traces of copper, the rubber became gradually hardened and destroyed. With reference to the use of the various blacks the authors point out that manganese oxides should not be present, but they assert that logwood chrome blacks may be used with impunity.

Action of Acids.—Very dilute solutions of hydrochloric, sulphuric, chromic, citric, or tartaric acid are stated not to be prejudicial, but nitric acid rapidly attacks rubber. A solution of sulphuric acid containing about 10 per cent of H_2SO_4 destroys the properties of the rubber.

Action of Hydrogen Peroxide.—Since ozone rapidly attacks India-rubber, and in view of the fact that chromic acid has only slight action, samples of rubber were placed in both acid and alkaline solutions of hydrogen peroxide for a month. Such treatment has no appreciable injurious action.—*W. Thomson and F. Lewis, Proc. Manchester Lit. and Phil. Soc.*

Sewage Experiments at Frankfort-on-Main.

The experiments here recorded have been carried out during the past three years, at the Frankfort works, under the supervision of a commission consisting of Dr. Spiess, Mr. Lindley, Dr. Libbertz, and B. Lepsius. Certain of the results obtained have been already published, and an account of the work is there given. In all eight series of experiments have been conducted, with five different systems of clarification. The various processes investigated were as follows:

(*a.*) Precipitation of sulphate of alumina and lime. Series I. to III.

(*b*) Precipitation with lime alone. Series IV.

(*c.*) Simple deposition, without chemicals. Series V.

(*d.*) Precipitation with sulphate of iron and lime. Series VI. and VII.

(*e.*) Precipitation with phosphoric acid and lime. Series VIII.

The volume of sewage dealt with was about 30,000 cubic meters (6,600,000 gallons) per diem, and upward of 1,000 complete and comprehensive analyses were carried out.

In its mean composition the Frankfort sewage, though considerable fluctuations were observed, does not differ materially from that of other towns, London Paris, Dantzig, Berlin, and Breslau, with which it is contrasted in a special table. By means of a set of graphic diagrams are shown the results of the various purification processes, as evidenced by the character of the effluent as compared with the raw sewage, and the author sums up the general effect of the different modes of treatment. In all cases the suspended matters were far more efficiently dealt with than those in solution, and the appearance of the sewage water, as tested by the eye alone, was greatly improved.

In dealing with the amount of organic matter present, special consideration is given to the phosphoric acid treatment, and a graphic diagram is appended to show the proportion of the phosphates removed at each different stage of the process, and carried off in the effluent. From this it appears that though all the added phosphoric acid is expended in enriching the sludge, the amount of phosphoric acid present in the deposit from untreated sewage is nearly twice as great as is that in the sludge from the phosphate process. The figures in milligrammes per liter are as follows:

Phosphoric Acid Originally Present.

1. In raw sewage	67·4
2. Added to secure precipitate	17·6
Total	85·0

Phosphoric Acid After Treatment.

1. In deposit in sand chamber	29·4
2. In sludge	17·4
3. In effluent	38·2
Total	85·0

Hence, instead of securing a sludge valuable for agriculture, more than twice the quantity of the phosphoric acid employed for the precipitation is carried away in the effluent, viz., 38·2 milligrammes per liter, of which about half is in suspension and half in solution. The author points out that from this point of view it would be better not to treat the sewage with phosphate of lime at all, but to clarify it by simple deposition, and then to add the phosphate to the sludge.

In conclusion, it is stated that the experiments have demonstrated that the effect of chemical precipitation is not so greatly superior to the purification obtained by simple deposition in tanks as to warrant the adoption of any of the above processes in preference to simple mechanical treatment. This, of course, does not hold good for sewage treatment generally, but it applies only to the conditions prevalent in the present works. It is proved, however, that in every case where tanks approaching the dimensions of those at Frankfort are available, more especially where the length of the tanks is equally great, it is possible to obtain, by purely mechanical means, results comparing favorably with the clarification attained elsewhere in tanks of smaller size only by means of chemical treatment, and therefore at a greater cost.

The Glacial Period.

Before the Technical Society of the Pacific Coast, San Francisco, Marsden Manson, engineer of the harbor commission, lately advanced a theory to account for the formation of the glacial period.

As a basis for his theory, he laid down this general law, as he called it: A terrestrial sphere, in passing from under the influence of interplanetary heat to the influence of solar heat, must experience a glacial period, because of the remarkable properties under different degrees of heat and cold possessed by water.

The earth was once a ball of fire. As it began to cool, a crust formed, and the air around the earth began to be cooled. This caused the aqueous vapor in the air to form water. But the internal heat of the planet was still intense, and an immense radiation of heat and a corresponding condensation of vapor arising from the seas went on constantly. Solar heat had not yet penetrated the cold atmosphere between the sun and the earth. As the heat of the earth decreased, the condensation of vapor surrounding the earth as fog and cloud increased, until layer after layer of condensed vapor surrounded the planet. Successive ice shells were formed, and as the earth grew colder these ice shells came nearer the earth, and finally shrunk down to it. Then the glacial period was on the earth. But the heat of the planet now ceasing to affect its crust, there was no more vaporizing going on. All was ice and snow; the mists and vapors were cleared away. Then the sun had a good chance, and it was not long before his rays pierced through the ether to the ice-bound earth. The ice began to melt, and the glacial period began to decline. When it was over, the earth's crust had passed under the influence of solar heat, and the seasons began.

THE plumber who deliberately puts imperfect work in the hidden parts of a house, and thus exposes a family to disease and death, is as much a criminal as any burglar or murderer. He knows that the diffusion of poisonous gases destroys health and imperils life, and when he deliberately leaves hidden vents in plumbing for sewer gas to carry its deadly fumes into homes, he is a criminal and should be treated and punished as a criminal.—*Sanitary News.*

Iron Ore.

Census Bulletin 113, in relation to iron ore, prepared by Mr. John Birkinbine, special agent, under the supervision of Dr. David T. Day, special agent in charge of the Division of Mines and Mining of the Census Office, shows the quantity of iron ore produced in the United States during the year 1889 to be 14,518,041 long tons, valued at $33,351,978, an average of $2.30 per ton. The total product reported in 1880 was 7,120,362 long tons, valued at $23,156,957. Of the twenty-six States and two Territories producing iron ore in 1889 the four leading ones are as follows: Michigan, 5,856,169 tons; Alabama, 1,570,319 tons; Pennsylvania, 1,560,234 tons; and New York, 1,247,537 tons, aggregating 10,234,259 tons, or 70·49 per cent of the total product. The number of employes engaged in mining iron ore was 37,707, who were paid in wages $13,880,108. The capital invested was $109,766,199, distributed as follows: Land, $78,474,881; buildings, fixtures, etc., $7,673,520; tools, implements, etc., $8,045,545; cash and stock on hand, $15,572,253. The report shows a remarkable increase in production and activity. The average wages paid to laborers in 1889 was $1.29 per day; to boys, 62 cents.

In the total cost of producing iron ore Alabama is the only State which averages less than $1 per ton, viz., 82 cents. Next in order of low cost come Texas, $1.05; Tennessee, $1.08; Pennsylvania, $1.10; Georgia and North Carolina, $1.14. In Colorado, for reasons before given, the cost of producing one long ton of ore, $3.49, is greater than in any other State.

Probably in no country has the transportation of iron ore assumed such proportions as in the United States.

To get facilities for cheaply handling Lake Superior ores the railroads which penetrate the various districts have constructed expensive terminal facilities, generally consisting of one or more docks, with the railroad tracks elevated from thirty-five to forty-seven and one-half feet above the water level, the sides of the docks being fitted with pockets, into which the ore from the cars is dumped by means of drop bottoms. From these pockets the ore is loaded into vessels by iron chutes, which are let down into the vessel's hold. In this manner the ore is never handled from the time it leaves the mine until it is shoveled into buckets when the vessel is being discharged at lower lake ports, and no manual labor is necessary other than poking the ore with poles from the cars into the bin and from the bin into the chutes, and in some cases but little of this is required.

The total investment for docks especially built and equipped for handling and shipping iron ore approximated $4,000,000 in the year 1889.

The largest of the receiving ore docks is at Fairport, Ohio, which has a frontage one mile in length, with room for stocking ore extending back 180 to 350 feet in width. The two docks at Cleveland are one-half mile in length, with a storage capacity of 350 feet wide. The capacity of the three docks named will reach from 1,000,000 to 1,500,000 long tons each, as the ore is stored from 25 to 50 feet in height.

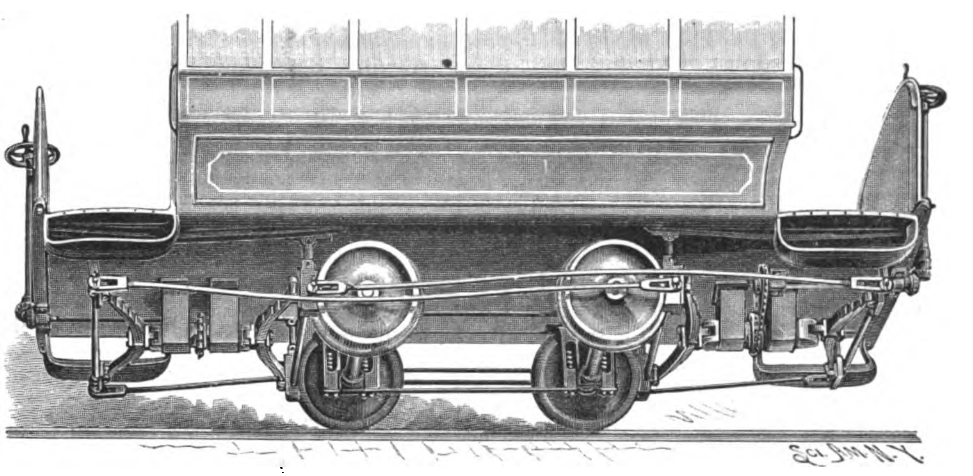
The ore from the Lake Superior region, when loaded into cars, occupies from 10 to 16 cubic feet for one long ton.

The machinery equipment of the various docks differs greatly, but five general types may be mentioned: (1) swing-boom derricks, operated either with engines placed on them or driven by wire rope from engines at a distance, the mast being either stationary or carried on trolleys; the iron buckets being lowered into the holds of vessels, where the navvies shovel the ore into them, the steam machinery raising the buckets and swinging the boom to the point where the ore is to be deposited; (2) a similar arrangement of swing-boom derricks, which discharge into hoppers and from these into tram cars, which carry the ore from the ore dock to stock piles located at a considerable distance from the water; (3) an A frame which lifts with the buckets and discharges them into tram cars, that run to the stock pile or dump into pockets and thence into cars; (4) aprons which project over the holds of vessels; the buckets traveling up the incline of this apparatus are dumped into tram cars, which run by gravity, discharge, and return automatically; (5) booms or aprons upon which the buckets are carried, and continue their journey either over cables or on trussed bridges, the buckets dumping automatically at the point desired and returning to the hold without detaching from the machinery.

These dock equipments have been put up at great expense, some of the docks costing, equipped, over $800,000, and by them it has been possible to handle quantities of ore which could not be moved in any other way, while the cost of such handling has been reduced to a minimum. The expense of shoveling the ore into buckets in the holds of vessels varies from 10 to 15 cents per long ton, while with the improved apparatus at some of the docks this ore is lifted from the vessel, carried back 850 feet, and dumped at a total cost, including the labor, wear and tear, interest, and fuel account, of from three-fourths to one and one-half cents per ton. With twenty-one men in the hold of a vessel carrying 2,000 long tons of iron ore, the entire cargo has been stocked in seventeen hours. Other instances are mentioned where with twenty-eight men 2,900 long tons were similarly handled in fifteen hours, and 2,100 long tons were handled by eighteen men in seventeen hours. In using these improved apparatus in loading from stock piles to railroad cars it is not uncommon to have a gang of men shoveling into buckets and load the ore on cars at the rate of eight or nine tons per man per hour.

AN IMPROVED SCREW SAFETY CAR BRAKE.

The accompanying illustration represents this improvement as applied to a four-wheel electric motor car, giving all the space between the wheels for motors. It is a patented invention of Messrs. A. B. Pool and J. J. Beals, of Boston, Mass., and affords a new departure from the old system of dead leverage, substituting therefor a live spring pressure. A right and left screw with traveling nuts thereon is hung to the car as shown, to which is attached two half elliptic springs at either end of the nuts, the springs having friction rolls at their ends and being pivoted to the nuts so as to conform to any position of the brake beams. Opposite the springs are placed sub-beams, to which draught rods are attached connecting with the brake beams. Sprocket wheels are placed at the center of the screws and are connected with corresponding wheels hung to the car by chain belts, the wheels having a shaft connection geared to the operating rod, by the working of which the springs are spread and a perfect equality of pressure is obtained upon all the wheels. Either end is worked independent of the other, or both together if need be, the proper application of the brake not only doing away with flat wheels, but overcoming the momentum of the car in the shortest possible time. This device is designed to be simple, durable and inexpensive, and when once adjusted will remain in position until the shoes are worn out, requiring no pawl or ratchet to hold it. It can be set at a certain pressure on a down grade, and will so remain without any attention of the motor man, and the power can be applied to or taken off the car by the same handle and at the same time that the brake is operated, but little power being required to do the work. The inventors have perfected this system for application not only to any kind of street car, but, by a simple method of air pressure, to steam trains as well. It is expected that the system will soon be given a practical demonstration on the West End Railway, Boston.



POOL & BEALS' SCREW SAFETY CAR BRAKE.

For further information relative to this improvement address the inventors, No. 16 Hanover Street, Boston, Mass.

The Uses of Peat.

The *Handels Museum* publishes an extract from an article by Dr. Leo Pribyl, who maintains that peat is a valuable raw material, the uses of which, except as fuel and litter, are as yet very limited. The fiber is unsurpassed as a packing material for use in the case of breakable merchandise, being much superior to straw, hay, etc., owing to its greater elasticity and dryness. In the case of consignments consisting of liquids, it possesses the advantage of being peculiarly adapted for absorbing any of the contents which may have escaped through breakage, and thus preventing damage which might result to other consignments through damp. In the shape of dust and litter it is especially adapted for preserving perishable articles. Meat when packed in it will keep fresh for weeks, and will eventually dry up, the moisture being absorbed by the peat. In this way fresh sea fish has been sent from Trieste to Copenhagen, and has reached its destination in perfect condition. Peat is also successfully used for preserving fresh fruit; even grapes may be made to retain their fresh appearance for months, and, owing to the high prices of this fruit in spring and summer, would amply repay the trifling expense incurred by the use of peat dust. Experiments have shown equally satisfactory results in the case of pears, apples, plums, etc., as also in the case of cabbage, turnips, and potatoes, peat packing having the advantage, not observable with other packing materials, of preventing the sprouting of potatoes in spring. The question as to the best method of preserving eggs for the winter months is an important one, and still remains without any satisfactory answer. Possibly the preservative qualities of peat might here again be illustrated, and a satisfactory solution of this important question be arrived at.

It has been found a drawback in the use of artificial saline manure that in wet weather it forms itself into hard lumps, which cannot be scattered by the manure-spreading machines, a difficulty which may be obviated by the use of a small quantity (2·5 per cent has been found to be sufficient in the case of kainite) of peat dust with the manuring salt.

As a substitute for ashes and straw in filling up the partition walls of cellars and ice houses, broken peat is most suitable, as the effect of moisture on the ashes or straw is such as to render their immediate removal a necessary condition for the continued use of such places. Ice has been preserved for eight days in a cement barrel when covered with dry peat litter. Two pieces of ice were exposed to the sun's rays in Braunschweig; one of them was covered with wood shavings and the other with a layer of equal depth of peat litter. The former had thawed in 72 hours, when it was found that the latter was still almost entire. From this it is seen that peat is a bad conductor of heat, and is consequently well adapted for isolating purposes.

Peat dust has been recommended as an excellent ingredient for use in the manufacture of light, porous bricks, being mixed with the clay previously to baking. Bricks of this kind are much sought after in certain branches of architecture. But still further industrial uses are found for peat. The peat bogs of Northern Germany and of Sweden are being worked by joint stock companies, with a view to obtaining the elastic fiber, which, when free from dust, is used for weaving into carpets and other textile fabrics. Considerable capital is invested in these undertakings in Oldenburg and Sweden. The paper industry, too, in the manufacture of peat cellulose, has shown a decided preference for this tender and pliant fiber, so that it may be justly said that at the present time the supply of good peat is inadequate to meet the demand, considering the varied uses of this unpretentious raw material.

The chemical industry is using peat in the manufacture of charcoal, peat coke, peat gas, etc., thus converting a cheap raw material into a valuable industrial product. Boghead naphtha, tar, solar oil, paraffine, acetic acid, and gas have been produced from peat, and it has even been used in tanning. It has been for years used in Germany for absorbing waste liquids and refuse in factories, and in this way has furnished large quantities of valuable manure in certain districts.

An enumeration of the manifold uses of peat will prove that this raw material, which has hitherto been considered of little importance, and which nature has provided in such abundance, even if it be in many districts partially distributed, is destined not only to benefit agriculture by its valuable properties and chemical composition, but to lay the foundation of a flourishing and widespread industry. A new era has been entered upon in the sanitation of towns by using peat, and it is to be hoped that advantage will be taken of the undoubted benefit arising from its use, both as regards the health of urban populations and the promotion of agricultural interests by the supply of large quantities of manure. In this way extensive and unproductive tracts of bog land would be converted into valuable properties, and a flourishing industry would provide work and wages for thousands of hands.—*Jour. Soc. Chem. Industry.*

A PATENTED process for obtaining cellulose and oxalic acid from the vegetable fibers contained in wood, which is the invention of M. Liefchutz, consists in reacting on wood with dilute nitric acid, in the presence of sulphuric acid, separating the intermediate product from the acid liquor, which contains in solution the oxalic acid formed, and subjecting the intermediate product to a further treatment to remove the remaining incrusting matters from the cellulose. As to the acid liquor, it is set aside and subsequently treated in a process for recovering the oxalic acid. The oxalic acid dissolved in the weak nitric acid can be obtained direct in the crystalline form, by repeatedly using the separated acid liquors for the treatment of fresh wood. —*Bull. Fab. Papier.*

RECENTLY PATENTED INVENTIONS.

Railway Appliances.

CAR COUPLING.—Henry C. Bugg and Edward B. Loomis, Memphis, Tenn. Combined with the drawhead and coupling pin of the ordinary type is a crank rod mounted across the end of the car, and having a forwardly projecting bent arm, the outer end of which is connected to the pin, while a spring catch on the car engages the crank arm when it is raised. This forms a simple lifter for the pin, to be operated from either side of the car, while another transverse crank rod has a forwardly extending arm terminating in a lifting plate beneath the drawhead, the plate being adapted to readily engage a link to guide it into the drawhead, the whole forming a simple device to facilitate the coupling of cars without endangering the safety of the trainmen.

CAR COUPLING. — Hamlin G. Russell, Lincoln, Ill. (deceased, David Gillespie, Lewis J. Sims, and Lydia A. Russell, executors). The drawhead of this device is pivoted in a housing, to which are secured springs engaging the drawhead, which has a hook-like extension or nose on one side, while a coupling hook is pivoted in the opposite side, a spring secured to the hook engaging the drawhead. The device is designed to be of simple and durable construction, capable of an automatic coupling action, and of being quickly and readily uncoupled from the top or sides of the car, while the connection made is a yielding adjustable one, the springs performing the double functions of draw and buffer springs.

CAR COUPLING.—William H. Violett, Grand Junction, Col. The drawhead of this coupling may be of the ordinary form, the device permitting automatic coupling and the uncoupling of the cars without the brakeman going between them, while there is also an auxiliary pin support which does not operate except when the pin is raised without withdrawing the link. This provision is made for cases where it is desirable to so adjust the coupling pins of a train that, when the cars are bumped or pushed together, they will become uncoupled when the engine pulls out.

VENTILATING CARS.— Albert Minnick, Colton, Cal. This invention is more particularly designed to provide means for ventilating cars used for transporting fruits, vegetables, meats, fish, etc., the improvement consisting in the peculiar construction and arrangement of sliding doors moving over openings in the end of the car. Both inner and outer doors are provided for the openings, to prevent the contents of the car from freezing when the weather is cold, and the arrangement is such as to prevent all choking of the parts by cinders and gripping and binding from wet weather, while both the inner and outer doors can be quickly and easily adjusted as desired.

CAR TRUCK. — Ferdinand E. Canda, New York City. Instead of the body of the car being carried from the center of the truck bolsters, as heretofore, this invention provides for having the car body suspended by an improved form of stirrups carried by the car truck and struts attached to the car bolster. The truck is swiveled on a king bolt, but no part of the weight of the car or its load is carried in the center of the truck, the entire load being carried on the four side bearings or stirrups of each truck. The construction is such that the trucks adjust themselves readily to the curves of the road and the irregularities of the track, at the same time acting as equalizers to the body and avoiding shocks common to the ordinary trucks.

SPIKE.—Charles D. Walcott, Russia, Herkimer County, N. Y. This is a special form of spike designed to hold a rail firmly in place to give greater resistance to lateral pressure and vertical vibratory motion, while being easily made. The body of the spike is round in cross section, but on one side are two projecting ribs, opposite which is a third rib, preventing the spike from turning as it is driven. The head has a lip of the ordinary form of the standard railroad spike, and the point is beveled off or curved on the same side as the lip of the head.

Mechanical Appliances.

JACK FOR REPAIRING MACHINES.— George W. Crouse, Lexington, N. C. This jack consists of two screw rods arranged in line with each other and mounted to turn in heads held adjustably on a table or bench, one of the screw rods having a fixed clamp adapted to engage one end of the bed plate or other portion of the machine being operated on, while the other end of the part being repaired is held by a clamp turning loosely on the second screw rod. This jack is very simple in construction and is more especially designed for conveniently examining, taking apart, cleaning and repairing sewing machines and similar machinery.

PEGGING JACK. — George Dorwart, Philadelphia, Pa. This invention covers a novel construction and combination of parts to facilitate the fastening of the boots or shoes on the jack, and bringing the work into the most convenient position for the operator, while it also has an extensible toe piece to enable the shoes to be clamped firmly in position without injuring them, the toe piece adjusting itself to the various movements of the shoe while the work is going on in such manner as to prevent the uppers from being scraped or otherwise injured.

SCREW PRESS. — Theodore J. Ashby and Archibald D. Melton, Sebree, Ky. This invention relates to that class of presses in which the plunger is carried upon a screw shaft, providing therefor a novel combination and arrangement of parts, constituting a simple, cheap, and efficient mechanism for reciprocating the plunger.

SAW SET. — Jacob P. Beck, Lock Haven, Pa. This is a simple device which may be used to set any kind of saw, and can be operated with great rapidity. It has parallel jaws with projecting teeth, curved arms being fixed to each jaw and pivoted together, while lateral levers are pivoted to the opposite ends of the arms, the levers having their inner ends pivoted together and their outer ends provided with handles. Pawls extending parallel with the sides of the jaws correct the alignment of the teeth of the set and of the saw and prevent endwise slip of the set.

THROAT PIECE FOR SAWS.—Thomas B. Deniston, Peru, Ind. This is an improvement for use on sawing tables or stands used in connection with scroll and band or jigger saws for cutting out ornamental or bracket work, sawing out the centers of sewing machine tables, etc. It is a yielding throat piece standing not lower than or a little above the top of the saw table, and capable of remaining as close to the working saw as if the latter were still; when depressed to a level with the top of the saw table by the weight of the piece being sawed, it will have an automatic backward and forward movement due to the rake or pitch of the saw.

Agricultural.

SULKY CULTIVATOR.—John F. Taylor, West Park, N. Y. This cultivator is more especially designed for the cultivation of grapevines, being adapted to effectually break the ground close to and between the vines and the posts. It has laterally swinging auxiliary cultivator frames pivoted at their forward ends to the outer sides of the main frame, which has pivoted swinging levers connected by links with the swinging frames, whereby the teeth or plows may be quickly and conveniently adjusted to or from the main frame and will be firmly held in both the outer and the inner positions.

Miscellaneous.

CARTRIDGE LOADER. — Willis E. Phillips, Saguache, Col. This is a simple and rapidly operated machine, comprising a box having compartments below which is an apertured slide, in combination with an operating lever adapted to engage opposite ends of the slide, a spring-pressed follower, a plunger, and other novel features. The machine is designed to deliver a required charge of powder and shot into a shell, and also insert the wads between the powder and shot and over the shot. The cartridge is completely loaded by two strokes of the lever, there being one thin wad and two thick wads placed on the powder and only a thin wad upon the shot.

ORDNANCE BRAKE.—Johannes Krone, Essen, Germany. This is an improved form of hydraulic brake, of simple and durable construction, designed to offer a uniform resistance on the ordnance on recoil, while it permits of withdrawing the fluid, on the firing of the ordnance, at the back end of the cylinder. The recoil of the piece of ordnance is received by a part of the brake that is movable with the top carriage, and works with a fixed cylinder a movable piston and with a fixed piston a movable cylinder, the invention consisting of a tube arranged in the brake cylinder to change the area of the passage or escapement connecting one side of the piston with the other.

SHIP'S PUMP. — Albert H. Lowell, Woodford's, Me. This invention provides a pump designed to be set in operation by the movement of a ship, being automatic in its action, as the vessel pitches fore and aft, while it can also be readily set to operate when the vessel has a side roll only. The sucker rods are connected to the outer extremity of horizontal arms attached to a ball centrally seated in a cylindrical socket, and depending centrally from the ball is a pendulum rod carrying at its lower end a weight, the pendulum being set in motion by the rocking of the vessel, and thus operating the arms and sucker rods. Spring buffer plates are arranged to prevent the too violent motion of the pendulum.

PIPE JOINT.—Patrick Brown, Philadelphia, Pa. This invention provides a joint for steam, water, oil and other pipes, which will allow for the free expansion or contraction of the pipes, and for their axial rotation without strain upon the joint. The engaging end of one pipe has an enlarged screw-threaded chamber and a concave seat, while the other pipe has an outer flange to fit within the chamber, a washer back of the flange fitting the concave seat, and a fibrous packing back of the washer, and a nut inclosing the washer and packing has a screw thread engaging the screw thread on the chambered portion of the adjacent pipe, an inner back flange being constructed to hug the flanged pipe in rear of the packing.

LUMBER PILING MACHINE. — Howard Daniels, Greenville, S. C. This is a machine for piling lumber on cars preparatory to being dried in a kiln or otherwise, and has a main frame adapted to receive a car, and on which travels a vertically movable frame with supports to receive the lumber, with a raking device to rake the boards off the supports and place them on the car, spacing strips being placed between the different layers. The machine can be regulated to suit the capacity of a mill, and is so constructed as to quickly and evenly pile the lumber, depositing the separating strips in a uniform manner, while only requiring the attendance of a single operator.

MECHANICAL ALARM.—Laban Lewis, Canadensis, Pa. This is a device which automatically fires cartridges at stated intervals during the day or night, for scaring persons and animals away from fields, gardens, houses, etc. It consists of a wheel mounted to turn and provided with a series of barrels arranged in a circle and adapted to receive cartridges, while a hammer actuated by clock work fires the cartridges successively at such periods as have been previously determined upon, and for which the apparatus has been set.

STAND FOR TYPE CASES. — Robert Mercer, St. John's, Newfoundland. This is a foldable stand for printers' cases so made that the cases may be readily adjusted to any desired angle or inclination, and the stand itself raised or lowered to suit compositors seated or standing, or workmen of different heights. It has pivoted folding legs and a vertically adjustable rail carried by one of the legs, while a frame pivoted to the rear leg rests on the rail of the front leg, the upper face of the frame having inclined planes. The stand has no offsets likely to interfere with a compositor while at work or while passing by the stand, and the construction is designed to be very simple, strong and durable.

NEWSPAPER HOLDER. — William C. Roberts, Sausalito Cal. A device composed preferably of wire, in combination with a suitable support, is provided by this invention, the holder portion being of such shape that it may be styled a hand. A hooked arm or brace projects outward from the support, whereby the angles of the fingers may be changed as desired, the whole forming a simple and readily adjustable device to hold a newspaper or book in position for reading when a person may have both hands occupied as when eating, knitting or doing many kinds of work.

REED ORGAN.—William E. Leighton, West Pembroke, Me. Combined with a series of reed chambers, each having an upper and lower row of reed cells alternately arranged, is a vertical valve stem for each series of cells, and horizontal keys or levers along which the lower ends of the valve stems are adjustable. By this improvement the reed cells are fully covered by the reed valves to prevent leakage of wind, and the reed chamb rs may be constructed to take up the least possible space.

WATCH JEWEL HOLDER. — Frank R. Cunningham, Ware, Mass. This is a simple tool for grasping and holding the jewels of watches while being cleaned, and consists of a bar of wood bored transversely and slotted at one end to form spring jaws, a strap extending from one jaw to the other and being connected with an eccentric lever for drawing the jaws together.

RUBBER SHOE. — James A. Brittain, Leadville, Col. This shoe is patented as an improved article of manufacture, and has, around the upper edge of the usual foot opening, a continuous or endless metal spring embedded within the material. The spring serves to stiffen and strengthen this part of the shoe, insuring a close yet elastic fit, preventing the tearing of the rubber down the sides of the shoe, and doing away with the necessity of using the ordinary steel shank.

COLLAR AND NECKTIE HOLDER. — George F. Carruthers, Winnipeg, Canada. This is a simple holder which can be readily attached to a shirt at the back for retaining the collar and necktie in proper position. It consists of a base plate having a stud at its upper end and a safety pin at its lower end, while there is a curved spring tongue between the stud and the safety pin, the tongue being struck up from the material of the plate.

* HANDLE BAR FOR BICYCLES. — William J. Matern, Bloomington, Ill. Ordinarily the handle bars of safety bicycles are perfectly rigid, so that the vibrations tire the hands and arms in riding over rough roads. This invention provides a handle bar which will yield vertically, and not jolt the hands and arms, and when lifted upon by the hands, as is usually done by the rider in going up hill, will be as rigid as the ordinary bar. This improved handle bar is made of flat spring metal, with a supplemental strip or spring clamped to its upper side.

ROLLING CHAIR AND CHILD'S CARRIAGE.—Albert Rudolph, New York City. This is a combination device in which two leg frames on wheels are pivoted to spread or fold, while a back frame is pivoted between and held adjustably on one leg frame, a seat frame being pivoted to the back frame, a foot rest hinged to the front of the seat frame, and a prop frame is provided. The improvement is designed to afford a compact, light, strong, and shapely construction, which may be quickly converted into a child's carriage or a rolling chair for an invalid, and be folded in small space when not in use.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention and date of this paper.

NEW BOOKS AND PUBLICATIONS.

A MANUAL OF THE STEAM ENGINE. For engineers and technical schools. Advanced courses. Part 1. Structure and theory. By Robert H. Thurston. New York: John Wiley. 1891. Pp. xx, 871. Price $7.50.

Professor Thurston's idea of an advanced course in engineering is certainly a very high one, as is evidenced by the magnitude of the first volume now under review. It is enough to say that the structure, philosophy and thermodynamics of the steam engine in practice and the ideal one are very elaborately developed, with tables and formulæ.

A COURSE OF EXPERIMENTS IN PHYSICAL MEASUREMENT. Part IV. By Harold Whiting, Ph.D. Boston: D. C. Heath & Co. 1891. Pp. 901 to 1226.

This volume brings to a close Dr. Whiting's excellent work, the preceding portions of which we have already reviewed in these columns. The fourth part is designed for the teacher, and contains appendices and examples for his use. Thus the first chapter gives notes on the construction of a student's laboratory and the care of the instruments, Dr. Whiting's principles appearing in directing a practical working system, rather than minute care of the instruments. Students' note books, report forms of experiments, an exhaustive list of experiments, with statement of apparatus required for each one, the doctrine of averages and of probable errors, are among the salient topics. In many respects this will appear the best volume of the series. Its index, of nearly 33 pages in extent, is a feature worthy of all commendation.

MASSAGE PRIMER. By Sarah E. Post, M.D. Pp. 51. New York: The Nightingale Publishing Co. 1891. Second edition. Price $1.

This work treats of the technique of massage and is written as a primer for nurses. The text is elucidated by photoplates and engravings illustrative of the different processes of massage. A series of questions on the text closes the work, making it convenient for use in training schools.

PHYSIOGRAPHY. By J. Spencer, B.Sc., F.C.S. London: Percival & Co. 1891. Pp. vii, 229. Price $1.

In its brief compass this work covers a wide range of subjects, from matter and its properties, through mechanics, physics, geology, meteorology, to geographical science. It is designed for use by a specified department of the English educational system, and although cast for so definite a horizon, should meet with some acceptance here.

PHILLIPS NEWSPAPER RATE BOOK. The John F. Phillips Advertising Co., New York, N. Y. 1891. Pp. 180.

The principal papers of the United State and Canada are described seriatim under the cities of their publication. The data given includes day of publication, date of establishment, subscription price, circulation, size, width of column, length of column, rates for advertisers and address. All these particulars and similar ones as fully as possible are given for the different journals. It is obviously a convenient manual for the publisher and advertiser.

THE SEXTANT AND OTHER REFLECTING MATHEMATICAL INSTRUMENTS. By F. R. Brainard, U. S. Navy. New York: D. Van Nostrand Company. 1891. Pp. 120. Price 50 cents.

To engineering students preparing for hydrographic work, as well as to those interested in navigation, this little manual will, we believe, be thoroughly acceptable. With its limitations as to accuracy, the sextant fills a field which for many years to come it will probably hold against all comers, and a manual devoted to it and allied instruments is very welcome.

HOW TO BECOME AN ENGINEER. By George W. Plympton, Am. Soc. C.E. New York: D. Van Nostrand Company. 1891. Pp. 218. Price 50 cents.

The question answered in this work is very frequently propounded by young aspirants, and Professor Plympton has done real service in producing this convenient manual. His own long course of training in preparing young men in the profession gives him a peculiar authority in the field of the book. He shows what is required here and abroad, and gives a thoroughly practical view of the difficulties to be overcome before success is attained.

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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.

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.

(3575) I. M. S. asks for a red and black copying ink. A. Red copying ink.—Dissolve 50 parts extract of logwood in a mortar in 750 parts distilled water without the aid of heat; add 2 parts chromate of potassium and set aside. After twenty-four hours add a solution of 8 parts oxalic acid, 20 parts oxalate of ammonium and 40 parts sulphate of aluminum in 200 parts distilled water, and again set aside for twenty-four hours. Now raise it once to boiling in a bright copper kettle, add 50 parts of vinegar, and after cooling fill into bottles and cork. After a fortnight decant. This ink is red in thin layers, writes red, gives excellent copies in brownish color, and turns blackish brown upon the paper. Black copying ink.—1. The quality required of a copying ink is that it shall afford one or more copies of the written matter by applying dry or damped paper to its surface, and subjecting it to more or less pressure. The best kinds of copying ink are usually prepared by adding a little alum to an extract of logwood of 10° B., 1·075 sp. gr., or to a decoction of the same, and then to improve its copying power some sugar and glycerine or table salt is added. Such inks have a violet tint, are purple when first written, and gradually darken on the paper. The copies taken from them are at first very pale, and only slowly darken. 2. Mix about 3 pints jet black writing ink and 1 pint glycerine. This, if used on glazed paper, will not dry for hours, and will yield one or two fair, neat, dry copies, by simple pressure of the hand in any good letter copy book. The writing should not be excessively fine, nor the strokes uneven or heavy. To prevent setting off, the leaves after copying should be removed by blotting paper. The copies and the originals are neater than when water is used. From "Scientific American Cyclopedia of Receipts, Notes and Queries." In press.

(3576) D. W. asks if the statement is true as to the frequent falling of Cayuga Lake to such an extent as 50 feet. A. We referred the matter to an esteemed correspondent who resides near Lake Cayuga, and his reply is as follows: So far as those who have lived, for years, about the neighborhood, and on the shores of the lake, are aware, there is no foundation for the story reported by the paper from which the slip is taken. Many houses on the border of the lake are at the water's edge and none has yet been known to be swamped. The city of Ithaca is on the bottom lands at its head, and, in the times of spring freshets, is on a level, in many parts, with the surface of the head of the lake; it has never suffered the fate of Atlantis, and no apprehensions are felt for the immediate future. The lake is deep (435 feet) and cold, and this fact may account for its retention of its prey, as stated, if that be a fact, which we doubt. No living inhabitant has yet seen the bottom of the lake laid bare. The records of Cornell University contain no accounts of such marvels as are described, and that institution has a constant altitude of four hundred feet above Cayuga's waters. The small rise and fall actually occurring in either Cayuga or Seneca Lake is simply that due the greater or less magnitude of the streams in times of freshets and in times of drouth.

(3577) J. R. H. asks for the best method of keeping cider sweet and drinkable. A. The following is from the "Scientific American Cyclopedia of Receipts, Notes and Queries." In press. A pure, sweet cider is only obtainable from clean, sound fruit, and the fruit should therefore be carefully examined and wiped before grinding. Add ⅛ to ¼ of an ounce of calcium sulphite to each gallon of cider in the cask, first mixing the powder in about a quart of the cider, then pouring it back into the cask, and giving the latter a thorough shaking. After standing bunged several days to allow the sulphite to exert its full action, the cider may be bottled off. The sulphite of calcium (which should not be mistaken for the sulphate of calcium) is a commercial article, costing about 20 to 25 cents a pound. The sulphite will preserve the sweetness of the cider, but unless care is taken not to add too much, it will impart a slight sulphurous taste to the cider. The bottles and corks used should be perfectly clean, and the corks wired down.

(3578) A. W. writes: I would like to inquire in regard to the use of copper in the valleys of a roof, instead of tin. I am building a house and am disposed to have something more durable than tin in the valleys, but some persons suggest to me that the water from a copper roof would be unwholesome and unfit for drinking. Now I can't imagine what there is in the water or air that will form a poisonous compound, and therefore wish to avail myself of your superior knowledge and experience. I expect also to place a tank of about 20 barrels capacity in the attic, lined with lead, and would like your views also in regard to the use of water from that, for drinking and cooking. A. Avoid the use of copper and of lead in connection with drinking water. Salts of both metals are formed, which are soluble in water and are poisonous. Let your copper valley plates be tinned. The metal lining of your water tank also should be tinned.

(3579) A. S. R. writes: Please tell me the formula for a good paste for mounting photographs that will keep without souring.

A.	Arrowroot	10 parts.
	Water	100 "
	Gelatine	1 "
	Alcohol	10 "

Soak gelatine in the water, add the arrowroot, which has been thoroughly mixed with a small quantity of the water, and boil four or five minutes. After cooling add a few drops of carbolic acid or oil of cloves.

(3580) G. A. S. asks: How shall I prevent frost from gathering on my outside office window? The house is new and well made. The windows are tight. The room is 10 feet square. It is lighted by two large 4 light windows. The outside windows are screwed on and made reasonably tight. Now, here is what I can't understand. While the north window will remain almost entirely free from frost the winter through, the east window is almost as uniformly covered with frost. A. Not being able to inspect the local details of leakage through the double windows, we can only assume that the dry westerly and northerly winds of winter press against the westerly and northerly side of the house. The leakage of the cold dry air in on this side prevents excess of moisture between the window glasses, and consequently they are free from frost, while for the east window the leakage of the warm moist air is outward, filling the space between the glasses with moisture, which on contact with the cold outer glass covers it with frost.

(3581) N. C. H. asks: Will you please let me know the best way to keep a quantity of American cheese for a number of years, that has been made this year, so as to keep it in its natural condition? A. Cheese should be kept in a dry cool room in boxes through the winter, so as to allow of drying. In the spring and summer the cheeses should be rubbed at least once a month with soft clean tallow, assuming that the cheese comes from the dairy in prime order. Another way is to seal them in tin boxes during dry cold weather, when they will require no further care.

(3582) F. H. C. writes: I have a sail whose height is 14 feet on mast, 20 feet on boom and 8 feet on gaff. The jib is 16 by 8½. Also topsail contains 6 square yards light sheeting. The mainsail and jib are 8 ounce duck. Please state what proportion I had better take to drawing. I would like to know how to restore checked varnish on a mandolin? It does not peel off, just cracks. Please name the best oil for keeping inside of gun barrels from rusting. A. Your sails will be right if you build the ice boat on a scale of ½ inch to 1 foot from the drawing in SUPPLEMENT, No. 624. You can only revarnish the mandolin. You cannot remove the cracks without scraping the old varnish off. Use vaseline for the inside of your gun.

(3583) H. R. K. asks the speed at which nuts can be punched, ¼ inch U. S. S. Hex., ½ inch U. S. S. Hex., and 1 inch U. S. S. Hex. And also quote papers or books where the subject is treated, so that I can get at the cost of punching, tapping, finishing, and casehardening. A. You will find some valuable experiments in punching iron in SCIENTIFIC AMERICAN SUPPLEMENT, No. 68. The speed for punching nuts is only limited by the strength of the punch. We have no books on the subject.

(3584) C. A. H. writes: There is a span of say 500 feet over which a wire is placed, fastened at both sides of the span. This is supposed to be straight. Now if a weight of say 10 pounds is hung at the center, causing a deflection of two feet, what will be the strain on each or both supports? I should like to know how this is worked out approximately. A. The formula for the weight on a stretched line is figured as follows: $\frac{250 \text{ feet}}{2 \text{ feet}} = 125$, which is the tangent of the greater angle. The tangent of 125 is 89° 32′. The strain on the line = one half the weight × secant of angle, which for 89° 32′ = 122·78 × 10 = $\frac{1227{\cdot}8}{2}$ = 618 pounds.

(3585) P. H. J. asks how to fill a crack on the top of the oven of a cook stove. That is, what mixture to use, that can be applied, and which will withstand heat? A. A good cement for stove cracks is made by mixing into stiff putty with water:

Wood ashes	10 parts.
Clay	10 "
Quick lime	4 "

(3586) W. B. D. asks: Is there any way of preventing excessive perspiration of machinist's hands and the consequent injury to steel tools? A. We know of no suitable means of preventing perspiration. Can only recommend wiping and oiling the tools.

(3587) E. B. D. writes: 1. About two or three years ago I saw an article, I believe in the SCIENTIFIC AMERICAN, which explained how one could determine the points of compass by means of a watch held so that the sun might shine on some particular point on the circumference of the dial (the point depending upon the time), and the diameter across the dial from 12 to 6 o'clock would then be in the line from north to south. Will you kindly explain in your Notes and Queries column how this can be done? A. When the hour hand of the watch is pointed to the sun, the south will be on a radial line of the dial half way between the hour hand and XII on the dial. This is only approximate for our latitude. 2. Please give directions for making a sun dial. A. You will find a sun dial described in SUPPLEMENT, No. 259.

(3588) A. M. B. asks for receipts for black writing inks. A. 1. An exceedingly fine ink is said to produced by the following recipe: 11 parts galls, 2 parts green vitriol, one-seventh part indigo solution and 33 parts of water. Writing executed with this ink may, it is true, be removed by means of dilute acids, but it may be rendered visible again by chemical means. 2. Arnold's Writing Fluid.—This writing fluid is a mixture of sulphate of indigo and ordinary ink. It flows freely from the pen and at last becomes very black. 3. Aniline Black Ink.—Concentrated solution of borax, 1 part; shellac, 4 parts; boil; add aniline black.

(3589) G. J. E. writes: Can you tell me of a preparation that is inexpensive for staining stone any desired color? That will not wash off. A. We have seen samples of white marble tiles stained in ornamental figures and polished. We suppose the staining is done with aniline colors.

(3590) H. C. K. asks what to mix or use with a potter's clay on cellar bottom while rolling it to make it hard. A. Use Portland or best hydraulic cement 1 part to 2 parts clay. Pulverize the clay dry and mix thoroughly with the cement, then wet with water just enough to make the mixture spread, and roll quickly and smooth with a shovel or trowel.

(3591) L. W. B. asks for match composition. A. The following is one of the best receipts for composition match tips without phosphorus. It is the same as that used in preparing the well known U. and P. matches and does not require a separate rubber or prepared surface:

Potassium chlorate	28 oz.
Manganese, black oxide	25 "
Potassium bichromate	20 "
Lead cyanide	20 "
Antimony oxysulphide	20 "
Glass powder	4 "

These substances are first powdered separately and then gradually mixed into a solution of 1 lb. gum in 4 lb. water, to form a thick, smooth paste; with this paste the dry wood splinters are tipped, and after about eighteen hours' exposure to the air in a drying room, kept at about 80° Fah., the matches are ready for boxing. To render the matches non-absorbent of moisture or waterproof, they are momentarily dipped into a liquid composed of:

Shellac, best white	1 lb.
Alcohol, or wood naphtha	1 qt.

digested together in a closed vessel for several days with occasional agitation, then strained through fine linen cloth. Use red lead to color.

(3592) N. S. F. asks: 1. In construction of Mr. Hopkins' telescope, in what respect is a meniscus better than a double or plano-convex lens? A. The meniscus lens gives a flatter field than the convex. 2. I thought of using a "cosmorama" lens, such as is sold for about $1.50; 3 to 4 in. diameter, 48 to 60 in. focus. Would double convex or plano-convex be best? A. A plano-convex lens will be preferable, but neither of them would be very efficient as a telescope objective. 3. How would a 4 in. by 60 in. telescope with such a lens compare as an astronomical with an ordinary spyglass with 1¼ in. objective? A. We think that an ordinary spyglass with a good achromatic inch and a half objective would be preferable. 4. What would be the best combination for a celestial eyepiece for above mentioned lens? A. For information on celestial eyepieces, we refer you to an article on "Telescopes for Amateurs" in SUPPLEMENT, No. 252. 5. How would a double concave eye lens answer with such an objective? A. A double concave eye lens would answer very well with a common plano-convex or meniscus lens as an eyepiece, as it has necessarily a very low power, but with a good telescope objective it is of no value. 6. Could the eyepiece of an ordinary spyglass be separated, and either the eye or field combination of the two lenses be used as a celestial? A. Yes.

(3593) L. W. asks how to make a preparation which applied to leather will dry quick and leave a hard coating and elastic? A. Dissolve shellac in a saturated solution of borax and water. The solution is effected very slowly, and to accomplish it, it is necessary to allow the ingredients to stand for several days, occasionally shaking them. When the shellac is entirely dissolved, add fine bone black until the blacking has sufficient body to cover well. If the blacking is too thick, it can be thinned with the borax solution.

(3594) G. W. W. asks: Can you inform me through your Notes and Queries column of a method of determining the displacement of small sail boats from drawings or plans of same? Also whether the water line can be accurately ascertained by calculation, and rule for same. A. There are rules for computing the displacement from the drawings. In general terms they require the water line to be assumed on the drawing, and below this line compute each cross section as many as laid out on the drawing. Add all the areas together and divide by their number, which will give a mean. If in inches, should be divided by 144 for feet; multiply the mean area in square feet by the length on the water line in feet, which equals the displacement in cubic feet, which multiply by 62½ and divide by 2,000 for net tons. The actual weight of the boat subtracted from the displacement gives the tonnage at the assumed water line. The water line can be computed by approximating the actual weight of the material in the boat and the required tonnage to the corresponding displacement computations.

(3595) F. R. C. says: A considerable body of solder, composed of lead and tin, rather more lead, which it is necessary to keep at a reddish heat for hours together, yields up a yellowish power which rises to the surface. What is this powder? Can it be reduced to metallic state again? If so, how? A. The yellow powder is the oxide of lead, with a possible mixture of the oxide of tin. It can be reduced to the metallic state by mixing with pulverized charcoal, placing in a crucible and heating to a red heat; stir the mass and pour off the lead.

(3596) E. D. C. asks: Can you refer us to a receipt for making type-writing ribbons that will copy? A. Melt vaseline on a water bath or slow fire, and incorporate by constant stirring as much lamp black or powdered drop black as it will take up without becoming granular. If the fat remains in excess, the print is liable to have a greasy outline; if the color is in excess, the print will not be clear. Remove the mixture from the fire, and while it is cooling mix equal parts of petroleum, benzine and rectified oil of turpentine, in which dissolve the fatty ink, introduced in small portions by constant agitation. The volatile solvents should be in such quantity that the fluid ink is of the consistence of fresh oil paint. One secret of success lies in the proper application of the ink to the ribbon. Apply the ink, after agitation, by means of a soft brush, and rub it well into the interstices of the ribbon with a tooth brush. Hardly any ink should remain visible on the surface. For colored inks use Prussian blue, red lead, etc., and especially the aniline colors.

Aniline black	½ oz.
Pure alcohol	15 "
Concentrated glycerine	15 "

Dissolve the aniline black in the alcohol, and add the glycerine. Ink as before.

(3597) J. S. L. asks: How much of the force that is expended in starting a piston and crosshead from one end to the center of the cylinder, is given out again in stopping the same from the center to the other end of the cylinder? A. All the force put into the piston is given out in stopping, save the friction.

(3598) T. T. says: I wish to know whether in looking at any particular object from 2½ miles up to 4 miles on a clear day, what kind of a glass is the best in the world, the binocular telescope or the spy glass? Are imported field and spy glasses, also binocular telescopes better than ones made in this country? In looking at any particular object, 25 miles distant, can a person see as plainly with the best binocular telescope as he could with the best spy glass? A. Binoculars are made for the convenience of light and perspective and for more exact judgment of distance. They are used for military and other special purposes, and not of great power. For their size they should define as well as the best spy glass or more properly telescopes of their size. The binocular field glasses are mostly imported and are considered first class. If you want fine definition and power for distant objects, the larger telescopes of from 2 to 3 feet in length are the best suited for the purpose.

(3599) F. C. P. asks: 1. I have a brass tube 1¼ inch diameter, 9 or 10 inches long; if I fit a piece of wood on each end, can I wind it for an induction coil, or would it be better to start winding on a very thin cylinder of wood and fill the brass tube with soft iron wires for a helix (I think that is the name of the inner rod). What size wire to use on the inner winding, and how many layers, also on the outside? What size wire, and must I put any insulation between the primary and secondary, or simply wind one over the other? A. A brass tube will not answer as a foundation for an induction coil, because it will absorb the energy which should pass into the secondary wires. Better use wood or rubber for the spool. Use for the primary wire 2 layers of No. 16 magnet wire. For the secondary wire, 8 or 10 layers of No. 36 magnet wire. 2. How do I get high amperage on this coil? A. What you gain in voltage you lose in amperage in an induction coil. If you secure a high amperage, you must expect a low voltage. 3. Must I insulate each layer of wire, or will the cotton covering do? A. It is well to put a thickness of paper between the layers. 4. Have you a SUPPLEMENT that fully describes induction coil winding and mounting, what number? A. For information on induction coils we refer you to SUPPLEMENT, No. 229. 5. If I make a camera of wood and use a pin hole lens, must it be set at an angle to the face of the plate or perfectly square? A. The surface in which the pinhole is made should be parallel with the plate. 6. Have you a SUPPLEMENT describing a small camera, both wood and bellows? A. For instruction on making camera bellows we refer you to SUPPLEMENT, No. 625. The only SUPPLEMENTS we have on cameras are No. 746, machine camera, panoramic camera, No. 507, photographic gun, Nos. 332, 336.

Enquiries to be Answered.

The following enquiries have been sent in by some of our subscribers, and doubtless others of our readers will take pleasure in answering them. The *number* of the enquiry should head the reply.

(3600) J. S. writes: Will you please give the following problem to your readers, requesting an arithmetical or algebraic solution of it? A. B and C are points on a straight line and ten miles apart; *m* is at A and *n* at B; *n* starts at 7 A. M. to go to C and travels at the rate of one mile per hour, arriving at 5 P. M.; *m* starts after *n* at 7 A. M., catches him and turns back, reaching B at 5 P. M., having also traveled just ten hours. Where was *n* when *m* caught him? Or how far and at what speed did *m* travel?

TO INVENTORS.

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