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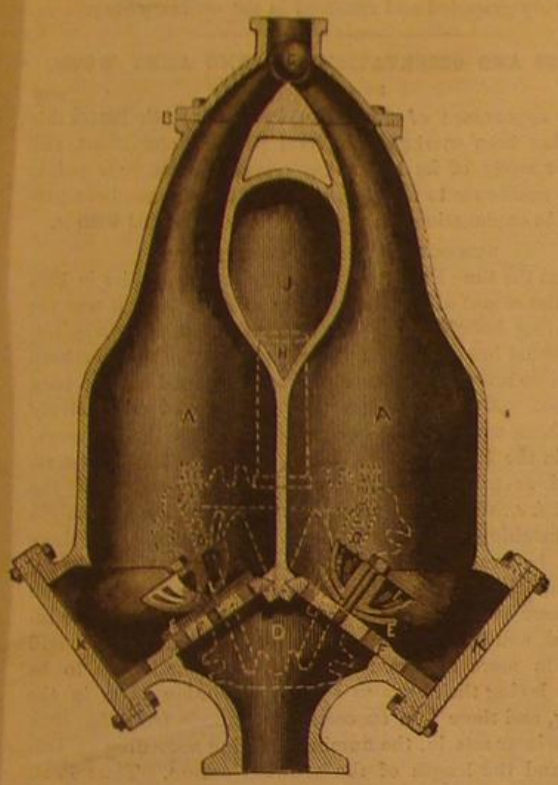

FIG. 1.—SECTIONAL VIEW.

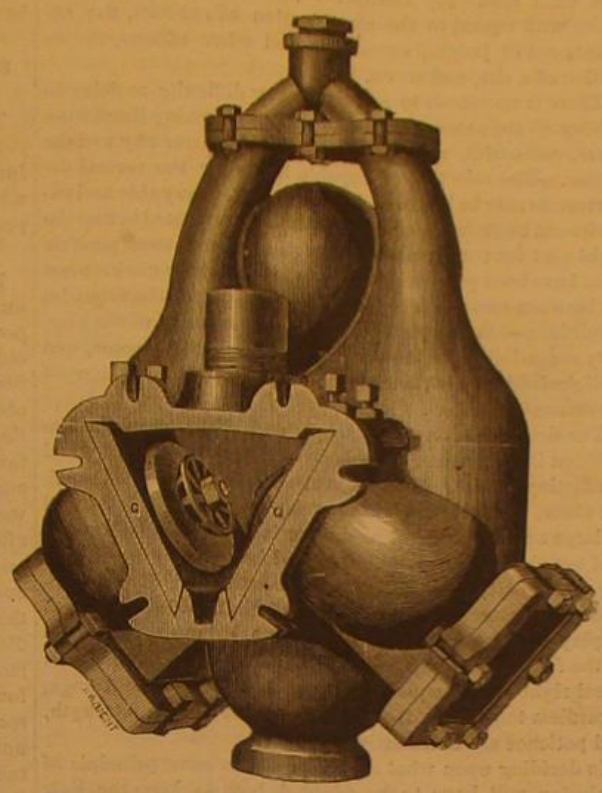

FIG. 2.—SHOWING DISCHARGE CHAMBER WITH COVER REMOVED.

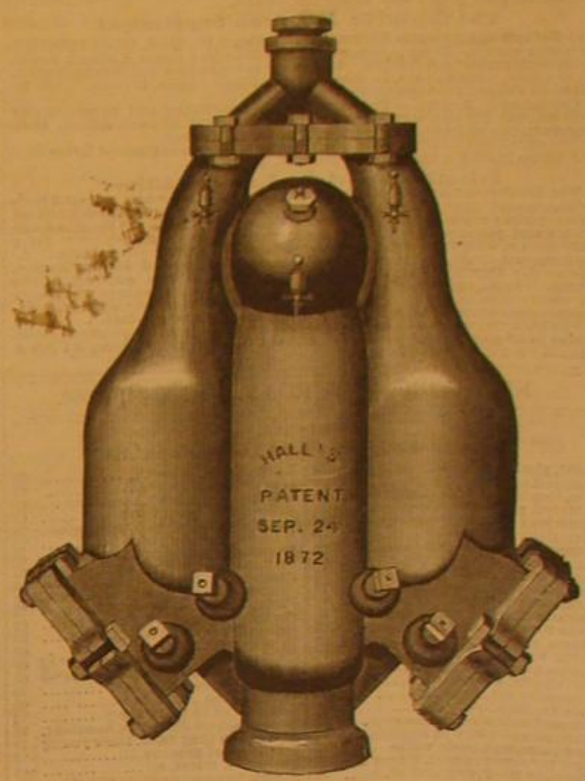

FIG. 3.—FRONT VIEW.

MANUFACTURE OF PULSOMETER PUMPS.—PULSOMETER STEAM PUMP COMPANY, NEW YORK.—[See page 69.]

Scientific American.

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NEW YORK, SATURDAY, JULY 31, 1880.

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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT
No. 289,
For the Week ending July 31, 1880.
Price 10 cents. For sale by all newsdealers.

THE WORLD'S FAIR OF 1883.

The Secretary of State has appointed August 10 for the first meeting, in this city, of the Commissioners of the proposed International Exhibition. The resident commissioners held a meeting July 13, to appoint committees to arrange for the general meeting. The main purpose of the meeting of August 10 will be to form a temporary organization of the commission, and to provide for the opening of books of subscription for the capital stock, as required by act of Congress. The capital stock is fixed at $12,000,000, and $1,000,000 must be subscribed and $100,000 paid in before any further steps can be taken.

The subscription books are to be kept open sixty days; then the commissioners will reassemble for the election of permanent officers. The first meeting of the shareholders will be called at the same time, to elect *from their number* a committee of finance, to consist of twenty-five members. Not until then—say October 11, next—can any action be taken with regard to the classification of exhibits, the appointment of judges, examiners, and other officers, the selection of a site, and so on.

There is no reason to anticipate any difficulty or delay in raising all the money needed to make the coming Exhibition great, successful, and entirely creditable to our city and the nation. The selection of capable heads for the several departments may be less easy, but among our many able and experienced business men it ought *not to* be very hard to find the right man for every place. Though a dozen or more possible sites have been proposed, it is obvious that the choice must lie between two or three which alone present the requisite conditions—ample space, nearness to the heart of the city, easy accessibility by land and water, high, wholesome, and well drained ground, and suitability for the reception of permanent buildings.

The determination of the scope and character of the Exhibition involves many problems of a serious, delicate, and conflicting nature. What is wanted is not the biggest possible show, but the best. It must be understandable as well as large and inviting. The danger is that it will be too big and too chaotic to be intelligible, and bewildering because of the multiplicity of indistinguishable exhibits. Every exhibitor will naturally want to show all that he has to sell, to display the magnitude of his own establishment, regardless of the fact that twenty other men in the same line have an equal right and an equal desire to show the same things; regardless too of the fact that the visitor's time, strength, and patience are necessarily limited.

In deciding upon what should be shown some principle of exclusion will have to be adopted, both to keep the Fair within reasonable bounds and to secure a proper classification of exhibits; and it might be well at the outset to rule out, so far as possible, everything, however worthy, if it cannot show or illustrate an advance upon what was exhibited at Philadelphia, either in the article itself or the method of its production. If this should threaten the exclusion of many staple products of high commercial importance, provision might be made for them in special representative collections, to show in a compact and intelligible way the best the country has to offer in each department, rather than a succession of bewildering displays in which substantially the same articles are endlessly repeated. In a word, the spirit of the naturalist, more than that of the showman or advertiser, should govern the choice and classification of exhibits. It must be borne in mind that in a cosmopolitan city like New York, with its many magnificent shops and warehouses, the visitor can see on all sides, and in every department of trade and industry, displays of the world's best products, which for bulk and variety are unapproachable in any world's fair. To attempt to compete with Broadway on that score would only challenge belittling criticism and failure. The visitor to a stated exhibition of universal scope has time to see, and desires to see, only what is newest and best in each department. Everything else obscures and wearies. And, so far at least as America is concerned, one decade of progress furnishes enough in every department of human activity to stock a creditable world's fair.

THE REMOVAL OF DIAMOND REEF, NEW YORK HARBOR.

After eleven years of persistent work the four acre obstruction to the commerce of our harbor, known as Diamond Reef, has been entirely cleared away, so as to give over the whole area a depth of twenty-six feet of water at low tide.

The reef was first attacked over twenty years ago, but no substantial progress was made toward its removal until the invention of General Newton's steam drilling scow, after the improvement of the East River channel was undertaken by the United States Government.

An extended description of the work was given in the SCIENTIFIC AMERICAN just a year ago, with a number of illustrations showing the construction of the Government drilling scow and the methods of using it in submarine mining. Thanks to the efficiency and economy of this invention, and the saving effected by the system of deep water hydraulic mining, introduced by General Stone during the past year, the great work has been carried out at a cost far below that of any similar work elsewhere.

The reef was composed in part of hard rock, but mainly of a compact deposit of glacial clay, sand, and bowlders, firmly cemented together. At first the drilling scow was employed in blasting off the projecting points and edges of the rock, so as to secure a channel of moderate depth over all the reef. *Latterly a system of face blasting has been carried out*, to insure a complete removal of all the rock down to the required depth, the fragments dislodged being raised by grappling. To remove the bowlder drift a different process was found necessary. *Though not so hard as rock* the cemented drift was more troublesome, the drill bars glancing on the hard bowlders, and the exploding charges of dynamite blowing out without greatly disrupting the body of the reef. To meet these difficulties General Stone devised his system of hydraulic *mining under water. By means of* powerful streams of water from a force pump, one stream being directed against the face of the reef, the other turned in the opposite direction so as to cause a strong current to carry away through a pipe the earth and stones stirred up by the first stream, it was found comparatively easy to wash away rapidly the lighter materials of the reef and convey them into deep water. The heavier bowlders were at the same time detached from the glacial clay and sand, so as to be readily grappled and removed in the ordinary way.

NOTES AND OBSERVATIONS ON THE ARMY WORM.

BY C. V. RILEY.

The appearance of this insect in the Atlantic States this year has been marked by several peculiar conditions, and further study of its habits has revealed some new points which enable me to recast the theories which have been proposed in explanation of the phenomena connected with it.

NUMBER OF ANNUAL GENERATIONS.

From the time Fitch wrote so fully on the species in 1861 until the record of my observations made in 1876, it was the prevailing belief among entomologists that there was but one annual brood of the species, especially in the Northern States, no absolute evidence of a second brood having been obtained. My experiments that year proved conclusively that there were always two, and sometimes three, generations in the latitude of St. Louis. The fact that I also recorded as to the remarkably rapid development of the worm, *i. e.*, that it can reach full growth within a fortnight after hatching, lent favor to the idea, in my mind, that there might be even more generations. Subsequent experience, and especially that of the present year, has convinced me that there is usually one other generation in the latitude indicated, and it is but natural to suppose that there are still more in more Southern latitudes. The moths are to be found laying their eggs as soon as vegetation starts in the spring, and there is a succession of broods from that time until winter sets in, the number differing according to latitude and the length of the growing season. Thus Prof. Comstock reports it as having been received at the Department of Agriculture in the larva state during every month of the past winter, from the Southern States, where, during the mild weather, it was active and injurious to oats and other grain.

There is no doubt that the prevailing theory of its single-broodedness was a result merely of the fact that it is observed in excessive numbers only once during the year, and usually when wheat is just about ripening. But, as I showed in my Missouri Reports (Eighth and Ninth), the worm is always to be found both earlier and later in the season, and attracts no attention at such times because living in its normal cut-worm condition.

HOW THE INSECT HIBERNATES.

In my previous discussions of this subject I have been led to conclude that the insect might hibernate in any one of the four stages of egg, larva, chrysalis, or moth, the evidence then at hand pointing to the chrysalis state as the more normal mode of hibernation in the northern regions, and the moth or imago state in the southern regions. With present light, and especially with the experience of this year, I am led to revise my opinions materially, and to believe that, as in the case of so many of our ordinary cutworms, the by far more common mode of hibernating is in the larva state. That the insect does hibernate in the larva state is now an established fact, based not only upon the experience just cited from Prof. Comstock, but upon the finding by Prof. S. A. Forbes of a partly grown larva in the stomach of a blue-bird as early as March the 9th, at Normal, Ill., or before vegetation could have fairly started.

The belief is further confirmed by the lateness of the season in which I have found the worms, and by the finding of the chrysalis and breeding of the moth by Mr. Meske, at Albany, N. Y., about the middle of May.* We have absolute evidence, therefore, of the hibernation as larva and as a moth; but none of hibernation either in the egg or chrysalis state, though presumptive evidence of the latter.

We are slow in getting at the simple truths in respect to many of our most common insects, because the original observers are so few compared to those who write fluently and copiously at second hand, and can, of course, never add to our knowledge of the facts. The fact of larval hibernation established, gives us at once a better explanation than we have hitherto had of many experiences with the insect. We can, for instance, at once see why the worm will be less disastrous in fields or meadows that have been burned over, and also at once account for the frequent freshness of the moths that are captured in early spring—a fact attested by many, and especially insisted on by Prof. Thomas from his experience the present spring, as narrated to me.

THE DESTRUCTIVE GENERATION PROBABLY NOT THE FIRST OF THE SEASON.

The hibernation of the larva being admitted, it follows, in

*Cited in the 8th Missouri Report, p. 44.

my mind, that the injurious brood will be that succeeding the hibernating one; *i. e.*, the resultant from the moths which the hibernating larvæ produce. Passing the winter, in different sizes, under the shelter of matted leaves, in unpastured meadows in grass fields, and in grain fields sown in the autumn, these worms will go through their transformations and produce moths soon after vegetation starts. The moths will show little tendency to leave the fields where they were bred, but will lay their eggs in such fields, and under favorable conditions their issue may, as during the present year, become so abundant as to be obliged to travel therefrom when approaching full growth.

There are some other interesting questions, as the relation of wet and dry weather to army worm increase, etc., which I will present in a future article.

MORE OIL TANKS FIRED BY LIGHTNING.

On the 14th of July a terrible storm with thunder and lightning passed over the neighborhood of Bradford, Pa., and as usual quite a number of oil tanks were struck and their contents burned. Property to the amount of half a million dollars is reported as having been destroyed. One stroke of lightning fired a 25,000 bbl. iron tank full of oil, at Custer City, near Bradford, belonging to the United Pipe Lines. Another large tank at Kansas Branch was struck and burned. Tank 367, containing 25,000 bbls., on Lewis Run, was also struck and burned.

At Coleville, a 250 bbl. tank was struck and burned, the flames spreading to other tanks. At Kendall Creek, two wells were struck and 600 bbls. oil consumed. At Sawyer City a well was struck and 250 bbls. oil destroyed. At Red Rock two oil rigs and 100 bbls. oil were struck and burned. The burning oil from the Custer City tank spread to adjoining tanks and great destruction of property ensued. This is a sad catalogue for one storm.

We recently called attention to the remarkable fact that lightning seems to make a special selection of oil tanks as objects for destruction. Almost every thunderstorm that sweeps over the Pennsylvania oil regions sets oil in a blaze somewhere; but up to the present time no observation seems to have shown exactly how these conflagrations are induced or what the remedy is.

We have heretofore presented two theories: 1. That the light hydro-carbon vapors from the oil, rising high in the air above the tank, form a conductor which the lightning follows into the tank and ignites the gas. (See SCIENTIFIC AMERICAN of July 3d and 17th.) 2. That the lightning strikes or is discharged from the iron supply pipe of the tank, at a greater or less distance from the latter, whereby a spark is induced within the tank, between the supply pipe and the iron casing of the tank. The most minute spark of electricity thus appearing in the tank would set fire to the oil, as the end of the supply pipe terminates above the oil, in an atmosphere of highly inflammable gas. If this theory is correct, and it looks reasonable, one remedy would consist in making an electrical connection between the oil supply pipe and the iron casing of the tank. This can readily be done by means of half a dozen short pieces of wires, or strips of copper, the respective ends of the copper being soldered to the outside of the iron casing of the tank and to the exterior of the supply pipe. It might be supposed that if the iron supply pipe is in contact with the iron casing of the pipe, no further connection would be necessary, which is very true. But if there is rust, or a film of oil, between the pipe and the casing, then the contact would not be perfect, a spark might result, and the gas be set on fire. We therefore advise tank owners to make use of soldered connections, done in the most thorough manner as we have indicated.

It is alleged that the use of lightning rods, arranged on masts near the oil tanks, has proved ineffectual. But we have seen no particulars of the manner in which such rods are grounded. If their terminals were simply stuck down a few feet into dry earth—which is the way most of the good-for-nothing rods are arranged—then of course no protection could be expected. If their terminals were soldered to iron underground pipes which were directly connected with the tanks, the protection might be secured.

The value of any lightning rod as a protector chiefly depends upon its being well grounded, or in other words thoroughly connected with the earth. One of the best groundings for a lightning rod is an iron water or gas pipe, which extends for a long distance underground, and thus affords an extensive conducting surface between the rod and the earth. The bottom of the rod should be soldered to such iron pipe.

THE AMERICAN CHEMICAL SOCIETY.

The June conversazione of the society was held with Dr. C. F. Chandler, at the School of Mines, Columbia College, New York, on Thursday evening, June 20.

A large attendance answered Dr. Chandler's invitation, and a pleasant time was spent examining a number of new additions to the Chemical Museum of the School of Mines.

Among the most interesting of the objects exhibited was a collection of the celebrated Arita porcelain from Japan. This material is true porcelain, made by the admixture of two natural clays found in Japan, without any preparation or other material. It is susceptible of being worked into the most delicate and artistic forms, and is decorated with all the beautiful and curious skill so characteristic of the Japanese.

Dr. Chandler explained the elaborate fittings recently put into the chemical lecture-room of the School of Mines for experiments with the electric light. These are so arranged that the room is lighted with two electric lamps suspended from the ceiling and inclosed in opal glass globes; while by means of an ingeniously devised switch at the side of the lecture table, these lamps can be thrown out of the electric circuit, and at the same instant the current is diverted to the experimental lantern to project objects upon the screen. The advantage of this arrangement is that the sudden change from the electric light of the experimental lantern to gaslight, as ordinarily arranged for lecture rooms, is obviated, and there is no sudden strain upon the eyes.

The electricity is obtained from a Wallace dynamo-electric machine, located in the engine room of the school, which machine is driven at a speed of about eight hundred revolutions per minute. Eight wires run from the different parts of the machine to the switch board in the chemical lecture room, thus giving the means of throwing out or using any desired combination of parts.

With the lantern Dr. Chandler made a number of experiments in spectrum analysis, showing the lines of silver, copper, zinc, and the reversing of the sodium line. He also showed the effect of the change of form in the slit of the lantern, by using Dr. Henry Morton's admirable contrivance to form round disks, circles, and zigzag lines of the spectrum on the screen.

Some examples of the beautiful artotype process of photo-printing were exhibited, and much admired for their near approach to ordinary fine photographs, experts only being able to detect that they are printed.

A very fine and large photograph of Lanyumantel's picture of the arrest of Lavoisier by the officers of the French Revolution, was much admired.

Among a number of other minor objects exhibited were some old hand blocks used in calico printing. Dr. Chandler said he had visited a print works where he found a cord of such blocks stored away among some rubbish, and he secured some of them as relics of a process which is rapidly becoming obsolete, being superseded by the more modern process of machine printing.

STATEN ISLAND AND OYSTERS.

From the log or bark canoe, that once carried the savages, to the commodious and elegant steamers of to-day, is a great step. Yet such is the change since 1524, when Giovanni Verazzano entered New York Bay, and now, when we can take a steamer down the harbor to Staten Island, and back again through Raritan Bay, Staten Island Sound, Kill von Kull, and Newark Bay.

A visitor at the foot of Charles and Tenth streets, New York, will be much interested in the large oyster boats moored at the docks of the North River at those points. He will find similar boats on the East River side, at the foot of Broome street and that vicinity. When he goes aboard and notes the busy scenes within and around, and the multitudes of yachts and sloops and smaller crafts coming and going about these docks and slips, he must be impressed with the fact that a great amount of business is transacted there. It is in fact the headquarters of a large trade in oysters and clams.

The Staten Island, Jersey, and Long Island oyster planters bring very much of their stock to be sold there. The names on the boats, such as Van Name, Hausmann, Elsworth, etc., direct you at once to Staten Island and its neighborhood. You are moved to go down the New York Bay again, to explore the place that is the occasion of so much business activity. In hunting up the oyster grounds and oyster cultivators, we come upon a number of interesting facts besides.

Verazzano anchored near the island in 1524, but before morning a severe gale compelled him to put to sea again. He never set foot on the land, then densely covered with forests, and occupied more or less by the Raritans, a branch of the great nation of Delawares or Leni-Lenapes Indians. It fell to Henry Hudson, sailing in the Half Moon, and arriving in the bay on September 3, 1609, to make the first landing for a white man. He called the island *Staaten Eylant*, the island of the states—that is, the States-General of Holland, under whose flag he was sailing. He found there tobacco, maize, and wild fruits. He took two of its Indians with him up the river to West Point.

The natives called the island "Aquehonga Manacknong." In some old accounts it is "Egquahous." One name makes it to signify "the place of bad woods."

In 1624 a number of Walloons, from near the river Scheldt, and from Flanders, came over with Peter Minuit, and settled the island. The Indians were always willing to sell, and they did sell the land several times over to successive parties, who came intending to stay, at different periods. The last of their deeds was given to Governor Lovelace in 1670. It was then designated as "the most commodiousest seate and richest land" in America.

Tradition says one of the first houses was built on the heights of New Brighton, and of bricks brought from Holland. In 1640 a "still" was erected, perhaps the first in America. A grist mill, a snuff mill, and a buckskin shop were soon started. At the present time many important industries are pursued on and about the island. Several large dyeing and printing establishments make colored fabrics of silk, cotton, and worsted. There are also fire brick and gas retort manufactories. The linoleum floor cloth, made from pulverized or ground cork and linseed oil, is manufactured here. This is an article more durable than oil cloth. There are white lead, linseed oil, and paper factories on the island. Also several large and extensive breweries. But the oyster farming is the most important of them all. It amounts to more than all the rest put together. This business has built up Mariner's Harbor, Tottenville, Port Richmond, and other places around the shores of the island. It has also had much to do in developing the extensive shipbuilding and commerce now carried on there.

Several things show that oysters and shell fish were abundant in these waters long before white men came. Shell heaps of several feet in thickness are found both on the shore and at points in the interior. They clearly mark the camping grounds of the aborigines, and show what furnished an important part of their food.

In the days when tribal wars were frequent, the Indians would naturally fix their camps amid the dense wood of the hills or vales a mile or two from the coast. The varying surface afforded numerous safe retreats. Squaws picked up the oysters with their hands, and carried them in baskets on their backs to the wigwams. Of course they could procure only such as were to be found in shoal water.

After the Dutch came rakes were used to some extent. But even to a quite recent date the oystermen have done much of their work by hand, wading into the water even in the coldest weather. The Dutch settlers have a number of family names now representing them connected with the various industries at present carried on. Some localities also possess Dutch names. The boats used in early times, and down to the memory of some now living, were the "periauguas," or "piroguas." These were vessels without keels, having heavy lee boards, two masts, and two large sails.

The word "Kill," which occurs several times, as in "Great Kills," "Fresh Kills," "Kill von Kull," means "stream" or "water passage." Newark Bay was formerly called "the Kull." Kill von Kull means the stream or passage from the Kull. These places, with Prince's Bay, Raritan Bay, and New York Bay, are the spots where the Staten Island oyster cultivators have their farms or grounds. Nearly every one of these places has its local tradition to account for its designation or to mark it. Thus, the highest part of the ridge, which runs a considerable way through the island, is called "Toad Hill." Before the Revolutionary war, a young lady residing on that hill had two suitors at the same time. She had her preference, and took a peculiar course to turn off the unacceptable one. She procured and put into his capacious coat pocket two large toads. He did not discover the trick until the next Sabbath evening as he was dressing, with the expectation of making the girl another visit. The strong perfume led to an investigation that opened his eyes to the state of affairs. He took the hint and called no more. But the story got out. His young acquaintances tormented him by asking "when he intended to go to 'toad hill' again?" or "how the people on 'toad hill' were?" Thus this name, which originated in a jest, became fixed upon the locality.

In the various wars that have raged around New York and New Jersey, Staten Island and its people have had a prominent place. Its peculiar situation has exposed it to many vicissitudes during such conflicts.

Daniel Butler, Lott Rhett, Henry Money, Benjamin Joline, and Aaron Van Name, were among the first persons to see and take advantage of the waters about this island for oyster production. This was between sixty and seventy years ago. For some time they depended solely upon natural supplies. They went South and procured oysters and planted them for a few months in these waters. It was difficult then to find markets for many oysters. They sold a limited quantity in Washington Market, New York. They even took sloop loads to Albany. But it sometimes happened that they were compelled to bring them back unsold. People generally had not learned to eat oysters. At that time the present flourishing village of Tottenville was mostly a forest. Henry Money was its only inhabitant until young Aaron Van Name came to aid him in the oyster business. Afterward John Totten inaugurated and carried on shipbuilding, and gave his name to the place. Now there are quite a number of what are called "shipways," or, in New England phrase, "shipyards," in that part of the island.

To stand on the docks at Tottenville as the tide comes to its flood will afford one a view of the fleet of oyster boats as they return laden from the grounds. Most of the oyster gathering is done at low tide. Hence the men are coming to port as the tide rises. Sometimes they may remain away over two tides. It will be seen that as the tides rise and fall once in twelve hours, and the time changes one hour in every twenty-four, the men must go out to work at all hours of day and night during one month.

When there began to be a greater demand for oysters the natural beds failed to keep up the supply. Prices went up enormously. There were times when it was a great advantage to have a fast sailing vessel in which to carry oysters. The first arrivals netted large returns. The eager retailers would pay almost any price to secure the earliest supplies. From the first oysters have been sold by Staten Island dealers "by the count;" that is, so much a hundred or thousand. The enormous tide of travel through New York city makes a constant demand for this food whatever may be the price. Some will have oysters if they have to pay, like the American in Copenhagen, twenty-one cents a piece for them. Hotels and first-class saloons always expect to have them on hand however costly they may be.

(To be continued.)

NOVEL STEAM MOTOR.

The engraving shows one of the small steam motors recently brought into use. This is especially designed for the purpose of churning. The steam pressure is exerted against a flexible diaphragm, A, which presses against a convex abutment projecting from the lever, B. The engine is single acting, the lever, B, being forced upward by the steam, and returned by a weight on the end of the lever near its connection with the churn dasher rod.

The entrance and exit of steam to the chamber of the diaphragm, A, is controlled by a valve, C, worked by an arm, D, on the fulcrum of the lever, B, through the agency of a pivoted triangular frame, E, having pins which strike the arm on the valve spindle. As this device alone would only partly open or close the valve, the inventor has applied to the triangular frame a double acting spiral spring, which completes the movement of the triangular frame, E, and insures the complete opening and closing of the valve.

The upper pipe connected with the valve chest is the supply and the lower one the exhaust pipe. As steam is alternately admitted to and exhausted from the space beneath the diaphragm the lever, B, is oscillated, working the churn dasher. The internal construction of the motor will be seen in Fig. 2, which is a vertical section through the center of the steam chest and diaphragm.

This invention was recently patented by Mr. T. Mayhew, of this city.

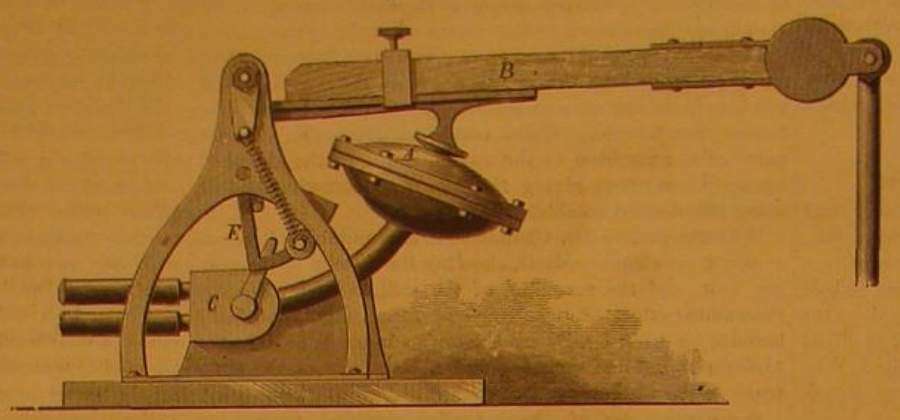


Fig. 1.—MAYHEW'S STEAM MOTOR.

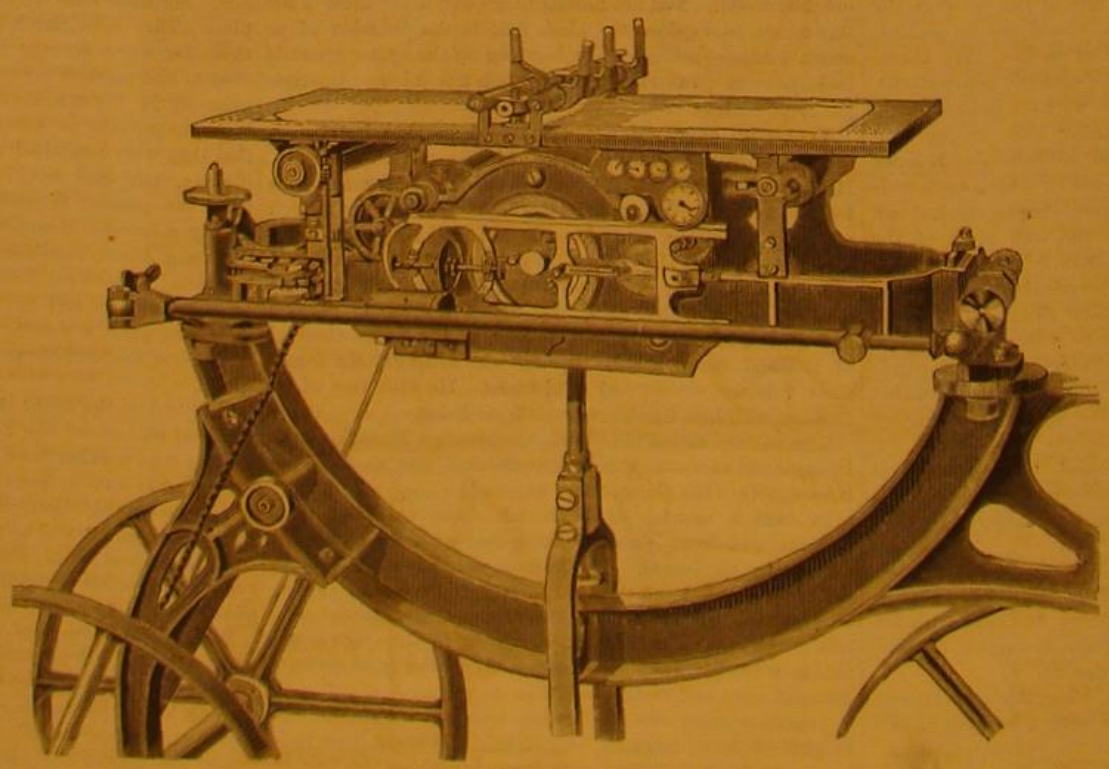
THE PROFILOGRAPH.

The instrument shown in the annexed engraving, which we take from *La Nature*, is the invention of Mr. Dumoulin, of Paris, and is used in obtaining the profile of a country. The instrument consists of a frame supported by four wheels, which may be adjusted rigidly in any desired position, but as a rule are arranged so that the movements of the machine do not deviate from a right line. The carriage supports a small table, upon which a sheet of paper is unrolled, parallel to the length of the table, for the purpose of receiving the drawing or tracing of the profile of the country traversed. The profile is drawn by a pencil or pin held perpendicularly above the table.

The entire mechanism of the instrument is operated by an endless chain, which is driven from the rear wheels or axle. An iron bar is suspended from the frame of the machine and is provided with a large metal ball at its lower end, forming a pendulum. If the carriage ascends or descends the pendulum will always maintain its vertical position, and it is only the machine that is inclined, and these alternate and variable inclinations produce either positive or negative displacements, accordingly as the machine ascends or descends.

These angular oscillations, which are transmitted by proper devices, determine the trigonometric law of the reciprocating movements of the paper and the pencil. The pencil mark is a resultant, for the sheet of paper moves positively, and this movement is constantly proportional to the cosines of the angles formed by the pendulum with the normal grade line of the country traversed, and the crayon rises and falls perpendicularly to the sheet of paper, the distances it rises and falls being proportional to the sines of the above angles, and the tracing obtained is nothing but a profile of the several angles. The apparatus does not only give an exact tracing of the profile of the country, in the scale of $\frac{1}{2500}$ for the horizontal dimensions and $\frac{1}{250}$ for the vertical dimensions, but it also records the distances traversed; that is, the figures of the horizontal dimensions or abscissas and of the vertical dimensions or ordinates.

The operation of the device is exceedingly simple, for one man draws the carriage along the line of the profile desired and the surveyor or superintendent accompanying the carriage stops it at every rod or post, notes the lengths shown on one of the indicators or counters, then draws a vertical line and notes the heights shown by the second indicators. He then proceeds and repeats this operation at each post. It is evident that an accurate profile can be obtained in a shorter time and with less expense than by the usual methods. It has been proposed to use this instrument in the government surveys in France.



THE PROFILOGRAPH.

MECHANICAL INVENTIONS.

Mr. William M. Thompson, Jr., of Barnhart's Mills, Pa., has patented an improved piston packing, which consists in wrapping the packing rope of a piston on a taper from the middle toward each end, so that it may be more readily inserted in the barrel and drawn out without catching on the tube joints.

Mr. Nelson Rogers, of Elgin, Ill., has patented certain improvements in jars of that class which are employed for holding fruits, vegetables, butter, milk, etc., and which are designed to be hermetically sealed. It is an improvement in that general form of jar in which a glass cover is made to rest inside the neck of the jar upon a shoulder, and the joint

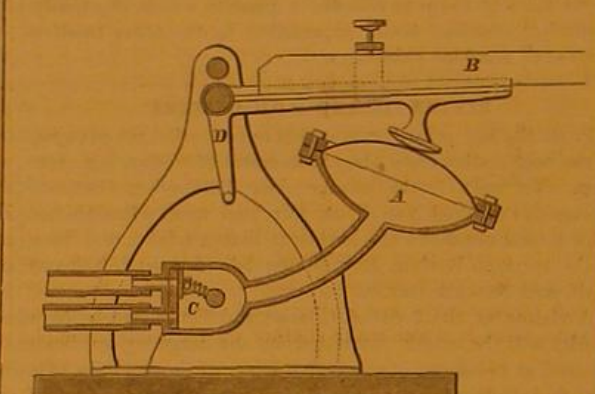


Fig. 2.—NOVEL STEAM MOTOR.

made tight by an elastic ring and a screw cap. The improvement consists, mainly, in forming the glass cover with a recess about its upper edge, placing therein a ring of cork or other elastic material, and then fastening an angular annular screw cap over the flush edges of the glass cover, the elastic ring, and the edge of the jar, so as to hold the parts to their place and make a tight joint.

Mr. James B. Cook, of London, Ontario, Canada, has invented a lock having a permutation wheel of novel construction, having pinholes carrying two or more pins, which release the bolt by their successive action when properly operated. The wheel also has a click for indicating the movement by sound, and a device that resets the lock or prevents movement of the bolt in case the wheel is improperly operated.

Mr. James Hall, of Glen Cove, N. Y., has patented an improved fastening for cans, which consists in a staple and plate of novel construction, especially adapted for application to milk cans as now made, as a permanent fixture, to be used with a padlock or other device to secure the cover.

Mr. David Bissell, of Detroit, Mich., has patented a bevel square in which the head can be set at any required angle quickly and with certainty, which contains in the stock or handle a pocket for the reception of a combined marker and screwdriver. It consists of a graduated arm pivoted at one end to the end of the handle opposite the head, by which, when thrown out of the pocket in the handle, the head is set to the required angle, and, lastly, of a pocket in the handle for the reception of the combined marker and set screw, provided with a rubber cushion for holding it in the pocket.

A useful pocket tool combining in one device the functions of several frequently used and desirable tools, has been patented by Mr. James H. Randell, of Acworth, Ga. It consists in a hollow metal handle formed with a shoulder to act as a square or gauge, and graduated in inches to form a rule, in combination with a blade sliding longitudinally into the chamber of the handle, having a series of saw teeth on one side, a cutting edge on the other, and a screwdriver point, the handle being made with a longitudinal slit, through which a lug or stem projects from the sliding blade and carries a tilting catch, by which the blade may be slid in or out and secured in either of the positions.

In the transfer of grain from railroad cars to elevators time is a most important element, and many labor and time saving methods and appliances have been adopted for the purpose of economizing in this direction. It is common now to lay a double track opposite the elevator and to sink a pit or pits between said tracks, into which pit or pits the elevating buckets are made to descend, so that the grain can be shoveled from the cars into these pits, and be thence elevated directly into the elevator building, the trains of cars being moved along at short intervals of time as one car is emptied, to bring the next succeeding one opposite the pit into which the car load is to be discharged. Mr. Stephen R. Kirby, of New York city, has patented a better and more effective device for this purpose. It consists of an endless chain or belt stretched over two chain pulleys or drums, and revolving between guides or in a long box that is fixed, preferably, in an upright or nearly upright position, the chain being provided at two opposite points in its length with lateral ears; a sliding plate or counterbalance moves in grooves in the guides, and is designed to be connected by a rope with one or more grain shovels or scoops, and the sliding plate is provided with lugs on its under face, with which the ears of the chain engage twice in each revolution, and thereby move the plate at each half revolution the length of the guide, and then release it so that the said plate may fall or be drawn back again.

An improved baling press, patented by Mr. Charles T. Christmas, of Riverton, Miss., is so constructed that the movement of the follower will diminish gradually in speed and extent, and the compressive power will increase in proportion; and as the levers come more into a perpendicular position the parts will be more capable of withstanding the strain, as the force will then be applied endwise of the levers.

Mr. Julien P. Wood, of Marlborough, Mass., has patented a novel construction of machines of that class in which the eyelet hole is punched and the eyelet set in one and the same operation; and it consists of a peculiar construction and arrangement of parts, in which the punch first descends upon a bed plate and cuts the hole, and then, without rising, passes laterally over a subjacent setting tool to feed the material. This material is then clamped by a presser foot, while the punch and bed separate and retreat laterally. An upper setting tool having the same lateral motion with the punch is then brought over the hole, after which the subjacent setting tool rises, catches an eyelet from a feed trough or chute, and then closes into the hole with the upper setting tool, to expand and set the eyelet.

A novel machine for blacking and polishing boots and shoes, while on the feet, has been patented by Mr. Pierre Paul Audoye, of Paris, France. It may also be used as well for harness, and, generally, for any articles that have to be polished.

Straw Thrashing in California.

The San Francisco *Alta* describes the process by which most of the wheat of California is thrashed by steam, usually the day it is cut.

The sickle is set on a level with the bottom of the lowest heads of grain, so as to take off no more of the straw than is necessary. From the platform behind the sickle the grain is carried by an endless apron or elevator into a wagon driven alongside the header; and this wagon, relieved by another at short intervals, transports the grain to the thrashing machine, which is not infrequently moved from one point of the field to another, so as to be near the header. Or, if the thrashing is to be done after the cutting, the header wagons throw their loads into piles, very different from the stacks carefully built of sheaves in those climes where rain is frequent in summer, and where the thrashing may be delayed until late in the fall. The management of the steam thrashing machine is usually the exclusive business during July, August, and September of its owner. If the machine is one of the ordinary size, he expects to thrash about 1,660 bushels—100,000 pounds—in a day; that is, if the crop is heavy and the circumstances favorable. He employs a dozen men, who are ordinarily boarded by the farmer, and he receives from 5 to 8 cents per bushel for thrashing. His total daily expenses may be $60, and his average gross receipts twice as much per day. He gets his pay on the basis of the weight of the grain as sacked, and the more soil, gravel, cheat, and other material that should be included, the greater his profit. If he thrashes the grain directly from the header wagon, there is little opportunity to get gravel in; but if the grain is fed to the thrashing machine from a pile on the ground, many shovelfuls containing as much soil as grain are fed into the machine. The foreign buyers complain to the shippers of the gravel, and the shippers to the farmers; but the remedy does not appear near at hand, for the evil is part of a complicated system. The thrasher may have $3,000 invested in his machine, wagons, horses, and tools needed for traveling and working; and as he hires and manages a dozen men, and has but a short season of thrashing, he must make a good profit. The business demands much skill in the control of machinery and men, and great care to prevent fires and accidents, so that the average profit is not unreasonably large. The charge for thrashing is low, because the farmers generally have preferred that the work should be done with haste rather than with care.

A NEW VELOCIPEDE.

The engraving shows an improved velocipede more especially designed for the use of children. It is propelled by the hands, and may be steered by either the feet or hands. The body of the velocipede is preferably made in the form of a horse, but it may be made in a variety of other shapes, such as that of a carriage body, a chair, etc. The rear portion of the body is supported upon two wheels placed on axles, A, which are entirely independent of each other, and carry at their inner ends spur wheels, B, which are connected by endless chains with spur wheels on two independent shafts, C, journaled in the neck of the horse, and provided with hand cranks by which they may be turned.

The forward portion of the velocipede body is supported by a caster wheel, whose shank, D, is jointed and provided with an arc-shaped slot, having a notch at each end for receiving a transverse bolt passing through the pintle of the caster wheel. By means of this device the axle of the caster wheel may be placed as shown in Fig. 1, or it may be placed directly under the pintle, as shown in Fig. 3, when the wheel will be turned in the operation of steering by means of a foot lever or tiller pivoted under the body of the horse. This lever carries a strap which passes around a drum or pulley on the pintle of the caster. When the strap is not in use it may be hooked up out of the way. The arrangement of the working parts may be seen in Fig. 2, which is a partial plan view with the figure of the horse removed.

This invention will be appreciated by the youngsters, and will make a pleasing change after using the velocipede propelled by the feet, and with this machine the arms and chest will be developed.

It will be noticed that the rear or driving wheels are driven independently, and that one may be driven faster or slower than the other to steer the machine.

This invention was recently patented by Mr. Alfred Vick, of Mount Carmel, Conn., and will be manufactured and introduced by the "American Cyclepede Co." For further information address Theo. J. Harbach, 809 Filbert street, Philadelphia, Pa.

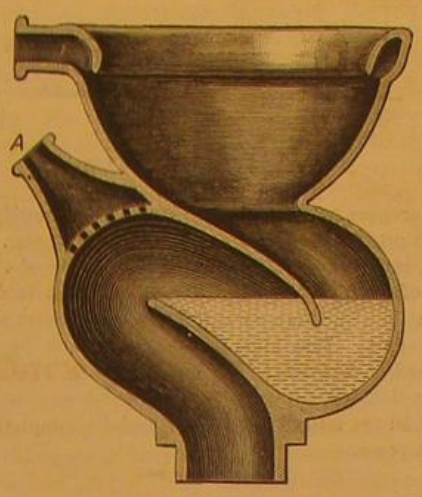
VICK'S CYCLEPEDE.

Banana Fiber.

Mr. Thomas J. Spear, of New Orleans, has been experimenting for many years with Southern plants with a view to their utilization in the manufacture of paper. The banana, he thinks, is the most valuable, as it grows with great rapidity, is nearly all fiber, never requires replanting after once a start has been made on a piece of ground, enriches the soil, and needs no cultivation. All that is required to do with it is to let it grow until frost, then cut and strip out the fiber. The plant grows to the height of ten or fifteen feet, and an acre planted in banana plants would yield eight or ten tons of fiber, out of which a paper equal, he thinks, to linen or hemp can be made.

IMPROVED CLOSETS.

The "complete" sanitary closet manufactured by Messrs. C. Winn & Co., Birmingham, is of a most simple and reliable character. It is made entirely of one piece of earthenware, and a reference to the accompanying sectional illustration clearly explains the arrangement. It is trapped above the floor line, is narrowest at the inlet, rendering stoppage scarcely possible. At the apex of this trap a deodorizing chamber is provided, to be filled with charcoal in connection with the ventilating outlet, A. The area of the closet for solid matter is very small, and there are no spaces where soil can in any way lodge or accumulate. The flushing apparatus, which, it will be understood, is an independent pump, having no connection with the closet except by the inlet pipe, is of the best known kind, and the force of water is concentrated where most required. After use, the whole of the water, soil, etc., passes from sight. We understand these closets are giving great satisfaction wherever fixed. This firm also make another on the same principle, called a slop closet, having a strong grating over the outlet, which prevents the loss of anything thrown in by accident.



IMPROVED CLOSETS.

Give the Boys Tools.

Almost all boys are naturally mechanics. The constructive and imitative faculties are developed, in part, at a very early age. All boys are not capable of being developed into good, practical, working mechanics, but most of them show their bent that way. There are few cases in which the boy has no competent idea of the production of a fabricated result from inorganic material, but such cases are rare. Given the proper encouragement and the means, and many boys whose mechanical aptness is allowed to run to waste, or is diverted from its natural course, would become good workmen, useful, producing members of the industrial community.

The mechanical boy ought to have a shop of his own. Let it be the attic, or an unused room, or a place in the barn or the woodshed. Give him a place and tools. Let him have a good pocket knife, gimlets, chisels, gouges, planes, cutting nippers, saws, a foot rule, and material to work. Let the boy have a chance. If he is a mechanic it will come out, and he will do himself credit. If he fails he is to follow some calling that does not demand mechanical skill.—*Boston Journal of Commerce.*

MISCELLANEOUS INVENTIONS.

An improved oil can top, which is so constructed that the oil that drips from the spout is returned into the can, has been patented by Mr. John R. Bennett, of Nunda, N. Y. The invention consists of a valve plug attached to a lever pivoted on the bottom plate of the spout, which closes a drip hole in an annular drip cup at the bottom of the spout when the lever is depressed.

An improvement in car brakes has been patented by Mr. Christian Ammarell, of East New York, N. Y. The object of the invention is to operate a car brake by a single spring and to lock the main lever of a car brake.

Mr. Stephen D. Field, of New York city, has patented a mechanical means for vibrating the tongue of a telegraph sounder or relay, and actuate the same by increase and decrease of current, or by making and breaking the circuit. The invention consists in a tongue fitted to vibrate between fixed points by the action of clockwork or other motive power, the clockwork being fitted with a brake that is operated by an electro-magnet in the line, so as to check and release the power, and thereby cause the vibration of the tongue.

An improvement in wire lathing has been patented by Mr. William Brennan, of New York city. The object of this invention is to support wire lathing in ceilings in such a manner as to leave no air spaces between the beams and the mortar; such spaces, in case of fire, serve as draught flues, and thus cause the fire to spread rapidly, and increase the difficulty of controlling the fire.

Mr. Felice Tocci, of New York city, has patented a book case that can be folded and its depth greatly lessened, thus enabling it to be packed in a much smaller space than when it is in use. It may be carried through narrow spaces where an ordinary case will not pass.

Mr. William Wilmington, of Toledo, O., has patented a car wheel chill formed with a solid body portion, and having an annular chamber located in its flange face, inclosed by an inner wall, formed in one piece with the metal inclosing the other sides of the chamber, and same shape as the adjacent contour of the flange of the wheel.

Mr. Jacob F. Weitzel, of Galveston, Tex., has patented an improvement upon that form of vegetable grater or slicer in which a tapering bucket or receptacle is made largest at the top, and is combined with a concentric and cone-shaped grater or slicer whose base rests close to the bottom edge of the bucket, and which cone-shaped grater or slicer is arranged to revolve and act upon the fruit or vegetables which wedge themselves by gravity down into the annular space. It consists in making the cone-shaped slicer or grater in oblate or elongated form in cross section, to improve the cutting action, and in combining the conical cutter and the reversely tapering bucket with a subjacent detachable pan carrying a spider frame with a socket to receive the end of the spindle of the cone-shaped cutter.

An improvement in car coupling has been patented by Mr. Charles H. Shippee, of Wickford, R. I. The object of the invention is to furnish automatic couplings of simple construction, having but few parts, strongly and durably fitted, and adapted for connection with the couplings now in use. The inventor makes use of a coupling and drawbar formed at its outer end with a swinging hook of peculiar construction, and fitted to slide endwise upon a block attached to the king bolt of the truck.

Mr. Carl J. Renz, of Hudson, N. Y., has invented an improved portable or pocket instrument or mould for use of travelers and others for making cigarettes neatly and expeditiously. It consists of a bed piece having a lengthwise groove and two compressing lids, which are hinged at the respective sides of said groove, and one of them provided with an extension consisting of a metal plate whose curve or conformation is similar to the groove in the bed piece, so that when the lids are closed the tobacco will be compressed in the paper envelope or wrapper.

An improved shoe-blacking machine, patented by Mr.

Pierre Audoye, of Bordeaux, France, has a series of circular bushes for cleaning, applying blacking, and polishing, and a treadle for imparting rotary motion to the same. The improvement relates particularly to the means for applying blacking to one of the brushes.

An improved horse collar has recently been patented by Mr. Fletcher C. Scott, of Fincastle, Va. This invention is an improvement in the class of horse collars in which the hames and collar proper are permanently attached to each other. The inventor forms the collar proper of a soft stuffed inner portion and an outer leather plate, which is comparatively stiff and forms the ornamental face of the collar, and also covers and protects said inner part. The collar is divided at top and bottom, and to each of the two parts thus formed is attached an iron hame, the same being inserted and secured between the outer covering plate and the inner or stuffed portion. Both the hames and the parts of the divided collar proper are connected at top and bottom by means of straps, so that they may be adjusted together to adapt the collar as a whole to necks of animals of different sizes.

A car coupling so constructed as to couple the cars automatically as they are run together, couple cars of different heights, and connect the cars securely, while giving them the necessary play for passing around the curves, has been patented by Messrs. Franklin A. Morand, of Cheyenne, and Joseph Edwards, of Hays city, Kan.

An improvement in fastenings for two handled fans, so constructed as to fasten the handles when the fans are opened and when they are closed, and which, while fastening the handles, will have a projecting loop to allow the fan to be hung, has been patented by Mr. Max Rubin, of New York city.

Messrs. Minard M. Smith and John Hassall, of New York, N. Y., have patented an improved fastener to be secured to the sides of the front opening of a glove for the purpose of keeping said opening closed, and the glove thereby close about the wrist of the wearer. The invention consists of two narrow flat strips of steel or other metal curved flatwise to conform with the hollow of the hand, and pivoted together at their enlarged circular ends, which are so fashioned that they lock together at the closed or fully open point.

Mr. Andrew McLean, of Jersey City, N. J., has patented an improved loom for weaving gauze fabrics. The invention consists in a novel combination of devices which cannot be fully described without engravings.

An improved bottle stopper, patented by Mr. James J. Allison, of Nelson, Ill., consists of a piece of spring wire that is bent double in the middle, forming an eye, and has its ends bent outward and down again to form two open side loops with free ends, whereby a double spring is obtained.

An improved snap hook, which does not require a spring to operate it and is simple and effective, has been patented by Mr. William Grassick, of Lucknow, Ontario, Canada. The invention consists of a curved U-shaped hook having an inner second hook at the bottom, and having a latch arm pivoted to the end for preventing the ring or staple from slipping out of the hook.

THE STEAMER ANTHRACITE.

Just at present steam and naval engineers in this vicinity are deeply interested in the application of high pressure steam to marine engines, an exhibition of the practicability of the system as developed by Mr. Perkins, of England, having been given by the Anthracite, the smallest steamer that ever crossed the ocean; and what seems anomalous is the fact that her boilers carry a larger pressure than any other steamer, while the engine power is developed by the smallest consumption of coal per horse power.

By invitation of Major George Deane, who represents Mr. Perkins in this country, we recently took a trip down the Bay and up the East River on this little steamer. She is not built for speed, but for economy. Her average speed is 7½ knots per hour. The engines are compound, having three cylinders, respectively 8, 16, and 23 inches in diameter, the stroke being 15 inches.

The small cylinder cuts off at ⅝ of the stroke when working normally, the intermediate cylinder at ¾, the larger one at ½.

The smaller and intermediate cylinders are arranged one above the other, and their pistons are attached to a common rod. The piston of the larger cylinder is connected with a separate crank.

The several pistons are provided with packing rings made of a metal invented by Mr. Perkins. The cylinders are never lubricated, yet the rings wear smoothly and are said to be very durable.

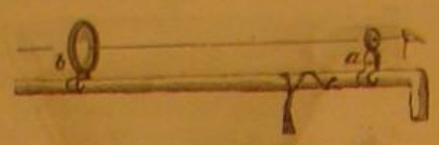
The engines are of 86 indicated H. P., and the boiler, which has only about 5 by 6 feet base, and a height of 8 feet, contains but 80 gallons of water, and consumes but 100 lb. of coal per hour. The screw is about 5 feet in diameter, and makes from 120 to 140 revolutions per minute.

The water, which must be pure, is used over and over again, and the waste, which is very slight, is supplied from fresh water carried on board. The steam pressure ranges from 350 to 500 lb. per square inch. The whistle is blown by a small supplementary boiler using salt water and receiving its heat from a coil connected with the main boiler.

We expect to give an engraving of the anthracite, together with some further particulars in our next issue.

NOVEL SPY-GLASS.

The spy-glass shown in the annexed cut is an invention of Mr. Theo. Geiger, of Stuttgart. Its construction is based upon the principles of Galileo's telescope, and it consists of a concave eye-lens and a convex object-glass, arranged so that the optical axis of both lenses are in a right line. In view of the increased focus of the object-glass, necessitating



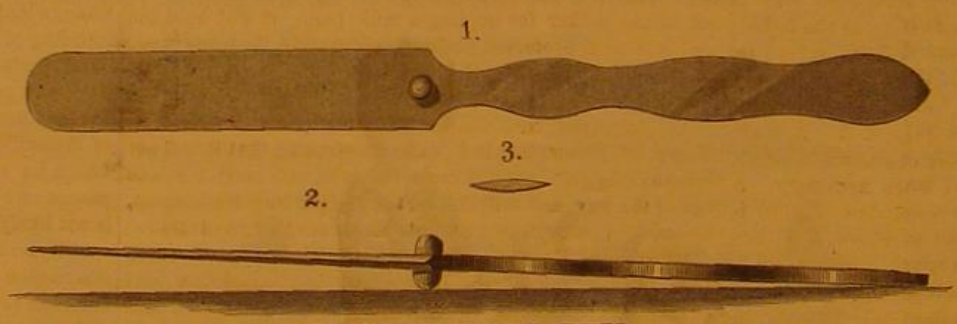
A NOVEL SPY-GLASS.

a greater space between the two lenses, the magnifying power is much greater than that of ordinary field-glasses. The eye lens, *a*, is attached to a cane near the handle of the cane by means of spring clamps, and the object glass is fastened to the cane in a like manner at *b*. The two lenses are 18 to 28 inches apart. The object-glass is focused by moving it backward or forward. The lenses may be used without a cane by simply holding them in the hands a suitable distance apart. In the latter form it is especially adapted for military purposes.

NEW TABLE KNIFE.

The table knife shown in the annexed engraving is a decided improvement over the knife now in general use. It is not only more shapely and more convenient to use, but in its manufacture little if any forging is done, it being made from thin metal, from which it is merely stamped into form. The grinding, polishing, and burnishing are easily and quickly done, as the knife has a smooth, flat surface from one end to the other, which makes it possible to do this part of the work by fixed machinery, thus saving a great deal of hand labor. The stud is put in after the knife is polished. It has two cutting edges instead of one, so that the user always finds his knife right side up; and, of course, two cutting edges will wear twice as long as one. It is lighter by one half than any of the other solid knives.

It is symmetrical and well balanced, and is more readily and agreeably handled than other forms of table knife. It is grasped by the hand and finger, and all of the pressure is exerted upon the handle, and never upon the blade.



COX'S IMPROVED TABLE KNIFE.

Fig. 1 in the engraving is a side view of the knife; Fig. 2, a transverse section through the middle of the blade, showing the two cutting edges; and Fig. 3 is an edge view, showing the position the knife assumes when resting on the table.

This novel and useful invention was patented July 13, 1880. For further information, apply to the patentee, Mr. Arthur W. Cox, Auburn, Androscoggin Co., Maine.

The Concord School of Philosophy.

The second year's term of the Concord Summer School of Philosophy began July 12. Nearly fifty adult pupils and lecturers were present, among them many notable scholars, authors, and teachers. This is one of the most remarkable educational institutions of the day, a revival of the ancient Greek academy modified by the peculiar conditions, needs, and developments of the nineteenth century as displayed in the higher levels of American speculative thought.

In our issue of July 10, in describing a novel corn sled we gave the inventor's name incorrectly. It should have been William H. Woods, Elizabeth, Pa.

THE MAN WHO RAN THE FIRST LOCOMOTIVE IN AMERICA.

At the recent commencement exercises of Stevens Institute, Hoboken, N. J., one of the interesting features was the extempore remarks made by Horatio Allen, who was introduced to the audience by Prof. Morton as the Nestor of American engineers.

Among other things, he said that the first locomotive brought to this country was purchased by himself for the Delaware and Hudson Canal Company. This engine, the first to draw a railway train on this continent, was run for the first time on the road connecting the Lackawanna coal fields with tide water by way of the Delaware and Hudson Canal. It was the first road of any consequence to adopt locomotive power.

Mr. Allen gave a graphic description of the scene; how he mounted the engine alone, placed his hand boldly upon the lever of the throttle, and pulled the valve wide open, resolved, if he went down, to go manfully. He took an honest pride in being able to present to the audience the man who owned the hand that opened the valve of the first locomotive on the continent, and who took the first ride on the first railroad. This experimental trip was made at Honesdale, Pa., August 8, 1829.

BRICK TEA.

In a recent report on the trade of Kin Kiang, China, some interesting facts are given in regard to the manufacture of and traffic in a product known as "brick tea." The quantity of this kind of tea exported from Kin Kiang during one year has amounted to 681,333 pounds. There are three kinds of brick tea made. The first, or largest kind, is a cake of coarse green tea, which weighs, when thoroughly dried, about three and a half pounds, and is about one foot long by seven inches wide. These cakes are made in a wooden mould while wet, and compressed by a lever press and afterward dried. This is all done by hand labor, and affords employment to a large number of coolies. When dried, each cake is wrapped in paper and packed in strong baskets, each containing thirty-six cakes. The cost of this tea per basket is about $6.75, and the annual exportation amounts to from 15,000 to 20,000 baskets. The tea is sent from Kin Kiang to Tientsin, from whence it goes overland through Mongolia for consumption among the inhabitants of West and Northwest Siberia, in the province of Kazan, on the Volga, and by the Kirghis and other Scutas tribes. A cake of tea of the same form, but of a much commoner quality, costing about $5.25, made by the Chinese at Yang-lon-tung, in Hupeh, is largely consumed in Mongolia. There being no copper currency in that country the Chinese bankers in Mongolia keep stores of this brick tea and issue it as a monetary medium.

The second kind of brick tea is of a finer quality, each cake weighing 1½ pound, and being 8¼ inches long by 5¼ inches wide. It is packed in baskets, each containing 80 or 90, and costs about $8.25 per basket. This kind is consumed in West and Southwest Siberia, at Kazan, and on the Amoor.

The third kind of brick tea is made of black tea dust, each cake weighing 2¼ pounds, and being 8½ inches long by 6 inches wide. It is packed in baskets containing 64 cakes each, and costs about $8 per basket. It is consumed throughout Siberia and in Eastern European Russia by the peasantry. It is made into cakes at Foochow, Kin Kang, and Hangkow. The yearly exportation from the three places is about 100,000 baskets. It is stated that at Hangkow there are now four brick tea factories, two of which employ steam power. The employment of steam instead of hand presses will ultimately cheapen the cost of production, and at the same time a more satisfactory article will be placed on the market. Brick tea made in the old manner was not pressed sufficiently hard to enable it to successfully resist the rough treatment it received *en route*, and frequently reached its destination in a broken and crumbling condition, which detracted from its value, buyers laying considerable stress on its hardness and perfection.

American Philological Association.

The Twelfth Annual Convention of the American Philological Association was held in Philadelphia, July 13–15. The attendance was fair, and a number of valuable papers were read. Professor L. R. Packard, of Yale, was elected President for the ensuing year. The other officers chosen were: Vice-presidents: Prof. Fred. D. Allen, of Harvard, and Prof. M. W. Humphries, of Vanderbilt University, Nashville, Tenn. Secretary and Curator: Prof. Chas. B. Lanman, of Harvard. Treasurer: Chas. J. Buckingham, Poughkeepsie, N. Y. Executive Committee: Dr. W. C. Cattell, President of Lafayette College, Easton, Pa.; Basil C. Gildersleeve, Professor of Greek, Johns Hopkins University, Baltimore; William W. Goodman, Professor of Greek, Yale College; Dr. J. Hammond, of Hartford, Conn., and Wm. D. Whitney, Professor of Comparative Philology, Yale College. Next year's meeting will be at Cleveland, O.

California Vineyards.

The average of vines in California is officially rated at about 60,000 acres, and it is thought that from six to eight thousand acres more will be planted to vines this year. If the entire grape crop were made into wine the yield in ordinary years would exceed 25,000,000 gallons. The actual wine product during the past five years has ranged between 4,000,000 and 6,000,000 gallons, the smallest yield falling in 1878. The possible yield in wine is lessened by the large distillation into brandies (about 250,000 gallons a year) the production of sweet wines, the consumption of grapes for table use and export to the Eastern States, and finally by the manufacture of raisins. The wine yield this coming year is expected to be very large, perhaps 10,000,000 gallons.

AMERICAN INDUSTRIES.—No. 51.

THE MANUFACTURE OF PULSOMETER PUMPS.

In 1872 an important addition was made to the previously existing varieties of pumps in the market, in the introduction of an entirely new style, made under patents then obtained by C. Henry Hall, in which the direct pressure of steam was used to force the liquid raised by a vacuum produced by the condensation of the steam. This idea at once struck engineers and mechanics as an important innovation, and, as the pump was constructed without pistons or connecting rods, and had neither cams, eccentrics, nor stuffing boxes, it had no exhaust and required no lubrication. In consequence of these desirable features it immediately became popular. There were, however, some defects in the mechanical construction of some of the earlier pumps made under these patents, on account of which many failed to work satisfactorily, while others were eminently successful, and have been in use to this day, showing that the principle on which they were designed to operate was all that the inventor claimed for it.

The illustrations we present on the first page of this paper show some of the processes of manufacture, and give different views of the "new" pulsometer pump, so styled because, while embodying no new elementary principles, the pump has been so improved as to obviate the difficulties of detail and imperfect workmanship which characterized many of the earlier pumps made under the Hall patents. These pumps are now believed to combine great strength, durability, and efficiency with a simplicity of construction that makes it almost impossible for them to get out of order, and an economy in working that places them in the front rank in a field where the competition is very searching and severe. The name "pulsometer" is a registered trade mark of the company, and is very suggestive of the operation of the pump.

An explanation of the working of the pump will be best understood by a reference to the illustrations. In Fig. 1, A A are two bottle shaped chambers formed in one casting, side by side. Their tapering necks are bent toward each other and terminate in a single upright passage, in which there is a ball valve, C, which is fitted to a seat in each neck, and capable of oscillating so as to close either neck. The upper portion of the pulsometer containing the ball valve is made separately, so that it may be renewed when worn out without having to replace the entire pump. The chambers, A, have openings connecting with the vertical induction passage, D, provided with valves, E E, of vulcanized rubber, which, together with their seats, F F, may be easily removed and replaced by new ones should they become worn. The delivery passage, H, is common to both chambers, and its valve seats, G G, have the same style of valves as the induction passage. The discharge chamber and its valves is shown in Fig. 2. J is the vacuum chamber, cast with and between the necks of chambers, A A, and connecting with the induction passage only below the valves, E E. K K are covers closing openings to the respective chambers to admit of getting at the valves and valve seats when necessary. A small air check valve, shown in the front view, Fig. 3, is screwed into the neck of each of the chambers, A A, and one in the vacuum chamber, J, the first to admit a small quantity of air above the water to prevent the steam from coming into actual contact with the water, thus forming an air piston, which prevents condensation. The valve in the vacuum chamber, J, serves to cushion the water column and to prevent the hammering which would otherwise occur upon filling the chambers alternately.

This pump when in operation is connected at the top with a steam supply pipe and at the bottom with the suction pipe, and the discharge pipe is connected with the discharge chamber. All the air check valves being closed, the steam is admitted, displacing the air from one of the chambers. The steam supply is then cut off, and the steam contained by the chamber condenses, forming a vacuum, when the chamber will immediately fill with water through the induction pipe. In starting the pump the hand is kept on the steam valve, turning the steam on and off four or five times until the regular operation is established. The vacuum formed in the chamber to which the steam is first admitted causes the ball valve, C, to close the opening in the neck of the chamber, and at the same time to admit steam into the opposite chamber, where, after shutting off the steam, a vacuum is made and the chamber fills with water. In this way, after the steam has been thus admitted four or five times, the alternate action of the chambers is established, and each of the air check valves is opened enough to cause a regular and continuous action, which will be recognized by the steady pulsation and smooth working of the ball valve, C, as the steam enters first one chamber and then another. The steam, entering the chamber directly above the water, presses upon and forces it out through the discharge valve with a force proportionate to the pressure of steam applied. When the water has been displaced by the steam, which follows it to the opening of the discharge chamber, the steam suddenly condenses.

It will be seen that in this way the steam pressure acting directly on the water, and the vacuum *resulting* from the condensation of the steam, act in alternation in drawing and forcing the water.

The economy of these pumps, working, as they do, without mechanical devices to absorb power, and with no appreciable friction, has been abundantly attested. It is estimated that 750 gallons per minute can be raised by a No. 8 pulsometer pump, supplied with steam through a one inch pipe; the pressure of steam necessary, depending on the height to which the water is raised. Good results on a lift of 40 feet have been obtained with steam at 30 lb. pressure, and on lifts of 70 feet with a steam pressure of 40 lb., although much must necessarily depend upon the situation of the pump, length of suction and delivery pipes, etc., while in other fluids than water these figures would of course be different.

The No. 8 pulsometer has suction and discharge pipes 5 inches in diameter, and occupies a floor space of only 20 x 31½ inches, its height being 54 inches, and weight 1,300 pounds. The company claim that the expenditure of power to operate their pumps is less than one-half of that ordinarily required to do the same work by other means, and have a large number of testimonials from both home and foreign users to support this statement. For use in mines the pulsometer has the special advantage of condensing all of the steam used. The temperature of the fluid being raised is increased one or two degrees, but there is no escape of steam. For tanneries, breweries, paper manufacturers, and as a ship's pump, or for filling water tanks of railways, it has some special advantages, as the arrangement of its valves is such that it is difficult for it to become clogged, and should this happen the parts can be readily removed and the trouble remedied. In a new sewage steamer lately built for the city of Liverpool, England, a large-sized pulsometer has given especial satisfaction.

It may be made of brass or other metal for pumping liquids destructive to iron, lead being used for acids, bronze for sugar works, and special compositions for other purposes; and one user of the pulsometer has it fitted with lignum-vitæ ball valves, instead of the usual vulcanized rubber valves, to adapt it to pumping liquids which have a large proportion of grease. The company also fit up the pulsometer with rubber ball valves, instead of the ordinary flat ones, for extra dirty sewer work, and for paper mills, tanneries, etc.

It is believed that the improvements which are embodied in the "new" pulsometer are such as will obviate all objections heretofore urged by those who have had imperfect pumps, and justify the claims long since made for this pump as being among the first for cheapness, simplicity, and strength, as well as for efficiency and economy in its operation. It is manufactured and sold only by the Pulsometer Steam Pump Company, 83 John street, New York, Wm. F. Kidder being president of the company, G. F. Badger, secretary, and Geo. W. Laird, treasurer.

AGRICULTURAL INVENTIONS.

Mr. Alfred C. Dodge, of Charlotte, Mich., has patented a simple and convenient device which may be attached to the leg of the milker for holding a milk pail. It will hold the pail in a well protected position, preventing its being upset by the cow, and preventing dirt from being thrown into it. It will admit of both hands being used by the milker.

An improved corn sheller, patented by Mr. Berthold A. Kamp, of Evansville, Ind., is so constructed that it will not become clogged, will not break the cobs, will carry the cobs out of the way, and will deliver the shelled corn into a spout, whence it can be drawn off into sacks or other receivers.

Mr. John J. Knapp, of Lewisburg, W. V., has invented an improved mower which is simple in construction and effective in operation, easily adjusted and controlled, and which will work with less wear and tear than mowers constructed in the usual way.

Prizes for Potters' Machinery.

Not long ago the attention of the readers of this paper was directed to the fact that in no other manufacturing industry had there been so little advance made as in the fabrication of pottery.

We are pleased to learn from the *Pottery and Glassware Reporter* that at the last annual convention of the United States Potters' Association this subject was considered and discussed at some length, and the following resolution was adopted:

"*Resolved*, That a reward of five hundred dollars be and is hereby offered to any person who may invent and offer to us any new and useful machinery of importance to us, applicable to our art and business.

"And that a reward of two hundred and fifty dollars be and is hereby offered by us to any person who may invent any essential and useful improvement to or upon any machinery now in use by us. Provided, that these inventions or improvements are free from all patents obtained or to be obtained from the inventor or any other person.

"And that a committee of three be appointed to investigate and test these inventions and improvements, and when, in their opinion, these rewards or either of them be fairly and *fully* earned, or if in their opinion a portion only of the above rewards be earned by the parties presenting them, the committee shall have power to draw upon the treasurer through the Executive Committee for such sum or sums as the committee may have agreed to, not exceeding the above named amounts."

These prizes are certainly worth competing for, and should enlist the earnest efforts of many inventors in the competition. All communications relating to machinery and rewards should be made to the members of the committee called for in the closing clause of the above resolution, Messrs. Thomas C. Smith, Greenpoint, N. Y.; John Moses, Trenton, N. J.; M. Tempest, Cincinnati, O.

In alluding to the premiums offered, the editor of the above journal adds: "Whatever causes may be to blame for it, it is an established fact that potting is behind the age in the matter of labor-saving machinery, the same hand processes being now employed as were in vogue thousands of years ago. While every other industry has benefited largely by the inventive genius of modern times, the potter plods on in much the same way as did his forefathers in the art. This state of affairs is largely due, probably, to the conservatism of the potters themselves, who seem very generally to go on the principle that 'what was good enough for their fathers is good enough for them,' and partly to the fact that the attention of inventors has never been publicly called to the needs of the industry in this regard. Once let it become known among inventors that the machinery of improved form is needed, and from all the devices likely to be offered something can certainly be selected to suit the different purposes."

Raisin Wine.

The conservative minds of old fashioned French wine merchants are just now greatly agitated with regard to the subject of making wines from dried grapes. These merchants affirm that the great entrepots at Paris were constructed for the purpose of holding wine, and not a liquid made by pouring water upon Turkish raisins and then fermenting the remarkable product. This "new departure" is not, they assert, wine at all, and its existence is a fraud upon the legitimate trade. They have consequently been petitioning the Municipal Council of Paris to repress this new and not particularly creditable industry. But the Council, after listening with much patience to the *pros* and *cons* of the case as put before them, have decided that the new kind of wine is lawful, because in the first place it is made from grapes, and is produced by processes similar to those used in the making of ordinary wine, namely, pressing, fermentation, racking, etc. The new description of wine contains alcohol, and yields its fair proportion to the direct taxation of the country and to the *octroi* of the different towns whither it may be conveyed. It is further asserted that this wine from dried raisins is not injurious to health, and that when blended in certain proportions with ordinary wine its presence cannot be detected. It is, moreover, comparatively cheap; and thus it affords for the lower classes a useful drink; therefore the Municipal Council of Paris considers that its production should be encouraged rather than repressed at a time when the natural wine products of France are so much below the average. With regard to English consumers, they will doubtless never have an opportunity of tasting the dried grape wine unless they find themselves in some low class cabaret in Paris, or some other large town in France. It is not probable that, in the ordinary way of trade, wines of this character will be sent over here. The *blending* of wines from various departments surrounding the Gironde has, we are well aware, been carried on for some time, and perhaps never was the demand for these adjuncts to claret greater than at present. The wines of Narbonne, of Roussillon, etc., have been largely purchased at Bordeaux for this purpose; in fact, claret at £5 per hogshead cannot now be produced without this aid. But raisin wine is not likely to be used just at present in the Gironde. If ever it should be employed by shippers there, owing to the destruction of French vineyards, then we can import raisins from the Levant almost as cheaply as our Gallic neighbors, and make the cheerful and exhilarating beverage at home. —*London Grocer.*

The Epidemic at Adams, Mass.

The epidemic at Adams, Mass., has finally been traced to the water supply. Engineer Locke has made a map of the town, indicating by red dots every house where there was a case of sickness, and by small circles every house which escaped, covering both the village proper and all the roads leading out of it. Afterward he drew the line of the water pipe on his map, and everywhere the red dots stop with the pipe and follow its course. He cites numerous instances to prove that the water was the sole cause of the trouble, and shows that nearly everybody who was pointed out as not using the town water, although sick, had been in the district and drank the water. He locates the impurity in an old mill-dam through which the water passes, and says he found it full of decaying vegetable matter which gave forth an offensive odor perceived at some distance from the pond. That, he thinks, was sufficient to cause the outbreak, in connection with the peculiar weather which had prepared the people for the epidemic.

Value of Swamp Muck.

Some time ago we remarked that an acre of swamp muck of good quality, three feet deep, was actually worth $25,000. No doubt such a statement is surprising. So was the statement of Dr. Lawes, of England, that a ton of bran fed to cows returned more than its cost in manure. Swamp muck, free from sand, contains two per cent or forty pounds of nitrogen in a ton. Nitrogen is worth in the market twenty-five cents per pound, so that a ton of swamp muck is actually worth $10 for the nitrogen in it. All that is needed is to work up the muck, so as to make the nitrogen available. An acre of swamp muck three feet deep contains 2,500 tons, and would require eight months to draw out, at ten loads a day. Few persons realize the value of the fertilizing elements of common waste matters which lie under their feet, and the innumerable tons of matter that may be available for fertilizing purposes, and that much of the idle and neglected materials represent a vast amount of wealth.—*American Agriculturist.*

IMPROVED METHOD OF SECURING CAR WHEELS TO THE AXLES.

The accompanying illustration shows the patented method adopted by Messrs. William Jessop & Sons (Limited), of the Brightside Steel Works, Sheffield, of securing car wheels to their axles. The advantages claimed for this method are simplicity of construction, few loose parts, and the ease and rapidity with which the wheels can be taken off and replaced securely on the axles, a great desideratum in the case of a broken wheel. The gripping action of wheels made according to this invention may be compared to the grasp of a hand, the boss of the wheel contracting round the whole surface of the periphery of the axle, and not bearing on two or three points only, as is generally the case where the wheel is secured by keying or by a nut.

Fig. 1 is a sectional view of a wheel fitted to an axle having inside bearings. A is the axle, the end being shown in section at B, showing the recess, D, and key plate, C, the lower end of which fits into the recess, D. The key-plate is held between the arm and lug, H (Fig. 2), in the space, E, and is secured by the bolt and nut, F. G is the center hole of the wheel. It will be seen that the boss of the wheel is not cast solid, but that the space or key-way, E, cuts through into the center hole; when, therefore, the nut of the bolt, F, is screwed up tightly, it draws the lug, H, toward the arm, and contracts the diameter of the center hole, gripping the axle with immense power. All that is necessary to release a wheel is to unscrew the nut, when the boss of the wheel expands, and the wheel may be removed. To make any movement of the wheel or the axle (either lengthwise or rotary) impossible, a slot or recess, as before mentioned, is made in the axle, a key plate is made to fit into this, and is held between the lug and the arm of the wheel, the bolt used to contract the boss being also used to secure the key plate by passing through a suitable hole at its upper end.

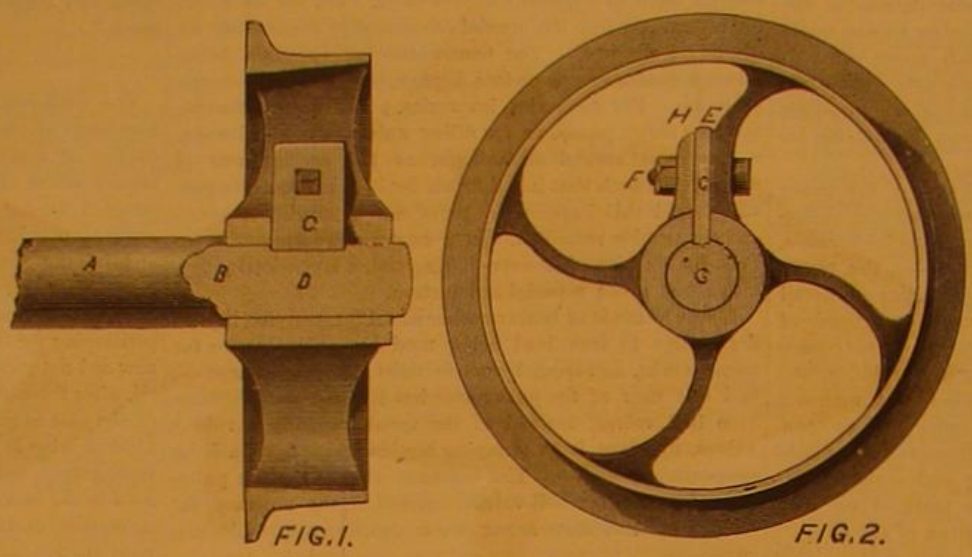


FIG. 1. FIG. 2.

NEW METHOD OF SECURING CAR WHEELS.

Our Sugar Refineries.

The discussion among the leading sugar refiners, looking to the placing of the refining business in the hands of an executive committee to put a stop to over-production, brings out the fact that there are in the United States nineteen refineries in active operation, with a capacity of about 7,500,000 pounds daily, while the daily consumption does not exceed three-fourths of this quantity.

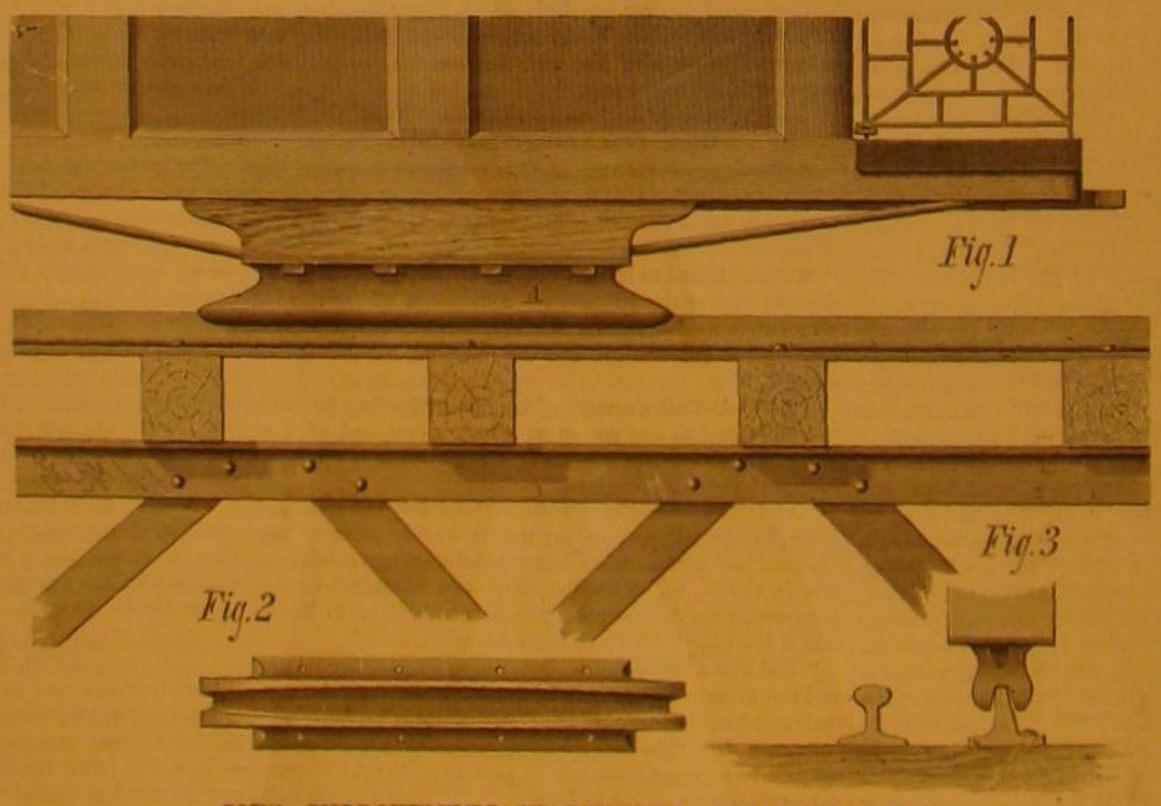
NOVEL METHOD OF RUNNING RAILROAD CARS.

The engraving represents a novel plan for moving the cars of elevated railroads without jar or noise and without subjecting the track or trestle work to the concussions incident to the use of wheels. The tendency of continued pounding and jarring is to enlarge the holes in the beams and braces, to shear off the rivets, and to weaken the structure. The inventor of the device illustrated proposes to do away with all of this wear and tear, and to make the elevated roads practically noiseless. Certainly such a state of things is greatly desired by the property owners, business houses, and residents along the lines of the elevated roads, and no doubt the roads themselves would be greatly benefited by the adoption of any device that would accomplish these results.

The device is exceedingly simple, and apparently not difficult to apply to the existing structures or the cars now in use.

The invention consists in substituting for the present wheels and axles a set of sliders or skates, which run upon special rails placed upon the ties, outside of the ordinary rails, the latter being used for the drive wheels of the locomotive. The inventor says that the drive wheels, being large and running at a comparatively slow speed, make no appreciable noise, and it is claimed that with proper lubrication a train may be moved with the skates on the plain track with less power than is now required to move cars provided with wheels. The skates are each provided with a chamber for containing a lubricant, and are fitted to receive wearing slips in the groove on the under side, so that when the skate becomes worn, the worn surface may be removed and replaced without interfering with the main portion. The auxiliary track is made of steel, and is quite narrow at the top, and is smoothly finished and polished, so that when slightly lubricated the car will glide smoothly and easily. The lubricant is slowly applied to the special track through small holes extending from the chamber to the lower face of the skate.

A portion of a car with the skate attached is shown in Fig. 1; and Fig. 2 is a bottom view of the skate, showing the removable wearing surface, and the curved form of the sides of the groove which adapt it to curves. Fig. 3 is a transverse section of one side of the track, showing the relative position of the two rails and the skate.



COX'S IMPROVEMENT IN RUNNING RAILROAD CARS.

The inventor claims that the saving which this device would effect in journals and wheels would pay the expense of the change, and that it would last much longer without repairs. As a matter of engineering, the problem of applying this invention to the existing roads is very simple. Switches, crossings, etc., are easily arranged, and no material changes will be required in the working of the roads.

This invention has been lately patented by Mr. James R. Cox, of Auburn, N. Y., who may be addressed for further information.

NEW INVENTIONS.

An improvement in cotton choppers, patented by Mr. John Warren, of Newton Factory, Ga., consists in combining with curved arms blades having upwardly turned cutting ends, a horizontal blade, and a slotted bar.

Mr. James M. Harrison, of Hollansburg, O., has invented a hand corn planter, which is an improvement on the hand corn planters for which letters patent No. 111,202 were granted to the same inventor January 24, 1871.

Mr. De Laski T. Clemons, of Hornellsville, N. Y., has patented a table-leaf support, so constructed that it will adjust itself in position when the leaf is raised, and by being slightly moved will allow the leaf to drop, the support being pushed out of the way by the weight of the leaf.

In an improved crucible furnace, patented by Mr. Georg Fischer, of Hainfeld, Austria, the lower part of the furnace containing the crucibles and fuel is fitted to be raised by means of an elevator and put in connection with the middle portion of the furnace, or let down upon a track on the floor of the smelting house for removal and replaced by another lower portion previously heated and charged with crucibles. The object of the invention is to produce a continuously working furnace by allowing the lower part of the furnace to be raised and put in connection with the middle part or separated therefrom and lowered on a track leading to the foundry. In this way separate charges of crucibles are being heated, raised into the furnace, and being taken to the foundry, rendering the operation continuous.

Mr. Nixon Thomas, of Dupont, Ind., has patented an improved device for increasing the efficiency of those washing machines that operate by pounding the clothes. The invention consists in a combination of parts that cannot be clearly described without engravings.

An improved force pump has been patented by Mr. Philip A. Myers, of Ashland, O. The invention consists in a novel construction and arrangement of the various parts of a pump. Although it is quite simple it cannot be clearly described without engravings.

Mr. Marion H. Simmons, of Atchison, Kan., has patented an improved self-locking clevis, which has two arms hinged to each other at their forward ends by a pin, the one arm having a pin at its rear end and the other having a notch to receive the pin, the corresponding hooks formed upon the forward ends of the arms, and the link hinged to the end of one of the hooks, whereby the clevis can be readily attached to a double tree or other object.

An improvement in the class of devices which combine the functions of a measure and funnel for use in drawing off and measuring small quantities of liquids and such dry solid substances as will flow readily, has been patented by Messrs. Allen C. Smith and Henry W. King, of Canaan, N. Y. The invention is embodied in two parts, which are connected so as to form practically one measuring funnel. The parts are a cylinder having a tapering nozzle and mouth or receiving opening to adapt it to serve as a funnel, and a measuring cylinder or vessel, which also has an open mouth, and is placed in the former or funnel cylinder and pivoted in such manner that it may be tilted for the purpose of discharging its contents into the same.

A ditching machine that, as it moves along, cuts and removes the earth and deposits it on the sides of the ditch by means of an inclined auger, has been patented by Mr. Andrew D. Martin, of Abbeville, La.

An improved fence post, patented by Mr. Andrew Climie, of Ann Arbor, Mich., combines the advantages of wood and stone and to produce a post or tie that is substantial and practically indestructible. It consists, essentially, in a post or sill made of concrete, and provided with an iron rod for strengthening it longitudinally, and with transverse branches of the rod for attaching the fence rails to the post or the planks or boards to the sill.

Messrs. James T. Coughlin and August P. Schneider, of New York city, have patented an improvement in the construction of boats. The invention relates to the manufacture of boats, especially light shell or race boats. It consists in the use of sheet cork as a material for the shell of boats, strengthened by sheets of thin cloth or other suitable material, which is secured upon the inner and outer sides of the shell by waterproof varnish.

Mr. Francis M. Myers, of Jersey City Heights, N. J., has patented an improved article of board for bookbinders' and box makers' use, and a new process of making it. Heretofore such board has been made of a single homogeneous sheet of paper of the required thickness and then dried on the cylinder. This mode of making the board is, however, objectionable, on account of the difficulty experienced in drying sheets above a certain thickness without injuring the qualities of the board. The improvement consists in making the board of two or more homogeneous sheets of board cemented together.

An improved washing machine, patented by Mr. Fred. Ernest Arnold, of Chicago, is so constructed as to do the work quickly and thoroughly. It is simple in construction and easily operated.

An improved apparatus for opening hinged gates, patented by Mr. Henry Allen, of Silverton, Oregon, consists in the combination and arrangement of devices for elevating the pivoted latch of a laterally swinging gate.

THE LEATHER CARP.

BY A. W. ROBERTS.

The leather carp (*Cyprinus nudus*, Block) is distinguished from the mirror carp by having only a few scales along the back and abdomen, and sometimes none. The intermediate space consists of a thick skin, soft, and velvety to the touch like that of a frog. The general color is a dark olive brown. Its mouth is toothless, but situated on the pharyngeal bones of the throat are three rows of stout teeth. The lips are thick, and on the upper jaw are four barbels, two short and two long.

Carp were first cultivated in Austria in 1227, in the time of Charles IV. At the present time the Princes of Schwarzenberg own ponds comprising a total area of twenty thousand acres. The annual catch of carp from these ponds is five hundred thousand pounds. The leather carp, from the fact of its being scaleless (or nearly so), is a much safer fish to transport and keep than the mirror or scale carp. In transporting fish great danger is always encountered from chafing, bruising, and scaling. As a rule, when a fish loses a scale or is chafed or bruised it seldom escapes being attacked with fungus; on the other hand, the leather carp, having a tough, pliable, and slippery skin, like that of a frog, it will heal more readily, the epithelium covering it immediately the new skin will begin to form. Mr. Rudolph Hessel says he has often seen scars on the leather carp produced from the bite of a heron or pike or some other hurt, but never saw anything of the kind on a scale carp, for if one of these be wounded it almost invariably dies. The scale, mirror, and leather carp will live in either fresh or salt water. They have been found in the Black Sea weighing twenty pounds, also in the Caspian Sea in great numbers. They are capable of living in almost any kinds of water, that of bogs, swamps, etc. In Germany they have been known to live and thrive in water having a temperature of over 100° Fah. I have at the present time a small specimen that has lived in a ditch of brackish water for over two months.

On the approach of winter the carp form into groups of from fifty to one hundred, making a cavity in the muddy bottom, which is called a "kettle;" in this they hibernate till spring, huddled in circles with their heads together, the posterior part of the body held immovably. In this condition they do not take a particle of food, yet during their long winter's sleep they neither diminish nor increase in weight.

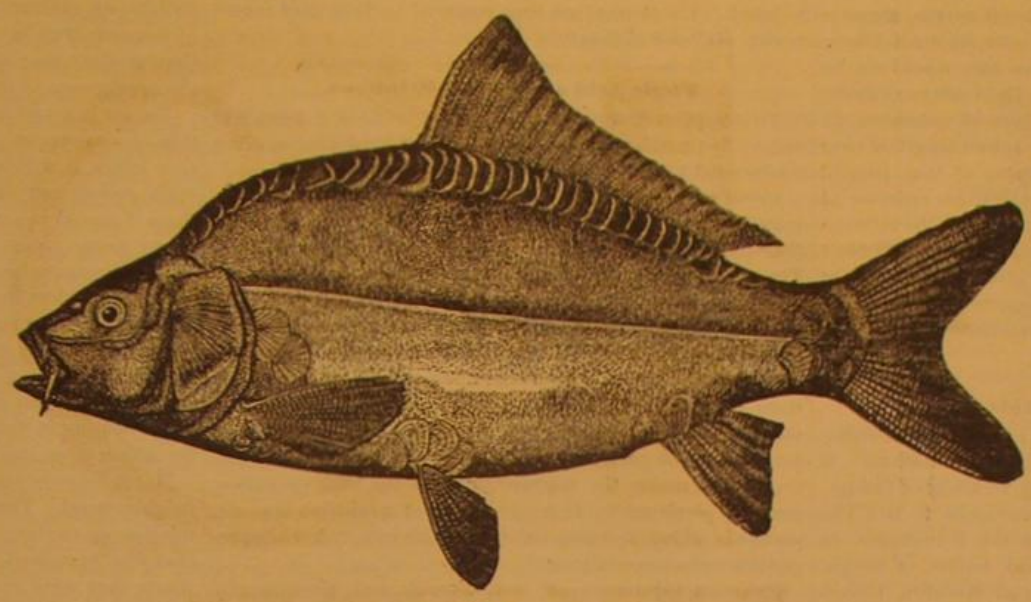
The carp leaves its winter home as soon as the water becomes warm. Spawning commences in May and continues through the warm months. Rainy and cool weather interrupts the spawning, which is again continued during warm and clear weather. The male, during the spawning season, displays a number of protuberances on the head and back. The pharyngeal teeth are cast some time before the breeding season; these are renewed every year. As the breeding season approaches the fish become more active, two or three male fish accompanying each female. The female swims more swiftly and keeps close to the surface, constantly followed by the males. This is called running spawning. The male fish follow the females close to the water's edge till there is hardly depth of water to swim in; they losing all their timidity and caution can be easily captured. They lash the water, twisting the posterior of the body energetically, and shoot through the water with short, tremulous movements of the fins. This is the moment when the female drops her eggs, which are instantly impregnated by the milter. As the female drops probably only from four hundred to five hundred at a time in order to gain rest, it will require days and weeks before she has given up her last egg.

The eggs of the carp are adhesive, and adhere in lumps to the object on which they are deposited.

Old carp have been taken in different parts of Europe weighing all the way from forty to ninety pounds. When this fish does so well in Europe, where it is forced to spend many months in its winter's sleep, and where natural food at best is scarce, what may we not expect of this wonderful and useful fish when introduced into the ponds and streams of the Southern States, where they can feed to repletion on the choicest of natural food all the year round, and where they will often spawn twice a year?

In the waters of Central Europe the carp, after its awakening from its long winter's sleep, seeks most diligently for the seeds of the white and yellow water lily, also the *Phellandricum aquaticum*, *Festuca fluitans*, etc. The waters of the United States abound in all these plants and many others, the seeds of which will serve the fish as food; for instance, the wild rice (*Zizania aquatica* and *Z. fluitans*), also the well known rice or "water oats," with its great riches of seeds, and many others which will yield food profusely, and which European waters do not possess.

Let us once more consider the extraordinary increase of weight of about one hundred per centum in the exceedingly short space of four months, for during the winter time it is



THE LEATHER CARP.

banished by nature into its temporary tomb. This fish needs from fifteen to eighteen months of growth, to gain, at a low estimation, three pounds without being fed. There are some culturists who obtain in the same space of time fishes of four pounds weight; but they possess ponds of warm situation, which thaw early in the spring, and perhaps they assist nature by feeding the fish.

Up to the present time of writing over twenty-five thousand carp have been distributed from the Smithsonian carp ponds over all parts of the Union. The carp, being slow and sluggish in its movements, has many natural enemies, such as turtles, large frogs, snakes, eels, mink, and muskrats. Persons having carp ponds should keep a sharp lookout for these pests. Dr. Hessel says that he has seen three year old fish so crowded in ponds in Europe that they were principally head with a small body. Such stunted fish will never recover when placed in roomy ponds. Five hundred fish to an acre of water is about the right proportion; more than that number will not do well.

Some two years ago I received from one of the German steamers, through the kindness of Professor Beard, a number of small leather carp; none were mere than an inch and a half in length. These were placed in an aquarium of the proportion of four feet by two, which was supplied with slow running water. The few that are now left are from seven to eight inches in length, and have always been kept in the same tank.

These carp have passed through every conceivable trial. They have jumped out of the tank repeatedly, but have recovered rapidly from the wounds. Fungus has attacked them many times, forming in patches about the head, but it did not seem to make the least impression on their tough skin, and soon disappeared. On one occasion I placed one of these carp in a sea-water tank, the density of the water being eleven, to rid him of fungus; but being called away I forgot all about the carp till the next day, and was surprised to find him perfectly at home in his new element. Some "horse leeches" escaping from their tank through the strainers, concluded to settle down for life in the leather carp tank. When I discovered them in the tank, one of the carp (to which was attached a well-filled leech) was lying on its side nearly exhausted. And yet this fish recovered from its injuries.

Having a number of soft clams left over after feeding the fish, I placed them in a pickle of strong brine to keep till next day; but forgetting till the end of the week, they were more like India-rubber than the tender soft clam.

Being anxious to learn the digestive powers of the leather carp, for I had long been of the opinion that they could digest anything they could swallow, and thus far they had swallowed every variety of food, I concluded to give them a feed of the pickled siphons of the clams, of which they partook bountifully. In the next tank were a number of yellow perch, all in fine condition, these also partook of the clams. Well—half the perch died, but the carp are living.

These carp are so tame that they will take the ends of my fingers in their mouths.

I am indebted for much of the information contained in the above article to Dr. Hessel, of Washington, and to Mr. Eugene Blackford, of New York, for living specimens of the fish.

MONSTER BONES FROM THE ANCIENT CRETACEOUS SEAS OF KANSAS AND COLORADO.

MONSTER BONES (FOSSILS) FROM THE ANCIENT CRETACEOUS SEAS OF KANSAS AND COLORADO.

BY C. F. HOLDER.

Among the recent additions to the geological department of the Museum of Natural History, Central Park, are some bones representing several large reptiles that existed during the cretaceous period of North America. The reader will remember that during this period—the time during which the Dover Cliffs of England and the green sand marl was deposited—the great plains of the West were the bottoms of a vast sea that found its eastern shore near the present site of Fort Riley, Kansas, and beat upon unknown sands far to the north, south, and west. The animals found in this era had arrived at the maximum of physical growth in all time, and the entire age is characterized by the enormous growth of its dependents. All of the species thus far discovered in the sands of Kansas and Colorado—and there are over fifty—have been referred to the reptiles and fishes, and are of the most gigantic proportions.

The late Prof. Mudge, of Kansas, has probably done more work in unearthing these extinct monsters than any other scientific man, and the fine collections in the Museum at Yale College and the specimens at the Central Park are legacies of his labor.

The largest specimens have been found near Cañon City, and are known to science as the *Clidastes*, *Cimarasaurus*, *Amphicelias*, etc. The first named was a veritable sea serpent of these ancient seas, and the huge bones and almost incredible number of vertebræ show it to have attained a length of nearly two hundred feet. Prof. Mudge states that while riding through the *Mauraise Terres* of Colorado, he saw from his horse the remains of no less than ten of these monsters strewn upon the plain, their whitened bones bleached in the suns of centuries, and their gaping jaws armed with ferocious teeth, telling a wonderful tale of their power when alive.

Some of the remains were found only partly weathered out, and could often be traced into the bed of a neighboring cliff, and, again, many of the large bones were scattered far and wide, probably by the gigantic sharks that infested the seas at that time. Many of the reptiles were allied to the crocodiles of the present day, and were wont to feed upon the banks of the great shallow seas. The thigh bone of one of these, the *Atlantosaurus*, is on exhibition at the Park, and is calculated to arouse the credulity of the most skeptical. It is over six feet in length, and looks more like a huge column for support than to assist locomotion. By its side is the same bone A six inches long—of the largest living crocodile of to-day, which rarely exceeds seventeen feet in length. Thus the question presents itself to the amateur restorer: If a crocodile with a thigh bone six inches long attains a growth of seventeen feet, how long would one be whose thigh bone exceeded six feet? The reader can easily surmise that the creature must have been of enormous dimensions, and scientific men have placed their length at over two hundred feet. Imagine an alligator of that length! But this is not the largest. We will place this estimate at one hundred feet; and since the discovery of the *Atlantosaurus* another huge form has been found which possesses a thigh over twelve feet in length, and although it would be obviously incorrect to take such a proportion to *determine* the physical increase, it points to an attainment of size that dwarfs the *heroic*.

Hotbeds made by Ants.

In the State of Colombia there is a large ant (*Atta cephalotes*) which causes a great deal of injury to plantations. It attacks and carries off indiscriminately all kinds of foliage, and no sort of vegetation seems to come amiss to it. The quantity of foliage carried off by these ants is immense; in quality it may be bitter, sweet, pungent, tender, or tough. Her Britannic Majesty's Acting Consul at Medellin, United States of Colombia, was led to mark carefully the uses to which the ants put this mass of vegetable matter which they convey to their nests, and he ascertained that they employ it to make hotbeds, upon which their eggs are deposited to be hatched by the heat produced by the fermentation of the leaves. The ants do not eat these portions for food, and the larvæ are fed upon a carefully selected diet. Once the brood is hatched, the ants clear away the hotbed, carrying out of their nest all the decomposed vegetable matter. This is thrown out in heaps apart, and in the large ant hills these heaps will contain bushels and upward. Many efforts have been made to exterminate these ants, at least in the vicinity of farms or gardens; but where the nests occur in plantings or in uncultivated grounds, all attempts have failed. Our consul, Mr. R. B. White, however, believes that he has discovered an efficaceous remedy, and it was shown to him by a negro. When a plantation or garden is attacked, all one has to do is to procure a quantity of the *débris* from the hotbeds thrown out of an ant hill entirely unconnected with that from which the invading ants proceed. Scatter this around the beds and on the ant roads, and the effect is marvelous. The ants seem seized with a panic; they drop their burdens instantly; the word seems passed along the roads, and empty-handed the whole of the invading army hurries off to its own nest. They will not return to the same place for many days, and even when they do they avoid all spots in which traces of this, to them, offensive matter remains. The smallest quantity will suffice, and a bushel will defend acres of ground. Mr. White, in a letter to the secretary of the Zoological Society of London, which is published in full in this society's proceedings, declares that he has seen this plan tried repeatedly, and it has never failed. The biggest army of ants—pioneers, engineers, directors general, and all—is utterly discomfited by this very simple means of defense. This plan is not generally known, even in the State of Antioquia (where these ants abound), and he thinks that our colonists might profitably be made acquainted with it.

Do Sharks Harbor their Young?

An interesting specimen of porbeagh shark (*Lamna punctata*) was caught recently off Great Neck, L. I. It was a female, and was sent to Mr. E. G. Blackford, of this city, who says: "When I received her she had not been dead more than seven hours. From the immense size of her stomach I though she must have swallowed a barrel or two of moss bunkers, and to gratify my curiosity I opened her. Imagine my surprise when instead of moss bunkers I found ten little sharks, evidently her offspring, and all just the same size—exactly two feet long. I should say they were about six months old, for a young shark when hatched from the egg measures about four inches. It has been a disputed question among fishermen for some time whether young sharks in time of danger do not seek safety in their mother's stomach. I think this case proves that they do, for the little ones were perfectly sound: there was no mark on them as if digestion had begun, and I have not a doubt but that if the mother had not been captured, as soon as the excitement was over the little ones would have worked their way out into salt water again, and in due time been big enough to give some unfortunate fisherman considerable trouble." The specimen measured six feet eleven inches in length, and was captured in a school of moss bunkers or menhaden.

Changing the Color of Flowers.

The natural color of flowers may be altered, according to C. Puscher, by exposing them to the diluted fumes of ammonia. Most of the blue, violet, and light crimson flowers turn to a splendid bright green. Dark crimson clove pinks turn black, other dark red flowers turn dark violet, all white flowers turn sulphur yellow. This change of color is especially beautiful when the flowers are variegated or the single petals possess a different color. As soon as the new color is fully developed, the flowers must be dipped at once in cold water, when they will keep their new shade for two to six hours; by degrees then their natural color returns. If flowers be exposed to the vapors of ammonia for one or two hours they turn a dirty chamois, which is permanent. Blue, violet, and red asters are dyed or turned intense red when they are exposed to the fumes of muriatic acid gas; it takes from two or four hours or more before the shade is fully developed. The flowers are then removed to dark, cool rooms to dry.—*Chemical Gazette.*

Picric Acid and its Adulterations.

Trinitrophenol, usually called picric acid, is a beautiful yellow dye much used in silk dyeing, and is, of course, often adulterated to enable the manufacturer to cheapen it.

Picric acid is slightly soluble in cold water, more so in hot water, and very soluble in alcohol. It melts at 122·5° C. (252½° Fah.). If carefully sublimed it leaves no residue. The most common adulterations are: Oxalic acid, resinous substances, saltpeter, niter, and Glauber salts.

The presence of oxalic acid *in small* quantities cannot be looked upon as an adulteration, because when picric acid is made by the action of nitric acid upon phenol, indigo, or the resin of *Xanthorrhœa hastilis*, more or less oxalic acid is always formed by the oxidation going too far. In crystalline form the white prismatic oxalic acid crystals are easily distinguished under the microscope from the brilliant yellow scales of picric acid. If it is in a powder, a solution is made, ammonia added, and then chloride of calcium. A white precipitate indicates oxalic acid.

Resinous substances are not directly and intentionally adulterations, as they are often present when the preparation is not very exact and careful, but they are injurious in dyeing, and the consumer must take the following precaution: The picric acid is dissolved in hot water and 1 part of chemically pure sulphuric acid added for every 2,000 parts of picric acid, stirring until completely dissolved. If resin is present it will separate; it is then filtered and sulphuric acid again added, which precipitates the last trace of resin. After a second filtration it is perfectly pure, and may either be used in solution or left to crystallize out. By this method Winkler found from 0·01 to 0·03 per cent of resin in different kinds of picric acid.

Potash and saltpeter are detected in different ways. First, by means of the microscope; secondly, by the blue cobalt glass: potash salts imparting a violet color to the colorless flame, soda a yellow. The third and best test is to put the picric acid in a test tube and add absolute alcohol. On shaking and slightly warming, the picric acid dissolves, but saltpeter does not.

Glauber salt is easily detected in the same manner as any other sulphate. The picric acid is dissolved in warm water, some chemically pure hydrochloric acid added, and then a solution of chloride of barium. A white precipitate of sulphate of barium shows the presence of a sulphate, probably the sulphate of soda, Glauber salt.

The above tests, by Dr. H. Kraetzer, are so simple that every dyer can repeat them for himself.

What the Atmosphere Contains.

M. Gaston Tissandier, of elevated ballooning notoriety, says a correspondent of the *Kansas City Review*, has revealed many interesting facts on atmospheric dust, its connection with cosmical matter, and the important role it plays in fermentation and decomposition. As the air is purer after being washed by rain, so in dry weather, and especially in cities, the atmosphere is a veritable dust bin. We are sensible to the existence of these particles of attenuated matter; in breathing them they disgust us, and in falling and remaining on clothing and furniture they demonstrate not only their presence but their plenitude. Admit a sunbeam into a darkened room and the molecules will be revealed like nebulæ; yet the numbers we perceive are perhaps but the minimum of what exists, for after the naked eye and the microscope there are minutiæ which dance still. Much of this atomic *débris* is of inorganic origin, and a great deal is derived from animal and vegetable sources. The renowned experiments of M. Pásteur have demonstrated that among these atomies which live, move, and have their being in the air, are germs or spores of fermentation and decomposition, that is to say, the seeds of disease and death. Showers of dust impalpable as flour, and sometimes red as blood, have fallen in several parts of the world, astonishing or frightening, as the populations are superstitious or cultivated. These showers are simply silicious particles whipped up to the superior regions of the atmosphere, and driven along by aerial currents. Such particles have been lifted in Guiana and showered on New York, the Azores, and France, as Ehrenberg detected therein animalcula and shells peculiar to South America. Over the summits of the high mountains of the latter country the atmospheric currents are ever charged with silicious powder, and in parts of Mexico the crests of mountains act as veritable bars, and compel the deposition from these air streams of the dust, and which accumulate in the valleys to the depth of ninety yards. Geology recognizes these atmospheric deltas.

The foam of waves as they dash against the coast is pulverized into feathery pellicles, which float skyward with a trace of saline matter and that a sea breeze carries far inland. Space contributes as well as earth and ocean to the production of aerial dust. When meteorites and falling stars are rendered luminous and incandescent by their rubbing against strata of air in their vertiginous flight, they part with quantities of their metallic elements in the form of powder, iron, nickel, and cobalt, substances that Nordenskjöld has gathered on the virgin snow of the Polar regions. When atmospheric dust, whether collected directly on a sheet of paper, or from the sediment of snow and rain, is probed by a magnet, the tiny particles of iron attracted have all a spheroid family likeness, resembling furthermore iron filings if melted in a flame of hydrogen, or the extinguished sparks that fall on striking an ordinary flint and steel. Nay more, similar atoms of meteoric iron have been traced in the Lower Lias formation, geology thus affording evidence, that as now, so before the appearance of man on earth, atmospheric dust existed.

The air is a vast storehouse of animalcules. Expose a solution of some organic substance to the atmosphere for twenty-four hours, it will be speedily inhabited by myriads of infusoria, rolling and tumbling, yet so small that hundreds of them if placed in a row would not form a line in length. These worms resemble little eels. Analogous animalcules induce decomposition and fermentation, for the latter cannot take place unless the organic matters be in contact with the air, to receive the seed of the leaven, which by cellule propagation leavens the whole mass.

It has lately been shown that the process of nitrification in certain soils is due to a peculiar ferment, that is to say, to a spore floating in the atmosphere, and finding its conditions for action stops and operates.

Marsh fever is due to cellules or spores existing in a bog neighborhood. The same spores have been detected by the microscope in the expectorations of the patient, in the dew that was examined, and on the surface of the peaty soil where they were generated. This is simply poisoning. To a like cause is due the fell disease known as hospital gangrene; the germs in the polluted ward atmosphere enter the wounds, induce putrefaction and death. Hence the importance of washing the affected part with carbolic acid or other antiseptic; then dressing it with a wadding that will intercept, by acting as a filter, the germs to be deposited, from being sown.

In many factories workmen become victims to the dust, generated by their special industry, entering and saturating the lungs. On dissecting old colliers, their lungs, after forty years' respiration of dust, instead of being rose colored as in health, were as black as the coal itself. The dust in this impalpable form is often the cause of accidents; it can take fire and blaze like alcohol. Witness the catastrophe at the Minneapolis flouring mills: the confined air highly charged with the flour became on a par with ether or alcohol, awaiting only ignition from the heated millstone to burst into flame and explode.

The Treatment of Burns.

Service of Dr. George F. Shrady, at St. Francis' Hospital, New York.—A number of cases of more or less severe burns have been treated very successfully by an application of a gum dressing, which consists of a paste composed of gum acacia, ℥ iij.; gum tragacanth, ℥ j.; carbolized water (1–60), 1 pint; and molasses, ℥ ij. It is applied to the burned surface with a broad flat camel's hair brush immediately on admission to the hospital, and dries in the course of an hour or two. The dressing is then renewed at suitable intervals, until a firm and unyielding scab is formed. Generally four applications are necessary for this purpose. The molasses appears to prevent the contraction of the covering, while the carbolized water destroys any odor.

The application is not attended with any pain to the patient, and effectually excludes all air to the burned surface, thus avoiding subsequent smarting. The scab cracks and peels off in the course of a fortnight, either leaving a mere rubefaction or a healthy granulating surface. If pus accumulates in the mean time under the scab, the latter is either punctured or gently lifted, giving exit to the discharge. No other dressing is required. Although forming a rather unsightly scab, the dressing is really a cleanly one. This plan of treatment is substantially the same as that advocated by the late Dr. Gurdon Buck, and, all other things being equal, is considered to give the best results. Its special advantages are its ease of application, the small amount of subsequent dressing required, and the freedom from pain. The granulating surfaces are treated with either simple cerate or the white oxide of zinc ointment, according to indications.

Genuine Hall Marks on Spurious Plate.

The rage for antique silverware in England has developed an ingenious method of swindling, which has just been discovered by the Goldsmiths' Company of London. The fraud is effected by cutting out genuine hall marks from small but antique articles of silverware and inserting them on large pieces of wholly modern plate. Thus the bottom of a salt cellar, say of Queen Anne's time, is dexterously removed and worked into the fabric of a tankard, a soup tureen, or some equally massive object in silver recently manufactured, and the sham antique—the authenticity of its hall mark defying all the ingenuity of experts—thus passes muster as having been made one hundred and eighty years ago, and commands a corresponding enhancement in price. One dealer of this sort has lately been convicted and sentenced to a heavy term of imprisonment.

Our Cows and their Value.

At the late convention of the American Butter and Cheese Association, the President of the Northwestern Dairymen's Association, Hon. G. P. Lord, of Elgin, Ill., read a paper in which he estimated the number of milch cows in the United States at over 13,000,000, requiring the annual product of 52,000,000 acres of land for feed, giving employment to 650,000 men, and requiring the labor of 866,600 men. Estimating the cows at $30 each, the horses $80, and land at $30 per acre, together with $200,000,000 for agricultural and dairy implements, and the total amount invested in the industry is $2,219,280,000. This is considerably more than the amount invested in banking and the commercial and manufacturing interests of the country, which is $1,800,964,586. The cattle and horses will require two tons of hay annually or its equivalent. If it is estimated that 5,000,000 cows are fed with grain for winter dairying, and that the horses daily require six quarts of oats or corn during the year, they will consume 28,383,300 tons of hay, 84,380,000 bushels of corn meal, 84,370,000 bushels of oat meal, 1,250,000 tons of bran, 30,000,000 bushels of corn, and 300,000,000 bushels of oats, of a total value of $384,459,400. To this should be added the labor of 650,000 men at $20 per month, $156,000,000, making the annual value of $504,459,400, or an average of $38.80 per cow.

Accepting 12 cents per gallon as a basis for computing the value of the milk product, and 446 gallons the average yield per annum (this being the average in sixteen States in 1860), the 13,000,000 cows produce annually 5,793,000,000 gallons of milk, worth $695,760,000. Analysis shows that 3½ pounds of milk contain the same kind and amount of nutrition as 1 pound of boneless beef. The total weight of the milk product is 50,732,600,000 pounds, equal to 14,495,000,000 pounds of boneless beef. About 50 per cent of a fat steer is boneless meat, so that it will require 20,650,000 steers of 1,490 pounds weight to produce the same amount of nutrition as the annual milk product. Such fat steers would sell at $4.50 per cwt., or $63 each—a total of $1,300,950,000; deducting for hide and tallow, $260,190,000, leaves the meat value $1,040,760,000. This gives the food value of the milk product in the United States annually. Willard, in his "Practical Dairy Husbandry," says that milk at 24 cents per gallon is equivalent in value to boneless beef at 9 cents per pound." It is false economy, therefore, that substituted meat for milk as an article of food.

The same authority (Willard) states that 50 per cent of the milk is used in making cheese and butter, and 41 per cent is consumed in a liquid state. The Department of Agriculture, 1877, estimates there are 1,000,000,000 pounds of butter and 300,000,000 pounds of cheese made annually in the United States. At 27 pounds of milk for 1 pound of butter, and 9½ for 1 pound of cheese, the total amount of milk used would be 29,950,000,000; add 41 per cent of the product for consumption, the total production is 50,732,325,000 pounds, within a small fraction of 1 per cent of the estimate made.

The caseine in the milk used for making butter, if utilized for cheese, would produce annually 1,890,000,000 pounds, and besides there is annually run off in the skimmed milk, buttermilk, and whey 200,000,000 pounds of milk sugar, which, if saved, would have a market value greater than the entire annual sugar crop of Cuba.

New Jersey Scissors in Sheffield.

A correspondent of the Portland (Me.) *Advertiser* relates as follows his experience in looking for a proper souvenir of Sheffield, England, famous for its cutlery:

"Every other shop in the place seemed to be a cutler's shop—and into one of the best of these I ventured, requesting to look at scissors. It is a hobby of the English shopkeeper to show his cheapest goods first, no matter who his customer may be. Enter a shop in pursuit of something really good, for which you are willing to pay, and it generally takes three or four strong efforts to obtain it—he will persist in showing you all the cheapest grades first. So tray after tray of common cheap scissors was displayed on the counter. "Have you nothing better than these?" I asked, at last. "I am buying these scissors for Sheffield's sake, and I want a good pair." Out came another case, still in no way fine goods. I had already looked at five or six grades. "If these are your best," I said, "I will look further on." "Oh," said the shopman, "we have one more kind—very fine goods indeed, the best in the shop, but they are quite expensive," and he unlocked a drawer and took out a tray of really good scissors. I took up a pair to examine them, and read, stamped on the blade, "Newark, New Jersey!" As I could not reconcile myself to take a pair of New Jersey scissors as a souvenir of Sheffield, I was obliged to leave the disgusted shopman to lock up his precious scissors again, probably more than ever grounded in his belief that the high price of his goods was my reason for not purchasing.

Pennsylvania Tanneries.

The largest hemlock tanning in the world is now done between Sterling Run and Warren, Pa., along the line of the Philadelphia and Erie Railroad. The district includes thirteen tanneries in Cameron, Elk, McKean, Forest, and Warren counties. Large tracts of land in these counties are covered with a dense growth of hemlocks. Little clearings are made in the wilderness, a tannery is erected on some splendid trout stream, and an unpainted village springs up within a few months. The thirteen tanneries have facilities for tanning 775,000 hides a year. This would produce 1,550,000 sides of sole leather, averaging 17 pounds to the side, and aggregating 26,350,000 pounds of leather a year. At a fair average, the hides weigh 21 pounds a piece; so that the 775,000 go to the tanneries with an aggregate of 16,275,000 pounds, and emerge in the shape of sole leather weighing 26,350,000 pounds. This gain of 10,075,000 pounds is made in the face of fleshing, hair scraping, and trimming. It is made by the absorption of the tannin leached from ground hemlock bark.

These tanneries almost exclusively use South American dry hides, worth, on an average, 23 cents a pound. The 775,000 hides, therefore, cost $3,742,250. The leather averages 25 cents a pound, and the hides that cost $3,742,250 turn out leather that sells for $6,587,500, the gain in value being $2,845,250. All this, however, is not net profit. It represents the labor of nearly 1,500 men at an average of $1.25 a day for 313 days a year, and the value of 155,000 cords or 340,000,000 pounds of hemlock bark, worth from $4 to $4.50 a cord delivered. The aggregate of the cost of labor is $585,000, and that of the cost of the bark $658,750, a total of $1,243,750. This leaves for the tanners $1,591,500, out of which come taxes, cost of acids, wear and tear of machinery, fuel, lights, insurance, and other incidental expenses, leaving a fair profit at the bottom. The bark runs 2,200 pounds to the cord, and a cord will tan about ten sides of leather.—*New York Sun.*

The Silvering of Mirrors.

The methods of silvering mirrors, as practiced in Europe, are described as follows by Mr. C. Colné in his report upon glass at the late Paris Exhibition:

Silvered plate glass is produced by causing a slight coating of mercury to adhere to the glass. To obtain this result mercury must be retained by a metallic medium; it is, therefore, amalgamated with tin. Mercury, owing to its power of reflecting light very brightly, has been chosen as the best medium.

The operation of silvering is briefly as follows:

Upon a very smooth stone table a sheet of very thin tin is spread very carefully, so as to prevent all wrinkles. Upon this sheet mercury is rubbed all over, then as much mercury as the sheet will retain is poured over it. The glass plate is now carefully slid over the edge of the stone table, as near as possible to the mercury, and lowered on it. All the parts previous to this operation have been carefully cleaned, and the plate is handled with pieces of tissue paper to prevent the introduction of dirt. The plate is now covered with a cloth and loaded with weights to expel the surplus mercury. When the plate has been so weighted, the table is slightly inclined, and gradually increasing the inclination from time to time, until the mercury has been sufficiently drained; this generally requires twenty-four hours. The plate is now carefully taken up and carried over to an inclined wooden table, which is depressed gradually more and more to finish draining the mercury until the plate is supposed to be dry.

This is the process which has been heretofore followed altogether, but of late plates have been silvered with a dissolution of silver. Mercury has deplorable effects upon the health of workmen, as they are exposed to its dangerous emanations; these are rapidly absorbed by the skin and produce the well known and terrible mercurial poisoning. It is hoped, therefore, that mercury will be abandoned, and the new silvering process described below will be adopted in its place. Several methods have been proposed for silver dissolutions, all springing, however, from the discovery of Liebig, that aldehyde (produced by a partial oxidation of alcohol) when heated with nitrate of silver, the metal revivified, covers the glass over with a brilliant metallic coating. It is not our purpose to trace the different improvements made by Drayton and Pettitjean, but we will briefly indicate the process of the latter, which is now altogether used by the St. Gobain works with perfect success.

The operation is very similar to silvering with mercury. The table, instead of being a stone, is a hollow sheet iron table, made quite smooth on its upper surface, and containing inside water heated by means of steam, to bring the temperature to 95° or 104°. Preparatory to silvering the glass it should be thoroughly cleaned. The table being ready, a piece of oilcloth is spread over it, and upon this is laid a piece of cotton cloth. The plates are now put upon these cloths, and the following solutions are poured over them:

Liquor No. 1.—Dissolve in a liter of water 100 grammes of nitrate of silver; add 62 grammes of liquid ammonia of 0·880 density; filter and dilute with sixteen times its volume of water. Then pour in this liquor 7·5 grammes of tartaric acid dissolved in about 30 grammes of water.

Liquor No. 2.—This liquor is precisely the same as the other, with the exception that the quantity of tartaric acid is doubled, say 15 grammes.

First pour of liquor No. 1 upon the plates as much as will remain upon the surface without running over. The heat of the table is now increased gradually to 95° or 104° Fah., and in about thirty minutes the glass is covered over with a metallic coating. The table is now inclined and the plates washed with water, which carries off the surplus silver. The table is again raised, and liquor No. 2 is now poured over. In about a quarter of an hour another coat is deposited, which covers the glass completely. The plates are again washed; then they are carried to a slightly heated room, where they are gradually dried.

This operation, as will be seen, is quite simple, and is generally performed by women. The silver carried off in washing and that contained in the cloths is recovered again. Since glass silvered by this process is liable to be altered when exposed to the air, and the coating may become easily detached if not covered over with a protecting coat of paint, the silver pellicle is covered with an alcohol copal varnish, put on with a brush, and when this is dry a coat of red lead paint is put on.

Plates silvered by this means have more brilliancy than with mercury, but as there is a slight tinge of yellow given to objects reflected by these mirrors, they were at first objected to. This objection has passed away, however, to a great extent, and the yellow reflection has been obviated by giving a slight coloration to the glass. I have not been able to get positively the relative costs of both processes; it is said, however, that by the new process the cost price is about 36 cents per square meter. Owing to the fact that such works as the St. Gobain have adopted it, and as the terrible disorders caused by mercury have been avoided, there ought to be no hesitation in adopting this new process everywhere.

The Use of Salt in a Dry Time.

A correspondent in the Chicago *Times* gives the following account of his experience with the use of salt in the garden and orchard. Young fruit trees can be made to grow and do well in places where old trees have died, by sowing a pint of salt on the earth where they are to stand. After trees are set I continue to sow a pint of salt around each tree every year. I set twenty-five trees in sandy soil for each one of seven years, and only succeeded in getting one to live, and that only produced twigs a few inches long in nine years. Last spring I sowed a pint of salt around it, and limbs grew from three to three and a half feet long. In the spring of 1877 I set out twenty-five trees, putting a pint of salt in the dirt used for filling, and then sowed a pint more on the surface after each tree was set. All grew as if they never had been taken from the nursery. Last spring I set thirty more, treating them in the same way, and they have grown very finely. The salt keeps away insects that injure the roots and renders the soil more capable of sustaining plant growth.

In 1877 my wife had a garden forty feet square. It was necessary to water it nearly every day, and still the plants and flowers were very inferior in all respects. In 1878 I put half a barrel of brine and half a bushel of salt on the ground, and then turned it under. The consequence was that the plants were of extraordinarily large size and the flowers of great beauty. It was not necessary to water the garden, which was greatly admired by all who saw it. The flowers were so large that they appeared to be of different varieties from those grown on land that was not salted.

I had some potatoes growing from seed that wilted down as soon as the weather became very hot. I applied salt to the surface of the soil till it was white. The vines took a vigorous start, grew to the length of three feet, blossomed, and produced tubers from the size of hen's eggs to that of goose eggs. My soil is chiefly sand, but I believe that salt is highly beneficial to clay or common prairie land.

[The above makes a very nice story; but one of our correspondents, a lady, tells us that she lately tried the salting plan on her flower beds, and in a few days all the plants were dead. The use of salt for killing weeds is well known. —EDS. S. A.].

Dr. Unger's Cure for Drunkenness.

The claims of Dr. Unger for a remedy for curing intemperance would seem to be justified, if we may rely upon as good authority as the Chicago *Tribune* for the evidence. Mr. Joseph Medill, the editor, is said to be a strong indorser of the new remedy, and from the editorial commendations of it in the columns of the *Tribune* we conclude the remedy has produced some benefit to the community already. It is claimed that the doctor has cured 28,000 persons of the worst form of intemperance with it, and that this is the first remedy ever discovered that kills the disease and the inclination to drink at one and the same time.

Remedy.—Take one pound of best, fresh, quill red Peruvian bark, powder it, and soak it in one pint of diluted alcohol. Afterward strain and evaporate it down to half a pint. Directions for its use: Dose—a teaspoonful every three hours the first and second day, and occasionally moisten the tongue between the doses. It acts like quinine, and the patient can tell by a headache if he is getting too much. The third day take as previous, but reduce the dose to one-half teaspoonful. Afterward reduce the dose to fifteen drops, and then down to ten, and then down to five drops. To make a cure, it takes from five to fifteen days, and in extreme cases thirty days. Seven days are about the average in which a cure can be effected.

A Treasure Wagon.

The removal of the Bureau of Engraving and Printing, at Washington, to a building half a mile from the Treasury has made it necessary to provide new arrangements for the transfer of money and bonds between the two establishments. The department has had constructed a heavy, van-like wagon, a sort of vault on wheels, built of iron and steel, and arranged internally like a bank vault with a sheet iron lining. The doors are fastened with tremendous bolts, and the locks are of the combination order. The body of the vehicle is painted an olive color with gilt ornamentation. When drawn through the streets by two immense horses it attracts considerable attention, especially as it is always accompanied by five armed agents of the Treasury Department, two guarding the front and three the rear.

Astronomical Notes.

Observatory of Vassar College.

The computations in the following notes are by students of Vassar College. Although merely approximate, they are sufficiently accurate to enable the ordinary observer to find the planets. M. M.

POSITIONS OF PLANETS FOR AUGUST, 1880.

Mercury.

On August 1 Mercury rises at 5h. 44m. A.M., and sets at 7h. 6m. P.M.

On August 31 Mercury rises at 4h. 10m. A.M., and sets at 5h. 59m. P.M.

Mercury is at inferior conjunction on the 5th, and at greatest elongation on the 21st, rising before the sun, and some five degrees north of sunrise point. Mercury is in perihelion on the 29th.

Venus.

Venus keeps so nearly the path of the sun in August that it is not likely to be seen.

On the 31st it sets after the sun, a few degrees south of the point of sunset.

Mars.

On August 1 Mars rises at 7h. 19m. A.M., and sets at 8h. 36m. P.M.

It may still be seen early in the month. It moves from Rho Leonis toward Tau Leonis.

Late in the month Mars sets before the sun. The crescent moon will pass south and east of Mars on August 8.

Jupiter.

On August 1 Jupiter rises at 10h. 6m. P.M. On August 31 Jupiter rises at 8h. 7m. P.M.

Jupiter will be so brilliant this autumn, as it approaches perihelion, that the most careless observer cannot fail to notice it in the evening sky.

If we take the hour from 9 to 10 P.M. for observing Jupiter, an ordinary telescope with an object-glass only two inches in diameter will show the satellites and their changes of position.

On the 23d the first satellite will disappear by going into the shadow of Jupiter, as the moon goes into the earth's shadow in a lunar eclipse.

On the 24th the same satellite will be invisible when Jupiter rises, because it is moving across the face of Jupiter. It will be seen to come off on the left or preceding limb of the planet.

On August 31 the same satellite will be seen between 9 and 10 P.M. moving toward Jupiter and entering upon the disk of the planet. A telescope with an object-glass of five inches diameter will enable one to see the dark shadow of these satellites pass across the face of Jupiter, as the shadow of the moon passes across the earth in a solar eclipse.

Jupiter will be about seven degrees south of the waning moon near midnight on August 23.

Saturn.

Saturn rises on August 1 at 10h. 34m. P.M. On August 31 at 8h. 36m. P.M., following Jupiter after nearly half an hour. The two planets separate a little in declination, Jupiter moving south a little faster than Saturn.

Like Jupiter, Saturn increases in brilliancy, and although far less conspicuous than Jupiter, will make the evenings of August very beautiful.

The waning moon rises nearly with Saturn on August 24.

A telescope of a few inches aperture will show Titan, the largest moon of Saturn, and the motions can be followed around the planet. A glass of five inches aperture will show Rhea, and on rare evenings, and when Saturn is on the meridian, Tethys may perhaps be seen.

Uranus.

Uranus rises and sets so nearly with the sun that it is useless to attempt to observe it in August.

Neptune.

On August 1 Neptune rises at 11h. 11m. P.M., and on the 31st at 9h. 13m. P.M.

It cannot be seen with a disk without the aid of a powerful glass.

South American Glaciers.

The English mountain climber, Mr. Whymper, writes to his friends that his last ascents in South America have been the mountains of Cayambe, Saraurcu, and Cotocachi. He has found very extensive glaciers on all these mountains, besides having previously discovered others on Chimborazo, Sincholagua, Antisana, Cotopaxi, Illiniza, Carihuairazo, and Quilindaña. How little is at present known of the Andes of Ecuador, the *Pall Mall Gazette* remarks, may be judged from the fact that in the edition of the "Encyclopædia Britannica" now appearing, in the article on Ecuador it is stated that the crater of the mountain Altar is remarkable as containing "the bed of the only real glacier known to exist in the Ecuadorian Andes." Mr. Whymper says that there are no glaciers upon Corazon, Imbabura, or Pichincha, but that among those upon the mountains which we have enumerated above there are many glaciers which are as large as the largest Alpine ones, and that the upper four thousand feet of Cayambe, Antisana, and Chimborazo, are almost completely enveloped by them.

Extensive Electric Light Experiments.

We learn from the *Paper World*, published at Holyoke, Mass., that Mr. H. C. Spaulding, of Boston, who was at first going to put his plans into effect in that city, has gone to Holyoke on account of the cheap power, and has made arrangements with the Water Power Company to put a wheel into their new pit expressly for his use. To make the experiment which he will attemp. will require 150 horse power, enough to run a paper mill. A tower about 175 feet high will be built and surmounted by an immense lantern of such power, says the enthusiastic editor, as to put all former electric lights completely into the shade. Mr. Spaulding will put up this tower and apparatus at his own expense, but he hopes to succeed so well that the city will adopt the system. His idea is that by *filling* the atmosphere above the city with light from several such electric towers he will get the same effect that we do from the sun and its reflected light, and that the shadows will be no darker than are those made by the sun. His idea is to fill the stratum of atmosphere just above the city so completely with light that it will permeate spaces which no direct rays reach, just as the sun's light does immediately after the sun has set.

The light which he expects to throw out from one lantern will be equal to 300,000 candles, while the largest electric light yet attempted by any one else has been of but 10,000 candle power. The estimated cost of the apparatus is $15,000, irrespective of any investment for power, but after the system is once in operation the cost of running it, aside from the power, will be small. The expense of lighting Holyoke at present, public and private, is estimated at $100,000 a year, and for about that amount the seven towers which are proposed could be set up and the lights put into operation.

The Air Breathed in Leadville.

Dr. H. Steinau, of Leadville, Col., sends to the *Medical Record* an interesting article upon the above subject. It has been asserted that the atmosphere of Leadville, which is 10,500 feet above the level of the sea, is poisoned by the smoke and gases from the numerous smelters, of which there are about twenty, in the neighborhood of the city. Dr. Steinau has examined into the question, and comes to the conclusion that the amount of deleterious vapor, though large, is quantitatively insufficient to produce any poisonous effects. The gases from which danger is to be apprehended are those containing lead, sulphur, chlorine, and arsenic. Estimating that each of the twenty furnaces around the city consumes thirty tons of ore per day, he finds that about ten ounces of chlorine, eighty pounds of sulphurous acid, and eighty ounces of arsenious acid would be given off every minute of the twenty-four hours. Most of the chlorine, however, unites to form solid chlorides; more than half of the arsenious acid fails to escape into the air, but is found in a solid condition in the speiss. The sulphurous acid is so diluted by the air that its presence is scarcely noticeable. The lead vapors are the most harmful, but their amount is small, and they can easily be prevented from escaping into the air. The conclusion, then, is that the furnaces are not sources of danger from their poisonous emanations. This conclusion is confirmed by practical experience, as no cases of lead or arsenic poisoning have been found.

Dr. Steinau is of opinion that Leadville is in much greater danger from its neglect to care for the drainage of the city and the disposal of filth. Nothing, he thinks, but the great natural salubrity of the place, with the high percentage of ozone in the air, has prevented an epidemic from occurring already.

Poisonous Effects of Alcohol.

We often hear it stated that pure liquors are much less injurious than those which are adulterated, and that much of the injury caused by alcoholic liquors is due to impurities. M. Dujardin has carefully determined by experiment the quantity of the various alcohols and similar substances, which are formed by fermentation or during distillation, required to produce death within twenty-four to thirty-six hours after injection. It will be seen that ethyl alcohol (or common alcohol) and glycerine are the most harmless, while amyl alcohol, the principal constituent of fusel oil, is the most deleterious. Glycerine differs from alcohol, in that it increases the bodily temperature, while alcohol lowers it. The results are given in grammes per kilo of the animal.

Classification.	Name of alcohol or derivative.	Pure.	Dilute.
Formed by fermentation.	Ethyl alcohol	8·00	7·75
	Acetic aldehyd	—	1 to 1·25
	Acetic ether	—	4·00
	Propyl alcohol	3·90	3·75
	Butyl alcohol	2·00	1·85
	Amyl alcohol	1·70	1·50 to 1·60
Non fermented alcohols.	Methyl alcohol, pure	—	7·00
	Common wood spirits	—	5·75 to 6
	Aceton	—	5·00
	Œanthic alcohol	8	2·50
	Caprylic alcohol	7 to 7·50	2 to 2·25
	Cetylic alcohol	—	—
Isomeric.	Isopropylic alcohol	—	3·7 to 3·8
Triatomic.	Glycerine	—	8·5 to 9

The contamination with higher boiling products, and the consequent injuriousness, increases in this order: 1. Brandy from wine. 2. Brandy from pears. 3. Brandy from apples. 4. Brandy from sugar beets. 5. Liquor from grain. 6. Liquor from beet sugar molasses. 7. Potato spirits. The brandy made from wine contains almost pure ethylic alcohol, and is therefore least injurious.—*Ding., p.* 406.

Courage Necessary to Success.

As the St. Louis *Journal of Commerce* pertinently says, a great deal of talent is lost in the world for the want of a little courage. Every day sends to the grave a number of obscure men, who have only remained in obscurity because their timidity has prevented them from making a first effort, and who, if they could have been induced to begin, would in all probability have gone great lengths in fame. The fact is, to do anything in the world worth doing, we must not stand back shivering and thinking of the cold and danger, but just jump in and scramble through as well as we can. It will not do to be perpetually calculating risks and adjusting nice chances. It did very well long before the flood, where a man could support his friends upon an intended publication for a hundred and fifty years, and then live to see its success afterward. But at present a man waits and doubts, and hesitates, and consults his brother, and his uncle, and his particular friends, until one day he finds he is sixty years of age; then he has lost so much time in consulting his first cousin and particular friends, that he has no time to follow their advice.

The Manufacture of Resin and Turpentine.

The turpentine and resin industry carried on at the South is much larger than probably most persons are aware. From the *Manufacturer and Builder* we glean the following account of the collecting of the gum and its conversion into a merchantable commodity

From Wilmington, N. C., southward, and nearly all the way to Florida, the pitch pine trees, with their blazed sides, attract the attention of the traveler. The lands for long stretches are almost worthless, and the only industry, beyond small patches for corn or cotton, is the "boxing" of the pitch pine trees for the gum, as it is called, and the manufacture of turpentine and resin. There are several kinds of pine trees, including the white, spruce, yellow, Roumany, and pitch pine. The latter is the only valuable one for boxing, and differs a little from the yellow pine, with which it is sometimes confounded at the North. The owners of these pine lands generally lease the "privilege" for the business, and receive about $125 for a crop, which consists of 10,000 "boxes." The boxes are cavities cut into the tree near the ground, in such a way as to hold about a quart, and from one to four boxes are cut in each tree, the number depending upon its size. One man can attend to and gather the crop of 10,000 boxes during the season, which lasts from March to September. About three quarts of pitch or gum is the average production of each box; but to secure this amount, the bark of the tree above the box must be hacked away a little every fortnight. Doing this so often, and for successive seasons, removes the bark as high as can easily be reached, while the quality of the gum constantly decreases, in that it yields less spirit, as the turpentine is called, and then the trees are abandoned. The gum is scraped out of the boxes with a sort of wooden spoon, and at the close of the season, after the pitch on the exposed surface of the tree has become hard, it is removed by scraping, and is only good for resin, producing no spirit. The gum sells for $1.50 a barrel to the distillers. From 16 barrels of the crude gum, which is about the average capacity of the stills, 80 gallons of turpentine and 10 barrels of resin are made. The resin sells for from $1.40 to $5 per barrel, according to quality, and just about pays for cost of gum and distilling, leaving the spirit, which sells for 40 cents a gallon, as the profit of the business. Immense quantities of resin await shipment at the stations along the line, and the pleasant odor enters the car windows as you are whirled along.

After the trees are unfit for further boxing, and are not suitable for lumber, they are sometimes used to manufacture tar; but the business is not very profitable, and is only done by large companies, who can thus use their surplus labor. The trees are cut up into wood, which is piled in a hole in the ground and covered with earth, and then burned the same as charcoal is burned elsewhere. The heat sweats out the gum, which, uniting with the smoke, runs off through a spout provided for the purpose. A cord of wood will make two barrels of tar, which sells for $1.50 per barrel, and costs 37½ cents to make. The charcoal is then sold for cooking purposes.

Medical Lakes of Eastern Washington.

In the neighborhood of Silver Lake, and about sixteen miles southwest of Spokane Falls, Washington Territory, are two small lakes, known as the medicated lakes, which are likely to become a great resort for invalids.

One lake is a mile and three-quarters long and three-quarters of a mile wide; the other a trifle smaller. They are about a mile apart. For ordinary bathing they are said to be delightful. The water invigorates and refreshes the whole system and leaves the skin soft and oily.

An analysis of these waters, by Dr. R. G. Rex, of Portland, Oregon, shows the following constituents:

Granite Lake.—Solid matter, 256 grains to the gallon, consisting of carbonate of soda and potassa, 160 grains; chloride of sodium and potassium, 64 grains; organic matter, silica, alkaline sulphates, etc., 32 grains.

Medical Lake.—Solid matter, 192 grains to the gallon; carbonate of soda and potassa, 120 grains; chloride of sodium and potassium, 48 grains; organic matter, silica, alkaline sulphates, etc., 24 grains.

Tall Sugar Cane.

The New Orleans *Times* has lately received from Ruatan three stalks of sugar cane measuring respectively 17 feet 9 inches, 16 feet, and 16 feet. The first had 57 joints, the other two 53 each.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

☞ The publishers of this paper guarantee to advertisers a circulation of not less than 50,000 copies every weekly issue.

NEW BOOKS AND PUBLICATIONS.

AN ELEMENTARY TEXT BOOK OF BOTANY. From the German of Dr. K. Prantl. Revised by S. H. Vines, M.A., D.Sc., F.L.S. Illustrated. Philadelphia: J. B. Lippincott & Co.

Professor Prantl bases his text book on the voluminous "Lehrbuch" of Professor Sachs. The English editor of the translation has adopted the general classification of thallophytes proposed by Professor Sachs in the fourth edition of his work, and has rearranged the various families of the group to correspond. Otherwise Professor Prantl's text has been for the most part closely followed.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) P. C. C. asks: What will remove stains from silk caused by new rich milk? The fabric was dyed an indigo blue; the original color was ashes of rose (a species of drab). Have tried lustral spirits, which is a distilled benzine preparation, also chloroform, ether, alcohol and ammonia, detersive soap, etc. A part of the spot is removed, apparently the oleaginous, but a stain remains. A. Rub well into the spots purified ox gall, mixed with an equal volume of soft water and a small quantity of fuller's earth; wash out with soft water, press between sheets of filtering paper with a hot iron, and brush. If the color has been discharged the judicious application of a little aniline blue or indigo extract dissolved in water will revive the parts.

(2) F. S. B. writes: I desire to know the proper acid mixture by which I can etch names upon steel, by melting a thin layer of beeswax upon the steel, then writing the name, and then putting on the acid. A. The etching fluid may consist of: 1. Nitric and acetic acid, each 1 part, water 3 parts. 2. Sulphate of copper, alum, and salt, equal parts, moistened with vinegar. 3. A strong solution of pyrogallic acid in water. The first is more active. Better use as a ground a mixture of equal parts asphaltum, Burgundy pitch, and beeswax. Melt together, pour into water, press out, and wrap in two thicknesses of silk. Rub this over the warm steel plate or surface.

(3) J. A. writes: In looking over my paper this evening (SCIENTIFIC AMERICAN, May 29th), I noticed vats for nickel plating. Thinking there was nitric or other acids used for plating, and as they appeared to be made with wood, I thought I might get some information that would help me out of what we find a great difficulty. We require a nitric acid bath 34 inches long, 30 inches high, 27 wide, for striping silk ribbons, etc., for redyeing. Of course the acid is diluted, say ¼ water to ¼ acid. Can they be made with wood to last any time? If so, what wood is best, or is there any thing better? A. Vessels of stoneware, glass, or porcelain-enameled iron are used for this purpose. Wood will not answer.

(4) W. H. I., referring to an article by Mr. Chase in No. 219, SUPPLEMENT, on building a canoe, asks whether it is to have a keel project from the bottom or is to be smooth. If smooth, should there not be a notch cut in the bottom of the pieces for bulkheads to admit keelson? A. There is to be no keel; the bulkheads to be jogged on keelson.

(5) L. J. O. writes: 1. I am making a telephone transmitter as described in your issue of May 8, 1880. I am desirous of having my battery at one end of the line, instead of one at each end, as one end will be exposed to frost in winter. Could you show me how the connections should be made? I can put up several wires if required. A. The battery should in all cases be near the transmitter. You should use some form of battery that will not freeze, or protect the battery in some way from the frost. 2. Is the carbon used in electric lighting by incandescence the same as is used in the ordinary electric light? A. Yes, but the pencil is usually much smaller in diameter.

(6) R. R. W. writes: Suppose a vessel is placed in a rain storm when the rain is falling exactly perpendicular; now, if the same vessel is placed in a storm when the rain is falling slanting, that is, at an angle, will the vessel contain the same amount of water each time, everything being equal? A. The vessel would receive less water when the rain falls at an angle, all other things being equal. Supposing the column of rain drops entering the vessel to be circular, the angular direction of the rain would give an elliptical section to the column which would be larger than the top of the vessel, and as a consequence some of the rain would fall outside the vessel.

(7) R. P. J. asks: What will drive away house ants? I have some at my house and they are very troublesome, and I have tried various things, but with no success. A. Dalmatian insect powder. Powdered borax with a little sugar. Blow into the cracks and crevices with a small bellows.

(8) B. F. V. writes: 1. I have a boat hull, extreme length 25 feet 7 inches; width, 5 feet 3 inches; depth at prow 3 feet, at stern 2 feet 3 inches, outside measure; the sides are 2 inches thick. It is made of well seasoned cotton wood, ¾ inch thick, sawed to shape, not bent; then the pieces were well matched and nailed down, piece upon piece, with eightpenny nails, the nails about six inches apart. Thus the hull is built up of layers of strips, 7-8x2 inches without rubbing, etc., on the inside of the hull. The weight of hull is appropriately about 1,000 lb. Her prow is long and tapers well. The keel tapers away from the prow to about midway aft, where the bottom becomes flat. How much canvas will she safely carry, and what style of rigging is best suited for inland waters, taking into account appearance and ease of handling? A. We can give no opinion about the amount of sail that can be carried, not knowing the model. We should say a jib and a shoulder of mutton sail, mast say 20 to 22 feet in length. You will probably have to carry ballast and add to the keel. 2. If steam were used, what power would be required to make about ten miles an hour? Would one horse power do? A. Neither one horse nor four horse will do it. 3. What size, pitch, and revolution of screw? A. A screw could not be used with success on account of the light draught of water.

(9) A. K. D. asks whether the pressure in a steam boiler is greater under the water than it is above the water? If so, why? A. It is. To get the pressure on the bottom, add to the steam pressure one pound for every twenty-six inches depth of water.

(10) J. N. S. writes: I want to get a cylinder large enough to force in with force pump 6,000 cubic feet of coal gas. How large a cylinder will it require, and at what pressure to the square inch? Please give size of cylinder in diameter and length, also the pressure to the square inch. A. If the 6,000 feet gas, approximately, be at the pressure of the atmosphere, and it is forced into a cylindrical receiver 43 inches diameter by 10 feet in length, the pressure will be 295 lb. per square inch, providing the temperature of the gas remains unchanged at the end of the process.

(11) I. S. asks: What will set the colors in cotton goods before washing? It is said turpentine will set blue, but how much? and what will set reds, green, and yellows, and how if two of these colors are in the same piece? Even the browns wash out. A. The attempt to render such colors on finished goods fast is likely to prove unsatisfactory and unprofitable. In washing such goods a little salt may be advantageously added to the waters, which should be soft and not too hot, and the cloth should not be allowed to remain longer in the water than is absolutely necessary.

(12) M. H. D. asks: What will remove printer's ink from linen or paper? A. Plenty of naphtha or benzole, strong, hot, caustic soda, or potash solution (in water).

(13) J. H. C. asks if a canoe, 13 feet long, 24 inches wide, and 18 inches deep, could be run by a hand pump, sucking the water in at one end, and sending it out the other, through a nozzle, made so as to form the rudder. If so, what kind of a pump? A. No; a pump would move the boat, but with much less rapidity than with the same power applied to oars.

(14) G. J. L. asks: 1. Which of the primary mechanical powers is illustrated in the action of a spring, a clock for example? A. Neither. It operates by its elasticity and is merely a reservoir of power. 2. What is the use of the bar magnet in the telephone, described in SUPPLEMENT, No. 142 (Fig. 4), as I can see no connection between it and any other part? A. The diaphragm of the telephone is always attracted by the magnet, but the force of this attraction is varied by the electrical impulses in the helix which surrounds the magnet. The electrical impulses are generated by the vibration of the diaphragm in front of the magnet of another similar instrument. This changes the force of the magnet and induces currents in the helix surrounding the magnet. These currents, being conveyed to the helix of the receiving instrument, vibrate the diaphragm and reproduce the sounds which vibrated the diaphragm of the transmitting instrument.

(15) S. M. R. asks (1) how to melt brass in an ordinary fire. A. Place it in a sand crucible with a little borax. A coal fire with a good draught will melt it. Place the crucible well down in the fire. 2. How to anneal brass to make it hard or soft. A. To make brass soft heat it to a low red and plunge in water. It cannot be hardened except by rolling or hammering.

(16) J. V. asks how to make bisulphite of lime in a simple way in small quantities, say ten gallons or so. A. Pass sulphurous acid (gas), derived from burning sulphur, through granular dry slaked lime until the lime will absorb no more. Keep the lime cool.

(17) W. M. S. writes: Can you give me the ingredients and proportions for making a soft solder that will melt quickly at a low temperature, over an ordinary candle or lamp, and to be used for mending tinware? A. Pure lead and tin 1 part each.

(18) F. A. T. asks: How can I restore to their natural color a half dozen ink-stained shirts? A. Most ink stains are readily removed by the application alternately of strong aqueous solutions of oxalic acid and chloride of lime (calcium hypochlorite). Rinse well with water before soaping.

(19) H. J. L. writes: Will you please inform me of the best and also quickest method of dissolving and precipitating pure gold a hundred ounces at a time, also the proportions to be used of chemicals? A. Gold is dissolved by a warm mixture of 3 parts muriatic and 1 part nitric acids. Boil down gold solution when complete, nearly to dryness, dilute with 4 or 5 volumes of water, filter, and add strong solution of sulphate of iron (copperas) until no further precipitate forms. The dark precipitate is finely divided metallic gold. Settle, decant, or filter, and wash with clean water.

(20) D. H. asks for information about artificial wood. What are its component parts? Whether it can be moulded, etc.? A. One preparation so-called consists of a mixture of sawdust and paper pulp moistened with glue water and subjected to hydraulic pressure.

(21) T. J. T. asks how to make a jet black varnish for small wood handles, that will make them smooth and shining, and that will make them hard and solid, so that they will not get dim by handling, or lose their gloss. A. The varnish consists of: Asphaltum, 3 oz.; boiled oil, 4 quarts; burnt umber, 8 oz.; and enough oil of turpentine to thin. The three first must be mixed by aid of heat and the turpentine gradually added (out of doors and away from fire) before the mixture has cooled. The work (dry) is given several coats, each being hardened in a japanner's oven. The last coat may be rubbed down, first with tripoli (applied on a soft cloth), then with a few drops of oil.

(22) W. H. T. asks: 1. What is the net percentage of gain from the use of the live steam jacket on steam engine cylinders? If there is no recorded experiments that will show it clearly, give your opinion as to its approximate value. A. There have been many experiments to determine the gain, and with very differing results. Under ordinary conditions it is probably not more than 5 per cent, often less. 2. Is the white oxide on zinc sheets poisonous? A. Yes. 3. Is any noxious gas given off during its formation? A. No.

(23) J. H. writes: We have a large lot of white bone tufting buttons, and on account of the color are no use to us. Can you tell me how we can color them a permanent black, or a good deep brown? A. Boil them in a strong aqueous decoction of logwood or logwood extract, then in solution of sulphate or persulphate or acetate of iron. 2. We also have a lot of beeswax, but entirely too black and dirty for our use in the business. How can we make it more clear so as to be useful? A light yellowish brown would do. A. Wax, 1 lb.; chloride of lime, 2 oz.; water, 1 pint. Heat the wax to about 212° Fah., and agitate with it the water and bleaching powder until the wax is whitened. Then agitate with a quantity of water containing about 5 per cent of sulphuric acid. Wash in boiling water, draw off and melt. Use lead lined vessels.

(24) M. A. D. asks: Will pumping the air out of an air tight vessel partially filled with water cause the water to freeze or turn cold? Would putting any kind of chemicals in another larger vessel around the air tight vessel help to turn it cold? If so, what kind of chemicals? What vacuum would have to be arrived at to freeze or turn very cold? A. Small quantities of water may be frozen in this way, provided the pumps are capable of maintaining a good overcurrent (say of 750 mm.); suitable provision is made for the rapid absorption of the aqueous vapor given off by the water and the vessel containing the water to be frozen is properly sheathed during the operation in non-conducting material. The absorbent for the vapors used may be strong sulphuric acid placed in a large vessel immediately adjoining the one containing the water and intermediate between it and the pumps. Small machines on this principle, made by Carre, of Paris, are in use. See "Ice and Ice Machinery," Knight's New Mechanical Dictionary.

(25) R. M. writes: 1. In making brine for curing beef tongues it is customary to use, besides the salt and water, a little molasses and saltpeter. Now, can you tell me why the molasses and saltpeter are used? All market men know that it is the proper thing to do, but I cannot find one who can explain their action on the tongues. A. Sugar (or molasses) is a powerful antiseptic, and in connection with salt preserves the flavor of the meat better than salt alone. Niter in the brine keeps the meat red and of a healthy color. 2. What liquid produces the greatest degree of cold in evaporating? A. That which evaporates most rapidly. Liquefied hydrogen stands at the head of the list.

(26) J. E. H. asks: 1. What is the best lacquer or varnish to apply to the bright parts of a bicycle to prevent their rusting and still have them look bright? A. Use a thin, clear alcoholic solution of bleached shellac. 2. Should the grease be removed before putting on the varnish? A. Yes.

(27) R. H. S. asks: 1. How can I dissolve common beeswax so as to mix with hot water? A. Wax is soluble in oil of turpentine, benzole, etc. An emulsion may be obtained by violently agitating these solutions with hot water. Wax cannot be made soluble in water. 2. What book is the best to get on training and athletics? A. See our advertising columns for the names of book dealers whom you should address.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

W. E. H.—1 and 4. Quartzose rock, probably auriferous. 2. Galena carries a little silver. 3. Iron pyrites.—O. M. S., R. C., M. T. B. W., and H. S.—Your minerals have not yet come to hand.—J. J. T.—Limestone containing iron pyrites of no value.—J. A. T.—It is celestite—strontium sulphate.—S. T.—1. An impure fluorspar. 2. Gypsum—lime sulphate.—A. L. B.—It is beryl —$3BeO.Al_2O_3.4SiO_2$.—E. B. B.—Biotite (hexagonal mica).—G. S. McC.—1. Calcite—lime carbonate. 2. Dolomite—magnesian limestone.—3. Mica schist. 4. Zinc blende—sulphide of zinc and iron.—S. W. W.—1. Not corundum but magnetite—a valuable iron ore. 2. Impure pyrolusite—oxide of manganese.—A. St. J., Jr. —Galena (lead sulphide) with chalcopyrite in quartzose; probably carries a small quantity of silver. We have several samples of minerals, etc., bearing no mark by which we can identify their senders.

COMMUNICATIONS RECEIVED.

On Conservation of Energy. By H. S. B.
The Bell Telephone Considered as an Induction Coil.
The Chemistry of Electricity. By W. H. G.
On Experiments in Magnetism. By E. P. T.
On Caving in of Mines. By D. E. H.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

June 29, 1880,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1865, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

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