1307

SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

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

Vol. XLIII.—No. 5. [NEW SERIES.] NEW YORK, JULY 31, 1880. [$3.20 per Annum. [POSTAGE PREPAID.]

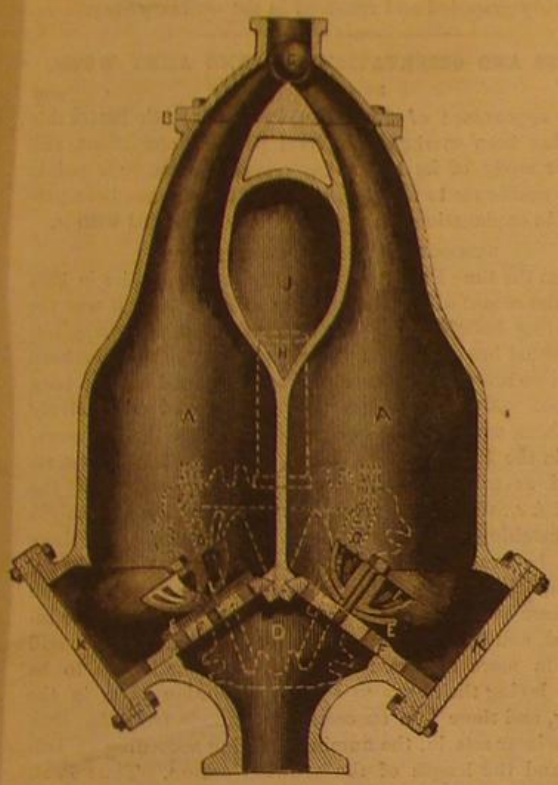


FIG. 1.—SECTIONAL VIEW.

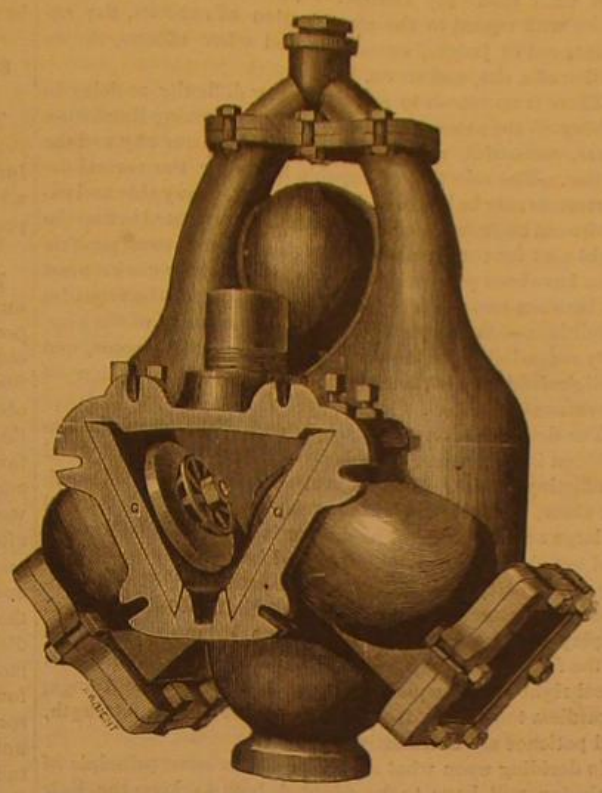


FIG. 2.—SHOWING DISCHARGE CHAMBER WITH COVER REMOVED.

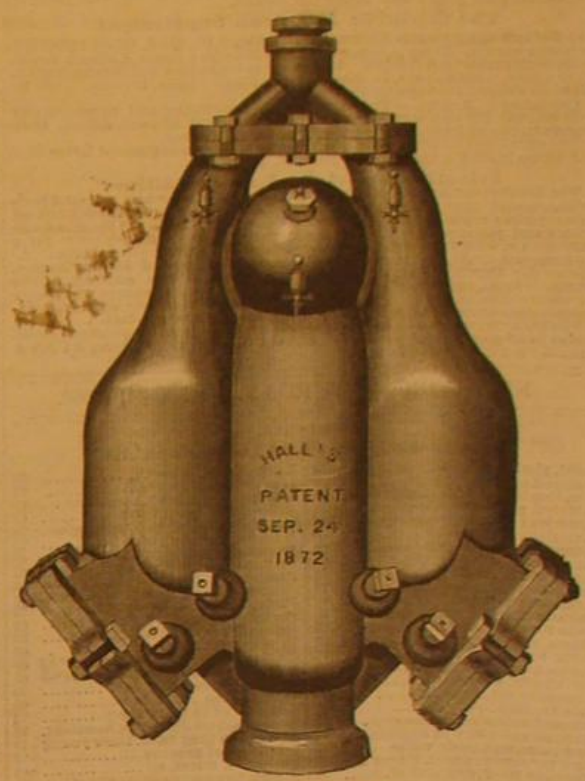


FIG. 3.—FRONT VIEW.

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

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year postage included $3 00
One copy, six months, postage included 1 50

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at $3.00 each; additional copies at same proportionate rate. Postage prepaid.
Remit by postal order. Address
MUNN & CO., 37 Park Row, New York.

☞ To Advertisers.—The regular circulation of the SCIENTIFIC AMERICAN is now **Fifty Thousand Copies** weekly. For 1880 the publishers anticipate a still larger circulation.

The Scientific American Supplement

Is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, postage paid, to subscribers. Single copies, 10 cents. Sold by all news dealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, postage free, on receipt of *seven dollars*. Both papers to one address or different addresses, as desired.
The safest way to remit is by draft, postal order, or registered letter.
Address MUNN & CO., 37 Park Row, N. Y.

Scientific American Export Edition.

The SCIENTIFIC AMERICAN Export Edition is a large and splendid periodical, issued once a month. Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1.) Most of the plates and pages of the four preceding weekly issues of the SCIENTIFIC AMERICAN, with its splendid engravings and valuable information; (2.) Commercial, trade, and manufacturing announcements of leading houses. Terms for Export Edition, $5.00 a year, sent prepaid to any part of the world. Single copies 50 cents. ☞ Manufacturers and others who desire to secure foreign trade may have large, and handsomely displayed announcements published in this edition at a very moderate cost.
The SCIENTIFIC AMERICAN Export Edition has a large guaranteed circulation in all commercial places throughout the world. Address MUNN & CO., 37 Park Row, New York.

NEW YORK, SATURDAY, JULY 31, 1880.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF
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.

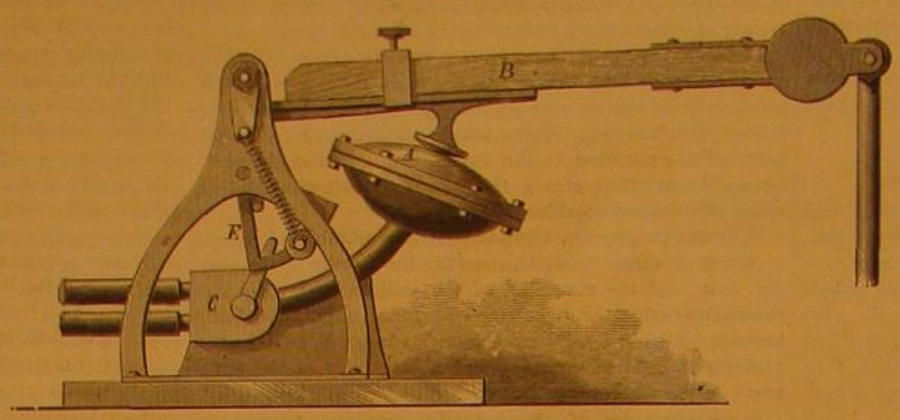


Fig. 1.—MAYHEW'S STEAM MOTOR.

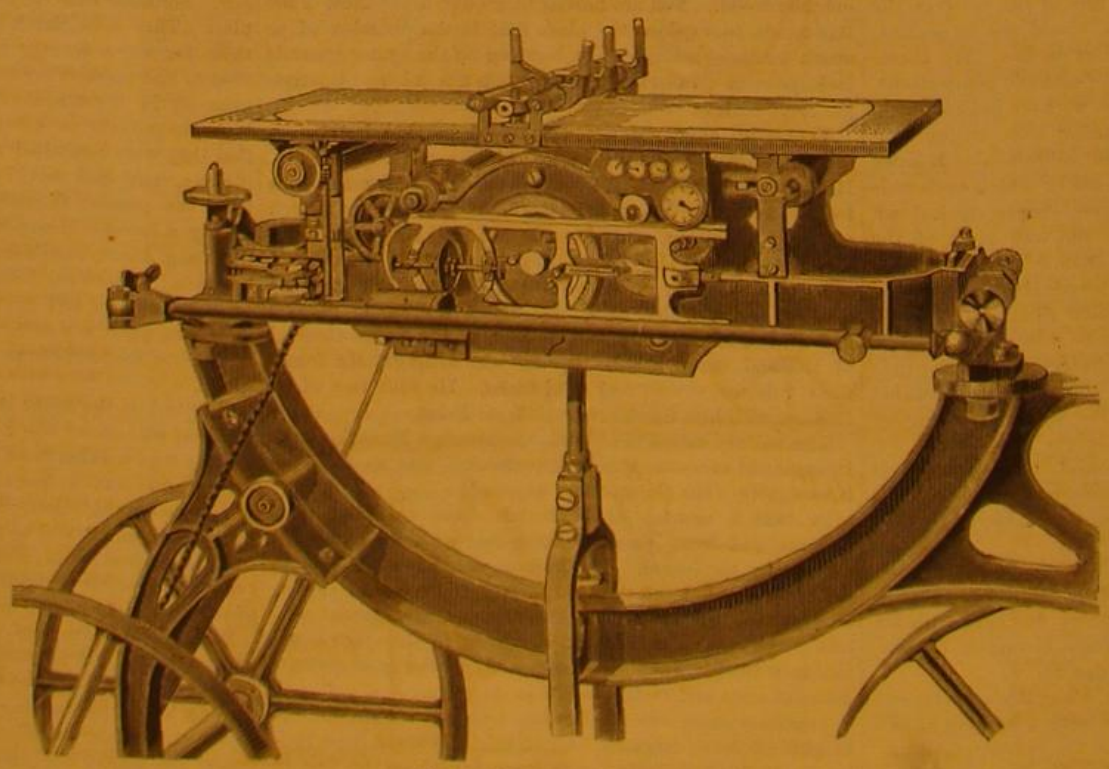
THE PROFILOGRAPH.

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

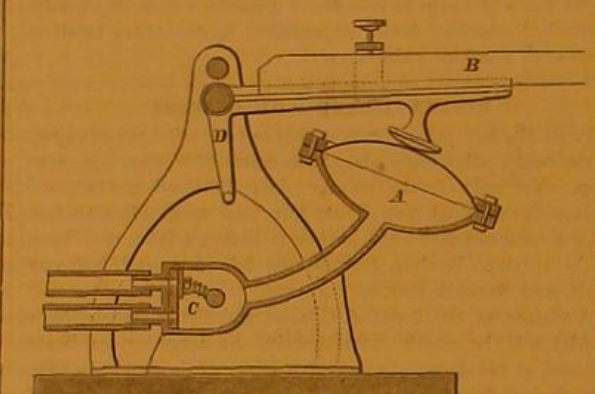


Fig. 2.—NOVEL STEAM MOTOR.

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.

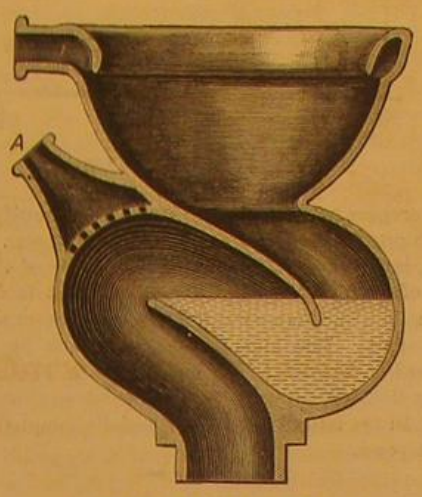
VICK'S CYCLEPEDE.

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.

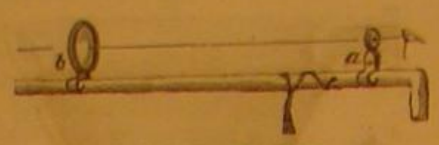
The engines are of 86 indicated H. P., and the boiler, which has only about 5 by 6 feet base, and a height of 8 feet, contains but 80 gallons of water, and consumes but 100 lb. of coal per hour. The screw is about 5 feet in diameter, and makes from 120 to 140 revolutions per minute.

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



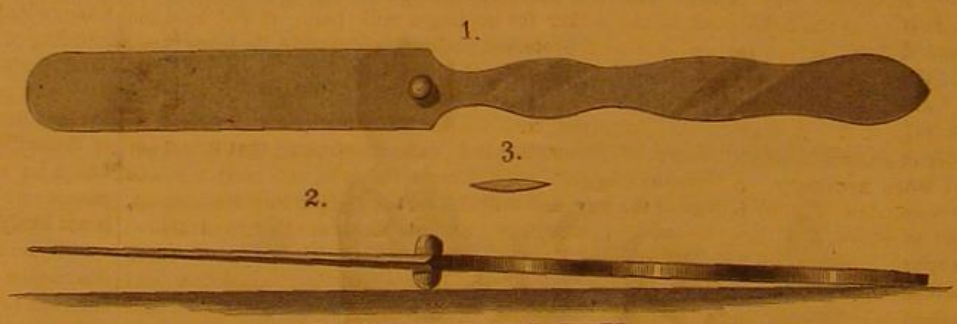
A NOVEL SPY-GLASS.

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.

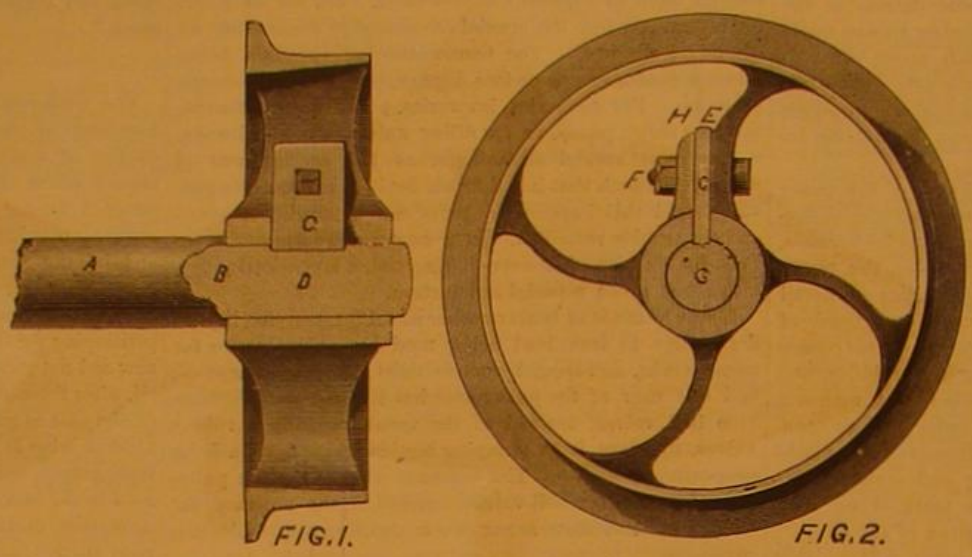


FIG. 1. FIG. 2.

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.

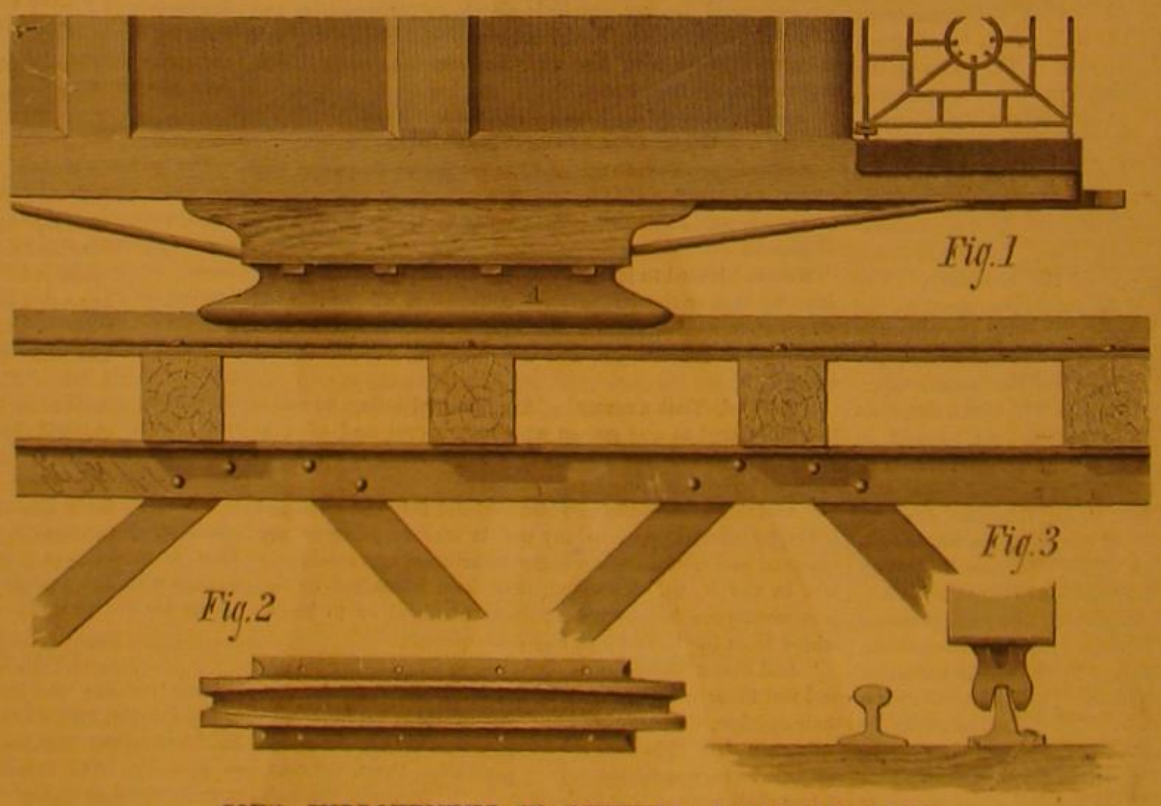
NOVEL METHOD OF RUNNING RAILROAD CARS.

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.

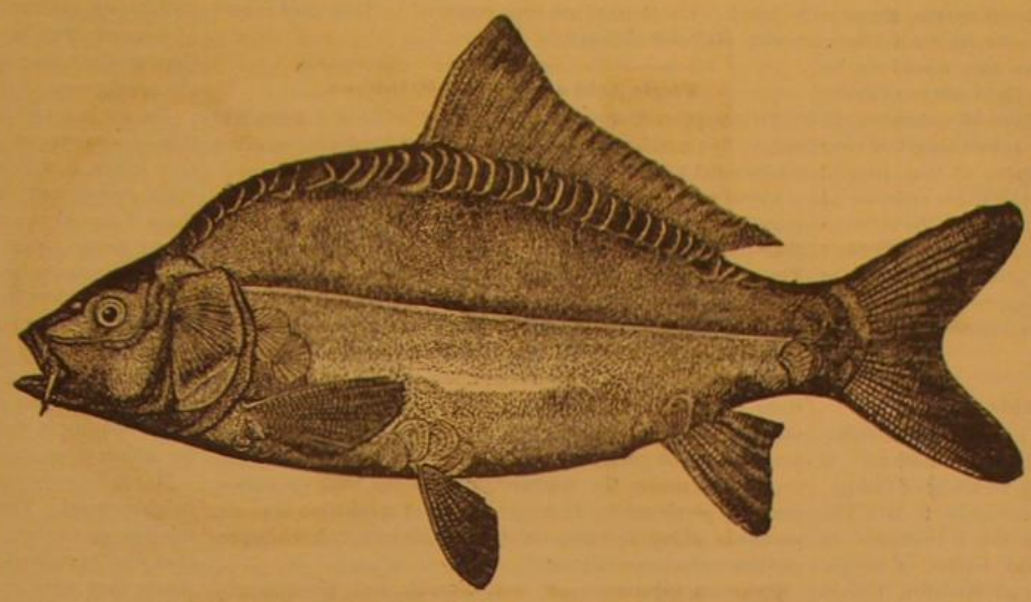
The carp leaves its winter home as soon as the water becomes warm. Spawning commences in May and continues through the warm months. Rainy and cool weather interrupts the spawning, which is again continued during warm and clear weather. The male, during the spawning season, displays a number of protuberances 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.

Aging liquors, J. M. Morrison 229,369
Air compressor, H. Richmann 229,408
Air medicating apparatus, H. R. Fowler 229,396
Amalgamator, A. V. Trust 229,406
Artist's board, E. F. French 229,344
Axle, carriage, F. D. Bliss 229,364
Baby carrier, H. Behr 229,253
Bag for packing and storing, J. H. Preater 229,333
Baking device, W. H. Henderson 229,314
Bale tie, wire, L. E. Evans 229,392
Barrel swing, J. Cummins 229,306
Beach seat, G. H. Chatterton 229,378
Bed, camp, T. J. Joslin 229,421
Bed rest, invalid, J. V. R. Towers 229,286
Bed, spring, O. S. Foster 229,343
Bedstead, invalid, L. Prince 229,460
Beehive, W. S. Blaisdell 229,362
Belt fastening, A. Schuhknecht 229,278
Belt for harvesters, etc., elevator, G. H. Raymond 229,275
Bolts, holder for galvanizing, W. P. Breeding 229,506
Boring, sawing, grinding, and rabbeting machine, combined, H. Boerstler 229,294
Bosom board, A. P. Ryan 229,475
Bracelet, C. P. Bishop 229,360
Bracelet, Riley & Freer 229,276
Bretzels previous to baking, apparatus and process for preparing, W. Lampert 229,220
Brick machine, W. L. Gregg 229,347
Bridle, H. Hartman 229,466
Brush making machinery, C. A. Watkins 229,289
Bucket, dinner, G. K. Shryock 229,480
Bullets, paper patch or case for, H. W. Mason 229,327
Button and stud, F. P. Barney 229,356
Button and stud, P. Laroussle 229,428
Button or stud, E. Dobell 229,340
Button, separable, E. S. Dodge 229,388
Buttons from plastic material, manufacture of, P. L. Sylvester ..... 229,490 to 229,494
Cans, swinging, F. C. Wilson 229,293
Car brake, Wohlfarth & Wakefield 229,510
Car coupling, R. B. Eubank, Jr 229,341
Car coupling, J. F. Gross 229,400
Car coupling, Hathaway & Myers 229,408
Car coupling, A. G. Hohenstein 229,411
Car coupling, H. C. Wofford 229,511
Car door, grain, W. A. McClintock 228,440
Cars, lever for moving, O. B. Blakeslee 229,365
Carbureter, G. Westinghouse, Jr 229,346
Carpet sweeper, W. J. Drew 229,389
Carpet tacker, S. S. Grannis 229,397
Carriage top joint, N. L. Fox 229,312
Cartridge loading implement, J. H. Barlow 229,201
Caster, furniture, C. T. Schoen 229,478
Casting metal, J. Duff 229,308
Casting printing rolls for graining woodenware, manufacture of patterns for, D. H. Wilder 229,508
Celluloid and other plastic compositions or substances, machine for grinding and mixing, J. Schmerber *et al* 229,477
Check rower, S. R. Allee 229,350
Churn dasher, J. M. Teasdale 229,496
Churn power gearing, J. H. & E. R. Elmer 229,391
Cloth finishing machine, D. C. Sumner (r) 9,265
Cloth, instrument for turning edges of, A. Y. Moorefield 229,447
Coal box and fire iron holder, A. F. Tripp (r) 9,267
Coffee pots, etc., manufacture of, G. H. Simmons 229,482
Cotter, J. Clayton 229,381
Copy holder, J. S. B. Patterson 229,453
Cooking vessel, J. R. Noble 229,450
Cot, folding, B. Van Dyke 229,503
Crochet needle, E. P. Haff 229,402
Cuff supporter, F. V. Libby 229,324
Cultivator, cotton, R. A. Johnson 229,318
Dentist's and barber's chair, A. Abel 229,237
Diagram sheet, perspective, E. M. Hamilton 229,404
Dish washer, B. J. Howe 229,503
Door, tilting, G. Wagner 229,416
Dwelling house, T. Hurley 229,372
Egg beater, T. W. Brown 229,331
Elbow joint, J. W. Orphy 229,335
Electric lights, carbon for, Sawyer & Man 229,476
Electric switch, Sawyer & Man 229,345
Electric switch board, T. A. Watson 229,235
Elevator bucket, A. Charles 9,266
Fabric, D. C. Sumner (r) 229,261
Fan, H. Birckenstadt 229,415
Fan, F. O. Horstmann 229,377
Fan fly, S. G. Stoddard 229,509
Faucet, automatic, T. H. Walker 229,268
Feather renovator, O. C. Monroe 229,315
Fence, H. Hill 229,311
Fence brace, J. M. Fleming 229,395
Fence post and gate hinge, combined, J. Cunningham 229,504
Fertilizer dropper, D. B. T. Walton 229,504
Fibers, treating pine leaves and other vegetable, G. J. Gregerson 229,348
Filter, reversible, J. A. Crocker 229,384
Firearm, breech-loading, D. M. Lefever 229,429
Firearm sight, F. W. & G. Freund 229,345
Fire extinguisher, C. T. Holloway (r) 9,271
Fish, preservation of salted cod, P. H. Brink 229,368
Fruit and lard press, E. D. Greer 229,398
Fruit crusher, J. Lamont 229,425
Furnace grate, steam boiler, J. L. I. Knox 229,319
Gas burner, H. W. Merritt 229,441
Gas generator for hydrocarbon furnaces, A. E. Watkins 229,344
Gas, process and apparatus for manufacturing hydrogen, C. M. T. Du Motay 229,339
Gas, process and apparatus for producing hydrogen, C. M. T. Du Motay 229,338
Gas, production of hydrogen, C. T. Du Motay 229,340
Gas regulating burner, G. J. Hickey 229,409
Gate, Hollinger & Flinner 229,412
Gilding process, Laurense & Matzka 229,427
Glass cutter, revolving, B. F. Adams 229,228
Glass plate cleaner, C. F. Linscott 229,430
Glove, J. M. Chaunt 229,377
Grain, and simultaneously purifying the products thereof, mode of and apparatus for reducing, G. Milbank 229,445
Grain binder, A. Goodyear 229,396
Grinding machine, H. Hammond 229,350
Grub and stump puller, J. J. Marshall 229,437
Gun lock, W. N. Crabtree 227,383
Handle for satchels, bags, etc., E. Simon 229,481
Harness hook, J. B. & M. J. Witter 229,348
Harrow, M. M. McDirmit 229,365
Harrow, rotary, H. H. Monroe 229,307
Harrow, rotary and drag, P. R. Weatherford 229,505
Harvester, H. A. Adams (r) 9,268
Harvester rake, P. Thompson 229,284
Harvester sickle bar, J. D. James 229,417
Hat, ventilating, R. Ray 229,464, 229,466
Hatch closer, automatic, S. E. Stokes 229,486
Hay loader, Richards & Brandenburg 229,469
Hay rake, horse, W. Adriance 229,349
Hay ricking and loading device, J. E. Kirk 229,424
Heel trimming machine, J. Langlois 229,426
Horse power for gins, etc., W. H. Harvey 229,407
Hub attaching device, W. Baker 229,353
Ink well, J. C. Latsbaugh 229,200
Insect destroying apparatus, L. T. Jones 229,317
Knitting machine, O. Twombly 229,288
Knitting machine for manufacturing fabrics for mattresses, etc., M. Townsend 229,487
Lacing hook, sheet metal, C. I. Humphreys 229,253
Ladder, extension, C. P. Rood 229,472
Lamp, electric, Fuller & Mackintosh 229,346
Lamp, miner's, J. A. Anton 229,351
Lantern, J. W. Orphy 229,330, 229,452
Latch, S. H. Wheeler 229,347
Lifting jack, F. S. Hartzell 229,406
Lightning rod, J. J. Cole 229,382
Liquid cooler for cooling liquids under pressure, E. Bigelow (r) ..... 9,272 to 9,274
Locomotive chair, O. Unzicker 229,500
Loom, J. C. Duckworth (r) 9,270
Loom shuttle operating mechanism, F. H. Davis 229,238
Magneto-electric machines, commutator for, N. S. Keith 229,255
Mail bag, Bennett & Trenbath 229,358
Marking and slitting gauge, C. Kinney 229,258
Measure, wooden, J. Armanet 229,231
Measures, adjustable gauge for liquid, T. F. Longater 229,431
Meat, etc., fabric for packing, F. Rohe 229,471
Mechanical movement, J. E. Underwood 229,256
Milk cooler, A. R. Brown 229,373
Milk cooler, W. E. Lincoln 229,302
Milk cooling apparatus, E. A. Roth 229,474
Music chart, J. W. Chambers 229,379
Music leaf turner, A. Heilprin 229,313
Music stand, J. W. Pepper 229,271
Musical instruments, marking the keys of key boards for, J. B. D. Black 229,365
Nailing machine, G. McKay 229,442
Necktie, J. H. Reynolds 229,334
Necklace fastening, L. L. King 229,257
Nickel depositing solution, J. Powell 228,274
Oils to buildings, apparatus for supplying hydrocarbon, J. S. Hall 229,316
Open hearth furnace, W. L. McNair 229,443
Ore concentrating pan, E. W. Lyon 229,263
Ore crusher and pulverizer, J. T. Davis 229,387
Ore washer, S. P. Speers 229,281
Ores, desulphurizing, H. F. Williams 229,509
Organ, reed, J. C. Briggs 229,369
Organ valves, spring for, J. C. Briggs 229,370
Padlock, C. Pease 229,332
Paint composition, G. Rossi 229,473
Paper, converting straw into bleached, J. Kauffmann 229,254
Paper folding machine, G. E. Jones 229,419
Paper hanger's table, W. Trilk 229,497
Paper, etc., machine for folding and cutting, G. E. Jones 229,420
Paper pulp, preparing wood for making, J. Davy, Jr. 229,307
Paper tubes, machinery for making, M. Young 229,296
Parer, apple, H. H. & I. A. Hebbard 229,251
Pattern plates, making, G. Woolnough 229,294
Pen, fountain, A. T. Cross 229,305
Pen, stylographic fountain, F. J. Seybold 229,336
Pencil sharpener, F. M. Livingston 229,323
Petroleum, etc., refining, J. H. Alexander 229,297
Photo-negative plates, apparatus for retouching, K. T. Pihlgren 229,272
Piano and organ indicator, D. D. Tracy 229,287
Pile driver, J. W. Putnam 229,461, 229,462
Plaiting machine, G. W. Kendall 229,423
Planter, corn, J. K. Voorhees 229,343
Planter, hand corn, C. B. Arnold 229,300
Planters, fertilizer distributer attachment for, A. N. Gabel, Sr 229,394
Pleating fabrics, machine for, J. J. Scholfield 229,479
Plow, J. L. Brinley 229,367
Plow, G. A. De Long 229,299
Plow, Z. R. Percefull 229,455
Plow, D. Stanchfield 229,484
Plow carriage, sulky, L. Cahill 229,375
Potassium sulphate from kainit, manufacture of, C. N. Hake 229,349
Precious stones, paste, or composition of glass, real or imitation, F. E. Meyer 229,328
Printing machine inking fountain, J. X. Browne 229,303
Printing press reversing mechanism, C. Potter, Jr. 229,273
Printing surfaces, producing plate, P. H. Mandel 229,435
Propeller, screw, L. Perkins 229,270
Pump rod adjuster for oil wells, H. Balliet 229,354
Railway rail, F. Hoffmann 229,410
Railway signal, electric, Leblanc & Loiseau 229,321
Railway signal, electric, C. D. Tisdale 229,285
Railway tracks, apparatus for laying, T. Adams 229,229
Razor strop, J. R. Torrey 229,342
Refrigerator, C. H. Saybolt 229,277
Rendering fat, apparatus for, Miller & Gross 229,446
Rivet or eyelet setting machine, Platt & Bradley 229,459
Rock drill, L. B. Stone 229,485
Rowlock, M. F. Davis (r) 9,269
Sash fastening, C. H. Nye 229,451
Saw, drag, M. B. Swindell 229,488
Seeding machine, J. L. McCall 229,439
Sewing machine, broom, C. E. Lipe 229,322
Shank making machine, E. M. Marston 229,438
Sheet metal strips, die for edging, E. E. Johnson 229,418
Shell, explosive, G. W. Turner 229,499
Shingle sawing machine, E. D. Greer 229,399
Shipping can, T. K. Webster 229,507
Shirts, connecting neck bands, yokes, and cuffs to, C. Barns 229,232
Shoe, J. A. Weaver 229,290
Shoe box indicator, L. D. Cooley 229,226
Shoe nail, E. S. Caswell 229,376
Shoe nails, making, H. F. Whidden 229,292
Sifter, ash, E. M. Brewster 229,371
Skirt supporter, Smith & Nall 229,483
Snow from railways, apparatus for removing, D. M. McMaster 229,366
Soda from spent liquors after treating vegetable fiber, recovering, Markle & Jordan 229,364
Soda water, etc., draught tube for drawing, W. P. Clark 229,304
Speed indicator and recorder, F. Petri 229,456
Spinners' staples, cleaning and opening, S. D. Keene 229,256
Square, try, L. S. Starrett 229,283
Stamp, canceling, G. D. Spooner 229,282
Steam boiler, G. H. Babcock *et al* 229,352
Steam machinery lubricator, G. H. Flower 229,242
Stereotype plate holder, F. Wesel 229,291
Stocking, H. J. Griswold 229,401
Stove pipe joint fastener, H. M. Wells 229,506
Stoves, vapor burner for, D. E. Bangs 229,355
Street sweeper, W. B. Dunning 229,390
Sun shade, laborer's, R. Ray 229,465
Swing, W. F. Phillips 228,457
Tape, etc., holder, E. P. Haff 229,403
Tea kettle, W. S. Withers 229,512
Telegraph conductors, underground conduit for, R. B. Lamb 229,250
Telegraph relay, G. M. Hopkins 229,414
Telephone call register, C. J. Bell 229,302
Telephone call register, S. Tainter 229,495
Telephone lines, signal box for, See & Gray 229,279
Telephone systems, individual signaling apparatus for district, Anders & Watson 229,298
Telephone, transmitting, L. W. Sutton, Jr. 229,489
Thill coupling, J. A. Fairbanks 229,310
Thill coupling, D. T. Robinson 229,470
Thill support, J. A. Beamisderfer 229,357
Tobacco, process and machine for drying, Lottier & Perrigo 229,434
Tray, C. Remhof 229,467
Trimming or edging, pointed, J. H. Emmerich 229,309
Truck, hand, M. Johnson 229,422
Type writers, finger guide for, A. M. Da Costa 229,386
Type writing machine, J. H. Phipps 229,458
Umbrella support, J. H. Gordon 229,395
Urinal mat, E. J. Mallett, Jr 229,436
Valve, balanced puppet, Tilden & Guerber 229,341
Vapor burner, W. R. Park 229,454
Vehicle running gear, A. H. Crawford 229,237
Vehicle running gear, C. M. Murch 229,329
Vehicle spring, E. C. Lefferts 229,261
Velocipede, railway, E. K. Hill *et al* 228,252
Vise, N. E. Lovejoy 229,432
Waffle iron, Selden & Griswold, Jr 229,280
Wagon jack, J. Charles 229,380
Washing machine, W. H. Long 229,433
Washing machine, S. C. McCullough 229,441
Water closet bowls, flushing device for, T. Maddock 229,326
Wells, tool for extracting tubular casings from oil, J. H. Luther 229,325
Whiffletree, safety, B. J. Quattlebaum 228,463
Wire stretcher, G. Nicholson 229,449
Wrench, J. C. Beeks 229,359
Zinc or white lead fumer, separating and condensing, S. Murrell 229,448

DESIGNS.

Carpet, H. Horan 11,831
Carpet, H. Nordmann 11,832, 11,833
Carpet, G. W. Piggott 11,834
Picture or mirror frame, J. R. Ritchie 11,835
Types, font of printing, J. Herriet 11,830
Types, font of printing, H. Ihlenburg 11,836, 11,837

TRADE MARKS.

Cigars, Straiton & Storm 7,952
Medicinal preparations, H. A. Cassebeer, Jr 7,953
Organs, pianos, and melodeons, G. P. Bent 7,956
Tobacco, chewing and smoking, Cullingworth & Ellison 7,957
Tobacco, smoking, Wellman & Dwire 7,955, 7,956
Yeast, compressed, G. K. Anderson 7,954

English Patents Issued to Americans.

From June 25 to June 29, 1880, inclusive.

Ball castors, L. A. Aspinwall, Albany, N. Y.
Button, T. L. Snyder, Montclair, N. J.
Button, E. Shrier, San Francisco, Cal.
Berth for ships, J. C. Thompson, Roslyn, N. Y.
Corsets, M. K. Bortree, Jackson, Mich.
Coupling link for railway cars, A. Middleton, Phila., Pa.
India-rubber, manuf. of, H. Gerner, New York city.
Liquor, aging, A. L. Wood, Boston, Mass.
Screw machinery, W. H. Eddy, Mass.
Turning lathe, J. Hill, Columbus, Ga.
Wheat polishing machinery, D. M. Richardson, Detroit, Mich.

PROSPECTUS
OF THE
Scientific American
FOR 1880.

The Most Popular Scientific Paper in the World.

VOLUME XLIII. NEW SERIES.

Only $3.20 a Year, including postage. Weekly. 52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains sixteen pages of useful information, and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity, Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc.

All Classes of Readers find in THE SCIENTIFIC AMERICAN a popular *resume* of the best scientific information of the day; and it is the aim of the publishers to present it in an attractive form, avoiding as much as possible abstruse terms. To every intelligent mind, this journal affords a constant supply of instructive reading. It is promotive of knowledge and progress in every community where it circulates.

Terms of Subscription.—One copy of THE SCIENTIFIC AMERICAN will be sent for *one year*—52 numbers—postage prepaid, to any subscriber in the United States or Canada, on receipt of **three dollars and twenty cents** by the publishers; six months, $1.60; three months, $1.00.

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis *for every club of five subscribers* at $3.20 each; additional copies at same proportionate rate. Postage prepaid.

One copy of THE SCIENTIFIC AMERICAN and one copy of THE SCIENTIFIC AMERICAN SUPPLEMENT will be sent for one year, postage prepaid, to any subscriber in the United States or Canada, on receipt of *seven dollars* by the publishers.

The safest way to remit is by Postal Order, Draft, or Express. Money carefully placed inside of envelopes, securely sealed, and correctly addressed, seldom goes astray, but is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to

MUNN & CO.,
37 Park Row, New York.

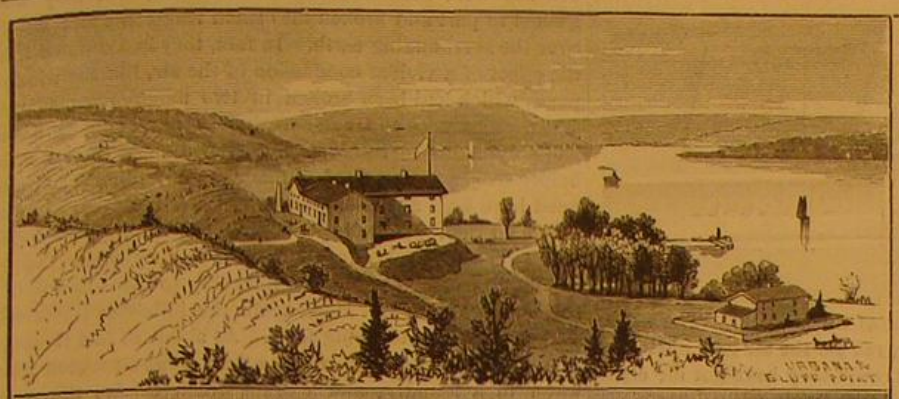
To Foreign Subscribers.—Under the facilities of the Postal Union, the SCIENTIFIC AMERICAN is now sent by post direct from New York, with regularity, to subscribers in Great Britain, India, Australia, and all other British colonies; to France, Austria, Belgium, Germany, Russia, and all other European States; Japan, Brazil, Mexico, and all States of Central and South America. Terms, when sent to foreign countries, Canada excepted, $4, gold, for SCIENTIFIC AMERICAN, 1 year; $9, gold, for both SCIENTIFIC AMERICAN and SUPPLEMENT for 1 year. This includes postage, which we pay. Remit by postal order or draft to order of Munn & Co., 37 Park Row, New York.

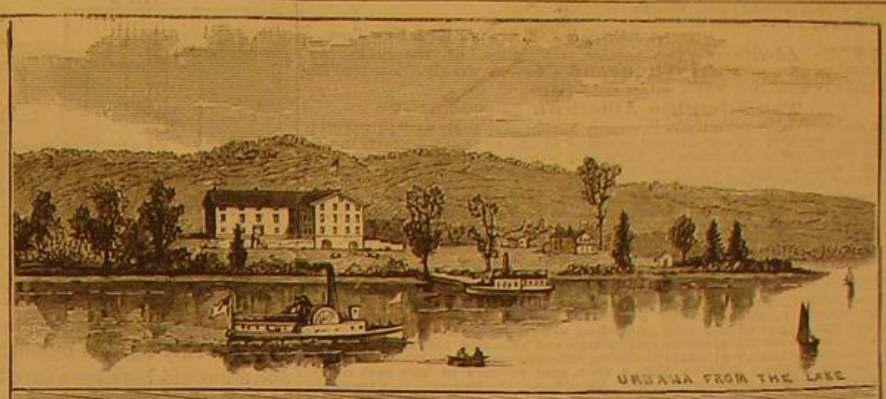
SCIENTIFIC AMERICAN

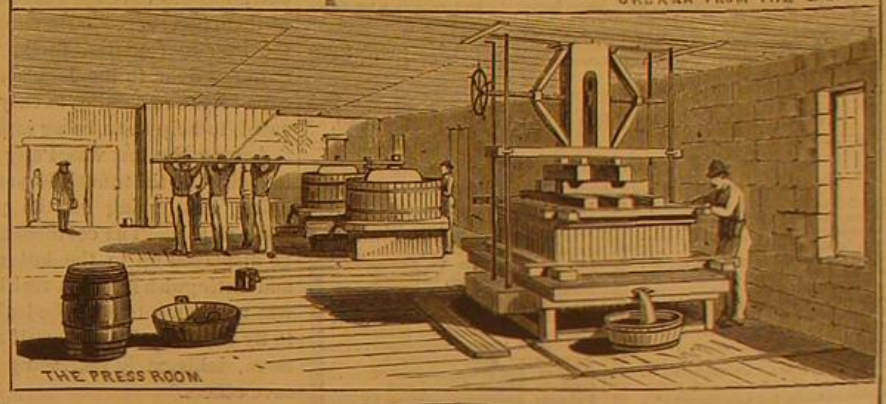
[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

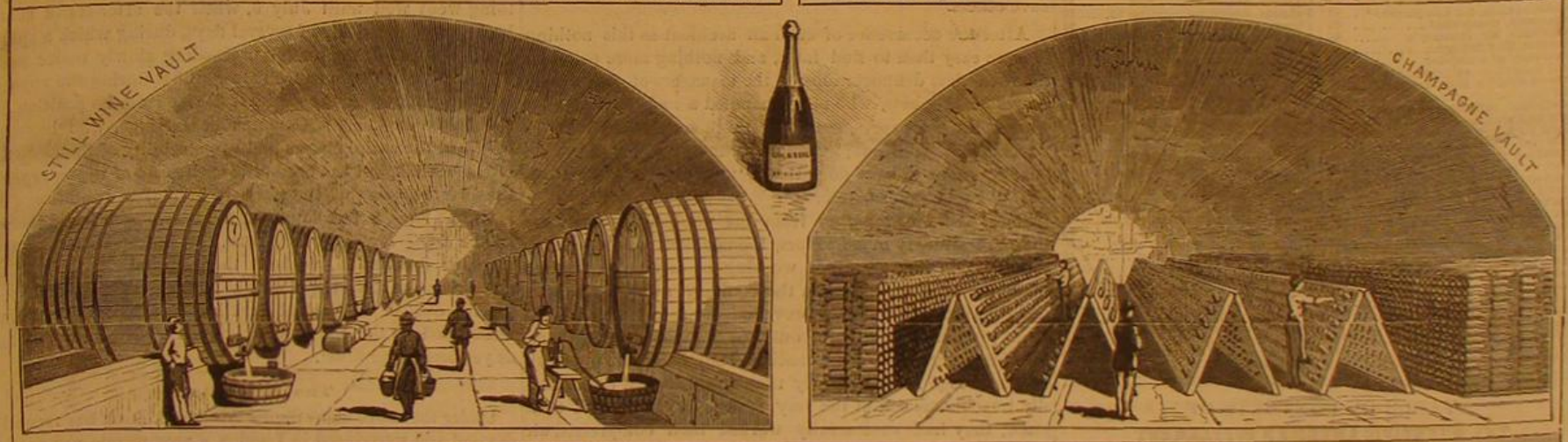
A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY AND MANUFACTURES.

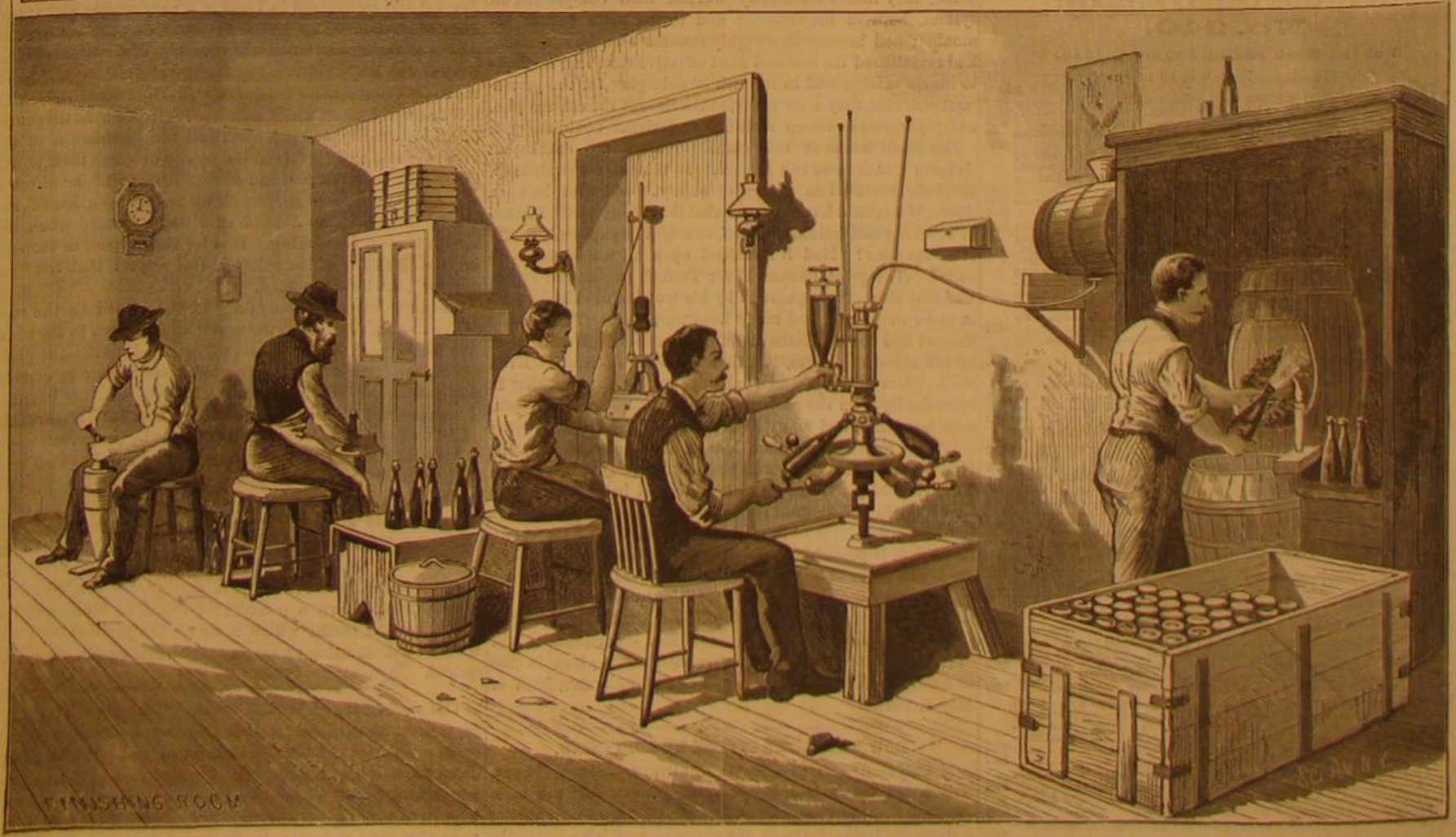
Vol. XLIII.—No. 6 [NEW SERIES.] NEW YORK, AUGUST 7, 1880. [$3.20 per Annum. [POSTAGE PREPAID.]











WINE MAKING.—THE URBANA WINE COMPANY, HAMMONDSPORT, N. Y.—[See page 84.]

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year postage included $3 20
One copy, six months, postage included 1 60

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at $3.20 each; additional copies at same proportionate rate. Postage prepaid.
Remit by postal order. Address
MUNN & CO., 37 Park Row, New York.

☞ To Advertisers.—The regular circulation of the SCIENTIFIC AMERICAN is now **Fifty Thousand Copies** weekly. For 1880 the publishers anticipate a still larger circulation.

The Scientific American Supplement

Is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, postage paid, to subscribers. Single copies, 10 cents. Sold by all news dealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, postage free, on receipt of *seven dollars*. Both papers to one address or different addresses, as desired.
The safest way to remit is by draft, postal order, or registered letter.
Address MUNN & CO., 37 Park Row, N. Y.

Scientific American Export Edition.

The SCIENTIFIC AMERICAN Export Edition is a large and splendid periodical, issued once a month. Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1.) Most of the plates and pages of the four preceding weekly issues of the SCIENTIFIC AMERICAN, with its splendid engravings and valuable information; (2.) Commercial, trade, and manufacturing announcements of leading houses. Terms for Export Edition, $5.00 a year, sent prepaid to any part of the world. Single copies 50 cents. ☞ Manufacturers and others who desire to secure foreign trade may have large, and handsomely displayed announcements published in this edition at a very moderate cost.
The SCIENTIFIC AMERICAN Export Edition has a large guaranteed circulation in all commercial places throughout the world. Address MUNN & CO., 37 Park Row, New York.

NEW YORK, SATURDAY, AUGUST 7, 1880.

Contents.

(Illustrated articles are marked with an asterisk.)

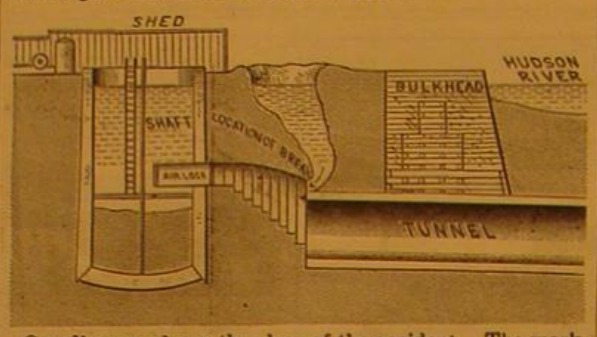
TABLE OF CONTENTS OF
THE SCIENTIFIC AMERICAN SUPPLEMENT
No. 240,
For the Week ending August 7, 1880.

Price 10 cents. For sale by all newsdealers.

SERIOUS ACCIDENT IN THE HUDSON RIVER TUNNEL.

An accident of a serious nature, consisting in the fall of a portion of the roof of the temporary entrance to the great tunnel now being built under the Hudson river between New York and Jersey City, took place early on the morning of July 21.

It appears that the workmen were engaged in excavating for the enlarged or permanent entrance to the tunnel, on the New Jersey side of the river, near the working shaft, when, suddenly, it was found that the compressed air had broken through the loose filling of earth at the junction of the brick wall of the tunnel proper and the roof plates of the temporary entrance to the tunnel, and that the leakage was so great that it could not be stopped.



Our diagram shows the place of the accident. The workmen, twenty-eight in number, ran for the air lock chamber, and all would have been saved could they have got in; eight of them had succeeded in entering the lock, when down came the iron roof plates, earth, mud, and water, closing the entrance door to the lock chamber and cutting off the escape of the remaining twenty men, who were quickly suffocated, to help them being impossible.

Among the lost was Peter Woodland, assistant engineer in charge of the tunnel, 35 years of age, a man of superior ability in carrying on the practical operations of such a work as this. The coolness and presence of mind which he displayed up to the last moment are quite remarkable, and distinguish him as a real hero. When he saw that there was no chance to stop the leak he instantly ordered the men to fly to the air lock, himself staying back to urge and help them, deliberately sacrificing his own life in his efforts to save others.

After the occurrence of such an accident as this nothing is more easy than to find fault, and nothing more common than senseless denunciations of the managers of the works. Scores of prophets, who never handled a tool, parade their wisdom in the papers, summing up in such expressions as "reckless carelessness;" "stupid blundering;" "didn't do this;" "ought to have done that;" "might have known better;" "I told you so," etc.

So far as we can gather from the published particulars and the testimony of survivors, the accident was not due to any defect in the system of working or any neglect of the engineers or directors. On the contrary, every protection against accident and every provision for safety which intelligent prudence could point out had been adopted by them, and this is greatly to their credit. They had gained practical knowledge in successfully tunneling through the unusually treacherous soil at the very spot where this break took place; they had successfully worked their compressed air system, both in the entrance and in the main tunnel, for months; had become thoroughly familiar with its operation; had established the best and most effective rules and methods to insure safety; and in the task of enlarging for the permanent entrance, they were using, at the time of the catastrophe, every precaution which skill and experience could suggest.

But in all works of this character there are contingent dangers which none can foresee. In this case the air lock, specially provided as a place of safety, stood with its open door. Who could have foreseen that the falling earth, instead of blocking and holding it open, as might be expected, would close the door? Had it remained open all would have escaped. The great Thames River Tunnel, engineered by the eminent Brunel and guarded by his wonderful shield, caved in more than once, and many lives were lost. The Hoosac Tunnel and the St. Gothard Tunnel, cut through solid rock by the ablest engineers, had their shocking disasters. Even the builders of the elevated railways in this city, working in open daylight on the surface of the ground, could not prevent accidents, and many lives were sacrificed.

Except for the deplorable loss of life the accident in the Hudson River Tunnel would be comparatively unimportant. The temporary entrance which has caved in (shown by the step rings in our diagram) is only thirty feet in length. The tunnel proper, built of iron plates and solid brick work, two feet thick, is probably not injured. As soon as the *débris* of the fallen part can be removed, which is to be done, we learn, by means of a coffer dam, the work of tunneling under the river will proceed rapidly, as heretofore, in both headings.

Our readers will find a full illustrated description of the tunnel and the system of its construction given in the SCIENTIFIC AMERICAN and in our SUPPLEMENT, both of May 8, 1880.

HOW TREES ARE STRUCK BY LIGHTNING.

M. Colladon says: "The lightning always, or almost always, strikes the upper branches, especially those that are most elevated and most exposed to the rain storm. From thence it descends through almost the entire mass of branches to the main branches, and from these to the trunk. These large branches, and especially the trunk, being in general much poorer conductors than the young branches, the passage of the electricity produces therein heat and repellent effects which lacerate the sap wood or the bark, and sometimes scatter the *débris* to some distance (150 feet and beyond). This is a law that I have ascertained by very numerous observations. The tree recently struck in Rue des Glacis de Rive presents an interesting case, in that it confirms this law.

"It is not a very common thing in France to see trees struck by lightning in May, when their as yet young leaves have little consistency. The tree under consideration was struck essentially on its chief branch—the highest one by some inches, and situated on the southwest side. The young leaves of this summit and those of the branches immediately beneath were neither dried nor withered, but they were gashed in part and broken into small fragments and strewn over the surrounding earth. In fact, they had suffered from the effect of a violent concussion of the air, like the window panes which had been broken in two neighboring houses, and were reduced to fragments, just as they would have been had a dynamite cartridge been exploded near them. Even before seeing the tree I had made up my mind that there must have been a well or stream of water near there in contact with the roots of the poplar; for the vicinity of a spring or a subterranean stratum of water is very often the determining cause to attract the lightning to the summit of a tree standing near it. Here, again, this influence is rendered evident by two interesting facts. At about 18 feet from the tree, *on the north side*, there is a lead conduit which leads water to a laundry, and a drain which carries the waste water off under the street. At the base of the trunk the wounds *swerved toward the north*, and, midway between the tree and the lead conduit, a board placed as a border on the earth was pierced with a round hole about 4 inches in diameter, showing that the electric fluid, concentrated in a powerful jet (if that expression is allowable), shot directly from the foot of the tree toward the lead conduit by the shortest route."

ARRIVAL OF THE EGYPTIAN OBELISK AT NEW YORK.

The steamer Dessoug, bearing the Egyptian obelisk, arrived at this port July 20, thirty-seven days from Alexandria. The Dessoug left Alexandria June 12, and arrived at Gibraltar June 22. Leaving Gibraltar on the 25th, everything went well until July 6, when the after-crank shaft broke, causing a delay of several days, during which a spare shaft was fitted, the vessel proceeding slowly under sail. The obelisk had been so well stowed that during the voyage it did not move in the slightest degree from its position in the hold. Lieutenant Commander Gorringe, who has not only had the entire charge and responsibility of the removal of the obelisk, but has borne the entire cost of the enterprise thus far, reports that the stone is in perfect condition. It is 70 feet long, 8 feet square at the base, and 5 feet 3 inches at the top. It weighs 200 tons, the pedestal 43 tons, the steps, or foundation, without the pedestal, 74 tons. The machinery for lowering it weighs 60 tons. The site selected for the obelisk in Central Park has been reconsidered and abandoned by the Park Commissioners. No other site has as yet been fixed upon.

The Resonator.

Under the above name Signor Alberto B. Bach has recently devised and introduced in London a very simple and apparently very effective appliance for increasing the volume and power of the human voice when singing, and a lecture on the subject was lately delivered at the Royal Academy of Music, the use of the resonator being illustrated by Signor Bach himself during a concert which followed the lecture. In the course of his lecture Signor Bach described the mechanism of the vocal organs, and explained the modes in which their power could best be developed, and among other points he directed attention to the office performed by the hard portion of the palate, this acting as a kind of sounding board when the mouth is open for singing. It is for the purpose of increasing the efficiency of the palate in this respect that the "resonator" has been designed.

The instrument consists of a gold plate fitted to the roof of the mouth, close above the upper teeth—much in the same way as the gold palate of a set of artificial teeth—the plate having attached to it another gold plate which is convex downwards in both directions. A hollow sounding board—if we may call it so—is thus formed, which has a remarkable effect on the volume of sound producible by the person wearing the instrument. The resonator appears to have no prejudicial effect upon the distinctness of articulation, and Signor Bach states that it can be used without the slightest inconvenience after a moderate amount of practice. Of course, as Signor Bach remarks, the resonator will not give a good voice to any one who does not already possess one, nor will it eradicate any faults in singing, but properly used it is reported to have a remarkable effect in increasing the power of the sound which a singer can produce, and this without deteriorating its quality or increasing the effort required.

The *Statesman*, of Walla Walla, Washington Territory, says, in its issue of July 3, that there are indications of volcanic activity at the summit of Mount Hood. On Tuesday, June 29, a bright light burned all night steadily from the summit, at times so bright that the flames themselves could be seen as they shot out from their crater prison, and all the time throwing a bright, lurid glare upon the clouds that hung like a pall over the far-away Cascade Mountains.

THE RECENT MILLING EXHIBITION.

For the twelve months to July 1 our exports of wheat from sixteen principal ports were 149,139,293 bushels, and our exports of wheat flour for the same period were 5,787,967 barrels—an increase of 40,045,758 bushels wheat and 437,358 barrels of flour as compared with our exports from the same ports for the year ending July 1, 1879. The value of these exports for the last year was $219,954,354, against $155,540,633 for the year preceding, the increase in value of the exports of flour alone being $5,913,863. The total exports of wheat flour from the United States for the year ending July 1, 1879, were 5,629,714 barrels, and of wheat 122,353,936 bushels, Great Britain and Ireland alone taking 2,629,665 barrels of flour, and next in order coming respectively, Brazil, British West Indies, British Possessions in North America, Hayti and San Domingo, and Cuba, while France and Germany took but 27,075 and 11,233 barrels respectively.

Probably the question which came with most force to the minds of all American millers who attended the International Exhibition lately held at Cincinnati was this: Can we, and if so by what means, considerably and permanently increase our exports of manufactured flour, instead of sending abroad so much wheat to be ground by foreign millers? While those present from abroad, who examined the wonderful display there made of American improved milling machinery, were undoubtedly at the same time revolving in their minds the possibilities of this question being answered in the affirmative. As for the trade with countries which have not been accustomed to making their own flour there can be little doubt that it is quite within the ability of our millers to compete successfully, but when we already make such considerable shipments, and more than half of our exports of manufactured flour, to Great Britain and her West Indian dependencies, there is evidently good ground for hope that we may yet materially extend this trade in all countries where there is a demand for American wheat. Looking at the matter in this light, the late Millers' Exhibition had a national significance, as, in showing the advancement our mechanics had made in this branch of industry, it indicated the possibility of a still larger field for labor here, to be profitably employed in competition with European cheap labor only because of the improved machinery our millers have introduced.

To mention in detail all of the different kinds of machinery and appliances for milling and in its collateral branches shown at Cincinnati would fill a large proportion of this paper. Commencing with a large variety of turbine wheels and many improved patterns of engines, with all the appurtenances of shafting, gearing, etc., which belong to all manufacturing establishments where power is employed, the display comprised nearly everything used in the milling business in this country, together with much that is thought best of the machinery used in England, Germany, Austria, Switzerland, and France. There were many kinds of gradual reduction mills; smooth and corrugated roller mills in great variety; bolts, bolting cloths, and reels of widely differing patterns; scouring, cleaning, brushing, and heating machines; hand and power millstone dressers of many kinds; electric and other purifiers, etc.; and nearly all of the machinery was shown at work, the flour made affording samples from which bread was baked in one of the departments of the Exhibition. For the best flour made on the grounds the award went to an Indiana firm, but the most important exhibits of flour and grain were from the States of Ohio, Illinois, Iowa, Kansas, and Missouri, although great interest was shown in an exhibit of Hungarian flour, which, though excellent in quality, was thought to be decidedly inferior to many of the samples shown by our own millers. A gold medal which had been offered for the greatest improvement in milling in the last ten years was awarded to a Michigan firm for the middlings purifier; a premium for the best mixing and sifting machine went to Prussia, and for the best bolting cloth to Switzerland, while a Budapest firm in Hungary received an award for the best roller mill.

In short, the Exhibition presented a comprehensive epitome of about all that is now being done in the milling business, either at home or abroad, and, as the trade is now in a sort of transition state—the minds of millers being divided on questions of high or low grinding, gradual reduction, and new process methods—it cannot fail to have had a most decided influence, which will make itself apparent in the future of the business in this country. German and Austrian mechanics have, during the past few years, rather taken the lead of England in improvements in milling machinery, but there is nowhere else so great a variety of excellent appliances for the business, some of which are of acknowledged superiority, as American inventors and mechanics have brought forward and perfected for the use of our millers. It is this fact alone which accounts for the past increase in our exports of flour, and gives promise of our being able in the future to export the products of our wheat fields in the shape of flour to a much larger extent than we have hitherto done.

ARTESIAN WELLS IN CALIFORNIA.

The necessity of irrigation in Southern California, and the large area of land dependent solely upon flowing wells for water-supply, have led to a remarkable development of artesian wells, especially in the San Bernardino and Los Angeles basins. The main artesian belt is that running through the coast valley of Los Angeles where the number of wells approaches six hundred. The majority of these wells are in three clusters, adjacent to the rivers Los Angeles, San Gabriel, and Santa Ana, and around Compton, Artesia, and Westminster. The wells range in depth between 50 and 550 feet, the general depth being from 150 to 200 feet.

Some of the wells irrigate from 100 to 200 acres each, though a well which will irrigate 40 acres is considered a good one. According to the recent report of Assistant State Engineer, Jas. D. Schuyler, the first flowing well in Los Angeles County was bored by ex-Governor Downey, two and a half miles from Compton, in 1868. Since that time the general desire to secure by such means a constant supply of pure water has led to a rapid multiplication of wells, until now almost every farm-house in the belt rejoices in a spouting well. The pipes are usually carried two or three feet above the surface of the ground, and the clear water pouring over the top has the appearance of a dome of glass glittering in the sunlight.

In boring the first well it was found that the upper water-bearing stratum, 40 to 125 feet below the surface, was so largely composed of quicksand, which rapidly filled the pipes, that it was necessary to go deeper for a permanent supply. The second water-stratum was open to the same objection, though it yielded an abundance of water; and the third, though more gravelly, contained sand enough to be troublesome. To overcome these difficulties, and at the same time utilize the several water-bearing strata passed by the pipe, a contrivance was invented for slitting the casing. The slits, which are about six inches long, and so narrow as to exclude the sand, are made lengthwise and in groups of not more than three in any one section. If the water-bearing stratum is under forty feet in thickness, the pipe is perforated the whole distance, the bottom of the pipe always resting on an impervious stratum. In one well, eight miles south of the city of Los Angeles, the first water-bearing stratum was struck at 85 feet, and was 10 feet thick. The second occurred at a depth of 316 feet, and extended 17 feet, as far as the pipe could be pushed down, ending in coarse gravel. The force of the outpouring water brought out a bushel of gravel, the largest stone just filling the pipe and weighing four pounds. The head was sufficient to raise the water in a pipe 20 feet above the surface. In another well, sunk from the summit of a mound, near the sea coast, and 52 feet above the general level of the plain, surface water was found at a depth of 26 feet, and at 196 feet artesian water was struck, rising to within six feet of the surface. A remarkable natural artesian spring occurs on a high hill between Old and New San Gabriel Rivers. In a sag of the hill, perhaps eighty feet above the surrounding plain, is a springy marsh, from which water flows westward to the sea and eastward to the valley. The shallowest flowing well is 1½ miles west of Santa Ana, a few hundred yards from the river. It is but 44 feet deep, and yields a large discharge. Three hundred yards away a well was bored 300 feet without striking water. In the southern portion of the artesian belt, near Westminster, the water strata are at depths of 80 to 230 feet, the lower yielding the strongest flow.

It is found that as the number of wells is increased the flow of all is lessened, while some of those on the higher land have gone dry. The level to which the water will rise in the pipes steadily fell in Los Angeles County until two years ago, since which time it has slowly risen. The fall amounted to 6 feet, about 1½ feet having been restored. The diameter of the majority of Los Angeles County wells is 7 inches. The temperature of the water is about 62° Fah., with the exception of some deep wells at Pomona, which show 67° Fah., summer and winter.

The area of the Los Angeles belt is about 300 square miles. In San Bernardino County the area in which flowing wells are obtained is about 30 square miles. The topography and geology of the valley show very clearly that it was originally the bed of a lake, which has been filled up by the erosion of the surrounding hills. Most of the San Bernardino wells are for domestic use and garden irrigation, and are but two inches in diameter; some are as large as eight inches. The most northerly well is 262 feet in depth; the most southerly, which yields the finest flowing stream in the valley, is 99 feet deep. The average depth of fifty-six wells built by one firm is 160 feet, the range lying below 80 feet and 380 feet. The deepest well in the valley is furthest east, and has a depth of 410 feet, with a diameter of 7 inches. Vegetable matter, consisting of decayed tule roots and pine wood, was brought up from the last sixty feet. Small suckers, two to four inches in length and resembling the same fish as found in the mountain streams, were occasionally ejected from this well. This well afforded a fine flowing stream, but was spoiled in an attempt to perforate the pipe at 350 feet to secure the water of the first stratum. The incisions were made too close together; a strip of pipe was accidentally torn out, and the quick-sand rushed in faster than it could be pumped out. The pipe is now filled with sand and clay up to the level of the incision, shutting off the flow. The next well to this has a depth of 285 feet.

Gas Detection.

An ingenious instrument, termed a "spark tube," for indicating the presence of inflammable gases in mines, was lately exhibited and explained at the meeting of the Manchester Geological Society, by Dr. Angus Smith. The design of the instrument is taken from the old compression syringe used for igniting tinder, and the instrument consists of a small brass tube with glass let in at the bottom, which is closed up, and a piston and rod fitting closely in the tube. The air to be tested is taken into the tube either from the top or by means of a stop cock at the bottom, and the piston then rapidly pressed down with the hand, the compression of the air thus effected with the aid of spongy platinum causing the gases to explode inside the tube, the explosion being visible through the glass let in at the bottom. Dr. Smith stated that the presence of gas down to 2½ per cent could be detected by this instrument, and as the explosion within the tube was perfectly harmless, he thought the instrument might afford a useful means for exploring gaseous mines.

Remarkable Discovery of a Murder.

The following account of a murder which was committed in Bermuda in the autumn of 1878 is by the Attorney-General of the islands, Mr. S. Brownlow Gray:

"In the autumn of 1878 a man committed a terrible crime in Somerset, which was for some time involved in deep mystery. His wife, a handsome and decent mulatto woman, disappeared suddenly and entirely from sight, after going home from church on Sunday, October 20. Suspicion immediately fell upon the husband, a clever young fellow of about thirty, but no trace of the missing woman was left behind, and there seemed a strong probability that the crime would remain undetected. On Sunday, however, October 27, a week after the woman had disappeared, some Somerville boatmen looking out toward the sea, as is their custom, were struck by observing in the Long Bay Channel, the surface of which was ruffled by a slight breeze, a long streak of calm, such as, to use their own illustration, a cask of oil usually diffuses around it when in the water. The feverish anxiety about the missing woman suggested some strange connection between this singular calm and the mode of her disappearance. Two or three days after—why not sooner I cannot tell you—her brother and three other men went out to the spot where it was observed, and from which it had not disappeared since Sunday, and with a series of fish hooks ranged along a long line dragged the bottom of the channel, but at first without success. Shifting the position of the boat, they dragged a little further to windward, and presently the line was caught. With water glasses the men discovered that they had caught it in a skeleton which was held down by some heavy weight. They pulled on the line; something suddenly gave way, and up came the skeleton of the trunk, pelvis, and legs of a human body, from which almost every vestige of flesh had disappeared, but which, from the minute fragments remaining, and the terrible stench, had evidently not lain long in the water. The husband was a fisherman, and Long Bay Channel was a favorite fishing ground, and he calculated, truly enough, that the fish would very soon destroy all means of identification; but it never entered into his head that as they did so their ravages, combined with the process of decomposition, would set free the matter which was to write the traces of his crime on the surface of the water. The case seems to be an exceedingly interesting one; the calm is not mentioned in any book on medical jurisprudence that I have, and the doctors seem not to have had experience of such an occurrence. A diver went down and found a stone with a rope attached, by which the body had been held down, and also portions of the scalp and of the skin of the sole of the foot, and of clothing, by means of which the body was identified. The husband was found guilty and executed."

The Germination of Unripe Seeds.

Many instances have been put on record by different observers of unripe seed germinating, and several botanists have conducted extensive series of experiments in raising plants from seeds in different stages of development. At first sight it seems rather surprising that an imperfectly-formed embryo should grow into as vigorous a plant as a mature one; but, when we understand the general plan of growth in plants the phenomenon is intelligible. Thus, ferns actually develop from a single detached cell. This property of premature germination may be taken advantage of in practice in propagating plants that do not fully ripen their seeds in our climate. A rather longer period elapses before unripe seeds actually germinate, but frequently the progeny is equal to the best from mature seed. Formerly it was supposed that only ex-albuminous seeds would germinate when unripe, but M. Sagot, a Frenchman, succeeded in germinating green grain of wheat in which the albumen was soft, semi-liquid, and milky, and several other experimenters have raised different cereals from grain collected a fortnight to three weeks before the crops from which it was taken were ripe. Although the practice of sowing unripe seeds is not likely to become general, and would not be profitable under ordinary circumstances, it might be useful to know, in the case of a rare plant suddenly dying before its seeds were mature, that there was a possibility of their germinating, and thus preventing the loss of, may be, a valuable plant.

How a Water Moccasin Fishes.

A correspondent, writing from Plano, Texas, describes as follows the manner in which a mocassin used his body as a sort of sieve in catching small fish. His snakeship was in a shallow pool abounding in minnows, and was briskly twisting and turning in all directions, giving his body as many convolutions as possible to inclose the fish or force them into narrow spaces between him and the bank. In either case the fish would endeavor to escape by leaping over the snake's body into the water beyond. Meantime the moccasin with elevated head caught the fish in his mouth as they passed through the air.

DENTAL ATTACHMENT FOR TELEPHONES.

The engraving shows a device to be attached to an ordinary receiving telephone for transmitting the vibrations of the diaphragm to the teeth, to enable deaf persons to hear conversation, music, etc.

The device may be readily detached so that the telephone may be used in the usual way. A link of rigid sound conducting substance, such as wood or hard rubber, is connected with the center of the diaphragm, or with a disk attached to the center of the diaphragm, and is supported by an elastic fulcrum attached to the mouthpiece of the telephone. The under surface of the link is provided with an elastic coating which prevents the vibrations from affecting the teeth of the lower jaw.

This device is applicable to either the electric, or the *string*, or acoustic telephone, and transmits the vibrations to the teeth and bones of the head, affecting the auditory

DENTAL ATTACHMENT FOR TELEPHONES.

nerves, and enabling persons having defective ears to hear. This device was lately patented by Mr. H. G. Fiske, of Springfield, Mass.

Canned Salmon by the Cargo.

The first cargo of canned salmon of this year's catch, from the Columbia River, was lately cleared from Portland, Oregon, for Liverpool, England. It comprised 56,756 cases, each containing four dozen one pound cans, or their equivalent. The gross weight was over 1,400 tons. Two other ships were soon to follow, both taking nearly full cargoes. Large consignments have also been received at San Francisco, for reshipment to England, Australia, and New York. The steamer Oregon, from Portland, June 25, brought 22,546 cases, the largest invoice of the season, if not the largest single shipment ever made to San Francisco from the Columbia River.

IMPROVEMENT IN SEWERS.

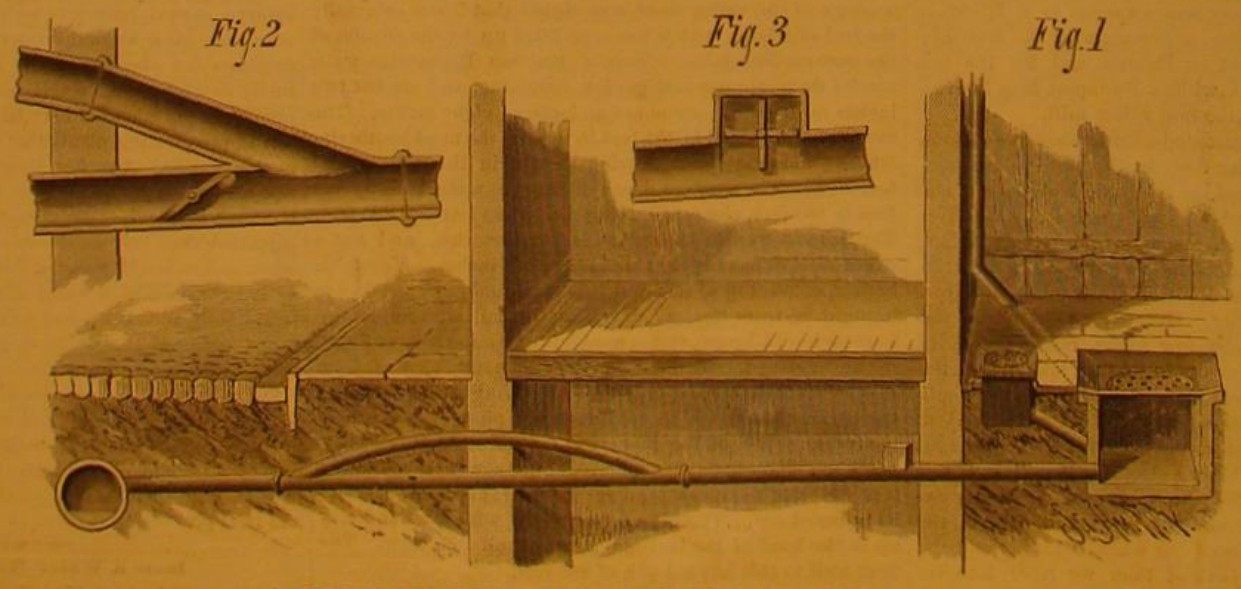
The engraving shows a device for preventing back flow of sewage in sewers, and for preventing noxious gases from being driven from sewers out into the air. The improvement consists in applying to the sewer a valve or gate provided with one or more floats, and a branch pipe running around the valve.

Fig. 1 in the engraving shows the arrangement of the sewer, and Fig. 2 is an enlarged view of the sewer and its branch. A short distance from the discharge end of the sewer there is a valve which swings on a horizontal axis running transversely through the sewer. The upper portion of the valve is provided with a float. Above the valve a branch pipe rises gradually to a height a little above high water mark, and then descends and discharges into the sewer beyond the valve. The branch may discharge into the river or into the main sewer, instead of returning, as shown in the engraving.

With this arrangement, when the outflow of sewage is obstructed by high water or otherwise, the back water having risen above the pivot of the valve, the float will rise, carrying the valve with it, closing it. The sewage will then rise and flow out through the branch. The engraving shows, in Fig. 3, a paddle wheel which may be applied to the sewer to increase the rapidity of the flow through the sewer, but the inventor has found that this is rarely needed.

The inventor states that bath tubs and water closets, where this improvement is applied, may be placed in the cellar without the slightest danger from floods, and we are informed that the device has been applied under trying conditions, and is working well, controlling the back flow and preventing flooding when, with the usual sewer provisions, a flood would be unavoidable.

This invention was recently patented by Mr. Charles Schirrmeister, of Brooklyn, E. D., and is being introduced by Mr. Alonzo Gaubert, 107 Broadway, Brooklyn, E. D., who should be addressed for further particulars.



SCHIRRMEISTER'S IMPROVEMENT IN SEWERS.

Death Rate of the Rich and the Poor.

An important paper on the comparative mortality of the rich and the poor was read at the recent meeting of the American Medical Association. The author, Dr. Charles Robert Drysdale, of London, began by pointing out the achievements of sanitary science during recent years. Yet, with all these advantages, it was found that the death rate in London had rather increased than diminished, having been 22·2 per 1,000 in 1856, 22·3 in 1876, and 23 in 1877. In all England the rate had remained identically the same for three decades, namely, 22·35 per 1,000. The point Dr. Drysdale endeavored to elucidate was, that the great cause of this non-improvement resided in the mass of indigence which, now as always, was instrumental in producing a large crop of premature deaths in all densely populated States. M. Villermé, the distinguished Parisian physician, and several of his able collaborators on the *Journal d'Hygiene Publique* had contributed some valuable facts to the argument. Thus, it had been observed in France that persons between the ages of 40 and 45 die, if in easy circumstances, in the proportion of 8·3 per 1,000, while, if poor, they died at the rate of 18·7 per 1·000. That is, the mortality between these ages was twice and a half as large among the poor as it was among the wealthy. It was found, too, that in Paris, between the years 1817 and 1836, 1 inhabitant in every 15 died in the Twelfth Arrondissement, which is peopled in great part by the poor; while in the Second Arrondissement, inhabited by the wealthier classes, the deaths for the same period were only 1 in every 65. M. Garnier, of Paris, in 1857, speaking of the mean life in a large English manufacturing city, had found that it was only 17 years in the quarters inhabited by the poor against 42 among the higher classes. Villermé calculated that the probable life of the infant of a weaver at Mulhouse was as low as 1 year and 6 months, while that of the baby of the proprietor of the factory was 26 years. Dr. Drysdale cited from a pamphlet written in 1877 upon the dwellings of the wages-receiving classes in Paris some further suggestive figures, from which it appeared that a death rate which was the mean of the whole population is always misleading. Thus, in part of a subdistrict in London, comprising houses in good condition, the death rate did not exceed 11·3 in every 1,000, while there were adjacent dwellings in the same sub-district in which the death rate had risen to 38 per 1,000; and it was now reported that there were particular districts in London where the death rate was 50 per 1,000. On the other hand, the average death rate of the whole population was only 24 per 1,000 in 1843, and had scarcely deviated from that figure since. If such statistics were insufficient, he would refer to the researches of Ansell, who collected the statistics of 48,044 children of the opulent classes in England, including professional men, the nobility, and gentry. It appeared from Ansell's tables that, among these classes, the death ratio was only 80·45 per 1,000 for children under a year old, while for all classes taken together it was 150. Dr. Little found the ratio in Berlin, a city of extreme poverty among the working classes, to be occasionally as high as 500 per 1,000. In conclusion, Dr. Drysdale referred to the statistics of New Zealand as a remarkable confirmation of Ansell's tables. In New Zealand, of late years, the wages of laborers had been very high, and the profits of capital large, with meat only 3d. a pound, so that a laborer was able to secure plenty of food without undue anxiety. The result was a death rate of only 12·5 per 1,000—a fact mainly due to the absence of an indigent and badly paid class. In England and Wales, with the same death rate, some 230,000 lives would be saved every year. In passing, Dr. Drysdale took occasion to dissent from the view that alcohol is the great cause of evils in modern states. It was probable that a New Zealand laborer did not drink less beer than he did before he left England, and yet he lived nearly twice as long in New Zealand as he could expect to live at home.

NOVEL CAN OPENER.

The can opener shown in the engraving consists of a curved blade, having its cutting edge tapered or inclined backward obliquely on each side of the penetrating point. This blade is secured in an annular groove in the handle by a pin passing through the handle and through slots in the blade.

The handle has two or more annular grooves into which the blade may be sprung and fastened to adapt it to cans of different sizes.

The method of using this instrument is obvious. The penetrating point is forced through the top of the can near

BROCK'S CAN OPENER.

one side; the blade is then pushed down, making a shearing cut and cutting out a circular portion of the can cover.

This invention was recently patented by Mr. W. E. Brock, of New York city.

NEW INVENTIONS.

Mr. Jules Lambert, of New York city, has patented an improved flitter for milliners' trimmings that is ornamental, and serves also to attach other ornaments, such as beads, bugles, etc., to feathers and other articles of dress.

An improved heater or steam generator for open grate fireplaces has been patented by Mr. Issac B. Potts, of Columbus, Ohio. It is designed that this heater or steam generator shall be placed in an open fireplace, with its pipes forming or lining the back and sides of the fireplace, and with upward inclined pipes forming or lining the lower slope of the chimney flue.

An improved car coupling has been patented by Mr. John F. Stanley, of Chaplin, Ky. The object of this invention is to furnish car couplings so constructed that they will couple automatically when the cars are run together, can be easily uncoupled, and will not be liable to become uncoupled accidentally.

Mr. James R. Thomas, of Calpella, Cal., has patented an improvement in eyes for securing hoe blades and other tools to handles, so constructed that the blades or tools will be held firmly in place and may be detached and exchanged when desired.

A telescopic or extension pedestal, to be used as an accessory in forming photographic backgrounds, and so constructed that it may be extended and lowered as the height of the person to be photographed or the character of the pose may require, has been patented by Mr. William F. Ashe, of New York city.

Mr. John Collins, of Brooklyn, N. Y., has recently patented an improved apparatus for generating gas for soda water. The object of this invention is to render the operation of gas generating continuous or intermittent, as may be desired, without removing the charge of carbonate or acid until it is entirely exhausted. The device which controls the supply of acid to the carbonate is entirely automatic after being once set in operation, the gas pressure controlling the flow of acid. The mechanical devices by which this invention is carried out cannot be readily described without engravings.

A new tree protector, for protecting trees from grubs and insects, has been patented by Mr. Joseph W. Richards, of Lynn, Mass. It is simple and effective.

An improvement in commodes has been patented by Mr. Andrew Climie, of Ann Arbor, Mich. The object of the invention is to prevent the unpleasant odor arising from a water closet, especially such as are used in railway cars, and to inclose the deposits and convey them away.

An improved nail for the soles of shoes, so formed that after being driven and having its head removed the nail will have a four pronged appearance, has been patented by Mr. Zephaniah Talbot, of Holliston, Mass.

An improved refrigerating and ice making apparatus has recently been patented by Mr. Charles P. G. Linde, of Munich, Germany. The improvements relate to that class of refrigerating or ice making apparatuses in which the refrigerating effect is obtained by the evaporation of a volatile liquid, the vapors of which are compressed by a pump into a condenser, and then liquefied ready to be again subjected to the process of evaporation. The object of this invention is, first, to prevent overheating of the pump; second, to effect a more perfect packing of the stuffing box of the pump, and the employment of the stuffing medium for the lubrication of the points of contact of the working parts; third, to provide means for replenishing the apparatus with pure liquid ammonia while in operation; fourth, to provide means for the production of transparent ice and the means for discharging the same from the carriers.

Mr. Samuel A. Bollinger, of Patterson, O., has invented a harrow so constructed that either side or the whole harrow can be raised from the ground to clear it from rubbish and to pass roots, grass, and other obstructions.

AN IMPROVED HARVESTER.

Although the general principle of the reaper shown in the engraving is common to many machines of this class, the particular machine illustrated embodies several novel improvements of considerable merit which render it superior. The machine is constructed throughout with a view to convenience in handling, to strength and durability, and at the same time the new features render it very efficient.

The frame containing the running gear is composed of two iron end pieces and two wrought iron side pieces, secured together by bolts or rivets. The outer side piece supports an adjustable slide, to which is attached the seat spring, thus making the seat adjustable, so that the driver may move it either backward or forward to balance the machine and relieve the necks of the horses from undue weight.

The inner side piece of the main frame carries an adjustable foot piece which forms a guide for a vertical bar, the lower end of which is jointed to the side bar of the platform or table. On the upper end of the vertical bar there is a hand lever, which is connected by a rod with the side bar of the platform, a short distance back of the vertical bar, so that by moving the lever the platform may easily be tipped one way or the other as may be required. The lever is provided with a bolt or latch, which retains it in any desired position by falling into one of several notches in a sector secured to the top of the vertical bar.

Upon the foot piece which guides the vertical bar there is a ratchet and chain wheel for winding a chain connected with the inner end of the platform. A lever carrying a pawl is adapted to work the ratchet wheel so as to raise or lower the inner end of the platform by winding or unwinding the chain. A holding pawl is provided for retaining the ratchet wheel in any desired position.

The crank shaft and gearing intermediate between it and the axle are supported by journal boxes attached to the main frame. Side draught is avoided by attaching the tongue to the inner side of the frame. The automatic rake is of a well known type, which will be recognized by those of our readers familiar with agricultural machines.

The appearance of this machine is trim and workmanlike, and it seems well adapted to the work for which it is designed.

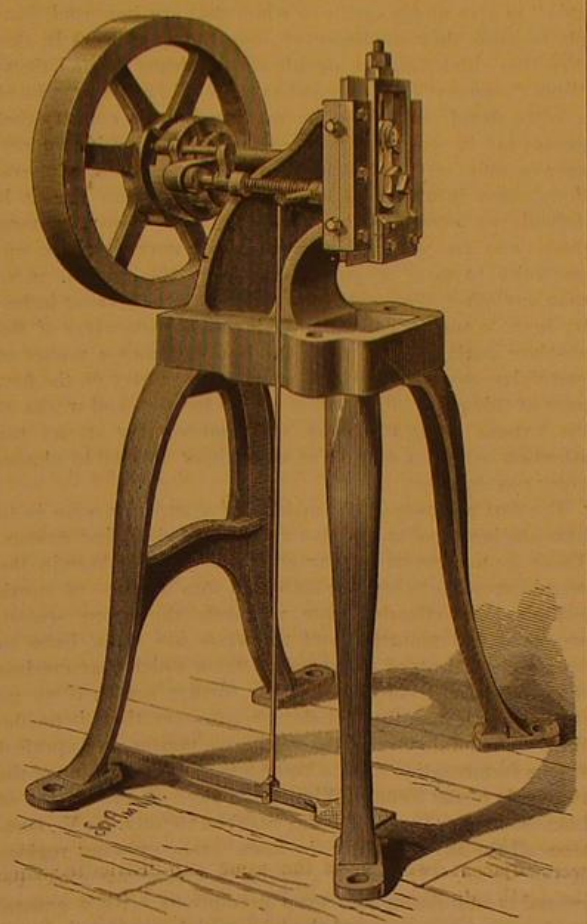
The adjustments, which are calculated to meet every requirement, are all easily made. The working parts are of wrought and cast iron and steel.

This machine is made by Messrs. Crawford & Co., at their Globe Agricultural Works, London, Ontario, Canada. The name given the machine is "The Imperial Harvester."

A NEW PUNCHING PRESS.

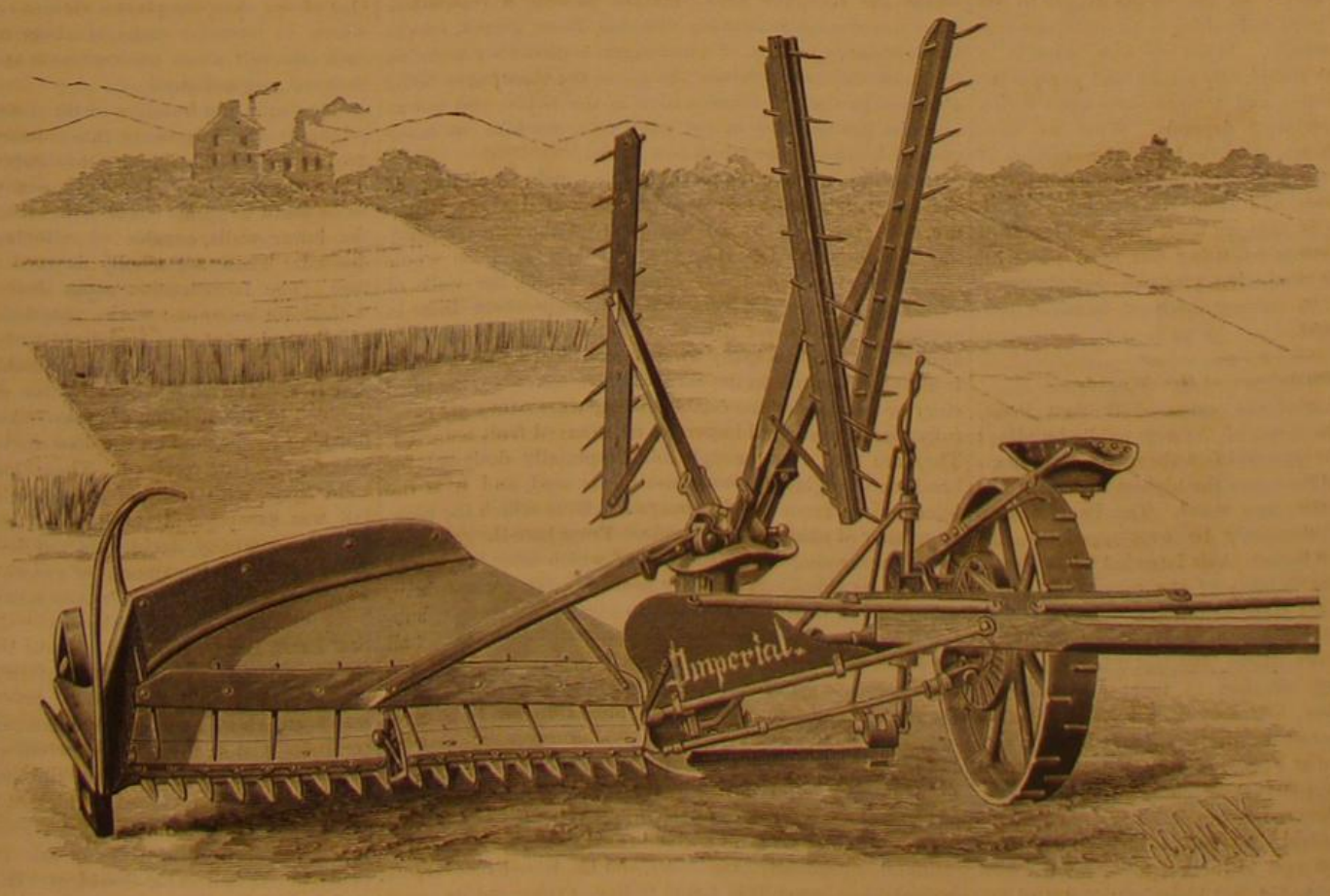
The Peerless Punch and Shear Company, 52 Dey street, New York, have just completed a new power press for punching sheet and bar metals, similar in design to their No. 1 foot press, of which we published illustrations in September last, excepting that the treadle and pendulum are replaced by a balance wheel for belt power.

One of these presses, although weighing but 500 lb., will punch a ½ inch hole in ¼ inch iron, or 1 inch hole in ⅛ inch iron, and will cut a blank 6½ inches square from No. 14 iron or brass. If used as a shear, it will cut bar iron 2 inches by ¼ inch in thickness, or ⅝ inch round.



PEERLESS POWER PRESS No. 1.

The wheel is 22 inches diameter and weighs 130 lb. The design embodies great strength, while the press occupies floor space only 2 feet 3 inches by 2 feet 11 inches. Many of this style of presses are sold with a pendulum attachment to be worked by foot power when steam is not available. This is a great convenience, as the operator is not altogether dependent upon steam power, and can use his press at any time by merely taking off the balance wheel and putting on the pendulum in its place.



THE "IMPERIAL HARVESTER."—MADE BY CRAWFORD & CO. LONDON, ONTARIO CANADA.

Covington, Iowa, Threatened.

In several instances thriving towns on the treacherous banks of the Mississippi and the Missouri rivers have been wiped out by the erosion of the river banks. Covington, Iowa, according to the Sioux City *Journal*, is another doomed city. It stands on a bend of the Missouri River, where the banks are being gradually eaten away. Many feet of fast flowing water now sweep over the spot where the court house stood a year ago. Recently the current set in shore and took off a strip of land thirty feet wide in a few hours. No invasions were made for another week, when another slice was cut off. Then about half a dozen buildings were moved back about some thirty feet, and the next day the land on which they had stood was all gone. The citizens have tried to moor trees and logs to the bank in the hope of forming a barrier for the flood, but the current is so swift and the water so deep that these attempts have failed. To give an idea of what the town of Covington has suffered in the past five years, the case of the ferry house and the principal hotel may be instanced. Two years ago there were six hundred and sixty feet of land between the building and the river bank; now you can toss a stone out of the hotel window into the river, and buildings are now being put on rollers for removal.

Hatching Spanish Mackerel.

Professor Earle, of the United States Fish Commission, has discovered that Spanish mackerel can be hatched artificially, and that its capacity of reproduction is many times that of the cod or the shad. Professor Earle received his first hint in regard to Spanish mackerel from Chesapeake fishermen, who reported that large numbers of them annually frequented the inland waters near Chrisfield, Md., and Mob Jack Bay. On being directed by Professor Baird to make experiments there with hatching apparatus, Professor Earle was surprised to find that the fish were hatched within eighteen hours from the time the milk and spawn were brought together. It requires five days to hatch shad, and from eight to twelve days to hatch cod. The number of eggs operated upon at a single hatching was between 200,000 and 300,000, while of shad only about 20,000 to 30,000 can be turned out at once.

Another fact of importance is that the season for operations with the spawn of the Spanish mackerel is toward the last of June and first of July, after the shad season is over, and before that of cod begins. It is estimated that the number of young fish "turned out" this season will be more than a hundred million.

How Mr. Hannay Made his Diamonds.

Mr. G. B. Hannay, in a recent number of the "Proceedings before the Royal Society," gives an interesting account of the method employed by him in starting and prosecuting his experiments in making diamonds. And if only as a record of indomitable perseverance against ever-increasing difficulties, of scientific acumen, and of the true application of the Baconian method of research, as the London *News* justly says, it is worthy of study. Some idea of the nature of the investigation may be obtained from the fact that out of complex and expensive experiments only three succeeded. Violent explosions were frequent; furnaces were blown to pieces; steel tubes burst, scattering their fragments around. On other occasions, tubes which had been carefully prepared, filled, welded, and nestled in a reverberatory furnace for many hours, were found to have leaked and spoiled the experiment. "The continued strain on the nerves," writes Mr. Hannay, "watching the temperature of the furnace, and in a state of tension in case of an explosion, induce a nervous state which is extremely weakening, and when the explosion occurs it sometimes shakes one so severely that sickness supervenes." The diamond-making experiments were started in September, 1879, when Mr. Hannay made many attempts to find a solvent for the alkali metal, sodium, potassium, and lithium. But in no instance could such a solvent be found which did not, in the gaseous state, and under pressure,

unite with the alkali. Even in the case of hydrocarbons, such as paraffine spirit, containing only hydrogen and carbon, the alkali combined with the hydrogen, setting free the carbon. Now, as we know, diamond is pure carbon; hence, when this element was set free from a pure substance, it was thought that conditions of pressure and temperature might eliminate it in the hard, crystalline, adamantine form, namely, as diamond. Glass tubes were first employed, but, although of great thickness in comparison with their bore, they were found to be insufficiently strong, and they were replaced by wrought iron tubes twenty inches long by one inch diameter, and having the diameter of the bore half an inch. In these lithium was heated for many hours to a high temperature in paraffine spirits, and on subsequently opening the tube carbon in a hard form was found within it. Great difficulty was experienced in getting the tubes perfectly airtight, and eventually the open end was welded at a white heat, and by that means alone did it resist leakage. Sometimes tubes would burst with an explosion like a gun. A tube twenty inches long by two and three quarters diameter and one half inch bore was filled with a hydrocarbon made from bone oil, to which some charcoal powder was added in order to keep an excess of carbon in the tube. Its open end was welded, and it was heated for fourteen hours with lithium. On opening it a quantity of gas appeared and some minute pieces of hard carbon which had evidently separated out from solution. Another similar tube burst at the end of eight hours' heating. A tube of cast iron, no less than three and three quarter inches diameter, and with a bore of only three quarters of an inch, exploded at the end of an hour with a fearful report, wrecking the furnace. Several tubes of steel also burst under the enormous pressure, at last shattering the top of the furnace. The author remarks that in nature the temperature must at one time have been much higher than anything we can now produce artificially; while the pressure obtained at a depth of two hundred miles below the earth's surface is greater than that which any of the materials from which we can form vessels can resist.

We come now to the great experiment which resulted in the artificial production of veritable diamonds. A tube twenty inches long by four inches diameter, of coiled Low-moor iron, was bored so as to have an internal diameter of half an inch. Thus the central bore was surrounded by walls of iron one and three quarter inches thick, and, of course, capable of resisting an enormous pressure. In the tube was placed a mixture of ninety per cent of bone oil and ten per cent of paraffine spirit, together with four grammes (about sixty-two grains) of the metal lithium. The open end of the tube was welded airtight and the whole was then heated to redness for fourteen hours, and allowed to cool slowly. On opening it a great volume of gas rushed from the tube, and within was found a hard, smooth mass adhering to the sides of the tube. "It was quite black, and was removed with a chisel, and as it appeared to be composed principally of iron and lithium, it was laid aside for analysis. I was pulverizing it in a mortar, when I felt that some parts of the material were extremely hard—not resisting a blow, but hard otherwise. On looking closer I saw that these were most transparent pieces embedded in the hard matrix, and on triturating them I obtained some free from the black matter. They turned out to be crystalline carbon, exactly like diamond."

Such is Mr. Hannay's account of his discovery. Subsequent chemical and optical analysis has proved that these hard shining crystals are, in every respect, true diamonds. The cost is obviously great; so, also, is the danger to life and property; and the great difficulties to be overcome render disappointments common. What we now want is to get vessels of a material sufficiently strong and non-porous to resist the high pressures and temperatures upon which the success of the experiment depends. What we have learned, among other things, from the brilliant researches of MM. Cailletet and Pictet, which led to the liquefaction of the so-called permanent gases, and from Mr. Hannay's experiments, described above, is, that we must push the forces of nature to their utmost strain by using our most powerful mechanical devices for producing pressure, our strongest materials for resisting it, and our intensest means of producing both heat and cold.

The High Buildings of the World.

The crown of the hat of the statue of William Penn, which is to surmount the tower of the new public buildings of Philadelphia, will be just 535 feet above the pavement. This is 10 feet 1 inch higher than the highest towers of the Cologne Cathedral as they now stand. The Penn Square tower, however, will ultimately be overtopped by the Cologne towers 41 feet 9 inches, their intended height being 576 feet 9 inches. The heights of the other chief lofty buildings of the world are given as follows:

Tower of St. Nicholas' Church, at Hamburg, 473 feet 1 inch; cupola of St. Peter's, Rome, 469 feet 2 inches; cathedral spire at Strassburg, 465 feet 11 inches; pyramid of Cheops, 449 feet 5 inches; tower of St. Stephen's, Vienna, 443 feet 10 inches; tower of St. Martin's, Landshut, 434 feet 8 inches; cathedral spire at Freiburg, 410 feet 1 inch; cathedral of Antwerp, 404 feet 10 inches; cathedral of Florence, 390 feet 5 inches; St. Paul's, London, 365 feet 1 inch; ridge tiles of Cologne Cathedral, 360 feet 3 inches; cathedral tower at Magdeburg, 339 feet 11 inches; tower of the new Votive church, at Vienna, 314 feet 11 inches; tower of the Rath-haus, at Berlin, 288 feet 8 inches; Trinity Church, New York city, 284 feet; and the towers of Notre Dame, at Paris, 232 feet, 11 inches.

AMERICAN INDUSTRIES.—No. 52.

WINE MAKING.

To have styled this branch of business an *American* industry a few years since would have provoked a smile. Now, however, it is becoming generally understood that the productions of American vineyards are affording the means by which the home demand may be supplied, and that in some cases American wines have won an enviable distinction in comparison with those of the most noted wine-producing countries of the world. The long established prejudices in favor of wines which have a foreign trade mark and an unreadable label are not, it is true, entirely removed; it will probably be many years before it will cease to be "fashionable" to give undue credit to wines that are imported, simply because they *are* imported; but the good work in this direction which has been already accomplished by the Urbana Wine Company, of Hammondsport, N. Y., gives promise of a future development of wine making in this country that cannot fail to make the business one of considerable importance among our industries. In foreign wines adulterations, often injurious to health, are so common that it is difficult to obtain a pure article, and many, among those who are not connoisseurs, have never had an opportunity to taste a pure wine. For this reason, more than any other, the establishment of the wine making industry here, in such way that all may assure themselves of the absolute purity of the wine they buy, becomes a matter of particular moment, and the engravings we give on the first page of this paper, illustrative of the location and works of the Urbana Wine Company, will undoubtedly attract the attention which a subject of such direct interest to almost every one deserves.

The first requisite in the making of a superior wine is to have the best quality and fine varieties of rich, ripe grapes. These are not grown to any great extent anywhere in the world except between the 35th and 55th degrees of north latitude. In climates more northerly the grape seldom arrives at full maturity, and the wines are weak, liable to sour, and destitute of the generous flavor which characterizes those produced from grapes grown further south; if we go further south than the 35th degree, however, there is too decided a predominance of the saccharine matter, and a perfect vinous fermentation cannot be effected. The location of the vineyards of the Urbana Wine Company, on the shores of Lake Keuka, or Crooked Lake, Steuben County, N. Y., combines all the advantages of the finest grape-growing regions of the world. The soil is a gravel on calcareous rock; the ground is undulating and even precipitous, with a general southeast exposure toward the lake, which tempers the summer breezes and gives that atmospheric equability best calculated to insure the perfect ripening of the grape. The location has been styled the Rheims of America, and has been famous for its grape production for many years, though it was not until about 1860 that this was made a regular business. Now, however, the vineyards here cover some ten thousand acres, in the heart of which, and immediately on the banks of the lake, affording ready means of cheap transportation, are the works of the Urbana Wine Company.

The principal varieties of grapes cultivated are the Catawba, Isabella, Delaware, Iona, Walter, and Concord, and it is the proper selection and combining of the fermented juices of these grapes, under conditions which are carefully regulated, that makes the various still and sparkling wines for which the company have obtained so wide a reputation. They use absolutely nothing else but these grapes, except the necessary quantity of pure sugar, so that they make no bogus or carbonized wines, the gas in the champagne being a natural product of fermentation in the bottle, and not an artificial gas injected in the wine by a machine, as is the case with some of the wines now made.

Referring to our engraving, the main building of the company's works is a very substantial stone structure, 150 feet long by 60 feet wide, with wings extending on either side, the ground floor of the whole being entirely taken up by capacious vaults, the walls of which are so thick and solid that the temperature there in summer weather never rises above 60°. The grapes, as they are brought in, principally by steamers, sloops, and flatboats from the vineyards on the lake, are first taken to the third story or top floor of the establishment, where they are carefully assorted, and all imperfect or decayed fruit removed. They are then run through mills especially designed for breaking the skins without crushing the seed, and it is the juice derived from this first operation from which the highest quality of champagne is made. From here the grapes go to the press room, an illustration of which may be seen in one of our views. There are several large presses here, where two or three workmen, with powerful leverage, subject the grapes to sufficient pressure to thoroughly extract all the juice, which is conveyed through rubber hose to large casks below, where the first fermentation takes place. For a perfect vinous fermentation the temperature has to be carefully regulated. Below fifty degrees it proceeds very slowly, and above seventy degrees it would be too rapid, with danger of passing into the acetous stage. As the fermentation proceeds the temperature of the liquor rises, it has a turbid appearance, and gives off carbonic acid gas. At length this commotion gradually diminishes, and the liquor recovers its transparency, when it is found to have exchanged its sweet taste for one of considerable pungency, and to have acquired the property of acting as a powerful stimulant on the animal system. After this first fermentation the wine is racked off into other and *clean* casks to remove from it all sediment or impurities, and it is now in the proper condition to combine in various ways the product of different kinds of grapes for making still wines, or for the subsequent processes necessary to make champagne.

In the selecting of the different grape products which will so blend as to give the best effects as regards spirit, flavor, acidity, etc., both in champagne and still wines, great care and experience are necessary. The proper combination being decided upon, the wine is bottled accordingly, as shown in the "bottling" room. This is done by the aid of an automatic bottle filler, the corks being held by a metallic fastening styled an agraff, always used in first corking, and the filled bottles are then piled up to await the second fermentation. The department in which this takes place should be kept at an even temperature, and for this purpose it is fitted up with steam pipes. The air being of the required warmth causes a second fermentation in the bottle, and this produces the carbonic acid gas which makes the sparkle; absolutely nothing else but this natural product of the grape being used to make the life and effervescence of the wines of the Urbana Company. As the process approaches completion it is marked by the frequent breakage of bottles, which are burst by the gas produced in them by the fermentation, about 5 per cent of all the wine made being lost in this way. In France and other wine-producing countries the natural heat of the atmosphere is depended upon to effect the fermentation, so that when the weather is exceptionally cool during the wine-making months the operation proceeds in a very tardy and uncertain way, while here it goes on as regularly as clockwork, and the results can be definitely calculated upon, although there is no difference in principle between the methods followed by this company and those in use by the best French wine manufacturers.

When the second fermentation has been completed the bottles are lowered into cool vaults, where they are allowed to quietly rest and mature for two years. When wanted for use the bottles are placed on sediment racks, necks downward, workmen passing through and shaking them gently twice a day for three or four weeks. In this way any sediment which has been produced by the fermentation is gradually worked down on the cork in the neck of the bottle. From here the bottles go to the finishing room, which is shown in the large view at the bottom of the page. Here the cork is removed by an expert, and as it flies out carries with it a small quantity of champagne and the sediment which had settled there. It is then passed to a "doser," who, with a small machine, injects a syrup made of white sugar candy dissolved in champagne. The quantity so injected is very small, but care is taken that the contents of each bottle shall be exactly the same. The bottle next goes to the corker, who, with the aid of a machine, closes it with a large cork, after which come the tying and wiring, all of the operations, however, being conducted in much less time than it takes to describe them. The bottle is now well shaken, to mix the sirup thoroughly with the wine, and then comes the labeling, putting on the foil, wrapping, packing, etc.

In the manufacture of sweet and dry Catawba, port, etc., particular care is taken in all the processes and in putting up the wine to make an article which will keep in every climate. The Catawba is a heavy, fine-flavored wine, and to a large extent takes the place of imported hocks. The port wine made by the company is from several varieties of grapes fermented on the skins, which gives it a heavy dark color. One of our sketches gives a view of one of the large vaults, where, in immense casks of about 3,000 gallons capacity each, the still wines are kept until they have been properly matured and mellowed.

The vaults and building of the Urbana Wine Company, originally the largest in this country, were last summer greatly increased, giving to the establishment quite double its former capacity. The entire new vaults, under the new stone south wing, are 80x40, with artificial ice houses behind the lower walls, capable of reducing the temperature if desired. These are wholly devoted to champagne manuture. The fermentation room above them is 80x40, fitted with steam boiler and works, controlling the temperature at any desired point, and is claimed to be the most complete fermenting room in any wine-making establishment in America. The storage capacity for wine was also nearly doubled by the addition of casks. Above this are the new finishing rooms, and on the floor above the store and rooms where grapes are received. These buildings are made of solid stone, with walls of great thickness. The crop last fall was exceptionally prolific and very superior in quality, and the company decided to put in a very large stock. More than twice the amount of grapes ever before purchased were crushed last autumn by this company.

At the late Paris Exhibition the "Gold Seal" and "Gold Seal Extra Dry" champagnes of the Urbana Wine Company were exhibited in direct comparison with the best champagnes of France. This was the first time there had been a real comparison between the champagnes of the different countries, and as a result these wines were awarded a medal. At our Centennial in 1876 the "Gold Seal" and "Gold Seal Extra Dry" were awarded the highest honors, obtaining two medals and two diplomas.

The officers of the company are: D. M. Hildreth, President; Clark Bell, Vice-President; H. H. Cook, Treasurer; and A. Smedberg, Secretary. A. J. Switzer, Hammondsport, N. Y., is the General Superintendent.

Hints for Preserving Fruits.

A useful hint to cooks was given at a recent sanitary convention in Grand Rapids, Michigan. It was pointed out that by adding sugar to sour fruits, during the cooking process, the greater part of the cane sugar was converted by the aid of the acid into grape sugar, which does not possess half the sweetening power. By cooking the fruit first, and then adding the sugar to an agreeable sweetness, a very great deal of sugar might be saved.

Raspberry, strawberry, and cherry sirups of the German Pharmacopœia have to be made by bruising the fruit and letting the marc and juice ferment, after which the juice is strained off and filtered. A better and safer way is to add at once to the freshly bruised fruits five to six per cent of alcohol, to let the whole stand for some days, decant and filter. Lastly, boil up once to remove the greater part of the alcohol. Sirups made with juice prepared as above retain in a remarkable degree the odor and taste of the fresh fruits.

NOVEL FRUIT GATHERER.

The annexed engraving shows a convenient implement for gathering apples, pears, peaches, and other fruit without bruising it. The cup that receives the fruit is movable on the upper end of the rod, and is provided with a forked hook which grasps the stem of the fruit. A cover is hinged to the cup and connected with the rod, so that when the cup is pulled downward in the act of fruit picking, the cover closes and guides the fruit, so that it falls into a rubber tube connected with the lower part of the cup. After the fruit stem has been removed, the spring on the rod returns the parts to their former position.

Jarman's Fruit Gatherer.

This fruit gatherer was recently patented by Mr. J. N. Jarman, of Peacher's Mills, Tenn.

Sapphires in Siam.

Five years ago a native hunter in Siam found sapphires in a remote and secluded district. Some men who were let into the secret followed him to the mines and brought back to Rangoon and Calcutta a number of very valuable stones. A rush ensued from British Burmah, thousands of adventurers flocking to the mines, some to find sudden fortune, but more to lose their lives from privation and jungle fever.

The mines occur in the provinces of Battambong and Chantaboon. In his commercial report for 1879 the British consul at Bangkok says that the miners are very careful to conceal their gems while in Siam. Being anxious to show some of the gems to Admiral Coote, the consul called for specimens from some miners who had just returned from the diggings. One miner, a poorly clad and miserable looking fellow, produced a few small stones, and after a great deal of coaxing was induced, with many precautions, to give a private view of his great prize, which was a very large sapphire in the rough, valued at $10,000. He would probably not have shown this stone at all had he not been on the point of leaving in a steamer. Owing to the secrecy thus observed by the possessors of valuable gems, it is impossible to give any estimate of the total value of stones found, but that individuals have made very large profits is certain. One man dug out a stone which he offered for sale in Chantaboon at $500, but did not find a purchaser. He went with it to Rangoon, where he was offered $7,500; but, having awoke to the value of the stone, he declined to sell and took it to Calcutta, where he eventually obtained $15,000 for it. Now, however, there are many experienced gem merchants established in the neighborhood of the mines, and something like the real value of the stones can be obtained by the miners on the spot. The largest sapphire hitherto found, so far as the consul knows, weighed 370 carats in the rough, and when cut turned out 111 carats of the finest water. The ruby, onyx, and jade are also found in the district, but the quality of none of these is such as to make them very valuable.

Pyrethrum for Grain Weevils.

Adjacent to my office is a warehouse filled with wheat. This spring the grain weevils therein commenced to migrate, and infested my premises. We therefore sprinkled some buhach, or insect powder, over the grain, and swept the weevils up literally by the quart. Those which emigrated to my office were also treated with a sprinkling, and it cut short their earthly career. . . .

I am convinced that a judicious use of this powder on board each grain ship would save an immense amount of loss. I have seen it used in one of the largest mills in the State, and it brought cockroaches out in quantities which astonished even the miller, who little thought he had so many on his premises. A clergyman, a friend of mine, who cannot sleep if a mosquito is within a mile of him, tells me he has only to put a little powder on some burning paper in his room, and there is "perfect peace."—*A. T. Elliott, in American Entomologist.*

Bogus Sugar.

The manufacture and great profits which the makers of glucose are now realizing are described in the following testimony lately given by one of the original producers, in a law suit at Buffalo, N. Y. It would appear from the evidence that the public rather prefers to be cheated, and will pay more for sugar that is not sweet than for the genuine article.

Mr. Horace Williams testified as follows:

"The manufacture of grape sugar from corn was commenced originally by witness and his partner. He invented some of the machinery by which the process was brought to perfection. He obtained patents in order to keep his process a secret. Their firm name was then A. W. Fox & Co. They commenced with two or three hundred bushels a day, and increased this amount gradually to two thousand. This was the amount in 1874. The Buffalo Grape Sugar Company was then organized. There were 200 shares, of which Fox owned 102; witness owned 60 shares, and the balance was held by William Hamlin. Improvements have since been made in the machinery, by which a better article of sugar is made and with greater facility. They first produced crude sugar—used in the manufacture of ale and lager beer, principally ale. The sugar was used in place of malt. At a later date they refined the sugar. Grape sugar also was used, in 1874, by tobacconists. As its quality was improved it was used in other branches of business. A large quantity is now used in making sirups for table use. Witness knew there was very little pure cane sirup sold now. The grape-sugar sirup is more wholesome and delicious. Glucose and grape sugar are one and the same thing—glucose being the sugar in a liquid form. When it is called grape sugar it is in a solid form. This is being used considerably in New York in making sugar, making what is called improved sugar. Witness understood that the Buffalo Grape Sugar Company was interested in this mixing of sugars in New York. At the present time the demand for grape sugar exceeds the supply, and the price of it has increased. In 1874 thirty pounds of sugar were made from one bushel or fifty-six pounds of corn. The price was then from 3½ to 4, and sometimes 4½ cents a pound. The refuse is sold for feed, and the price of it was from seven to eight cents a bushel. In mixing sugar the grape sugar is pulverized, and about twenty-five per cent. added to cane sugar. It improves the color of the sugar, and enables dealers to sell it for a better price.

During 1874 and 1875 the earnings were about $15,000 a month, and in 1876 they averaged from $19,000 to $20,000. In 1877 the earnings for one month were $35,000. Witness did not see many of the statements during 1878. A starch factory was run in connection with the sugar works, about 500 bushels of corn being used in a day. Witness did not know much about the earnings of the starch factory. He was aware that the business was profitable. He understood all of the processes of the establishment, and had charge of the manufacturing of the sugar, glucose, etc. He made estimates from time to time of the cost of turning a bushel of corn into sugar, and in doing so took into consideration the outlays, cost of machinery, building, etc. He estimated it to be about 25 cents a bushel, and the net profit of a bushel of corn, at 45 cents a bushel, when turned into sugar, to be 70 cents. A number of small manufactories have sprung up in this country, but there are only four or five of any account. The amount of corn consumed in 1879 was from 4,000 to 6,000 bushels a day. In some respects it costs less per bushel to run a large amount of corn than it would to consume a small quantity. The net profit per bushel from 1874 to 1879 was from 40 to 50 cents.

Composite Diamonds.

A diamond expert of Chicago asserts that many of the so-called solitaires, sold as single stones, are made up of small stones cleverly put together. Under the blowpipe they separate. He adds the surprising statement that not one diamond in ten sold in this country is other than the refuse of the London market. Nearly all are off-colored, specked, or feathered, and are sold at a fictitious value.

Mr. Whymper among the Andes.

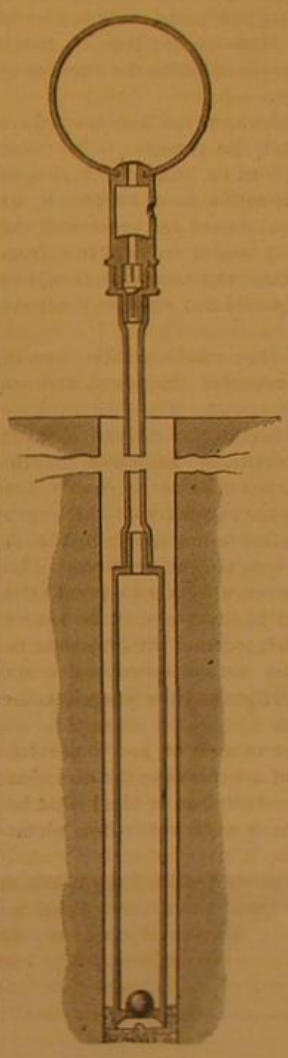
Mr. Whymper, the English mountain climber and artist, writes to a friend in London that, during a forty-one days' excursion north of Quito, the most of the time was spent in tents at altitudes varying from 10,000 to 14,500 feet. Seven days were passed without any shelter whatever. The objects of the trip were the exploration and ascents of Cayambe, Saraurcu, and Cotocachi, and the collection of Inca antiquities. He was accompanied by the two Carrels, the well known Swiss guides. They were entirely successful, though at a somewhat severe cost, being drenched every day and much reduced by exposure and diarrhea. On Saraurcu it rained on one occasion for seventy hours without ceasing for a minute, and for more than six days and a half out of seven consecutive ones. He found Cayambe to have a height of 19,200 feet, Saraurcu 15,600, and Cotocachi 16,200 feet. The ascent of the highest mountain gave least trouble, and the lowest one gave most. He waited for fourteen days before he could see it, as it is almost perpetually enveloped in mist.

The Best Vehicle.

An anecdote is told of a physician who was called to a foreign family to prescribe for a case of incipient consumption. He gave them a prescription for pills, and wrote the direction: "One pill to be taken three times a day, in any convenient vehicle." The family looked in the dictionary to get at the meaning of the prescription. They got on well until they got to the word vehicle. They found "cart, wagon, carriage, buggy, wheelbarrow." After grave consideration they came to the conclusion that the doctor meant the patient should ride out, and while in the vehicle he should take the pill. He followed the advice to the letter, and in a few weeks the fresh air and exercise secured the advantage which otherwise might not have come.

PNEUMATIC DRILL-HOLE CLEANER.

A simple device for removing drillings from drill holes is shown in the accompanying engraving. A tube having a ball valve at its lower end is connected at its upper end by a flexible tube with a hollow rubber ball, having a metallic neck containing a check valve, and having a small air hole in one side to be closed by the finger. The tube is inserted in the hole to be cleared of drillings; the rubber ball is compressed, and the air hole is closed by the finger. The ball being released, a partial vacuum is formed, and the external air pressure forces the drillings into the tube. The operation may be repeated several times before removing the tube, if necessary. The tube is emptied of drillings by pushing up the ball valve. This invention has been patented by Mr. J. L. Prentiss, of Cañon City, Col.



Drill Hole Cleaner.

Operations at Flood Rock.

In the government operations for the removal of Flood Rock, Hell Gate, East River, about one hundred and thirty men, in three sets, who relieve each other every eight hours, night and day, six days a week, and the work of making the East River practicable to ships of the largest class, is progressing rapidly. The area of rock to be undermined and blown away is between five and six acres, in addition to about three acres that have already been mined and made ready for the great explosion that is to give New York from twenty-six to thirty-two feet of water at low tide from Blackwell's Island into the Sound. The width of the channel at Flood Rock now is 600 feet; after the rock has been blown away it will be 1,200. It is believed that the velocity of the tide at Hell Gate will be decreased by the destruction of Flood Rock.

A Clever Trick.

The *Japan Mail* describes a clever trick which was being exhibited by a native juggler at Josbida-bashi. The performance takes place in a small room about twenty-six feet long by twelve feet wide, half being allotted to the spectators, who are admitted on payment of the moderate fee of two cents. The "properties" consist of a deal table and a sword, etc. After the usual soul-stirring flourish on a drum and samisen, a man and woman appear from behind a screen, the man binds the woman's head in a cloth, and she then kneels down close to the table, and sideways to the spectators. The man then draws the sword, makes a violent blow at the woman's head, she falls forward, arms extended and limbs twitching. He then, having first wiped the sword on a gory-looking piece of rag, takes up (apparently) the woman's head, wrapped in the cloth, and places it on the table. To all appearance it is a human head, the eyelids and features have a convulsive motion; presently the eyes open in a dreamy sort of way, and, to the accompaniment of the everlasting samisen, the head sings a mournful song. A curtain is interposed between the audience and the performers, and when again drawn back the woman is disclosed quietly seated alongside the man. When it is recollected that this all takes place within about three feet from the spectator, and that the "properties" are of the simplest description, some idea may be formed of the wonderful excellence of a performance which has excited attention.

IMPROVEMENT IN STEAMSHIPS.

That there is ample room for improvements in the construction of steam vessels and in methods of operating them no one will doubt after reading the records of marine disasters for the last few months, and no one who has encountered a rough sea on ordinary vessels would fail to patronize a line of steamers free from pitching and rolling and practicably unsinkable.

Our engraving shows a steamer intended to be of sufficient length to ride several waves at once, and thus avoid pitching, and having breadth of beam sufficient to prevent rolling. The vessel is without masts or rigging, and is to be propelled entirely by steam.

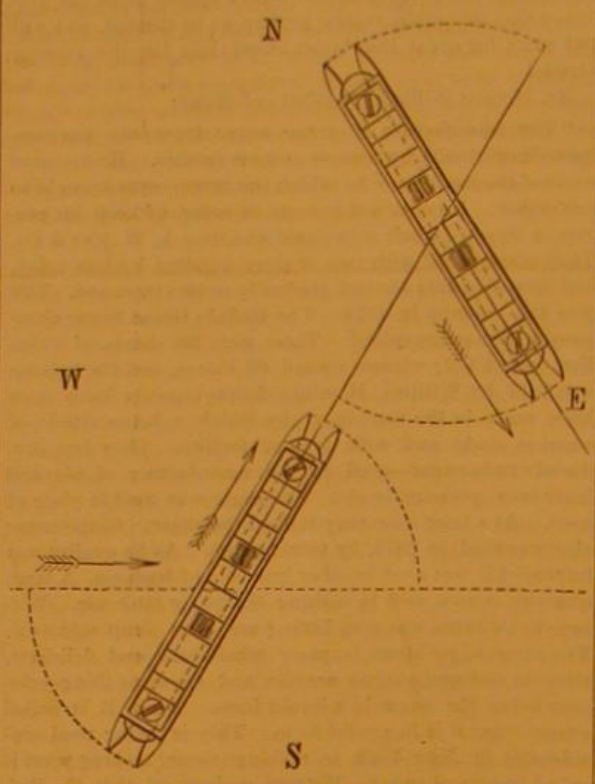
The vessel consists of two longitudinal tubular pontons, sustained parallel to each other at a suitable distance apart by transverse connecting braces, in combination with struts extending vertically from each ponton, longitudinal airtight cylinders connected to the upper ends of the vertical posts or struts immediately above and parallel to the pontons, and transverse braces connecting the two cylinders, the structure so formed being adapted to sustain the deck, cabins, and machinery of a sea-going vessel, and the arrangement being such that if the posts or struts and upper horizontal cylinders, which mainly support the deck and cabins, should accidentally become detached from the pontons by rough usage, the upper cylinders will still subserve the purpose of floating the remaining structure.

The tubes or pontons by which the vessel is supported are pointed at each end, to facilitate the passage of the vessel through the water, and are divided by transverse partitions into a series of water-tight compartments or bulkheads, so that if one of the compartments should be penetrated the remainder of the tube or ponton would be kept free from water. This arrangement of compartments adds greatly to the safety and strength of the vessel and renders it almost impossible to sink her.

The vessel is furnished with four paddle wheels, two of which are fixed at or near the center of the vessel, and are employed in driving the vessel ahead. Two other paddle wheels are arranged one at each end of the vessel. These paddle wheels have horizontal shafts, are supported in turntables which turn on vertical axes, so as to enable the paddle wheels to revolve in a plane parallel with the length of the vessel, or at right angles thereto, as shown in Fig. 2, or, if desirable, at any angle between the two positions. The object of thus swiveling the paddle wheels is to permit the vessel to be propelled in a direction transverse to the run of the waves without turning so as to present the broadside to the action of the waves, and they are also used in steering and maneuvering the vessel. There is at each end of the vessel a rudder of the usual form.

To make the ship lay to, in case of a storm, and to prevent as far as possible the drifting of the vessel in the direction of the run of the waves, the inventor has applied what he calls "water anchors," which consist of heavy iron plates hinged at the under side of the vessel and arranged transversely. When the vessel lays to and it is desired to keep from drifting, the anchor in the end of the vessel heading the run of the waves is let down; but when the vessel is being propelled forward, these anchors are swung up and secured in a horizontal position at the under side of the vessel.

The inventor states that, as the displacement of water is much less than that of common vessels, and as the propelling power is much greater, a very high rate of speed can be attained; and, although the vessel is very long, it may be maneuvered as readily as shorter vessels, as the end paddle



OLSEN'S PONTON STEAMER.—MANEUVERING.

wheels may be used in conjunction with the rudders in steering. It is easy, with this arrangement of machinery, to turn her in her own length.

The "Ponton Steamship" is peculiarly adapted for ocean navigation, but it is believed that even on rivers and lakes it will prove superior to other vessels. It can be made long enough to span several waves at once, thereby avoiding all pitching, and by never allowing the side to be presented to the rim of the waves rolling will be avoided.

In regard to her course in relation to the wind: Suppose the ship to be sailing east, then west and east winds are fair. Winds from any point within an eighth of the compass of these winds would not alter the course of the ship, but if heavy northerly or southerly winds prevailed it would be necessary to beat against them by tacking. The annexed diagram shows the maneuvering of the ship when sailing east with a north wind blowing. The arrows show the course of the vessel. It is claimed that the expense of building and running a vessel of this description will be much smaller than that of common ships.

Further information in regard to this invention may be obtained by addressing Mr. A. Olsen, 181 Richard street, Brooklyn, N. Y., until October 1. Permanent address, P. O. box 580, Salt Lake City, Utah.

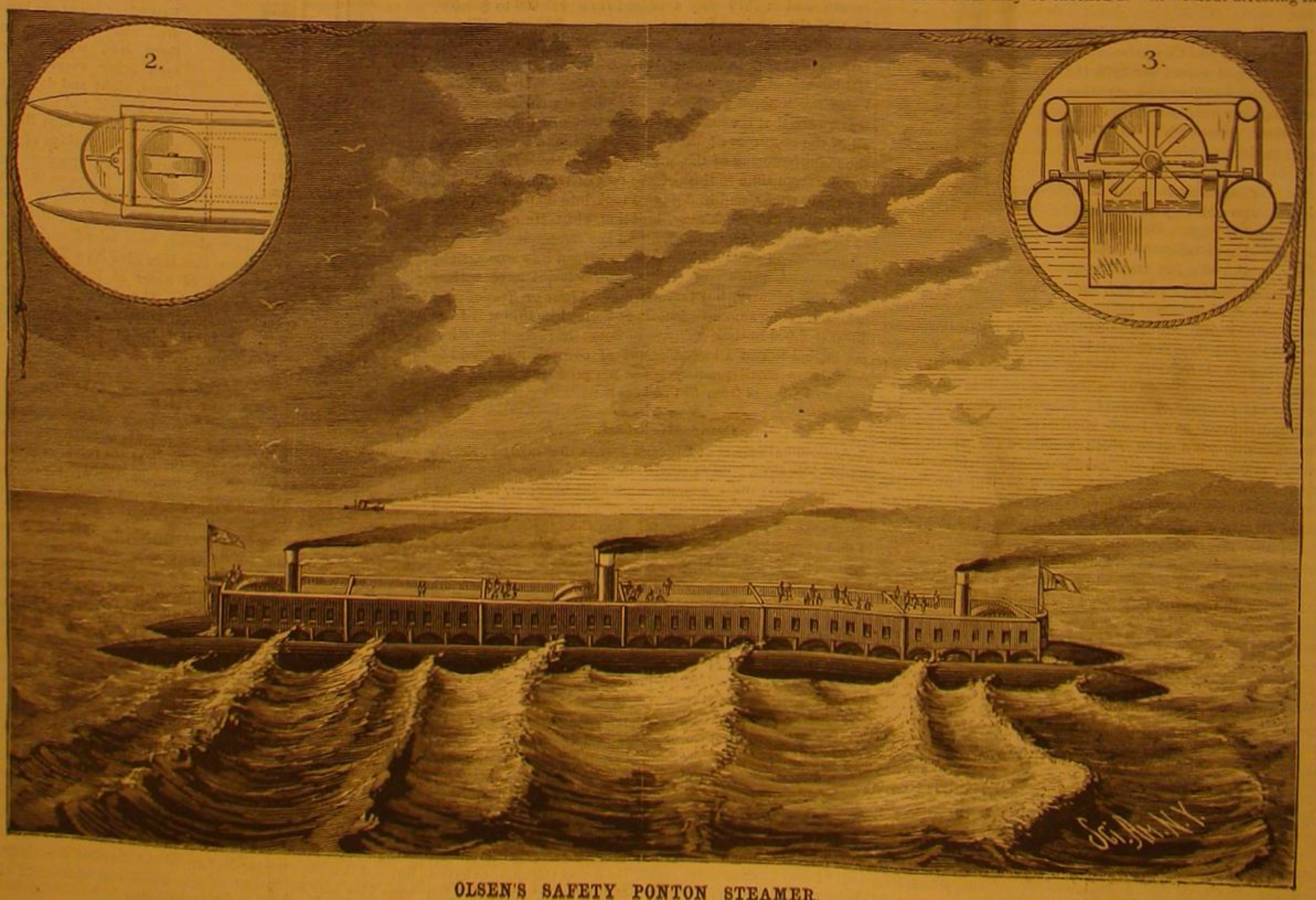
American vs. European Locomotives.

In his annual address as vice-president of the American Society of Civil Engineers, Mr. Octave Chanute compares the working of American and European locomotives, and makes out a strong case in favor of the superior efficiency of the former. Early locomotives were not expected to have a dragging power greater than one-fourteenth of the weight upon their driving wheels. Now, in other countries, one-seventh of the weight is considered a standard and satisfactory performance, while American locomotives regularly work up to one-fifth in winter and do rather better in summer. That is to say, a European locomotive weighing 88,000 pounds might be expected to pull a train equal in resistance to lifting 12,571 pounds, while an American locomotive would pull 19,555 pounds, or 55 per cent more. The average locomotive of Europe travels 15,720 miles per year, while the American performance is 21,900 miles. The reason assigned is simply that the American machines are better ones, and two chief improvements on the European prototype are mentioned: First, the leading wheels of locomotives and all car wheels are not rigidly atttached to the frames, but are fixed to trucks pivoted at the center; and, secondly, equalizing levers are used to distribute the weight equally over the driving wheels, thus keeping its apportionment nearly constant, while the wheels are free to adapt themselves to all the irregularities of the track. These and other improvements have reduced the resistance of cars so much that recent experiments have developed a rolling friction of only four or five pounds per ton, or actually only half that given in engineering note books.

MECHANICAL INVENTIONS.

An improved lock, provided with a controlling latch consisting of a flat bar provided with a pin extending into a slot in the tumbler and with a vertical projection at the end, has been patented by Mr. Christian F. Otto, of Zerbst, Germany.

Mr. Duryea S. Van Wyck, of Fishkill Plains, N. Y., has patented a device whereby power can be more conveniently applied to a sewing machine, and whereby the motion of the needle bar may be checked at will without arresting the



OLSEN'S SAFETY PONTON STEAMER.

motion of the treadles or the momentum of the balance wheel. The invention consists of a seat and treadles arranged so that the operator can easily apply the weight of the body upon the latter, of novel attachments for slackening and tightening the driving belt, and for arresting and restoring motion to the needle bar.

Mr. John Connelly, of Hallowell, Me., has patented improvements in sewing-machines, which relate to a permanent attachment for sewing-machines of a certain class, the function of which is to aid in removing the shuttle from the raceway. It consists of a spring-plunger or lifting-rod, attached to the oil pan of a sewing-machine beneath the raceway, so that it is made available in raising the shuttle when it is to be removed.

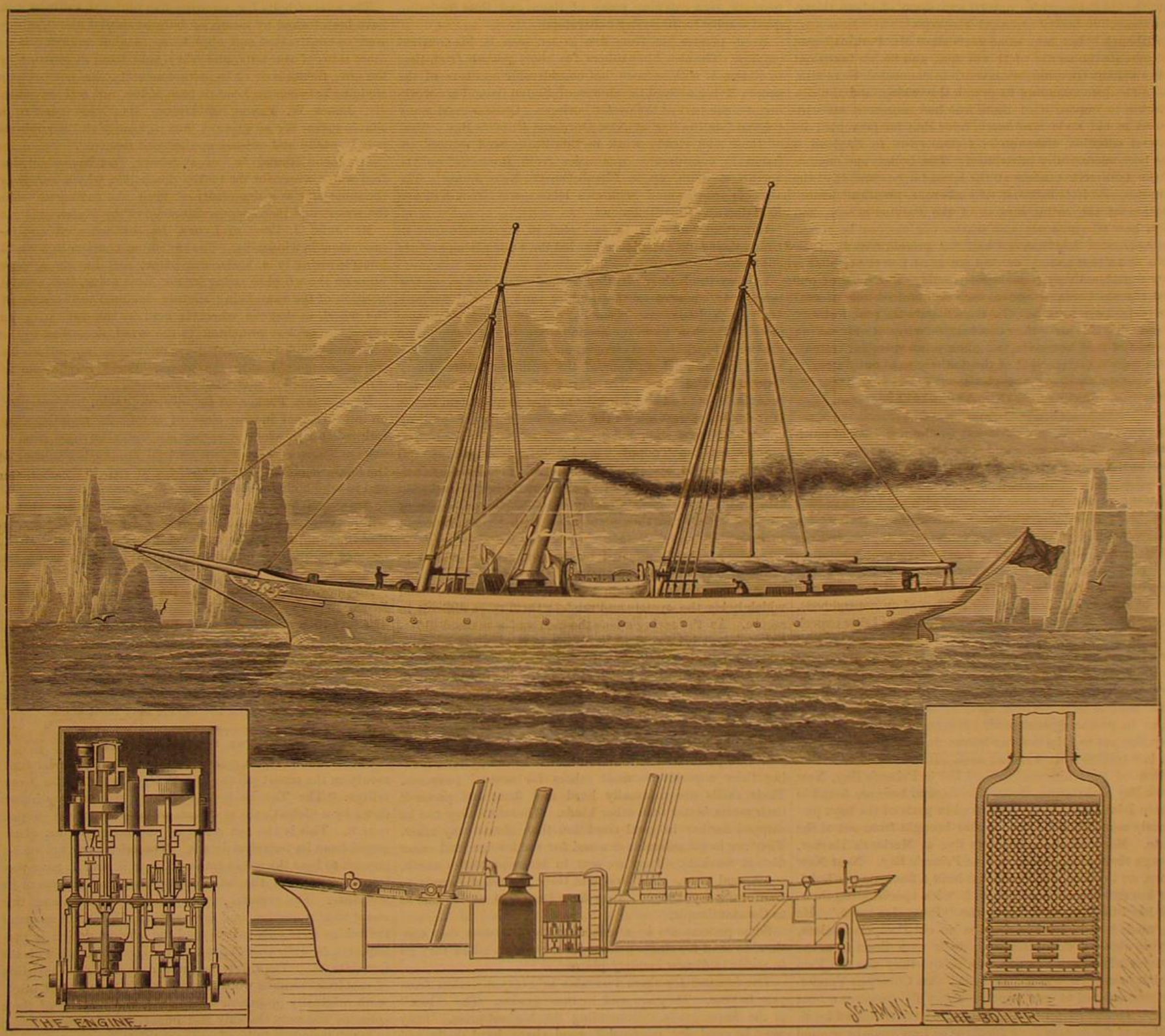
THE ANTHRACITE.

THE LITTLE STEAMER WHICH IS RUN BY ONE POUND OF COAL PER HORSE POWER PER HOUR.

The recent arrival of this little vessel in New York Harbor has excited an unusual degree of interest among engineers. Those interested in running marine boilers and engines are curious to know all the particulars regarding the machinery of the craft, which gives a practical illustration of the attainment of the greatest economy in fuel ever yet reached. We therefore present the accompanying engraving illustrating the general appearance of the steamer, and give outlines of her machinery, showing the proportionate space it takes up in the vessel. In former numbers of the SCIENTIFIC AMERICAN, as well as of the SUPPLEMENT, we have given some of the leading particulars regarding her construction, and have illustrated and described the Perkins system of utilizing steam at high pressures, and we now present some details not before given.

Of the 84 feet length of the Anthracite, her engines, furnaces, and boilers take up a space of 22 feet 6 inches, leaving a hatchway, kitchen, and forecastle cabin in the forepart of the boat, besides a water-tight bulkhead, which takes up 5 or 6 feet; abaft the engines are three cabins, with extra sleeping bunks beside the hatchway, and a water-tight bulkhead in the stern. The screw is of the ordinary fish tail pattern, with two blades. Her gross tonnage is 70·26 tons, and her registered tonnage 27·91 tons. Her average consumption of coal since she left England, on the voyage thence to Newfoundland, and from there here, has been one ton of coal a day, Welsh bituminous coal having been burned on the voyage. The weather was very rough coming out, consequently the sails could be used but little, and she is not remarkably well fitted for sailing, but her lines are such that she is well adapted to outride the roughest sea. The counter which registers the revolutions of her screw was set at 0 before she left England, and now marks 3,980,000. She has hitherto burned only bituminous coal, but it is intended to test the economy of using anthracite. In the voyage over the furnace was operated without any artificial blast, the natural draught only being used, but there is a fan blower connected with it which can be brought into use if increased consumption of fuel and a proportionately higher pressure of steam are desired.

The peculiarity of the machinery which effects the great economy of fuel lies solely in the means employed for using steam at very high pressures safely, and without undue wear or strain. The average boiler pressure on the voyage over was from 350 to 400 pounds to the square inch, but the boilers had previously been tested up to 2,500 pounds per square inch by hydraulic pressure, this pressure having been maintained for some time without showing any defects whatever. The body of the boiler consists of a series of horizontal tubes, welded up at each end, and connected together by a vertical tube, and the several sections are connected by a vertical tube to the top ring of the fire box, and by another to the steam collecting tube. The fire box is formed of tubes bent into a rectangular shape. The boiler is surrounded by a double casing of thin sheet iron, filled up with non-conducting material to prevent loss of heat. The cylinders and valve boxes are steam jacketed, and further protected by jackets of non-conducting material, so that, although all the parts are kept at a high temperature, the heat given out in the engine and fire room is much less than is usual with ordinary marine engines. The sections of tubes of the boiler are connected so that any one of the sections may be taken out and replaced without interfering with the others, and in case of any accident causing a rupture of one of the tubes, the comparatively small amount of steam liberated would escape up the smoke stack, while the remaining sections of tubes could be used with increased pressue to make good the loss. Very little water is lost in operating these boilers and engines. All the joints and valves are practically very nearly perfect. The steam generated is constantly and completely condensed in a surface condenser, and the water is reused; the loss of water is extremely small, and the additions required are easily provided for. Under these circumstances there is no deposit or scale inside the boiler, and the wear of the boiler is very slow. One built and operated on this principle, which was taken to pieces after twelve years' use, showed no appreciable effects of use. The steam required for the whistle, and also that for cooking, is generated in a small supplementary boiler heated by a coil from the main boiler, the coil being placed inside the boiler and in contact with the sea water, from which the steam is made. The steam coming from the main boiler is returned to the condenser to be reused in the boiler.



THE ANTHRACITE THE SMALLEST STEAMER THAT EVER CROSSED THE OCEAN.

The difficulty arising from friction and imperfect joints in practically working machinery at high pressures was one of the most serious obstacles encountered in developing this system. The inventor, after a long series of experiments, adopted an anti-friction alloy, of which the packing rings and internal rubbing surfaces are made. No lubrication is required beyond that furnished by the steam. The inventor states that cylinders fitted with piston rings made of this metal have been several years at work, the cylinders showing no signs of wear, the only wear occurring on the rings, which may be easily and cheaply replaced. Not only is the cost of oil and grease thus saved, but the destructive action on the machinery and boiler of the acids generated from lubricants is avoided.

For the use of steam at these high pressures three differ-

ent sized cylinders are employed, all jacketed with spiral tubes cast in the metal, which are supplied with steam direct from the boilers, and keep up the temperature of the cylinders. The first and second cylinders are arranged one above the other, and their pistons are connected to a common piston rod. The operation is thus described by Mr. Loftus Perkins, the inventor, in a paper read before the Institution of Mechanical Engineers, London:

"The high pressure steam is introduced into the upper end of the first cylinder, where there is no gland, and where the piston is formed so as to require no lubricating material. The steam is cut off at about half stroke in this cylinder, and when it is admitted for the return stroke into the bottom of the second cylinder, of four times the area, the temperature is so much reduced as to cause no difficulty when brought into contact with the piston rod gland. From the bottom of the second cylinder the steam expands into the top of the same cylinder, which is of larger capacity than the bottom, and serves as a chamber, and is in direct communication with the valve box of the third cylinder; this last is double-acting, and is arranged to cut off at about a quarter stroke, and at the termination of the stroke exhausts into the condenser, with a total expansion of about thirty-two times."

Although it has been some years since Mr. Perkins began to advocate the merits of this system, and he has taken out many patents covering his inventions connected therewith, the difficulties attending its practical working, and the disposition to oppose it of those who had enormous sums invested in old style machinery, have thus far prevented its general adoption, although in several cases in England it has been successfully introduced. The boilers and engines of the Anthracite contain all the latest improvements of the inventor, and it is believed they afford a practical demonstration of the entire success of the Perkins system, and show how all stationary and marine engines can be run at an expense of less than one-half the present cost for fuel. Two and a half pounds of coal per horse power per hour is now considered very economical running, and some of our best managed ocean steamers use one hundred tons of coal a day in their voyages. To demonstrate the practicability of reducing this more than one-half, thereby not only saving the cost of fuel, but giving so much more space for freight, is the purpose of the visit of the Anthracite to our waters.

STATEN ISLAND AND OYSTERS.

[*Continued from page* 65.]

As soon as attention was turned to the necessity of cultivation, the Legislature was applied to. Laws have been enacted that allow each individual to take up three acres in his own name. The occupant must stake out and clearly mark the ground, and plant the same with not less than fifty bushels of seed oysters within six months, or he forfeits his right to hold it. Those owning land along the shore have the first right to the ground in front of them. No oysterman is allowed to take fish in any county but his own, nor anywhere on public beds, between the 15th of June and the 15th of September. No dredging is allowed on natural beds. The cultivators have found so much of their labor experimental that they have earnestly resisted all efforts to tax them for their grounds. They look upon a tax as a burden that would overweigh and seriously check their industry. The owners of grounds buy their seed from men who obtain it from natural beds. These men, by the hundreds, are engaged in procuring such seed. It is their business only, as they hire out to help in other things during the season that the law forbids their working upon natural beds.

Most of the cultivated ground lies in Prince's Bay, New York Bay, and Raritan Bay. The natural beds are found in Staten Island Sound, the Kills, and in parts of the bays previously named. Much seed is also brought from out of the State. Many of the cultivators live at Mariner's Harbor, though their oyster farms are in Prince's Bay. Near New Dorp, on this bay, Mr. Petler has built a fine summer hotel. He has endeavored to surround it with special attractions. He has fitted up one room as the "Pompeian room." He has made it to resemble a room in an old Pompeian palace, having obtained many things to do it with direct from the remains of ancient Pompeii. In this vicinity was the Vanderbilt home. It was a "pirogua" that Cornelius Vanderbilt first aspired to own when he began his career as a boat man. To this island of his birth he always remained loyal.

Most of the oysters grow for three or four years on ground that is a little muddy. They are moved the spring before using to a hard and sandy bottom. They are taken up by tongues or dredges, culled and put into floats, and taken where they may have an infusion of fresher water, and then to the markets. Most of the Staten Island oysters have to to taken up near Rahway for the freshening. They are usually left in the floats there over one tide.

Sail boats or yachts are almost universally used. One cultivator has lately procured a small steamer. The harbor of New York abounds in tugboats. Their captains have an understanding with the oystermen; so, if the wind is unfavorable or the tide, they hitch on and pull the oyster boats up to the city. For pay the oystermen keep the tugmen supplied with oysters. These boats carry all the way from one to four hundred bushels at each trip. The Staten Island men are considerably annoyed by persons from New Jersey oystering in their waters. So far they have failed to secure a very effectual check to this.

Thirty years ago the oysters were prepared for market by men and boys handling them all over to sort them. Workmen stood in the water even in the coldest weather beside a pile of oysters and sorted them into a boat. Then it took fifteen persons all day to get a boat ready. It involved great exposure and hardship. Some years ago an old man straightened himself up after such a job, saying he could stand it no longer. He contrived a fork, at first a little straight-tined affair, with a guard at the top to prevent the oysters falling off. It at once took with the men. All quickly provided themselves The day of hand culling was over. The fork was gradually improved in size and shape, until it has reached a very perfect and complete form. Now with this aid two men can accomplish more in two hours than fifteen men formerly did in a whole day.

The beds here are in shoaler water than on the Connecticut shore. But the full and swift tides render them a protection from ice in winter, and some other troubles of shoal water in more quiet seas.

Stars and drills have at times been a trouble, but their greatest enemy has been the "drum fish." When the oysterman hears him "booming" over his grounds he trembles for his property; for this fish will crunch up oysters as cattle will apples or clover. The "moss-bunker" fishermen are now catching many of them, and thus rendering good service to the oyster cultivators.

Every planter has from five to ten men in his constant employ. He also hires others for short periods from time to time. It will be seen that considerable numbers of the people living around the shores of Staten Island are working at some part of the oyster business. Quite a good many colored families live at New Dorp and Prince's Bay. Most of these find steady work in this line. Seed oysters are found in considerable quantities from Rossville, on the northwest shore, up to Elizabethport, New Jersey. The same is true around Schuten's Island, and from Kill von Kull down to Port Richmond.

Important facts are to be noted in the conclusions to which their long experience has led the Staten Island oyster cultivators.

1. They think their planting grounds need rest every few years. An element in the mud or sand, needful for producing good oysters, becomes exhausted by successive crops. To then leave the ground bare for a year or two enables it to regain that element anew.

2. The continual working of the ground produces many "poppy" mud holes. These are holes where the mud has become so soft and slimy it kills all that is put upon it. A year or two of rest allows the action of the water to fill up and "heal" over such holes.

Some say the "poppy" mud holes render the ground poisonous to the oyster. They note this condition by finding an increasing number of black-meated oysters, and soon after many dead ones. Ceasing all work there for one or two years they can then plant anew with an assurance of success.

3. The ground is affected by the change from winter to summer. Though no frost is in the bottom of the sea, yet there seems to be a certain hardness of the mud or sand which holds the oysters and renders them more difficult to secure. As the spring opens the men see a marked difference. There is an evident loosening of the bottom much as takes place in the upland as the frost comes out of it.

4. A wet summer is much more favorable to the growth and quality of oysters than a dry season. This partly accounts for the varying quality of oysters produced in the same waters. Thus, a year ago, New York Bay oysters were much better than usual.

5. One peculiarity is found in Staten Island oysters, making them superior to most others for several purposes. Their shells are unusually hard and firm, and preserve their meats better than other kinds. Therefore they can be shipped farther in good condition than almost any other. They are in considerable demand for the foreign and other distant markets. They are sent in large quantities north, south, and west. One firm sent three thousand barrels to California a year ago. They have been sent as far east as to Constantinople.

Some patrons are so attached to these oysters they continue to send for single gallons of them even when they go to reside in distant country places.

The demand for them increases in every direction from year to year. They are sold in three grades. The "box" is the finest grade, commanding the highest price. They must be good size, good color, good shape, hard shells, and even size. The next are "barrel" oysters, running a little smaller and a little less even. The third are "culls." The second grade are also called "counts." The "culls" sell from thirty to forty-five cents a hundred, when the "box" grade cost from sixty to ninety cents per hundred.

Those that are sold out of the shell are opened on the boats at New York. A single firm on the North River sometimes opens one hundred and fifty thousand counts in a single day. Men who open oysters there are able to earn about three dollars a day.

With a fair season and no special adverse circumstances, the business is lucrative. But in the present stage of practical knowledge the risks are so many and so great that no man is able to estimate with much certainty at the beginning of a season what its results may be. Every year shows improvement, however, both in the quality of the oysters and the modes and security of cultivating and handling them.

Hundreds of vessels, thousands of people, and millions of money are already employed in the business. Its growing value only begins to be realized. It most certainly has a grand future. Staten Island has been noted for several important things, but this developing industry promises more for it than all its other interests, ancient or modern.

The island was General Horn's headquarters, and he had thirty thousand troops there during a most important crisis of the Revolutionary war. To the great disgust of its inhabitants a quarantine station was maintained on its north shore for many years. Some of its names recall noted places and persons of the Old World. Its climate is of great salubrity. Many seek its shores and elevations for quiet and healthy homes. Several humane retreats, like "The Sailors' Snug Harbor," "Retreat for Sick Seamen," "Home for Destitute Children of Seamen," "The S. R. Smith Infirmary for the Sick," are located upon it. Some of its old taverns bore the significant names of "The Black Horse," "The Bull's Head," "The Morning Star," "The Blazing Stars." But all these names and interests, though interesting and important, are eclipsed by the healthful and useful oyster cultivation.

ENGINEERING INVENTIONS.

The nuts of bolts for securing fish plates to railroad rails have been locked by means of bars or slotted plates, which were so constructed and applied as to abut against one or more sides of the nuts, and were held fixed in position by the nuts themselves, or by attachment to the bolts, or by wedging between the head or base of the rail and the nuts. Mr. James W. Payne, of Tipton, Mo., has patented a simple means for securing a nut locking plate, whereby it may be easily and quickly applied and removed.

Mr. Jacob Rhule, Jr., of Pittsburg, Pa., has patented a feed water heater for the inside of a boiler, which serves at the same time as a depository of mud and sediment from the water, and thereby prevents scale in the boiler.

Mr. John J. Reed, of Lyons, Ia., has patented an improvement in windmills. The invention consists in a wheel hung to swing in a horizontal plane, and having a vane hung on the wheel to swing in the same plane, the normal position of the vane being slightly inclined to the axis of the wheel, so that the wheel is held by the vane with its edge more or less presented to the wind, according to the pressure. This movement is regulated by an adjustable weight connected with the wheel. Brake mechanism of novel construction is applied to this mill.

Mr. William Tucker, of East Toledo, Ohio, has patented an improvement in the class of automatic couplings for railroad cars in which a spring jaw upon the draw head of one car engages with a jaw secured to the draw head of the next adjoining car when the cars are to be coupled, and in which chains secured to the spring jaw are employed to draw and hold the spring jaw in such position that it will not engage with the jaw of the next adjoining car, so that the coupling may be rendered inoperative when desired, or may be readily uncoupled without going between the cars.

An improved lubricator has been patented by Messrs. Isham T. Hardy and Noah H. Dibble, of St. Louis, Mo. The invention consists of a combined steam condenser, oil receptacle or tank, and gauge or indicator, so arranged that the steam from the boiler entering the condenser and condensing therein will flow into the oil receptacle or tank and force the oil thence through the gauge or indicator into the steam cylinder, to which the device may be attached.

The Tay Bridge Disaster.

The London *Times* makes the following editorial comments on the report of the Tay Bridge Investigating Committee: "The Tay Bridge, it appears, was simply blown down by a violent gale of wind while a train was passing over it. This is the net result of the inquiry when disengaged from its technical details. The bridge was not strong enough to bear the strain imposed upon it, and it gave way in consequence of the inherent weakness and defects of its structure. The remoter causes which brought about this result were numerous and far-reaching. First, the spans of the bridge were enlarged beyond the original design in consequence of difficulties encountered in connection with the foundations. Then, for the same reason, piers consisting of cast-iron columns were substituted for the piers of brickwork originally proposed. Moreover, the casting of these columns was very slovenly and imperfect; they were found in many instances to be of unequal thickness, and the bolt-holes connecting the various sections together, as well as those in the 'lugs' to which the cross-braces were attached, were all merely cast and left conical instead of being properly drilled and reduced to a cylindrical form. Thus, the cross-braces, on which the whole strength of the structure depended as regards resistance to lateral pressure, were very imperfectly fastened, and, by consequence, ill calculated to bear the strain imposed upon them. Such being the initial defects of the bridge, its practical supervision was intrusted to a person very imperfectly qualified, in the judgment of the court, to undertake such a responsibility. What defects he observed he did his best to remedy promptly; but he does not seem to have been sufficiently alive to the serious indications of weakness and danger shown in the loosening of the ties of the cross-braces, to the effect of which, as seems most probable, the disaster must be immediately attributed. In fact, it is impossible to resist the conclusion that the bridge was an unsafe structure from the very beginning. A weak and slender bridge is built in a peculiarly exposed situation; no attempt is made to calculate the possible effects of wind-

pressure or to provide against them; the structure is gradually weakened by excessive speeds, by stress of weather, and by the original fault of the materials used, and the defects are very inadequately remedied by a superintendent imperfectly qualified for such a task; a gale of wind comes, a train on the bridge is exposed to it, and the whole structure gives way at it weakest point. It is very difficult to admit that such an assemblage of causes and effects is rightly to be called an accident."

MISCELLANEOUS INVENTIONS.

An improved horse collar has 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 collar proper is formed 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 the inner part. The collar is divided at top and bottom, and to each of the two parts thus formed is attached an iron hame, which is 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.

Mr. John McLeod, of 127 W. 26th st., N. Y. city, has invented an improved self-adjusting mast for boats and vessels. It is hung upon trunnions so that it may swing from side to side, and it carries at its lower end an arc which is preferably made tubular, and is armed with very strong springs which resist the lateral movement of the lower end of the mast. The mast is also provided at its foot or lower end with a heavy counterbalance weight which increases the inertia of the mast and answers as an automatically shifting ballast.

An improved weather strip has been patented by Mr. John M. Ceis, of Abilene, Kan. The object of this invention is to furnish weather strips for doors to prevent wind, snow, rain, and dust from entering the house beneath the lower edge of the door, and which is simple, effective, and durable.

Mr. Asa G. Golding, of New York city, has patented a double walled pitcher, so constructed that the inner wall or lining can be readily removed and replaced, and which will not allow the contents of the pitcher to pass through the joint between the inner wall and its support into the space between the walls.

An improved sewer gas trap has been patented by Mr. Albert F. Pflughaupt, Jr., of Brooklyn, N. Y. The object of this invention is to furnish devices for connecting the waste pipes of houses with sewers, which is so constructed as to prevent sewer gas from passing from sewers into houses through the waste pipes.

Mr. William Hadden, of New York city, has patented an improved duplex telegraph system for sending and receiving two sets of signals in the same direction on one wire at the same time. This invention cannot be clearly described without diagrams.

Messrs. Edward C. Smith and Leroy S. Winters, of Lincoln, Neb., have patented an improved carpet stretcher, of simple construction, which will stretch carpets and hold any desired portion of the edge thereof while being nailed to the floor

Mr. Charles H. Brazeal, of Tye River Depot, Va., has invented a device adapted for use in connection with harness, for the purpose of enabling a horse to be detached from a vehicle. The device consists mainly of a buckle having a sliding tongue to which is attached a strap that is held by or is accessible to the driver, and which being pulled will retract said tongue and allow disconnection of portions of the harness, so that the horse may go free.

Mr. Sanford Bray, of Charlestown, Mass., has patented an improved target which may be thrown into the air without the aid of a trap, and whose broad tail pieces or wings shall be so attached to the body of the target as to be broken off or detached from the body of the target when struck by a ball or by shot.

Mr. George O. Sanborn, of Boston, Mass., has patented an improved cover or top for wooden vessels designed to contain pickles, preserves, etc., and to be used for shipping such goods. The invention consists, first, in providing the wooden cover proper of the vessel with a central opening, and in closing the latter with a thin transparent glass plate, which is secured by cement applied and held in an undercut groove. The wooden cover proper forms a strong, stiff, and durable integral portion of vessel, while the glass plate enables the contents to be easily inspected without allowing ingress of air, and it is adapted to be easily detached whenever it becomes requisite to have access to or to remove the contents.

Messrs. Theodore Phillips and Harley Phillips, of Winchester, Iowa, have patented an improvement in washing machines, which consists of a tank having a set of parallel strips in the bottom with rigid vertical bars at the end, and with inclined and notched upper edges forming a washboard, an oscillating beater consisting of a series of fingers passing between the parallel strips of the washboard and connected to the lower end of a horizontally pivoted lever handle, and a set of fingers fixed to a rock shaft and adapted to pass between the vertical bars rising from the ends of the washboard.

An improvement in heating stoves has been patented by Mr. John H. Shimmons, of Lawrence, Kan. This is an improvement in heating stoves of that class in which a set of pipes lead the air through the fire chamber into an air chamber above, from which air chamber pipes conduct the heated air through a drum placed above the air chamber, which drum receives the products of combustion, which further heat the air as it passes through the pipes.

An improved harness maker's sewing-horse has been patented by Mr. Joseph B. Underwood, of Fayetteville, N. C. This invention relates to a machine for harness makers' use, known as the "sewing-horse." It is an improvement upon that form of sewing-horse for which letters patent No. 221,373 were granted to the same inventor, November 4, 1879.

Mr. Stephen M. Hoye, of Mount Carmel, Conn., has patented an improved die for swaging carriage-clips. Dies of the ordinary construction have no side or end stops to confine the metal in its proper place. It escapes at both sides and ends of the dies. The clip, therefore, has a rough edge and requires to be trimmed, which is done in a trimming-press. From such press the clip is placed under a trip-hammer, for the purpose of rounding and pointing the shank. The improved die produces a perfect clip at one operation.

An improved screw-tap has been patented by Mr. Timothy A. Fleming, of Hoosick Falls, N. Y. The object of this invention is to cut a right and left hand thread in the same machine without reversing the motion, as is customary, by additional shafting and pulleys. The inventor accomplishes this by a change in the form of the machine-tap. Two taps are used—the ordinary right hand tap, together with the new left hand tap. It is equally applicable to vertical and horizontal tapping-machines, either single or in gangs.

Mr. Thomas J. F. Regan, of Brooklyn, N. Y., has patented an improved process for making illuminating gas which consists, essentially, in placing in a closed receiver a quantity of caustic lime and pouring upon it as much naphtha or other light hydrocarbon as it will absorb, and then drawing from the receiver by suitable means the gas arising from the saturated lime and forcing it into a gasometer. The lime absorbs a small quantity of water from the hydrocarbon, and also a small quantity of condensed petroleum or petroleum oil. The gas drawn off by the exhauster is permanent, and will remain uncondensed in the gasometer. This gas answers every requirement for illuminating and heating purposes, and may be produced at much less expense than ordinary coal gas.

An improved magazine stove has been patented by Mr. Carlton Seaver, of Traer, Iowa. The object of this invention is to construct a stove so that the smoke and other products of combustion shall pass downward through the bottom thereof into a pipe that leads under the floor of the room in which the stove is placed and into the chimney, while the heat and light of the fire shall warm and light the room in which the stove is.

Mr. George H. Brown, of Mount Vernon, N. Y., has patented a support for pictures so constructed that it may be put up and taken down without marring the wall, will allow the positions of the pictures to be readily changed, and will prevent the pictures from being accidentally detached.

A Gold Bearing Newspaper.

A correspondent of the San Francisco *Call* writes to that paper as follows: "I had observed, previous to last February, that the *Call* often contained golden nuggets, but from the 6th of that month to the end it was rare to have a number without its golden show. From the paper of the 6th I took fifty-six pieces of gold, the thickness of the *Call*, and varying in size from that of a small pin head to nearly the size of a three cent piece. I think I have more than a hundred pieces of gold taken from the paper that month. All left a hole when removed, as the thin film of paper on the inside was rendered brittle by the hard pressure which the calender rolls gave as they flattened out the golden deposits. In addition to the gold, I got platinum, silver, iron, tin, and some lead."

The explanation of the discovery is that in the manufacture of the paper pulp water is used that has been passed through a flume in which miners have washed dirt containing all kinds of precious metals. The gold is what is known as "float gold," and escapes the miners who still follow the primitive methods of washing. Some of the water used is taken from artesian wells. The manufacturers say that they have often noticed a substance that glistened in the water, but that they supposed it to be mica, as the wells were bored through mica deposits.

How to Make Fern Pictures.

There are two ways—the mechanical and the photographical. For the first, take a sheet of strong white paper, and with an atomizer pass over it a spray of very diluted mucilage, so as to obtain a very thin and slightly sticking film, which will make the ferns adhere of which it is desired to make the picture. The ferns and leaves must have been first pressed in a book, and after arranging them to suit your taste, cause them to lie as closely to the paper as possible; fill an atomizer with very diluted India ink, and blow a spray over the ferns, more or less in proportion as you want a darker or lighter shade. It is well to do this with intermissions, letting it dry a little, so as to avoid excess of moisture and possibility of running the liquid into drops. When nearly dry, but still a little moist, remove the ferns, which may be used over again several times. For the photographic method, cover a sheet of paper with a weak solution of salt in water and some white of an egg, well beaten; after it is dry, take it into a dark room, and with a tuft of cotton pass over it a solution of nitrate of silver (50 grains to an ounce of water); dry it in the dark, and the coat of chloride of silver formed on its surface will receive the impression. Then arrange your ferns between two plates of glass, and cut the paper to the same size as the glass plates; place it under them and expose to the sun, in the same way as a photographer prints a portrait. Watch it until dark enough, and before removing the paper from the glass take it into a dark room. Here place the picture in a solution of hyposulphite of soda, which will dissolve the chloride of silver, but leave the decomposed material (finely divided black silver) which forms the black background, while the shadow of the leaves will be white.—*Chemist and Druggist.*

A Remarkable Surgical Operation.

For about a year a little girl, ten years of age, has been a patient in the County Hospital, Chicago, suffering from a burn so extensive that the ordinary treatment by skin grafting hopelessly failed to effect a cure. It was therefore decided to try the experiment of transplanting a large section of skin partially detached from a healthy subject, the girl's twelve year old brother consenting to be flayed for his sister's sake. Drs. Lee and Feuger conducted the operation, which is described as follows by a reporter of the Chicago *Tribune:* A curious box had been constructed under the supervision of Dr. Murphy. It resembled nothing more than a pair of scissors opened out, except that one part was about four inches higher than the other. On one face of the cross the little girl was laid face downwards. On the other the boy lay on his side so that his leg crossed his sister, the part of the thigh from which the skin was to be taken being just over the burn on the girl. The children were kept unconscious during the entire operation by the use of ether, and two assistants constantly directed the vapor of carbolic acid on the wounds of both the boy and the girl. The surgeons then cut from the boy's thigh a leaf of skin four inches wide, five inches long, leaving it attached by the under side. The wound of the girl was then cleared of its decaying matter. The flap of the boy's skin was then laid on the wound and stitched to the outer edge of the skin about the wound, without cutting the edge, which rendered it still a part of the boy's fleshy covering. This was done to secure the vitality of the boy for the skin which is expected to grow to be a part of his exhausted sister. The boy's wound was ugly in appearance, but the skin had been separated, or dissected, so neatly that it will be easy to heal over by the usual process of grafting. The children, as they lay in this position, were so bandaged that they cannot possibly tear the flap of skin or move from their position. Thus their dual existence was begun, which will last for about three weeks. By that time the success of the operation may be known. During that length of time the boy's vital forces will be in a measure transferred to the assistance of his sister, and, at the end of that time, it is hoped that the transplanting will be complete and the skin firmly grown on the burned portion. The flap is not quite large enough, and, before the skin is finally severed from the boy, a still further portion will be dissected and applied to the remainder of the wound. The little girl's pulse dropped considerably toward the close of the operation, but she was revived by the application to the nostrils of a cloth dipped in brandy. The operation was a success as far as it went, and, if nature takes hold in the manner expected, the brave boy can congratulate himself on having saved his sister's life.

The Driven Well for Fire Purposes.

The *Firemen's Journal*, in an appreciative article on this subject, recommends the general adoption of the driven well for fire purposes, and for all small country places, where there is no large and constant water supply, we should think the suggestion an eminently practical one. In the SCIENTIFIC AMERICAN, of March 13, we gave some account of this system of obtaining water, and what was being done under it in New York city, where it is now largely used to save the expense attendant upon a large use of water from the city reservoirs. To obtain a supply sufficient for the usual form of fire engines in use in country places it might be necessary to put down two or three of these driven wells near each other, and connect them, so that the suction pipe of an engine being attached, water might be drawn from all the wells at the same time. Of course, these wells, working on the principle that the water is drawn from the ground around them by making a vacuum in the tube, will supply much more water than an ordinary open well, and they are not ordinarily so expensive to put down. An abundant supply of water can usually be obtained at distances varying from twenty to fifty feet from the surface, but, in each case where a well is put down, it should be at once thoroughly tested, to determine the probable permanent yield of the water-giving strata when it is driven.

The Texas Cattle Drive.

The Omaha *Republican* gives a detailed statement of this year's cattle drive, the total reaching 301,000. Of this number about 50,000 head will be driven to the Union Pacific. The cattle are in good condition, fully up to the standard of previous years, and are mostly one, two, and three years old, very few being beef cattle. The drive to Nebraska would have been larger had it not been for the drought making a scarcity of grass along the road. About 25,000 horses are being driven up from Texas this season, of which number about 5,000 go to Nebraska

An Early Plan to Improve the Mouth of the Mississippi by Jetties.

The New Orleans *Times* finds on page 357 of the first volume of Gayarre's "History of Louisiana" the following notice of an early proposition to deepen the mouth of the Mississippi River by means of jetties. The author says:

"The necessity of deepening the mouth of the Mississippi had attracted the attention of the French Government at the earliest period of the establishment of the colony, and the engineer Pauger made, in this year, 1723, a very interesting report on the practicability of arriving at this desired result. He represented that it was easy and not expensive to *fix* (fixer) or to control the current of the Mississippi so as to make it subservient to the plan of operating upon the sand banks which obstructed the several mouths of the river, and so as to give admittance to the largest ships, whatever might be the depth of water they drew; that, if necessary, a fine artificial harbor with quays might be created at the Balize, with the numerous resources which the nature of the locality offered, and that it might be effectually protected by such fortifications as he indicated. He recommended *to shut up all the mouths of the river except one*, in order to force a greater volume of water into the remaining channel, which would consequently acquire more depth."

It detracts nothing from the merit of Captain Eads' work that the idea of the system he adopted was not original with him. He never claimed that. It is to his credit, nevertheless, that he was able not only to appreciate the system, but was willing to risk fame and fortune in carrying it out in the face of strong professional opposition.

Our Trade in Foreign Fruits.

The seventh annual report of the foreign fruit trade of New York, just completed by U. S. Inspector of Customs J. H. Bostwick, contains much interesting information. The principal statistics for the year 1879 are as follows:

The importation of Mediterranean fruit at the port of New York during the year 1879 consisted of 108 cargoes by steamers and 54 by sailing vessels, and comprised 880,729 boxes and cases of oranges and 900,505 of lemons, showing an increase of 26 cargoes by steamers and 24 by sailing vessels, and of 525,732 boxes and cases over the importations of 1878. The number of oranges was 239,751,255, of which it is asserted 119,875,627 perished on the voyage, a loss of 50 per cent. The number of lemons was 315,176,750, of which it is asserted 113,463,620 perished on the voyage, a loss of 36 per cent. Total number of oranges and lemons, 554,927,975; boxes and cases of oranges and lemons, 1,781,234. There were 44,365 barrels and 56,721 half barrels of grapes imported last year, at a loss of 25 per cent, a slight decrease compared with the imports of the preceding year.

The trade in Mediterranean fruit during the past year has been disastrous to the parties engaged in it, especially to the producers. The price of box fruit was as a rule very low, particularly in the case of oranges imported from Catania and Palermo. These were seriously affected by a parasite which greatly impaired their value. A large proportion of the fruit arrived in bad order.

The importations of oranges from the West Indies consisted of 16 cargoes and several parts of cargoes by sailing vessels; also 33,736 barrels of oranges per steamers. Of the above, 21,286 barrels were from Kingston, Jamaica, and 7,450,100 oranges, of which 3,352,545 perished on the voyage. There were 15 cargoes and 665 barrels imported from Mayaguez, comprising 4,388,045 oranges, of which 1,912,195 perished on the voyage; from Havana, 7,212 barrels, comprising 2,307,735 oranges, of which 1,038,480 perished; from Nassau, 2,734 barrels, comprising 919,659 oranges, of which 299,249 perished; from Montego Bay, 1,389 barrels, comprising 771,665 oranges, of which 347,249 perished; from Trinidad, 445 barrels, comprising 285,917 oranges, of which 214,438 perished; from Abaco, 1 cargo, comprising 190,000 oranges, of which 17,000 perished; from Baracoa, parts of cargoes, comprising 84,900 oranges, of which 35,950 perished; from Guyanilla, 4 barrels, comprising 1,400 oranges, of which 600 perished. The above shows a grand total of 16,399,421 oranges, of which 7,217,706 perished, an average loss of 44 per cent. An increase is shown of two cargoes and 7,610 barrels of oranges over the imports of the preceding year.

The importation of bananas from the West Indies the past year consisted of 105 cargoes by sailing vessels. Of these there were 90 cargoes from Baracoa, comprising 191,888 bunches, and 15 cargoes from Port Antonio, comprising 28,823 bunches; from Kingston, per steamers, 47,965 bunches; from Montego Bay, per steamers, 36,134 bunches; from Trinidad, 284 bunches. Total number bunches of bananas imported from the West Indies, 305,094, of which 79,518 perished on the voyage, an average loss of 26 per cent. There were also imported from Aspinwall, per 55 steamers, 240,000 bunches of bananas, of which 38,000 bunches perished on the voyage, an average loss of 17½ per cent. There was an excess of 40,000 bunches of bananas over the imports of the previous year, and a decrease in loss of 22½ per cent.

The importations of pineapples consisted of 53 cargoes, of which 8 cargoes were from Eleuthera, 11 from Cat Island, 8 from Governor's Harbor, 9 from Nassau, 5 from Abaco, 3 from Rock Sound, 3 from Harbor Island, 1 from Tampum Bay, 1 from Rum Key, 2 from Mayaguez, part cargo from Antigua, and comprised 2,558,833 pineapples. There were also imported, per steamers from Havana, 143,555 pineapples; from Kingston, 21,148; and from Montego Bay, 16,466. The total number of pineapples imported from the places above named was 2,740,002, of which 712,391 perished on the voyage, showing average loss of 26 per cent. A comparison of the above with the imports of the preceding year shows an increase of about 40,000 pineapples.

Cocoanuts were imported from the following named places during the past year, viz.: Baracoa, 3,112,006; San Andreas, 1,540,863; Aspinwall (per steamers), 560,602; Carthagena, 374,492; Falmouth, 245,000; Ruatan, 217,500; Montego Bay (per steamers), 158,863; Honduras, 139,800; Port Antonio, 132,704; Port Maria, 100,000; Kingston (per steamers), 55,000; Gilarie, 38,800; St. Jago, 21,600; Mayaguez (part cargoes), 10,430; San Ann's Bay, 8,200; San Domingo (per steamer), 7,000; Maracaybo, 3,000; making a grand total of 8,205,578 cocoanuts, which comprised the cargoes and parts of cargoes of 114 vessels, exclusive of steamers. Of the above, 662,249 cocoanuts perished on the voyage, a loss of 8 per cent. A comparison of the above with the imports of 1878, the result shows a decrease of 981,307 cocoanuts.

The importation of limes comprised 988 barrels, on which there was a loss of 33 per cent; 126,000 grape fruit, loss 10 per cent; 5,144 shaddocks, loss 33 per cent; 9,000 plantains, loss 25 per cent; 28,000 mangoes, loss 80 per cent. There were also imported in small quantities of each, mandarins, cantaloupes, sapodillas, alligator pears, manma apples, and watermelons, on which there was a loss of 25 per cent. The countries and places whence the foregoing varieties of fruit were imported are the United States of Colombia, Mexico, Central and South America, Venezuela, British West Indies, French West Indies, Cuba, Porto Rico, England, Scotland, France, Spain, Portugal, and Italy. The value of green fruit entered for consumption at the port of New York from January 1, 1879, to December 31, 1879, is exhibited in the following table:

Varieties of Fruit.	Value.	Duty.
Oranges and lemons, 20 per cent.	$2,919,003	$583,800.60
Grapes, 20 per cent.	227,014	45,402.80
Pineapples, 20 per cent.	105,297	21,059.40
Bananas, 10 per cent.	382,473	38,247.30
Limes, grape-fruit, shaddocks, plantains, mangoes, mandarins, cantaloupes, melons, sapodillas, alligator pears, manma apples, and watermelons, 10 per cent.	9,315	931.50
Cocoanuts, free	213,438	. .
Total	$3,856,540	$689,441.60

A comparison of the value of green fruit imported in 1879 with that of 1878 shows an increase in value of $121,490, and of duty, $23,425.

RECENT DECISIONS RELATING TO PATENTS.

United States Circuit Court—Western District of Pennsylvania.—Acheson, J.

STROBRIDGE *vs.* LINDSAY, STERRITT & CO.—COFFEE MILL PATENT.

1. The first claim of reissued letters patent No. 7,583, granted to Turner Strobridge, March 27, 1877, for an improvement in coffee mills, is valid.

2. The mere fact that the device of the defendants has a function additional to that accomplished by the patented invention will not justify the defendants in the use of the latter without liability.

3. Letters patent themselves *prima facie* establish the fact that patentable invention is embraced thereby, and strongly confirmatory of this will be evidence tending to show the favorable acceptance by the public of the improvement and its recognition by the trade as something new and meritorious.

Messrs. Bakewell & Kerr for the complainant.

Mr. B. F. Thurston for the respondents.

United States Circuit Court.—Western District of Pennsylvania.—Strong, J.

ROBERTS *et al. vs.* SCHREIBER.—OIL WELL TORPEDO PATENT.

1. Reissued letters patent No. 6,258, granted to E. A. L. Roberts, January 6, 1875, the claim in which is for "the method or process of increasing or restoring the productiveness of oil wells by causing an explosion of gunpowder or its equivalent at or near the oil-bearing point, in connection with superincumbent fluid tamping, substantially as described," declared to be for the same invention as his original patent dated May 20, 1866, and sustained.

2. The decision in the case of *Roberts vs. Dickey*, 4 Fisher, 532, construing the true meaning and scope of such original patent, approved.

3. The application of a blast in a bore hole sunk in an ordinary well is not an anticipation of a process by which a torpedo may be exploded many hundred feet below the surface of the ground and below the top of the rock through which an artesian well has been sunk, and at the exact point in the well where the effect of such explosion is desired, with a water tamping sufficient to confine the effect to the vicinity of its location.

4. Unsuccessful and abandoned experiments cannot avail to invalidate a patent to an inventor who has disclosed to the public an invention the utility of which has been demonstrated by its general adoption.

5. The cause that works successful results cannot be the same as that exhibited in abandoned experiments, and holding the latter up as anticipations of the former is but an illustration of what is very common—an attempt to defeat a meritorious invention by proof that something similar had been previously known, though it had never been perfected, and had never been any useful contribution to human knowledge or convenience.

6. The process invented by Roberts, as disclosed by his specification, does not require that the superincumbent fluid tamping should fill the well, but that there should be a sufficient column of fluid to confine the effect of the blast.

7. Letters patent No. 47,458, granted to E. A. L. Roberts, April 25, 1865, for improvements in apparatus for exploding gunpowder or other explosive material in artesian or other similar wells, construed and sustained.

By the Commissioner of Patents.—Marble, Commissioner.

EX PARTE MCDOUGALL.—PATENT OIL CAKES.

1. The rule that several distinct inventions cannot be included in a single application is alike applicable whether such inventions be improvements in processes or machinery, and the mere circumstance that several processes pertain to the same subject matter will no more warrant their joinder in a single application than will the bare fact that two machines are in the same class of invention warrant the issue of one patent for the two.

2. Although each of the several "acts" of the "series of acts" constituting a process may be capable of performing separately its own peculiar function, and may be used independently of the others, yet if they all contribute in producing the final result they may be joined in a single application, and a claim may be made to the entire process, and separate claims can also be made to the sub-processes which go to make up the same.

3. Where one has discovered that a desired result can be attained by a process consisting of a series of steps, and that certain of the steps in such process can be replaced by others which will operate in an equivalent manner, a broad or generic claim can be made including all the modifications, and a more limited and specific claim can be made to any one of the modifications.

4. Where in several processes the order in which the several steps follow each is different, as are also the final results attained, the processes cannot be said to be modifications each of the other.

5. Alternative claims and claims for modifications condemned. The mere fact that courts, in order to save a patent, have sustained such claims is no warrant for the Office to shirk its duty in requiring that the claims shall be framed in the clearest and best form, and shall not embrace distinct inventions.

New Varieties of Tea.

An English consul reports the discovery of two curious varieties of tea on the western frontier of China. In the monasteries on Mount Omi (or Ngomi) he was given an infusion of tea which is naturally sweet, tasting like coarse congou with a plentiful addition of brown sugar. It is only grown by the monks on the slopes of the mountain, and two days' further west its existence was unknown. The other variety, odd as it may appear, has the natural flavor of milk, or, perhaps, more exactly of butter. What is most interesting is the fact that it is wild tea, growing in its native elevated *habitat*, without cultivation.

This wild tea is found in the uninhabited wilderness west of Kiating and south of Yachow, at heights of 6,000 feet and upward, and is a leafy shrub 15 feet high, with a stem 4 inches thick. Every part of the plant, except the root, is used for making the infusion; the wood is chopped up and put into a kettle of water with the dried leaves and twigs and being boiled yields a strongly colored but weak tea, possessing a buttery flavor, which gives it some resemblance to the Thibetan preparation.

Cold Air Fruit Curing.

The California *Mountain Messenger* reports an interesting experiment in fruit curing lately made at a Placerville foundry. About a peck of sliced apples were placed in a sieve and subjected to a cold air blast for three and a half hours in the cupola furnace of the foundry, and the fruit is reported to have been completely and beautifully cured by the treatment, remaining soft and without the slightest discoloration. The cured fruit showed none of the harsh, stiff dryness which results from hot curing, the cold blast completely freeing the fruit from excess of moisture, with no possibility of burning or shriveling it. The *Messenger* says: "Compared with our sun drying, it effects a great saving of expense, attention, and risk. Anybody who can command or devise a strong blast of cold air, can dry fruit in a superior—we might say perfect—manner, without being dependent on the weather and waiting on the slow process of sun drying, and without the most expensive resort to fuel and the risk of overheating."

Old-fashion Flowers.

The editor of the *Rural New Yorker* recently visited what he terms an old-fashioned garden, in which were growing and blossoming luxuriantly white herbaceous pæonies, *Pæonia tenuifolia* (single), tree pæonies, larkspurs, Canterbury bells, fox-gloves, June and hybrid roses, and many other good old things, now seldom seen except at some old country home. Are we not, pertinently asks the editor, making a mistake in neglecting these fine old plants? At some future time we may wish for them in vain.

Benjamin D. Frost.

Benjamin D. Frost, civil engineer, under whose supervision the Hoosac Tunnel was constructed, died at St. Louis, Mo., July 19. Mr. Frost was a resident of Massachusetts, but had been in the West several months prosecuting surveys for the improvement of the Mississippi River, in which work he was actively engaged to the end. He was within a few years of completing his fiftieth year.

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.

EL UNIVERSO Y LA PARALAXE. Por Francisco Gonzalez, Ingeniero Civil. Chillan, Chiugo. 1879.

The desire of men of science to resolve the great problem of the solar parallax in order to determine, with that exactness required by the present state of science, the true dimensions of our planetary system; the diversity of the values that the history of astronomy has furnished us from the times of Encke and Lalande; and the ardor of the whole scientific world, as evinced by the careful observations that it made on the transit of Venus in 1874, all decided the author of this brochure to devote some months to a resolution of the great problem. This he believes that he has successfully effected—not by the aid of direct observations, however, for he believes that the value of gravity on the surface of the earth, plus the time of the latter's revolution, gives sufficient data for the resolution of the problem. The pamphlet, which is mostly taken up with mathematical calculations, is prefaced with a succinct theory as to the origin of the material universe. The author states that he does not consider universal gravitation as a property inherent to matter, but as an effect of undulation of the elastic and subtle fluid that fills the universe, and which causes every body, every particle of matter, to become a new center of vibration.

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) W. R. C. asks how to make a bath to nickel plate about four gallons, and what kind of battery is the best, and about how large for four gallons. Can the bath be made too strong? Can plating be well done in fifteen minutes? A. You will find an article on nickel plating on p. 209, Vol. 38, SCIENTIFIC AMERICAN. Copper can be plated in fifteen minutes under favorable circumstances, but a longer exposure affords much better work

(2) A. L. L. asks for a receipt for making sticky fly paper such as is sold in the drug stores. A. See p. 171 (12), Vol. 39, SCIENTIFIC AMERICAN.

(3) R. C. S. writes: Do you know of any way to keep ants from building mounds in a lawn, or of destroying the ants without killing the grass? A. Try a little oil of turpentine, in very fine spray.

(4) F. G. W. asks how to manufacture carbolic acid. A. Phenol or carbolic acid is commonly obtained from light oil, one of the products of the distillation of coal tar, by rectification in a current of steam which removes cresol, etc. The tailings are agitated with caustic soda, and the alkaline mixture subsequently treated with an acid. This yields about 15 per cent of crude carbolic acid as a separate layer. This is rectified by distillation and dried by heating it to near its boiling point (368° to 370°) in a current of dry air. Otherwise by rectification over anhydrous sulphate of copper. It is still further purified by rectification over litharge. It boils between 368° and 370°.

(5) D. W. R. asks: What is the composition of phosphor bronze, such as is used in mining pumps to resist the action of sulphurous water; and how is this bronze mixed? A. An ordinary copper tin bronze to which has been added in the melting pot ½ to 1 per cent of phosphorus. See p. 409 (30), Vol. 39.

(6) A. B. asks: What is used by the ladies to bleach their hair? A. A strong aqueous solution of sodium sulphite, rendered slightly alkaline with carbonate of soda, constitutes one of the bleaches.

(7) C. O. M. asks: What cheap article can be used for thinning coal tar? A. Benzine or benzole, naphtha, oil of turpentine. 2. What thinning naphtha or light oil is made of? A. It is one of the products of the distillation of petroleum. 3. Where can it be obtained in great quantity? A. Of any dealer in oils.

(8) D. G. B. asks for a simple way of making carbonic acid water or soda water. A. Carbonic acid water is simply water charged with carbonic acid under pressure. The carbonic acid is generated by the action of dilute oil of vitriol (sulphuric acid 1, water 4 to 5) on marble dust in a lead-lined iron vessel capable of sustaining great pressure. This generator is provided with a pressure gauge. The gas at a pressure of 200 lb. or so per square inch is conveyed through a quantity of water in a second vessel to free it from impurities, and then to the bottom of a stout airtight, porcelain-lined, iron cylinder, partly filled with pure water. This is kept in agitation to facilitate the absorption or solution of the gas.

(9) F. H. M. writes: I have a marble mantel in my bedroom which has become discolored from smoke. I have tried several recipes to clean it, but they have all failed; Can you tell me what to use to clean it? A. Moisten powdered quicklime with a strong solution of washing soda in hot water; brush this over the stone and let it dry. Brush off, wash with plenty of water, and polish with a little tripoli.

(10) E. M. asks how to color or dye small pieces of ivory, black. At the same time the pieces must not be dipped into a solution. I desire to put the color on. How can I prepare such a paste? I suppose it must be such. A. Wash well with an aqueous solution of caustic soda, and then with a strong aqueous solution of neutral nitrate of silver. Expose to sunlight (under glass) until black. Repeat if necessary until the proper color is developed.

(11) F. B. asks what the process is for making very thin paper or any other substance insoluble or waterproof by means of ammonia cuprate, and the mode of making the solution. A. Pass ammonia gas into a saturated aqueous solution of cupric sulphate until the precipitate at first formed is completely redissolved. Concentrate over the water bath and pass the paper slowly through this. You will probably succeed better with a strong (sirupy) solution of zinc chloride. 2. Also the mode of making a very thin sheet of gelatine impervious to water. The mode or substance used for casing sausages by the Germans during the French war I think would answer my purpose, as I want something quite thin, impervious to water or nearly so, transparent if possible, and with a good degree of strength and capability of withstanding heat and cold. A. Pass through a strong solution of bichromate of potassa, then expose to sunlight. In preparing the covering for the pea sausages referred to, glue was mixed with a small quantity of bichromate of potash rolled out, formed into shape, exposed to the sunlight, and then thoroughly washed in water.

(12) F. S. P. asks how much calcium sulphate and carbonate a water can contain and be fit for boiler purposes. Also, what is the largest amount of solid matter a water can have dissolved in it and be fit for a boiler? A. Water containing 100 grains per gallon has been used. It should not be used if a purer water can be procured.

(13) D. F. M. asks: 1. How can I dissolve or melt sheet isinglass to mould it without losing its transparency? A. If you refer to mica, it cannot be so moulded or pressed. Glue isinglass (fish gelatine) may be softened by heating it in a vessel over a water bath. A trace of oil will prevent its adhesion to the moulds. 2. Does heat travel through a vacuum? A. Yes.

(14) S. W. W. asks: 1. Can gold be taken from the pounded ore (or rock) by the use of quicksilver? If it can, please tell me how it is done; and how do they get the gold from the quicksilver? I have about a half ton of some very fine rock, but not having much time I would like to know the cheapest and best way to get the gold. I can get plenty more of the rock if it will pay me to work it. A. The finely stamped auriferous ores are mixed with hot water and a few pounds of mercury in large iron pans provided with a stirring apparatus and mullers. The water is kept warm by a steam jacket, and the stirring is kept up until the mercury has absorbed or amalgamated all the gold. The amalgam is then drawn off and thrown upon a chamois skin filter; through this the excess of clean mercury runs, leaving the amalgam on the skin. This is placed in an iron retort and heated, when the mercury distills off (and is collected in water), while the gold remains in the retort. Consult Philip's "Mining and Metallurgy of Gold and Silver," or Percy's "Metallurgy of Gold, Silver and Mercury."

(15) W. P. K. asks for a recipe for coloring bright wire, black or blue, and perfectly smooth, the same as hair pins. A. Asphaltum, 3 oz.; boiled oil, 4 quarts; burnt umber, 8 oz.; mix by heat, and thin with turpentine (oil) before the mixture becomes cool. Dip the wire in this (not too thick) and harden in a japanner's oven at as high a heat as it will bear without blistering.

(16) K. & S. write: We have cast a lot of small plates of lead and antimony to be plated. After plating there remained on the plates a red or rusty appearing spot. What can we do with them so the spot will not show after plating? A. The spots may be due to imperfect alloying in the pot, or, what is more probable to imperfect cleansing preparatory to plating, or careless handling of the clean plates. If proper precaution is taken in these respects the spots will probably give no further trouble.

(17) F. L. B. asks: 1. Can I work a microphone with one telephone receiver? A. Yes. 2. Can I make a microphone out of the graphite in a carpenter's pencil? A. Graphite does not answer the purpose. 3. Would two Daniell's cells, with plates 3x7 inches, work it? A. One cell is sufficient for a microphone. 4. Could I insulate wire for an electro-magnet by varnishing it if I was careful in winding it? A. Yes. 5. Could I make a magnet for a telephone with a sounder magnet? A. No; use permanent magnets. 6. And what is the best way to magnetize it? A. For methods of magnetizing see p. 331 (13), Vol. 42, SCIENTIFIC AMERICAN.

(18) F. S. writes: I have a recipe for making Bengal lights composed of the following ingredients: 8 parts saltpeter, 4 parts sublimed sulphur, and 1 part antimony. The other day I made it up and it only made a common yellow flame. Will you please tell me what to put in it to make a red and blue light? A. Red may be produced by the addition of a small quantity of nitrate of strontium and sugar or charcoal; blue by zinc dust. The following compositions produce fine lights: Red.—1. Chlorate of potash, 32; nitrate of strontia, 48; calomel, 20; shellac, 12; Chertier's copper, 4; fine charcoal, 1. 2. Chlorate of potash, 84; nitrate of strontia, 80; calomel, 51; dextrine, 22; shellac, 18; Chertier's copper, 4. Purple.—1. Chlorate of potash, 28; Chertier's copper, 28; calomel, 13; shellac, 8; stearine, 1. 2. Chlorate of potash, 40; calomel, 28; Chertier's copper, 28; dextrine, 10; stearine, 3. These colored lights should never be burned indoors, as the vapors they give off are poisonous.

(19) A. L. F. asks: 1. How much working pressure will a cylindrical boiler, 12x30 inches, made of No. 26 galvanized iron, safely stand? A. From 20 to 23 lb. per square inch. 2. Dimensions of safety valve and adjustment to blow off at required pressure? A. ¾ inch diameter. You can put 8½ lb. direct on valve. 3. How large a pump is required for same, and at what speed should it be run? A. About ½ inch diameter by 3 to 4 inch stroke. The speed will depend upon the rapidity of evaporation. You can control the supply to the pump by a valve.

(20) A. W. R. writes: What are the conditions necessary to success in the "blue photo process" of copying tracings? A. Use pure linen paper, free from chlorides (bleach). Keep it for some time, before sensitizing and after, until required for use, in darkness; use as soon after preparing as possible, and wash thoroughly after printing in running water. See p. 410 (14), Vol. 40.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

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

July 6, 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 1866, 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.

Acid, pulverulent preparation of phosphoric, E. N. Horsford 229,705
Addressing machine, R. Dick (r) 9,282
Aging liquors, process and apparatus for, J. L. Martin 229,542
Air cooling process and apparatus, Portner & Ells 229,750
Baking powder, acid phosphate for, C. A. Catlin. 229,518
Baking powder, preparation of potassium phosphate for, Wilson & Catlin 229,573
Baking power, preparation of sodium phosphate for, Wilson & Catlin 229,574
Barrel hoop, E. Hale 229,690
Bath waste and overflow, S. G. McFarland 229,627
Bed, invalid, W. W. Snell 229,559
Bell, gong and signal, E. W. Vanduzen 229,567
Bell striker, E. W. Vanduzen 229,564
Bell wires, angle for, E. W. Vanduzen 229,566
Bells, attaching clapper strings to, E. W. Vanduzen 229,565
Bells, hanging, E. W. Vanduzen 229,568, 229,569
Bells, line stand for steamboat, E. W. Vanduzen 229,570
Bellows, J. Van Eps 229,563
Billiard table, S. R. Mathewson 229,625
Bird cage, F. T. Pinter 229,634
Blotter, rule, and paper cutter, comb'd, C. Sneider 229,708
Book binding, F. S. Hasbrouck (r) 9,275
Book mark, H. R. McCalmont 229,626
Book rack, J. Murphy 229,740
Boot and shoe edge setting machine, C. K. Bradford 229,517
Roots and shoes, making inner soles for, J. F. Ross 229,556
Bottle stopper, J. Erdmann 229,595
Bottles, etc., wrapper or envelope for, R. H. Thompson 229,775
Bougie, E. Pfarre 229,633
Brick, J. S. Smith 229,708
Brick linings, laying, Mann & Singer 229,734
Bridle, R. Arnold 229,702
Brush holder, blacking, H. B. Perham 229,748
Bucket, slop, G. W Knapp 229,714
Button attachment, F. J. Rosenberg 229,557
Calendar, A. R. Baker 229,578
Calendering paper, method and apparatus for, M. Newton 229,551
Can, I. Porter 229,749
Can top, R. Gillespie 229,531
Candy, manufacture of, C. G. Brommer 229,667
Car brake, G. D. Paul 229,747
Car, construction, G. F. Harris 229,702
Car coupling, C. J. Bell 229,693
Car coupling, Deamude & Cannon 229,679
Car coupling, C. H. Shippee 229,763
Car coupling, railway, A. Middleton 229,731
Car door, grain, Latta & Neall 229,716
Car doors, operating, W. W. Riley 229,755
Car, railway freight, E. B. Ward 229,778

Car, stock, F. W. Becker	229,659
Cars, etc., ventilating railway, J. S. Lloyd	229,730
Carpet lining fabric, D. Hunt, Jr	229,535
Carriage and cradle, combined baby, A. J. Marsh	229,623
Cartridge loader, C. W. Corr	229,523
Chains, making curbed, P. Nerney	229,742
Chair seating machine, J. C. Miller	229,734
Churn, J. Foreman	229,597
Churn, G. W. Freeman	229,599
Churn, A. Mearns	229,729
Churn dasher, H. W. White	229,784
Clamp, T. J. Carrick	229,670
Clasp knife, E. Jansen	229,706
Clock case, J. Scheina	229,643
Cloth shearing machine, D. C. Sumner	229,648
Clutch, J. D. Westgate	229,632
Clutch, automatic safety, B. E. Henriksen	229,606
Coffee extract, Gue & Grant	229,697
Coffee pot, H. C. Rice	229,640
Coffin handle, G. S. Eaton	229,683
Coin separator, J. H. Junkin	229,712
Compasses, dividing, J. D. Little	229,619
Confections, apparatus for dipping and coating, Murdock & Haynes (r)	9,286
Corset, C. W. Foster	229,598
Corset clasp, P. Laflin	229,617
Cotton opener beater, R. Kitson	229,615
Cranks, substitute for, S. W. Hanson	229,700
Cultivator, wheel, J. W. Hudson	229,534
Curtain fixture, H. Boss	229,665
Cylinder, reducing and triturating, J. R. Alsing	229,577
Dam and lock, J. Du Bois	229,682
Damper, furnace, E. W. Anthony	229,515
Dental engine, E. T. Starr	229,645
Dental engine treadle mechanism, W. A. Johnston	229,614
Dental plugger, E. T. Starr	229,709
Derrick, E. J. Marsters	229,624
Dividers, proportional, J. M. Villa	229,777
Dredging machine, J. Menge	229,730
Ear piercer, J. Böning	229,581
Edge trimmer and burnisher, D. F. Hallahan	229,698
Electric light regulator, M. G. Kellogg	229,536
Electric signal apparatus, H. G. Fiske	229,529
Electric switch board, J. S. Ross	229,757
Elevator, Smith & Davidson	229,558
Elevator and carrier, combined, J. P. Hillard	229,703
Elevators, electrical safety device for, W. E. Sawyer	229,658
Extension settee table, M. Gossett	229,692
Fabrics, putting up, J. J. Schofield	229,759
Fanning mill, G. Brooks	229,668
Fare register, J. B. Benton	229,662
Faucet, O'Brien & Splan	229,743
Faucet, beer, Redmond & White	229,637
Faucet, rotary measuring, D. Drawbaugh	229,592
Ferrule, J. H. Greenleaf	229,603
Filter, D. C. Otis	229,744
Firearm, breech-loading, W. W. Greener	229,604
Fire escape, L. Teven	229,561
Fire kindler, H. Finck	229,596
Flour bolt, J. Barkley	229,579
Foil, making ornamental metallic, H. S. & L. Crooke	229,677
Foil wrapper, rolled, H. S. Crooke	229,676
Folding stand, Freeborn & Chase	229,600
Fruit jar, R. B. Reilay	229,638
Game apparatus, G. Wunderlich	229,791
Gas burner, multiple, A. M. Silber	229,765
Glass mould, F. A. Weise	229,779
Gold saving apparatus, B. Tyson	229,650
Governor, dynamometrical engine, H. Knüdson	229,713
Grain and seed separating screen, B. F. Pettit	229,632
Grain binder, J. F. Gordon	229,691
Grain binder, J. H. Mudgett (r)	9,280
Grain loading scoop and elevator, W. S. Morden	229,737
Graphite from foreign substances, separating, H. Burgess	229,669
Grinding and reducing mill, B. F. Crabbs	229,589
Grinding mill mixing and feeding apparatus, J. P. Lowell	229,722
Halter trimming, E. G. Latta	229,717
Hand and foot motor, D. W. Mott	229,739
Harness attachment, C. H. & C. H. Easte, Jr	229,594
Harrow tooth, F. G. Winnek	229,788
Harrow, wheel, C. Murray	229,548
Harvester, J. Bordwell	229,584
Harvester, A. J. Hodges (r)	9,279
Harvester, W. F. Randolph (r)	9,276
Hatchway safety gate, F. M. Baker	229,657
Hay, apparatus for slinging and elevating, M. Potter	229,555
Hay rake, horse, Galloway & Larsen	229,530
Hermetically sealed jar, L. Lenglet	229,537
Hoisting and loading apparatus, J. Fisher	229,528
Horses, apparatus for breaking and subduing, D. Magner	229,541
Horseshoe, supplemental, C. G. Hill	229,607, 229,608
Hose nozzle, J. Clifford	229,521
Hose nozzle, A. M. Granger	229,695
Hydraulic elevator, D. P. Davis	229,591
Hydraulic motor, J. F. Montross	229,736
Hydrocarbon furnace, B. F. Sherman	229,762
Ice cream beater, J. McAnespey	229,735
Insulated electric conductor, A. F. Moore	229,735
Iron or other metals with tin, etc., machine for coating sheet, J. F. Duffy	229,527
Ironing machine, J. S. Rando	229,756
Jail or prison, G. H. Maetzel	229,540
Kitchen table, A. K. Hoffmeier	229,533
Knitting machine, G. Johnstone	229,709
Knitting machine burr, Vermilyea & Norris	229,651
Ladder, extension step, H. E. Phelps	229,563
Land roller, T. B. Patton	229,746
Leather punching machine, R. W. Owen	229,631
Lifting jack, J. F. McCormick	229,727
Liquid holder, Adams & Haynes	229,576
Lock washer for nuts, L. Garrigus	229,601
Loom, chair seat, J. C. Miller	229,732
Magneto-electric machine, T. W. Livingston	229,719
Mail bag label holder, J. W. & R. J. McKelvey	229,626
Malt and hop drier, A. J. Reynolds	229,639
Match box, G. Wegstein	229,780
Matched hook, M. L. Mount	229,738
Meat, machine for filling cans with, L. Catting	229,590
Millstone balancing device, J. B. Withee	229,787
Mining and drilling machine, coal, W. Weaver	229,781
Moulding machine, H. L. Eames	229,593
Motion, machine for transmitting, C. P. Grout (r)	9,284
Mower, lawn, Martin & Paxson	229,725
Music, apparatus for illustrating the principles of, J. C. McClain	229,545
Music leaf turner, A. Ramseyer	229,564
Music stand, E. B. Mansfield	229,622
Necktie or scarf holder, C. B. Carman	229,519
Nut lock, J. T. Sipe	229,764
Organ, reed, G. L. Grout	229,605
Ores, extracting precious metals from, T. C. Clark	229,586
Oven, baker's, S. Lord	229,539
Padlock, permutation, H. F. Webb	229,782
Paper boxes, manufacture of, F. R. Duck	229,594
Paper machines, guide roller for, T. Pusey	229,636
Paper, manufacture of, G. B. Fox	229,690
Paper pail, F. M. Davis	229,678
Paper pulp, wood grinder for making, S. M. Allen	229,513
Paper shovel blade, W. H. Murphy	229,741
Pencils, machine for trimming the ends of lead, H. C. Benson	229,661
Photographs on linen, producing colored, L. Graf	229,694
Picture frame, easel, R. Wright (r)	9,281
Pill box, H. S. Maynard	229,543
Pills, process of and apparatus for coating, J. A. Whitney	229,785
Pills with semi-fluid, device for coating, H. S. Maynard	229,544
Pipe coupling, W. M. Stuart	229,771
Piston, steam, H. A. Jamieson	229,613
Planter, corn, C. Berryman	229,516
Planter, corn, L. Grieser	229,696
Poke, animal, A. & E. Larrowe	229,618
Potato digger, T. R. Gray	229,602
Pottery, tile, and glass furnace, G. Duryee	229,525
Printing machine delivery apparatus, C. Potter, Jr.	229,635
Printing press, oscillating, E. M. Coryell	229,675
Pulp, machine for reducing wood to, C. W. Clark	229,588
Pump, H. A. Jamieson	229,612
Pump, cattle, J. P. Clement	229,587
Pump regulator, steam, C. E. Spiller	229,644
Rail joint, J. Lockhart	229,538
Railway, portable, N. W. Condict, Jr	229,674
Railway rail, J. H. Collingwood	229,522
Railway switch, J. B. Carey	229,671
Railway switch, J. T. Richardson	229,754
Railway switch, safety automatic, O. Pagan	229,745
Railway track, D. E. Dutrow	229,526
Railways, deadening noise on, E. Rider	229,641
Reclining chair, D. B. Hartley	229,701
Refrigerator car, S. Hughes	229,611
Revolving chair, double, L. Holl	229,704
Riveting tool, E. P. Farnum	229,688
Rocking chair, E. Michaels	229,733
Saw, C. Suisse	229,772
Saw file, H. A. Kimball	229,616
Sawing machine, drag, Smith & French	229,767
Scale beam, C. H. Bidwell	229,663
Sewing machine, Miller & Diehl	229,629
Sewing machine guide, J. F. Schroeder	229,760
Shovel, W. Chisholm	229,520
Shovel blanks, manufacture of, H. M. Myers	229,550
Show box cover, E. W. Albee	229,654
Shutter, J. G. Wilson	229,786
Soldering machine, C. R. Merriam	229,546
Spade, H. M. Myers	229,549
Spark arrester, Russell & Burgess	229,642
Sponge moistener, J. J. Doyle	229,680
Steam boiler covering, G. F. Lynch	229,620
Steam engine cylinder lubricator, C. E. Johnson	229,710
Steering gear for traction vehicles, Land & Campbell	229,715
Still, alcohol, C. J. T. Burcey	229,585
Stool, H. A. Seymour	229,761
Store service apparatus, J. C. White	229,783
Stove cone attachment, J. H. Egan	229,684
Stove pipe blank, G. Hipwell	229,532
Stove platform, E. Detwiler (r)	9,277
Stove shelf, W. E. Walker	229,572
Stoves, adjustable rolling support for, C. D. Woodruff (r)	9,283
Straw carrier, F. W. & T. B. Sumner	229,649
Stump puller, P. C. Thompson	229,776
Sugar into lumps, apparatus for chopping, McCrea & Cowper	229,728
Summer furnace, G. F. Robinson	229,756
Tag, butcher's, Allsop & McKenna	229,514
Telegraphic switch board, C. E. Chinnock	229,672
Temple teeth, tool for setting, E. S. Stimpson	229,646
Tether, W. L. Gerard	229,691
Thill coupling, W. Harder (r)	9,278
Thill coupling, C. Renner, Jr	229,555
Thill coupling, T. M. Richardson	229,753
Thread cleaning and polishing mechanism, C. Ellis	229,686
Tire upsetter, A. H. Struppler	229,647
Toy pistol, H. S. Lockwood	229,721
Toy shooting gallery, C. A. Bailey	229,656
Tray, child's table, A. Turner (r)	9,285
Truck, hand, J. S. Stewart	229,770
Type case, printer's, L. D. Evans	229,687
Type writing machine reel, W. K. Jenne	229,707
Umbrella, A. H. Ege	229,685
Umbrella, R. Ray	229,752
Valve, balanced, W. P. Tatham	229,773
Valve gear, engine, P. Josserand	229,708
Vehicle dash, A. Z. Beda	229,582, 229,583
Vehicle spring, A. D. Hickok	229,609
Vehicle spring, Morrow & Bush	229,630
Velocipede, W. Albrecht	229,655
Velocipede, C. M. Trautmann	229,562
Venting sealed cans, J. Wolff	229,789
Wagon brake, H. H. Woodford	229,575
Wagon brake lever, A. C. Fish	229,686
Wagon lock, Sprague & Perry	229,569
Washing machine, I. Hoover	229,610
Washing machine, M. L. Julian	229,711
Washing machine, F. L. Mitchell	229,547
Watch case bow, J. C. Dueber	229,681
Watch, stop, H. A. Lugrin	229,723
Water cooler, G. Booth	229,664
Water gauge, E. W. Vanduzen	229,571
Water wheel, turbine, T. S. Pyiant	229,751
Whiffletree hook, W. J. Woods	229,790
Whisky, making, Allen & Bradley	229,653
Windwheel, F. H. Bolte	229,580
Windmill, M. D. Thayer	229,774
Window opener, A. K. Mansfield	229,621
Wire and rods, machine for coiling, W. J. Lewis	229,718
Wrench, L. Coes	229,673
Wringer, R. C. Browning	229,666

DESIGNS.

Bulletin board, railroad, A. S. Mann	11,841
Carpet, H. Horan	11,840
Carpet, D. McNair	11,842, 11,843
Carpet, J. Neil	11,849
Carpet, G. W. Piggott	11,851, 11,852
Chain, ornamental, J. A. Lieb	11,855
Chair, E. L. Buckingham	11,839
Coffin handle socket, W. E. Stevens	11,837
Fireplace, W. C. Peet	11,850
Glass articles, stems of, J. Anderson	11,838
Hay rack, stable, M. Wiard	11,853
Oil cloth, C. T. & V. E. Meyer	11,844 to 11,848
Pianoforte case, C. F. T. Steinway	11,856
Stalls, post for stable, M. Wiard	11,854

TRADE MARKS.

Corundum, Alden Emery Company	7,961
Gloves, kid, C. Fortin & Co	7,962
Liniment, condition powders, and ointment, C. Bennett	7,959
Medicated belts, Walch & James	7,957
Tobacco, cigars, and cigarettes, chewing and smoking, S. Hernsheim & Brother	7,960

English Patents Issued to Americans.

From July 2 to July 6, 1880, inclusive.

Grain binding machinery, S. Johnson, Brockport, N. Y.
Harness buckle, J. A. Gavitt *et al.*, Dayton, Wash. T.
Letter file, W. Downie, Chicago, Ill.
Locomotive engine, E. Fountaine, Detroit, Mich.
Pulverizing grain, ores, etc., L. S. Chichester, Jersey City, N. J.
Pump, H. S. Lockman, *et al.*, New Brighton, N. J.
Sheep shears, J. Corey *et al.*, California.
Steam boilers, G. H. Babcock, Plainfield, N. J.
Telegraph wires, covering for, R. B. Lamb, Camden, N. J.
Telephone registering apparatus, C. J. Bell, *et al.*, Germantown, Pa.
Type writing machine, finger guide for, A. M. Da Costa, Brooklyn, N. Y.
Time signaling apparatus, W. H. Shuey, Minneapolis, Minn.
Vinegar compounds, G. Holland, San Francisco, Cal.

PROPOSALS FOR MAIL LOCKS AND KEYS.

POST OFFICE DEPARTMENT,
WASHINGTON, D. C., June 22, 1880.

In compliance with a provision in the law entitled "An Act making appropriations for the service of the Post Office Department for the fiscal year ending June 30, 1881, and for other purposes," approved June 11, 1880, requiring a re-advertisement for proposals for Mail Locks and Keys, notice is hereby given that SEPARATE SEALED PROPOSALS will be received at this Department UNTIL 12 O'CLOCK NOON, ON THE SECOND DAY OF AUGUST, 1880, for furnishing five new and different kinds of Locks and Keys for the sole and exclusive use of the United States mails, including, besides those to be used for mail bags, such as are to be used on the street letter-boxes of the United States.

As the public exposure and searching examination necessary to intelligent bidding on any prescribed model of a lock and key would tend to impair, if not entirely destroy, the further utility of all such locks and keys for the purposes of the mails, the Postmaster General prescribes no models or samples for bidders, but relies for a selection on the mechanical skill and ingenuity which a fair competition among inventors, hereby invited, may develop in samples submitted by them.

Proposals, with samples, will also be received at the same time, for Safety Chains for Mail Keys.

Specifications of conditions and requirements as to proposals, samples, kinds and quantities, contracts, etc., as well as forms of proposal, will be furnished on application, by letter, to the Second Assistant Postmaster General. No proposal will be considered, unless it shall have been submitted in accordance with such specifications and forms.

The Contracts which may be made will be in conformity to the specifications and the accepted proposals.

D. M. KEY,
Postmaster General.

SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

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

Vol. XLIII.—No. 7. [NEW SERIES.] NEW YORK, AUGUST 14, 1880. [$3.20 per Annum. [POSTAGE PREPAID.]

MANUFACTURE OF STEEL.—PITTSBURG STEEL WORKS. ANDERSON & CO., PITTSBURG, PA.—[See page 100.]

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, postage included..... $3 20
One copy, six months, postage included..... 1 60

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at $3.20 each; additional copies at same proportionate rate. Postage prepaid.
Remit by postal order. Address
MUNN & CO., 37 Park Row, New York.

☞ To Advertisers.—The regular circulation of the SCIENTIFIC AMERICAN is now **Fifty Thousand Copies** weekly. For 1880 the publishers anticipate a still larger circulation.

The Scientific American Supplement

Is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, postage paid, to subscribers. Single copies, 10 cents. Sold by all news dealers throughout the country.
Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, postage free, on receipt of *seven dollars*. Both papers to one address or different addresses, as desired.
The safest way to remit is by draft, postal order, or registered letter. Address MUNN & CO., 37 Park Row, N. Y.

Scientific American Export Edition.

The SCIENTIFIC AMERICAN Export Edition is a large and splendid periodical, issued once a month. Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1.) Most of the plates and pages of the four preceding weekly issues of the SCIENTIFIC AMERICAN, with its splendid engravings and valuable information; (2.) Commercial, trade, and manufacturing announcements of leading houses. Terms for Export Edition, $5.00 a year, sent prepaid to any part of the world. Single copies 50 cents. ☞ Manufacturers and others who desire to secure foreign trade may have large, and handsomely displayed announcements published in this edition at a very moderate cost.
The SCIENTIFIC AMERICAN Export Edition has a large guaranteed circulation in all commercial places throughout the world. Address MUNN & CO., 37 Park Row, New York.

NEW YORK, SATURDAY, AUGUST 14, 1880.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF
THE SCIENTIFIC AMERICAN SUPPLEMENT
No. 241.
For the Week ending August 14, 1880.

Price 10 cents. For sale by all newsdealers.

RAILWAY PROGRESS AND REQUIREMENTS.

The enormous growth of our railway carrying business, which exacts an amount of work always in increasing proportion to the facilities for its performance, gives great prominence to all questions connected with car construction, improvements in locomotives, and economy in every detail of operating. At the late Convention of the Master Car Builders' Association at Detroit, as at the previous meeting of the Master Mechanics' Association at Cleveland, many subjects of this character were discussed at considerable length by men who not only have a practical acquaintance therewith, but whose interest leads them to make careful investigation and comparison of results obtained in the actual working of the different roads of the country. It is, perhaps, hardly the province of such associations to decide absolutely what shall be done in regard to the general adoption or discarding of certain forms of construction, or the materials to be used, nor is it likely that they could arbitrarily dictate to their employers, the railway companies, as to such points, and for this reason the results of much of their work appear on the surface to be quite inconclusive. There can be no doubt, however, that great practical benefit has resulted from their discussions and comparisons of experiments made. Of the Master Car Builders' Association, the late meeting constituted the 14th Annual Convention, while the Master Mechanics' Association this year held its 13th Annual Convention.

Mr. Leander Garey, of the New York Central and Hudson River Railroad, and President of the Car Builders' Association, places the increase in freight tonnage since 1870 at more than 100 per cent, and says that, although there are times during each year when it is difficult to find storage room for idle cars, it is impossible, in the busy seasons, to furnish the number required. During such periods the cars are loaded much beyond what they were intended to carry, and so it has frequently occurred that cars meant to carry only 10 tons have been made to take 12 to 15 tons. The increased freight offerings are expected within a few years to call for even double the present capacity, and President Garey thinks it is evident, from past experience, that in a short time the maximum load for 8-wheel freight cars will be at least 20 tons, while 4-wheel cars will be loaded with from 10 to 12 tons each, making the present ordinary freight car a thing of the past. Already the sizes of car axles have been increased by many of the builders, and this has enabled the railroads to increase the allowable tonnage on cars so built, but there are many other details in regard to which builders are invited to anticipate the future wants of the roads, rather than wait till they are forced to make necessary changes.

The general substitution of iron for wood and steel for iron in car construction, with such arrangement and proportioning of the parts as will secure the greatest strength with the least possible weight, is one of the directions in which particular improvement is looked for. In Europe it is claimed that iron has been proved to be better, cheaper, and lighter than wood for this purpose, and many patents have been issued here covering forms of car construction in iron and steel, but thus far such cars have not been largely used. The tendency is to make the iron car bed much heavier than necessary, and, with sheet iron sides, there is a great deal of trouble from rusting. The large advance in the price of iron and steel last year is said to have afforded the principal reason why no greater progress has been made lately in their substitution for wood in building cars.

The question as to what is the best style of brake for freight trains has engaged the earnest attention of the car builders for some time past. There are many patented devices in this line, but no one of them has yet received general approval as being just what is wanted in all particulars. Such a brake must, say the committee of the Car Builders' Association, be automatic and always reliable, and be applicable and operative on any car equipped with it, without regard to its location or the presence of other cars not so eqnipped in the same train. The perfecting of such special brake has only been sought within the past three or four years, but great progress has already been made toward the attainment of the objects sought.

In regard to cast iron and steel-tired wheels, wrought iron wheels with steel tires, and paper wheels, accurate results of trials on several leading railroads were given by different members at the meeting of the Car Builders' Association, but hardly enough data have yet been collected to make it apparent which kind of wheel, considering cost and amount of work done, would be best for general use. As to the size of wheels to be used, the general opinion seemed to be in favor of 42 inches, such wheels now being adopted to a considerable extent in the place of the old 33 inch wheels. On a level track and good roadbed it was said that 4 to 5 per cent of power was saved by the use of the larger wheels, though this was about all lost on up grades.

The rules under which the different companies exchange cars provide that where wheels have flat spots of 2½ inches or over the cars need not be accepted. These flat spots generally come from the wheels sliding on the rails, when they are held firmly by the brakes. It is not the intention to have the brakes hold the wheels fast, but only to check their motion, and let them slip under the hold of the brake, as this stops the motion of the train quicker, but with the varying weight resting upon different wheels this is so imperfectly attained that many flat spots are made on the wheels. When these spots exceed 2½ inches the wheels must be taken out and replaced at the expense of the company to whom the car belongs. The necessity for such and other repairs, which have constantly to be made, render it very desirable for the car builders, as far as possible, to follow a uniform plan of construction.

The fact that various lengths of gauges are employed for setting wheels for the same gauge of track presents a serious problem in the working of trunk lines, over which the cars of many different companies are run. Some of the roads have made the gauge of their tracks 4 feet 8¾ inches, instead of 4 feet 8½ inches, in order to better accommodate the different gauges at which the wheels of various companies are set, the difference in the lengths of gauges at which wheels are set varying something like one inch. On crooked roads there must, of course, be more lateral play, and this is generally found on the roads in New England. The result of a want of harmony among the companies on this question is that while, in some cases, cars will get between the tracks, in other instances the wheels fit so tightly between the rails that a good deal of power is lost in running trains. It would seem that, in a matter of such great importance, and yet involving only the most elementary principles of mechanics, it ought not to be difficult to secure substantial harmony between the railways of the country.

At the Railway Master Mechanics' Convention the questions discussed embraced the desirability of different forms of locomotive boilers; the best manner of annealing steel sheets after flanging; button boiler riveting, and the prevention of smoke in locomotives. Valuable information touching the latter point was furnished by the master mechanics of several leading railways. The first and most important element in the prevention of smoke was conceded to be in having the locomotive boilers of the largest possible capacity consistent with a proper and safe weight upon the rails; the condition coming next to this in importance was more care in firing, so that the fuel should be varied in proportion to the amount of steam required with different loads, or in going up and down grades. The committee reporting on this subject ventured the opinion that the railroad companies might better have spent money in educating men how to properly fire locomotive engines then in most of the experiments they have made with "water tables, fire-brick arches, peculiar shaped furnaces, brick walls, and mid-feathers," etc.

All of these questions, with many more of the same nature, discussed at these assemblages of men practically acquainted with the subjects, are of leading importance to inventors, engineers, and mechanics everywhere. But they have also a much broader interest, in that the general public feel directly the beneficial effects of everything done to promote the efficiency of our railway service.

Freight on our railroads is now being carried at a cost of little more than one-half of what it was in 1873—the difference between now and then on thirteen trunk lines showing a reduction of 42·31 per cent. This freight, in 1879, was carried over nearly 2,000 miles more railway, thus largely increasing the cost, had it not been for the greatly lessened expense in operating the roads. A portion of this reduction has undoubtedly been effected by improved management, but how much of it is also due to the progress made by our mechanics and inventors? And to whom else are we to look for the further improvements sought? The field is a wide one, and practical men are constantly suggesting the direction in which it is most desirable for effective work to be done, the subjects here presented constituting only a few of those which hold a leading position.

Edison's Electric Light at Sea.

In the description of the Oregon Railway and Navigation Company's new steamship Columbia, in the SCIENTIFIC AMERICAN of May 22, special mention was made of the employment of the Edison electric lamp throughout the vessel. On the arrival of the Columbia at Portland, Oregon, July 26, the chief engineer reported that the system had worked with entire satisfaction during the whole trip in all kinds of weather. The ordinary skill of the engine room was sufficient for the management of the electric generators and the lights. This is the first application of small or incandescent electric lamps to the lighting of a ship's stateroom and saloons.

Trial of the Steam Catamaran.

The trial trip of the steam catamaran, Henry W. Longfellow, built at Nyack on the Hudson, took place July 28. The vessel behaved well; but the experimental propeller proved a failure. The partially submerged screw did not take hold sufficiently, and merely churned the surface of the water into foam without giving much headway to the boat. By substituting a submerged propeller with longer and broader blades, the builder is confident of attaining a speed exceeding twenty-five miles an hour.

A Lady Patentee Pleads her own Case.

We report in another column the suit of Helen M. McDonald vs. Sidenberg for infringement of her patent skirt protector. The case is interesting from the fact that the lady appeared in court as her own lawyer, and came off with flying colors, although she had for her legal opponent one of the ablest limbs of the law, Mr. Counsellor Dickerson.

A LARGE CARGO.—The cable steamer Hooper sailed from Boston, July 16, with probably the largest cargo that ever left that port. The Hooper carried 160,000 bushels of grain, 525 cattle, 1,450 sheep, 12,000 bags of flour, and about 400 tons of general merchandise.

THE EVOLUTION OF IDEAS.

Science declares that ideas are the results of the same natural forces which act in organic nature; and mental phenomena are not different from other natural phenomena in kind, but only in greater complexity. Herbert Spencer says: "All impressions from moment to moment made on our organs of sense stand in direct correlation with physical forces existing externally." "But how," he continues, in another chapter of his "Principles of Philosophy," "can we interpret by the law of correlation the genesis of those thoughts and feelings, which, instead of following external stimuli, arise spontaneously? . . . The reply is, that the immediate correlates of these and other such modes of consciousness are not to be found in the agencies acting on us externally, but in certain internal agencies. The forces called vital, which we have seen to be correlates of the forces called physical, are the immediate sources of these thoughts and feelings; and are expended in producing them. . . . That no idea or feeling arises, save as a result of some physical force expended in producing it, is fast becoming a commonplace of science; and whoever duly weighs the evidence will see that nothing but an overwhelming bias in favor of preconceived theory, can explain its non-acceptance." These words of the renowned English philosopher express the opinion of all those men of science who approve the theory of "evolution," and the object of this paper is to show how the results of the scientific investigation of ideas support this theory.

Evolution in nature is always going on from the unconscious toward self-consciousness. The highest stage it has reached on our globe is man, and with him terrestrial development has arrived at a remarkable turning point. It seems not to proceed, at least for the present, in a further organic evolution, but only in a higher development of consciousness. Intellectual evolution has become predominant, and the unfolding of ideas has become more significant than the creation of new organs.

Instead of producing higher organisms, nature has given to the human species the faculty of invention. By means of this faculty man has transferred the form of the human organs, as well as their functionary and formal relations, to the instruments he invented, and the productiveness and receptiveness of the former have thereby been remarkably increased. The evolution of ideas has thus accomplished what the further development of organisms would have done.

When we study the construction of our most important instruments we discover to our astonishment that the latter are true copies of some parts of our body, and simply a further completion of them.

In the first stone hammer man has unknowingly imitated his forearm with closed fist; in the shovel and spoon we see the forearm and hollowed hand; in the saw we find a reproduction of a row of teeth; tongs represent the closing together of thumb and fingers; in the hook is a bent finger reproduced; the pencil is simply a prolongation of the forefinger; so, we see in all instruments, from the simplest to the most complicated, only an improvement and completion of the human organs; and thus we find that all the inventional thoughts of men are directed toward the same aim as that toward which organic development tends.

But here we have first to answer an objection. Some might say, that this imitation of organs was intentional, or that man may have found instruments which resembled those organs and recognized them as most useful for the purpose. Though this explanation may not seem to us satisfactory, let us take it for granted. There could yet have been no conscious imitation of *interior* organs, of which the following furnishes some beautiful examples: From the most simple magnifying glass to the compound microscope, we find nothing else but an imitation of the lens in the animal eye; and these instruments were invented long before anything was known of the anatomy of the eye; yes, even more; the invention of these instruments has helped to solve a physiological problem hitherto unexplained, and the construction of the camera obscura and the daguerreotype has taught us the composition of our own seeing apparatus. When the telescope was invented, the discovery was made that colored margins which surrounded the objects disturbed the clearness of the view. This inconvenience was overcome by constructing object lenses composed of two different kinds of glass (crown and flint glass), which rendered these instruments perfectly achromatic. What was the astonishment of scientific men, when the fact was revealed that in the human eye there are also two refractory substances, the crystalline body and the lens, which render the sight achromatic. The construction of the human ear gives us another interesting proof, and we were only able to understand it after the invention of the piano. Corti's strings are a regular graduated series of strings which correspond to the strings of the harp or the piano, and just as each of the strings of these instruments resound only when a corresponding sound strikes it, so do Corti's strings in the ear.

In the same manner the construction of the organ has given to physiology the explanation of the organ of speech, and partially explained the mechanism of the heart. The late Prof. Dove has summed up the result of these facts in the words: "We only understood the mechanism of our own organs when we had unconsciously reproduced them by the exercise of our inventional faculties."

After a careful consideration of the facts before us few will doubt that in the invention of instruments we have reproduced the human organs, though some one might suggest that this reproduction is not the result of the action of natural laws, but only the consequence of careful contemplation, and say that in nature, as well as in technics, there are mechanical problems to be solved, and as in the former success is granted by natural selection, so in the latter by industrial progress, that a reproduction of organs can scarcely be avoided, for, if in our instruments the power and usefulness of our organs are to be extended, it is only natural that we give them a corresponding form. The weakness of this reasoning will be apparent if we show that in those products of our thought, which are not the results of a mere practical tendency, and where a further completion of the human organs was out of question, in products where our intelligence had seemingly a perfectly free field for operation, we have been directed by the same laws and led by the same tendency, which is the basis of all organic development. We are speaking of the products of art. Shakespeare, in his "Winter's Tale," says "art is but nature," and Schopenhauer calls a work of art "an anticipation of that which nature intends." One of the most interesting proofs of this fact is to be found in A. Zeising's book,* in which he speaks of the "golden cut."

The "golden cut" is the name given by German mathematicians to that division of a whole into unequal parts, whereby the smaller part is related to the larger as the larger to the whole, or *vice versa*—the whole is related to the larger part as the larger to the smaller.

Zeising endeavors to show that in this law is embodied the ground principle of all formation in nature and art, where the tendency is toward the total and the beautiful. He calls this law the ideal type and normal measure of all things, and recognizes it in the morphology of animals, of plants, of crystals, in the proportions of sculpture and painting, and even in the musical proportions. It cannot be denied that this discovery is of the highest value for the study of æsthetics. Although this principle had been long recognized in nature, Zeising was the first to demonstrate that it was represented in works of art, and illustrates in a very clear manner that it forms the basis of beauty in the "Apollo of Belvedere," in the "Antinous," the "Venus of Medici," the "Venus of Praxiteles," the "Eva of Raphael," etc.

Those who accept the dogma of free will can never find a satisfactory explanation of this remarkable fact, but it is easily understood if we admit that our ideas and thoughts are produced by natural causation, and are the result of unchangeable laws.

In works of architecture the same principle is repeated, and this is an additional proof that the activity of genius and the conception of an artistic idea are only the result of natural laws pervading the artist. The measures and proportions of different Greek buildings harmonize in a remarkable manner with the law of the "golden cut." We mention only the Parthenon in Athens, the Propylæa of the Acropolis, the Erechtheum, the Theseus Temple, the Temple of Apollo Epikurios, the Temple of the Olympic Jupiter in Agrigentum, the Propylæa of Eleusis, the Temple of the Capitolinic Jupiter in Rome, the most ancient of the temples in Selinuntum, etc. We also find the law of the golden cut in Gothic architecture—in the dome of Cologne, the Cathedral of Elizabeth in Marburg, and with more or less precision it is represented in nearly all cathedrals of the world.

That the rule of the "golden cut" was not known as an æsthetical principle, but only felt instinctively, is evident from the fact that only in a few cases it has been strictly observed; in all the others it is simply approached.

And now, after having seen the invalidity of the argument of conscious imitation, let us return to the technical sciences. It cannot be denied that in these sciences consciousness plays a more important part than in merely artistic conceptions. Very often there is a prefixed tendency to be recognized in the construction of machines and instruments, which are invented to supply a deeply felt want, and most of them are the product of careful and conscious meditation. But we have already seen that *meditation* and not *consciousness* is the productive element.

The truth of this assertion can be found by a careful study of technical development, and has been perfectly well recognized by Prof. Reuleaux,† who is perhaps the most able connoisseur of machineries. Among other things he says:

"When one observes the development of the technical sciences one is tempted to believe in a perfect *self-acting* evolution of ideas. . . . Everywhere we see how one idea unfolds from the other, as the leaf from the bud or the fruit from the blossom, just as in nature everywhere each new development is the product of some previous forms."

The development of technical sciences is based upon a continuous increasing of relations between man and the external world, and is perfectly identical with organic evolution, which takes place under a further differentiation of organs with increasing adaptation.

But this is not only true of this single phase of culture. The same organic construction is to be found in the whole world of thought.

Ideas unfold and evolve one from the other, and differentiate strictly according to the law of evolution.

In the history of the human mind there is to be found a process of adaptation of conceptions to reality. In this process there is a competition, an elimination of the "unfit," that is, of the *error;* and here likewise, as in organic nature, the greater adaptation—that is, the higher truth—leads to victory. It is the old law of the "survival of the fittest." And to make this analogy more complete, and to give it the worth of a real analogy, our thoughts are not coming to appearance in an arbitrary manner, but in a consequent order. They come forth when the foundation of their existence is laid, and not singly but in groups, which bear the same general character. "Each age," says Goethe, "hovers in an atmosphere of familiar ideas, and it is quite natural that the same discoveries are made by different persons perfectly independent, yet nearly at the same time, just as in different gardens fruits of the same species fall from the trees at the same season."

When the world is ripe for certain ideas they are produced. Before each great discovery a kind of fermentation seizes the minds of humanity, and it is the task of the genius to concentrate the thoughts of his time and bring them to a conclusion.

G. G.

* A. Zeising: "Neue Lehre von den Proportionen des Menschlichen Koerpers." Leipzig, Weigel, 1854.

† Reuleaux: "Theoretische Kinematic," Braunschweig, 1875.

THE PREVENTION OF VIRULENT DISEASES.

One of the most promising discoveries, since Jenner's day, in connection with the nature and treatment of virulent disease, has recently been made by the eminent investigator of microscopic life, M. Pasteur. A full report of the investigations leading up to the discovery will be found in the SCIENTIFIC AMERICAN SUPPLEMENT. In studying the microscopic organism which is the cause of that malignant disease of poultry known as chicken cholera, M. Pasteur finds this disease to be a connecting link between those virulent diseases of man and animals known to be caused by living virus and other diseases in the virus of which life has never been demonstrated. He finds also that under suitable treatment the nature of the virus of chicken cholera may be so modified that it will no longer produce virulent disease, but only a mild disorder, which, however, protects the animal organization against the fatal disease just as cow-pox protects humanity against small pox.

In the study of the microscopic germs of chicken cholera, M. Pasteur employs a broth made of chicken flesh neutralized with potassa and sterilized by high temperature. In this liquid the organism multiplies with astonishing rapidity just as it does in the bodies of poultry. If a few drops of a cultivation of the organism be fed to chickens the disease is quickly propagated, and the infected chickens transmit the disease to others. Repeated cultivation, by sowing in fresh broth a minute quantity of infected broth, does not weaken the virulence of the germ. But by a modified cultivation, the nature of which is not disclosed, the virulence of the germ is diminished, so that when chickens are inoculated with it they are sickened but not killed. And it is found that chickens which have had the mild disease are practically incapable of taking the malignant disease. The analogy of the behavior of the mild, artificial chicken cholera, to that of cow-pox in preventing small pox, is quite complete. M. Pasteur finds further that the attenuated virus most probably keeps its character of mildness after passing through the animal organization.

The possible outcome of this discovery covers a far wider field of sanitation than at first sight appears. It gives a clew to the nature of many of the worst scourges of humanity, and holds out the promise that when the viruses of such diseases as measles, scarlet fever, typhus, plague, yellow fever, and others, have been similarly investigated, it may be possible to develop mild disorders, by means of which the more virulent forms may be greatly mitigated in severity, if not entirely stamped out.

Earthquakes and Volcanic Eruptions.

The month of July has been characterized by seismic disturbances of more or less severity over many and widely separated regions. In the fore part of the month an earthquake at the island of St. George, one of the Azores, resulted in the formation of a new island, 600 yards distant, and about 18,000 square yards in extent.

About the same time, Sunday, July 4, an unusually severe and widespread earthquake was experienced in Switzerland. Several meters of the summit of Schnebelberg, near Quarten, fell, overwhelming a large forest. Two persons were killed by falling structures.

On the 13th seismic disturbances began in the Philippine Islands, and continued for several days. On the 21st an earthquake unequaled in severity since 1824, destroyed a large part of the city of Manila and killed many of the inhabitants. All the volcanoes of the islands were in full activity.

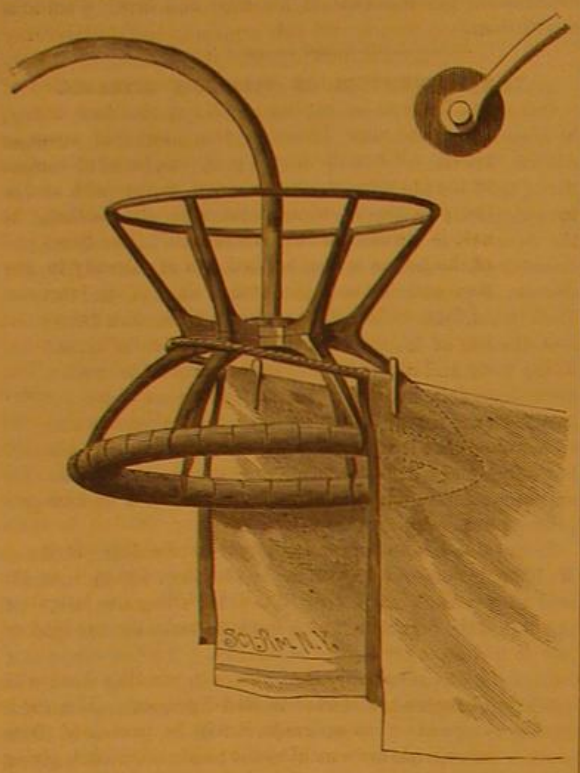
On the 20th New Hampshire experienced an earthquake shock of considerable severity, but noticeable chiefly as a symptom of the prevailing uneasiness of Mother Earth. The same may be said of the slight volcanic outbreak at Vesuvius.

Dispatches from Panama, July 17, speak of the exceeding activity of the long silent volcano Fuego, near the city of Antigua. The heavens for miles around were filled with smoke and dust. The first outburst occurred on the night of June 29. As seen from the deck of the Pacific mail steamer Wilmington, at a distance of nearly 50 miles, the spectacle was magnificent. From the highest peak of the Fuego great columns of flame darted up into the air to a height of from 400 to 500 feet. The surrounding country to the east and south was illuminated by the tremendous glare of the flames, while to the northward and westward the clouds of dust and smoke obscured the whole country.

NOVEL CLOTHES LINE PULLEY.

The engraving shows a pulley for supporting a clothes line, which will admit of pulling around the line, together with the clothes supported by it, without injury to the clothes, making it convenient to place the clothes on the line or remove them from it without change of position. This is particularly advantageous when the ground is wet or snow covered, or in cold weather, as it admits of placing the clothes on the line while the person is under shelter and on dry footing. With this pulley one end of the line may be supported in a position ordinarily inaccessible, and the line may be a great distance from the ground, as it must necessarily be in some of our tall flats and tenement houses.

The invention consists of a wheel, from whose hub several curved arms project outward and downward, and several corresponding straight arms project upward, with a ring fixed over and upon the points of each set of arms, the



PAYNE'S CLOTHES LINE PULLEY.

lower ring being completely filled with small rollers, which prevent the chafing of the clothes. This pulley is supported by a curved iron rod, and the clothes line passes around the smaller portion, as shown in the engraving.

This invention was lately patented by Messrs D. H. & J. H. Payne, of Troy, N. Y., who should be addressed for further information.

NEW FOLDING BOAT.

The boat shown in the engraving may be folded into a very small space, and is well adapted to the use of hunting, fishing, and exploring parties. The frame consists of a series of bows, connected by a set of lazy tongs, which are pivoted to all of the bows except the last one at each end. The lazy tongs at the side of the boat are made of flexible material, such as thin tempered steel, but the lazy tongs forming the keelson are much more rigid. They are sufficiently stiff to keep the bow and stern braced apart when the frame is extended. The shell or covering is made of canvas, sewed into suitable shape to be stretched neatly and tightly on the frame when extended. The edges of the covering are provided with eyelets, through which a cord passes for fastening the cover to the frame, a hook being attached to each rib for that purpose.

The boat is provided with one or more seats which fold as the boat frame is folded. Fig. 1 shows the boat extended ready for use, and Fig. 2 represents the frame folded up. This invention was recently patented by Messrs. T. W. B. Murray and C. J. Baker, of Chicago, Ill.

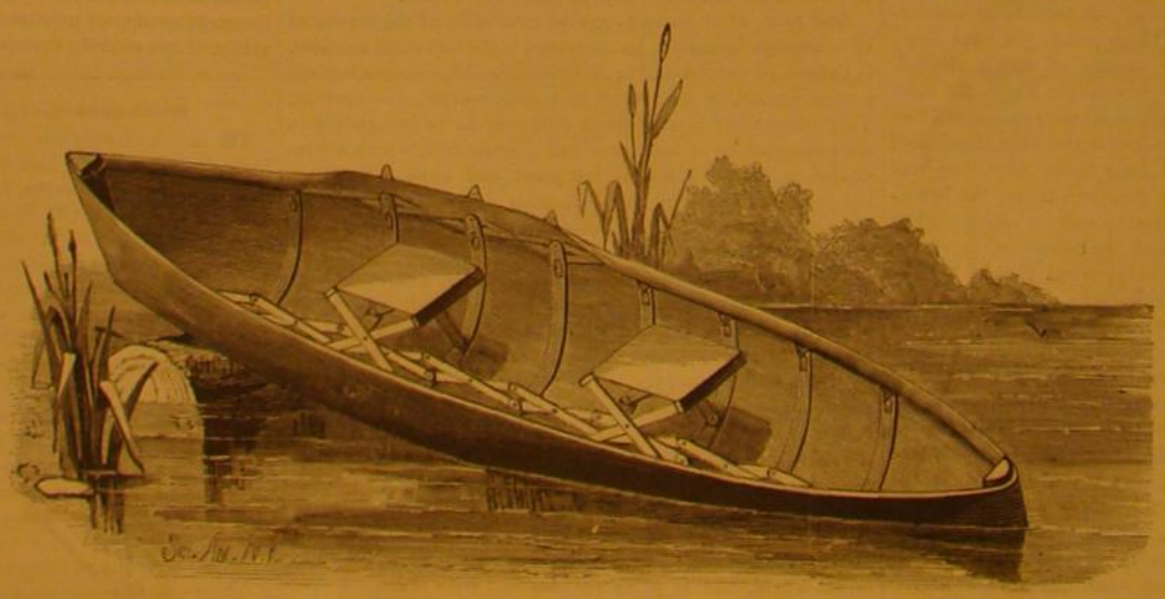


Fig. 1.—NOVEL FOLDING BOAT.

Well Marked for Identification.

The body of an unknown man, elaborately tattooed, was found floating in the Mississippi River, near New Orleans, July 8. On the back was pictured the crucifixion, with the Virgin kneeling at the foot of the cross. This extended from the nape of the neck to the middle of the back. There was a star on each shoulder, with the medallion of a lady in the center, on one shoulder a shield, with a ship in the center, and the name "Independent" on it; on the chest an American eagle, two crossed American flags, surrounded by a wreath of laurels; on the right arm two lovers in the act of kissing, and a sailor boy holding a rudder; on the left arm a tomb, with the inscription, "In memory of my mother," and a bouquet of flowers extending from the elbow to the wrist. On the back of the left hand was the letter H.

A VISIT TO THE TESTING STATION OF THE INDUSTRIAL ACADEMY, BERLIN.

This morning was occupied with another visit to the "Versuchsstation" of the Gewerbeschule, with the intention of noting the progress of certain of the "Dauerversuche." I found, unexpectedly, Prof. Spangenberg and his assistants in the midst of an exhibition of the whole apparatus and specimens of material belonging to the station to a class of twenty or more students, accompanied by the rector, Prof. Geheimrath Wiebe, and Engineer Brauer, of the Royal Polytechnic School, and Captain Nicholas Nevakhovitch, of the Russian Legation. The exhibition lasted about four hours, including the testing of a piece of Krupp's cast steel an inch in diameter.

As soon as possible, however, I got *into the rooms* where the "continuous experiments" are carried on. There are three rooms, of 20 to 25 feet square, occupied with machinery running during the day; one of these is devoted to the two horse power gas motor which, at an expense of 75 cents per diem, furnishes the power. Add to this the cost of such specimens as are purchased, attendance of two men, interest on machinery and room occupied, and we have the running expenses of the station. No such engine as the "Baxter" or "Diamond" is made in Germany, though gas motors are much used.

In the first room are four compound machines; they are old and dirty; some of them were made more than twenty years ago, but they do the work intended. The first machine twists a piece of iron, $\frac{7}{8}$ inch diameter and 15 inches long, first to the right, then to the left, backward and forward, day after day, until it breaks. The amount of strain to which it is subjected is each time the same, being regulated by a heavy steel spring. In the next room are two other machines of the same sort twisting away on steel rods. They are arranged to work in any one of three ways. The rod can be twisted to the right, allowed to come part of the way back, then again twisted, and so on; or it can be allowed to come entirely back to its natural position; or, finally, the machine can be so arranged as to twist first in one direction and then in the reverse.

Next to this machine stand two for experimenting on tension. Each has four heavy compound levers; at each depression these stretch pieces of iron or steel until they finally give way. The number of pounds strain put on the pieces is, in each case, perfectly definite and constant, and is made so by springs which rise when the desired amount is reached. These rods are about $\frac{3}{8}$ inch in diameter and 6 or 8 inches long. The pieces gradually elongate, and the springs are screwed up to follow them. At last the weakest point is found, and the elongation becomes more rapid until the breakage occurs. Next to these stands a machine where six bars, some copper, some iron, are continuously bent under the same conditions. Some are allowed to return to their natural straightness between the distortions, others come back only part way. The general size is 30 inches long by 2 wide and $\frac{3}{4}$ or $\frac{1}{2}$ inch thick. Copper springs back, within certain limits, as well as iron or steel.

We now enter the second room, where two similar machines are engaged upon other bars. One machine is bending three bars 5 feet long and four bars $2\frac{1}{2}$ feet long; the other works on bars of 30 inches. In this latter machine a most interesting experiment is going on. Two pieces of steel, 30 inches long and $\frac{5}{8}$ inch diameter, were tested for their coefficients of elasticity by observations made upon the musical tone which they gave when set in longitudinal vibration. One piece was then put in the machine, and after it had been bent a certain number of times the similar piece was put by its side. When the first piece breaks it will then be known about how many bendings remain for the second piece, which, however, will not be broken. This piece will then be tested again and the new coefficient of elasticity determined. At present, while the peculiar changes of structure are going on the bars will give no pure musical tone. The one side of them is crystalline, the other homogeneous, and this latter part is gradually extending over the whole section, so that meanwhile the bar has two coefficients of elasticity, and gives a confused sound. The remaining two machines are of a different kind, and each are at work upon six bars of round iron and steel about 15 inches by 1 inch diameter. These bars are fastened in the ends of horizontal shafts, and have a bending strain applied to their ends by means of heavy steel springs which pull them downward. The shafts revolve about fifty times per minute, and it will thus be seen that at every revolution the rods are bent successively in all directions. The rods are turned cylindrical, so that in common with the prismatic bars, which are being bent, they have their weakest point in a definite place, while in the cases of tension and torsion of cylinders the whole rod is equally strong, disregarding the slight variations in the metal. To all the machines there are counters attached for registering the number of revolutions or vibrations, and on a slate some of the main figures are posted. According to this the whole

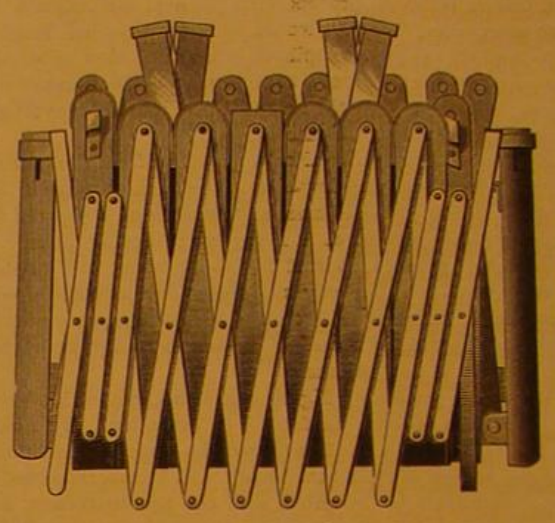


Fig. 2.—NEW FOLDING BOAT.

number of revolutions made by the machinery is over 80,000,000. All the machines run at the rate of 50 or 60 per minute, and when a piece is put in or taken out the position of the counter is simply registered in the proper book, thus giving at once the number of strains and the dates between which it was experimented upon. I understood that two rods of steel had been bent over 20,000,000 times already, and bid fair to stand some millions more. J. BURKITT WEBB.

Berlin, 1880.

ENGINEERING INVENTIONS.

Mr. James Duff, of Peoria, Ill., has patented a process of casting malleable iron and steel, which consists in simultaneously melting and deoxidizing these metals, and then, while in this same molten state, and without access of air, immediately pouring the metals in an atmosphere containing no oxygen.

An improved fire escape ladder has been patented by Mr. John F. H. King, of Port Richmond, N. Y. The invention consists in a mast mounted upon a truck, so as to be raised and supported in a vertical position for sustaining a swinging ladder when the escape is in use, and to be lowered with the ladder into a horizontal position on the truck for transportation.

Mr. Thomas Aveling, of Rochester, England, has patented an improvement in road engines, the object of which is to enable road locomotive engines of six horse power and upward to be used on railways the usual gauge of which is less than the gauge required for the road wheels of engines of such capacity. Hitherto it has been the practice to place the driving gear (or the greater portion thereof) between the boiler and the driving wheels, which necessitated a great width of gauge. To provide for a narrower gauge without altering the dimensions of the boiler, the inventor proposes to rearrange the gearing for working with two speeds, and also to place the gearing within the width of the boiler, and also to key all of the gear wheels firmly on their shafts, and thereby to avoid the inconvenience arising from the use of pinions sliding on feathers.

An improved railway switch has been patented by Mr. James M. Moore, of Canton, Conn. The object of this invention is to arrange the movable switch rails so that they can be operated by the engine as it passes along the track, and so that the moving of the rails and the locking and unlocking of the switch can be entirely under the control of the driver of the engine.

IMPROVEMENT IN STOVES.

The cone attachment shown in the annexed engraving is designed to economize fuel, improve combustion, and to utilize to the fullest extent the heat of the fire. A hollow cylinder, A, having a conoidal top and two radial pipes, B, is supported in the center of the fire pot of a stove or furnace a short distance above the grate by lugs which rest on a spider supported by the lining or side of the stove or furnace. There is sufficient space between the cylinder and the grate to allow the grate to move freely.

The pipes, B, are connected with segmental covered hot air boxes, C, resting on the stove lining and against the inner side of the stove. The inner and outer faces of these boxes are apertured and provided with sliding registers, D, which are connected together and have their apertures arranged in relation to those of the boxes, so that when communication is established between the interior of the boxes and the external air, communication between the interior of the stove or furnace and the boxes is shut off, while a movement of the register in the reverse direction will establish communication between the boxes and interior of the stove. Air is admitted beneath the grate into the cylinder, A, and through the connecting pipes, B, into the hot air boxes, C, becoming highly heated in its passage. Then, by adjusting the registers, the heated air may be admitted into the room in which the furnace or stove is located, or by simple arrangement of pipes may be conducted to any other room in the house. A contrary movement of the register will direct the current of hot air from the boxes into the stove or furnace itself.

When raking down or replenishing the fire in the stove or furnace the inner perforations of the hot air boxes are closed by the register to prevent the entrance of dust and ashes.

In a stove or furnace the cylinder occupies the space that would otherwise be occupied with coal, so that with an equal amount of coal placed in a stove or furnace about the cylinder more extensive heat-radiating surface is secured than there would be in the absence of the cone. As the economic value of coal in a house furnace or stove is in a great measure controlled by its exposed radiating surface, this device must serve to increase the heating capacity of the coal.

This invention has been patented by Mr. J. H. Egan, of St. Johnsville, N. Y., who may be addressed for further information.

Fig. 1

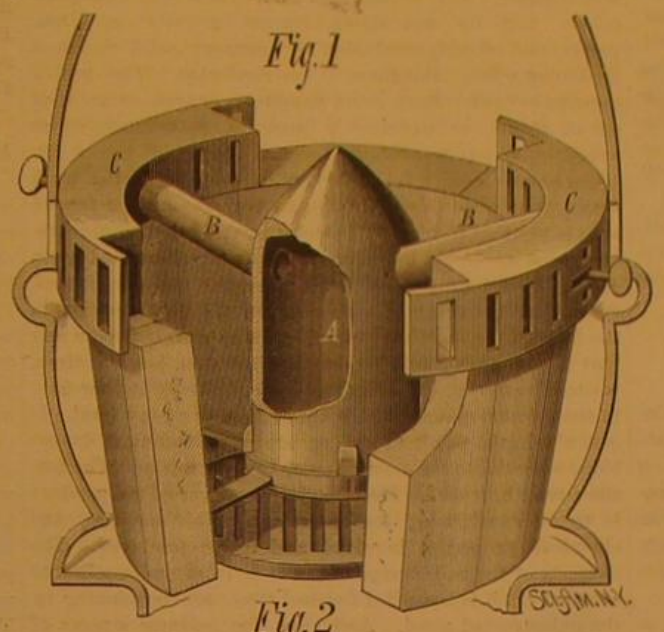
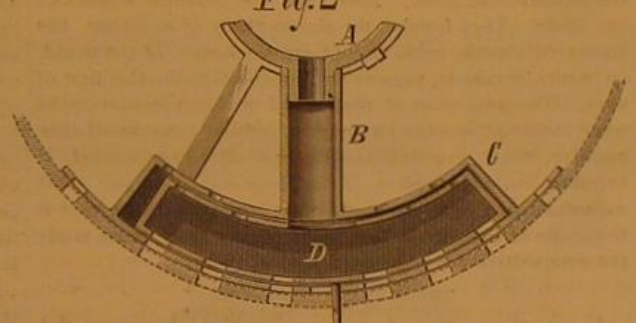


Fig. 2



EGAN'S CONE ATTACHMENT FOR STOVES.

Native Californian Tobacco.

Professor J. T. Rothrock is of the opinion that the early natives of California smoked the leaves of *Nicotiana clevelandii*—a species only quite recently described by Professor Asa Gray. It is a small plant with small flowers, and it was found by Professor Rothrock only in association with the shell heaps which occur so abundantly on the coasts of Southern and Central California. He states that perhaps of all the remains of extinct races so richly furnished by that region, none were so common as the pipes, usually made of stone resembling serpentine. The tobacco of *N. clevelandii* Professor Rothrock found by experience to be excessively strong.

IMPROVED CAR STARTER.

In the traffic of a great city like New York or Philadelphia it is no uncommon thing to see a pair of horses toiling up a grade with a car loaded to its utmost, the horses pulling almost to the limit of their strength, and when the car is stopped, as it necessarily is at very short intervals, it becomes evident that extraordinary exertions are required on the part of the horses to overcome the inertia of the heavy load and to get the car again in motion. The position of the horses, the slipping of their shoes on the pavement, and the tension of the traces all indicate that a great deal of power is required to start a car by a direct pull, and any observing person must have noticed that it requires a great deal of maneuvering on the part of the driver to release the car brake at the precise moment when the horses begin to pull. The fact is this is seldom or never accomplished, the brake being usually relieved before the horses have fairly started; the consequence is that there occurs a retrograde movement of the car, which adds to the momentum acquired by the backward movement the inertia of the load, making the matter of starting much more difficult than it would be if it were possible to start from a state of rest.

The case is the same on level roads, although not in the same degree; and, added to the effects already mentioned, there is the jerking of the passengers whenever the car is started, the racking of the cars, which results in their rapid destruction, the strain on the harness, the frequent loss of the horses' shoes, the latter being a matter of considerable importance, since the horse suffering this loss must wear a boot and go at a slow pace, often seriously delaying the entire line of cars following.

Most of what has been said in relation to street passenger cars is equally applicable to coal cars, mining cars, and railroads of every description employing horse flesh as a motive power.

It is certain that more damage is done to horses in starting the cars than in all the actual work done in drawing them along the track, and any invention calculated to avoid these evil effects is worthy of attention.

We give herewith an engraving of a nove car starter recently patented by Mr. Jacob Hansell, of Philadelphia, Pa. It has been practically tested for several months past upon some of the most trying street car lines in Philadelphia, and is found to work admirably, saving the horses from the sudden and severe strains which inevitably come upon them when starting the car in the usual way, and also effecting a great saving in the wear and tear of cars.

The invention shown in the cut is very simple, and may be readily applied to the ordinary cars. If the device is applied to a car while building, a saving of at least $5 will be effected in the construction of the car, as many of the heavier parts which are made especially for supporting the brake while under a heavy strain may be omitted.

Fig 2 gives a general idea of the manner of applying the starter to a car, and Fig. 1 is a detail view of the starting mechanism. A ratchet wheel is secured to one of the axles of the car, and a lever, A, which embraces the axle on each side of the ratchet and carries a pawl capable of engaging the ratchet when the free end of the lever is raised. The lever, A, is connected by a short link with a bell crank lever, B, pivoted in bearings suspended from the bottom of the car. The lever, B, is connected by a rod, C, with the drawbar, D, having a spring surrounding it between the two guides, and not differing materially from the drawbars in common use.

The tongue, if one be used, is supported by a vertical rod hinged to the outer end of the draw bar and supported at its lower end by a brace, G, connected with the inner end of the draw bar and provided with adjusting nuts by which the inclination of the tongue may be changed.

The pawl on the lever, A, is connected by a small rod or chain, F, with a lever on the driver's platform, the rod or chain being connected by suitable angled levers. By this arrangement the driver may disengage the pawl from the ratchet by simply pulling on the rod or chain, F, when the motion of the car is to be reversed. When the cars always run in the same direction this pawl will never be raised. When the horses pull, the forward motion of the draw-bar moves the lever, A, upward, and as the pawl is in engagement with the ratchet, the axle is turned and the car started. The direct pull of the horses is thus applied to a car already in motion and never to the dead weight of the inert car. In fact sufficient headway is given to a car by this starter to make it impossible for a balky horse to impede the car after having given one pull. This is very important, as it insures a ready and positive start. The power is then applied directly, in the most advantageous manner, propelling the car forward for from twenty to twenty-seven inches. The drawbar being then pulled out as far as possible, the car is drawn in the usual way, until it is again stopped. In passing around curves this device is especially effective, as it transfers the pull to the middle of the car, thus diminishing the lateral or twisting strain which tends to make the car bind on the track.

The actual saving of power in starting a car with Hansell's car starter is 33 1-3 per cent. If a car is stopped on an up grade, it will be prevented from retrograde movement by the pawl and ratchet, giving the driver the use of both hands and consequently full control of the horses, the brake being entirely unnecessary, and the car will be started from a state of rest.

When this starter is applied to a car in the process of construction, the ratchet wheel is simply keyed to the axle; but when it is applied to cars already built, the ratchet wheel is split and is held in place by bolts.

This device relieves the horses of dead weight in starting the car, and renders the operation of car-starting as easy as car-drawing. We are informed that horses with galled shoulders have been rapidly healed while working regularly drawing cars with this improvement attached. This invention may be applied with great advantage to cars propelled by steam, the lever, A, being connected with the draw bar in substantially the same way as in the case of street cars. With steam cars as with horse cars the greatest power is exerted in starting, and the application of this device by reducing the amount of power required to start will permit of using lighter engines in propelling the trains.

This starter not only saves horses from strains which wear them out more rapidly than all the steady work they accomplish, but it saves enough every year in horse-shoes alone to pay for its application to a car, and it relieves the car from the racking strains which loosen the joints of the wood work and cause every window and timber to rattle. It is stated that a car with this improvement attached will last twice as long as a car of ordinary construction which is started by a direct pull in the ordinary way. A first class car costs $1,000, and, as commonly used, becomes rickety in five years. With Hansell's car starter applied the same car will last at least ten years.

The device requires no attention whatever, needs no oil, and will outlast the car to which it is applied. It is as simple as a piece of mechanism can be to accomplish the work and is always ready for use.

Many attempts have been made to apply to a car apparatus for storing the power lost in stopping, and to expend the power thus stored in starting the car. Other devices have been tried which employ a combination of springs and

Fig. 1.

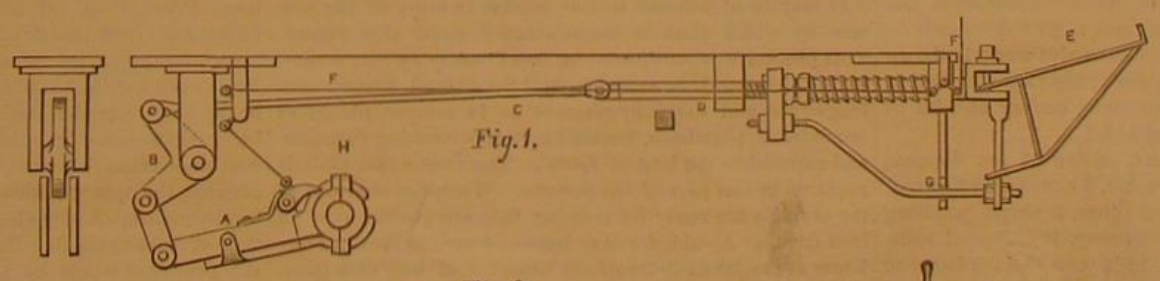
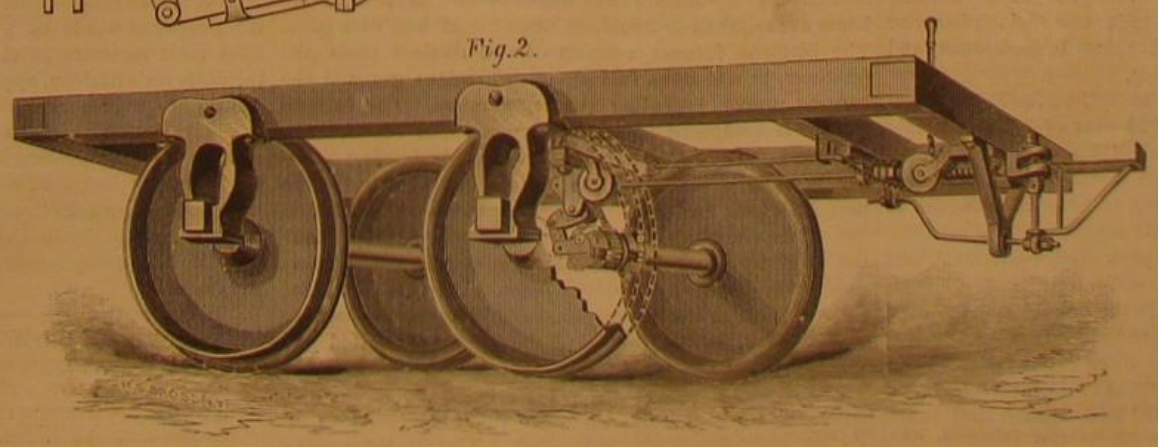


Fig. 2.



HANSELL'S CAR STARTER.

levers to start the car, but all of these have failed either through inefficiency or from their complicated nature. It is an admitted fact that anything to be applied to a car for this or any other purpose must be perfectly simple and absolutely free from liability to get out of repair. This device has these qualities, besides being very efficient for the purpose.

There are many points in favor of improvements of this class which will suggest themselves to those practically acquainted with the management of street-car lines, and it is deserving of attention not only as a matter of money saving but from a humane point of view. Any one witnessing the efforts of horses in starting a heavily laden car can but wish that a device calculated to relieve the animals from these extraordinary strains might be put into practical use.

The inventor informs us that the car starter has been critically examined by competent engineers during its several months of trial, and they have spoken in the highest terms of its value and practicability. However, the device needs no special indorsement, as any one familiar enough with mechanics to understand its construction and operation will readily admit that it must be efficient.

For further information address Mr. Thomas H. Kemble, 617 North Sixteenth street, Philadelphia, Pa., or the Inventors' Institute, 733 Broadway, New York, where a model of the invention may be seen.

AMERICAN INDUSTRIES.—No. 54.

THE MANUFACTURE OF STEEL.

The Pittsburg Steel Works of Messrs. Anderson & Co. are among the oldest in the United States, having been established in 1845, more than a third of a century since, long before railroads became universal, and at a time when it was generally thought that fine steel must necessarily come from England. But the steel industry has outgrown almost every other manufacture, and the quality of the various products is fully equal, if not superior, to anything imported.

The Pittsburg Steel Works had a small beginning, but as time passed they gradually developed, adapting themselves to the numerous and constantly increasing wants of the country, until they now cover a larger area and produce steel for a greater variety of purposes than any other mill in Pittsburg. Its managers are men of energy, perseverance, courage, and practical ability, who have fostered the growth of inventions in the manufacture and application of steel, and whose efforts have been very fruitful in the development of industrial resources.

Wherever a particular kind of steel has been required for a particular purpose it has been characteristic of this firm to embody the new form of steel in their manufactures. As a consequence of this they have many specialties in their business, among which may be mentioned the five-plate safe cast steel, which is used exclusively by Hall's Safe and Lock Company, of Cincinnati, whose safes are largely used throughout the United States; agricultural steel, which is used in the large plow factories of the West; steel for hoes, for shovels, also for forks, harrow teeth and rake teeth; grain drill, reaper, and machinery steel, and, in fact, steel for every variety of agricultural implement. They have acquired a reputation in the Eastern States for a fine quality of steel used in the manufacture of table cutlery, which is equal to any of the Sheffield productions. They have also a large railroad trade in frog points, side bars, and heel plates for switches, and they manufacture steel for hammers, chisels, and drills, which is generally used in the quarries of New England. Most of the steel rods from which the wire was drawn for the Brooklyn Bridge was furnished by this firm.

To turn out all these products, Messrs. Anderson & Co. employ 575 men, whose wages amount to $400,000 yearly.

The general appearance of these extensive works is shown in the small perspective forming one of the views in our title page engraving, and the interior views convey an idea of some of the operations conducted here.

The plant consists, briefly stated, of five 24 pot Siemens furnaces, 3 sets of coke hole furnaces, 6 converting furnaces having a weekly capacity of 90 net tons, 3 single puddling furnaces, 16 hammers, a rake tooth shop, 10 trains of rolls, two of them being 20 inch plate rolls, one 16 inch bar, one universal train, one 16 inch spring, two 16 inch sheet, and one 8, one 9, and one 10 inch guide.

The wire rod mill was erected in 1877 on the Belgian system, with a capacity to turn out 20 tons of No. 5 crucible steel every ten hours. One hundred and fifty pots can be used at each heat in the steel works. These are run double turn, making three heats each turn, making them equal to 900 single pots daily. The annual output is 15,000 net tons, the product is cast and German plow steel, plate steel, and the best edge-tool steel. The cast steel consists of selected pieces broken and melted in the crucibles and poured into ingot moulds. It is afterward reduced to bars or sheets by hammering and rolling. One of the upper views in our engraving shows the crucible furnaces in the foreground, and the iron ingot moulds being filled with melted steel in the middle ground.

The open hearth steel works, added in 1879, contain one 15 gross ton and one 7 gross ton Siemens open hearth furnace, one blooming mill, and one plate mill. The 15 ton furnace, which is shown in our engraving, is the largest in this country.

The rod rolling mill, shown at the top of the engraving, turns out rods for wire manufacturing, and one of the smaller views shows one of the trains for rolling sheets of steel. Under the huge steam hammer shown immediately below an ingot of heated steel seems as plastic as clay.

The lower right hand view shows several of the immense shears employed in cutting agricultural steel into the hundreds of shapes in which it is required.

THE MILL IN OPERATION.

To a person unaccustomed to the scene, a sudden introduction to the whirr, clatter, and roar of a vast establishment like that under notice is confusing. Trip hammers pound, trains of rolls whirl out the flaming iron or steel, engines puff and rattle, furnaces glow with white heat, and the heated iron or steel flashes as it is drawn out. Immense shears clip great sheets of iron as easily as ordinary shears would paper. Vast grindstones smooth and polish the plow colters, and up and down, intense activity, wondrous power, and seeming confusion are apparent amid the most deafening noise. But there is no confusion. The mill is departmentized. Each set of hammers, or train of rolls, or set of shears, or engines, is under a superintendent or manager, who is responsible for the quality of the work. Rigid accountability follows every department of the work—the standard in this mill being as near absolute perfection as it is possible to reach. It seems amazing that administrative capacity should be so developed as to follow the broken scraps of steel or pigs of iron, from the weighing room, through all the stages of manipulation, till they come out in the form of the most perfect steel now manufactured in any part of the globe, and yet avoid confusion, loss of time, waste of material, or loss in any form. Yet it is done here in the quietest manner and without display of any kind. It is confusing to think of the accuracy in technical knowledge essential to the management of such works. The tensile strength, resistive force, enduring power of the product is to be considered; the combination of material, the chemical properties involved and to be produced. The changes of the rude lumps of pig iron from one quality to another, till it is beautiful finished steel, are perplexing to the uninstructed mind. And then the business aspects of the affair! They involve the closest study of economy, the successful dealing with many men, the survey of the world, its wants, demands, present and prospective, in the line of steel. The proprietor of the works under mention looks upon the broad world as a market. Every section of this country, South America, and Europe, afford the market. It broadens one's conception of the importance of our great manufacturing establishments when we realize how vast is the scope of their trade, and how closely they must study the competitive forces arrayed against them.

THE SIEMENS FURNACES.

In appearance, these furnaces resemble coke ovens, flattened at the top. The pots, containing the metal to be melted and manipulated, are let down through long, narrow slits, at the top, and are thence taken out when ready. The fuel used is gas, manufactured for the purpose, and mixed with air, and introduced under the furnaces by means of huge pipes. The heat generated rises to 3,000° Fahrenheit—the most terrible intensity of heat known to be artificially produced. The men who take out the pots of melted metal stand over these slits, at the top of the furnace, exposed for the moment to the intense heat, and with long iron pincers grasp the pots of melted metal, lift them out and pour the metal into receptacles to cool. These men have cloths wrapped around their limbs, and thoroughly saturate them with water before going to the furnaces, thus preventing the burning of clothes or body. In a moment they turn away, smoking from the intense heat.

THE SIEMENS PROCESS.

It may be of interest to our readers to know of the process by which steel is manufactured under this patent. This process was introduced in this country by Mr. Anderson. Cast steel is made from blister steel, broken into fragments, and carefully selected as to temper, placed in crucibles of plumbago, lowered into the smelting furnaces, and exposed to the heat of 3,000°. The most exact skill is required in this part of the process. When the contents of the crucible are ready for pouring they are poured into an iron flask, or mould, forming ingots of various sizes. Four hours are required to transform blister steel into cast steel. The Siemens furnace consists of two distinct parts, the producer, in which the fuel is converted into gas, and the furnace proper, including the regenerators. The furnace proper is composed of one heating and four regenerating chambers. The latter are placed beneath the heating chamber in such a manner as to leave space between for the passage of air and gas. The gas enters at the bottom of one of the chambers, the air enters the neighboring chamber, and the two, mingling at one end of the furnace, produce an intense and uniform flame. This heat is utilized entirely, passing the regenerators, and being used in various ways. Thus, by the reversal of the current of heated gas, it is thoroughly used, producing a continuous heat of 3,000°. The action of the furnace is so perfect that the gases which enter the stack through the waste flue to be cast into the air do not exceed 300° Fahrenheit. This is the process which has been in use here since 1868, when this firm first introduced it into this country.

This vast business in all its extensive ramifications requires executive ability of a high order. The established success which the works have achieved is largely owing to the untiring industry, indomitable perseverance, and persistent energy of Robert J. Anderson, who twelve years ago, in connection with other partners, purchased the business from Jones, Boyd & Co., the senior member of which firm opened the business in 1845. The business has thus changed hands only once in thirty years. The best evidence of successful management is found in the fact that all through the last several years of financial depression these works have never stopped except for repairs, having run double turn, and sometimes the whole twenty-four hours of the day. They are now turning out agricultural steels, and bid fair to have a future as successful as the past. Progressive in their ideas, fully up to the wants of the age, having all the elements of success, they cannot fail to obtain it.

Representatives of this firm are located as follows: A. B. Parker, No. 21 Astor House, New York; Wm. F. Potts, Son & Co., Philadelphia, Pa.; Carolan, Cory & Co., San Francisco, Cal.; Augustus Wessel, Cincinnati, Ohio; Tronell, Handy & Greer, Baltimore, Md., and Miles & Cotton, 170 Lake St., Chicago, Ill.

ASTRONOMICAL OBSERVATIONS AT HIGH ELEVATIONS.

The progress of modern optics is now furnishing observers with telescopes of a power which exceeds the capacities of our lower atmospheres for their constant employment. The obstacles to definition due to this atmosphere have grown to be so nearly a barrier to any rapid progress that attention has lately been given to the conditions of vision which it is very commonly supposed will be found to be best on mountain summits. There is no exact information on this subject, however, and Prof. S. P. Langley was therefore led to make some observations on Mount Etna during a visit there in 1878, and the result of which he records in the July number of the *American Journal of Science and Arts*. His object was to gather some sort of quantitative estimate of the degree of transparency and definition, to take the place of vague statement, and to give a kind of standard for comparison with sites in our own territory. The station chosen was "Casa del Bosco," at an elevation of about 4,200 feet. The observations were directed to the sole end of determining the character of vision, as tested at night on stars and nebulæ, and by day upon the sun. After a limited number of comparisons, he infers that at this station about nine-tenths of the light of a zenith star reaches us, and that only one-tenth is absorbed by our atmosphere. The gain on Etna over a lower station, as tried by the tests of a double star observer, was more in clearness of the atmosphere than in that freedom from tremor which accompanies good definition. The latter was indeed upon the whole better than below, but not conspicuously so.

Prof. Langley concludes, as the result of his researches, that the balance of advantages for astronomical observations is most likely to be found in a dry atmosphere, and certainly at a great elevation. Such elevations have undoubtedly the advantage of diminishing the atmospheric absorption of the more refrangible rays, an absorption so important that it probably cuts off from us the larger portion of the ultra violet spectrum. The gain for observations of precision will be, though positive, not in itself probably such as to justify the difficulty and expense of such a site; but for the study of the nebulæ and stellar photometry the gain is very essential indeed, while for almost every problem in solar physics it may be said without reserve that, for rapid progress, such observations have now become not merely desirable, but indispensable. The summit of a lofty mountain, however, is not a desirable station. At an altitude of 10,000 or 11,000 feet the observer may still enjoy all the conditions of health that fit him for labor, but beyond this unfavorable conditions increase very fast.

Quoting from his own experience of a stay of ten days upon Pike's Peak, at an altitude of between 14,000 and 15,000 feet, Prof. Langley says that at this height the attenuated atmosphere makes a long stay impossible for some, while even for the healthiest the conditions of life begin to be such as to render continuous hard work scarcely possible. At the same time the mountain condenses about itself continuous clouds, so that, except during a brief period in the autumn, the opportunities for observation are far rarer than on the plains. A dry climate and a table land at an elevation of something like 10,000 feet, sheltered on the side of the prevalent winds by a mountain range, which precipitates their moisture in clouds that rarely advance beyond the observer's horizon, appear to be the most promising conditions in our present knowledge. Upon the whole, though the ideal station, where atmospheric tremor does not exist, and the observer pursues his studies in an ever-transparent sky, is not to be found on any part of the earth's surface yet examined, we find, says Prof. Langley, within our own territory, in the dry and elevated table-lands of Colorado or New Mexico, every condition which experience points out as favorable.

Our Leading Cities.

Cities.	1880.	1870.	1860.
New York	1,208,471	942,252	813,669
Philadelphia	843,000	674,022	565,529
Brooklyn	554,693	395,099	266,661
Chicago	502,940	298,977	109,260
St. Louis	395,000	310,864	212,418
Boston	352,345	250,526	177,841
Baltimore	350,000	267,354	212,418
San Francisco	280,000	149,473	56,802
Cincinnati	246,153	216,239	161,044
New Orleans	215,239	191,418	168,675
Washington	160,000	109,204	61,112
Cleveland	156,946	92,829	43,417
Newark	136,983	105,059	71,941
Milwaukee	130,000	71,440	45,246
Detroit	119,000	79,577	45,619
Louisville	112,000	100,753	68,033
Jersey City	105,000	81,744	29,226
Providence	104,500	68,904	50,666

Glycerine in Gastric Troubles.

Dr. Sydney Ringer calls the attention of the profession, in the *Lancet*, to the value of glycerine as a remedy in flatulence, acidity of the stomach, and pyrosis. He states that sometimes he finds all of these gastric troubles combined, but glycerine in nearly all cases relieves them. In some cases, too, it removes pain and vomiting, probably like charcoal, by preventing the formation of acrid acids, which irritate delicate and irritable stomachs. Glycerine does not prevent the digestive action of pepsin and hydrochloric acid; and hence, while it prevents the formation of wind and acidity, probably by checking fermentation, it in no way hinders digestion. He administers a drachm to two drachms either before, with, or immediately after food. It may be given in water, coffee, tea, or lemon and soda water. In tea and coffee it may replace sugar, a substance which greatly favors flatulence, as, indeed, does tea in many cases. In some cases a cure does not occur till the lapse of ten days or a fortnight.

IMPROVED CROSS TIE.

The engraving represents a light and durable cross tie made wholly of rolled iron or steel, and adapted to receive ordinary railroad rails, which are secured by a fixed and a movable clamp at each end. The body is made of steel or iron rolled in U shaped cross section, and having flaring sides of suitable depth to give it the required strength and rigidity. This form gives a broad top which affords a firm bearing for the rails. The body is attached to a base plate, B, by means of angled plates which are bolted or riveted. Angle plates are attached to the ends of the tie, forming a flange which extends downward and forms an additional safeguard against the end motion of the tie. This flange is usually applied only to ties used on curves to keep them from shifting or turning.

The rails are held in place by two clamps at each end of the tie. The inner clamps are formed with raised ends for receiving the flange of the rail, and are permanently attached to the tie by rivets. The outer clamps are similar to the inner ones, but they are attached to the tie by bolts and nuts, so that they may be removed to permit of changing the rails. The bolts may be readily inserted or removed, as they are accessible through the open end of the tie.

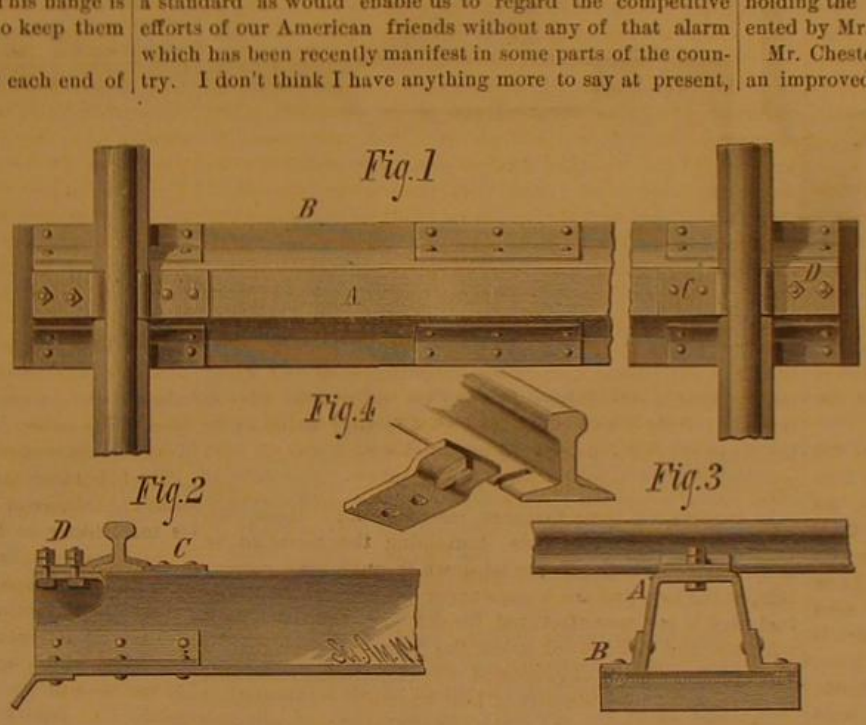
The ties will rest on the road bed, and the ballast can be tamped under it in the usual way.

To prevent the rails from creeping, the movable clamps may have lugs formed on them which may enter slots made in the rails as shown in Fig. 4. Only one tie in ten need be provided with this device.

Fig. 1 in the engraving is a plan view of the tie, Fig. 2 a partial side elevation, and Fig. 3 an end view.

The advantages of this tie over the wooden one and over other forms of iron ties will be readily seen by engineers and others familiar with the requirements. This construction secures strength, durability, cheapness, and facility of handling and application.

Further information may be obtained by addressing Mr. Louis Scofield, Chattanooga, Tenn.



SCOFIELD'S CROSS TIE.

AMERICAN MILLING AS SEEN BY AN ENGLISHMAN.

Mr. Samuel Smith, of Sheffield, President of the British and Irish deputation of millers to the late Cincinnati Exhibition, was called upon, at a reception given by the Utopian Club, to give some account of what he had seen in this country, and how the American milling industry stood as compared with the English. He expressed himself as follows:

"Among our competitors in the United States at Minneapolis, St. Louis, Milwaukee, Red Wing, and other places where the new process, or some modification of it, has been adopted, his voice would be like that of 'one crying in the wilderness.' (Laughter.) The millers in these places have thrown all that pertains to the old school to the 'moles and to the bats;' and although Mr. Z. might find some of them here and there using stiff irons, he would find few to adopt any other parts of the doctrine he expounded with so much ability at last meeting. As a rule, the organization of the American mills of the best class is perfect, and thoroughly automatic from top to bottom, every machine used in the process of flour-making being located in the right position relative to the work it has to perform. The bolting capacity of the dressing machines is much greater than that of ours, and where we use one middlings purifier, they use three at the very least. In new process milling they make all the middlings they can, which not only necessitates the employment of a larger number of purifiers, but a greater number of rollers, for softening middlings after purification, and while the entire system of machinery is worked at its highest capacity, no part of it is subjected to such a strain as to incur the risk of its doing the work badly.

"The conclusion I have come to, from all I saw in the best mills I had an opportunity of seeing, is that in order to compete with the American millers successfully there is no necessity for copying their system in anything like a slavish manner, but it is absolutely indispensable that we should adopt the thoroughness with which they do their work. They use at least four times as much silk as we are in the habit of doing in the dressing of their flour. They make more middlings than we do, and consequently use more purifiers and rollers, although in some cases stones are used for the treatment of middlings with highly satisfactory results, and if we are to hold our own we must reorganize our mills, increase our silk-dressing power, pay greatly more attention to our stones, than we have been in the habit of doing, both as regards dressing and balancing, the necessity of the latter being more than ever indispensable if the highest quality of work is required, and that, I need not say, under the conditions we are now placed, is a *sine qua non*. I certainly should not take the responsibility of recommending the adoption pure and simple of any of the specific systems which are in use in the United States in this country, partly because we cannot command to the same extent as is done in America a constant supply of the wheats that are used there. So far as our foreign supply is concerned, we must take what we can get. I noticed in an American milling paper that there was a chance of the millers of this country being able to make Minneapolis flour in consequence of the missionary efforts among us of milling experts from the other side of the Atlantic. I don't think it likely that we shall be able to accomplish that feat until we have the full supply of Minnesota spring wheat of the same quality as the Minneapolis millers have at their command. I am quite convinced, however, that by throwing our entire energies into the work, rearranging our mills upon principles which will secure for the different processes in the manufacture of flour the fullest manipulative efficiency, and adopting to the fullest extent the labor-saving contrivances which I saw everywhere in the States, and which so greatly reduces the cost of production, we could raise the quality of our own grades of flour to such a standard as would enable us to regard the competitive efforts of our American friends without any of that alarm which has been recently manifest in some parts of the country. I don't think I have anything more to say at present, but I may remark, in conclusion, that I will not readily forget the warmth of our reception in America, nor the hospitality that was so heartily extended to us."

A conversation here ensued on the remarks that had been made by the president, and the general impression seemed to be, that while there was no doubt that the reorganization of English mills to a greater or lesser extent upon principles approaching in some degree to those that had been adopted in the best mills in the United States—keeping in mind the special circumstances that controlled the action of the millers of this country, in order to deal effectively with American competition was indispensable—means must also be adopted to secure by means of special agencies under the complete control of the home trade of a fair proportion of the highest class of the wheats used with such beneficial results to their own interests by our American competitors.

Protection of Oil Tanks from Lightning.

To the Editor of the Scientific American:

Having never seen an oil tank, I can only gather by inference its mode of construction and surroundings. From the word supply, and from your statement that it is above the oil, I conclude that the pipe comes from a well at some distance, but I cannot learn that it is above ground or under it. If the pipe is underground and comes out of it a short distance from the tank, then, of course, the difference of potention between the pipe and the body of the tank will be nil, and consequently no current or spark will pass. The electro-motive force necessary to produce a spark in air, as you know, is enormous. From these considerations I think your remedy inapplicable. I should rather run a rod from the pipe up into the air, connecting it at the same time with both the top or cover and the body of the tank. This, I believe, would be more in accord with established electrical laws.

Of course, if the pipe is above ground for any distance from the tank in the direction of the well, your remedy will apply.

But another cause of the spark different from either of yours may be suggested. Oil is a well known non-conductor or dielectric, and may have a high specific inductive capacity and absorb a large quantity of electricity gradually from the earth. Being a dielectric, then, and allowing that the top or cover of the tank is insulated from the body by its style of construction, by a layer or coat of paint, thick oil, or any other way, we will have the body and the top or cover of the tank forming the plates of a condenser, with the oil or in the air or both acting as a dielectric. Under these conditions everything is very favorable for the passage of a spark between the top and body of the tank, or between either of them and the pipe, or in the reverse direction in a thunderstorm prevailing over the tank or at the distant well.

This may not be the cause, but examination in this direction should not, I think, be overlooked.

DAVID FLANERY.

Richmond, Va., July 26, 1880.

A Fast Locomotive for England.

The fast passenger locomotive lately built by the Baldwin Locomotive Works, and tested on the Bound Brook line between Philadelphia and New York, has been bought by Mr. F. W. Eames for brake trials and tests in England. It will be immediately fitted up with the Eames Duplex Automatic Vacuum Brake and shipped to London. Mr. Eames proposes, while showing the action of the Eames brake on railway trains at the highest speed possible to attain, at the same time to settle the vexed question of the relative superiority of American and English locomotives.

MECHANICAL INVENTIONS.

A device to be attached to lawn mowers for catching and holding the grass as it is cut by the mower, has been patented by Mr. Cyrus G. Baldwin, of Ripon, Wis.

Mr. Chester F. Allen, of Paw Paw, Mich., has patented an improved transfer truck for cars for transferring broad gauge cars over narrow gauge tracks without changing the truck of the broad gauge car. The invention consists in a narrow gauge truck constructed to carry a broad gauge truck, and provided with hooks for retaining the two trucks in position.

Mr. Charles F. Powers, of Sutherland Falls, Vt., has patented an improved tile facing and squaring machine, which will level and smooth by rubbing the faces and edges of several tiles at a time. It consists of revolving frames for holding and adjusting the tiles upon a rubbing bed or grinding plate or disk, and of novel devices for removing and replacing a tile without interfering with the work on the others.

Mr. Orville A. Wilson, of Bennington, N. H., has patented a cheap, strong, and durable fastening for uniting the handles and blades of knives and handles and tines of forks. The invention consists in combining a slotted handle having beveled annular shoulder, a bolster, a blade with slotted tank, and a screw bolt.

An improvement in calipers and dividers has been patented by Mr. William H. Warren, of New York city. This invention relates to measuring instruments, such as calipers, compasses, dividers; and it consists of revolving studs or pivots fixed at any convenient points on the instrument, and in combination with a slotted bar, whereby the legs of the instrument may be adjusted by means of screw and spring without loosening the clamping screws and nuts.

An improved baling press has been patented by Mr. Rufus P. Davis, of Monroe, N. C. The baling press is so constructed that the followers may be run down quickly while meeting little resistance, but slower and with great power as the bales become more compact, without forcing the bales out of shape.

Enlargement of New York Water Supply.

The works soon to be undertaken for the enlargement of the system of water supply for New York city includes the construction of a 15 foot dam at the outlet of Little Rye Pond, connecting both Big and Little Rye ponds, and forming a lake of 280 acres in extent, capable of storing 1,050,000,000 gallons. It is also proposed to build a dam on the Bronx, near Kensico, 45 feet high, making a reservoir of 250 acres, having a capacity of 1,620,000,000 gallons. A dam will be built across the Byram River 15 feet high, creating a lake with a capacity of 180,000,000 gallons. The Byram and Bronx rivers it is proposed to unite at this point.

From the Kensico dam the water will be conducted through a 4 foot iron pipe along the valley of the Bronx to a reservoir near William's Bridge in the upper part of the Twenty-fourth Ward, the elevation of which is 180 feet above tide-water and 65 feet above the Croton Aqueduct, and the capacity 100,000,000 gallons. The length of this conduit is 15 miles.

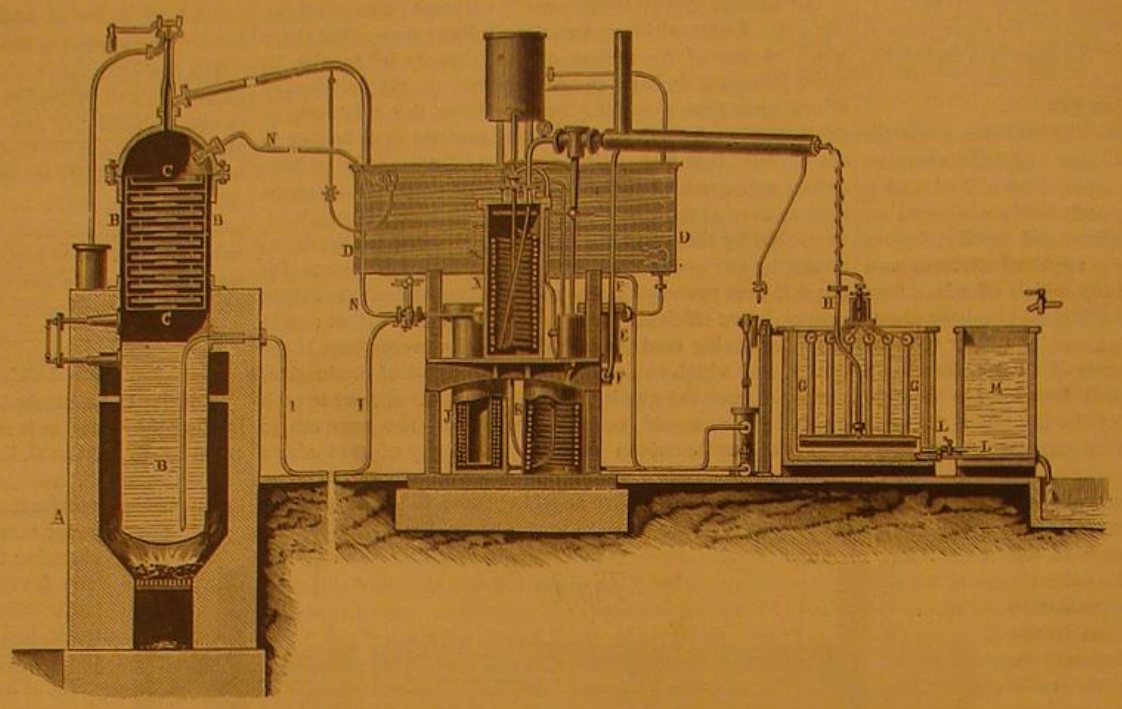
The Kensico reservoir will give the city of New York from 18,000,000 to 20,000,000 gallons more water daily. The contracts will be let August 4. It is estimated that the work will be finished in about two years, and cost about $2,700,000. By tapping the Bronx at Kensico there will be obtained not only pure water, but a remarkably good head. The country drained—over 13 square miles—is similar in geological character to the Croton Valley.

THE EXTRACTION OF THE SALTS OF SODIUM AND POTASSIUM FROM THE MOTHER LYE OF THE MEDITERRANEAN SALT PITS.

As is well known large quantities of salt are obtained in the southern part of France on the coast of the Mediterranean by conducting sea water into large basins and permitting the water to be evaporated by the heat of the sun; and it would seem as though salt could be obtained for such a low price by this method that it would not pay to utilize the residuum, but our modern economists do not believe in waste, and therefore extract as nearly as possible every particle. After the crystallization of all the chloride of sodium (common salt), the mother lye is evaporated in the open air until its density is about 32° Baumé, and is then conducted into other evaporating basins, where it abandons its mixed salts, consisting of sulphate of magnesium and chloride of sodium. After this crystallization the density of the mother lye is 35° B., and it is then conducted into large basins or reservoirs, where it remains through the winter, during which time the greater part of the sulphate of magnesium crystallizes.

The aqueous solutions, after these several crystallizations, contain almost exclusively potassic salts. To obtain the latter the solution is boiled, then mixed with a concentrated solution of chloride of magnesium, whereby a fresh quantity of mixed salts containing all the sulphate of magnesium is precipitated. The liquid is then poured off, and by cooling abandons the chloride of potassium and chloride of magnesium. To isolate the chloride of potassium it is sufficient to leave the salt in moist air and then wash it in cold water, which draws out all the chloride of magnesium. The chloride of potassium is clarified and dried, and is now ready for the industries.

In order to obtain the sulphate of soda the mixed salts, consisting of a mixture of chloride of sodium and sulphate of magnesium, are dissolved in water, and this solution is cooled by means of a powerful Carré refrigerating machine, represented in the engraving, which we take from *La Nature*. By this process chloride of magnesium and hydrated sulphate of soda of 50 per cent are obtained. But as yet this salt is not a merchantable product, and is therefore heated to about 50°–60° C., and then mixed with 20–30 per cent of mixed salts, containing from 8 to 10 parts of chloride of sodium. At about 33° C. it forms a precipitate containing anhydrous sulphate of soda. In the Carré apparatus, A is the furnace, B the receptacle for the ammonia solution, C C a rectifying device for retaining the vapor of the water, D D a worm for condensing the ammonia gases, E E a regulator for receiving the liquid ammonia and admitting it into the refrigerator, G, in which the temperature is decreased considerably by the change of the liquid ammonia to a gas. The solution of mixed salts enters in the refrigerator, G, circulates around the tubes of the same, and deposits the sulphate of soda, and in flowing through the tank, M, reduces the temperature of the liquid in the same. H H are tubes for conveying the ammonia gas to the absorption cylinder, X, where it is mixed with the exhausted solution of the receptacle, B. I I are tubes for conducting the exhausted liquid from the bottom of the receptacle, B, to the worms, J, K, in which the liquid is saturated with ammonia and cooled, and is then conveyed to the rectifier, C, by the tubes, N N.



EXTRACTION OF THE SALTS OF SODIUM AND POTASSIUM.

Surface Tension of Mercury.

The following pretty experiment, devised by Mr. R. H. Ridout, illustrates the surface tension of mercury. A shallow tray, six inches by three, is supported on three leveling screws, and inclined just so that the mercury does not flow over the lipped edge. If now a small quantity of the liquid be set flowing over the edge it will draw the rest of the liquid over with a siphon-like action. It is difficult, however, to get the surface so clean that no adherent trail should be left, marring the completion of the experiment.

THE LIVADIA.

The Livadia, the new Russian imperial yacht, was launched from the building yard of Messrs. John Elder & Co., Govan, near Glasgow, on July 7.

She is the latest development of ideas that may fairly be said to be revolutionary and subversive of all established principles of shipbuilding, and of which the earlier specimens are found only in the circular ironclads of Admiral Popoff. Speaking roughly, the Livadia must be imagined as a broad and shallow oval, half submerged, and carrying on its surface extensive lofty and sumptuous saloons and other apartments. It resembles a vessel of the ordinary kind, reposing upon a white air cushion. Its principal dimensions are: Length, 260 feet; breadth, 150 feet; depth, 50 feet; tonnage, 11,609; and displacement, 4,000.

The propelling power consists of three sets of engines, each having three cylinders, the diameters of which are: for the high pressure, 60 inches, and for the low pressure, 78 inches, with a stroke of 3 feet 3 inches. The propellers themselves are of manganese bronze, thus securing strength and lightness; and, with the view of obtaining the greatest possible power, steel has been largely used in the construction of the engines and boilers, which will be the most powerful in the world for their weight. The indicated horse power is 10,500, and the vessel is expected to make 14 knots an hour. The launch of the Livadia was the one great event at Glasgow.

NEW INVENTIONS.

An improved carriage pole foot, which is so arranged that it can be adjusted to different widths, has been patented by Mr. Henry Tine, of Danbury, Conn. The invention consists in combining a slotted pole foot and lugged guide plate with a screw bolt having a long head.

An improvement in distributing the wires of underground telegraphs has been patented by Mr. Mackintosh, of New York city. This invention relates to the leading of telegraph wires into buildings in such a manner that the wires cannot be seen from the street. The invention is an improvement upon patents for underground telegraph lines that were granted to the same inventor January 20, 1874, and January 16, 1877, and numbered 146,695 and 186,355, respectively; and it consists in leading telegraph wires or cable through suitable underground tubes or conduits to a pole or other device erected within the square inclosed by blocks of houses, and in leading the wires from the pole into the rears of the houses.

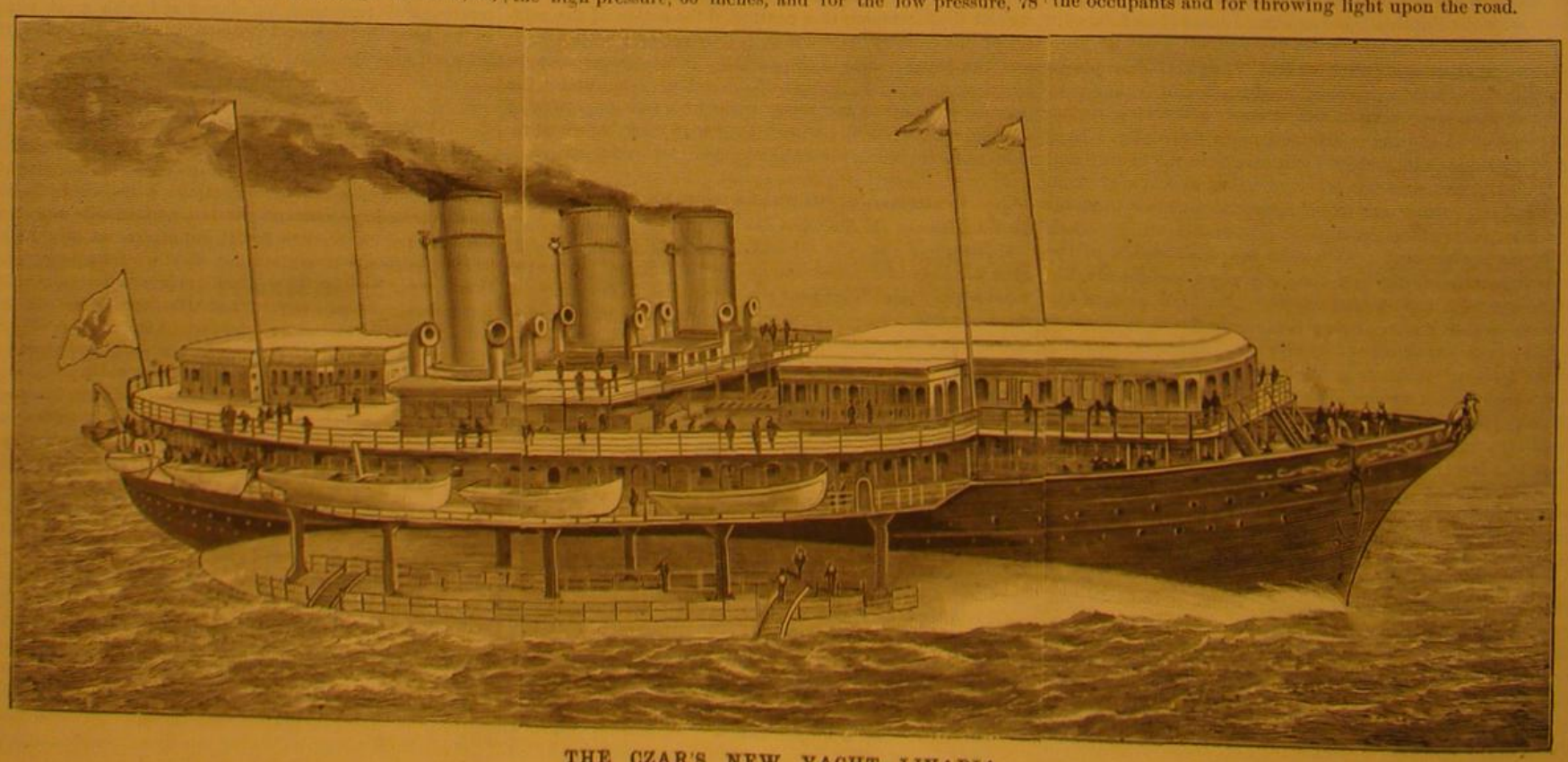
An improved beehive has been patented by Mr. Samuel Moore, of New Salem, Ill. The object of this invention is to provide a beehive with means whereby it may be thoroughly ventilated, and the bees thus always kept in a healthy and vigorous condition.

Mr. John M. Miller, of Huntsville, Ill., has patented an improved carpet stretcher, which consists in a novel arrangement of a stretching bar, a lever, and a pawl, by means of which a person can readily stretch a carpet and retain it under tension as long as may be required.

A bracket especially designed for dentists' use, which may be readily adjusted in a horizontal or vertical position, has been patented by Mr. Charles E. Kells, Jr., of New Orleans, La. The invention consists of a tube containing a spring-actuated longitudinally-moving ratchet, said tube being secured upon a plate which is pivoted to the end of two parallel arms, whose other ends are pivoted to a plate that is designed to be fixed to the wall of a room.

Messrs. Ebenezer Hathaway and Thomas H. Myers, of Hume, Ill., have patented a self-coupling coupler, by the use of which the necessity of going between the cars for the purpose of uncoupling will be avoided.

Mr. John J. Towle, of Dixfield, Me., has patented a combined foot warmer and lantern, which may be fixed in the bottom of a vehicle for the purpose of warming the feet of the occupants and for throwing light upon the road.



THE CZAR'S NEW YACHT LIVADIA.

THE STURGEON.

BY A. W. ROBERTS.

The most common varieties of sturgeon found in our waters are known as the sharp-nosed and the blunt-nosed sturgeon.

The sharp-nosed sturgeon (*Acipenser sturio*), so named from the fact of its snout being pointed, often attains a length of from twelve to fifteen feet and a weight of two hundred pounds. In habit it is a bottom fish, feeding on animal and vegetable substances. It is quite at home either in fresh or salt water.

The blunt-nosed sturgeon (*Acipenser brevirostris*) has a blunt, short snout, of but a quarter the length of the head. This variety is more frequently found in fresh water.

Hyde Park, some eighty-three miles up the Hudson River from New York, is one of the principal fishing stations for sturgeon (or, as it is sometimes called, "Albany beef"), whose roe, when properly prepared, is known as *caviare*, a food preparation greatly enjoyed by our German and French citizens, not to forget the Russians, to whom we export large quantities every year.

Of late years the take of sturgeon has fallen off steadily on account of the great increase in the number of both set and drift nets used in shad fishing, and also the greater number of vessels of all descriptions passing up and down the river, all of which scare the sturgeon from their favorite feeding and spawning grounds. Only a few years ago it was no unusual occurrence for a fisherman to take twenty and often thirty good-sized sturgeons a day, whereas now one and two a day are considered a good catch.

The fish are taken with a net varying in length from five hundred to seven hundred feet by thirty feet in depth. The net is made of heavy cotton twine well tarred, the size of the mesh being one foot. The fishermen knit their own nets. A good sturgeon net costs from $50 to $75. The anchor lines to which the net is attached are twenty feet long. Along that part of the net which is known as the "cork line" are attached from twenty to thirty wooden buoys, to show the position of the net when under water as well as to keep it in an upright position. As soon as a sturgeon butts or strikes the net with his head, or he becomes gilled in the mesh, the entire line of wooden buoys begin to dance; those directly over the gilled sturgeon disappear under the water and thus indicate exactly where to "cut-up" the net for the sturgeon. A noose is then passed over the tail of the sturgeon and he is hauled into a large flat-bottomed scow, after which he is well clubbed over the head to stop his flopping. A good sized "cow sturgeon" is worth about $5, the roe weighing about one third as much as the fish. A fifty pound roe is considered a large roe, thirty pounds being the average. A "bull" sturgeon seldom brings more than $3, and is usually cut up into steaks for smoking.

As soon as the sturgeons reach shore they are opened, and the roes taken out and conveyed in tin vessels to a very cool underground apartment built of stone, containing a cemented floor. Masses of roe are rubbed on wire sieves till each egg separates from the fatty and fibrous portion of the roe and passes through the sieve; the eggs are then placed in tin vessels and salted for a short time, after which they are laid on hair sieves to drain off. When thoroughly drained what was but a short time ago only halibut spawn, is now the toothsome *caviare*, of which thousands of pounds are annually spread on bread and eaten with much relish. After draining it is packed in barrels, each barrel containing one hundred pounds, which sells at ten cents a pound. In this country no use is made of the air bladder of the sturgeon, out of which isinglass is made in Russia.

The smoking of sturgeon is entirely in the hands of small dealers, mostly Germans in and about New York city, small lots of sturgeon and eels being smoked each day. Smoked sturgeon and eels have to be worked off rapidly, as they soon become mouldy and rancid.

I once brought a live sturgeon from Menemsha Bight, Mass., weighing one hundred and seventy-five pounds. He lived in the aquarium several weeks. When taken out of the tank dead it was discovered that his insides were gone (eaten out by other fish). How long he had lived in this condition none of the professors knew, but it was conceded that the sturgeon on the whole was a tough fish.

STURGEON AT THE BERLIN INTERNATIONAL FISHERIES EXHIBITION.

Duration of Vitality of Seeds.

The duration of vitality of seeds, says one of our foreign exchanges, depends upon a variety of circumstances. Under exceptional conditions, such as being buried at a considerable depth in a moderately dry soil, some seeds will retain their germinating power for an almost indefinite period; but great doubt and uncertainty attach to all the accounts of the germination of very old seeds. This remark applies to the so-called mummy wheat, said to have been raised from grain taken from an ancient Egyptian sarcophagus, and some other instances of the same nature. It is, however, not impossible that some seeds may retain their germinative force, under the exceptional conditions indicated, for a much longer period than that for which we have unimpeachable evidence. A humid atmosphere is very destructive, but exposure to a moderately dry air acts beneficially. The degree of cold a dormant embryo will bear with impunity, providing it has not been saturated with liquid, seems to be practically unlimited. Mr. Darwin and others have made experiments on seeds by immersing them in salt water. Out of eighty-seven kinds sixty-four germinated after being in salt water for twenty-eight days, and a few after an immersion of one hundred and thirty-seven days.

Instances are on record, too, of seeds of American plants, which have been washed on the shores of Western Europe, germinating after their long voyage across the Atlantic. Perfectly ripened seeds of different plants vary greatly in their germinating force; and the approximate duration of vitality of most common seeds when stored is known. Some seeds, such as those of angelica, coffee, etc., must be sown soon after they are collected; others, like those of the China aster, alder, birch, and sycamore, will rarely germinate the second year; while others retain the power for an unknown period.

Authenticated instances of seeds retaining their germinating powers for a considerable number of years are by no means numerous. Seeds of *Sida abutilon* kept in a seed warehouse for at least a quarter of a century have germinated as freely at the end of that period as when first received. M. De Candolle, in 1856, sowed seeds of three hundred and eighty-six species collected in 1831, twenty selected seeds of each sort being employed in the experiment. Only seventeen species germinated, and, of fifteen of these, only one, two, or three seeds; but fifteen out of twenty of *Dolichos unguiculatus* and six of *Lavatera* grew. Radish seed has been known to grow freely when seventeen years old, and it is also recorded that kidney beans one hundred years old, rye one hundred and forty years old, and *Mimosa pudica* sixty years old, have germinated. Probably some of these records are due to unintentional errors in the experiments. So far as experience goes, prolonged vitality seems to depend on the nature of the pericarp, testa, or albumen, though there are some inexplicable exceptions. Thus carrot will keep good four years, whereas angelica and parsnip (members of the same family), having more oily seeds, will only grow the first and second spring respectively after they are collected. The seeds of Australian acacias, which have a very hard, dense testa, are long lived, but the kidney bean, which belongs to the same family, rarely grows after the third season. Some seeds, for different reasons, are preferred two or three or more years old to quite fresh ones; in some instances because the older seed germinates more regularly as to time. Old balsam seed, other things being equal, has the reputation of yielding a larger proportion of double flowered plants than new, because its vital force decreases with age.

The average duration of vitality in seeds of some of our cultivated plants is as follows: Artichoke, five years; broad bean, six: beet root, five; cabbage, five; carrot, four; cucumber, five; lettuce, five; maize, two; melon, five; onion, two; parsnip, two; peas, four or five; radish, five; spinach, five; tomato, five; turnip, five; egg plant, seven; endive, nine; parsley, three; strawberry, three. An analysis of these figures shows a general agreement in the constitution of the seeds of different plants of the same families, with exceptions which can be accounted for in the way already explained. Exalbuminous seeds, and those with very little albumen, retain their vegetative power longer than seeds with a minute embryo and a relatively large quantity of albumen. Taking a broader survey, the rule holds good that the more highly developed embryo, whether small in itself or large, will lie longer dormant without losing life than the large or small embryo of albuminous seeds. Sir Joseph Hooker has stated that the seed of *Nelumbium speciosum*, taken from a herbarium known to be upwards of one hundred years old, germinated. This seed has an exceedingly dense testa.

FORMATION OF AMERICAN COAL.

The base of our coal measures is a rock, called the great conglomerate, which is chiefly composed of white, water-worn pebbles. Its composition proves it to have been the bed of an ancient sea; and that a great sea existed in the eastern half of our continent is a fact well known to geologists, who have traced it from the Rocky Mountains to the Blue Ridge. In this wide expanse of water the coal deposits of our country were formed beyond a doubt. It was a wise provision of nature to lay for their base the thick and strong conglomerate rock, as the violence of volcanic action in that early period was so great that a weaker barrier would have been broken, and the coal would have been destroyed by denudation. The 200,000 square miles of American coal are divided, by Prof. Rogers, into five great fields, of which the first, or eastern, includes the coal deposits of Newfoundland, Nova Scotia, Cape Breton, and New Brunswick. The second, or Alleghany coal field, is the largest, and extends from Pennsylvania and Ohio, southwestward, into Georgia, and includes the anthracite fields of eastern Pennsylvania. The third is a small field, known as the northern, occupying the central part of Michigan; and the fourth is the central field, including parts of Illinois, Indiana, and Kentucky. The fifth or western field, lies west of the Mississippi, principally in Iowa and Missouri, but extends into Arkansas.

Besides these well defined fields, we have, further west, the uncertain deposits of the Black Hills; but as the thickness of the American coal measures regularly decreases from east to west, the seams that may be found on the eastern slope of the Rocky Mountains must be very thin and scarcely workable. In the east, where the coal formation is thickest, there are in all about fifty seams, but not half of them are of sufficient thickness to be worked. In Nova Scotia only five are of workable dimensions, and these produce about twenty-five feet of coal. In the anthracite region, the number of productive seams is about twenty-five, and they average in some sixty feet of coal, but their maximum yield is somewhat over a hundred feet. The largest of the anthracite veins is the "Mammoth," which is thirty feet thick. In the Alleghany region the average thickness of workable seams is about half that of the anthracite fields; and in the western fields it is only about ten feet. Thus the number of seams, and the quantity of coal, decrease from east to west; as also the thickness of the intervening strata of rock. The greatest depth of the coal measures, including these strata, is 3,000 feet.

It is supposed that coal was formed during the carboniferous era, when the earth and the atmosphere were in a condition to produce an unlimited and gigantic growth of vegetation.

That the coal beds had their origin during this vast vegetable growth, is a well attested fact; but the process by which the carbon and bitumen of that rank vegetation were concentrated and solidified, is a point on which scientists differ. The fact that there is no sign of vegetation in pure coal, indicates that the component parts have been expelled by heat or pressure, in the form of oil. If accumulated vegetation or woody fiber had formed coal, it would doubtless be fossiliferous. It seems natural, therefore, that the enormous oil deposits of the carboniferous era, resulting not only from resinous vegetation, but also from the countless myriads of marine animals, when accumulated in localities having the requisite conditions, formed beds of coal. Great quantities of this oil were evidently sealed between rocky strata, and thus kept from solidifying, for want of exposure; and from these reservoirs issue the numerous oil springs of the present day. Herodotus, more than two thousand years ago, referred to a spring on one of the Ionian Islands, which is still flowing. The Chinese *Hotsing*, or wells of fire, are gaseous petroleum springs, and are made of much practical service in evaporating salt water. There is a similar spring in Fredonia, New York, south of Lake Erie, the gas of which is used for lighting the town. Genoa and Parma, in the north of Italy, are similarly lighted. In Cuba petroleum springs are very numerous; and between the fissures of rocks it has consolidated in the form of bitumen, which is used for fuel. When petroleum is thus solidified by exposure to a moderate heat, it bears a strong resemblance to bituminous coal; but under a higher temperature, the hydrogen and oxygen are evaporated, leaving a comparatively pure carbon, resembling anthracite; and when subjected to an intense heat, the carbon is also vaporized, leaving only the impurities.

The best anthracite coal contains about ninety per cent of carbon, which is rendered gaseous by the ordinary process of combustion. From these facts we may infer that the various kinds of coal are due to different degrees of heat to which they were exposed during formation. The oily cannel coal was evidently formed with little heat, the ordinary bituminous with more, while the hard anthracite was subjected to such a degree of heat as left it nearly a pure carbon.

Oil being lighter than water, it readily accumulates on the surface of lakes, and on long exposure it forms a sheet of bitumen, or pitch, which in winter is hard, so that a man can walk on it with safety. There is such a lake on the island of Trinidad, one of the West Indies; and similar lakes are known to exist in other volcanic regions. Hence, during the periods of vegetable and animal oils, and of extraordinary volcanic activity, producing, no doubt, an abundance of oil directly from mineral sources, it is reasonable to suppose that immense bodies of water were thus covered to a great depth with plastic coal. The time of such formation necessarily corresponded with a period of volcanic inactivity. While forming, the sheet may have been occasionally sprinkled with a slight shower of ashes, causing an impurity in the coal, such as slate or bone; and a rent in the sheet, caused by contraction, may account for the fact that the miner sometimes suddenly loses the vein, and must grope for it through the rock. When volcanic action revived, the greatest imaginable changes must have taken place, to account for the strata of rock overlying the seam. Between some of the seams the stratum is over two hundred feet thick. Showers of ashes or streams of lava may have sunk the sheet to the bottom, when, during the next period of inactivity, another seam may have been formed to be submerged in like manner, but perhaps with a stratum of only a few feet in thickness.

That these strata decrease in thickness from east to west, may be attributed to the well known geological fact that volcanic activity was greatest in the eastern section of our continent; and as the seams decrease in like manner, we may infer that coal owes its origin chiefly to volcanic sources.—*By Moses Zweizig, in Christian Weekly.*

PLANTS OF THE CARBONIFEROUS PERIOD.

NEW USE FOR CYPRUS REED STEMS.

Mr. John R. Jackson, of the British Museum, referring, in the *Gardener's Chronicle*, to the enormous trade now carried on in London in the manufacture of walking sticks and parasol handles, says that, notwithstanding the large number of these useful and ornamental articles that are constantly being produced, and the consequent demand for certain kinds of sticks, there is every now and then a utilization of something quite new, and different from anything that has hitherto preceded it. Such, for example, was the discovery and adaptation of the fasciated stems of the fuller's teasel, which some two years since were imported in vast numbers from France for the sole purpose of converting into parasol handles. At a recent meeting of the Linnæan Society specimens of a newly introduced cane were exhibited both in the rough and finished states. These canes were at first thought to be derived from a species of bamboo—*Bambusa nana*—and hence received the trade name of "Nana"; but it was afterwards discovered that they were from the Cyprus reed (*Arundo donax*). The peculiarity which has caused them to be taken up for the purpose to which they are now applied lies in the irregular and fantastic forms of the rhizomes, and especially in the ring-like ridges which encircle these rhizomes at regular intervals. Owing to the combined form, surface markings, and natural yellow tint, which harmonizes so well with the coverings used, a more unique handle for a parasol could hardly be produced. These articles have now become quite the rage, and may be seen in large numbers in the show windows of fashionable stores. The Cyprus reed is a robust grass, growing fifteen feet or more in height, with abundant leaves and very large terminal panicles of a brownish-white color. It is found in southern Europe, eastern Asia, and on this continent in Texas and Mexico, and is apparently the reed mentioned in Scripture. The uses to which the plant has hitherto been applied are as supports for vines, for fishing rods, etc.

Functions of the Air Bladder in Fish.

In a paper read at a recent meeting of the Cotteswold Naturalists' Field Club, by Mr. Francis Day, the author remarks that few among the organs in fishes have been the cause of so much discussion as the air bladder, which is a single or variously divided sac, situated beneath the vertebral column and the kidneys, and placed above the center of gravity. As this organ is sometimes present or absent in species of the same genus, it is evident that it is not entirely indispensable to the fish's existence. It originates as an offshoot from the stomach, elongates, and then enlarges at its extremity into what is termed an air bladder. In the dipnoids the air bladder communicates with the œsophagus during life, and its functions are analogous to those of lungs. In *Amia*, a ganoid fish, it has also a lung-like function, but in *Acipenser* it is used merely for hydrostatic purposes. The air bladders, however, are not considered as lungs in most fishes, since the blood is supplied to them from the adjacent arteries, and in many cases returns as venous blood into the circulation. In *Lepidosiren*, however, in consequence of the non-development of gills on the two inferior branchial arches, the blood is not arterialized there, but passes on to the air bladder for this purpose. The lepidosirens are doubtless the highest known form of living fishes. The chief use of the air bladder in teleostean fishes is (1) hydrostatic; (2) acoustic, it being partially or entirely employed for hearing by means of various modes of connection with the internal ear.

In the *Physostomi* the air bladder occurs as a closed sac. In the marine forms of these orders a tubular prolongation itself passes forward to the anterior portion of the skull to establish an auditory communication, but in the fresh water species the connection is formed by a chain of auditory ossicles. In conclusion, Mr. Day says that the air bladders in fishes is the homologue of the superior vertebrate forms, and that in some of the higher sub-classes it serves as an accessory respiratory organ.

Amplifying Small Motions.

At a recent meeting of the London Physical Society Mr. Ridout exhibited a device for amplifying small motions. A small barrel is slung by two threads between the prongs of a metal fork in such a manner that if the fork is bodily carried to and fro the barrels will rotate round its axis. This is simply effected by making each thread, in its passage from one prong to the other, take a few turns round the barrel. To the barrel an index is attached, and the fork is then fixed on the body whose minute motion is to be indicated. The translation of the body shifts the fork and rotates the barrel, which in turn deflects the index round the face of a dial, and the magnifying power is expressed by the ratio of the diameter of the barrel to the length of the index. With this apparatus Mr. Ridout exhibited the lengthening of an iron core when magnetized by the passage of the current of two Grove's cells through an insulated wire coiled round it. By riveting a slip of brass to the iron the unequal expansion of brass and iron under heat was also shown, the heat being generated by keeping the current flowing in the coil.

Mr. D. Winstanley exhibited his new radiograph for recording graphically the intensity of solar radiation throughout the day. It consists of a differential thermometer, with one black bulb and a circular stem. The lower part of the stem is filled with mercury; the upper branches with sulphuric acid and water. The tube is mounted on a brass wheel, so that when the black bulb is exposed to the sun's rays the differential motion of the mercury causes the wheel to turn. The wheel carries a light index or marker, which is free to traverse a vertical cylinder covered with paper coated with lamp-black, and leaves a white track where its point has scratched off the soot. The radiogram thus produced can be fixed and preserved.

Dr. Guthrie pointed out the curious "thermal twilight" these radiograms had betrayed to Mr. Winstanley. They show that before sunrise the temperature increases, owing to solar radiation. Moreover, half an hour after sunset the index falls, and remains till within a few minutes of midnight, when it mysteriously rises and sinks again, although the sun is then directly over the opposite hemisphere.

History and Progress of American Water Works.

The first works in America for the supply of water to towns were constructed by Hans Christopher Christiansen, and put in operation June 20, 1754, at the Moravian settlement of Bethlehem, in Pensylvania.

The water from a spring, which is still used for the supply, was forced by a pump of lignum vitæ of five inches bore, through hemlock logs into a wooden reservoir.

The same ingenious Dane, eight years later, replaced this rude pump by three iron pumps of four inches bore and eighteen inches stroke, which for many years were the only machinery for water supply on the continent, and for seventy years furnished the water for Bethlehem.

Among the oldest, if not the very next in date to Bethlehem, is the Morristown, N. J., Water Company, which was incorporated in 1791, and has ever since furnished the town with water collected from the neighboring hills.

The first application of steam to pumping was in Philadelphia, in 1800, when the third steam engine of any considerable size in the United States was erected on the banks of the Schuylkill. It is believed that these works were the first constructed by a municipality. The first cast iron water pipes were laid in Philadelphia in 1804.

New York was first supplied by a company which erected a small pumping engine about 1800.

During the first thirty years of the century several small works were constructed, among others, at Cincinnati, in 1817; at Detroit, in 1827; at Lynchburg, in 1828; Syracuse, in 1829; and Richmond, in 1830. Few of these works exhibited any great advance in engineering. The enlarged works for the supply of Philadelphia by water power, constructed at Fairmount, in 1822, showed, however, a marked advance, and were for many years regarded as a model of efficient and economical works. The design and execution of the gravity supply works for New York and Boston, between 1830 and 1840, were such as cannot be greatly improved, even at the present day, except in some minor details.

About 1850 the substitution of light wrought iron pipe, lined inside and out with hydraulic cement, for cast iron, at greatly reduced cost, was found to be practicable in many cases, and the formation of companies to manufacture and lay such pipes, introduced a commercial element into the matter of water supply, and led to the construction of many works.

Improved forms of pumping machinery, which performed a fair duty at small expense for construction and maintenance, were designed and their manufacture became a special business.

The careful analysis and investigation employed in the construction of the works for the supply of Brooklyn, between 1850 and 1860, resulted in a more decided advance, in both theoretical and practical science, than had hitherto been made, the effects of which were seen during the succeeding decade in improvements in pipe manufacture, in engine building, in reservoir construction, and in maintenance of works.

Between 1860 and 1870 a further impetus to water works construction was given by the vigorous prosecution of an enterprise for building entire works for direct supply, by pumping into the mains without the intervention of a reservoir. The success attending this enterprise, owing to the small first cost of construction and to shrewd management, created competition, the result of which has been to force the adoption of scientific methods and the employment of skilled engineers, and as a consequence there has been great improvement in the types of machinery and in economical working.

The pumping machinery of large cities has also been greatly improved; the duty now required, and uniformly maintained, being at least fifty per cent greater than it was thought possible to obtain twenty years ago, or than is now furnished by the less costly "commercial engines," of which two firms alone have built 242 for 168 towns, with an aggregate pumping capacity of 734 millions of gallons per day.

The construction by Mr. Chesbrough of a submarine tunnel for two miles under Lake Michigan, to furnish water for Chicago, was one of the boldest engineering feats of this century. Its successful completion was followed by the construction of several similar works.

On the Pacific coast the use of unprotected wrought iron pipe for conveying water great distances, and under great pressure, has proved very successful.

During the past ten years the most important work executed has been the enlargement of the gravity supply for Boston, by the construction of a conduit of masonry, in the designing and erection of which the latest and most perfect methods have been followed. The subjects to which particular attention has been paid by engineers during this period have been the efficiency of pumping machinery, the capacity of gathering grounds, the preservation of the purity of the water, and the prevention of waste by consumers.

All American works are constructed for a constant supply, and most of those first built had a capacity far in excess of the then demand, which caused the formation of habits of wastefulness, which it has been found difficult to check when the limit of the capacity was nearly reached.

The magnitude of the interests involved in this branch of engineering may be judged from the fact that there are now in the United States and Canada 569 towns with a public water supply, having a population of about 12,000,000, to whom there are daily distributed over 600,000,000 of gallons of water, through 13,000 miles of pipes, of which about 10,000 miles are of cast iron.

About one-half of these towns are supplied by gravity, many of them, however, having supplemental pumping power, the total capacity of the pumping engines now in use being about 1,900 millions of gallons per day.

Meanwhile improvements in plumbing and house distribution have greatly added to the convenience about our homes, and we now virtually have a spring of cold and another of hot water in almost every room of our city houses to put on tap at will.—*O. Chanute.*

Printing Exhibits.

An interesting exhibition has lately taken place at Agricultural Hall, London, of printing and book machinery, stationery, etc. Among the exhibits the proprietors of the *Daily Chronicle* have on their stand, besides a variety of raw materials and paper stuff, a large roll of paper such as is used in their printing works, but of exceptional dimensions, to show the capacity of paper-making machinery. This roll contains an endless band of paper 110 inches wide and about 5 miles long, and is manufactured on a machine made by Messrs. G. & W. Bertram, of Edinburgh, the rolls of which are 125 inches wide, and it is said to be the largest paper-making machine in the world.

The Lanham Printing Roller Company have on their stand a number of their patent India-rubber rollers, and among them some ink rollers of large size, which have been in daily use on one of the Hoe American printing machines at the London *Daily Telegraph* for over two years, and still appear in excellent condition. These rollers have a solid rubber surface about ¼ inch thick; below this an additional amount of elasticity for special purposes is obtained by casting thin iron rods, about ¼ inch in diameter, at about ½ inch pitch all round into the rubber, and drawing them afterward, leaving holes through the length of roller. The total India-rubber thickness of these rollers is about ⅝ inch, and this shell is fixed over an inner core. To insure perfectly true running, the rollers are carefully turned, and this operation can be repeated should their surface become worn. This, however, appears to be necessary only after very hard wear, and though the rubber rollers are no doubt expensive in first cost, they repay themselves by their reliability and durability.

Messrs. Waterlow & Sons, of London Wall, show a large group of miscellaneous exhibits, among others a stylographic pen, an American device recently introduced into England. It is an admirable specimen of workmanship, and is very ingeniously designed. The handle of the pen is also the ink reservoir, but it contains besides, a hollow stem projecting beyond the lower end of the handle into the cover which terminates in the writing point. The upper end of the stem is open to the air, but is closed with a screw cap that covers a small hole admitting air into the stem. To the lower end of the latter a light spiral gold spring is attached, carrying at its outer end a fine iridium-tipped needle point. This needle is protected by the cover which screws into the stem, and which terminates in a hollow iridium point, through which the end of the needle projects slightly and plays up and down as the point of the pen is passed over the paper, every slight motion of the point pumping down a small supply of ink, while air enters from the top of the pen down the stem already mentioned, and through a small hole at the foot of the stem. The point is protected by a cap, which is fitted on to the top of the handle when the pen is in use. These pens, says *Engineering*, are all of American manufacture, and we doubt whether it would be possible in this country to produce so well-finished a combination of vulcanite and metal.

Chemical Manufactures in Philadelphia.

One of the great industries of Philadelphia is the manufacture of chemicals, or of articles for the production of which chemical processes are necessary. Many of these take the form of drugs and medicines for the wholesale trade, not including specifics. Others are acids, alkalies, and chemical agents used in other manufactures. White lead and chemical paints are also included. The line of distinction is not easy to define to the general reader, though well recognized in the trade, and it does not include the body of products known as dyes, paints, and medicines, although closely related to them. As so defined, the chemical manufacture in Philadelphia includes, says the *Public Ledger*, about thirty establishments, whose annual product has risen from $6,152,380 in 1870, to $10,000,000 in 1875, and $12,000,000 in 1877, and, as nearly as may now be calculated, about $12,000,000 in value for the year just closed. They give employment to about 2,000 persons—a relatively small number for the values produced—and have attained a position of supremacy in their respective departments which renders them reasonably secure. The drug and medicinal products are the largest, eight or ten establishments producing $8,000,000 in value of quinine, morphia, preparations of iodine, bromine, etc., with other standard pharmaceutical preparations. These are now the basis and body of applied pharmacy in this country, and are likely to increase even more rapidly in the future. On the side of standard medicines used as specifics almost as much more would be added, and the classification would be entirely appropriate as a manufacture. The drug and chemical works insist on the distinction, however, and in a calculation of a total of $12,000,000 production they are not included. They would reach $6,000,000 at least, and under the general name of proprietary medicines, footed a total of $5,490,105 in 1870.

Progress of Railways in Texas.

Ex-Governor John C. Brown, Vice-President of the Texas and Pacific Railway, tells the *World* that the progress of the road is now very rapid. Already the line approaches the Brazos River, and by the end of the current year it will have 150 miles or more of track beyond that point. The region is remarkably fertile, and is rapidly filling up with population. Several other important railway operations are being vigorously forwarded in Texas.

Among these is the extension on the Texas and Houston Central westward from Waco to Eastland City. There it makes a junction with the extension of the Texas and Pacific Railroad Company; the extension of the Gulf, Colorado, and Santa Fé road northward and toward Fort Worth or Dallas; the extension of the transcontinental branch of the Texas and Pacific Company Railway line from Sherman to Whitesboro and thence to Denton; the early extension of the Dallas and Wichita to Denton, to connect with the extension from Sherman. A new line from Dallas toward Sabine Pass is being pushed forward under auspices which promise an early construction of the line, which will be most important to the enterprising and growing city of Dallas, and will be a very important feeder to the two trunk lines which cross each other in that city. This line will connect southeastern Texas with the great West and Northwest, and tapping as it does the vast forests of long-leafed pine and red cypress will transport to the prairie countries the products of these forests, which, while this carriage will be a very large source of profit to the lines over which they are conveyed, will furnish cheap lumber to the region of country west of Dallas, which is very rapidly filling up with population and is one of the most productive agricultural sections in the world. From Austin, the capital of Texas, to San Antonio, the most important city in the southwestern part of the State, the International Railroad is being constructed, and it is believed by many that either that line or the one known as the "Sunset Line" will be pushed rapidly to the border of Texas at Laredo or some other point on the Rio Grande.

There are also a number of narrow gauge roads in various parts of the State being rapidly built; among which may be mentioned one from Corpus Christi which follows up the valleys of the Nueces and the Rio Grande; the east line from Jefferson, which is now extended to Sulphur Springs, and is being pushed rapidly west by the way of Greenville and McKinney; the Texas and St. Louis from Texarakana by way of Tyler and Corsican, in the direction of Waco and beyond. Another and perhaps the longest line of narrow gauge in the State, is the one from Houston, known as the Bremonde road, running northeastwardly in the direction of Marshall and Shreveport. There is another railroad enterprise on foot which has been reorganized and promises an early commencement of work from Dallas to Cleburne among the richest and most populous communities in the State.

The Iron Capacity of the United States.

Speaking of the failure of the Vulcan Iron and Nail Works at Chattanooga, *Capital and Labor*, of England, says: "The failure of one remote mill at the present juncture means, perhaps, very little; but throughout the United States many works are reported unemployed, not because there is no demand, but because *the production of raw iron in the United States is really inadequate if America has any pretensions at all to the ability to supply her own needs in respect to raw material.*" These comments exhibit singular ignorance of the iron industry of the United States. The truth is, the blast furnace capacity of the United States is more than sufficient to supply the demand, as shown by the fact that a great many of them have been idle for six or seven years.

The *Enquirer*, on the other hand, "hits the nail on the head" squarely. In a lengthy editorial, besides other facts, it gives utterance to the following: "The United States have at the present moment a great deal more iron than they can possibly use, and *facilities for producing at any time more iron than they want*—always provided that the consumer does not insist in having supplied to him in any one year as much iron and steel as he can use in two years." This, says the *American Manufacturer*, is an undeniable truth most happily stated. It was this singular greed of consumers that led to the heavy importation of iron during the last ten or twelve months, and not the inability of our manufacturers to supply all the iron the country needed.

Expansion of Glass.

The expansion of glass by heat may be demonstrated as follows: A glass tube of narrow bore and about eighteen inches long is bent round in the shape of a horseshoe, so that the free ends are within a millimeter of one another. Between these ends a coin may be held, being nipped between the ends of the rod and held there by the grasp due to the elasticity of the glass. If now the *outer* portion of the curved part be warmed, the ends open slightly and the coin drops out. This experiment is due to the ingenuity of Mr. Ridout.

RECENT DECISIONS RELATING TO PATENTS.

United States Circuit Court.—District of Minnesota.

PATENT FOR CORRUGATED IRON FOR BUILDINGS.—BELT *vs.* CRITTENDEN.

The complainant is the assignee of the letters patent granted to F. E. Perkins, May 30, 1876, for improvement in metal coverings for buildings.

The claim is:

A metallic covering for wooden structures, composed of the metal sheets, B, applied to the surface of the structure in the manner shown, whereby an air space is left between the metal sheets and the wall or structure at all points, except at the edges of the sheets, substantially as and for the purpose set forth.

Nelson, J.:

The defendant's witnesses, upon the defense of novelty, refer to several forms of corrugated iron previously used, and all would fill the specification and claim made by the complainant. The fact that the iron at the point of contact with the wood is double in thickness, or that the nail holes at the joints may be made elongated in order not to interfere with the nails in case of expansion or contraction lengthwise of the corrugations, will not sustain the patent; nor will his manner of forming the joints connecting the several sections of sheathing aid him. There is no novelty in the latter.

The bill is dismissed, with costs.

United States Circuit Court.—Northern District of New York.

PATENT HAY RAKE.—WISNER *vs.* GRANT *et al.*

Wallace, J.:

1. Claims 1, 2, and 4 of reissued letters patent granted to William H. Field, November 5, 1878, for an improvement in horse hay rakes, held to be substantially anticipated by the patent granted H. W. Sabin, December 3, 1850.

2. Where the office of a reissue was to secure a broad claim the complainant in a suit upon such claim must be held thereto, even though the real invention is not secured thereby.

United States Circuit Court.—Southern District of New York.

MCDONALD *vs.* SIDENBERG *et al.*

The construction given by the court in the case of McDonald *vs.* Shepherd to the patent granted to Helen M. McDonald, September 29, 1874, for an improvement in skirt protectors, approved.

Helen M. McDonald for herself. Mr. E. N. Dickerson for the defendants.

Blatchford, J.:

The defendant's article in the present case does not have a fluted or plaited border, but it is like the plaintiff's article in all other respects. I concur with Judge Lowell in not regarding the fluted or plaited border as essential, in view of the state of the art prior to the plaintiff's invention in December, 1861. The affidavits presented by the defendant in the present case do not show any article anticipating that date like the plaintiff's invention, whether with or without a fluted or plaited border. T. D. Day gives no date earlier than 1865. The article of 1858, which J. Morrison speaks of, was only a facing. His entire affidavit is too vague and general. H. Douglass, as to a skirt protector of enameled cloth over a facing, gives, as a date, "as early as 1861." This is not sufficient. R. Hood goes back only to 1865.

An injunction is granted.

New Method of Precipitating Rain Falls.

Among the recent patents is one taken out by Daniel Ruggles, of Fredericksburg, Va., for what he designates as a new and useful mode of producing rain or precipitating rain falls from rain clouds, for the purpose of sustaining vegetation and for protection against drought and for sanitary purposes.

The invention consists in sending balloons into the cloud realms, said balloons carrying torpedoes and cartridges charged with explosives, and there to explode or detonate them by electric force.

"My design," he says, "is to employ every kind of explosive force at an elevation in the cloud region of the atmosphere, in order to condense rain clouds by concussive force or the power of explosion within such region, thereby precipitating rain to sustain vegetation, prevent drought, and also purify and renovate the atmosphere during periods of pestilence and epidemics.

"I contemplate the employment of nitro-glycerine, dynamite, chlorates of nitrogen, gun cotton, gunpowder, fulminates, and other explosives, and to use the magneto-electric telegraph on the surface of the ground and the phono-telegraph in the cloud realm to direct action in cases where a regular balloon not charged with explosives is occupied by an aeronaut to reconnoiter the cloud realm, to trail torpedoes and cartridges, or to throw them in parachutes, and to explode or detonate them either from the balloon occupied by the aeronaut or from the ground.

"Instead of a single balloon provided with explosives—say ten small torpedoes or cartridges, each charged with a half pound of dynamite, and arranged for simultaneous magneto-electric explosion—I propose in some cases the employment of small balloons in groups in the cloud region, each provided with explosives and arranged for simultaneous explosion or detonation by either electric or mechanical force; and I contemplate not only to precipitate rain fall, but also to check its fall in overabundance in a given locality by causing the rain clouds to discharge rain before the given locality has been reached by such clouds.

"My invention is based on discoveries in meteorological science, and that electrical force sways and controls the atmospheric realm and governs the movements of the rain clouds, bursting into thunderstorms, dispensing rain and hail, and into cyclones and tornadoes illuminated by magneto-electric forces as prime attributes of matter.

"I propose to employ the magneto-electric engine to send explosives into the cloud realm, and compressed air and steam into the atmosphere whenever found expedient, each through its appropriate medium of metallic wire, textile fiber, cordage, and elastic tubes."

AGRICULTURAL INVENTIONS.

In cutting grass or grain, more especially if it be heavy, much trouble, annoyance, labor, delay, and expense are entailed by the obstruction offered by the grass or grain previously cut and lying in the previous swath, since it tends to clog the cutter, and thus renders its operation difficult or imperfect, or arrests it altogether. By moving the grass or grain thus cut away from the standing grass or grain the machine has a clear track, so that the cutter bar can operate with freedom and without danger of becoming clogged. Mr. William Prindle, of Santa Clara, Cal., has patented a track clearer adapted to perform this function; and it is embodied in a certain construction and combination of tubes, rods, and other parts, forming an adjustable skeleton frame.

Elizabeth Dark, Davis Collins, and George W. Nelson, of Quitman, Mo., have patented a combined harrow, marker, and cultivator, so constructed as to harrow the ground and at the same time mark it for planting, and also to cultivate the plants. It is simple, convenient, and not liable to get out of order.

Mr. Edward M. Hand, of Fredericksburg, Iowa, has patented a device for collecting manure from various points and conveying it to a compost heap or a wagon or other place of deposit. It consists in a novel rake and the combination therewith of two hinged curved arms connected to a draught bar, and two pivoted straight arms serving as handles, whereby provision is made for adjusting the rake to different positions and for tilting it to discharge the load.

An improved rotary plow has been patented by Mr. Thomas J. Tally, of Rockport, Texas. This plow is designed for plowing land, preparing the land to receive the seed, and cultivating the plants. It is convenient, effective, and not liable to get out of order.

A fence that will effectually prevent cattle, fowls, dogs, etc., from passing into the field it surrounds, and which will also be strong and durable, has been patented by Mr. John Vance, of Forest, Ontario, Canada.

Ancient American Giants.

The Rev. Stephen Bowers notes, in the *Kansas City Review of Science*, the opening of an interesting mound in Brush Creek Township, Ohio. The mound was opened by the Historical Society of the township, under the immediate supervision of Dr. J. F. Everhart, of Zanesville. It measured sixty-four by thirty-five feet at the summit, gradually sloping in every direction, and was eight feet in height. There was found in it a sort of clay coffin including the skeleton of a woman measuring eight feet in length. Within this coffin was found also the skeleton of a child about three and a half feet in length, and an image that crumbled when exposed to the atmosphere. In another grave was found the skeleton of a man and woman, the former measuring nine and the latter eight feet in length. In a third grave occurred two other skeletons, male and female, measuring respectively nine feet four inches and eight feet. Seven other skeletons were found in the mound, the smallest of which measured eight feet, while others reached the enormous length of ten feet. They were buried singly, or each in separate graves. Resting against one of the coffins was an engraved stone tablet (now in Cincinnati), from the characters on which Dr. Everhart and Mr. Bowers are led to conclude that this giant race were sun worshipers.

Spiral Energy.

At a recent meeting of the London Physical Society, Dr. Shettle read a paper "On the Influence of Solar Radiation on the Earth's Rotation." The fact established by Dr. Shettle, that the magnetic energy of a bar magnet acts along spiral lines, has led him to surmise that the energy emanating from the sun and impinging on the earth on the zone of the ecliptic traverses the earth in a spiral path, and finally emerges at the magnetic poles. The spiral of energy is "right-handed" at one pole and "left-handed" at the other, like the magnetic force in a magnet, and the electric discharge in Crookes' vacuum tubes. Like to precession and nutation these spiral paths are constantly changing and producing magnetic variations. He therefore infers that the magnetic poles will complete a cycle corresponding to the period of precession. Dr. Shettle thinks that bodies exhibit magnetic properties in proportion as they change the direction of the energy traversing them, and throw it into the spiral form. Terrestrial magnetism would be due to the solar radiance. On this hypothesis gravity would also be produced; so, likewise, would the earth's rotation (by a kind of "magnetic whirl"), electricity, tornadoes, cyclones, water-spouts, and whirlwinds. Moreover, this "spiral energy" would seem to operate throughout the whole universe.

THE GEOLOGICAL HISTORY OF THE CATSKILLS.

In an article on the Physical Structure and Hypsometry of the Catskill Mountains, in the current number of the *American Journal of Science and Arts*, Professor Guyot states that the masses of rocks forming the Catskill Mountains were deposited in a gulf of the Devonian Sea comprised between the Adirondack plateau and the Green Mountain range, including the low silurian ridges between the Hudson and the foot of the Catskills, all of which were probably emerged when the Devonian age began. Most of New England was also above the level of the ocean. The thickness of the sediments shows that the bottom of this gulf gradually subsided during that time to a depth of some 5,000 feet, constantly making room for new deposits. The presence of the gray conglomerate capping the highest hills proves that the deposition of these sediments continued into the subcarboniferous period, after which they were upheaved above the level of the ocean before the deposit of the coal measures, and have remained emerged ever since. The slight southward dip indicates that during the Devonian age a general and gradual rise of the continent took place from the north, which raised successively above water parts of the lower and upper silurian in the Helderberg and Oriskany sandstone, which were laid dry when the Catskill sandstones and shales were still depositing. The most notable upheaval of the Catskill region probably took place at the time of the great revolution which raised the main Appalachian system; doubled the size of the early continent, and closed the carboniferous age. But the peculiar situation which sheltered it from the immediate effect of the force which was in play, the lateral pressure arising from the sinking of the bed of the Atlantic, modified the hypsometric form of that portion of the western plateaus. When this great Appalachian upheaval began, the domain of the Catskills was secluded from the ocean by large tracts of the pre-existing lands; the Adirondack plateau on the north, New England, and the Green Mountain ranges on the east, which, though affected themselves in a measure, served as a barrier against a strong action of the upheaving force from those quarters on the region beyond.

Farther south, however, no obstacle intervening, the force was free to display its full power; and to this cause Professor Guyot is inclined to attribute not only the folding of the numerous Appalachian chains, but also the remarkable bend westward of the whole system, in Pennsylvania, as well as the significant fact that it is in the prolongation of the axis of that convexity that the western plateaus beyond swell to their greatest average height in the region of the sources of the Susquehanna, Alleghany, and Genesee rivers. To this pushing northwest and northward of the land, and its reflex action northeastward, the swelling of the plateaus of western New York may be in great measure attributed. The Catskills would thus have been subjected to a pushing action, from three or four opposite directions, by the rising lands—from the Adirondack plateau on the north, from the Green Mountains on the east, and from the rising Appalachians on the southeast and south; and hence, perhaps, their superior elevation above all the surrounding lands. On the other hand, it might be supposed that the covering of the hard subcarboniferous conglomerate, which must have been general in the Catskills, protecting the underlying strata of the Catskill formation against denudation, prevented their being swept away, as in the surrounding region, and thus preserved, in a great measure, their primitive elevation. But the known facts hardly warrant more than a surmise. The Hudson River valley during the Champlain Epoch of the Quaternary age was an arm of the sea. The last end of the Catskills was then a series of high marine bluffs, worn out by the action of the waves, and this would explain the abruptness of their eastern termination.

Eighty Square Miles of Turtles.

The Galveston *News*, of June 29, reports that between Sabine and Calcasieu, in the Gulf of Mexico, June 22, the schooner James Andrews encountered a vast multitude of green turtles, many of them very large, and all of them on their backs. Captain J. B. Rodgers, owner of the schooner, states that the schooner was lying on and off, and from observation it was estimated that the water covered by these turtles formed an area of eight miles in width and ten miles in length. They were all sizes, and not one being seen in a natural position. The water was literally covered with them. During the passage among the turtles, Spanish mackerel were leaping high in the air in every direction, as if determined to escape from the sea, giving evidence that either the water underneath was in a dreadful commotion or the sea monsters had come down on them from some strange sea. Captain Rodgers is anxious to have nautical men explain these odd phenomena of the turtles on their backs and the excitement among the mackerel. During his nautical career he never saw anything similar to it, nor did he ever before lay eyes on as many turtles and Spanish mackerel.

Electricity Affected by a Magnet.

The phenomenon lately discovered by Hall of the action of a magnet in altering the path of a current of electricity in the conductor which carries it, has formed the starting point for two investigations, which have appeared separately in the *Wiener Anzeiger*, by Boltzmann and Von Ettingshausen respectively, in which they point out that this discovery may be applied to determine the absolute velocity of electricity in a conductor.

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.

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) G. H. M. writes: I have a photo-negative from which I wish to print pictures. I have done such work before, but have forgotten the strength of the solutions. Of what strength should the silver solution be? Of what strength the gold and hypo? How should the pictures be washed? and should the face of the negative be covered with tissue paper? Are the pictures soaked in any solution before putting them in the toning solution? A. Sensitizing bath, nitrate of silver, 5 drachms; water (distilled), 5 oz.; nitric acid, 2 drops; pure kaolin, 1 oz. Dissolve the silver nitrate, agitate with the kaolin, let settle, and use the clear liquid. Expose the dried sensitized albumen paper to the vapor of ammonia in a dark box for ten minutes. Wash the prints well in clear running water, then tone in 10 oz. water (distilled) containing gold chloride, 4 grains; acetate of soda, ¼ oz., filtered. Fix in, water, 1 pint; hyposulphite of soda, 8 oz., filtered. Do not use tissue paper.

(2) W. H. S. asks: How can I make acetate of nickel? A. Precipitate an aqueous solution of acetate of nickel with excess of a solution of carbonate of soda, settle, decant the liquid, wash the precipitate, and dissolve it in warm acetic acid. Concentrate by evaporation, and crytallize the salt—acetate of nickel.

(3) A. H. M. writes: 1. Give me a cheap air and water-tight process for making an umbrella air and water proof, which will be as good as a rubber umbrella. A. See p. 368 etc., seq., Spon's Workshop receipts. 2. Can you tell me how to set dyes by the insoluble gelatin process? A. Boil the cloth in weak aqueous solution of glue, then in strong decoction of sumac. 3. Can photographs be burned in on porcelain, glass, or crockeryware? If so, how; or can you mention a book telling anything about it? A. Transfer a well (gold) toned print on a thin gelatin back, to the slightly gummed surface, by wetting the back. Then burn in in the muffle. We know of no book on the subject. 4. What kind of liquid soap is petroleum soluble in oil or partly soluble? A. None that we know of. 5. There is a brilliant leather varnish, I think composed of shellac, gum, camphor, alcohol, and asphaltum. Can you tell me how it is made? A. We do not know the composition of this particular varnish.

(4) H. G. T. asks (1) for information as to what would destroy a little green insect called aphis. They cover the tender buds of a honeysuckle. A. Use a dilute aqueous solution of sulpho-carbonate of potash. Apply with a finely perforated sprinkler. 2. Do you know of anything that will rid the pantry of red ants (very small)? A. Have you tried Dalmatian insect powder, or a strong solution of sugar with three parts borax? 3. Do you know of any party that manufactures or deals in apparatus for pumping by horse power? A. See column of Business and Personal. A small advertisement therein would perhaps procure the desired information.

(5) C. asks for a method of preserving photographs, and also a receipt for renewing photographs that have faded. A. Keep them behind glass and away from the light as much as possible. All ordinary photographs are apt to fade by long exposure to light, and cannot be easily re-developed by chemical means.

(6) O. E. P. writes: In "Notes and Queries," July 24, 1880 (1), "F. J. B." wants to know how to keep pencil drawing, from rubbing out. Having been through the same experience fifteen years ago, I will venture to advise him to use varnish made of bleached shellac and alcohol. Use 95 per cent alcohol and the best shellac to be had; macerate 24 to 36 hours, and strain. Apply with a flat camel's hair brush. Pencil drawings made on manila paper will shrink badly after varnishing, but good drawing paper will come out all right, and if properly varnished may be washed with soap and water when soiled without injury to the lines. Some drawing paper, of an open texture, requires to be sized with a warm aqueous solution of isinglass before varnishing.

(7) F. A. L. writes: In SCIENTIFIC AMERICAN, No. 4, for July 24, "F. J. B." asks for a solution to prevent pencil drawing from rubbing. I think he will find a thin solution of white shellac sprayed on with an atomizer (a 25 cent one is good enough) the easiest method.

(8) J. McM. writes: A distillery near this city, being short of water, desires to lay a five inch iron pipe to a large spring about 3,600 feet distant from the pool they now draw their water from. The standard height of the spring or fountain is 15 feet higher than the top of strainer on the present pipe in the pool. There is a rise from the fountain (about 850 feet from same) of 24 feet, and from there to the pool (about 2,750 feet) a descent of 39 feet from said highest point, making the fall from the fountain as stated, 15 feet from fountain to outlet. The overflow pipe at the pool outlet is 5 feet below the surface of the fountain. Queries: 1. Is it necessary to have a stop valve in the pipe at the fountain? A. No. 2. Is it necessary to have an exhaust pump at the high point? A. Yes. 3. Is it necessary to have a globe valve at the outlet? A. There should be a valve to control the delivery of the water. 4. When filled with water, and the outlet valve opened, will the water continue to run on the siphon principle; and is there any trouble, provided the pipe is air tight, in a successful operation of said pipe on the siphon principle? The ascent from the fountain to the height named is gradual and the descent is gradual. A. Yes, if the pipe is perfectly tight. In laying the pipe we would advise you to sink it in the ground at the highest point as much as possible to reduce the lift.

(9) F. B. asks: At what date was telegraphing practically used in the United States, also in England? A. The first public exhibition of Morse's telegraph in this country was on September 2, 1837. The first working line was built between Washington and Baltimore in 1843–44. On May 27, 1844, the first dispatch was sent. The Morse system was introduced into Europe in 1845.

(10) E. D. T. asks for a recipe for ink powder that will make good black writing ink by dissolving in cold water, so as to be fit for use in a few hours or less. A. Tannic acid, 7 ounces; sulphate of iron (copperas), 1 pound; gum arabic, ½ pound; sugar (white), ¼ pound; powder as finely as possible; rub all together, adding a few drops of clove oil.

(11) F. H. M. asks: How is wood alcohol made? A. It is obtained mixed with pyroligneous acid (crude wood vinegar) from the destructive distillation of wood. When this is heated in a still the first portions distilling are impure wood spirit. This purified by several rectifications (redistillations) yields common wood naphtha. The empyreumatic matters, acetone, etc., which it contains may be removed by heating it in a still over a water bath with an excess of chloride of calcium as long as volatile matters escape (impurities), then distilling the remainder with a quantity of water equal to the spirit taken. Rectification of this dilute spirit over lime yields pure wood naphtha—methylic alcohol.

(12) J. H. M. says: We have had some discussion over the safety of a lightning rod, and would like to have your opinion. The rod is on the spire of one of our churches, about 155 feet from the ground to point of spire. The rod is of ¾ inch square wrought iron, and without insulation of any kind, but fastened about every 2½ feet by an iron spike driven into the wall or roof. The points are not soldered in any way, but the lower piece is pointed and hooked into an eye in the upper piece. We do not know how the rod is grounded. Do you consider this a safe rod? This spire has been struck once by lightning that we know of. The solder on the cross on top was melted, being the only injury sustained. A. If the rod is thoroughly grounded it may do; but it is not large enough to carry very heavy discharges of electricity, and unless enlarged there is liability to damage. The rod should be ¾ of an inch square, or four times the present size, and all the joints should be thoroughly soldered, so as to make a continuous rod as nearly as possible. If you put on three more rods of the size you have, that would do. The most important part of every rod is the bottom or underground connection. The lower end of the rod should be well connected with a metallic water pipe or gas pipe, or the electrical conducting body having an extensive surface that is in contact with the earth.

(13) D. F. S. writes: I have seen many inquiries about siphons in the column of answers to correspondents. I had some experience with them and find them more difficult things than they are generally supposed to be. The way to get the air out of the neck is to have a cell at the bend on top like an inverted bottle, with a stop cock in the neck. The air will collect in this cell and can be taken out by turning the cock and then filling the cell with water and closing it and again turning the cock. In siphons of large diameter the discharge end must be in water to prevent air from going in. Running water soon fills them with air on account of the small bubbles. A ram is better in such places. The places are not plenty where they are needed, and generally something else would answer better. That is my experience.

(14) C. H. B. asks: Will electricity in transit over or through a wire, or passing along a wire, emit sparks? or will it ignite combustibles that may surround a wire when passing through the same? A. If the wire is used as a lightning conductor, the current is likely to take the nearest ground, and wherever it leaps a space there will be a spark sufficient to ignite combustible substances. An ordinary battery current will not escape from a wire with a spark except when actual contact is made and broken between the terminals of the conductor.

(15) E. S. P.—An analysis of Smith Bros.' borax (slightly effloresced) gave: anhydrous borax, 53·01 per cent; water, 46·24 per cent; chlorides, 0·71. A sample of fine English borax (also slightly effloresced) gave: anhydrous borax, 58·63 per cent; water, 41·15 per cent; chlorides, 0·22 per cent.

(16) C. N. M. writes: In an argument, I contended that, in looking at the moon through a telescope first, and then through an empty tube of same dimensions—although illusory—it seemed really to the eye, to take a longer time for the moon to pass from sight while looking through the empty tube, than it did the telescope. The other party held out that there was no apparent difference in either. I tried to explain that the difference was caused in being magnified and bringing the object nearer to the eye. Which is right? A. You are right. The apparent motion of the moon is magnified in the same proportion as its disk is magnified, so that with the lenses in the telescope tube, the moon would pass much more rapidly out of the field than with the empty tube.

(17) G. J. S. writes: Thinking it an advantage to have the water consumed by our boilers by register rather than by yearly rent, we would like to find out the amount used at present, and would, therefore, respectfully ask you to inform me how many gallons of water will be consumed per hour per horse power at 75 lb. steam pressure? A. If your boiler and engine are reasonably good and properly run, you will require between 3 and 3½ gallons of water per hour per horse power.

(18) F. W. S. asks: 1. Can an engine with a cylinder say 2 inches diameter and 4 inches stroke, be constructed upon the principle of the small oscillating toy engines that would be of any utility for driving machinery? A. Yes, to work one-half to three-fourths horse power. 2. What should be the boiler capacity for size above given? A. Should have 10 to 12 feet face surface.

(19) E. A. B. asks (1) how outriggers are made for raceboats? A. Outriggers are generally made of iron ⅜ inch to ½ inch diameter, with the offset required and bolted to side of boat. 2. Is a boat 16 feet in length and 2 feet beam large enough for two oarsmen? A. 2 feet beam is not sufficient, it should be at least 3 feet.

COMMUNICATIONS RECEIVED.

On the Hydraulic Mineral Belt of Texas. By J. D.

On Mechanical Measures for Affecting the Water. By G. H. B.

Not a Serpent. By J. A. C.

Stone Implements. By S. C. G.

On the Thermal Telephone. By G. W. McP.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

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

July 13, 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 1836, 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 1836; but at increased cost, as the specifications not being printed, must be copied by hand.

Agricultural boiler, J. W. Hudson	229,891
Air compressing engine, E. Hill	229,821
Animal shears, J. G. Corey	229,872
Animal trap, J. L. Ramaley	229,913
Aspirator, W. Autenrieth	229,796
Auger, hollow, G. N. Stearns (r)	9,233
Axle box, car, A. Higley (r)	9,235
Axle lubricator, S. Broadbent	229,859
Axle skein, vehicle, J. C. Sebring	229,920
Baby chair strap, M. W. Blacker	229,846
Bale tie, J. White	230,083
Baling press, T. D. Kane	229,892
Ballot box, Crowe & Hestar	229,965
Bed bottom, J. R. Pafford	230,045
Bedstead frame leg, G. Steinson	230,078
Bedstead, invalid, L. Prince	229,910
Belt tightener, Rinehart & Albertson	229,841
Belt, woven endless, S. W. Baker	229,839

Berry basket, R. E. Morey 229,804
Berth guard, sleeping car, E. A. McMann 229,834
Berths, safeguard for sleeping, E. A. McMann 229,833
Bitters, J. Christophel 229,804
Blast furnace, J. M. Hartman 229,883
Blind fastener and s'at operator, W. I. Wooster 230,096
Boiler furnace, steam, M. C. Jones 229,827
Bolt and rivet cutter, R. Fawcett 229,887
Book cover, J. A. Möller 230,036
Boots and shoes, manufacture of, B. P. Scott 230,071
Bottle stopper, N. Fritzner 229,815
Bottle stopper, E. P. Raether 230,054
Bottle stopper and stopper fastener, W. Winkel 229,850
Box fastener, O. N. Brainerd 229,857
Brine evaporating apparatus, V. P. Collins 229,871
Brush tooth, Holz & Meyer 229,823
Brush, upholstery, E. M. Pine 230,051
Bung, barrel, C. W. Bauce 229,943
Button fastener, B. F. Bee 229,853
Button, separable, J. H. Hodges 230,017
Buttons from plastic material, apparatus for the manufacture of, P. L. Sylvester 230,083
Buttons from plastic material, manufacture of, P. L. Sylvester 230,082
Car coupling, J. C. Brooks 229,903
Car coupling, C. R. Howard 230,015
Car coupling, Morningstar & Roberts 230,038
Car coupling, A. Osterhout 230,044
Car coupling, J. T. Rice 230,058
Car coupling, W. S. Sampson 229,916
Car coupling, J. T. Wilson 229,849
Car coupling link, W. S. Sampson 229,917
Car door grain, T. Hibbert 230,012
Car seat, C. Beggs 229,944
Car seats, folding rack for sleeping, C. E. Lucas 229,897
Cars, etc., ventilator for, Hayden & Thiell 230,011
Cars by electricity, propelling, S. D. Field 229,901
Card, geographical game, W. G. Read 229,914
Card holder, F. G. Hunter 230,016
Carding engines, apparatus for turning cylinders of, B. S. Roy 229,844
Carding engines, machine for grinding the top flats of, B. S. Roy 230,075
Carding machine, A. W. Dean 229,808
Carriage spring and reach, J. A. McConnell 229,898
Carving fork, C. L. Butler 229,802
Cash register, J. R. Kenworthy 230,022
Casting apparatus, C. A. Caspersson 229,953
Chain, J. M. Dodge 229,978, 229,979
Chandelier suspension slide, J. F. Brown 229,860
Check bit, B. T. Henry 229,886
Child's chair, G. M. Patten 230,048
Child's chair and carriage, Mosler & Ladewig 229,906
Chuck for turning polygonal bodies, lathe, S. Block 229,855
Churn power, N. Boren, Jr 229,947
Churn power, B. D. Tabor 230,084
Cigarette, E. L. Witthaus 229,931
Clay tempering machine, W. L. Drake 229,810
Clay washer and grinder, G. L. Witsil 229,932
Clothes drier, R. Larter 229,831
Cork cutting machine, A. & A. Goetzinger 229,818
Corks, device for compressing, T. B. Comins, Jr 229,960
Cornice hook, J. Day 229,873
Corset, M. P. Bray 229,801
Crank pin, D. A. Woodbury 230,098
Crimping machine, J. W. D. Fifield 229,989
Crucible, J. Pedder 230,050
Crushing mills, ore feeder for, J. O. Mortz 229,903
Cultivator, wheel, J. H. Rhamy 230,057
Curling iron, O. Medary 229,833
Dental plugger, A. M. Denham 229,809
Dental plugger, electro-magnetic, W. G. A. Bonwill (r) 9,287
Dish heater, N. D. Morey 230,039
Ditching machine, E. Elayer 229,978
Door fastening, C. H. Roloson 230,062
Dredger, steam vacuum, H. C. Sears 230,072
Dress guard, T. O. Memery 230,032
Ear piercer, E. Seyfarth 230,073
Electric alarm and indicator, C. H. Carter 229,867
Electric conductor tip, J. H. C. Watts 230,090
Electric currents, regulating, C. W. Siemens 229,922
Electric signal apparatus, H. G. Fiske 229,990
Electrical switch board, J. I. Sabin 230,089
Elevator, A. C. Elithorpe 229,982
Elevator safety appliance, A. H. Hall 230,006
Engine lubricator, J. J. Royle 230,066
Excavating and grading machine, M. Parks 230,046
Faucet, oil can, Coleman & Aldrich 229,805, 229,806
Fence, portable, H. E. McWhorter 230,031
Fence, wire, E. T. Sprout 230,077
Fertiliser from stable manure, manufacture of an improved, J. H. Chambers 229,955
Fertilisers, apparatus for preparing, A. Edwards 229,876
Firearm, magazine, W. H. Elliot 229,812
Fire extinguisher for cars, J. Berg 229,854
Fire kindlings and machine for manufacturing the same, H. N. Bill 229,945
Fireworks, E. S. Hunt 229,890
Fluting machines, chain of chain, W. Walker 230,091
Friction drum, J. S. Mundy (r) 9,289
Game apparatus, E. Greey 230,000
Gas fixtures, smoke bell support for, G. S. Roberts 230,060
Gate, A. F. Denlinger 229,974
Gate, A. B. Minton 230,034
Gate, W. H. Tobey 230,087
Gearing, oscillating, Waters & Earnest 230,092
Gelatine or ichthyocolla from salted fish skins, extracting, J. S. Rogers (r) 9,296
Glass, annealing, J. B. Denman 229,976
Glass melting furnace, C. W. Siemens 229,846
Gloves, manufacture of, Granier & Fossemale 228,819
Governor, engine, B. Brazelle 229,948
Graduated glass or jar, T. A. Shinn 230,075
Grain cleaning and dampening apparatus, D. Miller 229,901
Grain drill, J. C. Sebring 229,918
Grain drill hoe cleaner, J. Saurer 230,068
Grain, etc., for grinding, preparing, L. S. Chichester 229,803
Gun, air, W. T. Chamberlain 229,868
Hay rake, horse, S. H. Bushnell 229,864
Harvester, W. E. Hart 230,019
Harvester gearing, T. M. Fienniken 229,993
Hat felting machine, G. Yule 230,101
Hat for wear in hot weather, J. C. Sebring 229,918
Hat ventilator, E. Chesterman 229,870
Hats, etc., sweat for, T. W. Bracher 229,949
Hay and cotton press, W. A. Pridgen 230,053
Hay press, traveling, P. Wright 230,100
Hides, machine for working raw, O. E. Drown 229,981
Hitching post, C. L. Peirce 230,049
Hoisting device, B. Goodman 229,999
Horse hoof expander, D. Magner 229,832
Hydrant, E. M. Zerbe 229,953
Hydraulic motor, F. W. Gordon 229,882
Ice, apparatus for the manufacture of, A. J. Zilker 230,102
Ice house, R. Bullymore 229,564
Ice making apparatus, compressor for, A. T. Ballantine 229,940
Ice making apparatus, condenser for, A. T. Ballantine 229,942
Ice making apparatus, congealer for, A. T. Ballantine 229,941
Incubator, H. B. Tatham, Jr 230,086
Indicator lock, H. L. Russell (r) 9,300
Ink fountain, Libbey & Parcelle 230,098
Knit fabric, S. Love 229,896
Lamp fixture, extension, E. A. Parker 230,047
Lamp, miner's, J. Vogele 229,929
Lamp shade holder, A. B. Hutchins 229,825
Lathe and planer, combined, F. W. G. Boettcher 229,800
Lathe, hub turning, C. Seymour 230,074
Leather finishing machine, J. Liedtke 229,895
Lifting jack, H. R. Ferris 229,814
Lime kiln, R. Dunlop 229,811
Liquors, etc., preserving the flavor of fermented, O. Zwietusch 229,934
Log turner, J. Torrent (r) 9,291
Loom shuttle box mechanism, Crompton & Wyman 229,967, 229,968
Loom shuttle box motion, Crompton & Wyman 229,969
Lubricator for slides for steam engines and other machinery, D. A. Woodbury 230,099
Map, O. S. Haskell 229,884
Medical compound, C. Dengel 229,874
Milk cooler, Kimball & Williams 229,830
Millstone dressing machine, W. E. Browning 229,858
Mirror, hand, C. E. Page 229,909
Mirror, toilet, F. J. Kaldenberg 229,828
Motion, device for transmitting circular, T. S. E. Dixon 229,875
Music leaf turner, Ransom & Stone 229,839
Musical reed instrument, M. O. Nichols 229,837
Nailing machine, L. Goddu (r) 9,299
Nut lock, J. Harding 230,009
Ore and coal conveyer, J. B. Reynolds 230,056
Packer, oil well, L. Stewart 230,080
Padlock, J. W. Reinhart 230,055
Paint mill, W. Daniels 229,973
Paper bag machine, W. C. Cross 229,970
Paper, machine for cutting lace from, A. Giraudat 229,997
Paper, machine for waxing, L. Bastet 229,798
Paper pulp, machine for preventing waste of, A. McDermid 230,029
Pen and brush, combined marking, C. I. Wallis 230,089
Pen, stylographic fountain, C. H. & C. L. Downes 229,980
Pencil, lead, J. E. Faber 229,988
Permutation lock, D. J. Kenny 229,829
Pianoforte, J. Hardman 229,820
Pipe coupling, Hand & Reitzel 230,018
Pipe grooving machine, G. P. Roseboom 230,064
Plaiter and ruffler, combined, W. T. Elliott 229,877
Plane, bench, W. T. Wainwright 230,088
Planter, corn, C. G. Everet 229,985
Plow, J. I. Case 229,954
Plow, corn, A. Michael 229,900
Plow, gang, R. Holgate 229,822
Plow, sulky, S. Gesley 229,816
Plow, sulky, J. I. Hoke 230,014
Plow, sulky, J. B. Neff 230,042
Postal card, C. Kehr 229,893
Printing plate, photo-mechanical, J. H. Whitley 229,930
Printing press feeding attachment, F. L. Goss 229,998
Pulp machine, wood, H. A. Frambach 229,879
Pump valve, H. F. Gaskill 229,881
Punch, metal, I. P. Richards 229,840
Railway crossing, J. B. Carey 229,865
Railway, portable, N. W. Condict, Jr. (r) 9,298
Railway signal apparatus, W. H. Shuey 229,921
Railway signal, electrical, T. A. B. Putnam 229,911
Railway switch, J. B. Carey 229,866
Railway switch, M. Wood 230,095
Railway tie and fastening, H. Reese (r) 9,292
Railway train arrester, automatic, J. Wood 230,097
Rainfalls, precipitating, D. Ruggles 230,067
Refrigerator, A. J. Chase 229,856
Riveting machine, J. F. Allen 229,795
Roofing cement, T. Sparham 229,924
Roofing composition, T. Sparham 229,925
Rubber, etc., manufacture of goods made of hard, L. Tillinghast 229,847
Rubber, manufacture of substitutes for hard, A. B. Allen 229,794
Rubber products, manufacture of vulcanized India, H. Gerner 229,817
Rule and scale, combined, B. G. Corser 229,962
Ruler, parallel, J. H. Harden 230,008
Safe, M. Mosler 229,905
Salve, C. G. Annan 229,937
Sash fastener, N. Haynes 229,884
Sash fastener, S. J. Freeman 229,995
Sash fastener and burglar alarm, combined, M. Bourke 229,856
Sash fastening, Kolb & Osberghaus 229,894
Sash, window, H. Kneuppel 230,024
Saw clamp, Winterbottom & Murray 229,851
Saw, drag, C. S. Dean 229,975
Saw filing machine, gin, F. Moore 230,037
Sawing machine, scroll, E. Nunan 229,908
Scarfs, etc., device for the display of, R. B. Parke 229,838
Scraper, earth, A. R. Byrkett 229,863
Scraper, road, J. Stubbs 230,081
Screws, machine for making metal, C. M. Spencer (r) 9,290
Seal lock, J. Kinzer 230,025
Seat lock, J. L. Dolson 229,977
Sectional boiler, J. G. Curtis 229,964
Seeder, grass, C. F. Johnson, Jr 229,826
Sewing machine, F. Jacob 230,010
Shade roller, C. P. Rose 230,063
Shingle machine, E. C. Schermerhorn 230,070
Shirt, C. J. Coyle 229,874
Shovels, spades, and scoops, handle socket for, P. W. Groom 230,003
Shutter worker, L. J. Lanphere 230,026
Sign, street, E. J. Hardy 230,007
Signs, spacing and lettering, J. J. Callow 229,952
Skate, roller, S. Winslow 230,094
Snap hook, A. S. Henn 229,885
Snow and ice from railways, apparatus for removing, E. H. Angamar 229,936
Soldering coppers, furnace for heating, Alexander & Wells 229,935
Spring motor, N. N. Horton 229,887
Spring motor for operating churns, etc., J. H. Tabler 229,926
Steam boiler, J. A. Cunningham 229,966
Steam boiler covering, T. Merriam 230,033
Steam generator, J. Everding 229,984
Steam pipes, non-conducting jacket for, J. Riley 230,059
Steam trap, McMann & Barnard 230,030
Steering apparatus for vessels, power, A. J. Stevens 230,079
Steering lever, J. Gates 229,880
Stereotype, E. P. Brown 229,861
Stereotype block, G. E. Jones 230,021
Stereotypes, blocks for interchangeable, E. P. Brown 229,862
Stocking supporter, J. A. House 229,889
Stove attachment, G. E. Hopkin 229,824
Stove board, A. I. Griggs 230,002
Stove grate, E. W. Anthony 229,852
Stove pipe collar, N. D. Morey 230,040
Stove pipe shelf, H. Clayton 229,957
Sun shade, R. Ray 229,912
Table knife, A. W. Cox 229,961
Tanning process, T. P. Tucker 229,928
Telegraph, duplex, D. B. Grandy 230,001
Telegraph pole, J. L. Taylor 230,085
Telegraph sounder, H. Van Hoevenbergh 230,013
Telephone transmitter, A. W. Rose 229,843
Thill coupling, E. H. Shine 230,076
Tile kiln, W., L., & B. Wickers 229,848
Timber chutes, frog for, H. L. Day 229,971
Time lock, E. H. Flint 229,992
Tobacco, machine for making plug, M. J. Farmer 229,813
Tobacco, process and apparatus for treating, G. Robinson 230,061
Traction engine, J. Poltevent 230,053
Truck, barrel, B. Colvin 229,958
Tug, hame, J. E. Moeller 230,035
Type, elastic-faced printing, E. D. Chamberlain 229,869
Uppers, machine for stretching and notching, H. P. Fairfield 229,986
Valve, J. W. Moore 229,902
Valve gear, steam engine, F. H. Ball 229,797
Vapor burner, G. W. Billings 229,799
Vegetables, desiccating, H. Halvorson 230,004
Vehicle, passenger, C. M. Murch 230,041
Vehicle seat spring, E. R. Merrill 229,899
Vehicle spring seat, W. Snow 229,923
Vise, J. F. Hall 230,005
Wagon brake, Ladenberger & Hazelton 230,027
Wagon running gear, C. E. Adamson 229,793
Wagon running gear, J. C. Fowler 229,994
Walls, coating and finishing, J. W. O'Bryan 230,043
Warming and ventilating, A. C. Rideout 229,842
Washing machine, Trumbile & Gilbert 229,927
Waste pipe valve, J. C. Daggett 229,972
Water from atmospheric air, apparatus for freezing, O. Kropff 230,035
Waterproof compound, P. Crippen 229,963
Well boring apparatus, H. S. Gail 229,996
Wells, blasting in oil, J. Sager 229,845
Wells, temper screw for oil, R. B. Magee (r) 9,288
Whiffletree hook, W. C. Coddington 229,959
Whiffletree hook, Horner & Ray 229,883
Whip socket, A. Searls (r) 9,297
Wind wheel, G. A. Myers 229,907
Wire coiling device, C. D. Rogers 229,915
Wire cutting machine, J. Adt (r) 9,294
Wire for drawing, preparing, C. H. Morgan 229,836
Wire tightener, R. Ellwood 229,983
Yoke, neck, J. L. Babb 229,938

DESIGNS.

Bottle, T. M. Lahey 11,864
Bottle, fountain, M. H. Hagerty 11,868
Carpet, H. Christie 11,859, 11,869
Carpet, H. Horan 11,860, 11,861
Carpet, W. L. Jacobs 11,862, 11,870
Carpet, G. W. Piggott 11,867
Chain hook, watch, E. A. Bliss 11,858
Match box, C. Kitschelt 11,863
Table cover, H. Pichler 11,866
Upholstery trimming, L. Lindenthal 11,865

TRADE MARKS.

Baking powder, yeast powder, and similar bread preparations, Hatch & Jenks 7,970
Bed bottoms, spring, G. Heyman 7,972
Butter, G. W. Simpson 7,967
Damascée, Moss Manufacturing Company 7,966
Muslins, plain and fancy, J. Haslam & Co 7,969
Pickles and chowchow, N. S. Watts 7,968
Tobacco, chewing and smoking, Hoffman & Co 7,971
Veterinary powders, S. J. Fouts 7,973
Whisky, Hoffheimer Brothers 7,964, 7,965

English Patents Issued to Americans.

From July 9 to July 16, 1880, inclusive.

Beveling edges of plates, apparatus for, R. Riggs, Philadelphia, Pa.
Brick machine, W. L. Gregg, Philadelphia, Pa.
Churn, rotary, S. W. Murch *et al.*, Kennedy, N. Y.
Flour purifying apparatus, D. B. Mosely, Hartford, Conn.
Garments, A. Horner, Baltimore, Md.
Gas apparatus, E. Stern, New York city.
Governor, engine, G. F. Pottle, Boston, Mass.
Harvesting machine, D. House, Lathrop, Cal.
Ink bottle, E. W. Stiles, Hartford, Conn.
Labels, express, etc., J. H. Small, Buffalo, N. Y.
Pens, fountain, A. T. Cross, Providence, R. I.
Phosphoric acid, apparatus for pulverizing, E. N. Horsford, Cambridge, Mass.
Pictures, transferring, H. K. Flagler, Boston, Mass.
Printing machinery, W. P. Kidder, Boston, Mass.
Railroad signal, J. A. Emery *et al.*, Boston, Mass.
Railroad signal, J. L. Williams, Riverton, N. J.
Refrigerating apparatus, J. Chase, Boston, Mass.
Screw threads, machine for cutting, I. S. Schuyler *et al.*, Brooklyn, N. Y.
Signaling apparatus for mines, C. Cummings, Virginia City, Nev.
Type, means for holding curved lines, of, H. P. Hubbard, New Haven, Conn.
Vegetable fiber, cleaning, T. Trelfal, San Francisco, Cal.
Waterproofing cloth (2), D. M. Lamb, New York city.

PROPOSALS FOR MAIL LOCKS AND KEYS.

POST OFFICE DEPARTMENT,
WASHINGTON, D. C., June 22, 1880.

In compliance with a provision in the law entitled "An Act making appropriations for the service of the Post Office Department for the fiscal year ending June 30, 1881, and for other purposes," approved June 11, 1880, requiring a re-advertisement for proposals for Mail Locks and Keys, notice is hereby given that SEPARATE SEALED PROPOSALS will be received at this Department UNTIL 12 O'CLOCK NOON, ON THE SECOND DAY OF AUGUST, 1880, for furnishing five new and different kinds of Locks and Keys for the sole and exclusive use of the United States mails, including, besides those to be used for mail bags, such as are to be used on the street letter-boxes of the United States.

As the public exposure and searching examination necessary to intelligent bidding on any prescribed model of a lock and key would tend to impair, if not entirely destroy, the further utility of all such locks and keys for the purposes of the mails, the Postmaster General prescribes no models or samples for bidders, but relies for a selection on the mechanical skill and ingenuity which a fair competition among inventors, hereby invited, may develop in samples submitted by them.

Proposals, with samples, will also be received at the same time, for Safety Chains for Mail Keys.

Specifications of conditions and requirements as to proposals, samples, kinds and quantities, contracts, etc., as well as forms of proposal, will be furnished on application, by letter, to the Second Assistant Postmaster General. No proposal will be considered, unless it shall have been submitted in accordance with such specifications and forms.

The Contracts which may be made will be in conformity to the specifications and the accepted proposals.

D. M. KEY,
Postmaster General.

DESIGN FOR THE FIRTH OF FORTH BRIDGE.—I. General Description of the New Bridge, embracing calculations of forces and strains, weight, wind-structure, and stability against overturning. II. Complete Description of Details. III. Process of Erection. IV. General Remarks. The object of this valuable engineering article is to compare the merits of an arch bridge with those of a suspension for a given locality, and to show that the advantages are, without exception, on the side of the former. Illustrated with nine figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 229. Price 10 cents. To be had at this office and from all newsdealers.

INDUSTRIAL EDUCATION, A NEW feature in. A description of the new system of hand education adopted by the Society for Ethical Culture in the instruction of young children in the principles underlying all mechanical arts and occupations; an improvement on the well known Russian system. With fifteen diagrams showing the mode of instruction in the carving of geometrical figures in clay. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 230. Price 10 cents. To be had at this office and of all newsdealers.

CAVEATS, COPYRIGHTS, LABEL REGISTRATION, ETC.

Messrs. Munn & Co., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine Improvements, and to act as Solicitors of Patents for Inventors.

In this line of business they have had OVER THIRTY YEARS' EXPERIENCE, and now have *unequaled facilities* for the Preparation of Patent Drawings, Specifications, and the Prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs. Munn & Co. also attend to the preparation of Caveats, Registration of Labels, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business intrusted to them is done with special care and promptness, on very moderate terms.

We send, free of charge, on application, a pamphlet containing further information about Patents, and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.

Foreign Patents.—We also send, *free of charge*, a Synopsis of Foreign Patent Laws, showing the cost and method of securing patents in all the principal countries of the world. American inventors should bear in mind that, as a general rule, any invention that is valuable to the patentee, in this country is worth equally as much in England and some other foreign countries. Five patents—embracing Canadian, English, German, French, and Belgian—will secure to an inventor the exclusive monopoly to his discovery among about ONE HUNDRED AND FIFTY MILLIONS of the most intelligent people in the world. The facilities of business and steam communication are such that patents can be obtained abroad by our citizens almost as easily as at home. The expense to apply for an English patent is $75; German, $100; French, $100; Belgian, $100; Canadian, $50.

Copies of Patents.—Persons desiring any patent issued from 1836 to November 30, 1866, can be supplied with official copies at reasonable cost, the price depending upon the extent of drawings and length of specifications.

Any patent issued since November 30, 1866, at which time the Patent Office commenced printing the drawings and specifications, may be had by remitting to this office $1.

A copy of the claims of any patent issued since 1836 will be furnished for $1.

When ordering copies, please to remit for the same as above, and state name of patentee, title of invention, and date of patent.

A pamphlet, containing full directions for obtaining United States patents, sent free. A handsomely bound Reference Book, gilt edges, contains 140 pages and many engravings and tables important to every patentee and mechanic, and is a useful handbook of reference for everybody. Price 25 cents mailed free.

Address
MUNN & CO.,
Publishers SCIENTIFIC AMERICAN,
37 Park Row, New York.
BRANCH OFFICE—Corner of F and 7th Streets, Washington, D. C.

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.
(About eight words to a line.)

Engravings may head advertisements at the same rate per line, by measurement, as the letter press. 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 30,000 copies every weekly issue.

THE NEW YORK BELTING AND PACKING COMPANY.

THE BEST IS THE CHEAPEST.

Those who have used our Rubber Fabrics for many years have had the best service at the lowest cost.

37 & 38 PARK ROW, NEW YORK.

Shafts, Pulleys, Hangers, Etc.

Full assortment in store for immediate delivery.

WM. SELLERS & CO.,
79 Liberty Street, New York.

"The 1876 Injector."

Simple, Durable, and Reliable. Requires no special valves. Send for illustrated circular.

WM. SELLERS & CO., Phila.

BEAN HARVESTER Patent for sale. Address M. A. HINDS, Hindsburgh, Orleans Co., N. Y.

Mill Stones and Corn Mills.

We make Burr Millstones, Portable Mills, Smut Machines, Packers, Mill Picks, Water Wheels, Pulleys, and Gearing specially adapted to Flour Mills. Send for catalogue.

J. T. NOYE & SONS, Buffalo, N. Y.

THE NEW RAILWAY UP MT. VESUVIUS.—Description of the recently constructed railway for the ascent of Mount Vesuvius, up the immense grade of sixty-three feet in one hundred. Details of construction of road bed, machinery, and rolling stock, accompanied by six engravings, giving a general view of the railway, mountain, and crater; plan of road; side and end view of passenger car; map showing the physical conformation of the mountain; and carriage road and railway. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 235. Price 10 cents. To be had at this office and from all newsdealers.

BUSINESS FOR SALE.

To close an estate. Established 1858. Has always done a profitable business. Dealers in Steam Fittings, Engineers' Supplies, Copper, Tin, and Sheet Iron Work. Will not require a very large capital.

DUDLEY BROS.' ESTATE,
61 Main St., Buffalo, N. Y.

THE UNDERSIGNED WILL OFFER, AT public sale, on the premises, 197 to 219 Main St., Allegheny, Pa., Monday, 16th August, 1880, at 10 o'clock, A. M., the following:

The Patterns, Stock, Materials and Tools, Fixtures, Lease, and Good Will of the business of the Crawford Manufacturing Co., manufacturers of Saddlery Hardware and Malleable Iron Castings.

These works are well adapted for the business, and the firm have been and are in control of a good trade.

To Capitalists or those desiring to engage in this business, this offers an excellent opportunity.

For further information, call on or address

W. JARVIS or W. McCONWAY, Receivers,
Pittsburg, Pa.

RAIL ROAD DEPOTS IRON BUILDINGS WHARF SHEDS SUGAR HOUSES SAW MILLS FITTING COTTON STORES PUBLIC MARKETS CATTLE SHEDS RETORT HOUSES
WALTER C. BERGIUS & CO - GLASGOW - SCOTLAND.

Pictet Artificial Ice Co., Limited,

P. O. Box 385. 142 Greenwich St., New York.
Guaranteed to be the most efficient and economical of all existing Ice and Cold Air Machines.

Cigar Box Lumber,

MANUFACTURED by our NEW PATENT PROCESS.

The Best in the World.

SPANISH CEDAR,
MAHOGANY,
POPLAR.

Also thin lumber of all other kinds, ⅛ to ½ in., at corresponding prices. All qualities. Equal in all respects to any made, and at prices much under any to be obtained outside of our establishment. Send for price list.

GEO. W. READ & CO.,
186 to 200 Lewis Street, N. Y.

DOUBLE PITMAN PRESSES.
STILES & PARKER PRESS CO., Middletown, Ct.

WANTED, AGENTS.

We want agents to sell the world renowned Wilson Oscillating Shuttle Sewing Machines in unoccupied territory, to whom we are prepared to offer extraordinary inducements whereby from one to six thousand dollars a year can be made. There never was a better time to engage in the sale of sewing machines, as all the machines made in the past twenty years are wearing out, and must be replaced. For terms and further particulars, address WILSON SEWING MACHINE CO., CHICAGO, ILL.

H.W. JOHNS' ASBESTOS

LIQUID PAINTS, ROOFING, BOILER COVERINGS, Steam Packing, Sheathings, Fireproof Coatings, Cements, SEND FOR PAMPHLET, ILLUSTRATED PAMPHLET, AND PRICE LIST.

H. W. JOHNS M'F'G CO., 87 MAIDEN LANE, N. Y.

THE MACKINNON PEN OR FLUID PENCIL.

Particulars mailed Free.
MACKINNON PEN CO.,
200 Broadway, near Fulton st., N. Y.

TELEGRAPH AND ELECTRICAL SUPPLIES.

Send for Catalogue.
C. E. JONES & BRO.,
CARLISLE BUILDING, CINCINNATI, O.

WM. A. HARRIS,
PROVIDENCE, R. I. (PARK STREET),
Six minutes walk West from station.
Original and Only builder of the
HARRIS-CORLISS ENGINE
With Harris' Patented Improvements.
from 10 to 1,000 H. P.

A PLANING MILL OUTFIT FOR SALE very low for cash. Will sell all together or each machine separate. All first-class machines, good order.
J. H. KERRICK & CO., Indianapolis, Ind.

TO INVENTORS AND MANUFACTURERS

The 49th Exhibition of the American Institute will open September 15. Heavy machinery will be received August 23; other goods, September 6. For blanks and information, address

GENERAL SUPERINTENDENT,
AMERICAN INSTITUTE, NEW YORK CITY.

BOGARDUS' PATENT UNIVERSAL ECCENTRIC MILLS—For grinding Bones, Ores, Sand, Old Crucibles, Fire Clay, Guanos, Oil Cake, Feed, Corn, Corn and Cob, Tobacco, Snuff, Sugar, Salts, Roots, Spices, Coffee, Cocoanut, Flaxseed, Asbestos, Mica, etc., and whatever cannot be ground by other mills, etc., and for Paints, Printers' Inks, Paste Blacking, etc. JOHN W. THOMSON, successor to JAMES BOGARDUS, corner of White and Elm Sts., New York.

J. STEVENS & CO.,
P. O. Box 28, Chicopee Falls, Mass.
Manufacturers of Stevens' Patent Breech-Loading Sporting and Hunters' Pet Rifles, Single and Double Barrel Shot Guns, Pocket Rifles, Pocket Shot Guns, Gallery Rifles, Superior Spring Calipers and Dividers, including the New Patent Coil Spring Calipers; also Double Lip Countersinks and Hathaways' Patent Combination Gauge.

Metallic Shingles

Make the most DURABLE and ORNAMENTAL ROOF in the world. Send for descriptive circular and new prices to

IRON CLAD MANUFACTURING CO.,
22 CLIFF STREET, NEW YORK.

WOOD SOLE SHOES.
The cheapest, most durable, warm, good looking, and thoroughly waterproof shoe. Particularly adapted to Brewers, Miners, and all classes of laborers. Send stamp for circular and price list.

CHAS. W. COPELAND,
122 Summer St., Boston, Mass.

BUY NO BOOTS OR SHOES
Unless the soles are protected from wear by *Goodrich's Bessemer Steel Rivets. Guaranteed to outwear any other sole.* All dealers sell these boots. Taps by mail for 50 cents in stamps. Send paper pattern of size wanted.
H. C. GOODRICH, 19 Church St., Worcester, Mass.

BOILER COVERINGS.

Plastic Cement and Hair Felt, with or without the Patent "AIR SPACE" Method.

ASBESTOS MATERIALS,

Made from pure Italian Asbestos, in fiber, mill board, and round packing. THE CHALMERS-SPENCE CO., 40 John Street, and Foot of E. 9th Street, New York.

Do Your Own Printing $3 PRESS prints cards, labels, &c. (Self-inker $4.) Larger sizes for larger work. For old or young. Great money saver. A paying business anywhere for all or spare time. Send two stamps for a catalogue of full sized Presses, Type, Cards, Paper, &c., to the Manufacturers KELSEY & CO., Meriden, Conn.

The New York Ice Machine Company,

21 COURTLANDT STREET. ROOM 54.

Low Pressure Binary Absorption System.

Advantages over all other Machines.

Makes 25 per cent. more Ice. Uses only ¼ water of condensation. No Pressure at rest. Pressure in running, 14 pounds. Self-lubricating. No Leaks, non-inflammable. No action on Metals. Easy Attendance. Machines and production are guaranteed by C. H. Delamater & Co.

COLUMBIA BICYCLE.
A practical road machine. Indorsed by the medical profession as the most healthful of outdoor sports. Send 3 cent stamp for 24 page catalogue, with price list and full information, or 10 cents for catalogue and copy of *The Bicycling World.*
THE POPE M'F'G CO.,
89 Summer Street, Boston, Mass.

OUR CATALOGUES, illustrated and priced, of Microscopes, Telescopes, Opera and Field Glasses, Thermometers, Barometers, mailed free to any address. R. & J. BECK, Manufacturing Opticians, Philadelphia, Pa.

HEKTOGRAPH

Patents for the process of Dry Copying have been issued to us, dated May 18 and June 1, 1880. The Hektograph is now the only gelatine copying pad which can be manufactured, used, or sold, without infringing our patents. All infringements will be prosecuted to the full extent of the law.

HEKTOGRAPH CO., 22 and 24 Church Street, New York.

HARTFORD
STEAM BOILER
Inspection & Insurance
COMPANY.

W. B. FRANKLIN, V. Pres't. J. M. ALLEN, Pres't.
J. B. PIERCE, Sec'y.

SNOW'S BEST
Water Wheel Governor,
MANUFACTURED BY
COHOES IRON FOUNDRY AND MACHINE CO.,
COHOES, - - N. Y.

The Asbestos Packing Co.,

Miners and Manufacturers of Asbestos,
BOSTON, MASS.,
OFFER FOR SALE:

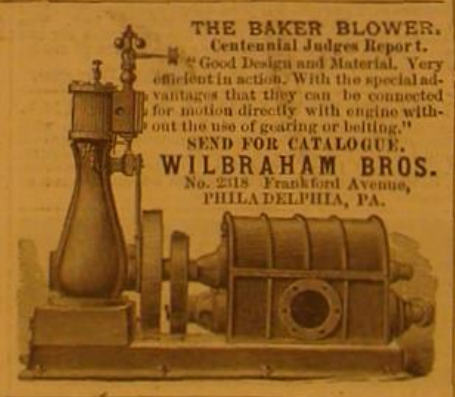
PATENTED ASBESTOS	ROPE	PACKING,
"	"	LOOSE "
"	"	JOURNAL "
"	"	WICK "
"	"	MILL BOARD,
"	"	SHEATHING PAPER,
"	"	FLOORING FELT.
"	"	CLOTH.

TELEGRAPH and Electrical Supplies. Send for Catalogue.
C. E. JONES & BRO., CINCINNATI, O.

HOLCOMB'S
Automatic Telephone,
Patented in U. S. and Canada.
Works 1 mile, secures great clearness and volume of tone. Best in use. Price $1 per set. Illustrated circulars free
HOLCOMB & CO.,
Mallet Creek, O.

STEAM PUMPS,

THE NORWALK IRON WORKS CO.,
SOUTH NORWALK, CONN.



THE BAKER BLOWER.
Centennial Judges Report.
"Good Design and Material. Very efficient in action. With the special advantages that they can be connected for motion directly with engine without the use of gearing or belting."
SEND FOR CATALOGUE.
WILBRAHAM BROS.
No. 2318 Frankford Avenue,
PHILADELPHIA, PA.

1880. 1880.

Pittsburgh Exposition Society.

THE FOURTH
EXPOSITION AND FAIR

Will open to the public Thursday, September 2 and remain open day and evening (Sundays excepted) until Saturday, October 9th, 1880.

Blank forms of application for space, Prospectus, and Premium list may be had by addressing the secretary.

Exhibitors are earnestly requested to make early application for space, thus enabling the managers to better arrange the whole Exhibition.

New Machinery Hall; new Engine and Boilers.

Manufacturers and Inventors should avail themselves of the unsurpassed facilities offered by this Exposition for the introduction of new machinery to the public.

Office, GERMANIA BANK BUILDING, 89 Wood St.
P. O. BOX 895, PITTSBURGH, PA.

E. P. YOUNG, General Manager. J. C. PATTERSON, Secretary.
JOHN D. BAILEY, Asst. Manager and Cashier.

DISTILLING AND HOISTING MACHINERY for Sea-going Vessels.—By Hamilton W. Pendred. Description of Gravelev's distiller for sea-going vessels, capable of yielding eighty to one hundred gallons of water per day of ten hours and suited for a ship of 1,000 to 1,500 tons. Also distiller combined with cooking hearth, by means of which arrangement the processes of cooking and distilling may go on either together or separately. Description of Chaplin & Co.'s distiller and patent aerator, and steam winch. Messrs. Robertson, Osborne & Co.'s horizontal steam winch. Brown's patent fresh water condenser and steam winch. Application and performance of the foregoing apparatus. Illustrated with fourteen figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 234. Price 10 cents. To be had at this office and from all newsdealers.

THE TANITE CO.,

STROUDSBURG, PENN., AMERICA.

THAT FREIGHT BILL?

Yes! We know all about that! A man out in Ohio wrote us the other day—"Please send me two 12x½, ¾ Hole, Class 2, Beveled Wheels, for gumming Saws, and do try to get them to me so that the freight won't come to very much more than the wheels do!"

We sympathize with that man, and to save that freight bill we have opened depots at the following places, at all of which we can be addressed:

London, Eng., 9 St. Andrews St., Holborn Viaduct, E. C.
Liverpool, Eng., 42 The Temple, Dale St.
Sydney, N. S. W., 11 Pitt St.
New York, 14 Dey St.
Philadelphia, 11 North Sixth Street.
Chicago, 152 and 154 Lake St.
St. Louis, 209 North Third St.
St. Louis, 811 to 819 North Second St.
Cincinnati, 212 West Second St.
Indianapolis, Corner Maryland and Delaware Sts.
Louisville, 427 West Main St.
New Orleans, 26 Union St.
San Francisco, 2 and 4 California St.

NOVEL, BEAUTIFUL, PRACTICAL.

Walter's New Method of Carpeting fine Stairways. Send for circular to T. F. WALTER, Patentee,
1227 Girard Avenue, Philadelphia, Pa.

Pyrometers. For showing heat of Ovens, Hot Blast Pipes, Boiler Flues, Superheated Steam, Oil Stills, etc.
HENRY W. BULKLEY, Sole Manufacturer,
149 Broadway, N. Y.

BROWN'S PAT. SPLIT Shafts, Hangers, PULLEYS

At low prices. Largest assortment. A. & F. BROWN, 57, 59, & 61 Lewis St., New York.

OF THE

Scientific American

FOR 1880.

The Most Popular Scientific Paper in the World.

VOLUME XLIII. NEW SERIES.

Only $3.20 a Year, including postage. Weekly. 52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains sixteen pages of useful information, and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity, Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc.

All Classes of Readers find in THE SCIENTIFIC AMERICAN a popular *resume* of the best scientific information of the day; and it is the aim of the publishers to present it in an attractive form, avoiding as much as possible abstruse terms. To every intelligent mind, this journal affords a constant supply of instructive reading. It is promotive of knowledge and progress in every community where it circulates.

Terms of Subscription.—One copy of THE SCIENTIFIC AMERICAN will be sent for *one year*—52 numbers—postage prepaid, to any subscriber in the United States or Canada, on receipt of **three dollars and twenty cents** by the publishers; six months, $1.60; three months, $1.00.

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis *for every club of five subscribers* at $3.20 each; additional copies at same proportionate rate. Postage prepaid.

One copy of THE SCIENTIFIC AMERICAN and one copy of THE SCIENTIFIC AMERICAN SUPPLEMENT will be sent for one year, postage prepaid, to any subscriber in the United States or Canada, on receipt of seven dollars by the publishers.

The safest way to remit is by Postal Order, Draft, or Express. Money carefully placed inside of envelopes, securely sealed, and correctly addressed, seldom goes astray, but is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to

MUNN & CO.,
37 Park Row, New York.

To Foreign Subscribers.—Under the facilities of the Postal Union, the SCIENTIFIC AMERICAN is now sent by post direct from New York, with regularity, to subscribers in Great Britain, India, Australia, and all other British colonies; to France, Austria, Belgium, Germany, Russia, and all other European States; Japan, Brazil, Mexico, and all States of Central and South America. Terms, when sent to foreign countries, Canada excepted, $4, gold, for SCIENTIFIC AMERICAN, 1 year; $9, gold, for both SCIENTIFIC AMERICAN and SUPPLEMENT for 1 year. This includes postage, which we pay. Remit by postal order or draft to order of Munn & Co., 37 Park Row, New York.

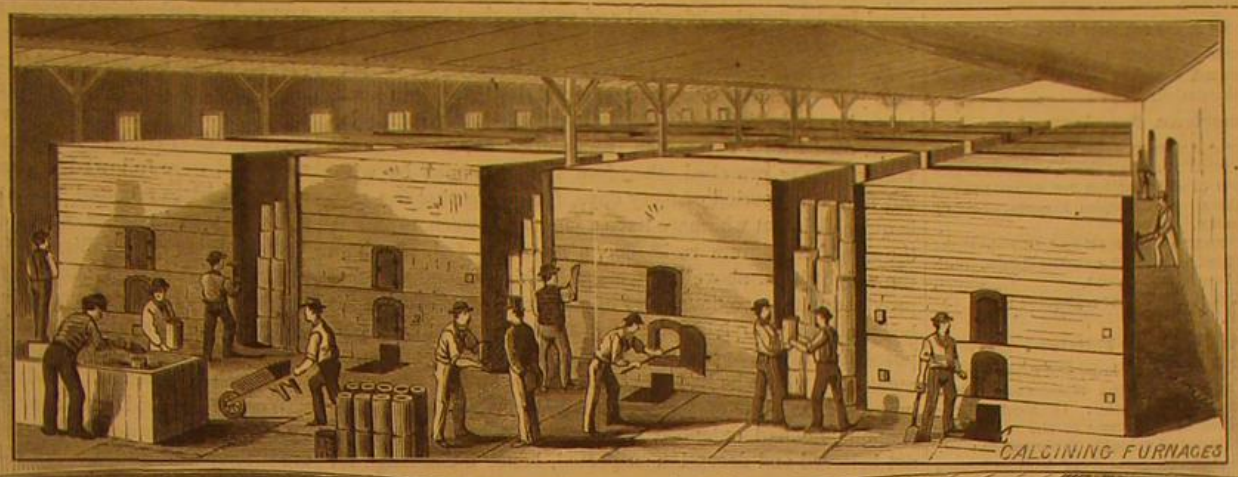
THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts., Philadelphia, and 50 Gold St., New York.

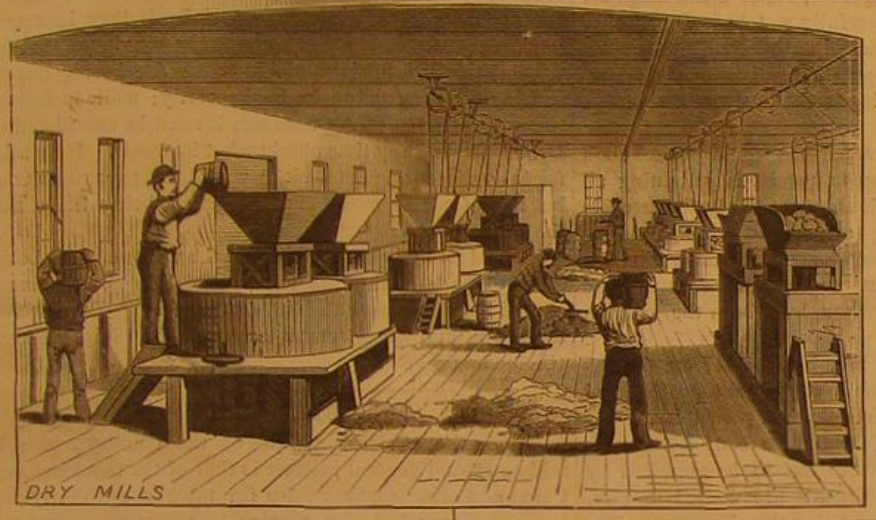
SCIENTIFIC AMERICAN

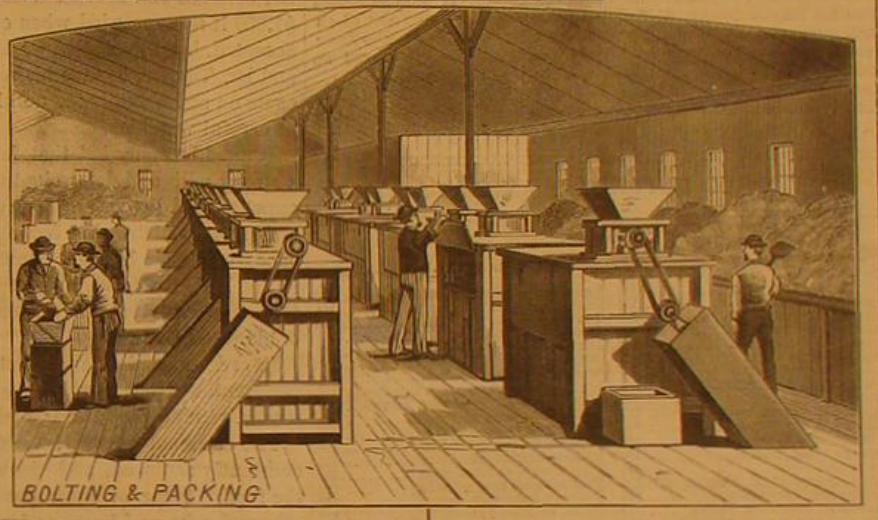
[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

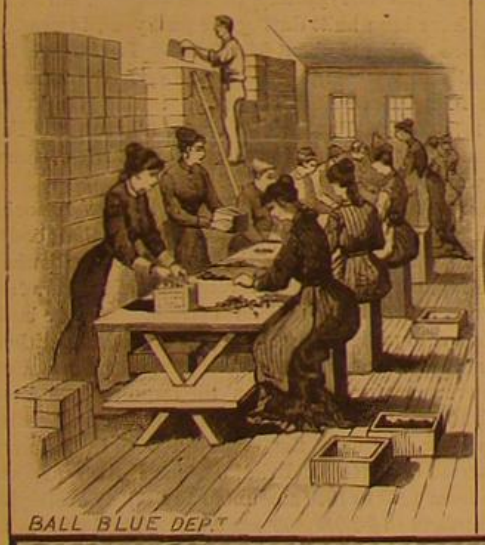
A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY AND MANUFACTURES.

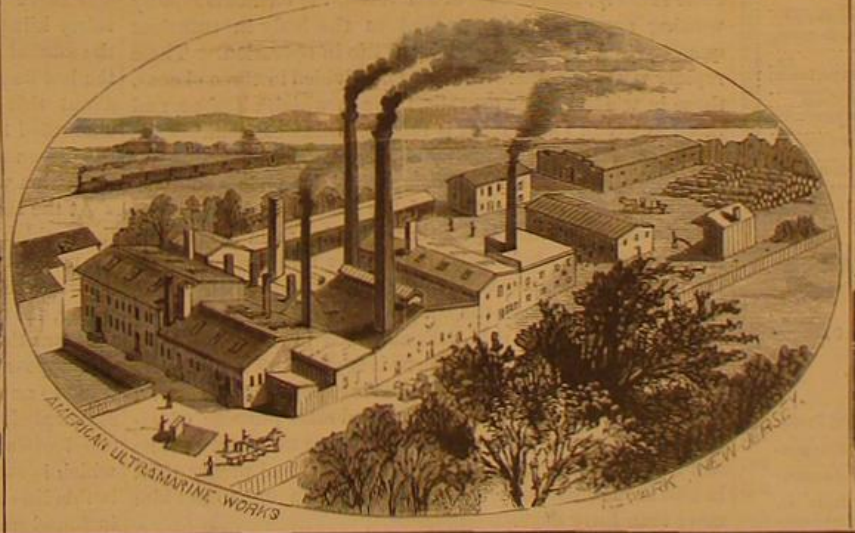
Vol. XLIII.—No. 8. [NEW SERIES.] NEW YORK, AUGUST 21, 1880. [$3.20 per Annum. [POSTAGE PREPAID.]

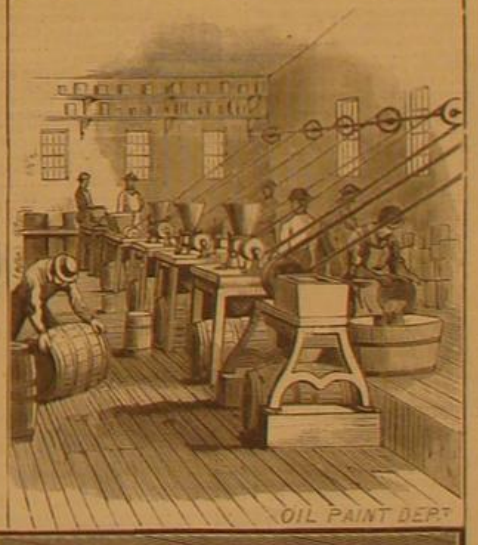

CALCINING FURNACES

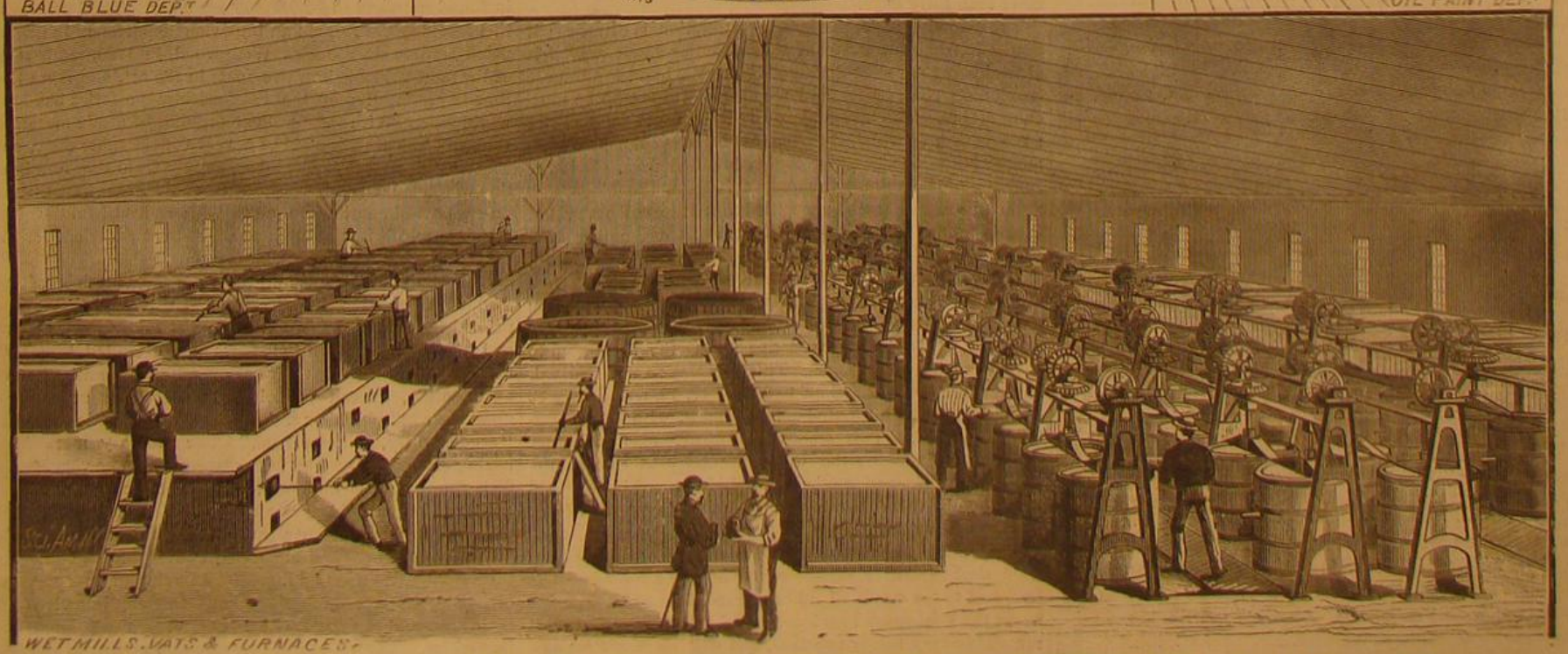

DRY MILLS


BOLTING & PACKING


BALL BLUE DEPT


AMERICAN ULTRAMARINE WORKS


OIL PAINT DEPT


WET MILLS, VATS & FURNACES.

THE MANUFACTURE OF ULTRAMARINE.—AMERICAN ULTRAMARINE WORKS NEWARK, N. J.—[See page 117.]

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, postage included $3 20
One copy, six months, postage included 1 60

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at $3.20 each; additional copies at same proportionate rate. Postage prepaid.
Remit by postal order. Address
MUNN & CO., 37 Park Row, New York.

☞ To Advertisers.—The regular circulation of the SCIENTIFIC AMERICAN is now **Fifty Thousand Copies** weekly. For 1880 the publishers anticipate a still larger circulation.

The Scientific American Supplement

Is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, postage paid, to subscribers. Single copies, 10 cents. Sold by all news dealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, postage free, on receipt of *seven dollars*. Both papers to one address or different addresses, as desired.

The safest way to remit is by draft, postal order, or registered letter Address MUNN & CO., 37 Park Row, N. Y.

Scientific American Export Edition.

The SCIENTIFIC AMERICAN Export Edition is a large and splendid periodical, issued once a month. Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1.) Most of the plates and pages of the four preceding weekly issues of the SCIENTIFIC AMERICAN, with its splendid engravings and valuable information; (2.) Commercial, trade, and manufacturing announcements of leading houses. Terms for Export Edition, $5.00 a year, sent prepaid to any part of the world. Single copies 50 cents. ☞ Manufacturers and others who desire to secure foreign trade may have large, and handsomely displayed announcements published in this edition at a very moderate cost.

The SCIENTIFIC AMERICAN Export Edition has a large guaranteed circulation in all commercial places throughout the world. Address MUNN & CO., 37 Park Row, New York.

NEW YORK, SATURDAY, AUGUST 21, 1880.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF
THE SCIENTIFIC AMERICAN SUPPLEMENT
No. 242,
For the Week ending August 21, 1880.

Price 10 cents. For sale by all newsdealers.

DR. TANNER'S FASTING EXPERIMENT.

Of all the exhibitions which have attracted the attention of the people in and around New York city, the forty days' fast of Dr. Tanner is not the least remarkable. If his aim was to draw public attention and be extensively noticed, he has fully attained it, as no daily paper can be taken up which does not contain a full account of his doings and feelings of the last twenty-four hours, while he is watched by the physicians of the allopathic as well as of the eclectic school, and in addition to this always by a *Herald* reporter, to make sure that there is no deception practiced, as has been so frequently the case with other pretended fasters.

That his experiment is not altogether useless, as is maintained by some, we will try to elucidate, notwithstanding we agree that the sacrifice and danger he exposes himself to appears so great that it is doubtful if they will be compensated for by the physiological and pathological lessons to be learned by it.

His fast has, in the first place, proved the mistake of those who judged all men alike, and reasoned that, because a weak, hysteric, and ill fed girl of 18, perhaps consumptive besides, died within two weeks from starvation, as soon as she was carefully watched, therefore nobody could be without food for a period of forty days, forgetting that the case is quite different where we have a man of between 40 and 50, the age of maximum resistance, a man well fed, of whom the weight is far above the average for his size, and who was provided with a copious layer of adipose tissue around his body, a man who had practiced fasting for sanitary purposes, finding it the best way for him to cure gastric derangements, for which he had a liability, and who had gradually increased the time of fasting until, at his last fast in Minneapolis, he had extended it to forty-two days. This was not believed and deception suspected, hence a challenge for $1,000 if he succeeded when carefully watched. Dr. Tanner accepted, but the challenger backed out under some pretext, and Dr. Tanner, to save his reputation and prove his theory, came on and submits for nothing to the task under the eye of careful watchers.

It must be conceded that few persons would possess such a strong will and determination to persist in subduing all appetite, and disregard the no doubt exceedingly disagreeable and perhaps distressing feelings consequent to total abstinence from food; but Dr. Tanner possesses this determination in the highest degree, and he never thought of cutting the fast short, whatever may sometimes have been the opinion of his watchers.

In order to understand what may be learned from this experiment we will, for the benefit of the non-professional reader, remind him of a few physiological principles.

The chemical constituents of the human body have to be constantly renewed, and the waste has to be supplied by the food. Some of these constituents are wasted rapidly, others slowly, and in case of starvation the elements rapidly wasting away must be present in the body in sufficient quantity to keep the functions of life in operation. These rapidly wasting constituents may be divided in three classes, those in which carbon prevails, those in which nitrogen, and those in which phosphorus is the prevailing element.

The carbonaceous compounds are wasted in keeping up the animal heat. This is accomplished by a slow combustion, that is, a combination of the carbon with the atmospheric oxygen, which is continually going on in the capillaries through the whole body, the oxygen being furnished by the blood, which absorbs it in the lungs, and which by the arteries is sent through the body. The product of this combustion, the carbonic acid, still absorbed in the blood, is by the veins sent to the lungs, where it is given off and escapes in the act of respiration. After having stripped Dr. Tanner, when he commenced his fast, for the double purpose of ascertaining his physical condition and leave no doubt that he had no food about him, it was seen that he had plenty of fat in and around his body to furnish carbon enough to last him more than forty days.

The second element of rapid consumption is nitrogen; it proceeds from the waste of the muscular tissue, which is always going on, even during sleep, as the heart is a muscle continually contracting, and respiration is kept up by muscular action. The blood takes up this waste in the form of a compound, of which the chemical name is cyanate of ammonia, but which by physiologists is called urea. It is the function of the kidneys to secrete this from the blood, and numerous experiments have settled the nature and amount of this secretion, which in healthy persons consuming food varies from 25 to 35 grammes every twenty-four hours. When Dr. Tanner began his fast it was secreted at the rate of 29 grammes, and as the nitrogen in any excess of nutrition is similarly changed and secreted, it was expected that a large reduction would be observed as soon as the fast began to have effect on the system. This expectation was realized, and the amount soon fell off to 23, 20, 17, 16, and finally 13 grammes, at which it remained stationary, with slight oscillations beyond. This amount of nitrogenous substance represents, therefore, the waste necessary to sustain the functions of life, and would at once be increased in case food was taken by the experimenter, at least nitrogenized food, such as beef extract or its equivalent, albumen, casein, milk, etc., the only substances which would be of benefit to him. Analytical chemistry, therefore, acts here as a reliable detective, and to the credit of all concerned it must be said that never the least suspicious increase of urea was observed, it remaining very nearly constant, and will no doubt become double and more as soon as after the fast food is again taken.

The third element of rapid waste is the phosphorus; it proceeds chiefly from the waste of the brain and nervous tissues. It is so important in these functions that a great German chemist has formulated the expression, "*without* phosphorus, no thought." Every mental act and every nervous excitement is accomplished by a consumption of phosphorus, which, combined with different bases in the body, especially soda, magnesia, and lime, is secreted by the kidneys as a soluble salt, not only easily detected as crystals by the microscope in the sediment, but even an approximate estimate may be had of its reduction or increase by the *number of crystals seen in the field under the same* circumstances.

This third element did not at first show any reduction in quantity, but, to the contrary, for a few days some increase. It was at the occasion that Dr. Tanner had been unjustly accused by a physician present that he had surreptitiously accepted food from one of the watchers; this appears to have preyed upon his mind. Attention was therefore called to the danger in this direction, a danger proceeding from the more rapid waste of the nervous system. *Relaxation* was therefore devised, and daily carriage rides, which eased his mind and were followed by a more sound sleep, soon reduced the phosphates secreted, and at the same time reduced the irritability and temper of the experimenter.

This observation tallies perfectly with what has been observed in the case of such clergymen who have every week the periodical labor of preparing and delivering two sermons on Sunday. Chemical analysis has proved that at that time they secrete more phosphates than in the middle part of the week, after the rest of Monday and Tuesday.

We will only add that the suspicions occasionally expressed by those who cannot realize the possibility of so long a fast are utterly unfounded. All those who have taken the trouble to watch long enough, especially if they became acquainted with Dr. Tanner, came to the conviction that he is too high minded, upright, and honest to deceive any one with so mean a device as to take food secretly; while in regard to the responsibility of the watchers it must be considered that Dr. Tanner can any time obtain what he wants. If he asked, for instance, for a beefsteak it would be procured at once, but this of course would end the watch, being the close of the experiment.

He told us that some years ago he was married, but became disgusted with his wife, who, he says, continually stuffed her stomach with all kinds of food. He could not stand this, and when remonstrance did not improve her he obtained a divorce.

OUR POTTERY INDUSTRY.

Among the special industries of the country which but seldom attract general interest is that of the manufacture of China and other earthen ware for table use. Thirty years ago there was but one pottery in the country, but some thirty kilns have been built during the past year, increasing the annual production to about $4,000,000. The imports for the last fiscal year were $4,082,787, and they have averaged about this figure since 1873, although in that year they amounted to $6,015,925, and in 1872 were $5,270,785. For the eleven months to June last the imports of earthen, stone, and china ware, were valued at $5,101,504.

At the last meeting of the United States Potters' Association, which was the sixth annual convention of that body, the members were congratulated that "American manufacturers were rapidly gaining, and foreign manufacturers fast losing, the control of the American market." As the business was then said to be in a generally healthful condition, we suppose manufacturers here have shared in the increased trade to an even greater extent than the imports have been augmented, but still our business in this department seems small when compared with the extensive pottery industry which is carried on in Great Britain. The British exports in this line from 1869 to 1879 amounted to £17,748,028, equal in round numbers to $8,850,000 annually. The business in this specialty has formed an important department in British manufactures since Josias Wedgwood, in 1763, made some of the most valuable improvements in the art, and from that time the reputation of the Staffordshire potteries has been worldwide. With the excellent supplies of crude materials we have, however, the aid of a very considerable duty, and constant accessions to our labor supply from the immigration of skilled English workers, it would seem that this industry should continue to meet with a healthful development here until its productions are at least sufficient for the supply of the home market.

In a report of the committee on raw materials of the Potters' Association, it was suggested that funds be appropriated for making analyses of the different clays, feldspar, and quartz found in various parts of the United States, so that each member might have the results of an authoritative examination, instead of being dependent, as at present, upon their individual experiments, which were described as "crude, costly, and empirical." The ordinary methods of testing clays employed by potters were said to be very imperfect; "one clay is unctuous, another refractory; one dries hard, another crumbles; one burns pure white, another yellow; one is short, another tough," etc., few if any of the members knowing the real causes of such differences. The same difficulties were said to exist in relation to spars and quartz, which were ground without an exact knowledge of their nature, and mixed with many foreign substances and impurities. The want of proper care and system in opening and working clay pits was also the subject of considerable

criticism, as this made it difficult for the potter to obtain just the kind or grade of clay he needed, the different qualities frequently being mixed, so that there was no uniform standard. To remedy this it was said that clay miners must work their beds on a broader scale, so as to obtain a more even grade, as, even in the best strata, there were variations every few feet, and, by working in a small way, it was impossible to prevent the mixing of the different qualities.

The interesting archæological discoveries of Dr. Schliemann and General Di Cesnola have, of late years, drawn more particular attention to ancient accomplishments in the ceramic art, but, while so much interest is being developed in the purely artistic side of the question, we hope the practical department—that which tends to develop and enlarge an important home industry—will not be lost sight of.

ANOTHER RAIN CONTROLLER.

Several schemes for the artificial production of rain have been noticed in recent issues of the SCIENTIFIC AMERICAN. Mr. Geo. H. Bell, of this city, goes further, and sends us the plan of a rain tower, by which he would not merely produce rain when it is needed, but prevent rain when nature is disposed to grant that blessing too liberally.

Mr. Bell's rain tower is a charming little structure of stone, one hundred feet in diameter at the base, and tapering to sixty feet diameter at a height of one thousand feet. Above this rises a tubular tower of wood or iron, say five hundred feet. It would not often be necessary to go above one thousand five hundred feet, Mr. Bell thinks, though that altitude might be exceeded if necessary. Of course there would be no risk of such a tower being blown down or crushing its foundation by its own weight.

The interior hollow of the tower would have a diameter of twenty feet; and through it a vast volume of saturated air could be blown into the upper atmosphere by means of proper machinery at the base of the tower. In case that might not suffice to secure the desired precipitation of rain, an additional up-rush of air around the tower is obtained by means of numerous tubes leading upward and outward from the interior of the tower at an angle, say, of 45°. Similar tubes descending from the inside to the outside of the tower serve as inlets, the air let in through them being sucked in by the ascending current within the tower; then, after it has received "the upward impetus of the inside force," it will be ejected upward through the ascending tubes. "Thus," in the words of the inventor, "through every stratum of air pierced by this mammoth rotunda, the air surrounding the outside walls will be agitated by an upward influence," making the exterior ascension indefinitely exceed the interior.

The inventor adds: "While these tubes, discreetly located at meteorological centers, would doubtless become reliable agencies for the formation of clouds, it should be their faculty also to prevent rain; for by reversing the motion of the fan or blower, a descensional flow of air would begin, which might annihilate the clouds overhanging, by bringing them to earth in aeriform and holding them here [securely bottled of course!] until they be wanted in precipitation on some locality, then instituting the ascensional flow and send them up to be condensed."

Mr. Bell suggests that a single timely rain would pay the cost of building a tower of this sort, "and a nation furnished with a reasonable number might prove them her wealth and grandeur."

REMARKABLE EXPLOSIONS OF GAS.

An explosion of gas of a magnitude unprecedented in the history of gas illumination, occurred in London, July 5. The district in which the disaster happened had been supplied with gas through a system of small (three and four inch) mains, which had become inadequate. Accordingly preparation had been made to increase the supply by laying down a new thirty-six inch trunk main. This work had nearly been completed, only a single length of pipe having to be put down before the gas could be turned in. The point of junction was in an open trench, where the end of the main had been plugged and fitted with a half inch stand pipe.

Just before the explosion workmen had been engaged in cutting out the plug from the end of the pipe. The foreman was standing on the main near the stand pipe, from which he had removed the pressure gauge with which he had tested the main, and ascertained that there was no pressure in it. He then smelt the stand pipe to ascertain whether any gas was issuing therefrom, and finding none came out, he applied a light, and almost immediately a dull rumbling sound was heard, followed by an explosion, which blew one of the workmen a considerable distance into the open pipe on the opposite side of the trench, killing him instantly, and so injuring the other man that he died shortly after his removal to the hospital. The foreman escaped unhurt. There was a quantity of dust and smoke, but no flame was seen.

Almost simultaneously another explosion occurred some yards away, and was followed by five or six more explosions at varying distances along the line of the main. The streets were much torn up, many buildings were wrecked or more or less seriously injured, and several persons were hurt. At the second point of explosion something like a dozen lengths of main were upheaved; at others, from three to six lengths were blown out; while in two places the explosion was limited to one length. At each point of explosion the paving stones were hurled into the air, causing great destruction of surrounding property, and peril and injury to passers-by.

At the coroner's inquest, the foreman of the pipe layers testified that the point of first explosion was nearly two miles from the "live" main containing gas. The new main —technically "dead" main—was shut off from the live main by means of a valve and cap, the cap being bolted on so that there was no flow of gas from the live main to the dead one. Everything was ready, however, to turn the gas into the new main when the lacking length at the west end had been laid. How the gas got into the main which was broken up is a mystery. In his testimony, the chief inspector of the gas company said:

"I was certainly not aware of there being gas in the main; but it did not occur to me to test it. I did not think gas had come there. The valve in Howland street was put in under my superintendence, and I know that it was sound and proper. I have no doubt that the explosion was caused through there being gas in the main to the westward. About five per cent of gas combined with atmospheric air would be sufficient to create an explosive mixture, but ten per cent would be more dangerous. The main had not been tested with a view to seeing whether gas was present. It is my belief that gas had got mixed with the air in the main, but I cannot account for it. The theory I have formed is that gas must have escaped from a fracture in one of the smaller pipes, and found its way into the main."

Another theory was that the passage of some heavy vehicle over the valve in Howland street might have loosened it enough to let a sufficient quantity of gas into the "dead" main to make the mixture of gas and air explosive. The explosion not only tore up the streets in places, but broke in the sewers, and so damaged the gas and water connections of the houses as to leave the district for some hours without water or light.

Though this accident was pronounced unprecedented by gas engineers, it was quickly followed by a similar but fortunately less disastrous one of the same sort. A number of workmen were engaged in enlarging a gas main at Bilston, near Wolverhampton, England, when, through an incautious use of a light, an explosion occurred, and a portion of the roadway and pavement was upheaved. The explosion traveled underground, and burst at some distance from its origin. The amount of damage done, however, was not great, and no lives were lost. A second explosion occurred some hours after the first.

THE TEXAS HYDRAULIC MINERAL BELT.

A correspondent, writing from Round Rock, Texas, announces the recent discovery of a valuable and very extensive deposit of hydraulic earth, which crops out along a belt many miles in length. At Del Valle, on the Colorado River, eight or ten miles from Austin, it shows a stratum from sixty to eighty feet thick, above the river. At Round Rock, twenty miles northeast of Austin, it lies two feet below the surface, and is of unknown depth. At this point it is easily converted into quicklime by burning. Mixed with from two to four parts of sand it produces a hydraulic building mortar or artificial stone, said to be equal to that made with the best English Portland cement. By similar treatment with three parts fine sand through one-eighth mesh sieve, and three parts coarse gravel through one-fourth sieve, it produces a concrete which, when moulded and pressed, gives a hydraulic stone brick of superior quality, suitable for all common building uses. The presence of such an inexhaustible supply of material for making cheap and strong artificial stone cannot fail to be of great benefit to Texas.

ARSENIC IN WALL PAPERS.

A law suit concerning the use of arsenic in colors was lately tried in the High Court of Justice, London. Steinhoff, a color maker, sued Woollams & Co. for a small bill for colors furnished. Woollams refused to settle because the colors were found to contain arsenic; they not only refused to pay, but claimed damages against Steinhoff to the amount of nearly two thousand dollars. It was proven on the trial that Steinhoff, when he sold the colors, which were the "imitation azure blue," guaranteed that they contained no arsenic. Woollams showed that his reputation in business was to a great extent founded on the fact that his wall papers were made without arsenic. Believing that the colors of Steinhoff contained no arsenic, he made up a lot of wall papers therewith. Subsequently it was found that the colors contained arsenic to the large extent of fifty per cent. The jury allowed the claim for damages. So the plaintiff, instead of obtaining a judgment in his favor, had a heavy judgment rendered against him, and had to pay the costs on both sides in addition.

THE MAGNET IN MEDICINE.

Some recent researches undertaken under the direction of Prof. Charcot, in his laboratory at the Salpêtrière, have attracted attention anew to a therapeutical agent which has been known for a long time, but which at the present time has fallen into disuse. We refer to the application of the magnet in the treatment of certain diseases. It is claimed by the believers in the efficacy of this mode of treatment that magnetization has fallen into discredit on account of the absence of precise rules for the application of the remedy, and also because of the air of mystery which seems to be connected with it. To Prof. Maggiorani, it is said, is due the credit of calling attention again, in 1869, to the value of magnetic medication, and of endeavoring to establish it on a rational and strictly scientific basis. The first experiments were made at the Salpêtrière in order to verify the facts collected together by M. Burq under the generic title of metallotherapy. After the results obtained by metallic applications, it was natural to endeavor to throw some light on these phenomena by varying the conditions of experimentation. It was found that patients (especially those afflicted with nervous diseases) were not only acted upon by plates of different kinds of metals, but that like results were obtained by the majority of physical agents, such as weak currents, static electricity, sonorous vibrations, differences of temperature, magnetized bars, etc. It was soon found that magnetized bars were remarkable for the consistency of their action and the facility with which they could be employed. It is not claimed that magnets are endowed with specific properties, but that they form part of a group of physical agents which, in varying degrees, possess the same power as the above-named of affecting the nervous system and giving rise to biological phenomena. The Salpêtrière researches have provoked a lively discussion. The facts announced have been confirmed in Germany, Italy, England, etc., but have been boldly attacked likewise in the last-named country.

A medical writer in *La Nature*, who has been a witness of Prof. Charcot's experiments, says that the action of the magnet is in some respects so surprising that it might *a priori* excite mistrust. The application is not direct. The magnet is not placed in contact with the skin of the subject experimented on, but its action takes place at a distance. To influence the organism and to produce the same effects as with metals it only suffices to place the poles of the magnetized bar at one or two centimeters' distance from that portion of the body upon which it is desired to act. It is thus that all the experiments have been made at the Salpêtrière. It is not necessary that the magnet should be a large one, but merely that the magnetic force should be appreciable. It is alleged by the writer in question that this mode of treating disease should be ranked of equal value with other methods now in use, such as that of electricity, etc.

The Growth of our Export Trade.

During the year just closed both the value of the imports of merchandise into and the value of the exports of merchandise from the United States were larger than during any preceding year in the history of the country. According to the annual report of the Chief of the Bureau of Statistics, just issued, the value of the exports of merchandise during the year ended June 30, 1880, exceeded the value of the exports of merchandise during the preceding year about $125,000,000, or 18 per cent, and the value of the imports of merchandise during the year ended June 30, 1880, exceeded the value of such imports during the preceding year about $222,000,000, or 50 per cent. The increase of the value of imports of merchandise exceeded the increase in the value the exports nearly $97,000,000.

The value of the imports and exports of merchandise during the fiscal year just closed exceeded the value of such imports and exports during the preceding year about $347,000,000—an increase of 30 per cent. The rapid growth of the foreign commerce of the country is strikingly exhibited by the fact that the value of the imports and exports of merchandise during the fiscal year just closed amounted to $1,503,679,489, being about 81 per cent greater than the value of the imports and exports of 1870, and nearly 119 per cent greater than the value of the imports and exports for 1860.

The exports of coin and bullion during the year ended June 30, 1880, were about $7,800,000 less than during the preceding fiscal year, and the imports of coin and bullion during the year ended June 30, 1880, exceeded the imports during the preceding fiscal year about $72,700,000. During the year just closed, for the first time since 1861, the imports of coin and bullion exceeded the exports of the same.

Wanted—An Easy Place.

Rev. Henry Ward Beecher some time since received a letter from a young man, who recommended himself very highly as being honest, and closed with the request, "Get me an easy situation, that honesty may be rewarded." To which Mr. Beecher replied: "Don't be an editor, if you would be 'easy.' Do not try the law. Avoid school keeping. Keep out of the pulpit. Let alone all ships, stores, shops, and merchandise. Abhor politics. Keep away from lawyers. Don't practice medicine. Be not a farmer nor a mechanic; neither a soldier nor a sailor. Don't study. Don't think. Don't work. None of them are easy. O my honest friend, you are in a very hard world! I know of but one real 'easy' place in it. That is the grave."

Injurious Effects of the Buttonball.

Les Mondes states that a French medical journal has recently called attention to the injurious effects that are apt to follow a residence near the common shade tree, the buttonball or plane tree. The fact has long been known, even from the time of Pliny, that a stay near these trees is often followed by an irritation of the air passages, followed by a disagreeable and sometimes persistent cough. This is due to the fact (familiar to botanists, though perhaps not to the general public) that the young shoots, leaves, and stipules are covered with a fine thick down composed of minute branched rigid hairs, which falls off as these parts become older, and often floats in the air in large quantities. It is the inhalation of this that causes the throat difficulties. It often causes serious annoyance to employes in nurseries where the tree is raised, and who fail to take precaution against it.

Lake Michigan White Fish.

For the past three years the catch of white fish in Lake Michigan has been small, owing, the fishermen say, to the prevalence of northeast winds. Recently the fish took a sudden departure from the southern end of the lake, abruptly cutting off the supply from the Chicago market. This unusual movement is attributed partly to an extraordinary influx of "sheepheads," but more to a sudden and remarkable change in the temperature of the water, from extreme cold lasting well into July, to a very high temperature for Lake Michigan. The white fish live principally upon worms and small shell-fish, and their chief enemy is the Mackinaw trout.

IMPROVED STEAM GENERATOR.

The steam generator shown in the accompanying engravings is of the class in which the water is contained in the interior of the tubes. Two horizontal tubes of large diameter serve the purpose of mud drums, and two similar tubes located at the top of the boiler form the steam and water drums. The mud drums and the water drums are connected by vertical or slightly inclined heating wrought iron lap-welded tubes, which are secured in the lower drums by simply screwing them in, in the usual way, but they are secured in the upper drums by means of a screw fitting, D, which is threaded both externally and internally, as shown in Fig. 2. The internal thread engages with the external thread on the end of the tube, and the external thread engages with the internal thread in the upper drum, B. To increase the size of the upper end of the tube sufficiently to permit of passing the felting, D, over the tube, and make a perfect connection, the end of the tube is enlarged either by welding a ring on the end of the tube or by swaging the tube at the end so as to increase the diameter. Mr. F. P. Franke has secured a patent for this method of connecting the tubes with the drums.

In putting together one of these boilers a first and last heating tubes are put in place by first passing the enlarged end through the opening in the upper drum, then screwing the plain end into the lower drum. Then the fitting, D, is screwed over the tube and into the upper drum. It will be noticed that this boiler has no seams nor rivets.

This method of putting in the tubes has many advantages over right and left hand threads and other methods of making connections between tubes and drums, as it affords a ready means of introducing the tubes, and admits of readily removing any one of them without difficulty and without disturbing the others. The inventor informs us that ordinary wrought iron pipe is preferred for the tubes, as it is thicker than common boiler tubes and is stronger and more durable.

This boiler may be made of any height desired. It may be used for generating steam for power or heating purposes, and for hot water heating; and is now in successful use for all of these purposes, giving the highest satisfaction.

Any kind of fuel may be used with this boiler, and there is no possibility of the heating surfaces becoming covered with ashes or soot. It is very economical in the use of fuel, and is free from the danger of destructive explosion.

The heating surface being very large in proportion to the water contained in the boiler, steam may be raised quickly, and the circulation being good, steam is generated very freely. It may be shipped in sections and is readily set up.

Further information will be furnished by the manufacturers, Messrs. Renwick & Franke, 605 Main street, Buffalo, N.Y.

Novel Plating Process.

At a recent meeting of the Royal Dublin Society, says *The Ironmonger*, Dr. J. E. Reynolds gave some illustrations of a process he has discovered for coating metallic and other surfaces with a brilliant and strongly-adherent layer of galene. The plating of a tube of brass, and another of glass, was effected at the meeting by simple immersion in a solution which speedily deposited a beautiful mirror-like layer on the material. This layer readily assumed its final polish by friction with a wash leather, and it bore some severe treatment without giving way. The color of the deposit is darker than pure silver, but brighter than oxidized silver, and the coated surface can easily be made to assume a peculiar bluish bloom, which enhances its beauty. Dr. Reynolds exhibited a number of specimens in iron, steel, brass, glass, porcelain, ebonite, and other articles, which had been subjected to the action of the atmosphere for a period of more than two months in some instances, and all withstood this severe test completely without showing tarnish or rust. Dr. Reynolds mentioned that the cost of his galene plating process did not exceed one-eighth that of the nickel plating. Moreover, any intelligent workman could quickly become his own plater, as the use of electricity is altogether avoided.

MISCELLANEOUS INVENTIONS.

An improvement in mail bags has been patented by Messrs. Thomas O. Bennett and Samuel Trenbath, of Clifton, Mich. This invention consists in a hinged metallic frame attached to the mouth of the bag, and in a lock used in connection therewith, whereby provision is made for holding the mouth of the bag open when desired and for securely locking it when closed.

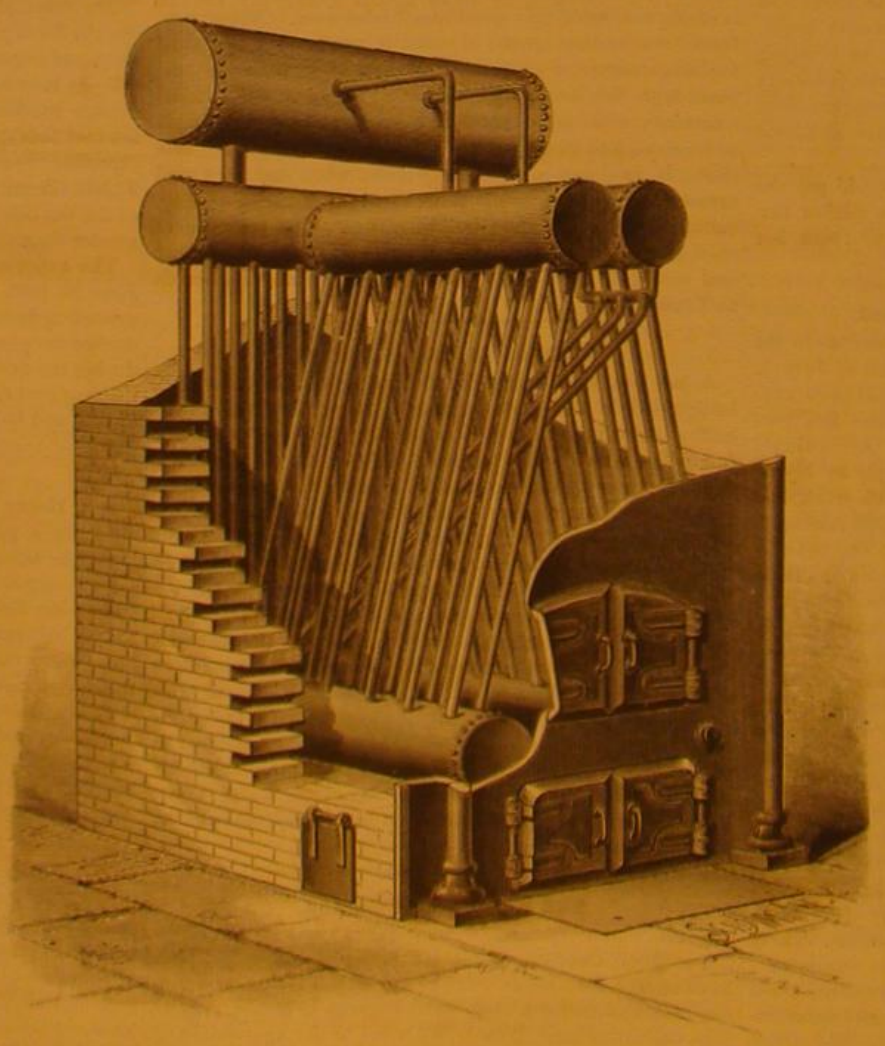
Mr. Charles S. Philips, of Brooklyn, N. Y., has patented an improved sweat house for curing tobacco, which is so constructed that the tobacco, while packed in cases, can be subjected to the vapor of water at any desired temperature, and thus moistened without being made wet. The invention consists in constructing a tobacco sweat house of a metal-lined tray, an interior wooden bottom, and steam pipes, and a double walled sweat house or chamber having a slotted or slat floor, an inclined roof, and upright cleats attached to the inner surface of its side walls.

FRANKE'S STEAM GENERATOR.

Mr. William C. Thornton, of Castle Rock, Mo., has patented a device by means of which the weighing of canned fruit, vegetables, etc., can be conveniently and quickly effected.

Mr. John B. Clopton, of Elgin, Texas, has patented a mechanical telegraph sounder adapted for the use of learners for practicing the manipulation of a telegraph finger key. It consists in a sounder wherein a finger lever and sounding lever are combined together with a spring in such manner that the action is very delicate and sensitive, and produces a sharp clear sound without the use of a battery.

An improved fan has been patented by Mr. Max Rubin, of New York City. This invention relates to that class of fans in which the web is secured upon two hinged handles, and consists in connecting the handles by a double-jointed hinge, in recessing the handles to receive the folded web, in combining stiffening strips with the hinge pivots and the web, and in combining with the handles a catch for fastening the handles together when the fan is closed or open.



FRANKE'S STEAM GENERATOR.

Mr. Jacob C. McCarty, of Edray, W. V., has patented a compound for saturating charcoal, coke, or coal to be used as fuel, consisting of a solution of chloride of sodium, sulphate of iron, and nitrate of potash.

An improved music chart has been patented by Mr. James W. Chambers, of Baltimore, Md. The object of the invention is to have music on the piano and organ rendered in all its completeness and purity of harmony, etc., in whatever key the music is originally written, without the necessity of knowing how to read music as usually written.

Messrs. Eugene H. and George F. Conant, of Camden, N. Y., have patented an improved knockdown rocking chair, so constructed that it may be closed into compact shape for transportation and may be conveniently put together for use.

Mr. James H. Mackintosh, of Paterson, N. J., has patented an improved spindle and bolster for spinning frames, so constructed that the spindle can be driven at a greater velocity than is practicable with spindles constructed in the usual way, and which will allow the driving band to be put on without detaching the whirl or bolster.

In the plumbing arrangements of houses it is common to fit a pan or safe beneath the wash basins and water closets to catch water from leaks and overflows, and fit such safe with a pipe to the cellar for discharging the water. Such pipes have been trapped or sealed at their lower ends by a tank of water to prevent foul or damp air from ascending; but such seal requires attention to supply water, and it is not practicable to apply a metal valve, as the pipe is seldom used and the valve rusts to its seat or becomes otherwise fixed and useless. Mr. Thomas Clements, of Jersey City, N. J., fits such pipes with a trap or valve which prevents entrance of air without preventing escape of water at any time.

Mr. George Wagner, of Swanville, Pa., has patented a door intended for use in connection with a pen, stable, or other building in which swine, sheep, or other small animals are housed; and the object of the invention is to allow ingress or egress to the animals at proper times, and also to provide for readily removing the door when desired.

An improved bee-hive has been patented by Mr. William S. Blaisdell, of Randolph, Vt. The object of the invention is to keep the bees at a uniform temperature, supply fresh air without a draught, give convenient space for surplus honey frames, afford easy access to the bees, and protect their food.

Mr. William Ford, of Great Bend, Kan., has patented a novel device to be placed on the top of a stove or furnace for holding and burning hay; straw, corn stalks, weeds, etc. It consists of a sheet metal drum closed at the bottom by peculiarly constructed dampers, and having a small central hole in its top for the introduction of a rod or poker for the purpose of pushing down or compressing the contents of the burner.

Mr. Franklin W. Lamb, of Hydesville, Cal., has patented an improvement in that class of gates that are operated by a system of cords and pulleys, and the object is to enable the gate to be easily opened and closed, and to support it in all positions.

Mr. Francis N. Still, of Lake City, Ill., has patented an improved gate pivot which is simple and effective. It consists of a conical socket secured in the top of the gate post, and containing a ball supporting a conical stud of a hood-shaped disk, upon which disk the top longitudinal bar of a balanced swinging gate rests.

Mr. William H. Rogers, of Amherst, Nova Scotia, Canada, has patented a fishway so constructed that the fish will readily find the entrance, and it is capable of being used at all stages of water. The invention consists in constructing the fishway with inclined partitions having openings and flanges at their upper ends and with openings and slides at their sides; also, in constructing the fishway with its lower end connected with an opening in the lower part of the dam, and extending it up stream with a gradual rise.

An improved device for adjusting and fastening transom sashes, greenhouse sashes, and other window sashes, so constructed that the sashes may be opened and closed easily, however heavy they may be, and held securely in any desired position, has been patented by Mr. Justus H. R. Prall, of Elmira, N. Y.

A light portable folding table for paper-hangers' use, which may be readily carried in the hand, and which is of sufficient length and strength to accommodate the strip of paper and bucket of paste, has been patented by Mr. William Trilk, of La Crosse, Wis.

Mr. Louis Prince, of Jersey City Heights, N. J., has patented an improvement in the class of invalid beds having a permanently attached bowl or funnel.

ENGINEERING INVENTIONS.

Mr. James M. Thayer, of Randolph, Mass., has patented an improvement in elevators by which they will be stopped and prevented from falling should the hoisting apparatus break or in any manner become disarranged.

Mr. John H. Blake, of Batavia, N. Y., has patented a cheap rotary engine that consists of few parts and is economical in the consumption of steam. The invention consists of an adjustable abutment, and a spring and crank shaft for effecting the movement of the abutment, and a rotary valve of simple construction.

An improved pile driver has been patented by Mr. Joseph W. Putnam, of New Orleans, La. This invention relates to an improvement in the class of pile drivers which are adapted for use in the construction of railroads, being for that purpose mounted on a truck or platform car in such manner as to admit of lateral movement in the arc of a circle, so as to drive several piles successively without requiring any change in the position of the truck or car.

Dika Bread.

The following interesting note concerning the preparation of the dika or odika bread of Western Africa has recently been received from Dr. H. W. Bachelor, in the Gaboon, by Mr. Thomas Christy, to whom we are indebted for it:

"The plums are gathered as they fall from the tree, and are emptied from the baskets one after another until a large heap is formed. They are allowed to remain many days until the outside has putrefied, and then the nuts are cracked, the seeds or kernels taken out and smoked for many days. Then they are put into a large mortar and crushed into a homogeneous mass. The rays of the sun are now allowed to pour on the mass, which melts and is put into a mould. This mould is of the shape of a frustum of a cone, and the cakes vary in diameter from eight inches to a foot at the base. These will keep for six months."

Dr. Bachelor also makes the following interesting remarks with regard to the native medicinal plants of the country:

"The only way of ascertaining the properties of any product here is to ask the natives 'if it poisons goats,' or 'if the monkeys eat it,' and by direct experiment. The natives themselves know nothing of one medicine for one disease, and another for another. It is, in their opinion, the *witchcraft* that cures, not the leaf itself."

LIFTING TACKLE.

Every engineer, builder, and millwright knows the great importance that is attached to lifting heavy weights and fixing materials and machinery. It is no use for work to be properly finished if accidents happen in fixing. The young and inexperienced erector is frequently at a loss to know how and where to attach his ropes and other appliances to secure the best result, and, worst of all, no effort is made to teach him; he must rely entirely on his own observations. So well known is this ignorance with respect to lifting and hoisting in mechanical trades, that it is frequently stated, and often acted upon, that an old sailor makes the best erector. He is as nimble as a monkey on a pole or scaffold. We know very well that in our younger days we experienced considerable difficulty in obtaining information respecting knots, loops, and other rope fastenings.

No doubt all who have to do with the moving of machinery and other heavy masses will find the rope knots and fastenings shown in the engraving very useful. The information is not only useful when away from home in foreign countries, or away from the workshop, but it is useful *in* the workshop. The man who understands the use of rope tackle is a king among his fellows.

We have often thought that in these days of steam cranes and hydraulic jacks, men are not so ready in resources as they were many years ago. They trust too much to machinery and too little to themselves. They seem afraid to exert their real strength at the end of a rope. If we can only induce a few of our readers to study the art of lifting weights and encourage confidence in manual strength, we shall not consider our efforts to have been in vain. The various kinds of knots and loops are shown in the annexed engravings.

LIFTING TACKLE.

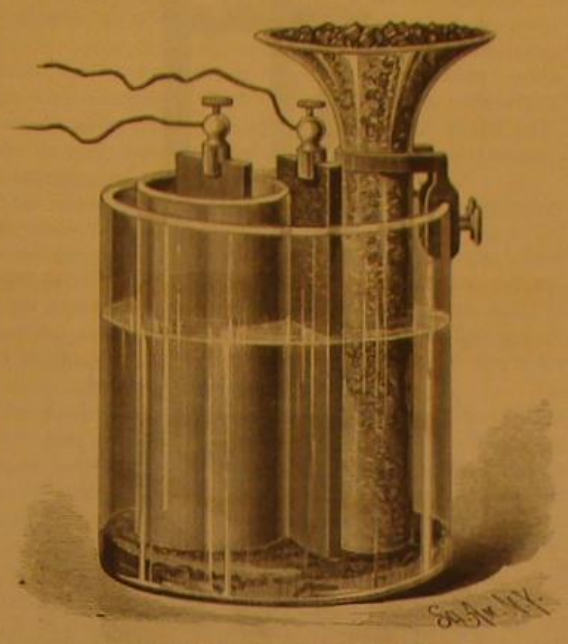
Figs. 1, Half Hitch. 2, Timber Hitch. 3, Half Hitch and Timber Hitch. 4, Clove Hitch. 5, Hammock Hitch. 6, Cask Sling. 7, Bale. 8, Butt Sling on End.

The Fastest Time in a Trotting Match.

On the closing day of the Jockey Club meeting, in Chicago, July 24, the best time ever recorded in an actual trotting match was made by the chestnut mare Maud S., owned by William H. Vanderbilt. The time was 2 m. 13½ sec. for the mile. Rarus has trotted in exhibition trials against time in 2:13¼ and 2:13½, and St. Julien in an exhibition trial in 2:12¾.

IMPROVED GALVANIC BATTERY.

In the battery shown in the engraving the ordinary zinc and carbon elements are employed, the zinc being placed in the porous cell and immersed in a solution of muriate of ammonia, and the carbon in oxalate of chromium and potash in combination with free bichromate of potash and muriatic acid.



ANDERSON'S GALVANIC BATTERY.

The negative portion of the cell may be charged in various ways, as for instance, by placing in the muriatic acid any oxalate, such as oxalate of copper or of ammonia, and adding bichromate of potash, whereby oxalate of chromium and potash is more or less quickly formed in the cell; but the mode the inventor has found advantageous to adopt is to add oxalic acid to a solution of bichromate of potash until effervescence ceases, and then to slowly evaporate the solution, whereby crystals of the oxalate of chromium and potash will be obtained. A sufficient quantity of this salt is then placed in the bottom of the carbon cell, together with about an equal quantity of crystals of bichromate of potash and muriatic acid, either pure or more or less diluted with water, according to the strength of the solution required, and the carbon is then placed in this solution. Instead of dropping the crystals or other agents loosely into the cell containing the negative solution, as has been generally the practice, the strength of the battery is regulated by inclosing the crystals of bichromate of potash in an adjustable glass tube, open at the top and having a bottom of perforated platinum or of platinum wire gauze, or the tube itself may be perforated either at the bottom or sides. This tube is immersed in the negative solution to a greater or less depth. The greater the depth of immersion of the tube the stronger the power of the battery, as more crystals are then exposed to the action of the solution. In this way, by adjusting the depth to which the tube is immersed the strength of the battery is regulated.

For a one-fluid battery the oxalate of chromium solution is common to both zinc and carbon. Arranged in this way the action of the battery, although of much shorter duration than when two fluids are used, the battery will be rendered much more intense, and the internal resistance of the cell will be less. The two fluid form of battery is employed where great constancy, combined with a certain degree of power extending over a considerable period of time, is required, as, for instance, for telegraph work, the ringing of electric bells, and for the driving of electro-motors and the production of the electric light. On the other hand, the one-fluid form of battery may be used with advantage for purposes where a short, steady, and powerful action is required.

To prevent the escape of the fumes usually arising from the acids the solutions are covered with a film of oil or with a layer of finely powdered charcoal.

This battery was recently patented in the United States by Mr. Robert C. Anderson, of Woodgreen, England.

NEW INVENTIONS.

Messrs. Jacob Hollinger and John Flinner, of Millersburg, O., have patented improvements in that form of gate which, instead of swinging horizontally on hinges, is fixed upon a horizontal pivot bolt at one end between two posts, and is connected with rods and levers, whereby the gate is turned vertically over on its end when it is to be opened.

Mr. George K. Shryock, of Johnstown, Pa., has patented a dinner bucket the cover of which is provided with a glass lined sauce holder, preferably made in cup-shaped sections, which are made removable.

Mr. John Clayton, of Brainerd, Minn., has patented an improvement in rolling colters, which has for its chief object the exclusion of dust and dirt from the friction surfaces, thereby preventing wear of the journals, so that the durability and efficiency of the colter, as a whole, are increased. The inventor also provides for taking up such frictional wear as is unavoidably incident to use, and for supplying lubricant to the friction surfaces.

Mr. Jacob Katzenberg, of New York city, has patented an improvement in the class of suspenders in which a cord is combined with shoulder straps by means of pulleys or sliding attachments, so as to allow the free movement of the button pieces, and thereby accommodate the movements of the body of the wearer.

Mr. Thomas Ragan, of Philadelphia, Pa., has patented a non-freezing hydrant that can be disconnected from the water main and removed for repairs or other purpose without digging or excavating about it.

Mr. George Milbank, of Chillicothe, Mo., has patented an improved method of reducing grain or other substances, consisting, essentially, in subjecting the material under treatment to the action of reducing disks and an air current simultaneously, the air current passing between the disks and conveying the reduced material in opposition to the centrifugal action.

A metallic awning, so constructed that it may be folded compactly against the front of buildings and readily extended, has been patented by Mr. Wm. P. Woodruff, of New York city. The invention consists in a set of overlapped top strips, sets of overlapped end strips, and connecting and suspending chains and rod.

Messrs. Nicholas C. N. Laurense and Ernest G. Matzka, of Detroit, Mich., have patented a process of applying gilding or bronzing powders to mouldings, consisting, first, in mixing the gilding or bronzing powder with a solution of chlorine, alcohol, turpentine, diluted acetic acid, or any liquid compound with which the powder can be incorporated; in then adding thereto glue, isinglass, gelatine, or other soluble adhesive substance, and in then applying the mixture with a brush.

Mr. Henry Hartman, of Salt Lake City, Utah Ter., has patented an improved bridle, which is so constructed that horses can be easily and quickly controlled should they become frightened or attempt to practice ugly or dangerous tricks.

A novel device that may be attached to sewing machines for plaiting the fabrics to be sewed in plaits or folds of any desired width or any desired distance apart, has been patented by Mr. Leopold Lyon, of Hazleton, Pa.

An improved pianoforte attachment, by which the performer is enabled to sustain or permit the continuance of the sound of one or more strings after the fingers have been taken from the keys, has been patented by Mr. Carl Mahling, of New York city.

An improved safety whiffletree has been patented by Mr. Bolivar J. Quattlebaum, of Ridge, S. C. The object of this invention is to provide means for releasing horses from vehicles that may be instantly and conveniently operated in case of imminent danger, when it is desired to arrest at once the movement of the vehicle and the speed of the horse cannot be checked in time to avert the danger; and it may be used at any time for conveniently unhitching the horse from the vehicle by timid and unskilled persons, and at the same time provide against the accidental displacement of the trace from the end of the whiffletree.

Mr. William R. Parks, of Palmer, Mass., has patented a boiler which will heat water and make steam rapidly with a small amount of fuel.

An improved signal conveyer for hotels and other buildings has been patented by Mr. Joseph C. Beard, of Pine Bluff, Ark. The apparatus consists of a system of tubes leading from the different rooms to a common tube terminating at the office, and balls numbered to correspond with the numbers of the rooms, the messages being on the inside and being impelled by gravity. The pipe which conveys the balls descends continuously through the various rooms of the building to the office, and has an opening in each room. The box in which the balls are received contains a signal bell.

A self-closing faucet, that will close without spring or screw, has been patented by Mr. Thomas H. Walker, of Kansas City, Mo. The invention consists in a combination of devices that cannot be clearly described without engravings.

Mr. Elijah S. Caswell, of Taunton, Mass., has patented an improved shoe or boot nail, having the oblong head and a point beveled equally on both sides, and provided with lateral projections a short distance from the head.

A diagram for the use of draughtsmen in making perspective sketches or drawings, whereby such drawings may be made in true perspective and to scale in every part, has been patented by Mr. Emery M. Hamilton, of New York city. The invention consists in a diagram sheet having printed upon it guide lines in perspective and vertical and horizontal lines, the result of these combined lines being that the sheet is laid out in perspective scales, which can be utilized as guide lines for making a drawing at any angle to the horizon and vertical.

Mr. Charles F. Linscott, of Boston, Mass., has patented an improved glass plate cleaner, which consists of a head or holder and one or more rubber strips made thicker at one edge, with one side flat and the other side concaved from the thicker edge to, or nearly to, the thinner edge.

Mr. Edward Weissenborn, of Jersey City Heights, N. J., has patented an improved package for pencils, crayons, and similar articles, so constructed as to prevent the pencils or other articles contained in the packages from rubbing against each other.

An apparatus by means of which, with the aid of water and certain chemicals, the dry air of high altitudes may be made to resemble the moist air of low altitudes, has been patented by Mr. Henry R. Fowler, of Leadville, Col.

Mr. William F. Phillips, of Watford, Ontario, Canada, has patented a swing, having two pairs of crossed posts, strengthened by cross bars, a cap box, and branched swinging bars, from which is suspended a basket.

Mr. Edward J. McClellan, of Brooklyn, N. Y., has patented a device that may readily be attached to a pan for use in mixing and kneading dough for bread and cake. The invention consists in an adjustable bar or plate fitted with a clamping screw and carrying the mixer and gearing. The mixer consists of an arbor or staff provided with radial arms and fitted with eccentric gearing, whereby both a revolving motion and up-and-down movement may be given to the staff.

Mr. Alfred N. Gabel, Sr., of Ridgeville, Ill., has patented a fertilizer distributing attachment for planters for distributing fertilizers in hills or drills and in any desired quantity.

Mr. Benjamin J. Howe, of Sing Sing, N. Y., has patented an improved dish washer, by which, the inventor claims, as many dishes can be washed and thoroughly cleansed in five minutes as can be done by hand by one operator in an hour.

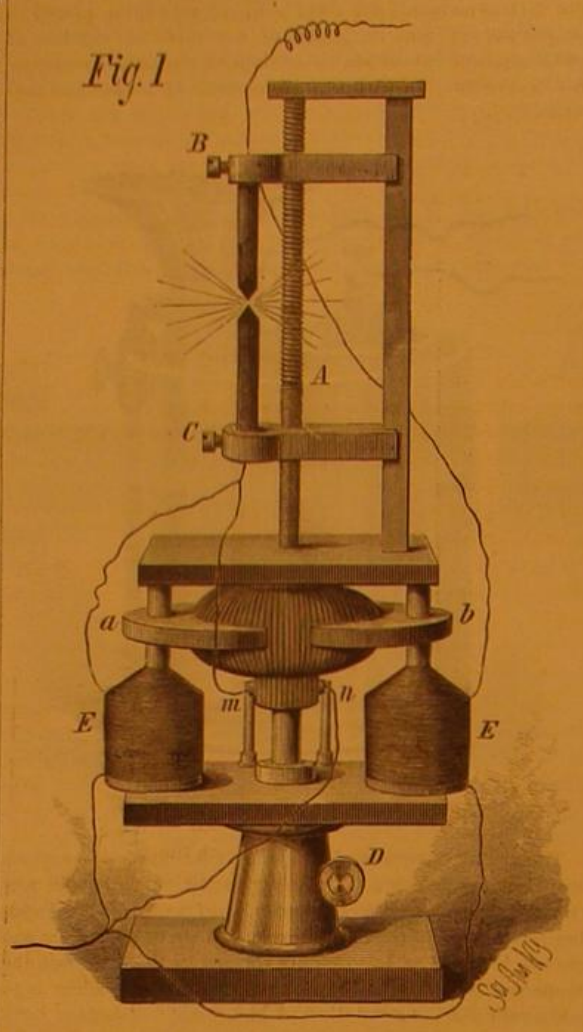
Mr. Thomas F. Longaker, of West Philadelphia, Pa., has patented an adjustable gauge for liquid measures, which consists in providing the measuring attachment with a device for adjusting the attachment for measuring liquids of different specific gravities, and also in so constructing the discharge valve that the packing may be renewed by unscrewing the valve seat.

The combination of a bench hook or screw, fitted in the table, with a swinging frame and clamping jaw or vise, has been patented by Mr. Nathan E. Lovejoy, of Columbus, O.

Mr. William N. Crabtree, of Porterville, Cal., has patented an improvement in hair trigger gun-locks, which consists in devices that will prevent accidental discharge of the gun without requiring additional manipulation or interfering with the rapid handling of the piece. A blocking piece is interposed between the hammer and breech, to prevent contact of the hammer with the cap tube, and a thumb lever fitted upon the hammer holds the blocking piece out of action when the hammer is set for firing. These devices work automatically by the usual manipulations of the hammer.

THE ELECTRIC LAMPS OF W. TCHIKOLEFF.

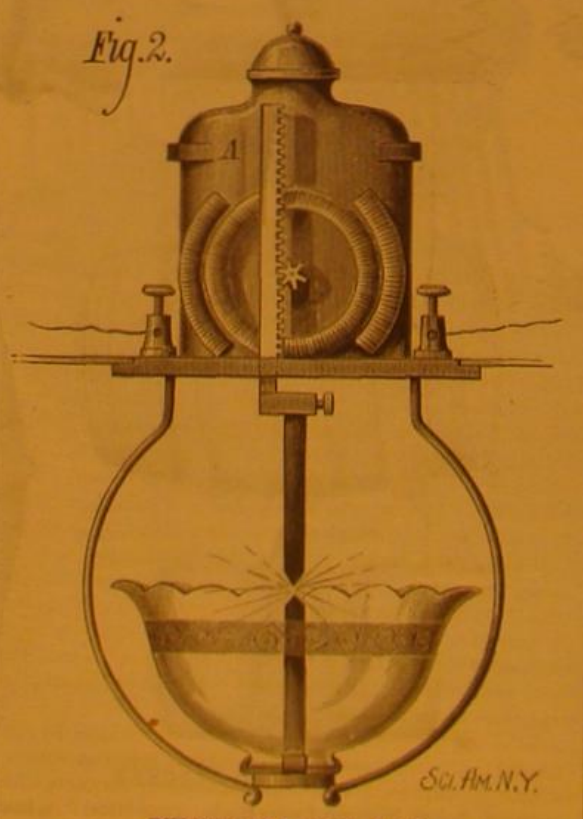
W. Tchikoleff, the head of the electric lighting department of the Russian artillery, has described, in *La Lumière Electrique*, a new lamp, the design of which was lately brought before the physical section of the Moscow Society of Naturalists, and which is represented by Fig. 1.



TCHIKOLEFF'S ELECTRIC LAMP.

E E′ are electro-magnets disposed like those on the other systems, and having poles, *a b*, spread out in circular form as in the Gramme machine. K is a Gramme or Siemens ring, the rotary motion of which causes the carbons to move through the intermediary of a double thread screw, A, and two nuts, B C, which carry the carbons. Lastly, D is a regulating screw, for the purpose of raising or lowering the luminous focus.

The current passes from the positive pole of the generator to the negative pole by three derivations, one of which includes the arc and traverses the ring by means of the contact pieces, *m n;* while a second, also including the arc, excites the electro-magnet, E (or both electro-magnets in a given direction); and a third which, without passing by the arc, influences the high resistance magnet, E (or both magnets in contrary directions), so that the action of this magnet upon the ring shall be in a reverse direction to that of E.



TCHIKOLEFF'S NEW LAMP.

In consequence of this arrangement the action of the electro-magnets upon the ring, K, is almost nil when the arc possesses its normal resistance; but when the resistance of the arc augments, the action of the electro-magnet, E, becomes weakened, allowing E′ to preponderate, and the ring, K, will rotate so as to bring the carbons into closer proximity. The contrary effect will, of course, be produced if the resistance of the arc should diminish.

Experience has shown that with such a lamp it is possible to obtain, with regularity and safety, a good electric light with twenty-four Bunsen cells, and at first with even twenty cells. Some of these lamps have been in use in the Russian artillery since 1877. This lamp may also be constructed on the principle of the Wheatstone balance.

The form of this lamp intended for public lighting is represented by Fig. 2. The rod, A, with the upper carbon holder, works by the effect of its own weight. When the current traverses the lamp the distance between the two carbons is maintained by the aid of helical coils, but these coils and the toothed wheel which controls the movements are worked, as in the former case, on the principle of derivations. When the current is interrupted, the carbons come into contact by the effect of the weight of the rod, A.

Certain details of construction have been omitted in this description, but enough has been given to make the principle clear.

To sum up, the advantages of this lamp may be enumerated as follows:

1. Its construction is extremely simple; it is free from clockwork mechanism, springs, and electrical contacts.

2. It does not require preliminary regulation nor any manipulation before or during its working.

3. Several of these lamps may be arranged in series in a circuit, and they are always in due relation with the intensity and the tension of the current which is to act upon them.

4. The lamp can work with comparatively weak currents, and also produce a very powerful light when the power of the current is augmented.

The inventor is convinced that the problem of the divisibility of the electric light by means of lamps having a voltaic arc can be solved only with the lamps based on the principle of the derivation of the current, which he discovered prior to Messrs. Lontin and Siemens.

Lamps with movable carbons, offering a certain resistance between their polar extremities, are, moreover, far preferable, from the point of view of divisibility, to lamps with fixed carbons, which may offer great variations in the resistance of the arc, in consequence of impurities, the action of the wind, etc. These variations may, in fact, be greatly reduced in the former description of lamp, and it is not necessary with them to employ currents of such high tension, or, if such currents be employed, additional lamps may be inserted in the circuit.

DECISIONS RELATING TO PATENTS.

U. S. Circuit Court—Southern District of New York.

COLLENDER *vs.* GRIFFITH *et al.*—BILLIARD TABLE PATENT

Blatchford, J.

1. The fact that a mechanical patent was issued more than two years after the date of a design patent showing, but not claiming, a like invention, will not invalidate the former.

2. A billiard table having the broad side rails made of beveled or inclined planes shows sufficient utility and advantage in the way of cheapness of construction, as compared with a table having sides of curved or ogee form, to support a patent.

3. Reissued letters patent No. 6,469, granted to H. W. Collender, June 1, 1875, for an improvement in billiard tables, declared invalid in view of evidence showing the existence in this country of similar tables many years prior to the date of the patent.

United States Circuit Court—Western District of Pennsylvania.

KNEELAND *et al. vs.* SHERIFF *et al.*—PISTONS FOR DEEP WELL PUMPS.

McKennan, J.

1. Patent No. 53,630, granted April 3, 1865, to E. Y. Kneeland, for improvements in pistons for deep well pumps, sustained.

2. "A patentee whose patent is assailed upon the ground of want of novelty may show by sketches and drawings the date of his inceptive invention, and if he has exercised reasonable diligence in perfecting and adapting it and in applying for a patent, its protection will be carried back to such date." (*Reeves vs. Keystone Bridge Company*, 1 O. G., 466.)

U. S. Circuit Court—Southern District of New York.

WILLIAMS *vs.* BARKER *et al.*—WILLIAMS' PATENT RUBBER FLOCK MACHINE, PATENTED NOVEMBER 26, 1861.

Wheeler, J.

When the several elements of a patented machine differ from a prior machine only as to the form of certain parts common to both, the patent, in order to be sustained, must be restricted in scope to the improvements in the form of such parts.

Bill dismissed.

U. S. Circuit Court—Northern District of New York.

MAYNARD *vs.* PAWLING *et al.*—PATENT RADIATING CONDENSER, ISSUED JANUARY 30, 1877.

Blatchford, J.

Where the device sold by the defendants is capable of use independently of a feature necessary to the plaintiff's apparatus, and it does not appear that the defendants intended

that such feature should be added to their device, the case cannot be said to come within that class of cases where the seller of parts of a patented combination is liable for infringement if there be a concert of action proved or legally inferable between him and others who supply others parts necessary to the complete combination.

Bill dismissed.

AMERICAN INDUSTRIES.—No. 54.

THE MANUFACTURE OF ULTRAMARINE.

Ultramarine is a blue pigment, used extensively for paint, bleaching paper, printing calicoes, paper hangings, staining paper, blue printing ink, laundry blue, and various other purposes. Its shades run from a very light greenish blue, through light and dark clear blue, to a very deep pinkish blue. There are also green, violet, red, yellow, and white pigments of nearly the same composition, the two latter being mere curiosities.

The chemical composition of this color is not yet fully understood. The generally accepted theory is, that alumina, silica, soda, and brimstone enter into a combination, forming an aluminous silicate, and thus combining with the meanwhile forming sulphuret of soda produces the ultramarine. It is entirely free from poisonous substances, resists the action of alkalies to a high degree, is very permanent in air and light.

White lead changes under its influence to a dull brown, and should never be used with it, oxide of zinc being far preferable. It loses its color gradually if in contact with acids. It was formerly made from "lapis lazuli," an opaque blue stone, which is found in some parts of Europe, Asia, and South America. The lapis lazuli was pounded into pieces of the size of a hickory nut, calcined, and washed with water and vinegar. This process was repeated several times, until the stones could with ease be crushed to a fine powder. This was mixed with a paste of turpentine, rosin, wax, white pitch, and linseed oil, and kneaded thoroughly through a bag under water. The blue washed out through the bag was collected on filters. It was sold, according to quality, for $50 to $200 per pound, and consequently could not be of general use.

In 1814, lumps of a blue pigment were found in various soda furnaces in France and Germany, and the chemical analysis disclosed the fact that they were of nearly the same composition as lapis lazuli, the natural ultramarine.

In 1824, the Société d'Encouragement of France offered a prize of 6,000 francs for the artificial production of ultramarine, provided its price should not be above 600 francs—about $20—per pound. Guimet, of Toulouse, in 1828, succeeded in producing an artificial ultramarine of a very fine quality, and received the prize. He kept his process a secret, and, although the price sank rapidly to as low as $3 to $4 per pound, he grew immensely rich, producing, in 1834, at the rate of about 120,000 pounds a year.

At about the same time, and, as is positively asserted, prior to Guimet, Gmelin, of Tubingen, made the same invention, and published his researches in full, thus probably causing the supremacy of Germany in the manufacture of this beautiful pigment.

The first factory started in Germany was that of Leverkues, in Wermelskirchen, on the Rhine, in 1834; the second in Nuernberg, in 1838, by Leykauf & Heine. To-day there are thirty-four ultramarine factories in the world, producing about twenty millions of pounds annually. The establishment which we describe to-day ranks as the third in extent and importance, and furnishes about one-tenth of the entire product.

Up to 1869 several unsuccessful attempts had been made to manufacture ultramarine in the United States. The failure was attributed to the prices of labor, rent, and chemicals, which were much higher here than in Europe. In the fall of that year Messrs. Heller & Merz set up their machinery in a building, 50 x 125, in Newark, N.J. Success was the true companion of their energy, and in 1873 they bought a large tract of land at the eastern limits of Newark, N. J., and there erected new and extensive works, which have been gradually enlarged until they cover three acres of ground, comprising seven large buildings and several sheds, stables, and dwellings. The works are driven by two engines of 100 and 50 horse power respectively, and one hundred workmen are employed. A new engine of 250 horse power and two new boilers have lately been set up, and the old ones will remain for unforeseen emergencies.

In the process for the manufacture of ultramarine the following ingredients are used: 1. Kaolin (china clay), Glauber salt, and coal, or rosin. 2. Kaolin, soda, silica, sulphur, and rosin. 3. Nos. 1 and 2 mixed with or without silica, according to the desired shades.

The raw material must be ground by burrstones to an impalpable powder, thoroughly mixed, pressed into large crucibles or muffles, and calcined to a red heat in furnaces for from 12 to 36 hours, as the various qualities require. The firing is finished when the sulphur is nearly burned out. This operation must be watched very closely through holes in the brick work of the furnace. When the firing is completed the furnaces are closed nearly air-tight, and the material allowed to cool off. This will take from five to six days. On opening the furnace the material appears dark green when Glauber salt has been used. With mixtures 2 and 3 the color is a very dark blue. The green ultramarine must be roasted with finely powdered sulphur in pans or retorts under influx of air, to produce the lightest shades, which are called cobalt ultramarine. Either kind must be thoroughly washed, as large quantities of Glauber salt and sulphureted soda are formed. After the washing the ultramarine is ground in wet mills from two to five days. When the grinding is finished the pulpy mass is run into large iron tanks, where it is refined under the influence of heat and various chemicals, then repeatedly washed in large vats, and, after separating the various grades of fineness, dried in ovens, bolted, and packed.

The qualities of ultramarine made by Messrs. Heller & Merz are to-day, with the exception of a very few unusual brands, good as any imported, and their product always finds a ready market. Their share of the world's business in ultramarine is much larger than a statistical record will make it appear, for in Europe more than one half the ultramarine sold is adulterated to an incredible extent, while American consumers are looking sharp for a pure article. Thus, factories in Europe claiming a sale of 10,000 cwt., may, in fact, not produce more than 5,000 cwt. of pure ultramarine.

The chemical qualities of ultramarine are of importance only when used by paper manufacturers. They use it for giving the paper a white or bluish tint, but as the alum, which is used in treating paper materials, causes an acidity, which tends to destroy the ultramarine, it must be made to resist this action. This is done by the use of larger quantities of silica in the raw material, yet ultramarine can never be made entirely acid proof.

The product of Messrs. Heller & Merz is much more alum-proof than any of the European ultramarines. The alum test is made by exposing equal quantities of different samples of ultramarine, say five grammes, to the action of equal quantities, say two ounces of a saturated solution of alum, in test tubes. The chemical action will soon set in, particularly when the tubes are put in warm water, sulphureted hydrogen will evolve, and the ultramarine will change its color to a light blue and gray. The sample holding out the longest is the best for paper, *i. e.*, if the coloring strength is even. The coloring strength is tested by mixing equal quantities of ultramarine with about ten times its weight of finely ground barytes or gypsum upon paper with a palette knife, taking great care to weigh the quantities very exactly, and to not press too hard with the palette knife. The sample showing darkest when thoroughly mixed is the strongest, taking in consideration its bluish or reddish shade.

For laundry purposes ultramarine is generally put up in balls. It is thoroughly mixed with small quantities of an adhesive substance, such as gum arabicum, dextrine, starch, and is worked into a thick dough, rolled flat, cut into square blocks, and rolled by hand into balls. This work is generally done by children. Ultramarine is a better bluing agent than either soluble blue or aniline, on account of its more beautiful tint and its bleaching power. Prussian (soluble) blue particularly will impart to clothes a yellowish rusty tint after continued use. In using the ultramarine for this purpose it should be strained through a fine cloth and not allowed to settle lest it should spot. The price of ultramarine ranges from 10 to 30 cents per pound in large quantities, and some extremely fine qualities as high as $1. Violet ultramarine is made by exposing unground blue ultramarine to chlorine gas under high temperature, and red by exposing violet under low temperature to diluted nitric acid vapors. Both kinds are sparingly used.

Since the beginning of the manufacture of ultramarine in the United States the price has constantly declined, and it sells now at a much lower figure than formerly in spite of the higher duty. Prejudice and too much conservatism kept it out of the market too long, but now it is used in most places in preference to the imported article, on account of its even running qualities, its lower price, and on account of the responsibility of the manufacturers.

The large engraving in our present issue accurately represents the American Ultramarine Works of Messrs. Heller & Merz. The buildings occupy a ground space of three acres, the inclosure being 350x600. There are two distinct factories for the full process of ultramarine. In the front are small dwellings, which are omitted in the picture for the sake of clearness. The first building is 60x150, and the second 75x160. In the covered space between of 100 feet are the main factories, which are being rapidly filled with mills and furnaces. The engine house contains the large engine, two boilers, and a completely fitted up machine shop, where two machinists, with their attendants, attend to the new and repair work of the factory all the year round. The last building on the front line 100x75 is the paint shop where the blue paint used by oil refiners in painting barrels is ground. This, by the way, is quite a large business with this firm. On the rear line are sheds for bulky raw material, the cooper and carpenter shops, and the large store house, 160x60.

One of our views shows the dry mill room where the raw material is ground on 14 sets of burrstones, while another represents the furnace house. There are twenty furnaces, with a capacity for 30–75 cwt. of ultramarine, such large furnaces being quite a novelty in this branch. There is also a pottery connected with this establishment for making crucibles, of which this firm uses about 75,000 per annum.

One of the larger views represents the room for washing, grinding, and refining ultramarine. There are for this purpose eight large wooden tanks holding about 40 cwt. of ultramarine each, and 120 wet mills set up in rows. A large number of iron tanks and vats, also 72 wet mills, are in process of erection, and will, with an increased number of furnaces, raise the capacity of these works to 30,000 cwt. per annum.

One of the views shows the bolting and packing room, in which the men, with their clothes saturated with blue, present quite a novel spectacle. The ball blue room is also represented. Here about one half the ball blue for the United States is manufactured. The interior of the paint shop is also shown in the engraving. The consumption of chemicals in this establishment is very large—about 2,000 tons per annum. The space where these works now stand was formerly a swampy, fever-and-ague ridden spot. Dwellings are drawing nearer every year, giving the place the appearance of quite a little town. The continuous filling up of ground, and the extensive use of brimstone, which distributes large volumes of sulphurous acid gas, seem to have a very salutary effect. Fever has disappeared almost entirely, and the men look strong and robust. The salesroom of Messrs. Heller & Merz is located at 55 Maiden Lane, New York city.

English Fast Trains.

A correspondent of the *English Mechanic* writes as follows: A great stride seems to have been made, at the commencement of this half year, by all our railway companies, in the matter of speed, notably by the M. R. and G. N. R.

Some of the results attained by the latter are wonderful. The "Scotchman" will be quite in the shade shortly.

There are no less than eight trains daily, running from King's-cross to Grantham, 105½ miles, without a stop, and without picking up water, in 123 and 128 minutes each. In the case of the Leeds expresses, the speeds further on are yet more surprising.

From Grantham to Doncaster is 50½ miles, which distance is covered several times a day, without a stop, in 61 minutes.

From Grantham to Wakefield there are 73 miles, which are accomplished by the 6:30 P.M. down, *in 77 minutes*. This last run is at a speed, therefore, of 56·88 miles per hour.

Allowing for stoppages, this last mentioned train runs 186½ miles in 215 minutes, at a speed of 52·05 miles per hour.

Compare this with some other favorite performances. The "Dutchman" runs from London to Exeter in 4¼ hours, and stands on the road 20 minutes, thus running 193 miles in 235 minutes, or 49·5 miles per hour.

That is broad gauge; but their fastest narrow gauge runs from London to Birmingham, 127 miles, in 2 hours 45 minutes. Deduct 6 minutes, and we have running speed, 48·8 miles per hour.

Let us take a light M. R. train. The 10 A.M. from London is their best. It runs 192 miles (to Leeds) in 4½ hours, and stands 14 minutes. The speed, therefore, is exactly 45. Some of the runs, however, are very good. Sheffield to Leeds, 39½ miles in 49 minutes, means 48·3. I am not, however, quite sure that the shortened distance is as much as I have given.

Enough has been shown, however, to prove that the G. N. R. run, by a great deal, the fastest trains in the world; and not only that, but they run the greatest number of them; and also what our companies in the south might conveniently notice, is, that, with two exceptions, all convey third-class passengers in a state of luxury which second-class passengers on less favored lines might envy. Between London and Peterborough, and *vice versa*, there are daily 37 trains, doing the 76 miles in an hour and a half, more or less.

The good town of Leeds, of which I am a native, cannot but congratulate itself on the excellent catering of the M. R. and G. N. R., which has finally resulted in 19 express communications with the metropolis, each way daily. A minor point, worthy of notice, is that the L. Y. R. are waking up, and will seriously imperil the L. N. W. R. traffic between Leeds and Manchester, unless they wake up too.

Dry Fog.

It has been frequently noticed that during fogs near large towns the air is not saturated with moisture, the dew point in one instance being as much as 10° C. below the temperature of the air.

Seeing the possible connection between this phenomenon and the fact that the evaporation of water is greatly retarded by its surface being covered with a film of coal tar, the author made a series of experiments on the comparative rates of evaporation of water, when freely exposed to a current of air, and when covered with a film of coal tar or of coal smoke. It was found that the film retarded the evaporation from 92·7 per cent to 66·6 per cent.

The results of these experiments point out a condition of very common occurrence, competent to produce "dry fog," while they also explain the frequency, persistency, and irritating character of the fogs which afflict our large towns.—*E. Frankland, Proc. Roy. Soc.*

The Treatment of Rattlesnake Bite.

A professional snake catcher, of Holyoke, Mass., treats rattlesnake bites as follows: He first ties a cord tightly around the member bitten so as to cut off the flow of blood toward the heart. The bleeding wound is then sucked out thoroughly to withdraw as much of the poisoned blood as possible, after which strong spirits of ammonia is applied. After a while the string is loosened a little to allow the remaining poison, if any, to be so slowly absorbed into the system that no serious results are likely to follow.

IMPROVED WAGON JACK.

We give herewith an engraving of a very simple and inexpensive wagon jack, which has lately been patented and is being manufactured and introduced by Messrs. R. S. Hartzell & Co., No. 235 South Third street, Philadelphia, Pa. The cut shows the jack with one side removed to show the internal construction. The lifting device consists of three parts: the lever, A, the intermediate piece, B, and the follower, C. These parts are arranged in relation to each other, so that when the lever, A, is pressed down the follower, C, rises, and when in its highest position is locked

NEW WAGON JACK.

automatically by the short arm of the lever, A, and the intermediate piece, B, being then placed so as to take the full weight of the load on their pivots.

The standard, base, follower, C, and lever, A, are made of wood. The intermediate piece, B, and the shoes at the ends of the follower and at the end of the lever, A, are made of cast iron, and the cover which incloses the working parts is made of rolled iron. The jack is substantial, serviceable, and cheap.

Any further information in regard to this useful invention may be obtained from the manufacturers, whose address is given above.

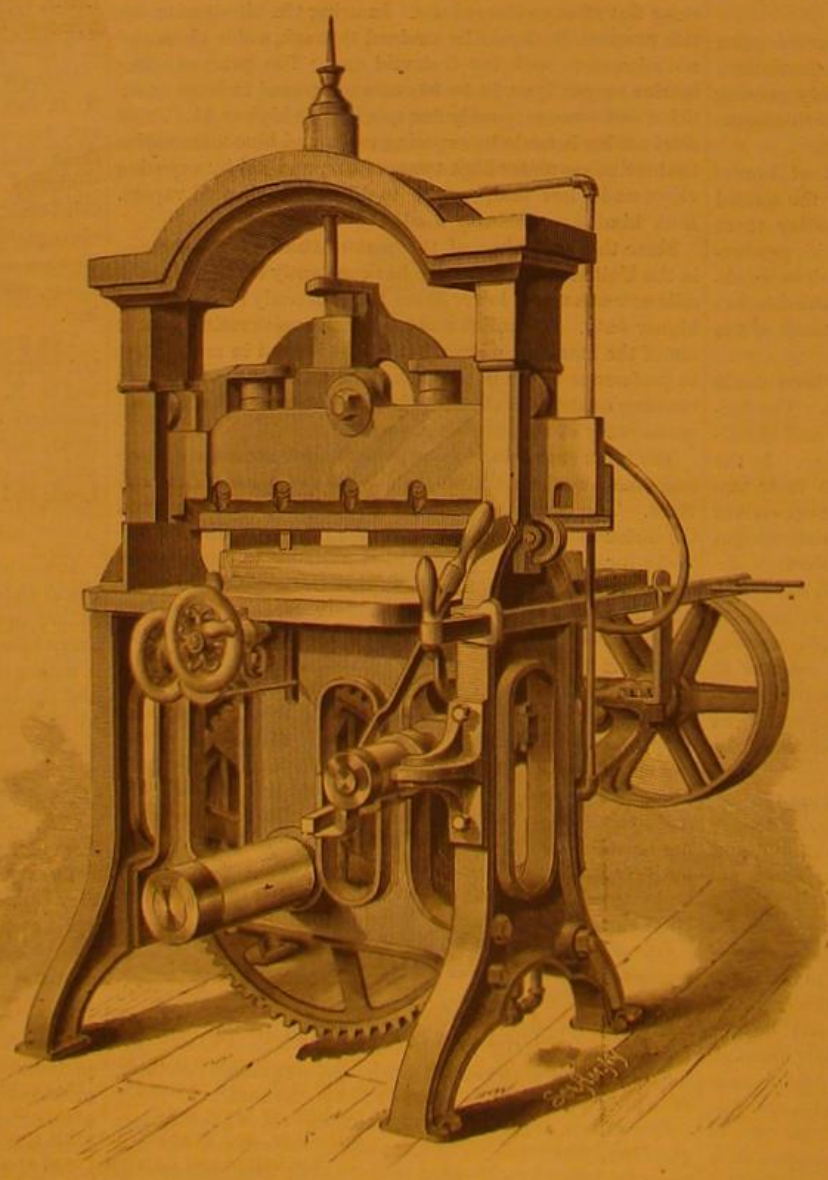
NEW AUTOMATIC CLAMPING AND PNEUMATIC PAPER CUTTING MACHINE.

Our engraving shows an improved paper cutting machine, invented by H. P. Feister, M.E., and manufactured by Rex & Bockius, No. 614 Filbert street, Philadelphia, Pa.

This machine in its construction is a new departure, and differs from former paper cutting machines chiefly in the use of compressed air to operate the automatic clamps for holding the paper while being cut, the compressed air being so applied that the same pressure which clamps the paper, also acts as a power, in an equal ratio, to help in the process of cutting, thereby relieving the gearing of a portion of the strain while making the cut, and avoiding the breaking of gear teeth so common to other machines.

Persons familiar with this class of machines will readily understand its working from the engraving, as it does not differ essentially from other machines of the kind, except in the application of compressed air to clamp the paper, and at the same time assist in cutting. It consists simply of a driving shaft, with a pinion and clutch, an air pump, and a large gear having a crank to impart an upward and downward motion to the table, the motion of the table also giving a lateral or draw cut to the knife bar as it rises upward in the operation of cutting. Secured to the table is an arched or curved yoke, fitted with pistons which have an upward and downward movement in cylinders secured to the paper clamp on its rear side, the clamp resting on pins slightly below the cutting edge of the knife. The knife is arranged to traverse to the right and left between rollers in the housings, and it has neither an upward nor downward movement.

In working the machine the operator pulls toward him the inclined lever, seen at the side of the machine, which throws in gear a clutch, starting in motion the large crank gear, which imparts an upward motion to the table, carrying with it the paper against the clamp, the clamp being held down firmly against its seat by the air pressure between the pistons and bottoms of the two air cylinders, the same movement of the lever which started the clutch having at the same time admitted air through a suitable valve to the two cylinders and underneath their pistons, and also at the same time to the cylinder on top of the machine, all the pressure entering the upper cylinder assisting in pulling upward on the table, by means of the connecting rod attached to the tongue on the yoke, and helping the gearing to force the paper against the knife, thus aiding in cutting the paper, while, at the same time, the two cylinders are holding it firmly in position to be cut. To make the process of clamping still more plain, it may be stated that the air clamp, being held down firmly against its seat, the upward movement of the table carries the paper against the clamp, it of course cannot move the clamp until the paper is pressed upward firmly against the clamp, after which the clamp, cylinders, yoke and table all move upward together until the end of the stroke is reached and the cut made, when they again move downward together until the lower end of the stroke is reached, when the clutch is automatically unshipped and the valve opened, releasing the air from their respective cylinders and loosening the paper from the clamp. The manufacturers claim that this machine will do twice as much work as other paper cutting machines with the same power applied.



FEISTER'S AIR-CLAMPING PAPER CUTTING MACHINE.

What Is Space?

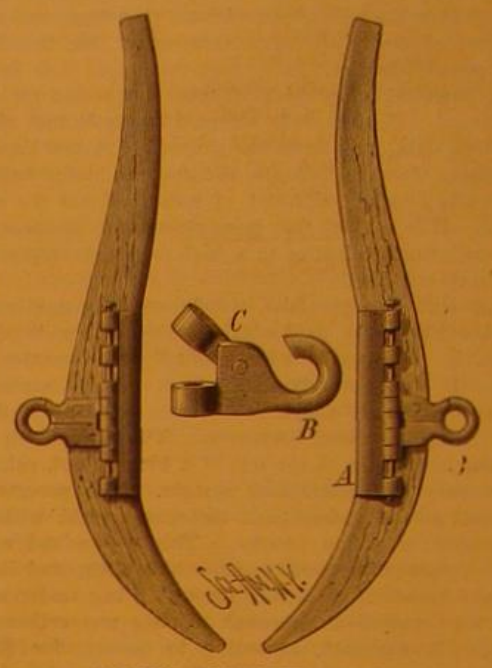
"Space is a real, objective, immaterial, extended, continuous, infinite, immutable, eternal, and absolute whole of capacity to receive extended substance, existing in trine extension of infinite length, infinite breadth, and infinite depth, which is ideally divisible in each dimension, into finite wholes of locality, all of possible forms and sizes, possessing the relations of similarity, difference, ratio, direction, distance, contiguity, and conjunctibility; and comprising units of trine extension, surfaces, lines, and points, each of which is infinitely divisible; trine extension into surfaces, surface into lines, lines into points, and points into infinitesimal fractions of position, which compose the infinitude of space, in a number which is formed by the involution of relatively infinite number to the seventh power."

This simple and lucid description is furnished by Rev. H. L. Gear, in an article on "The Concept of Space," in the Cincinnati *Baptist Review*. We trust that all our readers will be careful to bear it in mind always when they have to think of that fundamental concept. No end of intellectual difficulties arise from a neglect to form and hold just views of such important elements of right thinking.

IMPROVED HAME.

The engraving shows an improved hame lately patented by Mr. James M. Davis, of Peach Orchard, Ark. The invention relates principally to the irons for connecting the traces with the hames, the object being to permit of shifting the pressure on the horse's shoulder when necessary to avoid galling and irritation.

Plates, A, which are fitted to the convex face of the hames, have a series of jaws with recesses between them, and a hole through them to receive a pin which passes through them all. The hook, B, which connects the traces, is fitted to one of the recesses in the plate, A, and



DAVIS'S IMPROVED HAME.

is provided with a pivoted part, C, which fits in the adjacent recess and has an extension which meets the end of the hook and forms, when the hook is in place on the hame, a complete eye, from which the trace fastening cannot escape. The hook is thus made perfectly safe, and being entirely closed it is prevented from catching into the harness of another horse.

Should the horse's shoulders become sore the hook, B, may be readily shifted up or down by simply withdrawing the pin and placing the hook in a different position and replacing the pin.

This device is very simple and serves a very useful purpose in adjusting the draught to the best advantage, thus relieving the horse of a great deal of discomfort and in many cases actual suffering.

Further particulars may be obtained by addressing the inventor as above.

MECHANICAL INVENTIONS.

An improvement in wagon jacks has been patented by Mr. John Charles, of Clear Spring, Md. This invention relates to certain improvements in that class of wagon jacks in which a lever carrying two pawls or griping jaws is combined with a lifting bar having a double set of ratchet teeth, whereby the oscillation of the lever is made to cause the travel of the lift bar over the main section, to which the lever is pivoted. The improvement consists in pivoting the pawl jaws to the lever in such relation to springs on the main bar that the lifting bar may be made to travel either up or down without change in the adjustment by simply changing the range of oscillation of the lever.

An improved vehicle wheel hub has been patented by Mr. Lindsey Rossiter, of Port Carbon (Bridgeport P. O.), Pa. The object of this invention is to improve the construction of axles, axle boxes, and hubs, so that they may be conveniently oiled, will not leak or waste oil.

A press for bending rims of pianofortes to the shape required, and at the same time veneering them, has been patented by Mr. Frank Denninger, of New York city. This invention consists in a press bed of rectangular form, having combined with it loose presser blocks of the shape to which the rims are to be pressed, and fitted with clamping shackles and screws for compressing and holding the rims which are placed between the blocks in the press. The presser blocks are also fitted with adjustable gauges for retaining the rims in position.

Mr. Johannes A. Osenbrück, of Hemelingen, near Bremen, Germany, has patented a new bearing, which is simple in construction, and which can carry great weights without the friction which acts so destructively upon the bearings in use at present and renders them useless. The bearing is provided with one or more disks for distributing the lubricating material; these disks are below the spindle in case the same is vertical, and are rotated by the spindle by means of intermediate gearing in such a manner that the disks rotate in the same direction as the spindle, but their rapidity decreases in arithmetical progression from the end of the spindle.

One of the principal defects in an ordinary brake is that the shoe is fastened to the clog by bolts or keys that in a short time become loose, thereby causing a disagreeable rattling and increased expense and labor for repair, and the clog, in time, also works loose on the brake bar, because of the shrinking of the latter; and in ordinary brakes the brake guide ordinarily consists of a straight piece of iron fastened to the end of a brake bar itself, and consequently the guide does not always operate effectively. Messrs. Charles F. Wohlfarth and Clovis W. Wakefield, of Norwich, Conn., have patented a car brake intended to obviate these difficulties.

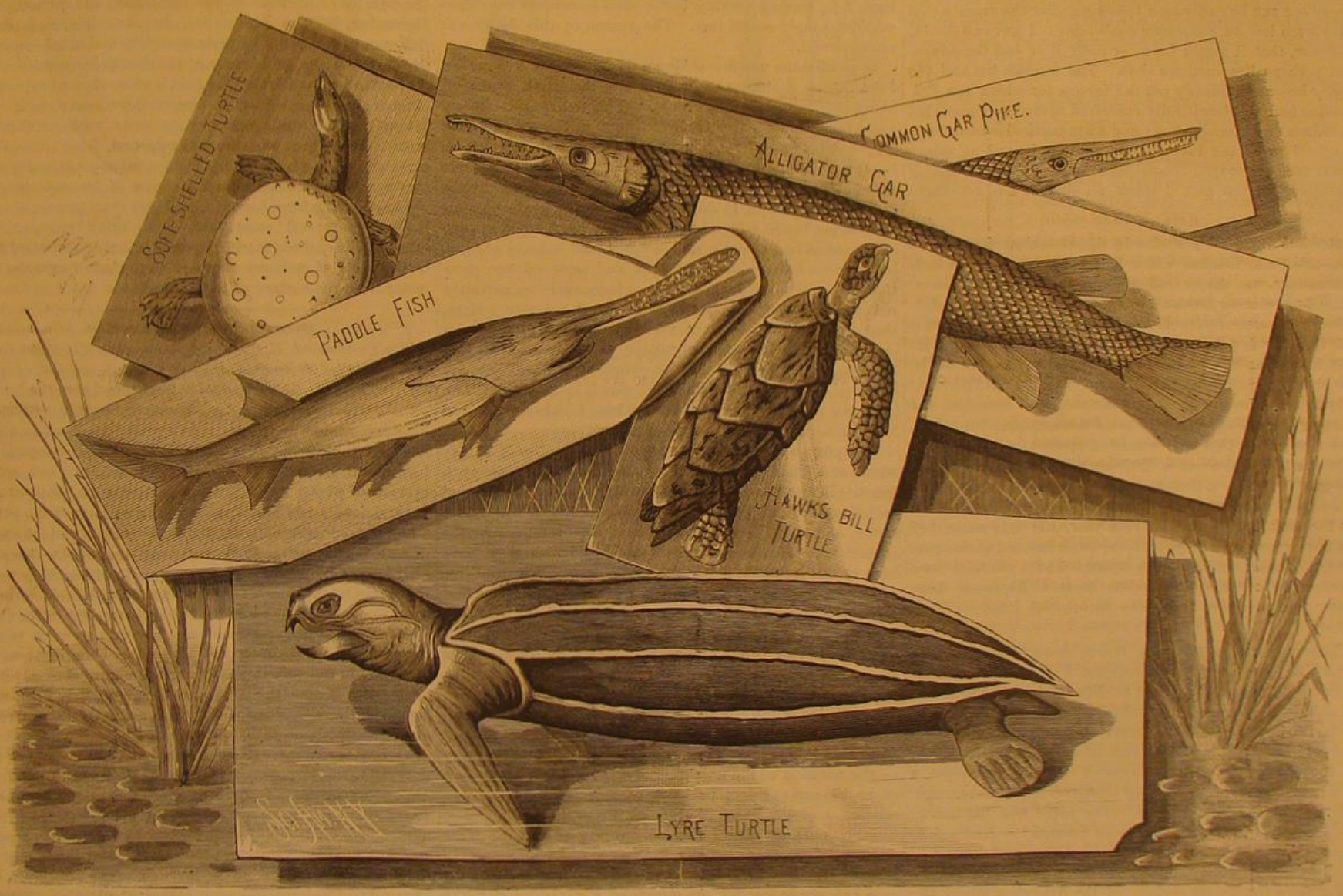
THE BERLIN FISHERIES EXHIBITION.

BY FREDERIC A. LUCAS.

The Fisheries Exhibition, which opened at Berlin on the 20th of April, is very wide in its scope, including, besides fishes and the apparatus used in their capture, and examples of the varied articles of food, oil, etc., prepared from them, almost all aquatic animals, such as seals, whales, turtles, and batrachians, down to shell fish and sea urchins. The United States National Museum, in conjunction with the Fish Commission, secured a space of 500 square meters, and sent a large and interesting collection, which was arranged under the supervision of Mr. G. Brown Goode. Among private individuals, Prof. H. A. Ward, of Rochester, sent a very creditable series of specimens, a few of which are shown on this page. Noteworthy among these is the lyre turtle (*Sphargis coriacea*), the largest of existing species, and *par excellence* a sea turtle. Until quite recently specimens of this were extremely rare; but during the past few years at least six have been taken between Newport and Cape Cod, having followed northward the warm waters of the Gulf Stream. Instead of the usual bony shield, this turtle is covered with small plates about the size of a ten cent piece, embedded in a thick leathery skin, from whence comes its popular appellation of leather turtle. The name of lyre turtle was bestowed upon it from its fancied resemblance to that musical instrument, the five dorsal ridges representing the strings. The paddles are nailless and covered with black skin a little suggestive of India-rubber. The animal figured was about seven feet long, and as much in width from tip to tip of the front flippers. The throat is lined with sharply-tipped spines, about an inch and a half long, and pointing backwards, so that whatever the animal starts to swallow must go down. The great size of this turtle—it weighs from 300 to 1,500 pounds—would render it a prize indeed were it not that the flesh is poisonous, and causes severe illness to any one rash enough to partake of it. Its home is the tropical Atlantic and the Mediterranean; but it is probably a mere straggler in the latter sea.

The beautifully mottled plates which cover the back of the hawk's-bill turtle (*Eretmochelys imbricata*) form the well known "tortoise shell" of commerce, and cause it to be much sought after. Thus its very means of protection becomes its greatest source of danger. The plates, when softened by heat, can be united in a homogeneous mass and worked to any required shape. The peculiar color and markings are now so skillfully imitated in horn that it is difficult even for an expert to recognize the difference; but as there will always be plenty of customers who want "the real article," it is not probable that the turtle will be any the less hunted. A great proportion of the sea turtles are captured by spearing them while asleep with a round pointed spear. This is technically called "pegging."

The soft-shelled turtle, of which we have several species, inhabits our Southern and Western streams. The central part of the carapace, or covering of the back, is of bone, but is covered with a smooth skin, and widely bordered by a thick but pliable leathery margin, under which all the extremities can be drawn. These turtles have extremely long necks, are remarkably quick and vigorous in their movements, and exhibit great ferocity when captured. Still



SPECIMENS AT THE BERLIN FISHERIES EXHIBITION.

The paddle fish (*Polyodon folium*) is a curious resident of the Ohio and its tributaries. It is said, and the statement seems plausible, to stir up the bottom for insects and crayfish, and pick them up in its capacious mouth. As it is also accused of a predilection for offal it is not used as food, although the flesh looks firm and palatable. Still its personal appearance is somewhat against it, for many people have strong prejudices against anything that seems at all uncanny. Some refuse to eat eels because "they look just like snakes," and the skate is held in abhorrence simply because it isn't a *pretty* fish.

The gars, one might almost say, are living fossils, for they are among the few existing representatives of the hosts of mail-clad fishes that swam the Devonian and Oolitic seas and carried terror and destruction among their weaker brethren. Compactly built, clad in silvery armor, and equipped with a goodly supply of wicked-looking teeth, they are true fresh water tyrants. Numbers of them are taken in seines, to the disgust of fishermen whose nets are torn by their teeth. The common gar is found west of the Hudson, and ranges from the great lakes to Florida and in the Mississippi and its tributaries. The alligator gar (*Lepidosteus platystomus*), so called from his short, broad muzzle, is a more Southern fish, and dwells from Florida to Texas, running some distance up the Mississippi. The Rio Grande is perhaps its headquarters, although it would seem on some accounts an ill-chosen habitation. Running up into the warm shallows when the river is high, the rapid fall of the waters entraps numbers of them in small pools. Then begins a veritable struggle for existence; the large fish prey upon the smaller ones, and in their turn fall victims to starvation or are killed by the evaporation of the little pond. This fish attains a length of four or five feet, sometimes six, and very rarely eight feet; but this last is exceptional. The common gar pike (*L. osseus*) is a much smaller and more slender fish, not often exceeding three and a half feet in length, and quite abundant in the great lakes and Western and Southwestern streams.

NATURAL HISTORY NOTES.

Origin of Flowers through Selection by Insects—Dr. Herman Mueller has, not long since, published a work in which he seeks to explain the existing variations in the forms of flowers on the principle of selection. His supposition is that insects of different tastes bred peculiar flowers, just as men breed peculiar races of cattle. Carrion-loving insects bred their kind of flowers, and long-tongued insects the tubular kinds, and many other classes of insects have, each class, bred the flowers they love best. Dr. Mueller has a note in *Nature*, of July 8, in which he points out that *Saxifraga umbrosa* has been adorned with brilliant colors through selection by dipterous insects of the family Syrphidæ. He says: Among diptera the most assiduous visitors of flowers are certain Syrphidæ, which, elegantly colored themselves, are fond of splendid flower colors, and, before eating pollen or sucking nectar, like to stop awhile, hovering free in the air, in front of their favorites, apparently fascinated, or at least delighted, by the brilliancy of their colors. Thus, I have repeatedly observed *Syrphus balteatus* hovering before the flowers of *Verbascum nigrum*, and often before *Melanostoma mellina; Ascia podagrica* before *Veronica chamædrys;* in the Alps, the lank *Sphegina clunipes* before *Saxifraga rotundifolia;* and, in my garden, *Ascia podagrica* before *Saxifraga umbrosa*. Of *Verbascum nigrum*, the main fertilizers are humble bees, diptera co operating only in a subordinate degree; in the case of the three other species, on the contrary, the above named Syrphidæ are such frequent visitors and cross fertilizers that we may safely conclude that it is by their selection of elegantly colored varieties that these flowers have acquired their beautiful peculiarity. Hence, in order to estimate the color sense of these Syrphidæ, it is worth while to consider what color combinations they have been able to produce by their selection. *Saxifraga umbrosa* being, as far as hitherto known, their finest masterpiece, we may, in the first place, look at the variegated decoration of this species. Its snow-white petals are adorned with colored spots, which, in size and intensity of light, gradually decrease from the base of the petals toward their extremity. Indeed, nearest to their base, within the first third of their length, there is a large irregular spot of an intense yellow;

about the middle of their length there follows a narrower cross band of red color, vermilion toward the base, intensely pink toward the outside, not reaching the margins of the petals, sometimes dissolved into several separate spots; lastly, beyond the middle of the length of the petals there are three to eight smaller roundish spots of paler violet pink color. The flowers of *Veronica chamædrys* prove that also gay blue colors are perceived and selected by *Ascia*.

Bees and Flowers.—Mr. Thomas Meehan, in a note in the *Bulletin of the Torrey Botanical Club*, says: I find that the behavior of bees is governed by circumstances. When flowers are abundant they visit those only which they prefer; at other times they examine anything which comes in their way. At the time I am writing, May 18, there is a dearth of garden flowers. Those of the early spring are gone, and the later ones are not well formed. But Columbines in many species are in bloom. The humble bee bores the ends of the nectaries and sucks the honey stored there; and the honey bee follows and sucks from the same hole what may be left, or what may be afterward generated from the honey gland. I have often watched closely to learn whether the honey bee bored for honey. Its quick motions are unfavorable to correct observation. I thought once I had caught it boring lilac flowers, but I afterward counted all the flowers that had been bored by the humble bee, and then watched the work of the honey bee on the cluster, and there were no more bored afterward than before. The Columbines (*Aquilegia*), with curved nectaries, such as *A. vulgaris* and *A. olympica*, are very favorable for observation, as the slit is made on the upper side of the curve, and the honey bee can be easily seen following after the crumbs that have been left on the strong one's table. I have no doubt, however, that it would bore for itself if it had the power, and perhaps it sometimes does. The humble bee and the honey bee are evidently not the insects for which the Columbine had this beautifully contrived nectar cup provided to induce cross fertilization; and what particular insect was designed to be the favored one, so that it, and no other, could turn its tongue around these twisted spurs to get at the honey in the end, I think no student has yet discovered.

A Fresh Water Jelly Fish.—In the Botanical Gardens, at Regent's Park, London, a new jelly fish, about half an inch in diameter, was discovered on June 10, by Mr. W. Sowerby, and has created no small stir among the zoological celebrities of the metropolis. It has already received two names, one from Prof. Allman and the other from Prof. Ray Lankester, and has formed the subject of two papers, one at the Royal and the other at the Linnæan Society. Hitherto no jelly fish has been found in fresh water, and therefore the discovery of this species is the more remarkable. Prof. Lankester concludes that it is a tropical species, as it is active only at a temperature of 90° F., becoming sluggish at 60° F. It comes nearest to a Brazilian species, and one might therefore suspect that it came originally with the *Victoria regia*. As the tank is cleared out every year, and this water lily has been grown several years from seeds ripened at the gardens, it seems singular that the animal should not have been observed before if such were its source. Professor Lankester thinks it may have been introduced from the West Indies.

Natural Spread of the Apple Tree in South America.—It is surprising how quickly the vegetation of many countries settled by Europeans has been modified. A writer in Petermann's *Mittheilungen* on the flora of Chili south of the Valdivia River, states that the scenery between the Rio Bueno and its winding affluents reminds one very much of home. In the park like prairies, associated with *Fagus obliqua*, a deciduous beech, are numerous scattered apple trees, originally introduced from Europe. The apple tree has spread from Valdivia to Osorno, and even crossed the Andes into Northwestern Patagonia, and thence eastward. Indeed, it has become so widely spread, and so general, that the Indians from the distant regions of the Argentine rivers Rio Negro and Rio Colorado, are called manzaneros, or apple Indians. As a matter of fact, they and their kin in the provinces of Valdivia and Osorno live far more on the fruit of the apple tree than any European people, for it affords them both food and wine.

Irritability in Leaves of Robinia.—M. Phipson read a note at the recent session of the Academie des Sciences on development of sensitiveness in the common locust (*Robinia pseudacacia*). In his first experiment, tried last September, on an afternoon when the sun was shining brightly, he found that by giving the terminal leaflet a series of ten to twenty smart raps with his finger he was able to cause all the leaflets to close up, just as those of the sensitive plant do under like circumstances. On a second experiment he obtained the same results, and found that it took two or three hours sunshine to cause the leaflets to unfold again and resume their horizontal position. Heat applied to the terminal leaflet had no effect on the lateral ones, as it does in the sensitive plant, hence M. Phipson is led to conclude that the sap moves more slowly in the locust than it does in the latter plant. M. Phipson believes that these experiments add another proof of the truth of an opinion enunciated by him in 1876, to the effect that sensitiveness or irritability in the sensitive plant should not be regarded as a property peculiar to that plant, but rather as the highest manifestation of a phenomenon the traces of which are to be observed running throughout the entire vegetable kingdom.

THE AILANTUS TREE.

Not long since the well known authority on arboriculture, Prof. C. F. Sargent, urged the claims of the ailantus as a timber tree. Among other valuable properties, it was said to possess greater tenacity or ability to resist a strain than even the elm and the oak. Some experiments made in the French dockyard at Toulon showed that the ailantus, on an average of seven trials, broke with a weight of 72,186 pounds, while the elm yielded to 54,707 pounds, and the oak gave way under a pressure of 43,434 pounds.

Such a great tenacity as this, together with the rapid growth of the tree, ought certainly to make the ailantus worthy of culture for industrial purposes were it also durable when grown in exposed situations. The latter point, however, being one that has not as yet been ascertained, we are able to judge of the durability only from specimens seen in cultivation, and these would seem to give an answer in the negative. It is a well known fact that during the progress of the wind storms, which occasionally rise suddenly in this latitude during summer and sweep with terrific velocity through our streets, the very first tree to give way, in the majority of cases, before the brief fury of the storm, is the ailantus. This was notably the case in the hurricane of Sunday afternoon, June 13, when, out of the large number of trees blown down in various parts of our city, nearly every one was a to all appearances healthy specimen of this same Chinese "Tree of Heaven." All of the trees examined by us had snapped off close to the ground. In nearly every case the base of the trunk, although it gave no outward sign of the fact, had rotted away internally to a depth of two to three feet, leaving nothing but a shell to support the otherwise seemingly sound tree. The reason of this decay was not apparent.

In an ailantus which was blown down in Fifth Avenue last June during a similar storm of wind, the trunk broke off about two feet above the ground. This tree, to all external appearances, was extremely healthy and in vigorous growth, the bark being perfectly sound and the tree in full flower; but an examination showed that the interior was a mere mass of corruption from base to apex. The inner surface was literally alive with the large white fleshy grubs of some tree-boring beetle, which had riddled the heart wood to such an extent as to convert it into sawdust, and to leave nothing but a mere external shell of bark and sapwood not more than two and a half inches thick—a mere skeleton, certainly not well calculated to resist much wind pressure. Here, then, in this insect we have one hidden enemy at least that may prove disastrous to the culture of the tree for its timber, one that may even now be committing its ravages unobserved in trees still living, and one that may have been the cause of death of those trees whose trunks are allowed to stand here and there along our streets.

Two years ago the city was sued by the family of a lady who was killed by the fall of an ailantus tree in Eleventh street. It was proven by the plaintiffs that the tree was not in foliage during the year previous, and that it was hence rotten, and should consequently have been removed by the authorities. However derelict the authorities may have been in this instance, it is quite probable that this dead tree was no more dangerous than a large number of those that are now living, and filling the atmosphere with the unsavory odor of their blossoms.

A question of prime importance, therefore, for the lives of our citizens would appear to be this: How many of the ailantuses standing along the edge of our sidewalks are in the condition of the one above mentioned—all soundness and beauty without, but all rottenness and corruption within, and liable to topple over on the passer-by without warning on the occasion of the least gust of wind? The ascertaining of so important a fact probably comes within the scope of the duties of the Board of Health. From these statements, based on our own observation, it will be seen that, however great a future there may be for this malodorous tree as a timber producer, the ailantus can scarcely be recommended as a safe shade tree for the streets of a populous city like New York; and, moreover, that it would be prudent to give it a wide berth whenever the wind rises to more than ordinary velocity.

The Creosote Plant.

According to a note in a recent botanical journal, the resinous substance found on the branches of *Larrea Mexicana* has been proposed as a substitute for lac in the preparation of lac dye. The plant, which belongs to the natural order *Zygophyllea*, is a shrub from four to six feet high, growing in dense scrub-like masses in Mexico, especially on the borders of the Colorado desert, where its luxuriant growth forms an impenetrable mass of vegetation, effectually preventing the inroads of the drifting sand. The presence of this plant is said to be a sure indication of a sterile soil, little else being found where it flourishes, though the bright green of the foliage imparts a freshness to the surrounding scenery. The common name is derived from the fact that the plant has a strong creosote-like odor, which is so powerful that no animal will touch it. The resinous matter to which the smell is due is abundant in all parts of the plant, the branches being frequently covered with it, in the same manner as true lac. The resin itself is of a light ruby color. It is used by the natives in the treatment of rheumatism; it is also used by the Indians for fixing their arrow heads to the shafts, and for forming into balls, which they kick before them as they journey from point to point of their trail.

Bacteria in the Air.

By a certain process M. Miquel has succeeded in seizing and numbering the spores or eggs of bacteria, and while confirming M. Pasteur's observation, that they are always present in the air, shows that their number presents incessant variations. Very small in winter, it increases in spring, is very high in summer and autumn, then sinks rapidly when frost sets in. This law also applies to spores of champignons; but while the spores of moulds are abundant in wet periods, the number of aerial bacteria then becomes very small, and it only rises again when drought pervades the soil, a time when the spores of moulds become rare. Thus, to the *maxima* of moulds correspond the *minima* of bacteria, and reciprocally. In summer and autumn, at Montsouris, one finds frequently 1,000 germs of bacteria in a cubic meter of air. In winter the number not uncommonly descends to 4 and 5, and on some days the dust from 200 liters of air proves incapable of causing infection of liquors the most alterable. In the interior of houses, and in absence of mechanical movements raising dust from the surface of objects, the air becomes fertilizing only in a volume of 30 to 50 liters. In M. Miquel's laboratory the dust of 5 liters usually serves to effect the alteration of neutral bouillon. In the Paris sewers infection of the same liquor is produced by particles in 1 liter of the air.

These results differ considerably, it is pointed out, from those published by Tyndall, who says a few cubic centimeters of air will, in most cases, bring infection into the most diverse infusions. M. Miquel compared the number of deaths from contagious and epidemic diseases in Paris with the number of bacteria in the air during the period from December, 1879, to June, 1880, and, certainly, each recrudescence of the aerial bacteria was followed at about eight days' interval by an increase of the deaths in question. Unwilling to say positively that this is more than a mere coincidence, he projects further observations regarding it. M. Miquel further finds (contrary to some authors) that the water vapor which rises from the ground, from rivers, from masses in full putrefaction, is always micrographically pure, that gases from buried matter in course of decomposition are always exempt from bacteria, and that even impure air sent through putrefied meat, far from being charged with microbes, is entirely purified provided only the putrid filter be in a state of moisture comparable to that of earth at 0·30 meter from the surface of the ground.

Bees and Sugar Refineries.

The Council of Hygiene, of Paris, says *La Nature*, was recently called on to pronounce upon quite a singular question. There are in Paris, especially in the Thirteenth, Nineteenth, and Twentieth wards, depots of bee-hives, which, of little importance at the start, have finally become quite extensive establishments. Certain of these depots contain no less than from 120 to 150 hives. Now, as each hive contains upward of 40,000 workers, there are several millions of bees in each depot. At first sight it might seem surprising that a honey-producing industry should be carried on in the heart of a great city, where there are no flowers that the bees can visit to obtain nectar; but on investigation it has been found that these establishments have either through accident or design (undoubtedly the latter) located themselves in the vicinity of the large sugar refineries. The consequence is that the latter are constantly visited by the bees in immense numbers, to the serious annoyance of the workmen. In a short space of time the sirup pans are completely filled with bees, and the loss occasioned by this amounts, in one refinery alone, to about $5,000 a year.

Various means of extermination have been devised, but thus far to no purpose. One refiner, M. Say, destroys the insects by means of fly-traps placed near the windows. There are about 60 of these traps in his refinery, and the number of bees captured per diem in each one of them amounts to about a quarter of a bushel. But in spite of all this the works continue to be infested. The sugar refiners have asked for damages, but at present the Prefect of Police has at his disposition no ordinance which will permit him to allow them. The refiners will be obliged to suffer the loss and inconvenience till the Council makes some ruling on the subject.

AGRICULTURAL INVENTIONS.

Mr. John L. Brinly, of Louisville, Ky., has patented an improvement in plows, the object of which is to prevent the plow from being broken should the front bolt that secures the plow to the beam break, and to facilitate the renewal of the land side when worn.

An improvement in plows has been patented by Mr. Zeadock R. Percefull, of Port Smith, Ark. This invention relates to a combined mould board or turn plow and subsoiler; and it consists in a vertical standard blade, having a mould board adjustably fixed thereto on its side, and carrying at its bottom a point in advance of the mould board, and just in rear of this a share and heel piece, by which arrangement the furrow is turned by the mould board, the earth pierced in advance of the mould board by the subsoil point, and then broken by the share in the rear, the adjustable connection of the mould board affording means for regulating the relative depth of the furrow and subsoil track.

Mr. Perry R. Weatherford, of Waverly, Ky., has patented a combined rotary and drag harrow, so constructed that it can be adjusted to work at any desired depth in the ground, and can be readily raised from and lowered to the ground.

RECENT INVENTIONS.

An improved grub and stump puller has been patented by Mr. Joseph J. Marshall, of Pulaski, Tenn. This invention consists in a novel construction and arrangement with relation to each other of the arms which form the jaws, whereby lightness, strength, and efficiency are obtained.

Mr. Edwin A. Roth, of Philadelphia, Pa., has patented an improved milk cooling apparatus, in which the suspended vessel used for containing the ice is provided with a flexible drain pipe, which admits of using the ice receptacle as a cream receptacle.

An improved holding tool has been patented by Mr. John S. Birch, of Orange, N. J. The invention consists in constructing the holding tool with the case in the shape of a tube flattened upon two or four sides to give a side support to the jaws; also, in forming grooves in the sides of the jaws and in the inner surface of the sides of the end of the case to prevent the jaws from slipping when under strain.

An improvement in the class of devices known as "self-acting car couplers" has been patented by Mr. Charles J. R. Ballard, of Watertown, N. Y. The invention consists, essentially, of a pair of double hooks or links crossed and pivoted together at their centers, with a coiled spring between them, so that they will open and admit a coupling pin and then close upon it and hold it firmly in their jaws.

An improved apparatus for receiving and recording votes has been patented by Mr. Richard S. Conover, of Sayreville, N. J. The inventor states that by means of this invention election frauds will be prevented and the number of votes cast will be strictly controlled and quickly counted.

An improved ore concentrator for washing the impurities out of ore and depositing the ore in suitable receptacles, has been patented by Mr. John McColl, of South Ryegate, Vt. The invention consists in the combination, with two or more endless carriers provided with transverse riffles, of a hinged platform provided with amalgamated copper plates and perforated iron plates, upon which platform the crushed ore or pulp is fed, whereby the particles of ore drop through the perforations in the iron plates, the gold being held by the amalgamated copper plates of the platform and amalgamated copper rollers pivoted below the platform. From the platform the particles of ore drop upon the upper endless carrier, are then washed off on to the lower carrier, and are then washed off from that, whereby the dirt and impurities are carried away by the waste water, and the particles of metal are deposited in suitable receptacles.

Mr. John Sandles, of Hinsdale, Ill., has patented an improvement in washing machines, which consists of a circular plunger made to nearly fit the tub, and provided on its under side with several circular cups, that are so fastened to it that they can revolve in a horizontal plane.

An improved machine for mixing materials for making soap has been patented by Messrs. William Cornwall, Sr., William Cornwall, Jr., and Aaron W. Cornwall, of Louisville, Ky. This invention relates to an improvement in machines for mixing fats and alkalies for making soap, and also for mixing various other substances which are plastic or liquid. The improvement consists in the construction and arrangement of the rotating arms of the mixer proper. The arms are each made of two flat blades or paddles, which are set at an angle to each other, and connected so as to extend radially from the rotating shaft. The corresponding paddles of adjacent or neighboring arms are also set at opposite inclinations to the plane of rotation.

Messrs. William Burkart, of Smithville, Ind., and John M. Burkart, of Canton, Kan., have patented an attachment for organs, pianos, and other similar musical instruments, by which the leaves of music can be turned without the necessity of removing the hands from the key board. The invention consists of a plate to be applied to the music rest, fixed fingers to hold the covers, open movable fingers to grasp the leaves, levers for operating the movable fingers, cords running from the levers to a knee lever under the key board, and tension devices for regulating the movement of the levers, all arranged so that by pressing against the knee lever the leaves of music are successively turned.

Mr. John S. Affleck, of 16 South William St., New York city, has patented an improved packing ring for boiler tubes, which is so constructed that it will adjust itself to any imperfections in its seat, and will melt should the boiler become unduly heated. This ring is especially applicable to the class of boilers made wholly of tubes and joined at the ends by connectors. With this packing, should the water get low in the boiler, and the boiler become unduly heated, the packing rings will melt and allow steam to escape and give warning before the overheating has reached a dangerous point.

Mr. Richard B. Lanum, of Circleville, Ohio, has patented a grave torpedo which is so arranged that if placed in a grave it will explode if any attempt be made to rob the grave.

Mr. Frank L. Sheldon, of Rahway, N. J., has patented a fishing basket which is so constructed that it may be readily folded into small compass for convenience in carriage.

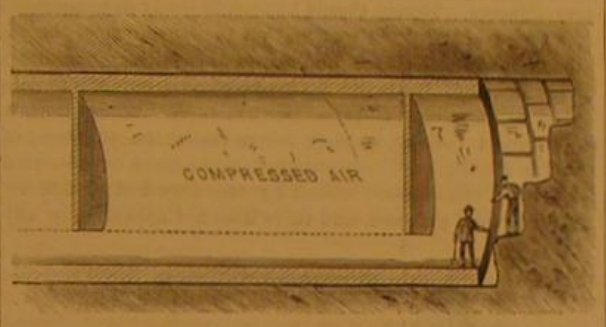
VON HEEREN proposes a method of cooling hot journals by a mixture of sulphur and oil or grease. The fine metal dust formed when a journal runs hot, and which strongly acts upon both journals and bearing, forms a sulphide of sulphur. This compound, which grows soft and greasy, does not cause any appreciable amount of friction. It has been very successfully used by the steamers of the North German Lloyds.

A SAFETY APPLIANCE FOR THE HUDSON RIVER TUNNEL.

BY P. H. VANDER WEYDE.

Allow me to suggest a safety appliance which is adapted to be used as soon as the connection of the Hudson River Tunnel with the vertical shaft is completed by help of the coffer dam at present in course of construction; then all danger from the rear will have ceased, and only a break in soft soil when reached by the tunnel head has to be feared. My project will prevent the air from escaping and the whole tunnel to be filled with water and mud, even if the whole head caved in suddenly.

My plan consists simply in a plain movable solid circular shield or partition, to be placed against the top and sides of the tunnel, and closing it except three or four feet from the bottom, where the men can pass under it. It is made to fit well, while the joint with the wall is kept air-tight by mud or clay. This partition is advanced from time to time, and kept as close to the men as convenient to them. When a caving in of the tunnel head takes place and water gains access in great quantity, while the air escapes at the top, this partition will prevent the rest of the air in the tunnel from being lost, and allow only that to escape which is between it and the tunnel head, while all the rest of the air will be kept back, as the water or mud will not be able to rise above the dotted



line shown in our figure. In case of such a calamity the men have only to pass under the partition to have the upper part of their bodies in the air, so that they cannot be drowned nor suffocated in the mud, while the compressed air will keep this down to the dotted line.

According to incomplete theory there would be no tendency to displacement of such a partition, as the pressure is always equal on both sides, whether it be water or mud on one side and compressed air on the other. We suggest however, that the pressure of the water on one side, being variable with the tides, and the perhaps still greater variability of the air pressure on the other side which it is practically impossible to keep up to the same standard, especially when a break occurs, would make it necessary to keep this screen or shield well braced, so to as be secure against its displacement in case of an emergency, as this would diminish its protective capacity by allowing air to escape toward the break.

Inventors and the War Office.

A question asked in the House of Commons one evening this week, the reply given to it by Mr. Childers, and a comment on that reply by Colonel W. Hope, appearing in the *Times* recently, give cause for reflection and comment. Mr. O'Shea inquired whether an offer had been lately made by Lieut.-Colonel Hope and General Ripley to supply 200 breech-loading naval guns to the Government, 80 per cent lighter, 60 per cent cheaper, and about ten times stronger than those of the Woolwich pattern, the said guns not to be paid for till they had been found to be in all respects satisfactory to the department; and whether this offer had been refused by General Campbell. Mr. Childers replied that substantially such an offer had been made to his predecessor, that Colonel Hope and General Ripley had been furnished with a copy of the 1869 regulations, drawn up to deal with inventors, and that the gentlemen in question declined to comply with the first condition requiring all inventors to describe their inventions; this refusal disqualifying them from receiving further official attention. Colonel Hope's letter discloses some interesting features of departmental correspondence. He states that in answer to his offer, General Campbell replied in effect: "Before I can come to any decision as to the expediency of considering your application for a grant of money with which to conduct experiments and perfect your inventions, you must tell me all your secrets." Which reply, as Colonel Hope points out, had nothing to do with the proposition made to supply 200 guns, which should be subjected to any conditions of trial and proof that could be desired, and to receive no payment till these guns had been approved by the authorities. No wonder that, under these circumstances, Colonel Hope asks, "Why do officials treat inventors as natural enemies?" We are by no means as sanguine of the invention of Colonel Hope and General Ripley as these two gentlemen naturally are, and we fail to see why they should not have first offered one of their marvelous guns for proof to the department conditionally upon 200 being afterwards ordered, instead of requiring so large a number to be accepted at once. On the other hand we are aware that inventors are not unfrequently, perhaps generally, so great a nuisance to the War Office, that restrictions which must silence a large majority of them at the outset are very necessary. But surely intelligence, and not routine wholly, should guide the heads of the department in dealing with the numerous applications made to them; and an offer, involving nothing but a slight amount of labor in testing and reporting, should not be met by a reply adapted only to silence a needy and pertinacious schemer. The matter will hardly rest where it now is, and the discussion may possibly be of more use to the country than the guns to which it has given rise may be to the service.—*Engineering.*

Correspondence.

A Meteorite in British Columbia.

To the Editor of the Scientific American:

Your number of the 6th of March contains an account of the finding of several meteorites. Last summer, while on a canoe trip with an Indian crew, I visited Chilcat, at the head of Lynn Canal, latitude 59° 14', longitude 135° 40', I found a meteorite in possession of an Indian, who gave the following version of finding it:

He was in the interior, on the watershed of the Yukon, fur trading. One day while resting he heard a loud buzzing noise overhead, and immediately afterward, at a short distance, a tree was struck and broken off. On examination he found the meteorite, which he packed to the sea coast. It is used as an anvil, and I should judge it weighs over 40 pounds. From his story it must have been procured about 125 miles inland in British Columbia.

The coastal tribes are the middlemen of the interiors, making annual visits with supplies of powder, balls, blankets, etc., for the purpose of barter. The furs accumulated are sold to the white traders here and at Sitka. They do not permit the interiors to visit the coast, except occasionally a chief in charge, and then he is not permitted to trade with, and in fact not to see, any whites or outside Indians.

W. H. WOODCOCK.

Fort Wrangel, Alaska, July 13, 1880.

A Novel Spray Bath.

To the Editor of the Scientific American:

After two or three hours of fruitless labor, endeavoring to entice the trout with hackles, gnats, coachmen, magpies, butterflies, etc., I gave it up in despair, and, following the example of the trout, sought a secluded, shady nook, where I lay down for a nap, hoping that toward evening success would crown my efforts at fishing.

The spot was a delightful one. At my feet was a lovely ripple, and overhead was dense foliage of cottonwood and willow. The thermometer stood at 102°, and the sky was cloudless and perfectly Italian in its azure, but a light breeze across the rippling water, with the shade above, rendered my situation more than endurable.

I lay on my back, but had barely gotten comfortably fixed when I felt cool particles like water falling on my face. Surprised, I looked carefully through the foliage above me, and wherever the light was favorable saw fine spray falling quite fast through the leaves. For some minutes I watched in wonder, and tried to account for the phenomenon by the combination of the heated air without and the water and shade beneath, affected by the light breeze, causing condensation of the air's moisture, but could not satisfy my mind by this theory.

After enjoying the falling of the cool particles on my face for a while longer, I proceeded to examine the foliage above me. The particles were now clearly seen to be emitted from the leaves and twigs. A closer examination led to the discovery that thickly distributed over these parts were many little insects, and to my great surprise I saw that the particles of spray were ejected by convulsive but quite periodical movements from the anal extremity of the abdomens of these little animals. After careful watching I learned that they each ejected from twenty to thirty particles of water a minute, indicating a wonderful power of drinking the sap from the tree on which they were feeding.

Inclosed are specimens of the insect, which I hope will be recognizable after the long journey; also a twig from the tree on which I found them.

This is not offered as being new to the scientific world, but as entirely so to myself, and as matter which may interest some of the many readers of your valuable paper.

C. A. W.

Lapwai, Idaho, July 17, 1880.

Buttermilk as Summer Food, Drink, and Medicine.

A Detroit physician asserts that for a hot weather drink nothing equals buttermilk. It is, he says, "both drink and food, and for the laborer is the best known. It supports the system, and even in fever will cool the stomach admirably. It is also a most valuable domestic remedy. It will *cure* dysentery as well and more quickly than any other remedy known. Dysentery is really a constipation, and is the opposite of diarrhea. It is inflammation of the bowels with congestion of the 'portal circulation'—the circulation of blood through the bowels and liver. It is a disease always prevalent in the summer and autumn. From considerable observation I feel warranted in saying that buttermilk, drunk moderately, will cure every case of it—certainly when taken in the early stages."

IN coining $20,000,000 in silver and $22,000,000 in gold at the San Francisco Mint, in 1878, there was lost only $29. The carpet, which had been down five years, was taken up last spring, cut up into small pieces, and burned in pans. The *débris* was put through the same process as the mining dust, and there was got from the old carpet $2,500!

The Chicago Case of Skin Grafting.

The remarkable attempt to graft a section of skin from a boy's leg upon the thigh of his sister, described in a late issue of the SCIENTIFIC AMERICAN, unhappily proved a failure. The skin refused to adhere, shriveled, and became dry and hard. The narrow connecting hinge of skin was so sharply folded back that the life of it was destroyed, the circulation being cut off by the pressure which could not be avoided.

The brave boy who had made the sacrifice for his sister's sake was willing to endure another trial, but the physicians decided against it. It was thought best to make the second trial with the skin of a lamb, as soon as the burned child's strength should be sufficiently recruited. The proposed plan of operation is this: A mould of the lamb will be taken in plaster of Paris, so that the animal can be kept perfectly still in juxtaposition to the sufferer. Then the skin of the lamb, closely shorn, will be flayed for the space of 6 inches by 2½, leaving the skin uncut at one end of the strip. Under this loosened strip of skin a piece of soft white silk will be placed to keep the wound clean and facilitate the formation of blood fibers. When the "sprouting" is sufficiently advanced the silk will be removed, and the fibrous inner coating of the lambskin will be applied to the wound of the child, the lamb being bound as the boy was. Great confidence is felt in the success of the new method.

THE ACME CUBE PIPE TONGS.

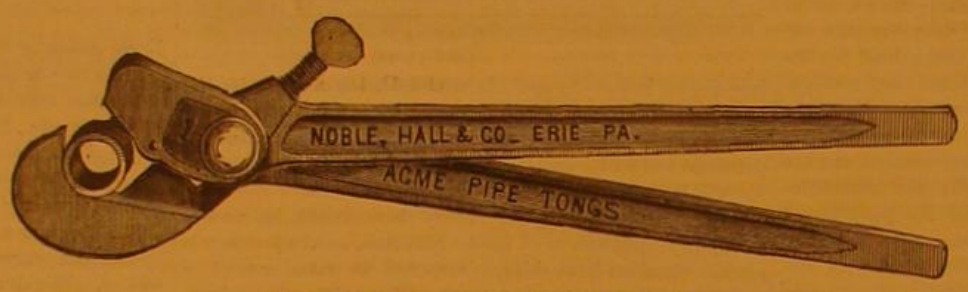
These tongs, which were patented March 18, 1879, are manufactured by Messrs. Noble, Hall & Co., of Erie, Pa. The main features are shown in the engraving.

The rivet or pin has a bearing on each end. This construction gives a firm bearing and avoids the twisting which is usually so destructive to ordinary tongs which has but one bearing, thereby saving the pin from wearing and breaking, besides the bit is held square and in line with pipe, which gives it a good hold or bite.

The check piece on one handle has a recess formed in it for receiving a cube or bit of hardened steel. This bit is held with one of its cutting edges directly or a little above the center of the pipe, whether the pipe is large or small.

It will be noticed that the cube has twelve available cutting or holding edges, so that as one edge becomes dulled by use, the tapering pin, which holds cube in, can be taken out and a sharp edge of cube placed toward pipe for use, until all of the twelve edges have been used. Then when all of the holding edges have been worn, the cube may be sharpened by grinding, and when entirely worn out, can be replaced by a new one at a slight cost. This patent also covers a flat bit, which has only eight holding edges. One of the jaws is made adjustable with a thumb screw, to adapt the tongs to different sized pipes.

This firm also make tongs of the same general character without the adjustable jaw and with flat bit. The manufacturers claim that for strength, durability, cheapness, and lightness, these tongs have no equal in the market. For circulars and prices, address Noble, Hall & Co., Erie, Pa.



THE ACME CUBE PIPE TONGS.

Severe Hail Storms.

Not a summer passes that we do not hear of hail storms of "unprecedented severity" in many parts of our broad land. This summer is no exception to the rule. Perhaps the most remarkable fall of hail, thus far reported, occurred in Warren County, Mo., July 1. The extent of the storm was about 20 miles by less than 1 mile in width, the heaviest fall of hail covering about 2 square miles. Mr. G. O. Hardeman, of Gray's Summit, assures us that the hail-stones were of various shapes, and ranged in size from that of a hazelnut up to blocks of ice 10½ inches long, 5 inches wide, and ½ inch thick. The hail fell to a depth of 5 or 6 inches on a level, and in places where it was drifted against houses or fences it reached a depth of a foot or more. The damage done was very great, the ice smashing not only windows, but sashes and blinds; and the roofs of all the houses in the path of the storm were so injured that new roofs had to be put on. All growing crops were destroyed, and nearly all the poultry in the region were killed, besides many hogs. The horses, mules, and cattle exposed to the storm were badly bruised; some had their eyes knocked out, and others were so seriously battered as to be unfit for use for several days. Forest trees were greatly injured, the bark being torn from the sides exposed to the storm.

Cast Iron Car Wheels.

Cast iron car wheels, as is generally known, are little used in Europe, and are generally regarded there as very dangerous, and especially unfit for use under passenger cars. We might suppose this opinion to be founded on ignorance, were it not that some cast iron wheels have been used for many years, especially in Austria, there being some Hungarian iron works famous for the "chilling" property of their iron. But as, in spite of this long experience, the opinion prevails there that cast iron wheels are not only inferior, but positively unsafe, so much so that we believe many companies will not permit cars with cast iron wheels to pass over their roads, though loaded with freight for stations on or beyond their lines, it has naturally been supposed in this country that the European chilling iron must be greatly inferior to ours. But it now seems questionable whether the cast iron car wheels in Europe are not quite good and safe. An Austrian engineer, Mr. Emil Stotzer, foreman of the shops of the Empress Elizabeth Railroad at Linz, calls attention to the fact that during the past winter, which in Europe was an exceptionally severe one, while the cases of *tire* breakages amounted to thousands, and not a few accidents were due to this cause, so far as is known there was *not a single case* of the breakage of a cast iron wheel, at least not one which interrupted traffic. In view of this he suggests that the prevailing prejudice against cast iron wheels should be abated, and that a great deal might be gained if at least all the freight cars that have no brakes should be provided with cast iron wheels, but thinks that experiments should be made with cast iron wheels under brakes also. He mentions the use of cast iron wheels under passenger cars in *this country*, but seems not to understand how general this use is, and that of the 496,718 cars reported by "Poor's Manual" as the stock possessed by our railroads in 1879, probably 495,000 have cast iron wheels.—*Railroad Gazette.*

Pressure of Wind.

The question of the amount of pressure to be assigned to wind in calculating the stability of structures does not, hitherto, appear to have received in England any satisfactory solution. Recent events have sufficiently demonstrated its importance, and yet we find that the President of the Institute of Civil Engineers and one of the railway inspectors of the Board of Trade are both agreed that no definite rule exists on the subject. These gentlemen, Mr. W. H. Barlow and Colonel Yolland, in their recent report on the loss of the Tay Bridge, say: "In conclusion, we have to state that there is no requirement issued by the Board of Trade respecting wind pressure, and there does not appear to be any understood rule in the engineering profession regarding wind pressure in railway structures; and we therefore recommend that the Board of Trade should take such steps as may be necessary for the establishment of rules for that purpose."

It is perhaps natural that Colonel Yolland and Mr. Barlow should consider that the Board of Trade is the proper authority to decide upon this doubtful point, as to this department has been intrusted the testing of the safety of railway structures, and the strains to which iron and steel may be subjected, before the public are allowed to pass over them. The Board of Trade, moreover, possesses a recognized authority to which all engineers are obliged to defer. Howeves, Mr. Rothery, the other member of the court of inquiry, does not take this view of the matter. His opinion is very clearly expressed in his separate report. Referring to the paragraph in the report of his colleagues quoted above, he says: "I cannot, however, join in that recommendation, for it appears to me that, if there is no understood rule in the engineering profession regarding wind pressure in railway structures, it is for the engineering profession, and not for the Board of Trade, to make them. I will add that, if I rightly understood my colleagues at our last interview, they concurred with me in the conclusions to which I had come, that there might be a maximum wind pressure of from 40 lb. to 50 lb. per square foot, and this not only over a few feet, but over the whole extent of a span of one of the high girders, and I gather as much from their report. And, if so, seeing that it is the practice in France to allow 55 lb. per square foot for wind pressure, and in the United States 50 lb., there seems to be no reason why a similar allowance should not be made in this country."

The question really belongs to the science of meteorology, and can only be settled by the examination of careful observations, taken with accurate instruments, and extending over a series of years. It might be interesting to ascertain upon what grounds the French and American engineers have fixed upon the values they assign to wind pressure; but we think that sufficient data exist in this country to arrive at an independent conclusion.

Any one might be led to suppose, from the vagueness of the views expressed on the subject, that there were no records in existence in England on the rate or force of the wind. On turning, however, to the meteorological observations of the Royal Observatory at Greenwich, printed by the Government in a yearly volume with the various other observations, we find most valuable information, both on the daily rate and maximum force of the wind. For the purpose we are dealing with, the maximum force is the quantity required. It is true that, given a certain velocity, it is easy to deduce, by means of a simple formula, the corresponding pressure. A formula used for this purpose on the Continent is: Pressure in kilogrammes per square meter $=\frac{1}{16}$ (meter per second)^2, which converted into *English measures*, is: Pressure in lb. per square foot $=\frac{.51}{10000}$ (foot per second)^2. Unfortunately, however, the observations of velocity are only given in the form of the total distance traversed by the wind during the whole of each day, *as measured* by the revolutions of an anemometer; and this is the only form in which the motion of the wind is recorded in many observations. This would merely enable us to calculate the average wind pressure throughout the day, which is quite a different thing to the maximum pressure. The *wind on very stormy days* blows frequently in gusts, and what we require to know is the force or pressure of the strongest gust which has occurred as far back as the observations extend. For instance, for determining maxima wind pressures, the observations at the Radcliffe Observatory at Oxford in past years are of little value, as, for example, though on one occasion, April 14, 1867, the wind, as *recorded by the anemometer*, traveled at the rate of 1,094 miles in the day, which furnishes an extremely high average speed for a whole day, it appears from the Greenwich observations that no unusual pressure occurred on that day. At Greenwich Observatory, fortunately, the maximum pressure each day has been recorded for several years. We have looked through the published records of the Observatory for the years 1865, 1866, 1870, and 1877, the three first being years during which we knew some severe storms had taken place, and the year 1877 being apparently the latest record hitherto published. In the year 1866, the maximum pressure of wind occurred in January, and amounted to 32 lb. per square foot, and in February and December it reached 30 lb. per square foot. It was in the month of January of that year that the London foundered in the Bay of Biscay during a violent storm. The greatest pressure of wind in 1867 occurred on the 8th of February, amounting to 41 lb. on the square foot. This great pressure, however, was nearly reached again on the 12th of March in the same year, when a pressure of 40 lb. was recorded. The maxima pressures in January and October of that year were 35 lb. and 30 lb. respectively. In 1870 four records are given, in different months, of the pressure being more than 30 lb., no actual figure being given; and on three other occasions in that year the pressure reached that amount. The highest pressure in 1877 was 32·6 lb. in the month of November. It is evident from this brief glance at the Greenwich Observatory records that the pressure of 30 lb., adopted by some eminent engineers, is considerably too low to be received as a standard maximum pressure, and that even 40 lb. is insufficient. It is possible that a thorough examination of the whole of the Greenwich observations might indicate a higher maximum even than the one we have given. Also, it must be borne in mind that Greenwich Observatory is not situated near the sea, or in a specially exposed position, so that a maximum recorded there might be exceeded in some other places. In a treatise on "Meteorology," by Dr. Loomis, an American professor, published in New York, the velocity of the most violent hurricane is stated to be 100 miles per hour, with a corresponding pressure of 49 lb. per square foot, which may, perhaps, be the basis upon which American engineers have founded their rule of taking 50 lb. as a maximum. Professor Rankine, however, states, in his "Treatise on Civil Engineering," that the maximum pressure of wind observed in Great Britain amounts to 55 lb. per square foot. The rule followed in Belgium is to assume a wind pressure of 275 kilogrammes per square meter for places on the sea coast, and 176 kilogrammes for places inland; which, converted into English equivalents, amounts to 56 lb. per square foot on coast, and 36 lb. inland. With these facts before us we feel bound to concur in the opinion expressed by Mr. Rothery; and we consider that English engineers should no longer hesitate to accept 55 lb. per square foot as a possible pressure of wind in very exposed situations, and to design structures in future, subject to this consideration, with a proper margin for safety. Also, we hope that all observatories will follow the example of Greenwich, and record daily the maximum pressure, and not merely the average daily velocity, so that a valuable collection of facts relating to the pressure of wind may be constantly accumulated.—*Universal Engineer.*

Deflection of Iron and Steel Rails.

In the *Comptes Rendus* of the Paris Society of Civil Engineers is a paper by M. Tresca, giving the results of some experiments on the deflection of iron and steel rails between the limits of elasticity and rupture. They show that, for these two metals of ordinary commercial character, the coefficient of elasticity is nearly the same, thus confirming certain special experiments in 1857 and 1859 upon Swedish iron, and cementation steel made from such iron. M. Tresca finds that the limit of elasticity for a given bar may be extended in proportion to the strain to which it had been previously submitted, and that the elastic limit may be pushed almost to the point of rupture without the coefficient of elasticity having varied in any perceptible degree. The metal, when it comes from the workshops, is in a state of instability, which disappears only by use; it becomes, by means of the actions to which it is successively submitted in its employment, more homogeneous and more elastic, but at the same time a little more flexible.

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.*

Dish Washing Machine wanted one that is capable of washing 25,000 daily. A liberal offer will be made any party possessing such a machine, by addressing D.W.M., Box 773, New York city.

Hotchkiss Improved Mechanical Boiler Cleaner. Removes all sediment from steam boilers, preventing incrustation. Send for circular. J. F. Hotchkiss, 84 John St., N. Y.

Books relating to Civil Engineering, Electricity, Electric Light, Gas, Heat, Hydraulics, Mining, Sanitary Engineering, Steam Engine, Turning etc. Catalogues free. E. & F. N. Spon, 446 Broome St., New York.

The classic moralist bids "*Festina Lente*," but when you want a good pen, you cannot get one of Esterbrook's too quickly.

A 4½ in. 2 Jaw Chuck, Independent or Universal, for Brass Finishers. Address A. F. Cushman, Hartford, Ct.

For Yale Mills and Engines, see page 109.

A. Young, Houston, Texas, Lumber and Mill Supplies. Intimate relations with thirty mills and one hundred yards. Articles of merit in machinery or builders' ware introduced.

Lightning Screw Plates and Labor-saving Tools, p. 108.

Glass Window Blind Slats.—This new invention, which consists in making the slats of glass, in different colors, is made by the Corning Glass Window Blind Company, of Corning, N. Y. These glass window blinds are not expensive, are a house decoration, elegant in appearance, and are an ornament to any apartment. Nothing equals them for convenience, usefulness, and beauty. The colored blinds effectually protect costly upholstery or delicate colors of tapestry from injury by sunlight. They give sufficient light for dining-rooms, and exclude flies.

A Man, with twenty years' experience in the Foundry and Machine business, wants something to do. Address F. J. Masten, Toledo, O.

Planers to face 2 x 4 inches; price $18. Box 170, Montclair, N. J.

For Sale.—No. 1 14 inch 6 roll 4 side (Schenck) Planer and Matcher. All late improvements, and never used. Also second-hand, 8 inch, 4 side (Huntington) Moulder, and 70 horse Upright Engine. Send for list of second-hand machinery in stock. Belcher & Bagnall, 40 Cortlandt St., New York.

Superintendent wanted, well skilled in use of wood-working machinery. Address Skill, Box 773, New York.

Rules for Engineers and Firemen, and the Removal of Scale in Boilers. Send for circular. Rankin & Co., 50 Federal St., Boston.

Alden Ore Crushers and Pulverizers, six sizes, $45 to $1,500. E. T. Copeland, 30 Cortlandt St., N. Y. city.

Saw Mill Machinery. Stearns Mfg. Co. See p. 77.

See Stockwell Screw and Machine Co.'s adv., p. 76.

For Best Quality Brass and Composition Castings, address E. Stebbins Mfg. Co., Brightwood, Mass.

Telephones repaired, parts of same for sale. Send stamp for circulars. P. O. Box 205, Jersey City, N. J.

Asbestos Board, Packing, Gaskets, Fibers, Asbestos Materials for Steam & Building Purposes. Boiler & Pipe Covering. Asbestos Pat. Fiber Co., limited, 194 B'way, N.Y.

Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole m'f'rs., H. Lloyd, Son & Co., Pittsb'g, Pa.

Malleable and Gray Iron Castings, all descriptions, by Erie Malleable Iron Company, limited, Erie, Pa.

Apply to J. H. Blaisdell for all kinds of Wood and Iron Working Machinery. 107 Liberty St., New York. Send for illustrated catalogue.

Our new Stylographic Pen (just patented), having the duplex interchangeable point section, is the very latest improvement. The Stylographic Pen Co., Room 13, 169 Broadway, N. Y.

Advertising of all kinds in all American Newspapers. Special lists free. Address S. N. Freshman & Bros., Cincinnati, O.

Skinner & Wood, Erie, Pa., Portable and Stationary Engines, are full of orders, and withdraw their illustrated advertisement. Send for their new circulars.

Sweetland & Co., 126 Union St., New Haven, Conn., manufacture the Sweetland Combination Chuck.

Power, Foot, and Hand Presses for Metal Workers. Lowest prices. Peerless Punch & Shear Co., 52 Dey St., N.Y.

Peck's Patent Drop Press. See adv., page 76.

The Brown Automatic Cut-off Engine; unexcelled for workmanship, economy, and durability. Write for information. C. H. Brown & Co., Fitchburg, Mass.

For the best Stave, Barrel, Keg, and Hogshead Machinery, address H. A. Crossley, Cleveland, Ohio.

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros., 531 Jefferson St., Philadelphia, Pa.

National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 40 John St., N. Y.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Stave, Barrel, Keg, and Hogshead Machinery a specialty, by E. & B. Holmes, Buffalo, N. Y.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, importers Vienna lime, crocus, etc. Condit, Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Presses, Dies, and Tools for working Sheet Metal, etc. Fruit & other can tools. Bliss & Williams, B'klyn, N. Y.

Instruction in Steam and Mechanical Engineering. A thorough practical education, and a desirable situation as soon as competent, can be obtained at the National Institute of Steam Engineering, Bridgeport, Conn. For particulars, send for pamphlet.

Hydraulic Jacks, Presses and Pumps. Polishing and Buffing Machinery. Patent Punches, Shears, etc. E. Lyon & Co., 470 Grand St., New York.

Sheet Metal Presses, Ferracute Co., Bridgeton, N. J.

Wright's Patent Steam Engine, with automatic cut off. The best engine made. For prices, address William Wright, Manufacturer, Newburgh, N. Y.

Special Wood-Working Machinery of every variety. Levi Houston, Montgomery, Pa. See ad. page 77

Blake "Lion and Eagle" Imp'd Crusher. See p. 77

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 93.

For Separators, Farm & Vertical Engines, see adv. p. 93.

For Patent Shapers and Planers, see ills. adv. p. 93

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 93.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 421, Pottsville, Pa. See p. 93.

Rollston Mac. Co.' Wood Working Mach'y ad. p. 93.

Machine Knives for Wood-working Machinery, Book Binders, and Paper Mills. Large knife work a specialty. Also manufacturers of Soloman's Parallel Vise. Taylor, Stiles & Co., Riegelsville, N. J.

Silent Injector, Blower, and Exhauster. See adv. p. 110.

Steam Engines, Boilers, Portable Railroads, Sugar Mills. Atlantic Steam Engine Works, Brooklyn, N. Y.

For Alcott's Improved Turbine, see adv. p. 110.

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 15,000 Crank Shafts, and 10,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

Brass & Copper in sheets, wire & blanks. See ad. p. 108.

Air Compressors. Clayton Stm. PumpW'ks, Bk'lyn, N.Y.

Diamond Saws. J. Dickinson, 64 Nassau St., N. Y.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

For Superior Steam Heat. Appar., see adv., page 109.

Eagle Anvils, 10 cents per pound. Fully warranted.

Millstone Dressing Machine. See adv., page 110.

Gear Wheels for Models (list free); experimental and model work, dies and punches, metal cutting, manufacturing, etc. D. Gilbert & Son, 212 Chester St., Phila., Pa.

Walrus and Sea Lion Leather for Silver and all Metal Polishing. Greene, Tweed & Co., 118 Chambers St., N.Y.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St., N. Y. Wm. Sellers & Co.

The best Truss ever used. Send for descriptive circular to N. Y. Elastic Truss Co., 683 Broadway, New York.

Comb'd Punch & Shears; Universal Lathe Chucks. Lambertville Iron Works, Lambertville, N. J. See ad. p. 78.

Wheels and Pinions, heavy and light, remarkably strong and durable. Especially suited for sugar mills and similar work. Circulars on application. Pittsburg Steel Casting Company, Pittsburg, Pa.

New Economizer Portable Engine. See illus. adv. p. 109.

Blake's Belt Studs. The best and cheapest fastening for rubber and leather belts. Greene, Tweed & Co., N.Y.

Wm. Sellers & Co., Phila., have introduced a new injector, worked by a single motion of a lever.

Ore Breaker, Crusher, and Pulverizer. Smaller sizes run by horse power. See p. 109. Totten & Co., Pittsburg.

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) S. E. S. writes: I have a rowboat made of ¼ inch cedar, which I wish to make watertight. I thought of two ways: 1. To cover the outside with ⅛ inch boards and fasten with copper rivets; or 2. To cover with canvas, using some cement or glue. Which do you think is best, or do you know of a better method? I have tried calking, but it does no good. A. Use canvas, well painted.

(2) A. F. N. asks: 1. What length of stroke and diameter of cylinder will be necessary to run a boat 18 feet long by 5 feet beam to run at a fair speed in still water? A. 3 inch cylinder by 4 inches stroke. 2. Where can I obtain rough castings for above engine? A. We do not know of any one having them in stock. 3. Can I use lap welded boiler tube for boiler? also, what diameter and length and number of flues? A. Yes; you should have 70 to 75 feet fire surface. 4. Which will be best, paddle wheels or screw? A. Screw.

(3) J. W. R. writes: 1. I have a boiler 8 feet long, 14 inches in diameter, with a return flue 6 inches. I want to know what is the heating surface. A. 26 feet. 2. My cylinder engine is 5 inches stroke, 3 inches bore; what is the horse power at 50 lb. steam, at 250 revolutions per minute? A. A little over 2 horse power.

(4) W. S. F. asks: Will an ordinary two inch spy glass objective do for a photographic camera? A. It might answer a purpose if the focus is not too long. However, a regular camera combination is better.

(5) W. E. asks (1) where to obtain statistics and plans for steam launches (engines, etc.) from 30 to 40 feet in length; their speeds and running expense. A. We know of no statistics or data respecting the performance of steam launches more full than you will find in the SCIENTIFIC AMERICAN SUPPLEMENTS. 2. Please tell me if the license for launch engineers has been changed. A. The fee has not been changed.

(6) G. T. C. writes: We are using a solution here which has to be raised to a height of 30 feet, and it is almost impossible to get any kind of a pump to stand it, not even a rubber one. Is a little heavier than water. Would it be possible to make a wooden tank strong enough to raise the solution by air pressure? If it would, about what thickness of material would be required? Could we use an air blower, or would it require an air pump to get the required pressure? A. A centrifugal pump of either iron or brass might suit your purpose, unless the material you pump will attack the metal. It would be possible to construct a wood vessel and use compressed air. You would require an air compressing pump a blower would not do. Could you not use a steam ejector?

(7) A. K. D. asks: Will a brick smoke-stack 55 feet high be sufficient height for a sixty horse steam boiler to produce the best results in raising steam, and what size hole should there be in the stack, and should it be smaller at the top than bottom? A. Make your chimney not less than 60 feet high and flue 28 inches or 30 inches square, and parallel the whole height.

(8) H. B. asks: 1. What size flywheel should I use for engine with 6 inch cylinder by 2½ diameter? A. 16 to 18 inches. 2. Can you give me any information on melting zinc? I have melted some, but it will not run solid. Is there any mixture I could put with it to make it run solid, and would it do for steam engine cylinder of the size above mentioned? A. You had better use block tin or brass for your cylinder. 3. Would block iron ¼ inch in thickness be strong enough to make boiler for cylinder mentioned, boiler to be 3 feet high and 1 foot 6 inches diameter. Would boiler be large enough? A. Would recommend three-sixteenths inch thick. Make boiler at least 20 inches diameter and 4 feet high.

(9) S. S. J. writes: In fitting key to cross-head and piston rod with usual taper, should it bear equally on each side, or should some be cut away to give draught? A. The sides of key should be parallel and a good easy fit. The draught to be on the edges and keyways cut away so that the rod will draw home.

(10) D. D. H. asks for the best method of putting in a non-conductor of heat between an iron roof and wooden ceiling. Will building paper answer the purpose? If so, how should it be used? A. The best method would be to give free circulation to the air between the roof and ceiling, then the heat from the roof would be carried away by the air.

(11) A. J. S. asks: Is there any way to keep the bright work, "hot bright work," such as ends and valve box of the Corliss engine, clean? A. A mixture of white lead and tallow, put on with a brush will keep the surfaces from rusting, but the cleaning must be done by hand.

(12) J. J. S. asks for some information relative to the source and method of preparation, etc., of what is known as a "snood," an article used by fishermen for attaching hooks to fishing lines. A. It is silk worm gut. The best comes from Spain. We believe it to be the contents of the silkworm's sac drawn out in bulk just as it is ready to spin its cocoon.

(13) D. H. F. asks: 1. What is the best material to make buttons of to prevent rusting on an electric switch that must necessarily be exposed to the weather? A. Copper. 2. Suppose I use a double electro-magnet with a permanently magnetized armature; the armature is attracted when the current passes. Reverse the current, thereby reversing the poles, will the armature be repulsed, and with what proportionate force? A. It will be repelled; the force will depend on the size of the armature and the amount of magnetism in it.

(14) F. D. H. asks: What is the "hall mark," spoken of in connection with London plate and jewelry? Of what does it consist, and what was its origin? A. Hall mark—the official stamp of the British Goldsmiths' Company and other authorized assay offices on gold and silver articles to guarantee their purity. The standard silver of England is an alloy, containing, in 1,000 parts, 925 parts silver and 75 copper. Originally the Goldsmiths' Company had a monopoly of gold and silver work in England. The company is still authorized to search the shops of silversmiths and seize articles which do not bear the hall mark of the company. A charge of 1s. 6d. an ounce is made for assaying and stamping, the larger portion of the revenue so derived being paid over to the government.

(15) J. H. T. writes: In SUPPLEMENT No. 225, p. 3589, under "Farming in Southwestern Minnesota" it is stated that: "Throughout these Western States lands are frequently pointed out as belonging to Englishmen, who to counterbalance the depreciation unfortunately going on in land property in England, are investing in desirable estates in America." Can this be true? I have always been under the impression that aliens could not hold real property in this country. Am I wrong in my impression? A. You are wrong. Different States have different laws on this point. 2. In both the SCIENTIFIC AMERICAN and SUPPLEMENT receipts frequently appear in which it is stated that so many parts of a solid and so many parts of a liquid are to be taken. By parts is it always meant parts by weight of both solid and liquid? If not, how then are such formulas to be interpreted? A. Parts by weight are intended unless otherwise specified. Fluids may often be more conveniently measured—taking the fluid ounce or liter and pure water as the standard. Their specific gravity must, however, be taken into consideration—sulphuric acid, for instance, is nearly twice as heavy as water (1·8). 3. Is it possible for a man engaged in active business, but who desires to employ such leisure time as he may have in the study of mineralogy, to obtain access to a cabinet of minerals in this city or vicinity? A. Visit "School of Mines," Columbia College, or Metropolitan Museum of Natural History, Manhattan Square, near Central Park, west side.

(16) J. G. S. writes: I am employed in a large engineering works in this country. Many of us have had quite a discussion on the question whether it takes more power to stop a fly wheel than it does to start it. Suppose an engine of certain power could get the speed of a fly wheel up in a minute, which is 300 revolutions, if the same, applied in the opposite direction, could it stop it in the same time? A. It would be stopped in less time. In starting you have the friction operating against the power, and in stopping the friction aids you.

COMMUNICATIONS RECEIVED.

On a Catamaran that will Come About. By J. B. C.

On the Theory of Scientists concerning Perpetual Motion.

On Artificial Diamonds. By N. B. C.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

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

July 20, 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 1866, 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.

Air, method of and apparatus for heating, conducting, and utilizing, Chaffee & Priest 230,107
Alumina or alum, making and purifying sulphate of, W. Chadwick *et al* 230,196
Ammonia, manufacture of aqua, J. L. Marsh 230,201
Animal trap, J. H. Eatman 230,182
Annunciator drop, electrical, E. T. Gilliland 230,265
Bale tie, J. F. McLaughlin 230,213
Baling press, J. H. Simonson 230,259
Bedstead fastening, N. P. Bradish 230,172
Bedstead, folding or cabinet, S. S. Burr 230,165
Binder for the filing and protection of papers, W. Keenan 230,135
Biscuit cutter and sticker, comb'd, I. W. Lincoln 230,294
Boiler furnace, steam, S. E. Babcock 230,218
Boiler furnace, steam, J. Wavish 230,273
Book covers, metallic guard for, G. W. Emerson 230,256
Boot and shoe, W. H. Hannaford 230,273
Boot and shoe counter stiffeners, machine for forming flanges on, H. G. Farr 230,258
Boot and shoe heeling machine, T. Cowburn 230,242
Boot and shoe soles, machine for shaping, J. B. Johnson 230,187
Bottle and stopper, ointment, R. Gordon 230,136
Box nailing machine, W. H. Brock 230,230
Brick machine, F. W. Schu 230,244
Bridge and bridge iron, A. Gottlieb 230,185
Bridges, barrier for draw, A. R. Sherman 230,302
Broom and brush holder, J. H. Rosson 230,242
Brush, H. Hendrickson 230,277
Brush, fountain, A. J. French 230,139
Buckle, H. G. Bardwell 230,221
Buckle lever, L. A. Sprague 230,156
Burglar alarm, E. Glover 230,266
Button, A. J. Shipley 230,302
Button, G. C. Thomas 230,261
Button and stud, separable, W. P. Dolloff 230,115
Button backs, machine for making, F. C. Cannon 230,236
Buttoner, glove, J. W. Partridge 230,196
Calendars, etc., back and brace for, G. Bergen 230,170
Camera attachment, Molera & Cebrian 230,319
Cans, apparatus for exhausting air from, T. G. F. Dolby 230,179
Car brake, D. R. Dwyer 230,181
Car coupling, W. H. Ward 230,320
Car coupling, P. B. Williams 230,279
Carbon conductors, manufacturing, H. S. Maxim 230,309
Carpenter's gauge, W. Goodwin 230,271
Carpet lining, Smith & Beale 230,205
Carriage bow, B. J. Warden 230,272
Carriage curtain fastening, O. M. Tuttle 230,264
Carriage dash frame, G. Monteith 230,325
Carriage lifter, C. F. Haynes 230,275
Carriage top, J. McKee 230,312
Caster, J. F. Ohmer 230,191
Catch for holding chest covers, etc., A. Montant 230,326
Centering apparatus, C. L. Wolff 230,284
Chair brace, R. J. Farum 230,117
Chisel, J. D. Baxter 230,223
Churn, C. M. Smith 230,154
Churn dasher, S. J. Linn 230,295
Cigarette machine, A. Decouflé 230,177
Clapboard machine, A. Cunningham ..... 230,110 to 230,112
Clock, alarm, H. J. Davies 230,246
Clock calendar, self-adjusting, I. W. Johnson 230,134
Clock dial, geographical, C. F. Bourquin 230,227
Clock pendulums, suspension of, S. B. Jerome 230,283
Clothes prop, Meeker & Fisher 230,215
Cock, three-way, W. H. Ward 230,321
Coffee mill, F. Hickman 230,279
Coffee roaster, W. Languer 230,189
Collar, J. W. A. Cluett 230,109
Collar fastening, horse, Fisher & Watson 230,261
Columns, fireproofing iron, C. Mettam 230,316
Compass, ship's, F. Alsing 230,215
Converter bottom, T. & S. McDonald 230,142
Cooking can and dinner pail, combined, J. B. Haskell 230,274
Copper for making cast hollow cylinders and other castings, treating molten, S. Walker 230,269
Corn husker, W. B. Farwell 230,183
Corset, C. F. Allen 230,163
Cotton, device for handling and shipping, C. H. Merry 230,144
Culinary vessel, F. Schifferle 230,303
Depurator, A. Seyberlich 230,251
Diphtheria remedy, S. H. Longard 230,141
Dish handle, detachable, J. B. Timberlake 230,262
Dish heater, H. A. Sawyer 230,199
Disintegrating apparatus, A. B. Lipsey 230,140
Distilling petroleum, process and apparatus for, S. Cheney 230,239
Ditching and dredging machine, J. A. Murray 230,329
Diving bell, C. F. Pike 230,197
Door for cabinets, cases, etc., circumrotary, C. Senrick 230,153
Electric light circuits, automatic regulator for, W. Sawyer 230,245

Electric light circuits, automatic safety switch for, W. Sawyer 230,316
Electric switch, Molera & Cebrian 230,321
Emery cloth, F. K. Sibley 230,302
Excavator, W. P. Smith 230,258
Fare register, J. B. Benton 230,169
Faucet valve, L. Brandeis 230,172
Feed water heater for locomotives, C. H. Magoon 230,190
Fence, B. B. Townsend 230,210
File, paper, M. N. Lovell 230,298
Filter, Scannell & Lipscombe 230,347
Filtering press, L. L. Baxley 230,160
Firearms, spring extractor for, F. N. Beebe 230,224
Flue cleaner, H. Le Boy 230,139
Fur mixer or deviling machine, D. Almond 230,164
Furnace, E. Brook 230,174
Furnace feeder, I. Erickson 230,257
Furniture joint, metallic, A. M. Eastman 230,254
Fruit, etc., drier, G. G. Stegmann 230,207
Galvanic ring, Osselin & Meyer 230,194
Gate, C. W. Barnes 230,165
Glass, polishing, G. F. Lapham 230,137
Glasses, detachable cover for, W. Konrad 230,188
Governor, steam engine, F. W. Robinson (r) 9,306
Grain binder, R. K. & J. Laraway 230,297
Grain binder, C. B. Withington 230,262, 230,263
Grain drill tooth, A. & A. Franklin 230,184
Grain drills, drag plow or shoe for, J. Caldwell 230,235
Grain sampler, J. B. Frost 230,171
Grain toller, W. J. Wilson 230,378
Hame clasp, C. G. Calo 230,234
Harrow and seed sower, R. Hamilton 230,271
Harvester, C. A. Joslyn 230,284
Harvester, J. F. Mahon 230,302
Hat or other head covering, Heimann & Wall 230,276
Hay rake and loader, J. Barlow 230,222
Heat, porous or spongy mineral composition and non-conductor of, D. C. Sanford 230,151
Heating and ventilating houses, etc., A. K. Campbell 230,227
Heels, apparatus for shaping wooden, D. A. Sutherland 230,157
Hinge, awning blind, W. S. Stockman 230,255
Hoe, ditching, H. & L. Iwan 230,130
Horse detacher, S. June 230,285
Horse detaching device, J. A. Copeland 230,241
Horse toe weight, C. S. Woodruff 230,285
Horses' hoofs, appliance for, S. D. Spence 230,155
Horseshoe machine, J. H. Dorgan 230,180
Ice, process of and apparatus for making, J. W. Miller 230,318
Incubator, J. Dennis, Jr. 230,247
Inkstand, R. L. Webb 230,374
Insulator, lightning rod, C. H. Lilly 230,290
Iron melting furnace, B. F. Stockford 230,256
Ironing board, J. W. Dewey 230,249
Lactometer, E. E. Page 230,330
Ladders, adjustable leg for step, H. Stretcher 230,208
Lamp, E. M. Lowden 230,299
Lamp, F. A. Taber 230,360
Lamp chimney cleaner, C. W. Ferguson 230,260
Lamp, electric, H. S. Maxim 230,310
Lamp fixture, extension, J. A. Evarts 230,258
Lamp, glass, D. C. Ripley 230,340
Lamps, manufacturing electric, T. A. Edison 240,255
Lathe, engine, H. Dilldeck 230,253
Leather skiving machine, M. A. Holton 230,280
Lightning rod connection, C. H. Lilly 230,293
Liniment, M. V. Watts 230,365
Locomotive boiler, H. A. Towne 230,363
Loom, Crompton & Wyman 230,243
Low water alarm for boilers, N. L. Adams 230,213
Low water indicator, G. L. Jaeger 230,282
Lubricants, machine for testing, R. H. Thurston 230,158
Lumber, compound, W. E. Brock 230,174
Lumber drier, E. J. Sumner (r) 9,309
Mail bag, T. J. Mayo 230,308
Match, friction, C. F. Bonhack 230,226
Measuring machine, cloth, J. E. Windle 230,381
Milk can, automatic measuring, G. Koons 230,136
Mechanical movement, L. Scofield 230,349
Microscope, Molera & Cebrian 230,320
Milk cooler, E. M. Way 230,211
Milk setting apparatus, F. G. Butler (r) 9,302
Millstone clearing device, W. H. Hall 230,269
Millstone furrow staff, U. H. Palmer 230,331
Motion, device for transmitting, T. S. E. Dixon 230,250
Mower and reaper knives, machine for grinding, L. V. G. Fois 230,119
Nitro-derivatives from cellulose, etc., manufacturing, J. A. Arrault *et al.* 230,216
Nursery pin, W. R. Clough 230,240
Oar, R. McManus 230,314
Offal drier, J. F. Gubbins 230,128
Oiling can, J. E. Bard 230,167
Optical instrument, Molera & Cebrian 230,322
Organ, reed, G. Woods (r) 9,308
Packing, piston, S. S. Sprague 230,206
Packing, piston rod, Bailey & Glass 230,220
Packing, piston rod, C. C. Jerome 230,133
Packing, piston rod, G. E. Mitchell 230,317
Packing, valve stem, C. C. Jerome 230,132
Paging and numbering machine, W. Robinson 230,198
Pantaloon brace, C. Laffite 230,289
Paper and paper board, machine and process for enameling, coating, and calendering, Van Benthuysen & Bott 230,366
Paper filtering stones, etc., machine for making, B. Klary 230,287
Paper pail, J. A. Weed 230,375
Passenger register, J. B. Benton (r) 9,312, 9,313
Pegging machine, L. Goddu (r) 9,315
Pencil sharpener, H. C. Rice 230,338
Pendulum, compensating, C. T. Mason 230,305
Petroleum refineries, process of and apparatus for treating residuum from, H. Bower 230,171
Photographic apparatus for reducing to a microscopic scale, Molera & Cebrian 230,324
Photographic printing frame, J. A. Todd 230,159
Pianoforte, upright, C. F. T. Steinway 230,354
Pivot gate, E. Lanning 230,291
Planter, seed and corn, T. A. Crowell 230,244
Plate lifter, M. Churchill 230,108
Plow, gang, H. A. Olmsted 230,192
Plow marking attachment, Brown & Deidrich 230,231
Plow, sulky, L. W. Powell 230,335
Printing machine, plate, C. A. Guy (r) 9,317
Propeller for vessels, reciprocating, R. Smith 230,204
Propelling ships, F. Von Leicht 230,140
Pump, J. W. Powers 230,149
Punch for paper fasteners, eyelet, F. J. Lippitt 230,296
Punch, ticket, W. Hill 230,129
Radiator, steam, S. E. Babcock 230,219
Radiator, steam, Goldsmith & Reed 230,267
Radiator, steam, C. C. Walworth 230,368
Railway gate, C. H. Young 230,162
Railway switch, E. Parker 230,147
Reaping and mowing machine, D. Forrest 230,263
Refrigerator, J. H. Wickes 230,376
Refrigerator packing box, J. Dooling 230,252
Rock drill holes, tool for clearing, W. S. Moses 230,145
Rod and wire cutting and twisting, S. G. Wilcox 230,377
Roof, W. P. Walker 230,161
Roof, composite, Foster & Benton (r) 9,314
Roofing, etc., manufacture of and material for, G. S. Page 230,148
Safe, T. Heineman (r) 9,326
Safe, provision, A. Osborne 230,196
Sash holder, W. C. Curran 230,113
Sash supporter, J. Chandler 230,238
Saw swage, W. W. Rochelle 230,341
Sawing machine, circular, C. Bryant 230,175
Scraper, road, C. H. Matthiessen 230,307
Seed cleaner, McMurtry & Carroll 230,143
Seed drill fertilizer attachment, A. C. Hendricks 230,278
Sewing covered wire to hats, etc., machine for, C. H. Willcox 230,212
Sewing machine treadle, J. E. Donovan 230,251
Sheet metal tubes, machine for bending, S. W. Gear 230,135
Ships, construction of, T. W. Kirby 230,286
Shovel, W. A. Reddick 230,337
Shutter opener, window, J. R. Day 230,114
Sickle holder, H. L. Fisher 230,118
Sign, E. Grah 230,268
Smoke stack, S. E. Babcock 230,217
Smut mill, T. Ryan 230,343
Spinning frame spindles, mechanism for supporting ring, W. Mason 230,306
Stamp, branding, Garretson & Draper (r) 9,311
Starching machine, L. J. Ryerson 230,744
Steam boiler purifying apparatus, A. Dervaux 230,248
Steam engine, J. Curtis 230,245
Steam generator, F. A. Gardner 230,124
Steam heater, J. H. Osborne 230,193
Steam trap, J. Burns 230,233
Still, alcohol, O. L. Perin *et al.* 230,333
Stone crusher, S. L. Marsden 230,304
Stove board, A. C. Shoessiger (r) 9,361
Stove urn, G. W. Herrick *et al.* 230,186
Strainer, milk, T. H. Ludington 230,301
Sugar, machine for the manufacture of cube, Jasper & Boushey 230,131
Suspender strap webbing, J. O. Fryer 230,122
Switches and signals, locking apparatus for, J. Saxby 230,309
Tack strips, machine for making, Woodward & Brock 230,286
Tanning and preparing leather, S. Bloom 230,225
Telephone call signals, magneto-electric generator for, E. T. Gilliland 230,264
Telephone switch, F. A. Klemm 230,288
Telephones, automatic short circuiter for, A. G. Bell 230,168
Tether, H. E. Briggs 230,229
Tobacco leaf cutting knife, S. M. Dougherty 230,116
Toilet case, F. A. M. Deschamps 230,173
Torsion spring, R. Mulholland 230,327
Trace fastener, G. W. Roberts 230,150
Trace fastener, C. W. Barnes 230,166
Traction engine, Lippy & Roush 230,297
Transom lifter, J. F. Wollensak (r) 9,307
Tray, child's table, W. M. Conger (r) 9,304
Valve, balanced, J. F. Allen (r) 9,303
Valve gear, A. C. Rand 230,336
Vapor engine boiler and condenser, Molera & Cebrian 230,323
Vehicle spring, W. P. Hansell 230,272
Vehicle spring, R. P. Palmer 230,332
Velocipede, D. H. Collins *et al.* 230,176
Wagon brake lever, E. S. Plimpton 230,334
Wagon running gear, D. Lyman 230,300
Wagon, side bar, T. C. Sebring 230,350
Wagon spring, W. G. Hughes 230,281
Walls, elastic lining for, T. Boyd 230,228
Washing machine, C. C. Oviatt 230,146
Washing machine, J. H. Van De Water 230,367
Washing machine, J. H. Williams 230,380
Watch crystal, C. F. Allen 230,214
Watch key, self-adjusting, J. S. Birch (r) 9,310
Watches, removable escapement for, F. Fitt 230,262
Water meter, steam, J. Burns 230,232
Waterwheel, turbine, W. H. Ridgway 230,339
Wells, apparatus for increasing the production from oil, C. S. Shoup 230,353
Wheat, etc., apparatus for trimming or smutting, W. Lauhoff 230,138
Wheelbarrow, H. E. Smith 230,357
Windmill, J. H. Therien 230,209
Window spring catch, F. Babcock (r) 9,301
Wire coiling machine, G. Gale 230,123
Wool washing machine, F. G. Sargent 230,152
Wrench, Hall & Coleman 230,270
Yoke, neck, A. K. Munson 230,328

DESIGNS.

Button hook, C. T. Jones 11,876
Carpet, W. L. Jacobs 11,875
Cigar and cigarette holder, P. Kurczyn 11,877
Hinge, C. B. Clark 11,871
Lamp shade, J. Palme 11,880
Stove, Vedder & Heister 11,882
Stove, base burning, Vedder & Heister 11,884
Stove box, C. A. Hodges 11,873
Stove, cooking, Bascom & Heister 11,879, 11,885
Stove, cooking, I. A. Sheppa. d 11,881
Stove, cooking, Vedder & Heister 11,872, 11,883
Stove, globe, Bascom & Heister 11,878
Stoves, elevated oven cooking, T. S. Heister 11,874

TRADE MARKS.

Clasp knives, A. J. Jordan 7,980
Dyes, packages of, Felt & Hotchkin 7,975
Lard, Coe & Harbaugh 7,974
Oils and compounds, lubricating, National Lubricating Company 7,977
Opera glasses, marine glasses, field glasses, and telescopes, Sussfeld, Lorsch & Co 7,976
Shoe tips, W. W. Apsley 7,979
Tobacco, smoking and chewing, W. W. Wood 7,978

English Patents Issued to Americans.

From July 20 to July 23, 1880, inclusive.

Boat, dumping, N. Barney, Bergen Point, N. J.
Drying machinery for boards, etc., G. W. Read, N.Y. city.
Electric lamp, regulator for, J. H. Guest, Brooklyn, N.Y.
Flour mills, apparatus for cleaning the screens of, J. W. Collins, Chicago, Ill.
Filters, The Boston Water Purifier Co., Portland, Me.
Guns, method of preventing heating, E. G. Parkhurst, Hartford, Conn.
Lasting machine, G. McKay, Cambridge, Mass.
Photographic plate, covering for, G. Eastman, Rochester, N. Y.
Plaiting attachment for sewing machines, S. Onderdonk *et al.*, Adams' Station.
Sewing machine, C. H. Wilcox, New York city.
Spinning machinery, J. Birkenhead, Mass.
Spinning mechanism, W. Mason, Mass.
Spirometers, W. Downie, Chicago, Ill.

Founded by Mathew Carey, 1785.

BAIRD'S BOOKS FOR PRACTICAL MEN.

Our new and enlarged CATALOGUE OF PRACTICAL AND SCIENTIFIC BOOKS, 96 pages, 8vo; a Catalogue of Books on DYEING, CALICO PRINTING, WEAVING, COTTON and WOOLEN MANUFACTURE, 4to; Catalogue of a choice collection of PRACTICAL, SCIENTIFIC, and ECONOMIC BOOKS, 4to; List of Books on STEAM AND THE STEAM ENGINE, MECHANICS, MACHINERY, and ENGINEERING, 4to. List of Important Books on METALLURGY, METALS, STRENGTH OF MATERIALS, CHEMICAL ANALYSIS, ASSAYING, etc., 4to; List of Books on MINING, MINING MACHINERY, COAL, etc., 4to; two Catalogues of Books and Pamphlets on SOCIAL SCIENCE, POLITICAL ECONOMY, BANKS, POPULATION, PAUPERISM, and kindred subjects; a Catalogue of recent additions to our stock of PRACTICAL, SCIENTIFIC AND TECHNICAL BOOKS; as well as a List of LEADING BOOKS on METAL MINING, METALLURGY, MINERALOGY, ASSAYING, AND CHEMICAL ANALYSIS, sent free to any one who will forward his address.

HENRY CAREY BAIRD & CO.,
Industrial Publishers, Booksellers, and Importers,
810 WALNUT STREET, PHILADELPHIA.

WESTON DYNAMO-ELECTRIC MACHINE CO

Machines for Electro-plating, Electrotyping, Electric Light, etc. In addition to testimonials in our Catalogue of Jan. 1, we beg to refer to the following houses: MERIDEN BRITANNIA CO.; RUSSELL & ERWIN M'F'G CO.; REED & BARTON; HALL, ELTON & CO.; RICHARDSON, BOYNTON & CO.; WM. H. JACKSON & CO.; STANLEY WORKS; ROGERS CUTLERY CO.; CHAS. ROGERS BROS.; EDWARD MILLER CO.; MITCHELL, VANCE & CO.; NORWALK LOCK CO.; HAYDEN, GERE & CO.; DOMESTIC SEWING MACHINE CO.; EBERHARD FABER; JOS. DIXON CRUCIBLE CO.; MUMFORD & HANSON; FAGAN & SON, and over 700 others. Outfits for NICKEL, SILVER, BRONZE, Plating, etc. The two highest CENTENNIAL AWARDS, and the CENTENNIAL GOLD MEDAL of American Institute, and Paris, 1878. **Prices, $150 to $500.**

CONDIT, HANSON & VAN WINKLE
Sole Agents NEWARK, N.J.

New York Office, 92 and 94 Liberty St.
English Agency, 18 Caroline St., Birmingham, England.

STEAM PUMPS.

HENRY R. WORTHINGTON,
239 Broadway, N. Y. 83 Water St., Boston.
709 Market St., St. Louis, Mo.

THE WORTHINGTON PUMPING ENGINES FOR WATER WORKS—Compound, Condensing or Non-Condensing. Used in over 100 Water-Works Stations.

WORTHINGTON STEAM PUMPS of all sizes and for all purposes.

Prices below those of any other steam pump in the market.

WATER METERS. OIL METERS.

BIBB'S
Celebrated Original
BALTIMORE FIRE-PLACE HEATERS
To warm upper and lower rooms. The handsomest, most economical Coal Stoves in the world.
B. C. BIBB & SON
Foundry Office and Salesrooms, 39 and 41 Light Street,
Baltimore, Md.
MARBLEIZED SLATE MANTELS.
Send for Circulars.

NEW SYSTEMS OF IRON BRIDGES.—

Sketch of the rapid improvements that have been made during the last twenty years in the construction of iron bridges, and a review of some of the more valuable features which characterize the latest systems. The imposing works of American engineers. The Kullenberg bridge in Holland. Bridge over the Rhine at Coblentz. M. Köpcke's system. Herr Föppl's system. Bridge recently built over the Elbe, near Riesa, Saxony. Illustrated with three figures of combined curved and parabolic girder bridges of long span. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **233.** Price 10 cents. To be had at this office and from all newsdealers.

SHEPARD'S CELEBRATED
$50 Screw Cutting Foot Lathe.

Foot and Power Lathes, Drill Presses, Scrolls, Circular and Band Saws, Saw Attachments, Chucks, Mandrels, Twist Drills, Dogs, Calipers, etc. Send for catalogue of outfits for amateurs or artisans.

H. L. SHEPARD & CO.,
331, 333, 335, & 337 West Front Street,
Cincinnati, Ohio.

Perfectly Smooth, Thoroughly Seasoned CUT THIN LUMBER!!

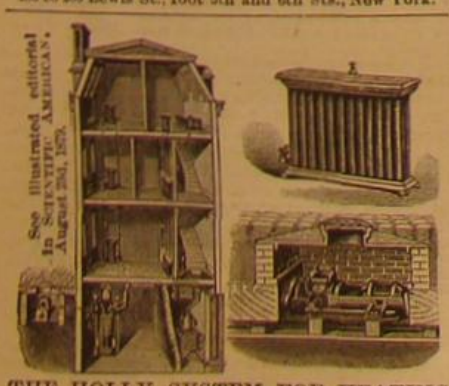
Manufactured by our Patent Board Cutting Machines and Seasoning Presses.

Pronounced the only Perfect Cut Lumber!!

MAHOGANY,

Rosewood, Satinwood, Walnut, Ash, Red Cedar, Cherry, Oak, Poplar, Maple, Holly, French Walnut, etc., etc., in Logs, Planks, Boards, and Veneers.
Send for catalogue and price lists.

GEO. W. READ & CO.,
186 to 200 Lewis St., foot 5th and 6th Sts., New York.



See Illustrated editorial in SCIENTIFIC AMERICAN, August 28th, 1880.

THE HOLLY SYSTEM FOR HEATING cities and villages, under the Holly Patents, is in practical operation in many places. For economy, comfort, and convenience, is superior to any other principle. Licenses granted to corporations for the use of this system. **Holly Steam Combinat'n Co., Lim., Lockport, N.Y.**

NEW YORK BELTING AND PACKING COMP'Y.

The Oldest and Largest Manufacturers of the Original
SOLID VULCANITE EMERY WHEELS.

All other kinds Imitations and Inferior. Our name is stamped in full upon all our standard BELTING, PACKING, and HOSE.
Address NEW YORK BELTING AND PACKING CO., NEW YORK.
Emery Wheel. JOHN H. CHEEVER, Treas.

WANTED, AGENTS.

We want agents to sell the world renowned **Wilson Oscillating Shuttle Sewing Machines** in unoccupied territory, to whom we are prepared to offer extraordinary inducements whereby from one to six thousand dollars a year can be made. There never was a better time to engage in the sale of sewing machines, as all the machines made in the past twenty years are wearing out, and must be replaced. For terms and further particulars, address WILSON SEWING MACHINE CO., CHICAGO, ILL.

Bookwalter Engine.

Compact, Substantial, Economical, and easily managed; guaranteed to work well and give full power claimed. Engine and Boiler complete, including Governor, Pump, etc., at the low price of

3 HORSE POWER..... $240 00
4½ " " 280 00
6½ " " 320 00

Put on cars at Springfield, O.
JAMES LEFFEL & CO.,
Springfield, Ohio.
or 110 Liberty St., New York.

Wood-Working Machinery,

Such as Woodworth Planing, Tonguing, and Grooving Machines, Daniel's Planers, Richardson's Patent Improved Tenon Machines, Mortising, Moulding, and Re-Saw Machines, Eastman's Pat. Miter Machines, and Wood-Working Machinery generally. Manufactured by WITHERBY, RUGG & RICHARDSON,
26 Salisbury Street, Worcester, Mass.
(Shop formerly occupied by R. BALL & CO.)

EXTRA BARGAINS.

Town rights, $10; county, $25. Best novelty yet manufactured. If you want to make money, address, with stamp, J. H. MARTIN, Hartford, N. Y.

ROCK BREAKERS & ORE CRUSHERS.

(THE "BLAKE" STYLE.)

This machine has for twenty years stood the TEST, and found to be the *best one* made for breaking all kinds of hard and brittle substances, such as ORES, QUARTZ, EMERY, etc., etc. Mr. S. L. Marsden, for the past twenty years connected with the manufacture of this machine, superintends its manufacture.
FARREL FOUNDRY AND MACHINE CO., Manufrs., Ansonia, Conn.

ERICSSON'S NEW MOTOR.

ERICSSON'S
New Caloric Pumping Engine,

FOR
DWELLINGS AND COUNTRY SEATS.

Simplest, cheapest, and most economical pumping engine for domestic purposes. Any servant girl can operate. Absolutely safe. Send for circulars and price lists.

DELAMATER IRON WORKS

C. H. DELAMATER & CO., Proprietors,
No. 10 Cortlandt Street, New York, N. Y.

TELEPHONE Works 1 mile. Price $4. Pat'd. Circulars free. HOLCOMB & Co., Mallet Creek, Ohio.

WOOD WORKING MACHINERY.

J. A. FAY & CO.
CINCINNATI, O. U. S. A.

The attention of Architects, Engineers, and Builders is called to the great decline in prices of wrought
STRUCTURAL IRON.
It is believed that, were owners fully aware of the small difference in cost which now exists between iron and wood, the former, in many cases, would be adopted, thereby saving *insurance* and avoiding all risk of *interruption to business* in consequence of fire. Book of detailed information furnished to Architects, Engineers, and Builders, on application.

$777 A YEAR and expenses to agents. Outfit Free. Address P. O. VICKERY, Augusta, Maine.

B. W. PAYNE & SONS, CORNING, N. Y.

ESTABLISHED 1840.
Patent Spark-Arresting Engines, mounted and on skids. Vertical Engines with wro't boilers. Eureka Safety powers with Sectional boilers—**can't be exploded.** All with Automatic Cut-Offs. From **$150** to **$2,000.** Send for Circular. State where you saw this.

ACME STEAM PUMPS,

FOR EVERY DUTY.
VALLEY MACHINE CO.,
EASTHAMPTON, MASS.

Pulley Blocks.

Iron Sheaves. Phosphor Bronze Self-Lubricating Bushings. PENFIELD BLOCK WORKS, Lock Box 99, Lockport, N. Y.

RECENT ADVANCES IN PHOTOGRAPHY.—

By Capt. Abney, F.R.S. A recent lecture before the London Society of Arts, recapulating the new processes and improvements that have been introduced into the art of photography during the last few years. The gelatino-bromide process and its advantages and disadvantages over the old wet process. Photo plates without glass. Photographs of the invisible. Oxidation of the photo film. Platinum pictures. Ferrous oxalate pictures. New mode of photo-printing. Other new modes of photo printing. Photography in natural colors. Seeing by photography. Discussion by the Society of Arts. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **237.** Price 10 cents. To be had at this office and from all newsdealers.

FIRE BRICK TILE AND CLAY RETORTS ALL SHAPES
BORGNER & O'BRIEN
23 25 ST. ABOVE RACE PHILADELPHIA.

JOHN R. WHITLEY & CO.

European Representatives of American Houses, with First-class Agents in the principal industrial and agricultural centers and cities in Europe. London, 7 Poultry, E. C. Paris, 8 Place Vendôme. Terms on application. J. R. W. & Co. purchase Paris goods on commission at shippers' discounts.

14 STOP ORGANS, SUB BASS and Oct. Coupler, 4 Set Reeds, **$65.** Pianos, $125 and upwards, sent on trial. Catalogue free. Address DANIEL F. BEATTY, Washington, N. J.

"BLAKE'S CHALLENGE" ROCK BREAKER.

Patented November 18, 1879.

For **Macadam Road** making, Ballasting of **Railroads**, Crushing **Ores**, use of **Iron Furnaces**, etc. Rapidly superseding our *older styles* of Blake Crusher on account of its superior *strength, efficiency*, and *simplicity*. Adopted by important Railway and Mining Corporations, Cities, and Towns. First Class Medal of *Superiority* awarded by American Institute.

BLAKE CRUSHER CO., Sole Makers, New Haven, Conn.

THE STRONGest, most complete, and *reliable* of Engines and Boilers. Special sizes, 4 to 40 H. P. Others on application. Also jointless steam kettles and machinery generally. Geo. W. Tift, Sons & Co., Buffalo, N. Y.

CIVIL, MECHANICAL, AND MINING ENGINEERING at the Rensselaer Polytechnic Institute, Troy, N. Y. The oldest engineering school in America. Next term begins September 16th. The Register for 1880 contains a list of the graduates for the past 54 years, with their positions; also, course of study, requirements, expenses, etc. Address
DAVID M. GREENE, Director.

VENTILATION. — PARTIES HAVING charge of churches, schools, etc., or any one in need of ventilation, will find the Wing Fan Ventilator the best. See SCI. AM., Jan. 31, 1880, or send for circulars.
L. J. Wing or Simonds Mfg. Co., 50 Cliff St., New York.

THE
Eclipse Engine

Furnishes steam power for all *Agricultural* purposes, *Driving Saw Mills*, and for every use where a first-class and economical Engine is required. Eleven first-class premiums awarded, including Centennial, '76. Refer to NO. 7, issue of '77. No. 14, issue of '78, of SCIENTIFIC AMERICAN, for Editorial illustrations.
FRICK & CO., Waynesboro, Franklin Co., Pa.
When you write please name this paper.

The "Burgess" Non-Conductor, for Heated Surfaces. Applicable to plane or curved surfaces, pipes, elbows, and valves. Easily applied, efficient, and inexpensive. Burgess Steam Pipe Covering Co., 20th and Ridge Ave., Phila., Pa.

Pond's Tools,

Engine Lathes, Planers, Drills, &c.
DAVID W. POND, Worcester, Mass.

The George Place Machinery Agency

Machinery of Every Description.
121 Chambers and 103 Reade Streets, New York.

Furnace Hoist.

ELEVATORS.

All kinds of Hoisting Machinery a specialty. Steam, Hydraulic, and Belt Power for Passengers and Freight. Iron Furnace Lifts. Portable Hoists. STOKES & PARRISH, 30th and Chestnut St., Phila., Pa.

ROOTS' NEW IRON BLOWER.

POSITIVE BLAST.
IRON REVOLVERS, PERFECTLY BALANCED
IS SIMPLER, AND HAS
FEWER PARTS THAN ANY OTHER BLOWER.
P. H. & F. M. ROOTS, Manuf'rs,
CONNERSVILLE, IND.

S. S. TOWNSEND, Gen. Agt., 6 Cortlandt St., 8 Dey Street,
WM. COOKE, Selling Agt., 6 Cortlandt Street,
JAS. BEGGS & CO., Selling Agts., 8 Dey Street,
} NEW YORK.

SEND FOR PRICED CATALOGUE.

CORRUGATED AND CRIMPED IRON ROOFING AND SIDING,

Iron Buildings, Roofs, Shutters, Doors, Cornices, Skylights, Bridges, etc. MOSELEY IRON BRIDGE AND ROOF CO., 5 Dey Street, New York.

INDIAN CORN.—BY LOUISA REED Stowell. A microscopical examination of Indian Corn, showing internal structure of kernels, structure of starch grains, etc., and accompanied by a concise description of this valuable grain, giving its chemical composition, its properties as a nutriment, and the various forms under which it appears in market. Illustrated with six figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **237.** Price 10 cents. To be had at this office and from all newsdealers.

SPARE THE CROTON AND SAVE THE COST.
Driven or Tube Wells

furnished to large consumers of Croton and Ridgewood Water. WM. D. ANDREWS & BRO., 235 Broadway, N.Y., who control the patent for Green's American Driven Well.

SWEEPSTAKES, WITH THE ELLIS Patent Journal Box. The best Planer and Matcher ever made. Planing 30 in. wide, 6 in. thick, weight 2,100 lbs., $300; planing 24 in. wide, 6 in. thick, weight 2,500 lbs., $350. Beading, Arbor, and Head, extra, $30. Sash, Door, and Blind Machinery a specialty. Send for descriptive catalogue to Bowley & Hermance, Williamsport, Pa.

CAVEATS, COPYRIGHTS, LABEL REGISTRATION, ETC.

Messrs. Munn & Co., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine Improvements, and to act as Solicitors of Patents for Inventors.

In this line of business they have had OVER THIRTY YEARS' EXPERIENCE, and now have *unequaled facilities* for the Preparation of Patent Drawings, Specifications, and the Prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs. Munn & Co. also attend to the preparation of Caveats, Registration of Labels, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business intrusted to them is done with special care and promptness, on very moderate terms.

We send, free of charge, on application, a pamphlet containing further information about Patents, and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.

Foreign Patents.—We also send, *free of charge*, a Synopsis of Foreign Patent Laws, showing the cost and method of securing patents in all the principal countries of the world. American inventors should bear in mind that, as a general rule, any invention that is valuable to the patentee, in this country is worth equally as much in England and some other foreign countries. Five patents—embracing Canadian, English, German, French, and Belgian—will secure to an inventor the exclusive monopoly to his discovery among about ONE HUNDRED AND FIFTY MILLIONS of the most intelligent people in the world. The facilities of business and steam communication are such that patents can be obtained abroad by our citizens almost as easily as at home. The expense to apply for an English patent is $75; German, $100; French, $100; Belgian, $100; Canadian, $50.

Copies of Patents.—Persons desiring any patent issued from 1836 to November 20, 1866, can be supplied with official copies at reasonable cost, the price depending upon the extent of drawings and length of specifications.

Any patent issued since November 20, 1866, at which time the Patent Office commenced printing the drawings and specifications, may be had by remitting to this office $1.

A copy of the claims of any patent issued since 1836 will be furnished for $1.

When ordering copies, please to remit for the same as above, and state name of patentee, title of invention, and date of patent.

A pamphlet, containing full directions for obtaining United States patents, sent free. A handsomely bound Reference Book, gilt edges, contains 140 pages and many engravings and tables important to every patentee and mechanic, and is a useful handbook of reference for everybody. Price 25 cents, mailed free.

Address
MUNN & CO.,
Publishers SCIENTIFIC AMERICAN,
37 Park Row, New York.
BRANCH OFFICE—Corner of F and 7th Streets, Washington, D. C.

DR. SCOTT'S ELECTRIC HAIR BRUSH.

A REMARKABLE INVENTION,

Which has won its way to Royal favor in England, been cordially indorsed by the Prince and Princess of Wales, and written upon by the Rt. Hon. W. E. Gladstone, is now brought to the notice of the American public. It cures by natural means, will always do good, never harm, and is a remedy lasting for many years. It should be used daily in place of the ordinary Hair Brush. The Brush Handle is made of a new odorless composition resembling ebony; a combination of substances PRODUCING A PERMANENT ELECTRIC VOLTAIC CURRENT WHICH ACTS IMMEDIATELY UPON THE HAIR GLANDS AND FOLLICLES. This power can always be tested by a silver compass which accompanies each Brush.

IT IS WARRANTED TO
CURE NERVOUS HEADACHE IN 5 MINUTES!!
CURE BILIOUS HEADACHE IN 5 MINUTES!!
POSITIVELY REMOVE SCURF & DANDRUFF!!
PREVENT FALLING HAIR AND BALDNESS!!
CURE ALL DISEASES OF THE SCALP!!
PROMPTLY ARRESTS PREMATURE GRAYNESS!!
MAKES THE HAIR GROW LONG AND GLOSSY!!
IMMEDIATELY SOOTHES THE WEARY BRAIN!!
MONEY RETURNED IF NOT AS REPRESENTED!!

IT NEVER FAILS to PRODUCE A RAPID GROWTH of HAIR ON BALD HEADS, WHERE THE GLANDS and FOLLICLES ARE NOT TOTALLY DESTROYED.

Proprietors: The Pall Mall Electric Association of London. New York Branch: 842 Broadway.

[From Rev. Dr. Bridgman.]
Brooklyn, June 1st, 1880.
"*Gents:* I have never before given a testimonial, but am willing to encourage the use of an honest remedy. I am so pleased with your Hair Brush that I deem it my duty to write you recommending it most cordially. My hair, about a year since, commenced falling out, and I was rapidly becoming bald; but since using the Brush a thick growth of hair has made its appearance, quite equal to that which I had previous to its falling out. I have tried other remedies, but with no success. After this remarkable result I purchased one for my wife, who has been a great sufferer from headache, and she finds it a prompt and infallible remedy. A. Bridgman, D.D."

London, Jan. 4th, 1879.
"The Hon. Mrs. Locke deems it a pleasure and duty to state that they have never failed in her case, and many other cures have come under her observation. She also finds them most beneficial for the hair, it being greatly improved by their use."

9 Goodwin St., Bradford, England, Dec. 19th, 1878.
"My Aunt writes me they are the greatest blessing to her, as in all cases they relieve her at once. My hair is growing rapidly, the bald place being quite covered. I do think you ought to make these things known, for the benefit of others, as I am convinced it is the best Hair Renewer yet put before the public.
"Yours truly, J. JEWETT."

"Over 1,300,000 in use, an honest remedy, worthy of all praise."—**British Medical Index.**

Round Lake Camp-Meeting Grounds, Saratoga Co., N. Y., June 8th, 1880.
"Your Brush is certainly a remarkable cure. I am highly pleased with it. Its effect is most wonderful, and you may be sure I shall recommend it heartily among my friends. It is also a splendid Hair Brush, well worth the money, and will last me for years. Rev. J. D. ROGERS, Superintendent."

[FROM ALLEN PEARCE & CO., WHOLESALE DRUGGISTS.] Bristol, England, Feb., 1879.
"The effect was really astounding, removing the pain after a few minutes. As far as real value, they are worth a Guinea each."

Over 7,000 similar Testimonials can be seen at our office.

Remember that this is NOT a "metallic" wire brush, but made of PURE BRISTLES.

A Beautiful Brush Lasting for Years.

Mention this Paper. **Sent, postpaid, on receipt of $3.00;** or by Express, C. O. D.

MONEY RETURNED IF NOT AS REPRESENTED.

As soon as you receive the Brush, if not well satisfied with your bargain, write us, and we will return the money. What can be fairer?

☞ Remittances should be made payable to GEO. A. SCOTT, 842 Broadway, New York. Agents wanted in every town.

WIRE ROPE

Address JOHN A. ROEBLING'S SONS, Manufacturers, Trenton, N. J., or 117 Liberty Street, New York. Wheels and Rope for conveying power long distances. Send for circular.

The Asbestos Packing Co.,

Miners and Manufacturers of Asbestos,
BOSTON, MASS.,
OFFER FOR SALE:

PATENTED	ASBESTOS ROPE	PACKING.
"	" LOOSE	"
"	" JOURNAL	"
"	" WICK	"
"	" MILL BOARD,	
"	" SHEATHING PAPER,	
"	" FLOORING FELT.	
"	" CLOTH.	

COLUMBIA BICYCLE.
A practical road machine. Indorsed by the medical profession as the most healthful of outdoor sports. Send 3 cent stamp for 24 page catalogue, with price list and full information, or 10 cents for catalogue and copy of *The Bicycling World*.
THE POPE M'F'G CO.,
89 Summer Street, Boston, Mass.

HARTFORD STEAM BOILER Inspection & Insurance COMPANY.

W. B. FRANKLIN, V. Pres't. J. M. ALLEN, Pres't.
J. B. PIERCE, Sec'y.

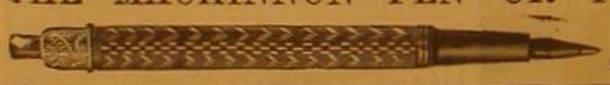
SAWS 40,000 SAWS
EMERSON'S ILLUSTRATED SAWYERS HAND BOOKS (FREE) TO ANY PART OF THE WORLD.
PLANER SAW SET 25 CENTS EACH
ADDRESS EMERSON, SMITH & CO. BEAVER FALLS, PA.

ROOFING.

For steep or flat roofs. Applied by ordinary workmen at one-third the cost of tin. Circulars and samples free. Agents Wanted. T. NEW, 32 John Street, New York.

TELEGRAPH and Electrical Supplies. Send for Catalogue. C. E. JONES & BRO., CINCINNATI, O.

THE MACKINNON PEN OR FLUID PENCIL.



Particulars mailed Free.
MACKINNON PEN CO.,
200 Broadway, near Fulton St., N.Y.

WM. A. HARRIS,
PROVIDENCE, R. I. (PARK STREET),
Six minutes walk West from station.
Original and Only builder of the
HARRIS-CORLISS ENGINE
With Harris' Patented Improvements,
from 10 to 1,000 H. P.

PREVENT SLIPPING. The handsomest, as well as the *safest* Carriage Step made. Forged from best iron, and formed with a sunken panel, in which is secured a plating of richly moulded rubber. Durability warranted. Send for illustrated circular. Rubber Step M'f'g Co., Boston, Mass.

NOVEL, BEAUTIFUL, PRACTICAL.
Walter's New Method of Carpeting fine Stairways. Send for circular to T. F. WALTER, Patentee, 1227 Girard Avenue, Philadelphia, Pa.

A PLANING MILL OUTFIT FOR SALE very low for cash. Will sell all together or each machine separate. All first-class machines, good order. J. H. KERRICK & CO., Indianapolis, Ind.

The gate is tight and easily operated on. Over 1,000 of these Wheels in operation in this and Foreign countries. *Pamphlet sent free.*

Pyrometers. For showing heat of Ovens, Hot Blast Pipes, Boiler Flues, Superheated Steam, Oil Stills, etc. HENRY W. BULKLEY, Sole Manufacturer, 149 Broadway, N. Y.

ELGIN WATCHES, All styles, Gold, Silver and Nickel, $6 to $150. Chains, etc., sent C. O. D. to be examined. Write for Catalogue to STANDARD AMERICAN WATCH CO., PITTSBURGH, PA.

WOOD SOLE SHOES. The cheapest, most durable, warm, good looking, and thoroughly waterproof shoe. Particularly adapted to Brewers, Miners, and all classes of laborers. Send stamp for circular and price list. CHAS. W. COPELAND, 122 Summer St., Boston, Mass.

BUY NO BOOTS OR SHOES Unless the soles are protected from wear by *Goodrich's Bessemer Steel Rivets. Guaranteed to outwear any other sole.* All dealers sell these boots. Taps by mail for 50 cents in stamps. Send paper pattern of size wanted. H. C. GOODRICH, 19 Church St., Worcester, Mass.

HANCOCK and other candidates. Best Steel Portraits. By mail, 10 cents each. Agents. G. F. PERINE, Pub., 100 Nassau St., New York.

WATSON'S NON CHANGEABLE GAP LATHE. GREAT FACILITIES FOR LARGE OR MEDIUM SIZE WORK. JAMES WATSON MANUFACTURER 8 FRONT ST. PHILA PA.

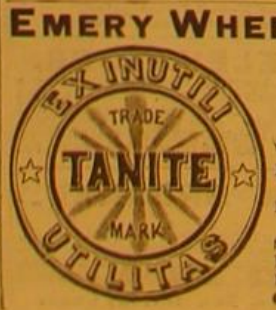
Working Models And Experimental Machinery, Metal or Wood, made to order by J. F. WERNER, 62 Centre St., N. Y.

52 Gold, Crystal, Lace, Perfumed, and Chromo Cards, name in Gold & Jet 10c. Clinton Bros. Clintonville, Ct.

H.W. JOHNS' ASBESTOS

LIQUID PAINTS, ROOFING, BOILER COVERINGS, Steam Packing, Sheathings, Fireproof Coatings, Cements, SEND FOR SAMPLES, ILLUSTRATED PAMPHLET, AND PRICE LIST.
H. W. JOHNS M'F'G CO., 87 MAIDEN LANE, N. Y.

EMERY WHEELS and GRINDING MACHINES.



THE TANITE CO.,
Stroudsburg, Monroe County, Pa.

Orders may be directed to us at any of the following addresses, at each of which we carry a stock:

London, Eng., 9 St. Andrews St., Holborn Viaduct, E. C.
Liverpool, Eng., 42 The Temple, Dale St.
Sydney, N. S. W., 11 Pitt St.
New York, Dey Street.
Philadelphia, 11 North Sixth Street.
Chicago, 152 and 154 Lake St.
St. Louis, 209 North Third St.
St. Louis, 811 to 819 North Second St.
Cincinnati, 212 West Second St.
Indianapolis, Corner Maryland and Delaware Sts.
Louisville, 427 West Main St.
New Orleans, 36 Union St.
San Francisco, 2 and 4 California St.

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.
(About eight words to a line.)

Engravings may head advertisements at the same rate per line, by measurement, as the letter press. 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 YORK BELTING AND PACKING COMPANY
CAR & WAGON SPRINGS
Made by our processes are thoroughly efficient and practically indestructible.
37 & 38 PARK ROW, NEW YORK.

OPEN BACK PRESSES.
STILES & PARKER PRESS CO., Middletown, Ct.

THE BAKER BLOWER.

(FORCED BLAST.)

The revolving parts are all accurately Balanced.
Warranted Superior to any other.
WILBRAHAM BROS., 2318 Frankford Avenue, PHILADELPHIA, PA.

THE COST OF ADVERTISING

For any responsible advertiser, making application in good faith, we prepare and furnish a written estimate, showing the cost of any proposed advertising in the leading American newspapers.

We prepare and exhibit printed proofs of any proposed advertisement.

For preparing estimates no charge is made, and the applicant is placed under no obligation to transact his advertising business through us unless it appears to him that by doing so he will best advance his own interests.

A copy of the advertisement, a list of the papers, the space the advertisement is to occupy, and the time it is to appear, should be given with the application for an estimate of the cost.

When an advertiser does not know what he wants, or what he ought to do, he can designate some sum of money within which he wishes to limit his expenditure; this will enable us to prepare for him such a list of papers as will be the best for his purpose, within the limits which he prescribes.

Send 10c. for 100-page pamphlet.

GEO. P. ROWELL & CO.,

NEWSPAPER ADVERTISING BUREAU,
10 SPRUCE ST. (Printing House Square),
NEW YORK.

BROWN'S PAT. SPLIT Shafts, Hangers, PULLEYS
At low prices. Largest assortment. A. & F. BROWN, 57, 59, & 61 Lewis St., New York.

Mill Stones and Corn Mills.

We make Burr Millstones, Portable Mills, Smut Machines, Packers, Mill Picks, Water Wheels, Pulleys, and Gearing specially adapted to Flour Mills. Send for catalogue.
J. T. NOYE & SONS, Buffalo, N. Y.

Pictet Artificial Ice Co., Limited,

P. O. Box 3983. 142 Greenwich St., New York.
Guaranteed to be the most *efficient* and *economical* of all existing Ice and Cold Air Machines.

BOILER COVERINGS.

Plastic Cement and Hair Felt, with or without the Patent "AIR SPACE" Method.
ASBESTOS MATERIALS.
Made from pure Italian Asbestos, in fiber, mill board, and round packing. THE CHALMERS-SPENCE CO., 40 John Street, and Foot of E. 9th Street, New York.

THE NEW
PULSOMETER

Is more economical in points of original cost, expense for repairs and running expenses, than any other Steam Pump in the World.

Simple and compact, with no machinery whatever to oil, or get out of order, it stands at the head of all means of elevating water or other liquids by steam. *It needs no skilled labor to look after it.*

Send for book giving full description, reduced prices and many letters of commendation from leading manufacturers and others throughout the country who are using them

PULSOMETER STEAM PUMP CO., Sole Owners of Hall's Patents in the U. S., 131,813 to 131,843, both inclusive, and the NEW PULSOMETER, Office, No. 83 John St., P. O. Box No. 1533, New York City.

THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts., Philadelphia, and 50 Gold St. New York.