SCIENTIFIC AMERICAN

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ARTESIAN WELL ENGINEERING.

An artesian well which is remarkable for the power and constancy of its flow is illustrated herewith, and being taken directly from a photograph, gives an accurate representation of its great force and volume.

This well is situated at St. Augustine, Fla., and is 1,4[illegible] feet deep and has a diameter of twelve inches.

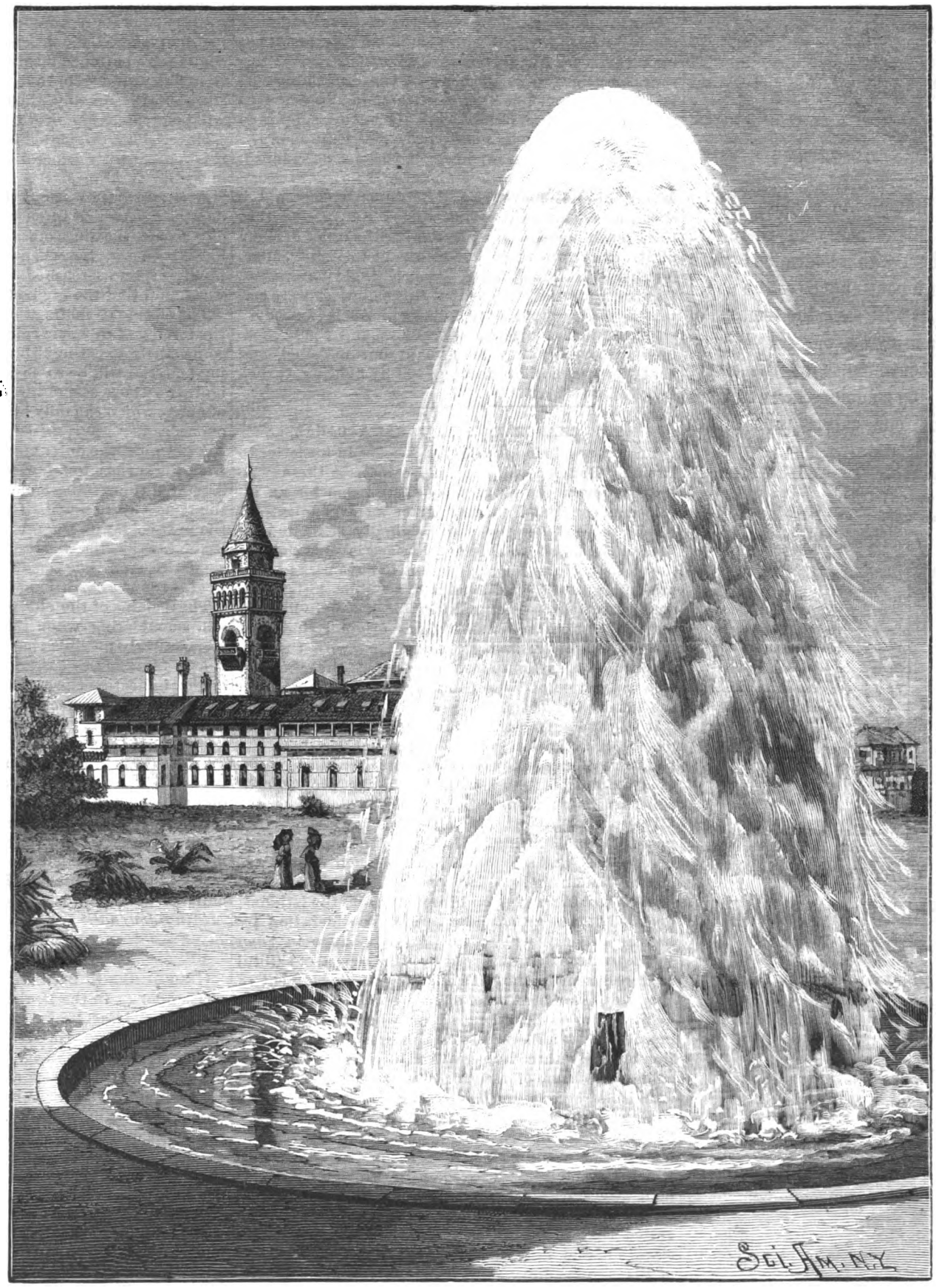
The water flows continually and with sufficient force to maintain the form of a fountain about twenty feet high and an estimated volume of 7,000 gallons per minute, or [illegible] million gallons daily. The mouth of the well is about ten feet [illegible] tide water. After passing through various strata of sand in boring the well, small shells, and blue clay, rock [illegible] rock in which, at [illegible] 450 to 495 feet, [illegible] bearing vein was [illegible] and in chalk formation. At a depth of 520 feet, there was a sudden large increase in the flow. The drilling was further continued through coral and thin shells of limestone, but with no further accession of water until a depth of 1,100 feet had been reached, when the flow was perceptibly increased. After this the drilling was continued down through alternate layers of sandstone and limestone to the total depth of 1,400 feet, but without materially adding to the supply.

The temperature taken at different depths showed a constant rise, as follows: 62° Fah. at 27 feet below the surface, 74° at a depth of 94 feet, 79° at a depth of 520 feet, and 86° at a depth of 1,340 feet. The formations passed through were generally soft, and the whole time occupied in the work was but a little over two months.

In the making of tools and appliances for drilling deep wells, American inventors and mechanics have long held the lead; but in order that such work may be successfully attempted and economically prosecuted, and a well put down that will give permanent satisfaction, considerable geological data and competent engineering supervision are of the utmost importance. Few of those following the occupation of well drilling make the causes and conditions of artesian flow a special study, or find it within their province to master the geological elements of the question. Large sums are often needlessly spent in endeavors to obtain these natural fountains, when the essential conditions warranting a reasonable expectation of success are altogether wanting. It is, therefore, especially gratifying to note this instance of a phenomenal success in artesian well drilling. The well was commenced with a diameter of 9¼ inches, but when indications pointed to there being so large and constant a supply, its size was increased to twelve inches. This work was done by Mr. Daniel Dull, of this city (corner of Broadway and Fifty-first Street), who is an extensive and successful operator, having an experience in this line extending over more than twenty years, and is now boring wells in six different States in the Union. He has bored a large number of wells of great depth and capacity, having recently completed one at Northampton, Mass., to the depth of 3,700 feet.

The immense volume of water from this well—having a developed pressure of over 50 H. P.—is utilized as a source of power, fire protection, and most efficient sanitary purposes at the hotel. It is designed to construct on the grounds terraces of colored glass lighted by electricity, and after the water gushes forth as an impetuous geyser it will be conducted over these illuminated terraces, producing with prismatic effect a most gorgeous cascade.

The beautiful fountain made by this well has also most appropriate surroundings in the buildings and grounds of the new Ponce de Leon Hotel. This hotel has been erected by Mr. H. M. Flagler, of New York. It is the most desirable site in the city of St. Augustine, covering in all an area of six acres, and introduces one of the most beautiful examples of Spanish Renaissance that has been erected in this country. On another page will be found an illustration of this magnificent structure, now almost completed. The material used in the construction is beach sand, small shells, and cement, making a beautiful and durable concrete, with arches, window caps, and trimmings of deep red brick, and cornices and finials of terra cotta of the same hue. There are also several other buildings erected and in process of construction, some of them being copies of historic Spanish structures, which, with the gardens rich in tropical plants and avenues overarched by orange trees, will undoubtedly make this section of St. Augustine one of the most beautiful places on the continent for a winter residence.



ARTESIAN WELL AT HOTEL PONCE DE LEON, ST. AUGUSTINE, FLA.

Sensitiveness of Taste.

The substances examined were weighed and then dissolved in known volumes of the appropriate solvent. This solvent was generally water, and water was always used in dilution, so that the taste was not interfered with by the solvent. To eliminate personal error, two persons acted as tasters. In each case one cubic centimeter of the solution was tasted. The solutions were diluted to a point at which the taste was barely perceptible (in some cases perceptible to only one of the experimenters), and that was taken as the limit.

The results were as follows:

Sugar.—3-1000ths of a grm. barely tasted.
Salt (NaCl).—1-1000th of a grm. barely tasted.
Tannin.—2-10,000ths tasted; 1-10,000th failed to taste.
Hydrochloric acid.—1-10,000th of a grm. barely tasted.
Saccharin.—5-1,000,000ths of a grm. barely tasted.
Strychnin.—5-10,000,000ths of a grm. barely tasted.—*F. P. Venables, Chem News.*

A GRANITE tile on exhibition in a show window at Detroit is over eight hundred years old, and said to have been taken from the tomb of William the Conqueror at Caen, Normandy.

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NEW YORK, SATURDAY, DECEMBER 17, 1887.

The year 1887 is drawing to a close, and if those subscribers to this paper—and there are several thousand of them—whose term ends with the year will remit for a continuance of the paper before the year closes, it will save the removal of a large number of names from our subscription list, and insure the continuance of the paper without interruption. By so doing the subscriber will be benefited and our subscription clerks greatly relieved.

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 624,

For the Week Ending December 17, 1887.

Price 10 cents. For sale by all newsdealers.

ONE EFFECT OF SHAM BATTLES.

The sham battle afloat and ashore, while undoubtedly of great value in schooling officers and men in alertness and precision, can scarcely be made sufficiently realistic to even approach the real thing. Those who know what the torpedo and torpedo boat have done in war must often have been surprised to learn how small a part they are made to take in the sham battle, and will find it hard to understand why, in all the sham engagements of recent years, the torpedo attack has been gravely set down as beaten off. In the sham battle, it seems only to be necessary to pick up a torpedo boat out of the darkness at long range with an electric light to have it counted out of the fight; but it is certain that in war you can't destroy a torpedo boat with a flash from a voltaic arc light. It would keep right on in its course for the ship, and if several were advancing from different directions, there would be far more call for gunners than light tenders. Indeed, if only one got close aboard and discharged its projectile, life preservers would, like enough, be in greater demand even than gunners.

Our French contemporary, *Revue de Cavalerie*, cites one instance of the fatal effect sham battle exercise has upon cavalry. At the battle of Worth (Franco-Prussian campaign), a small body of the 8th Cuirassiers and 6th Lancers, while in retreat from Morsbroun, came suddenly upon the 13th Uhlans (Prussian), supported at a short distance by more cavalry. A captain of the 8th promptly formed up his men, the charge sounded, and the Frenchmen dashed forward. But the Prussian cavalry did not move, as if determined to receive the shock at a standstill. This was so unexpected that the French horse, as if remembering the order of sham fight, drew up their horses at pistol shot range. Neither side did anything. Had a single man rushed forward with the standard at this point, it were certain a *melee* would have followed. As it was, both sides emptied revolvers and carbines, and the Frenchmen, discovering they were vastly outnumbered, and that there was nothing to be gained by fighting, turned and fled.

THE CHANGE IN THE PANAMA CANAL.

The proposal made by M. De Lesseps in his letter to Premier Rouvier will not fail to interest those who have followed the progress of his scheme for an interocean canal at Panama. After an expenditure of nearly three times the sum originally estimated by him as sufficient to build a surface level canal, he now asks the French government to authorize him to raise $113,000,000 additional by a public lottery, to enable him to construct a lifting lock canal, holding out the hope that eventually the original tide level scheme will be realized. "It now rests with the government," he says, "to insure definitely the execution of our programme by authorizing the company to issue lottery obligations."

It would seem from this that unless the French people subscribe a sum which, with what has been expended, will raise the cost of the canal to the extraordinary total of nearly $500,000,000, the project of a canal at Panama must be abandoned.

Up to the present, M. De Lesseps has strongly opposed the use of lifting locks along the line of the proposed canal, and stoutly denied that such a plan was afoot, though fully a twelvemonth ago Lieutenant Kimball, of our navy, on his return from the Isthmus, declared it was then under serious consideration by the canal's engineers. The present change in plan seems to have been induced by the report of skillful engineers sent to the Isthmus by the department of Ponts et Chaussées, who, after a careful examination of the formidable Culebra section, where the iron backbone of the Cordillera crosses the line with an elevation of nearly three hundred feet, decided as impracticable the scheme of a cut or a tunnel for ships. They found that because of the extraordinary rainfall and consequent floods, such a cut, even if made, could not be kept free from turbulent, devastating waters; in fact, that it would but become a huge reservoir, into which the mountainous region in its vicinity would pour—the starting point whence the sections of canal on either side would be fiercely beset. They suggested that lifting locks be built on either side this elevation, and ships in transit be taken over instead of through its flinty sides. This serves to make the Panama scheme similar to that proposed at Nicaragua, but, as this latter is much farther northeastward, and consequently offers a shorter voyage over the great commercial lanes, it is easily seen that it could not compete with it, even leaving aside the probable difference in cost of construction, which, doubtless, would be greatly in favor of Nicaragua. But the route of the proposed ship railway at Tehuantepec is hundreds of miles north and east even of Nicaragua, and, aside from other advantages which it possesses, would be vastly more advantageous to commerce, considered from a geographical standpoint.

A WOODEN case containing a complete set of surgical instruments, many of which are similar to those used at the present day, was a recent discovery at Pompeii.

The Calumet and Hecla Mine Fire.

The boom in the price of Lake copper, which is now selling here at 16 cents a pound, and of Chili bars in London, which has reached £67 15s. per ton, as against £39 5s. at the corresponding date a year ago, and Best Selected, the brand most nearly approaching our Lake copper, which is now quoted £68 10s. as against £45 December, 1886, though not originally due to the Calumet and Hecla fire, has been greatly intensified by this unfortunate accident.

This expected rise, instead of commencing a year ago, and moving gradually in accordance with the statistical and technical conditions of the industry, has come suddenly and has bounded upward with an energy that must soon bring on a relapse, not, of course, to the old ten cent basis, but to a degree that may tend to demoralization. Copper is now higher than it should be, even considering the immense help the market is receiving from the Calumet and Hecla fire. This is, under the circumstances, a very important matter, and we have sought to obtain from disinterested sources the fullest information possible concerning it.

From good sources we learn that the fire now burning had gained much greater headway before the shafts were battened down than that which preceded it, and it would seem that the fire has come nearer the surface. Presumably, then, the damage to No. 1 shaft will be greater than to No. 2.

How the fire originated is a puzzle to everybody, and it is consequently generally concluded that it was of incendiary origin.

It is stated now that the fire in No. 2 shaft some months ago, which was accounted for by "a boy with oily waste thawing out the pump exhaust," must have been set, for when the platform on which the pump is set was reached, since work was resumed, it was found that the fire had not come near it.

The closing of shafts at once checks combustion, and the forcing of carbonic acid gas into the mine will, of course, help to extinguish the fire; but when the burning material will be so cooled off that it will not reignite on the access of fresh air is pretty much a matter of guess, which can only be settled when the mine is reopened.

A gas pipe, the outer end of which is plugged, leads from the surface to a few feet below the shaft collar. At stated times a thermometer is dropped down, and the temperature noted. One day it gets hotter and the next colder, presumably as the underground currents vary. This and an analysis of the gas which comes through the pipe are the indications on which to guess at the condition of the fire.

The remains of the old fire about No. 2 shaft were still smouldering when this took place, but it would seem scarcely possible that this fire should come from that.

The indications are that it will continue to burn longer than the former fire, and that the mine cannot be reopened during the remainder of this month, and possibly not for a much longer time.

The loss to the company must be very heavy, but it is so rich it could afford it, and would only have to cut off one or two of its dear little extravagances to make up for this unexpected expense. To the thousands of workmen it will be a very severe blow, for the other mines are full-handed, and the stoppage of work at many of the iron mines of Michigan increases the difficulty of getting work elsewhere.—*Engineering and Mining Journal.*

GEORGE SCHNEIZER, the young man who was killed on October 22, in the Harlem Electric Light Company's building, 244 East 122d street, was an inspector of lamps for the company. He received his death stroke from a defectively insulated lamp which hung in the cellar of the building. It was an arc light of the familiar street light pattern. It hung in front of a big dynamo machine in the cellar. Two men were working about the dynamo, and Schneizer came down to look at them. As he leaned forward, his hat struck the lamp and set it swinging. Without a thought of danger he caught hold of the round, brass-finished tube which holds the bottom carbon. With a spasmodic shiver he fell to the ground. The men raised him up, and one of them ran across the street for Dr. T. H. Hay. It was not more than five minutes after the shock that Dr. Hay arrived. He found Schneizer just gasping his last breath.

At the office of the Harlem Electric Light Company no one would give any information about the accident. Lamps of this kind are extremely dangerous. The current used is one of great intensity. If the lamp is in order, the wires and carbons are all insulated from the frame. In this case there was a contact somewhere, and when Schneizer caught the lamp the whole strength of the current passed through his body to the ground.

Schneizer was unmarried, and lived with an uncle at 117th Street and First Avenue.—*New York Sun.*

[There is no excuse for the employment of dangerous electric light wires or lamps, and whoever does so should be subjected to adequate penalties.]

DECISIONS RELATING TO PATENTS.

Supreme Court of the United States.

THE SMITH & GRIGGS MANUFACTURING COMPANY *v.* SPRAGUE, Administratrix.

Appeal from the Circuit Court of the United States for the District of Connecticut.

The first, second, third, fourth, and sixth claims of Leonard A. Sprague's patent No. 228,136, dated May 25, 1880, and the second, third, and fifth claims of Leonard A. Sprague's patent No. 231,199, dated August 17, 1880, both for improvements in machines for making buckle levers, declared invalid by reason of more than two years' public use before the date of application for said patent.

When a machine was used by a manufacturer in the regular conduct of his business by his own workmen, and in the view of such part of the public as resorted to his establishment for the purpose of buying or selling, such use was a public use.

Where the machine in question consisted in the new combinations of old elements, each of which constituted a new invention, and the machine was practically useful, and its product was used commercially and profitably in the ordinary course of business, such use was not experimental, although the inventor was engaged in the improvements by which it was hoped and expected that the machine would be made more valuable and useful.

Use by the inventor of a machine in order to devise by experiment improvements upon the same to perfect it is permissible even where, as an incident, the product of the machine is sold; but where the use is mainly for trade and profit and the experiments for improvement are incidental, then the principal and not the incident gives character to the use, and the latter is a public use under the statute, and comes within its prohibition if it takes place more than two years before the application for the patent.

Mr. Justice Matthews delivered the opinion of the court.

PHOTOGRAPHIC NOTES.

Photo-Mechanical Processes, Combined Asphalt and Albumen Process.—In the *Amateur Photographer*, Mr. Walter E. Woodbury gives the following interesting account of photo-mechanical processes:

It is only recently that these mechanical branches of photography have played any important part in England. The most useful process is, of course, the process of producing printing blocks from photographs, that can be printed with the ordinary letter press, and give to the eye the appearance of half tones. This is done by breaking the image up into a series of dots or stipple equal in number on equal spaces, but differing, however, in size in proportion to the density required in the shadows of the photographic subject that is to be reproduced, or by dots equal in size, but different in number in the same proportion, or by lines differing in thickness on the same ratio. A very large number of different processes have been patented, but it is only necessary to mention those now in practical use. Many of these, such as the Meisenbach, Winstanley, Mosstype, etc., are well known. I have recently been favored by a few phototype printing blocks, manufactured at the well-known photographic mechanical institute of Messrs. Angerer and Goeschl, of Vienna. They are undoubtedly the best of the kind. This firm work many different kinds of printing processes with an excellence not known in England. Indeed, some of our photographic mechanical printers would do well to go over to Germany and take a lesson or two in the art.

But it is not only in Germany that these processes are brought to such perfection. In France also great steps are being made. The latest improvement in this direction is a combined albumen and asphalt process of phototypy. A zinc plate is prepared in the ordinary manner, and after warming is coated with a solution of the sensitive asphalt prepared from—

Purified asphalt	4 grms.
Chloroform	90 c. cm.

If the solution is well filtered, it flows over similar to collodion. Coating is done by pouring the solution over the zinc plate, and, allowing it to run off at one corner, a very thin film is obtained. The plate is laid in a dark place to dry. In this manner a large number of plates can be kept in the dark, and if protected from dust and damp, they will keep for months. The plate, which should be from 3 to 4 centimeters larger than the negative, is next coated with the chromated albumen solution, prepared as follows:

The whites of two eggs are beaten up into froth with half pint of pure water, allowed to set, and 2 grammes of bichromate of ammonia is added, also sufficient liquid ammonia, until the solution is of a yellow straw color, and smells strongly of ammonia. With this mixture, previously filtered, the plate is entirely covered at one movement, and if it does not run easily over the asphalt film, it must be spread with a clean finger. The plate is coated a second time with this solution, and then warmed gradually over a spirit lamp, without becoming too hot. The operation of coating can be done in daylight, but the warming of the plate must not, and after the plate is dry it must be laid in a dark place to cool, for, after drying, the albumen solution is extremely sensitive to dispersed light.

The plate is then exposed under a negative for about 1 to 1½ minutes in the sun, and from 10 to 20 minutes by diffused light. A long four-sided box is placed over the printing frame to prevent unsharpness in places where the two plates are not quite even. After the exposure the plate is laid in water in which a quantity of aniline violet has been dissolved. After about 20 minutes the water will have penetrated the film and colored it. That part of the film not affected by the light may then be lightly washed off with a soft sponge. The plate is then dried and exposed to the light for 20 minutes in sunlight, or from 3 to 5 hours by ordinary daylight. The lines of the drawing become thereby insoluble, while the asphalt film underneath the red albumen still remains soluble. Before the development of the asphalt picture, the albumen film must now be removed. This is done by laying the plate in a weak solution of acetic acid about 1-25. When the last trace of the drawing has disappeared, and the plate looks exactly as before, it is dried carefully. The developing is done by laying the plate for about 10 minutes in a mixture of benzol and olive oil. By this means the insoluble parts are washed out. If the developer is too weak, a little turpentine is added. The plate is then laid in warm water, and the grease entirely removed. The plates are then etched in the usual manner, mounted on suitable wooden blocks, and are ready for the printing press.

Perseverance an Important Factor.

In any line of business, the man who uses reasonable economy and has the ability to give fair management and the perseverance to hold on will, in a great majority of cases, make a success; while, on the other hand, the one who rushes into whatever he has undertaken with a spasmodic endeavor to win all at once, as a general rule wastes his energies and often fails for sheer want of perseverance. The editor of the *Industrial Gazette* has observed that the man who starts in to do a day's work, and attempts to do as much in one hour as ought to be done in two, will usually find it necessary in a short time to take a rest, and while he is resting will lose valuable time which he evidently feels that he ought to make up, judging from the spasmodic efforts he will make when he starts in to work again. But, at night, the man who works steady, but perseveringly, will be found to have accomplished the most, while usually he will also be found in a much better condition to commence again the next day.

So it is in business. One will seem to hustle around and make a considerable to-do over what he is doing, and after wasting his energies in accomplishing what, by taking a little more time, could be done with very little effort, and then, because, as he thinks, he fails to meet the success he imagines he should, becomes discouraged and is ready to make a change to something else. This, in a majority of cases, proves a loss, and, in consequence, he does not succeed as the energy he displays would seem to warrant. Another man, while he may not make a great display of his energies at the start, will go to work more systematic, and will have better opportunities to economize, and in many cases to manage better than when he attempts to rush matters. If he will but observe, he will be ready to take advantage of any favorable circumstances that may arise. It always seems that the man who is constantly shifting about is always making a change at the wrong time, when a little perseverance would have brought him through all right. In all lines of business there are fluctuations, ups and downs, and in order to succeed we must persevere. It is when the odds seem against us that it seems the most important to persevere.

Distillation of Peppermint Oil.

It is now nearly ten weeks ago since the last bundles of peppermint herb were distilled at Mitcham, Eng. The crop, which at the commencement of the season gave every indication of falling much below the average, began to show signs of improvement just before the plants were ready for cutting. A few days' rain at that period had an excellent effect upon the growing plants, and after all the quantity of oil obtained was not very much less than last season's, and of exceptionally good quality. Just when the distilling period was drawing to a close we had occasion to inspect one of the principal works in Mitcham, conducted by a French pharmacist, who undertook, in his own words, to retrieve the fame of the Mitcham essential oils in the eyes of his countrymen, at the instance of a syndicate of French peppermint consumers, pharmacists and confectioners. According to this gentleman, English peppermint, always much esteemed in France, had of late years acquired an unenviable distinction by reason of the sophisticating processes to which it was so frequently subjected. When, therefore, a practical pharmacist, who, moreover, had acquired considerable experience of the essential oil industry at Grasse, announced his determination to start a distillery at Mitcham, the principal French consumers of English peppermint readily promised him their support, and as a matter of fact the bulk of the peppermint oil manufactured at his distillery finds its way into France.

The distilling and rectifying process adopted at the Mitcham works, though in no material point differing from the methods usually followed, may be described in a few words: The stem and leaves of the mint or the leaves alone of the lavender are placed in a huge iron container or still and covered with water. A fire is then lighted under the container, and when the water in the latter commences to boil, the steam is forced through the only exit, viz., a worm-shaped pipe which has been fixed to the still before the heat is applied. This pipe runs into a cooling vat, where it is surrounded by cold water, and then the vapor passing from the still, which carries the essential oil with it, is condensed, the oil being at the same time liquefied. Oil and water together are then drawn from the worm by a tap and left to separate, the oil being subsequently drawn off. The steamed-out part of the plants is put aside, dried in the air, and burned, but, especially just after the distilling season, the accumulation of this waste product causes much inconvenience. The peppermint oil is usually sold as it comes from the still, this being the cheapest variety; but in another part of the works there is a rectifying apparatus in which the more expensive grades of oil are treated, in order to remove the resinous matter and improve the color. The oil which first runs out of this apparatus is placed aside and sold as "triple rectified;" the bulk following forms the second quality, and the remainder is simply "rectified" oil. After each distillation, or if a different material has to be distilled, the container is cleaned and the odor of the preceding, which still adheres to it, destroyed by boiling water rendered alkali.

A large proportion of the mint is raised on land belonging to the works, but part of the material is bought from farmers in the neighborhood, and it is said that the acreage devoted to the crop by growers in Mitcham and the surrounding villages is increasing every year. This year nearly 3,000 pounds essential oil of peppermint were distilled at the Mitcham works, about 360 pounds being obtained from the white mint, the most prized variety, which of course is always distilled separately. This oil of white mint sells at 45s. to 50s. per pound, but the cultivation of the white mint is not likely to extend in the same proportion as that of the black—the former only containing about one-half the percentage of essential oil of the latter. Besides, white peppermint is a crop which is particularly sensitive to climatic influences, and suffers more severely from drought or frost than does the black mint. Of course, the quantity of 3,000 lb., large as it is, only represents a fraction of the whole of the oil actually distilled at Mitcham. There are several works in that district, and many farmers are in the habit of getting their crops distilled at some of these, paying a royalty for the use of the stills. Lavender is also an important crop in Mitcham. At the distillery which we have described, only the leaves of the plant are placed in the still, the stems being thrown away, as they are thought to render less fragrant the aroma of the oil of the leaf. The lavender crop this season has been the best for about ten years, and nearly 500 pounds of oil were obtained at the distillery. The proprietors are endeavoring to extend the growing of this crop and to induce farmers to try the cultivation of new products.

Chamomiles were a total failure this year, and only 30 or 40 pounds of oil were obtained from Mitcham flowers. This had all been sold as soon as it was distilled. We were shown a fine sample of beautiful deep green color and penetrating odor. Their oil averages from 30s. to 40s. per pound in price; but this year the firm were able to make 80s. per pound for the small quantity which they distilled.—*Chem. and Drug.*

Books for the Insane in Asylums.

Some weeks ago we published a short appeal suggesting that books should be contributed to the insane asylums of the country, in order to form libraries for the unfortunate inmates. Already one result of the suggestion has been heard from as far off as Texas. The North Texas Asylum at Terrel is now forming a library, and has sent our editorial with comments to the local journal, which published it as an appeal to the public of Texas for this most deserving charity. The asylum has now nearly 300 books as a nucleus of a library, and receives regularly over 78 newspapers. Besides these, hundreds of copies of periodicals have been donated to it. This we cite as an instance of what can and should be done in this direction. Almost every house has some books to spare, which are of no value to any one. Many would be glad to directly foster such work were their attention called to it. Unfortunately, every State can find plenty of field within its own borders for the exercise of this labor of love. We hope that the work now inaugurated may be continued, and that an insane asylum without books may soon be unknown in America.

MECHANICAL COOPERAGE.

Receptacles destined to contain wine have borne different names, but, though the cooper's art is lost in the night of ages, researches have proved that the primitive form has been preserved. As for the material, that has changed, and wood has only succeeded the pitch-hardened skins that are still used in Spain, Italy, Greece, and Algeria. In antiquity, moulded clay or chalk, dried in the sun and hooped with iron or lead, preceded wood. Diogenes' tub was of baked clay, and Homer sings to us that Jupiter had a tub on each side of him, one of which contained blessings and the other evils. These poetic vessels were indeed of baked clay; but, alas! they were not of equal capacity, since the one containing evils had the greatest bulge. Human nature was already showing a bad disposition.

However it be with poetry, wood finally prevailed. Its native qualities and its abundance in nature designated this elastic and workable material for its noble mission. It is Pliny who tells us of this use of wood, and he attributes the first employment of it to the Alpine Gauls, the Piedmontese of our day.

As long ago as the year 70 A.D., Varro and Columella, in their works on rural economy, spoke of pieces of wood united by bands.

Since that epoch the construction of tuns, or casks, has gone on improving. The manufacture of casks by hand is a very complex operation, and requires great skill. The tools used are the plane, jointer, drawing knife, bench, hoop bender, block, broad ax, bung borer, dowel, notching knife, compasses, and hammer. Each of these tools has a special duty to perform. We shall not dwell upon the details of the various operations, but shall proceed to a description of four machine tools that perform all the work formerly done by hand with the above named implements.

The wood to form the staves is cut to the proper thickness by means of a band saw. These slabs of wood are then put in a planing machine and planed according to the curves of the internal and external surfaces. We do not illustrate the saw and planer, because these apparatus do not belong exclusively to the cooperage industry.

The staves are next put into a machine (Fig. 1) which gives them the proper curve, and trims the edge so that it will form a joint with mathematical precision. This latter operation is performed by a small circular blade, which moves exactly in the plane of the axis of the cask. This blade is toothed, and both saws and planes the surface that is to form a joint. This operation, which by hand is performed by means of a jointer, requires great dexterity. The machine, however, can be run by anybody, and do perfectly accurate work in all cases.

The staves, having been bent and jointed, are next placed in the machine shown in Fig. 2. Here, after being accurately fitted together, a strong iron cone descends automatically and tightens them up. This done, the cone rapidly ascends, leaving upon the cask a temporary hoop. After opening the cone, the cask is inverted and the same operation is performed on the other extremity. The cask is thus perfectly assembled, and the joints are absolutely tight.

Thus mounted, the cask is placed in the crozing and chamfering machine (Fig. 3). Here, in a single revolution, the two extremities are shaped in the most accurate manner, and prepared for the reception of the heads.

After the boards that are to form the heads have been planed in the machine mentioned above, a joint is made by means of a small mechanical jointer, whose frame likewise carries a lathe for making the dowels, and two small boring apparatus that form the apertures into which the dowels are to be inserted. After the head pieces have been assembled and cut into a circular form by the band saw, they are placed in the fourth special machine (Fig. 4), which bevels their edges. The last operations—inserting the heads and putting on the hoops—are done by hand.—*From La Nature.*

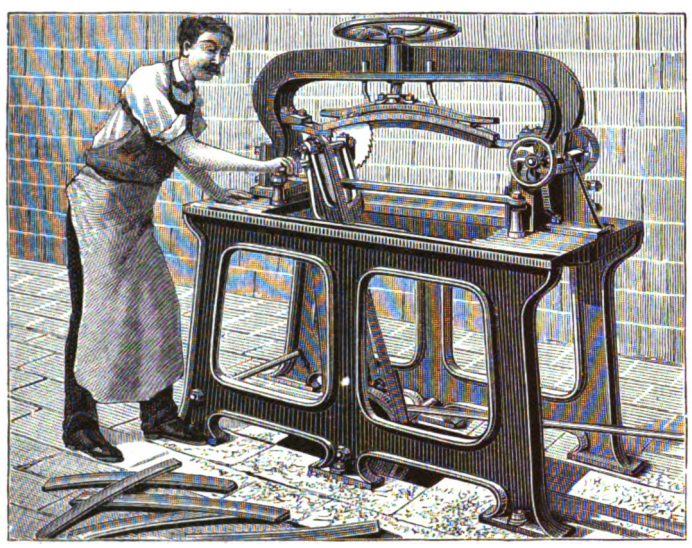


Fig. 1.—MACHINE FOR CURVING AND JOINTING STAVES.

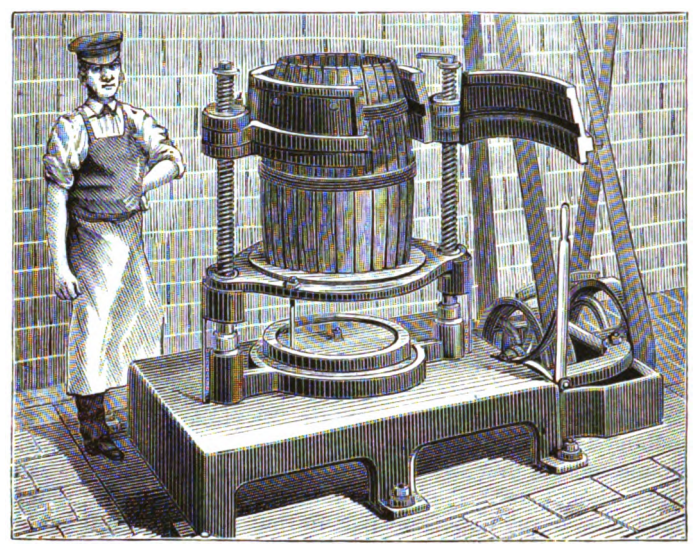


Fig. 2.—MACHINE FOR ASSEMBLING STAVES.

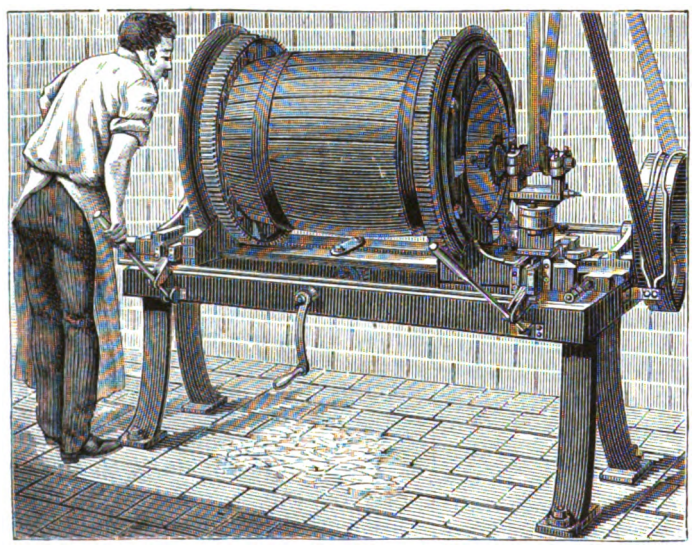


Fig. 3.—CROZING AND CHAMFERING MACHINE.

Fig. 4.—MACHINE FOR TURNING AND CHAMFERING BARREL HEADS.

Some Newly Discovered Virtues of Phosphoric Acid.

Phosphoric acid is not a remedy that has hitherto enjoyed much of a reputation, its employment having been chiefly that of a tonic, giving place even in this application to the other mineral acids. But if some recent therapeutical experiments can be accepted, this drug possesses virtues which will serve to place it in the front rank of curative agents.

In the *Gazzetta Medica Italiana* for October 29, 1887, Dr. Antonio Grossich reports a number of cases in which most remarkable results followed the external use of phosphoric acid. He was first led to employ it from a consideration of the results obtained by Kolischer in the treatment of local tuberculosis by interstitial injections of a solution of calcium phosphate. He tried local applications of the same solution in the treatment of ulcers of the leg, and found it to give satisfactory results. But, as there were no tubercles in these cases, the action of the remedy ought to be explained otherwise than by a calcification of the tubercles, and the author concluded that the phosphoric acid must be the active agent. Acting upon this belief, he began to treat all his cases of obstinate ulcer of the leg by local applications of a ten per cent solution of strong phosphoric acid in distilled water, the compresses being renewed three or four times a day. The results obtained were so satisfactory that he was encouraged to try the same substance in various tubercular affections.

In the case of two young girls suffering from multiple ulcers of the neck following tubercular adenitis, the application of a solution of phosphoric acid of the above mentioned strength brought about a cure in five weeks. The injection of the solution, in another case, into an enlarged gland of the neck effected a reduction of the swelling and induration within twenty-four hours. Suppuration of the gland followed later, but was limited to a very small part of it.

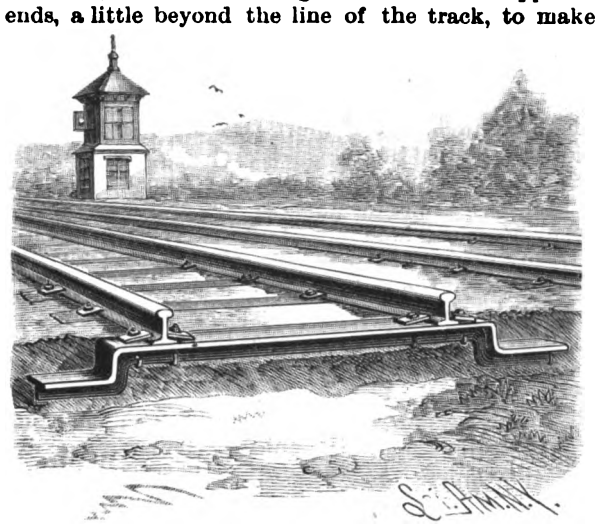
Perhaps the most striking results were obtained in a case of caries of the wrist. The disease had lasted a year, and the hand was greatly swollen from the carpus to the metacarpo-phalangeal articulations, and there were two sinuses, one on the dorsum and the other in the palm, communicating with each other. Pressure on the hand caused the exit of blood mingled with pus and caseous matter. Exploration with the probe showed a large extent of carious bone and a general undermining of the soft tissues. The hand would ordinarily have been condemned by any one to amputation. Trial was first made of interstitial injections by means of a hypodermic syringe, but little improvement followed; and then recourse was had to daily irrigation, through the sinuses, with the phosphoric acid solution, compresses wet with the same being applied in the interval. Some benefit was observed from this treatment, and it then occurred to the author to immerse the hand in the solution. Two such baths were given daily, each of two hours' duration. At the end of seven weeks the sinuses were closed, the swelling was reduced more than one-half, and there was free motion at both the carpal and metacarpo-phalangeal articulations. A tubercular abscess of the walls of the chest, treated by free incision and stuffing of the cavity with lint wet with the phosphoric acid solution, was completely and permanently cured in less than four weeks. Finally, in a case of chronic eczema marginale, in a girl of 22 years of age, applications of the same solution had, at the time of writing, two weeks later, caused such marked improvement that the author felt confident of effecting a perfect cure within a short time.

Dr. Grossich reported a number of other cases than those to which we have referred, in which he obtained equally good results. He is naturally somewhat enthusiastic in his praise of this remedy in the treatment of local tubercular processes, and he believes that phosphoric acid has a future before it which would never before have been imagined. Lentin, it may be stated, some time ago recommended the use of a ten to twelve per cent solution of phosphoric acid in the treatment of caries, believing that this process was due to a deficient amount of the acid in the osseous tissues. The cases in which he tried these applications were benefited somewhat, but he obtained no such brilliant results as those reported by Grossich.—*Med. Record.*

AT Barre, Vt., is being quarried an immense block of granite to be used in a California bank vault. It is to be twenty-five feet long, five feet thick, and five feet wide, and it will require thirty span of horses to draw it four miles to the railroad station.

AN IMPROVED METALLIC RAILROAD TIE.

A railroad tie designed to be made of iron or steel, which can be inexpensively made, and is calculated to give great stability, is shown herewith, and has been patented by Mr. Charles Netter, of No. 131 Water Street, New York City. It is formed by rolling the iron or steel into the form of a straight bar having a T section, and then bending the bar near its opposite ends, a little beyond the line of the track, to make

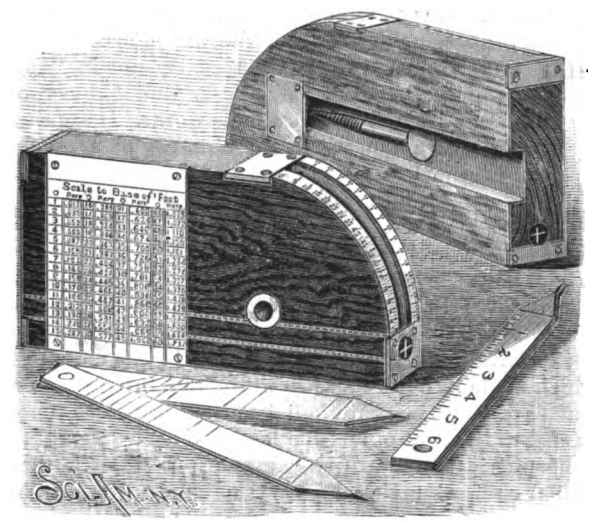


NETTER'S METALLIC RAILROAD TIE.

portions depending at right angles and further portions projecting horizontally outward. The tie is buried to bring its top plate on the surface of the track bed, by which it will be anchored to prevent further sinking, the vertical end portions preventing endwise movement, and the horizontal extensions thereof preventing lifting, while the central longitudinal flange resists movement longitudinally and acts as a rib to stiffen the tie. The rail may be fastened by passing a hook bolt through an aperture formed in the top portion of the tie and slipping the hooked end of the bolt over the lower edge of the flange, drawing an ordinary clip plate down upon the base of the rail by means of a nut screwing on the upper end of the bolt.

A COMBINED LEVEL AND RULE.

An instrument applicable in many and various ways, as for leveling and obtaining horizontal and vertical



WICKHAM AND ROACH'S LEVELING INSTRUMENT.

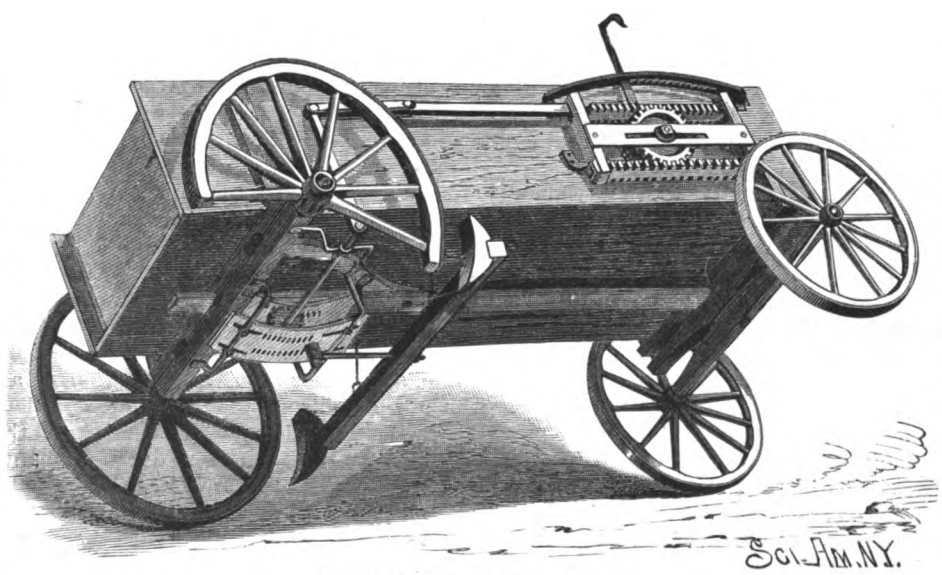
angles, is illustrated herewith, and has been patented by Messrs. Almeron W. Wickham and James M. Roach, of Burnside, Conn. The block, which constitutes the main body of the level, has in its forward end a tube bent to the form of an arc, and five or ten degrees longer than a quadrant, being divided into degrees from 0° to 90°. In the back of the block is a groove adapted to receive a folding rule, there being also a recess in the groove to hold a screw-pointed pin, to be used for holding the level upon a tree, post, or other proper surface, by passing the pin through an aperture shown in the block, and bringing its screw-threaded end into engagement with the support. A longitudinal bore parallel with the bottom of the block has crossed wires in each end, the bore to be used for sighting, and to the face of the block is secured a plate which gives the scale of perpendicular of any angle up to sixty degrees. The rule is formed in two sections, connected by a pivot pin, one face of the rule being divided into inches, while the other is marked with angle lines, so arranged that when any two lines formed upon the two rule sections are brought together and form a straight line, the numbers placed in connection with the two meeting lines will indicate the angle at which the two lengths of the rule are extended. The free ends of the rule sections are pointed, so that the rule may be used as dividers. By means of this level the heights of trees, houses, etc., from any given level can be found, and the instrument is designed to be a convenience for mechanics and artists as well as for architects, surveyors, and engineers.

A New Acid—Peculiar Properties.

Mr. David Hooper, F.C.S., of Ootacamund, India, has extracted a new acid from the leaves of the plant known to botanists as *Gymnema sylvestre*. It is a plant of the family of Asclepiadiæ, which grows in the Deccan Peninsula, Assam, and Africa, and it was found that on chewing its leaves, all sense of the sweet taste of sugar disappeared as if by magic. For instance, if gingerbread were eaten, only the taste of the ginger was perceived; if a sweet orange, only the acid flavor of the citric acid, and the orange seemed as sour as a lime or a lemon. But what is still more curious, not only the sweet taste of substances containing sugar is effaced, but bitterness is also destroyed at the same time. Hence if a person takes sulphate of quinine after chewing the leaves of the *Gymnema*, it merely tastes like so much chalk or plaster of Paris. The effect in question lasts, as a rule, for one or two hours, and then the sense of taste returns to its normal condition. The active principle of the leaves of this plant appears to be soluble in water, alcohol, ether, and benzol. The aqueous solution of the substances soluble in alcohol had a decided acid reaction, and the author extracted an acid from it not unlike chrysophanic acid in some respects, but different in others. To this new product he has given the name of *gymnemic acid*, and it possesses the anti-sweet and anti-bitter properties found in the leaves as above described. The pulverized sun-dried leaves yielded about 6 per cent of their weight of this singular new product, about which we shall, no doubt, hear more in the course of a short time.

AN IMPROVED VEHICLE BRAKE.

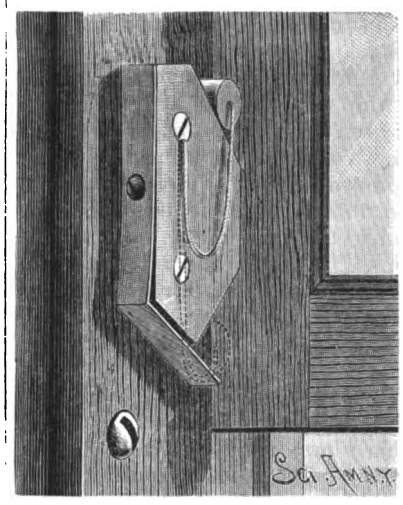
A wagon brake which can be conveniently operated, which need be moved but a slight distance to bring the shoes in contact with the wheels, and wherein the shoes may be normally positioned a much greater distance from the wheels than in the ordinary form of brake, has been patented by Mr. Marshal D. Platner, of Virginia City, Montana Territory. A double frame is secured to the side of the wagon body at the front, the lower bar of the frame having teeth making a fixed rack. Above the fixed rack two parallel plates are secured, a pinion being journaled to slide in slots in the plates, the teeth of the pinion engaging those of the lower fixed rack and of an upper sliding bar carrying a rack, the pinion being operated by a lever extending upward within a yoke, which is also provided with a series of notches whereby the lever may be retained in a locked or half-locked position. Beneath the reach, at the rear, a fixed plate is held horizontally suspended from the hounds and axles, having a double semicircular row of spaced and aligning apertures, and beneath this fixed plate a segmental plate is held to slide in more or less U-shaped brackets, one bracket being attached transversely to the under side of the rear axle, and the other to the hounds parallel with the axle. The sliding plate has at each end concentric slots, through which pass bolts adapted to guide the plate in its reciprocating movement. To the right of the running gear a horizontal bar is attached to the side of the hounds, and also to the under side of the rear axle, a crank shaft being journaled in the bar, whose inner end projects inward between the fixed and sliding plates, and carries a pinion adapted to simultaneously engage the apertures therein. The crank arm of the shaft extends upward outside the wagon body, and is pivotally connected with the sliding rack-carrying rod extending forward. The brake bar, carrying the brake shoes, is held to swing by any approved means, and derives its motion, by means of a connecting bar, from the sliding plate.



PLATNER'S VEHICLE BRAKE.

AN IMPROVED SASH HOLDER.

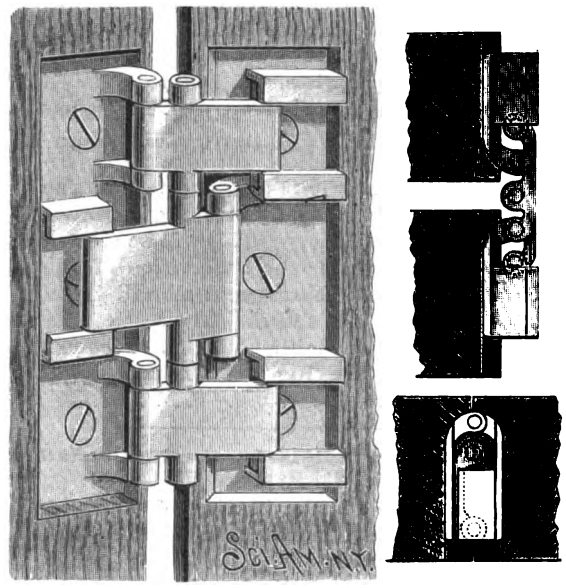
A simple form of sash support and lock, in which a plate having two oppositely inclined surfaces is secured to the window casing adjacent to the sash, and adapted to receive a roller between either of its inclines and the sash to support or lock the latter in position, is represented in the accompanying illustration, and has been patented by Mr. Joseph F. Hambitzer, of Houghton, Mich. To and against the inner face of the casing, adjacent to the face of the sash, a thick flat plate is held by screws, the inner edge near the top of the plate being inclined downwardly toward the sash, and its inner edge near the bottom being inclined downwardly away from the sash. A roller is suspended from a cord attached to the plate, so that when the roller is removed from its seat it will leave both hands of the operator at liberty for adjusting the sash, but by placing the roller between either of the inclines, the sash will be firmly supported and locked in the ordinary way, against an upward movement by placing the roller at the top, and against a downward movement by placing it at the bottom.



HAMBITZER'S SASH SUPPORT AND LOCK.

AN IMPROVED HINGE.

A hinge designed particularly for use in fine cabinet work, and which may be applied so as to be invisible from outside the joint formed thereby when closed, is illustrated herewith, and has been patented by Messrs. Ferdinand L. Scheidemann, of No. 3958 Girard Avenue, and Frederick W. Bender, of No. 4048 Girard Avenue, Philadelphia, Pa. The hinge leaves are combined with links having one end pivoted to either hinge leaf and the other end adapted to travel on a guide on the opposite leaf, the links being connected pivotally together on a medial line nearer their pivotal than their traveling ends, as shown in the main view and sectional figure. The smaller figure represents the joint closed. When the joint is opened, the action of the scissors-like links is to automatically separate the two joint sections, while allowing them to fold outward, so that the crushing of the edges of the joint, which would ordinarily occur if the hinge pin directly connected the two sections on a line within the joint, as in this case, is prevented. A mortise is formed in each joint section to receive the respective hinge leaves and attachments, the mortise terminating at a short distance from the outside joint edge.



SCHEIDEMANN AND BENDER'S HINGE.

A STEAM catamaran, intended for whale and walrus hunting in the Arctic regions, is being built at Montreal, Canada. It has two steel cigar-shaped hulls, each sixty-five feet long, and built in two compartments, one for water ballast, and the other to carry petroleum for fuel. The catamaran is constructed so that it may be taken apart for transportation on the deck of a whaler.

The Big Bend Tunnel Completed.

For five years past a company of New York capitalists have been engaged in the stupendous undertaking of turning Feather River from its bed at the Big Bend, 16 miles above Oroville, in Butte County. [Illustrations of this remarkable work were given in the SCIENTIFIC AMERICAN of February 6, 1886.] Here a mountain spur has caused the river to make a detour, which, following the trend of the mountain for 14 miles, returns to a spot not more than two and one-third miles from the point on the opposite side. For years the Yuba and Feather Rivers have been noted for their richness in the early days of the State, and untold millions had been taken from their beds, but at this point the depth of the canon through which the river flowed, coupled with the large volume of water, made it impossible for the pioneer miners to extract the great stores of wealth. It is this which attracted the attention of Dr. R. V. Pierce, of Buffalo, New York, and he determined to associate a number of capitalists with himself, and by tunneling the mountain spur at the Big Bend obtain the gold which had defied all other efforts to get it.

The work of tunneling the mountain was begun five years ago and has just been completed. The tunnel is 12,000 feet, or nearly two and one-third miles, in length. One hundred men have been engaged on it night and day, using the largest sized Burleigh drills, driven by compressed air. The tunnel, as completed a year ago, was nine by sixteen feet, but this was found too small for the volume of water, and the aperture has been increased to twelve by sixteen feet in size. On October 16 the river was turned through the tunnel, which was found of sufficient capacity, and the bed of the river was laid bare. Numerous prospect holes were sunk at various spots, and gold was found in paying quantities, some of the places paying as high as fifty cents to the pan of dirt. Owing to the quantity of water coming through the gravel and the want of pumping machinery, but little can be done this season, but enough has been discovered to show the richness of the claim, which will be thoroughly equipped with all the necessary pumps for next season's work. The water of the river, as it comes from the tunnel, is at a height of 300 feet above the river below, and this tremendous fall will be utilized to generate electricity, which will be conveyed to the various pumps by copper wires, and again developed into force by the dynamos there. Dr. Pierce has brought a number of samples of gold nuggets and dust from the claim as an earnest of what is promised in the future. He is now stopping at the Palace Hotel, and is engaged in making contracts for his pumping machinery. This will be erected during the winter under the supervision of the superintendent, M. A. Harris, and all will be in readiness for next season's work. The cost of the tunnel has been nearly one million dollars. This expense has been borne by the Big Bend Tunnel Company, whose capital stock is $20,000,000.—*S. F. Alta.*

The Heating of Points by the Electrostatic Discharge.

In a recent note on the heating of points by the electric discharge, M. Semmola thus describes some experiments he has made:

A point is used made half of antimony and half of bismuth soldered at the extremity, so as to constitute a thermo-electric couple. Having connected the point with the prime conductor of an electric machine, the poles of the thermo-electric couple are connected by wires with an insulated galvanometer of low resistance. When the plate of the machine is rotated, the needle of the galvanometer deviates because of the thermo-electric current produced by the heating of the point as it discharges the electricity of the conductor to which it is attached. (It is scarcely necessary to remark that with a mono-metallic point no current is produced.) A current may even be obtained by attaching the point, not to the conductor, but to a large metallic bar in communication with the ground and at a short distance from the machine.

On performing these experiments in the dark it is observed that when a small star appears on the point, the deviation of the needle is much greater than when the "plume of light" appears there. This proves that the discharge of negative produces more heat than does the discharge of positive electricity. By bringing the point near the conductor, so as to have a constant spark, thin, hissing, and visible in day light, the deviation of the needle decreases.

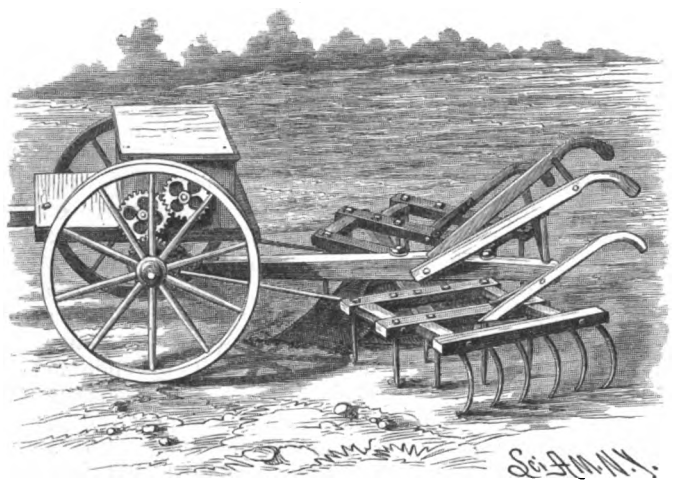
The electric blast of air that blows from the point is also hot, as can be easily proved by placing upon the conductor of the machine a curved mono-metallic point, a few centimeters distant from one of the faces of a Nobili's thermo-electric battery. On turning the plate of the machine, the electric blast blows against the battery and the galvanometer needle at once deviates.

A point of bismuth and antimony or one of iron and platinum placed on a metallic bar in communication with the earth, and exposed upon the summit of an edifice, like a lightning rod, might in certain cases be of use in examining the atmospheric electricity, and in detecting by the production of a current of feeble intensity the electricity of storms or of the *aurora borealis.—Revue Scientifique.*

A CULTIVATOR, DUSTER, AND DIGGER.

A machine intended to prepare ground to receive crops, to dust poison as required, and to dig or harvest potatoes or other crops, is illustrated herewith, and has been patented by Mr. William C. Davidson, of Grandville, Mich. The beam of the plow, having reversely set or double mouldboards, is connected at its forward end to the sulky axle, preferably by links engaging a clevis of the plow beam, the plow having the usual handles. In a couple of eye bolts in the sulky axle are hooked two draught bars, to each of which a cultivator harrow is held, each of which has a handle, allowing the operator to guide the harrows sidewise, or to lift them bodily to clear their teeth of trash or for passing over obstructions. The opposite harrows are so connected that they may be set nearer to or farther from each other, according to the work to be done, and are so constructed as to allow of the attachment of interchangeable forks or mouldboards at the backs of the harrows, and disposed at like angle with the harrow-frame bars, to facilitate potato gathering.

On the sulky frame is fitted a box in which is journaled a cylinder or drum, its periphery being made of sheet metal and provided with a series of perforations, for scattering or dusting poison upon plants, there being any preferred arrangement for closing a portion of the holes in the drum, according as the poison is to be dusted upon plants set in drills or in a continuous line, in hills, etc. The drum is rotated by the advance



DAVIDSON'S CULTIVATOR, DUSTER, AND DIGGER.

of the machine, from a gear wheel fixed to the sulky axle, through a belt and pulley.

For simply dusting poison on growing plants, the plow and harrows are removed; and for gathering crops, the belt is unslipped from the drum-driving pulley.

The Tin Mines of California.

Within three or four miles of the railroad leading from Riverside to Santa Ana, is a deposit of tin ore, consisting of over 200 ledges carrying tin, or rather that number of mining locations, and more, were made some twenty years or more ago, upon what is now known as the Rancho Sobrante San Jacinto. This ranch, consisting of eleven square leagues of land, patented by the United States government in 1868, after a large amount of litigation, was purchased afterward by a corporation organized under the laws of our State, called the San Jacinto Tin Company, which at once took steps to ascertain whether or not there were tin lodes upon it. A thorough examination developed the fact that an area of about ten square miles was permeated with tin veins of various thickness to such an extent as to establish the fact that there was tin enough there to supply the United States with that metal. The company selected one location as easiest of access, called the Jahalco, and upon this vein sunk a shaft to a considerable depth, and ran drifts each way, developing one of the richest deposits of tin ore ever known.

Some one or two tons of tin was smelted from the ore in this city, in a crude way, from ores sent up from the mine. Quite an amount of tin sheets and tinware, as well as many bars of tin, were also made and exhibited at the Mechanics' Fair in this city in 1869, for which a gold medal was awarded. Some of the tin, both in bars and in the ore, was sent to England, and tested there fully, with the result of being found almost perfectly pure, carrying no wolfram, arsenic, or tungsten, as is usual with tin ores. At the time this company, which still owns the property, carried on this work, it was very expensive to get supplies and labor there. Los Angeles, fifty-five miles away, was the nearest place for supplies, which had to be hauled by wagon. Tin ores have to be treated in a peculiar way, requiring power to crush and concentrate, and fuel for this purpose, as well as to smelt the concentrations, was not to be had then, in that section, unless at too great an expense.

When the company ceased work, not because the ore had given out, but because it would not then pay to work, the vein was over 8 feet in width of solid ore, carrying in tin from 5 to 50 per cent. The want of water, and the cost of transporting the ores to a point where water and fuel was to be had, was too great, and the company closed the mine. But enough had been done to justify the statement that within what is known as the tin district, of about 10 square miles, there are mines enough and tin enough to furnish all the tin required west of the Rocky Mountains, if not for all the United States.

Shortly after closing the mine, the company disposed of some 3,500 acres of its *mesa* land to the Riverside Company, which land now comprises a portion of that thriving place, and of Arlington. Afterward the government of the United States allowed its name to be used in a suit brought by a person named Baker, of Los Angeles, who owns, or claims to own, a large number of tin locations made in early times. This suit was decided in the United States Circuit Court here in 1885 by Judges Sawyer and Hoffman, after a long and expensive litigation, in favor of the company, in an exhaustive opinion. As the plaintiffs had two years within which to make an appeal to the Supreme Court of the United States, an appeal was taken within but just previous to the expiration of the time allowed by law, and the case is now before the Supreme Court, or rather will be before it in this term. As it has been advanced on the calendar to be heard on January 7, 1888, we may hope to get a final opinion upon it early in the new year of 1888.

If decided in favor of the company, we hope to see this industry of tin mining carried on with vigor, as it will add another to the many mining industries of our State. It is believed now that the railroad is so close to the mines that the ores can be transported to water and fuel so cheaply that the mines can be worked very profitably. Coal has been discovered within a few miles of the mines, and the Santa Ana River is but a few miles away. —*Min. and Indus. Advocate.*

The Alteration of Iron by Moderate Heat.

An important question to engineers and contractors having to do with iron and steel exposed to variations of temperature of more than a natural range—such as, for example, in connection with gas retort house work—was recently put in *Engineering* by Mr. A. Elink Sherk, the engineer of the Lake Haarlemmer drainage works. It appears that a chain hanging in the chimney of a pumping engine broke with the weight of a man in a gantry seat, although the material was the best that money could buy, and the links 5-16 inch in diameter. The chain was two years old when it broke. When new, the chain had been tested to 1,353 kilos (nearly 3,000 lb.). The manufacturer, on being appealed to, ascribed the breakage to the metal having been continually heated and cooled in the chimney, which made it hard, loose in grain, and brittle. As a matter of fact, the chain had been subjected 35 times *in situ* to the heat of melting lead and cooled again to atmospheric temperature. The curious point is that similar chains hanging in other chimneys for four or five years have apparently remained perfectly sound under exactly similar conditions, although these were not so good to begin with. In reply to Mr. Sherk, Mr. C. E. Stromeyer has written to state that in his experience steel and iron exposed to the heat of melting lead in the fumes of a sulphurous coal will lose nearly all their strength.

Mr. B. H. Thwaite also suggests that the contact of the heated chain with soot might recarbonize the metal and turn it practically into cast iron. Mr. Thwaite remarks, however, that mere heating and cooling, not in a chemically active atmosphere, will not alter the molecular structure of metals, and states that wrought iron tie bars of high temperature furnaces do not become altered chemically or physically. Any gas manager who has ever pulled down an old retort stack, in which tie bars may frequently be found turned to lumps of carbon rather than iron, will be able to testify that there are conditions in which iron alters its constitution and appearance, though buried in brickwork, and not subjected at any time to a red heat.—*Jour. Gas Lighting.*

American Dentistry Abroad.

Among the new companies lately formed in London is one entitled the American Dental Institute. Capital 1,000*l.*, in shares of 1*l.* each. Object, to promote the adoption of advanced American and other scientific methods of dental surgery; to protect the interests of dentists and the profession of dentistry; to consider all questions connected therewith; to promote or oppose legislative and other measures affecting the profession; to collect and circulate statistics and information in regard thereto; to act as and to appoint arbitrators for the settlement of any disputes in connection with dentistry.

Correspondence.

Transplanting Trees.

To the Editor of the Scientific American:

In the article on transplanting trees published in the SCIENTIFIC AMERICAN, November 26, from *Garden* (London), one of the most important precautions is entirely overlooked; that is, to have the tree, when transplanted, in the same position as to the points of the compass as before removal.

The south side of a tree is exposed to the direct rays of the sun, while the north side is more or less protected from them. Nature accommodates itself to this changed condition, and the difference in development in many trees on the south and north sides is obvious to ordinary observation.

When the south side of a tree is turned to the north, each side finds itself in a position for which nature has made no preparation, and death follows almost as certainly as if the top were put in the ground and the roots turned up to the sky.

The willow and some other trees will grow if planted upside down, and many trees will grow with the south side turned to the north; but with trees difficult to transplant at best, it is a mistake very apt to be fatal to turn the south side to the north, and the older the tree, the greater the danger from changing sides in transplanting. D. S. TROY.

Montgomery, Ala., November 28, 1887.

A Singular Railway Accident.

To the Editor of the Scientific American:

An unusual accident occurred on the railway at Parkersburg, W. Va., a few days ago in which a locomotive was badly used up and several persons somewhat injured. The locomotive attached to a freight train was pulling out of the station up grade, and was working a full head of steam at full stroke, the fireman was shoveling fine or slack coal into the furnace, when suddenly the netting in the diamond stack became entirely stopped up, which forced all the blaze, gas, smoke, and steam from the exhaust out of the furnace door into the cab, severely burning the engineer and fireman and brakeman. The engineer jumped out through the front window of the cab, leaving the throttle wide open. The engine commenced slipping with fearful velocity, and when stopped it was found that both parallel rods were bent down about four inches out of a straight line, and all the wrist pins badly sprung. The engine was hauled to the shop and repaired, started out with a train, but broke down again. This time one of the piston heads broke off from the piston inside the cylinder, knocking out the head and otherwise injuring the cylinder. The peculiarity of the accident has caused considerable comment among railroad men as to the cause and some of the effects of the accident. My opinion is that the exhaust caught up some of the fine coal that the fireman was using, and carried it up against the netting, and the pressure in the stack, immediately following, holding it there as securely as though it had been cemented. This caused the fire, etc., to come out of the furnace door, with the result above stated. As to the rods becoming bent, the great velocity of the revolutions of the wheels, the rods not being strong enough to resist the strain caused in changing the motion from down to up, is what caused them to be bent; and the piston must have become fractured when the engine was shut off, as it would not be apt to occur while working steam with the engine slipping, as the steam would act as a cushion to receive the blow of the piston at the end of each stroke; but when shut off, this cushion, as it were, was removed, and the piston became fractured, so that when steam was applied after the engine was repaired, the head broke off entirely. I believe that the axles of locomotives are frequently sprung while slipping, by the engineer giving the engine sand, especially if the sand is fed by one pipe. In this case the sand would act as a powerful brake on one driver, while the others would with their momentum tend to force ahead, with the result of springing the axles or pins. I was much pleased in reading Prof. Sloane's account of his experiment on the injector in a late number of the SCIENTIFIC AMERICAN, as some months ago I wrote to the *Locomotive Engineer's Journal*, giving my views as to "why the injector worked." I compared it to a shot gun in which the steam was the powder and the water was the shot. The powder, or steam, was harmless without the water or shot. The steam having no weight could not penetrate the check; but give it the shot, or water, and it would go through the check instantly. Prof. Sloane proves this clearly in his experiment. He could blow through the tube all day with no effect, but when the shot are put in, they strike with such force as to open the little check valve easily. Some of our great wise men laughed at my explanation, and it is a great satisfaction to see it so clearly explained by Prof. Sloane.

Marietta, O., November 26, 1887. "W. M."

THE curvature of the earth is such that a straight line a mile long would be 2·04 inches from the surface at either end.

Work Begun on the Ship Canal between Liverpool and Manchester.

The actual work of constructing the Manchester Ship Canal was commenced, November 11, in a strangely modest and unassuming manner, says the *Engineer*, considering the magnitude and importance of the undertaking. Instead of having an elaborate ceremony, with a public personage as the leading figure, as is customary in such cases, the directors went quietly up the Mersey to Eastham, on the Cheshire shore, and each cut a sod. Nothing could be more unpretentious than that method of inaugurating what is likely to prove a revolutionary enterprise, commercially speaking; but it must be observed that Eastham is not the most convenient or most accessible spot for an elaborate public ceremony, and this may have influenced the directors in dispensing with formalities. An ordinary navvy's spade being handed to Lord Egerton, the chairman of the company, his lordship cut the first sod, amid ringing cheers from the assembled spectators. Following him, Sir J. C. Lee, deputy chairman, Mr. Alderman Bailey, Mr. Henry Boddington, Mr. J. K. Bythell, Mr. W. J. Crossley, Mr. C. J. Galloway, the Mayor of Stockport (Mr. J. Leigh), and the Mayor of Oldham (Mr. S. R. Platt), each cut a sod, they being directors. Mr. Leader Williams, C.E., chief engineer to the company, next filled a wheelbarrow with earth and tipped it near by, thus really beginning the work of excavation, and subsequently Mr. Boulton, of Ashton-under-Lyne, cut a sod on behalf of himself and other shareholders.

Later on the directors examined the plant which the contractor, Mr. Walker, has collected, which, at Eastham and Ellesmere Port, embraces fifteen locomotives, numerous steam navvies, or excavators, of the latest and most improved type, massive cranes, and a vast quantity of timber and steel rails. It is expected that rapid progress will be made with this, the lower part of the canal, notwithstanding the advent of wintry weather, and the upper part will be proceeded with. A sufficient number of trucks have been provided by the Ashbury Railway Carriage Company, which has contracted to supply 100 wagons each week up to next May. Already within a week a good deal has been done. The steam excavators have been put in position, railways are being laid down for carrying away the excavated matter, and smiths' and joiners' workshops and store sheds have been erected. Naturally, the prospect of work has drawn many hundreds of unemployed men to the scene of operations; but as only one section of the canal is at present being proceeded with, only a small number of men has been taken on yet. Only some three or four hundred are so far employed, but there is a good prospect for genuine and capable workmen, for this section alone will probably require at least two thousand men, and when the whole work is in progress the number of men employed will be between twenty and thirty thousand.

Gerson's System of Filtration.

The system of filtration invented by Dr. Gerson, of Hamburg, depends chiefly for its action upon the presence of iron in the filtering material, and is carried out in two stages. The fatal influence of iron on the class of organisms found in water is well known, although only imperfectly understood. It is taken advantage of in the well known Bischof spongy iron filter and in the process of water purification pursued at the Antwerp Water Works under the superintendence of Mr. William Anderson. In the former case, contact with metallic iron seems to be the means by which bacteria and the like are destroyed, while in the latter the impurities in the water are attacked by a solution of iron, and are afterward removed by a sand filter. In Dr. Gerson's apparatus the germicidal material is insoluble tannate of iron, which is presented to the water by being distributed thoughout the entire mass of the filtering medium. Two substances are used to carry the iron. The first is sponge, and the second pumice stone. It is well known that sponge makes a capital filtering material, taking solid matters out of water most efficiently. But as ordinarily used it is subject to decay, and consequently it not only requires renewal, but may also introduce contamination into the water which it is supposed to purify. But if all its fibers be filled with insoluble tannate of iron, the vegetable material is preserved, and may be regarded almost as a mineral. In passing through the sponge the greater part of the insoluble matter in the water is removed, while there is a prolonged contact with the iron, which cannot fail to affect the organisms. It is, however, the second filtering material which is supposed to have the greater effect on these creatures. In this the tannate of iron is held in the cells of pumice stone, which is used in layers of different size, varying from gravel to fine sand. Here we have the separating power of a sand filter added to the action of the iron, the result being that the water emerges with a very high degree of purity.

This system may be carried out by aid of various apparatus. A usual method is to employ a pair of vertical iron cylinders for the preliminary filtration and a second pair for the final filtration. The water is admitted simultaneously to the lower parts of the first two filters, and flows upward under a head of about 15 feet. The greater part of the sand and mud is extracted by the first few inches of sponge, the office of the remainder being to catch the finer floating particles. After emerging at the top of the cylinders, the water passes to the bases of the cylinders forming the secondary filters. These are filled with layers of pumice of various degrees of fineness, also impregnated with tannate of iron. In passing through this material every drop of the water has to come in contact time after time with the iron, and not a single organism can escape the prejudicial effect of the iron. The secondary filters can, according to local circumstances, be worked either under high pressure or low pressure. In the first case their capacity is about half the capacity of the preliminary filters, and the total pressure for both filters, 26 feet to 28 feet; while in the second case, under low pressure—namely, about 32 inches—they require ten times the surface of the preliminary filters, but still exceed the capacity of sand filters twenty-five times.

The filters are cleaned by reversing the current, valves being provided by which this result can be immediately attained. By this device the greater part of the dirt, which lies at the bottom, can be washed out, although it is, of course, impossible to thoroughly cleanse the filtering material in this way. It is not, however, a very serious affair to take out the whole of the sponge and the pumice and to purify them thoroughly. As far as the sponge is concerned, the method adopted by the Pulsometer Engineering Company, of Nine Elms, London, of alternately compressing and relaxing the sponge in the cylinder, while at the same time water is flowing through it in the reverse direction, would probably add greatly to the efficiency of this filter, as it would enable one-half of it to be made thoroughly pure every day, or several times a day if required.

Dr. Gerson's filters are designed for bleach works, paper works, breweries, boiler feeding, and other industrial purposes, as well as for towns' water works. For the latter purpose they only require about one-ninth the floor space occupied by sand filters. For many industrial purposes the first filtration is quite sufficient without the second. Already there are two installations at work in this country, one at the Alexandra Dock, Newport, Mon., and another at the paper mills of Messrs. Fletcher & Son, Stoneclough, Lancashire. On the Continent these filters are used in many large breweries, paper works, and the like. The following are some analyses made of water from sand filters in comparison with Dr. Gerson's filters. The quantity of organic matter has been determined by the consumption of oxygen for their oxidation:

	Oxygen.
Analysis by the German Imperial Sanitary Board:	
Water from the Elbe, unfiltered	0·365
" " " filtered through sand	0·316
Analysis by the German Hygienic Institute in Munich:	
Water from the Elbe, unfiltered	0·420
" " " filtered through sand	0·400
Analysis by Dr. Niederstadt, in Hamburg:	
Water from the Elbe, unfiltered	0·373
" " " filtered through Dr. Gerson's filter	0·11
Analyses by Messrs. Senurier and Lubeen, in Amsterdam:	
Water from the downs at Amsterdam, unfiltered	0·23
Ditto, filtered through sand	0·22
Water of the Schie, near Rotterdam, unfiltered	0·29
Ditto, filtered through Dr. Gerson's filter	0·17

Analysis by Mr. Stein, town chemist at Copenhagen:
Water from the canal of the water supply, cleared through standing.

	Unfiltered.	Filtered through Dr. Gerson's system.
Residue after evaporation (130° Cent.)	4·800	3·540
Ammonia	—	—
Nitric acid	traces	traces
Hydrochloric acid (HCl)	0·592	0·374
Sulphuric acid (H_2SO_4)	1·144	0·563
Lime (CaO)	1·100	1·100
Magnesia (MgO)	0·382	0·216
Oxygen required for the oxidation of organic matter	0·097	0·076

Microscopical Examination.

Unfiltered water:
Tails of [algæ, vortochaceæ, infusioriæ, wire bacteria, dust bacteria, oscillariscæ, palmellaceæ, pedlostocæ, desmediacæ, diatomeæ, green wire algæ, living crabs, and some urchins.

Water from Dr. Gerson's filters:
No organisms found.

—*Engineering.*

Rise and Progress of Steam Navigation.

In fifty years steamships have increased in tonnage from 67,969 tons to 4,318,153 tons, while their proportion to the total registered tonnage of British ships has increased from 1 to 41 to 1 to 2·14. The first Cunarders were only 207 feet long and 34 feet 4 inches beam, while the first steamer which plied regularly between Liverpool and New York, the Royal William, measured only 175 feet in length. The steps by which the marine engine has developed have been, first, the screw propeller, then the introduction of iron and steel in the building of ships, then the increase of steam pressure in the boiler, then the adoption of surface condensation, followed by the use of compound and duplicate expansion cylinders, and a much larger increase in boiler pressure, rendered possible by the use of mild steel in the construction of boilers, have effected in all a reduction of 70 per cent in the consumption of coal and an increase of 110 per cent in speed.

SINGLE FLUID BATTERY.

T. O'CONOR SLOANE, PH.D.

The battery here illustrated is a very efficient and simple form for open or closed circuit work. It represents a favorite and recent type for such cells, and can be put together with the minimum number of tools and appliances.

The cover is made of wood. If a circular vessel is used, the cover should be cut in a circle equal in diameter to the outside of the jar, and a shoulder should be formed to hold it in place and prevent lateral motion. Any number of holes, according to the size, are bored through it, one set for the reception of the carbons and the others for the zincs. Care should be taken to bore these holes truly vertical to the plane of the cover, and the bit used should make a hole of exactly the right size to fit the carbons and zincs respectively. The fit must be a very tight one, so that the rods have to be driven into their places with a mallet or hammer.

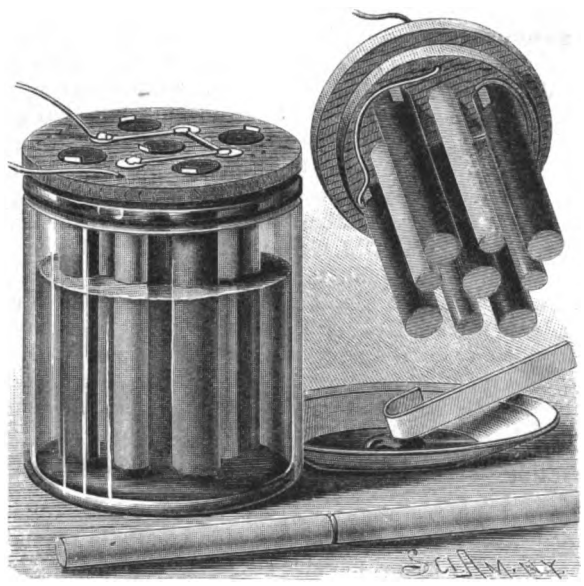
For the positive elements, zinc rods, such as sold for the Leclanche battery, are used. Such rods can be bought of 6 or 8 feet in length and of uniform diameter. Pieces are cut off of the proper length, a cold chisel, hack saw, or file being used. A very easy way of dividing the rod is with mercury. A fine groove is filed around it. A globule of mercury is placed in a saucer with a little dilute sulphuric acid. A thin slip of zinc or a strip of galvanized iron is dipped in the mercury. Some adheres to it. This is then drawn around the cut, so as to fill it with mercury and amalgam. Then the rod is broken off, either in the hand or in a vise. It becomes almost as brittle as a pipe stem. This process is hardly to be recommended for the upper ends of the zincs. These have to be soldered, and the mercury interferes with the operation to some extent.

For negative elements, electric light carbons are used. The copper is dissolved off by nitric acid, they are washed, dried, cut to the proper length by a saw or cold chisel, and their upper ends are soaked in hot paraffine.

Both elements are now driven into their respective places. With each carbon a slip of copper ¼ inch wide is also introduced, and lies alongside, pressed hard against it and projecting about as much below the cover. As shown in the cut, a wire is carried around the outer circle of the carbons, and is soldered to the copper strips. If a central carbon has been used, as shown, a special connection is soldered to it and to the main wire. The end of the wire is carried up through a hole in the cover. A second wire is soldered to the zincs, this piece lying on the upper surface of the cover. Concentrated hydrochloric acid (muriatic acid) is the best flux for the zincs. If desired, the projecting end of the zinc connection may be secured to the wood by a staple. This is not necessary if the soldering is solid.

To amalgamate the zincs, a strip of galvanized iron is far the best instrument. The end of such a piece, which may be 2 inches by ½ inch, is bent into a hook, so as to fit the zinc rods. This is dipped into the globule of mercury as it lies under a little dilute acid, and is rubbed up and down the rods. If the mercury does not take hold at once, the zincs and carbons may be dipped nearly to the level of the cover in dilute sulphuric acid. After a few minutes' immersion the zinc will be ready to amalgamate, and the rods will shine like silver after a few minutes' rubbing with the galvanized iron and mercury.

The soldering may of course be dispensed with. Instead of strips of copper, the ends of some pieces of wire may be flattened and driven into the holes along with the carbons and zincs. By twisting together the



SINGLE FLUID BATTERY.

ends of these, zinc connections and copper connections separately, the battery will work perfectly if care is taken to avoid short-circuiting. When it is made in a hurry, for temporary use only, the paraffining of the carbons may be dispensed with, and the copper may be left upon their upper ends. The wires may be soldered directly to this, although such connection is rather weak.

For bichromate solution, 2½ oz. of bichromate of potash in fine powder are shaken up in 10 fl. oz. of water. To this 2¼ fl. oz. of sulphuric acid are added slowly with constant stirring. Great care should be taken in pulverizing the bichromate of potash, as it causes ulcers if inhaled. For open circuit work a solution of sal ammoniac may be used. The ends of burned-out carbons, such as are thrown away by the lamp attendants, answer perfectly for the smaller sizes of this battery.

DR. W. CROOKES mentions that if gallium could be obtained in sufficient quantity, it would be a perfect metal for producing vacuum in air pumps, as it is liquid at 86° F., gives off no vapor, and does not oxidize.

The Bell Telephone Patent Canceled in Austria.

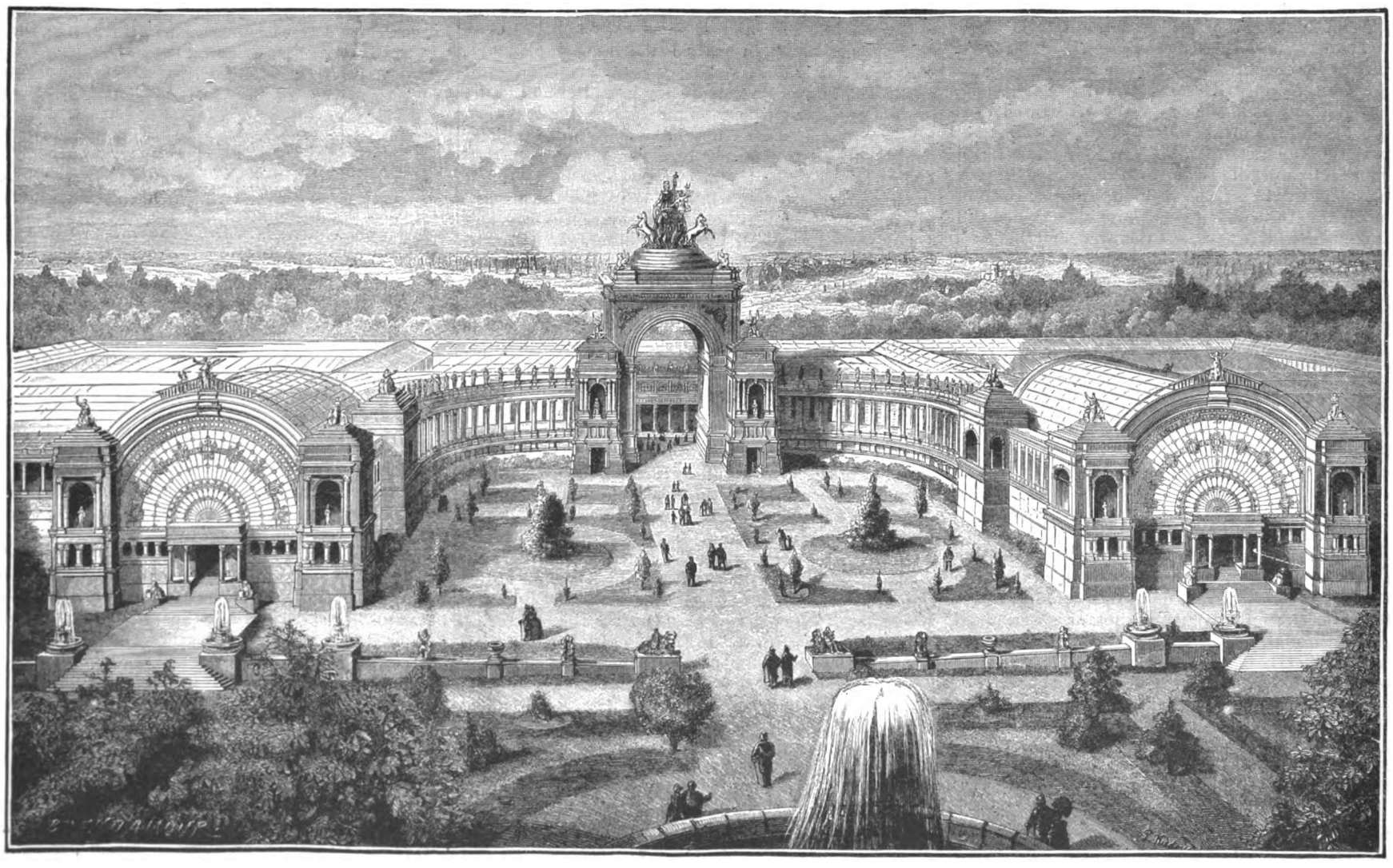
The efforts of the Telephone Company of Austria to get the Bell patent canceled have at last been successful. Their manager, Mr. R. Howard Krause, believed this possible from the commencement, and with the assistance of Mr. Otto Schaffler the company has been the means of securing free trade in telephones in Austria. The result of the decision of the Austrian Ministry of Commerce and the Hungarian Ministry of Agriculture, Industry, and Trade, dated October 28, 1887, seems to be that all those clauses of Bell's patent which refer to the telephone are canceled, only those referring to the multiplex telegraphy being allowed to stand. Certain clauses were canceled because the Telephone Company of Austria was able to prove prior publication, and others were canceled because the company proved that they embodied scientific principles which, according to Austrian law, cannot be the proper subject of a patent.

THE BRUSSELS INTERNATIONAL EXHIBITION, 1888.

A great international competition of sciences and industry and universal exhibition will be opened at Brussels, the capital of Belgium, on the first Saturday of May, 1888. Applications for space must be made by January 15, and all entries by April 15, the goods to be in their places by April 25. Belgium is in an eminent degree a manufacturing country, and in many lines of production a close competitor with France, Germany, and England; therefore it is proposed to make this exhibition rather an exception to most previous international displays in the fact that a more enlarged programme of direct competition has been offered, which will tend to bring out a good representation of the different industries represented. The products are to be grouped in fifty special competitions, in such manner as to supply material for the complete study of any branch of industry in comparison with the similar products of other nations.

The rewards and cash prizes are to amount to $100,000, and numerous committees have been appointed to the end that the greatest possible amount of information may be obtained and placed at the service of the public. Exhibitors will be free to take part in the competitions or in the exhibition only, or simultaneously in both. An international jury on rewards will be appointed, whose members will be designated by the governments of their respective countries, and the jurymen of nations not officially represented will be proposed by delegates of the exhibitors of such nations. Foreign products designed for the exhibition may be imported with provisional right of free entry, on condition that they will be afterward exported. The exhibition buildings will cover an area of 100 acres, the permanent ones being supplemented by temporary structures of brick, iron, and glass, and the grounds being laid out in beautiful gardens.

Messrs. Armstrong, Knauer & Co., of Nos. 822 and 824 Broadway, New York City, are the authorized agents for the exhibition in this country.



THE BRUSSELS (BELGIUM) INTERNATIONAL EXHIBITION OF 1888.

Tomatoes from Cuttings.

I am very much in favor of propagating tomatoes by cuttings. If a gardener has a good variety, and is not certain that it will come perfectly true from seed, the best plan is to keep up the stock by cuttings. The earliest fruits in spring are readily secured from plants rooted as cuttings in the autumn, and grown during the winter as store plants. At the present time, tomatoes that are about to cease bearing are producing numerous shoots, and if these are taken off and inserted at the rate of from four to six in a 4 inch or 5 inch pot, they will turn out well during the early spring months. The pots should be plunged in a little bottom heat until the cuttings are rooted, then harden them off a little, and keep them afterward with pelargoniums or plants of this sort. They winter better in a cool place, away from frost, than in much heat; but they may be potted singly and started into growth very early in spring, and it is then the cuttings have the advantage over seedlings. The latter are always inclined to make very long stems; but cuttings are always dwarf, and I have proved them over and over again to be earlier and produce more fruit than seedlings. All will admit that it is an advantage to have strong tomato plants early in spring, and autumn propagation by cuttings is a certain way of securing them.—*J. Muir, in Field.*

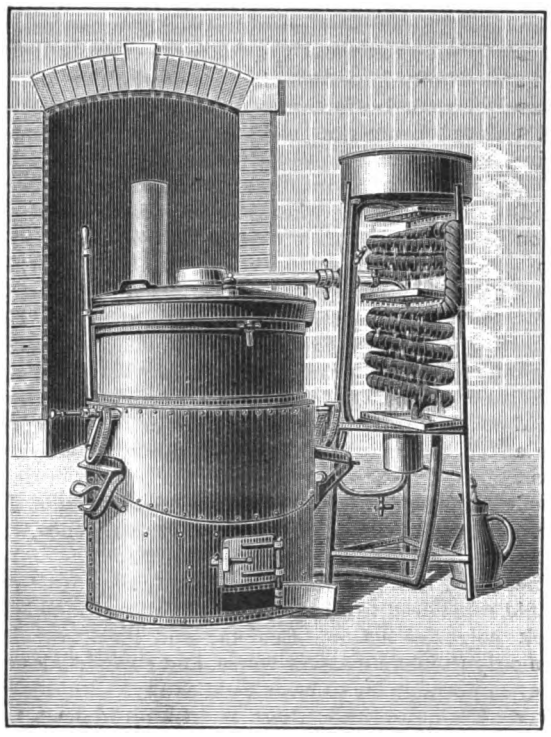
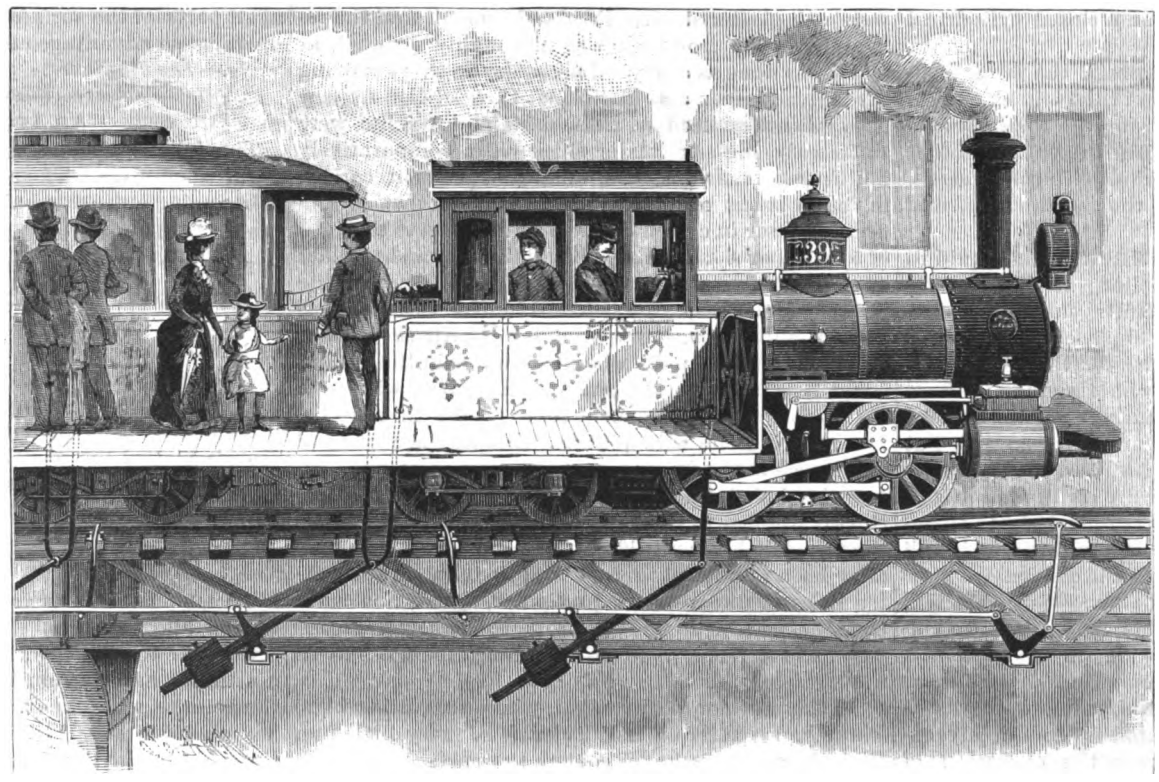


Fig. 1.—EGROT'S DISTILLING APPARATUS.

AN AUTOMATICALLY WORKING RAILROAD GATE.

A gate which is designed to be self-opening and self-closing with the movement of the cars on and off the track at stations, and which is more especially designed for use on elevated railroads, is shown in the accompanying illustration, and forms the subject of two patents recently issued to Mr. John B. Carey, a stenographer, of No. 109 Livingston Street, Brooklyn, N. Y. On the platform supports are secured a number of guides, which extend up to the outer edge of the platform, a vertically sliding gate being held between each two succeeding guides, the gates being connected at each end by a link with a weighted lever fulcrumed on a post or on a bracket secured either to the track posts or to the platform supports. From the fulcrum of each weighted lever extends an arm pivotally connected with a rod arranged horizontally along the platform, the outer end of the rod being pivotally connected with one arm of a bell crank lever pivoted on one of the track posts, and connected at its other arm by a link with the free end of a rail lever held alongside of one of the rails of the track. This rail lever is arranged in position covering the usual locomotive stopping places, and is so formed as to be acted upon only by the larger treads of the locomotive wheels, and not by those of the car wheels. Each gate link may be connected to a separate weighted lever, or the links of two adjoining gate ends may both be connected to one lever. The weights of the levers are so arranged that the levers hold the gates in a closed position and also hold the rail lever slightly extending above the rails of the track. When a train moves up to the station, the treads of the front locomotive wheels press the rail lever downward, swinging the bell crank lever, and drawing the horizontal rod forward, so that the weighted levers are swung to draw down the gates until the top edge of each is flush with the top of the platform, thus permitting passengers to pass from the platform into the cars, or *vice versa*, in the usual manner. As soon as the train starts to leave the station, and the treads of the locomotive wheels move off the rail lever, the gates move upward vertically again by the action of the weights of the levers, and the station platform is closed on its track side. Levers also extend from the horizontal bar to the track rails in such way that the passage of the train, before the locomotive reaches the rail lever, will cause the gates to move alternately up and down for a distance of about six inches, as a warning for those near them to keep out of possible danger. As a still further protection, a rod-like hand rail is held slightly out from and just below the top of the gate, being bent down at its ends and inclined inward. It is hinged on the gate at the platform edge, and is drawn down with it, but is extended in position by a spring as the gate rises, acting as a guard to keep people from crowding too closely up to the gate. Instead of operating the rail lever by the locomotive wheels, a special device located in the locomotive or in one of the cars may be employed, under the control of the engineer or a train hand, but the whole construction is designed to be simple and durable and to operate automatically.



CAREY'S RAILROAD GATE, ESPECIALLY DESIGNED FOR PLATFORMS OF ELEVATED RAILROADS.

THE DISTILLATION OF FRUITS AND MANUFACTURE OF BRANDY.

Among the fruits given us by nature some figure with advantage on our tables and others serve for the manufacture of brandy, preserves, marmalades, etc. Those of inferior quality and less pleasing aspect, and those that cannot be utilized in such a way, because of their abundance, are employed in the manufacture of fruit liquors. Through great carelessness, the larger part of such fruit is lost, thus depriving the land owner of a resource that is of no small consequence.

The distillation of fruits is an operation that is so much the more lucrative in that the law of December 14, 1875, relative to the privileges of distillers of wine and fruits, dispenses with affidavits and frees the farmer who distills the results of his harvest from inspection, and consequently exempts him from tax. The grower, then, has the best of reasons for utilizing the products of his land, since he can cheaply obtain an excellent liquor that he knows to be natural and healthful.

All fruits do not render the same proportional quantity of spirit, the proportion of the latter being greater or less according as they are more or less saccharine.

In Bohemia and Moravia, plums give a liquor called *sliwowitz*. The spirit obtained in France has a great analogy with kirsch, which is more especially produced by a small, black, very sweet cherry.

Kirsch is manufactured principally in Switzerland, in the Black Forest, and in France in Franche-Comte, the Vosges, and Meurthe-et-Moselle.

In Algeria, dates, sweet figs, and Indian figs yield an excellent liquor. Huckleberries and raspberries also are sometimes distilled, although rarely.

The method employed in the manufacture of spirits is just about the same, whether it concerns fruit with or without stones, and, moreover, it is very simple. As soon as the fruit has been collected in sufficient quantity, it is put upon an osier frame placed over a tub, and is crushed so as to make it give up all its juice, which, along with the pulp, passes into the tub. With plums, cherries, and other fruits whose stones are held back by the frame, care must be taken to throw these stones into the tub, as this is what gives the liquor that peculiar bouquet to which it owes its value.

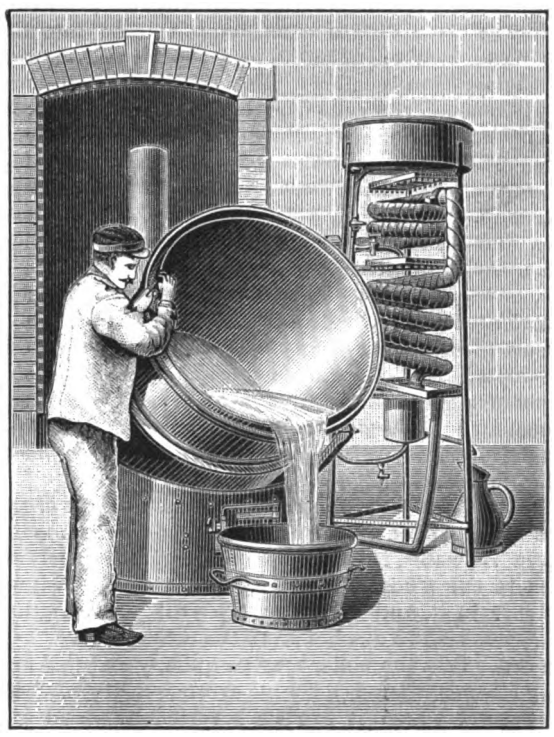


Fig. 2. MODE OF EMPTYING THE STILL.

The whole is then thrown into a fermenting tub, which is generally a cask with one head removed. Care is taken to pour in a small quantity of tepid water, in order to start fermentation, and then the cask is covered. A room must be selected that has a nearly equable temperature of between 18 and 25 degrees. The temperature of 25 degrees should never be exceeded, for, were it to be, fermentation would be arrested and the yield in alcohol would be diminished very largely. On the contrary, if the temperature were too low, the fermentation would proceed more slowly.

When the fruits to be fermented are dry ones, such as figs and raisins, they must be placed in tepid water and allowed to macerate. It is preferable to chop figs up, so that they may be reduced to a pulp. The water in which the fruit is macerated enters into fermentation in the same manner that the juice does.

The duration of the fermentation depends on the fruit. It may be eight days, and sometimes a month. Plums and cherries require from twelve to fifteen days. The cessation of fermentation is shown by the settling of the cap, which consists of grains and pellicles carried to the surface of the liquid by the disengagement of carbonic acid gas. It is likewise shown by the vinous odor that is emitted. When the fermentation is over, the liquid is drawn off and the marc is pressed in order to extract from it all the juice, and the latter is added to the liquid. In this state the juice is ready to be distilled. It contains not only the alcohol of the fruit, but also the latter's characteristic bouquet. Many routine distillers do not take the trouble to separate the solid and liquid material, but distill the whole in a pasty mass. But the spirit obtained has a peculiar, more or less pronounced empyreumatic taste, due to the boiling of the solid substances, which, despite all care, adhere to the side of the still and are burned.

The marc of the grape alone does not have to be fermented, since it is due to the fermentation of the fruit, contains alcohol all formed, and can be distilled at once, or be allowed to macerate in water, in order that it may give up its alcohol thereto. This latter method gives a better product, and one that has not the characteristic taste of marc spirits.

In the distillation of fine fruit alcohols, the liquid to

be distilled is placed in a water bath, heated by a boiler over a fire, so as to prevent an empyreumatic taste from being given to the product. In this way the liquid to be distilled can never have a temperature of over 100°, and the product will have a delicate flavor that it would be difficult to obtain by direct heating over an open fire. The drawback to this method is that it takes a long time, and is relatively costly; and it should be employed only for obtaining superior products from very ripe and perfect fruit.

The still that has been employed up to the present furnishes, on the first distillation, what is called first runnings—an alcoholic product marking 20 degrees Gay Lussac. This distillate must be put back into the alembic to be distilled anew, and the product of this second operation is called faints. This is the ordinary brandy, marking 50 or 55 degrees; so that the production of this liquor necessitates two quite long operations. This complication explains the slight eagerness that farmers display to draw all the profit possible from their crop.

Mr. Egrot is constructing a distilling apparatus that does away with all complication, and gives alcohol at once, without faints. This apparatus excited much attention at the agricultural fairs this year, where it appeared for the first time. The condenser, which is constructed according to new principles, allows of a saving of more than half in the water used for cooling in ordinary stills, and, through an analysis of the vapors, effects a separation of the aqueous from the alcoholic ones. This condenser consists of two parts. In the first, which is in the open air, the product of the distillation condenses, and in the second, which is immersed in water, it is further cooled. The part exposed to the air is so arranged that the weak vapors condense in it, and return to the still. Nothing but the vapors rich in alcohol go to the condenser.

In order that the boiler may be quickly emptied and easily cleaned, there is a simple arrangement provided, by means of which it can be inverted by hand and without any effort.

The annexed engravings show Mr. Egrot's apparatus during distillation (Fig. 1) and at the moment the spent liquid is emptying from the boiler.

The copper boiler into which the liquid to be distilled is put rests upon an iron plate furnace, from whose front a semicircular piece has been removed. The boiler is provided with an iron plate that exactly covers this space, so that, when all is in place, the furnace looks like a common cylindrical one. To the boiler are affixed two parallel cams that rest upon brackets riveted to the furnace. These brackets serve as a guide to the cams in the operation of emptying the boiler, which, to this effect, is provided with a handle. The cover of the boiler, which is convex, is provided with a flange which, when the cover is in place, enters a channel at the top of the boiler. As this channel is filled with water, an absolutely hermetical joint is formed. The cover is connected with the condenser by a steam-tight coupling that is capable of being maneuvered almost instantaneously.

On a tripod of galvanized iron, surmounted by a reservoir of water, is placed a part of the condenser, consisting of straight copper pipes connected at the ends by elbows, and forming a worm. This part of the condenser is connected with a worm of very small size, immersed in water contained in a closed cylindrical vessel.

The condensing is effected through the water contained in the reservoir at the top of the tripod. From thence a pipe leads the water to the lower worm, where it gets heated in cooling the brandy. Another pipe leads it to a number of small distributing vessels, whence it falls in a shower on the large worm, and evaporates.

The operation of distilling is simple. The liquid to be distilled is poured into the boiler. If it is a question of distilling the marc of fruits, such as grapes, apples, and pears, care is taken to place a copper grating at the bottom of the boiler for the purpose of preventing the solid substance from touching the bottom and getting burned. A quarter of its bulk of water should be added to the marc The cover is put on, the joint is sealed with water, the worm is connected with the cover, and the fire is lighted in the furnace. The distillation then begins, and three-quarters of an hour afterward the liquid will be in full ebullition and vapor be entering the condenser.

When the separation of the first vapors is effected, those that are rich in alcohol condense, and are collected, on their exit from the worm, in the form of a very limpid spirit, fit for consumption. About three hours after setting the still running, the operation is finished, and the liquid treated is completely exhausted of alcohol. Then comes the operation of emptying the boiler.

The empty boiler is held in an inclined position by a simple device, and it can be very readily cleaned. When the cleaning has been effected, the boiler is placed in position on the furnace again, and is filled for another operation. It takes but one man to operate this still. On another hand, as the spirit obtained is without faints, it is better, and the cost of manufacture is reduced. The same is the case with the condensing water, the quantity of which used is scarcely half that necessary in the old style of apparatus.—*La Nature.*

The Preservation of Iron and Steel Ships.

The inner surface of the side and bottom plating in the earliest iron ships was protected by paint only against corrosion and such other wasting influences as might operate on the interior of the vessel. It seems to have been considered at that time the greatest wear and tear would take place on the outer surface of the vessel below the water line, and that it was sufficient on the inside to simply paint the surface of the iron, and lay close ceiling upon the frames as high as the upper turn of the bilges to form a platform for the cargo and keep it clear of the bilge drainage. But ship owners were not long in discovering that whatever might be the ultimate durability of the bottom plating, the wear and tear from corrosion proceeded at a much more rapid rate on the inside than upon the outside of the vessel. This was seen to be particularly the case in the flat of the bottom, where the inner surface of the plating and the rivet heads were exposed to the continual wash to and fro of bilge water with every roll of the vessel. This action was much intensified when hard substances, such as fragments of ballast and lumps of coal or other portions of cargo, found their way into the limbers; and as these accidental droppings through holes in the ceiling, or by reason of inattention when limber boards were lifted, proved to be of common occurrence, it became evident that some steps should be taken to provide greater protection to the inner surface than was afforded by two or three coats of paint. Among other means which were adopted, the employment of a thick layer of asphalt seemed for a time best calculated to meet the circumstances of the case. But after a time it was found that asphalt was not a stable protection, especially in the machinery spaces of a vessel. With a moderate rise of temperature the asphalt became sufficiently fluid to "run," and when a vessel had much rise of floor the protecting material would slowly leave the bilges and accumulate toward the middle line. Even the increase in temperature of such cargoes as grain or wool when stowed in the hold would at times be sufficient to soften the asphalt, and consequently expose a large area of the bottom plating, with its rivets and butt straps, to the wasting action of the bilge water and whatever hard substance might happen to be lying in the spaces between the frames. Ultimately, after trying various materials, the shipping community by common agreement pronounced Portland cement to be the most trustworthy substance with which to protect the horizontal portions of the inner surface of an iron ship's bottom. At the present day scarcely any other covering than this is employed, the only variation being in the proportion of sand which is added to the cement and in the extent to which such substances as brick, broken tile, and coke are incorporated with the cement at places requiring a more than ordinary thickness of the protective material.

The internal structural arrangements in the early iron ships were very simple, so that when the inner surface of the bottom and the frames below the bilges were well plastered with Portland cement, and the remainder of the ironwork was thoroughly painted, as much was done as appeared necessary to avert wasting through corrosion and attrition. Competition for cargoes was not so keen in those days, and freights were sufficiently high to render shipowners comparatively indifferent regarding the weight of cement carried in the bottoms of their ships. It was not at all unusual to pour in cement between the floors to a height of 5 inches or 6 inches at the middle line, and to place at least an inch of cement where it was thinnest at the bilges. An advantage was found in this, inasmuch as a flush surface was prepared level with the limber holes in the floors, upon which the water in the limbers could flow freely to the pumps. Moreover, with such a great thickness of cement to be worn through before reaching the skin plating, the presence of hard substances in the frame spaces became a matter of comparative indifference. It was when the cement was thickly applied to this extent that recourse was sometimes had to broken bricks, tiles, and coke, to economize both in regard to cost and weight. At the extremities of the vessel, in particular, spaces not sufficiently accessible to be kept properly clean and painted were, and still are, filled with a conglomerate of this kind.

On the interior of the vessel, where exposed to bilge water or to water ballast, paint is of very little use. Most ship owners have coated the surfaces at these parts with "cement wash," or, in other words, with a very fluid preparation of Portland cement laid on with a brush. The same kind of coating has often been laid upon the upper surface of inner bottom plating, and with fairly good results. Elsewhere within the vessel iron or steel work should be painted, the thoroughness of the painting and the number of coats applied being of greater importance than the nature of the paint itself, which may be red lead, iron oxide, or white zinc, just as suits the taste of the person paying for it.

Although "cement wash" has proved a fairly satisfactory protection to the iron or steel work at the parts already referred to, yet recent experience tends to show that more advantageous results follow the use of Stockholm tar and Portland cement. The surfaces coated must in all cases be free from oxidation and quite dry. If at all damp, the intended protection rapidly falls off. The surfaces are first coated with Stockholm tar, and at once sprinkled with dry cement powder until as much cement is applied as will stick to the tar. The tar and cement speedily amalgamate and slowly set; but when set, the protection is quite hard and wholly impermeable to water. The upper surfaces of inner bottoms may advantageously be covered with this protection, more especially when under engines and boilers. Indeed, the wear and tear to inner bottom plating below machinery and boilers has been found to be so great that in all probability the placing of double bottoms at that part of the vessel will, to a large extent, be avoided in the future. The wasting of double bottoms has become a serious question with the owners of some lines of steamers and with the committee of Lloyd's Register. Unless some means can be taken to check the corrosive action which is so destructive at that part of the vessel, it will be necessary to add considerably to the scantlings in order to provide a sufficient margin for possible and probable deterioration. The Stockholm tar and Portland cement remedy appears so far to meet the necessities of the case, and it is to be hoped that further experience will confirm present expectations regarding it.

Uncovered iron and steel decks continue to waste at a rapid rate, despite all the attempts hitherto made to check corrosive action. Coal tar and black varnish seem only to make matters worse, and the "let alone" policy appears so far to be as good as any. Singularly enough, the more traffic there is on an iron deck, the less the wear and tear is found to be. At the sides of large hatchways, for instance, the corrosion is less than at parts of the deck where men seldom walk. It is not difficult to explain this phenomenon. As is well known, oxidation of iron progresses most rapidly in the presence of existing rust. The rust of copper prevents further corrosion, and only by the constant exfoliation on the surface is the bottom of a copper sheathed ship kept clean. If that exfoliation is checked, the substance of the copper is preserved from wasting, but at the cost of a foul bottom. With iron the case is different. Oxidation engenders further oxidation, and hence the necessity for frequently scaling the surface of iron which is permitted to oxidize at all. The wear and tear of traffic near the hatchways wears away the scale of rust as it is formed, and consequently corrosion proceeds more slowly there than elsewhere on the iron deck. The constant falling of salt water on the deck is undoubtedly the cause of its rapid corrosion, and up to the present time no means appear to have been successful in keeping the water from acting on the surface of the iron. Probably, the Stockholm tar and Portland cement remedy would be as efficacious as any if it were hard enough to endure, but that is doubtful. Under present circumstances, the best course seems to be to scale the deck frequently, and so imitate at all parts of the surface the action which nominally operates so advantageously at the sides of the hatchways.—*The Engineer.*

An Aerolite Hoax.

The following clippings from recent exchanges explain themselves. The aerolite as a subject for hoaxes is becoming antiquated already.

From the New York Sun, Nov. 19, 1887.

FALL OF AN AEROLITE WEIGHING THREE TONS.

AMSTERDAM, N. Y., Nov. 18.—The *Recorder* this evening says: "An aerolite weighing three tons dropped with a loud report in front of the Merchants' National Bank, on East Main street, at 11:20 this morning, making a deep indentation in the ground. Great excitement was created by the occurrence, and large crowds viewed the celestial visitor. Local experts find traces of iron, nickel, aluminum, and other metals in the aerolite. The Dudley Observatory has been notified by telegraph of the meteor's fall."

From the Amsterdam Democrat, Nov. 19.

"A man came down from Fort Hunter this morning to see the 'aerolite.' A meteorologist from Troy arrived in town to-day, having come in haste, without his dinner, and was much disappointed when told that the aerolite was a hoax. It is also stated that a party are on their way hither from Philadelphia. A big stone did fall in the place indicated. The only trouble is that instead of falling from the sky, a wagon which was loaded broke down with it. That's all, but it rather spoils the sensation."

The conclusion reached by the Amsterdam journalist is ingenious, to say the least. The finding by the local experts of "traces" only of iron, nickel, and aluminum in the supposed celestial missile is suggestive of a discrepancy.

A New Electric Welding Apparatus.

The electric welder invented by Professor Elihu Thomson, which was described and illustrated in the SCIENTIFIC AMERICAN of November 26, 1887, has already found a rival in an apparatus devised by Messrs. Nicolas de Bernardos and Stanislas Olszewsky, of St. Petersburg. *Industries* gives the following:

The new method, which was invented almost simultaneously with that of Professor Thomson, has during the last few months been elaborated so as to render it applicable in cases where Thomson's welder cannot be used. The action of both instruments is based upon the conversion of electrical energy into heat in that place in the circuit where the resistance is greatest; but while in Thomson's welder this resistance is merely that of an imperfect contact between the materials to be welded, in the new apparatus it is that of an electric arc, and therefore considerably higher. As a natural consequence, Thomson's apparatus must work with very large currents of low e. m. f., and for convenience alternating currents are used, while that of Messrs. Bernardos and Olszewsky works with moderate continuous currents at a comparatively high e. m. f.

The first experiments were made about a year ago in the electric workshops at Creil, and were so successful as to induce Messrs. Rothschild, of Paris, to acquire the patent rights for several Continental countries. Further experiments were carried out last summer by Messrs. Garbe, Lahmeyer & Co., at an industrial exhibition at Aix-la-Chapelle, which the writer witnessed, and at the present moment experiments on a still larger scale are in progress at the laboratory of the "Germania," a marine engine works in Tegel, near Berlin. The process is as follows:

The joint of the two metals which are to be welded together is connected with the negative pole of a dynamo or other source of supply, the positive pole of which is formed by a carbon pencil. Under the heat of the arc the two metals are melted at their junction and fused together, the carbon being handled very much in the same way as a blowpipe. It is necessary that the current should pass from the carbon to the metals, as otherwise the latter would be volatilized. The metals do not oxidize, but through the presence of the carbon a slight reduction takes place. In this manner it is possible to join copper and iron, or steel and iron, or any two similar or dissimilar metals. The idea of thus welding by means of the electric arc is not new, but the inventors have elaborated the apparatus so as to make it commercially applicable. How small is the chemical change produced by the action of the arc at the joint is shown by the following table given by the inventors:

Composition of material.	Steel.		Iron.	
	Before welding.	After welding.	Before welding.	After welding.
Carbon..... ...	0·48	0·25	0·34	0·14
Silicon.	0·04	—	—	—
Manganese.....	0·50	0·25	0·50	0·23
Sulphur.....	0·04	0·04	0·14	0·09
Phosphorus....	0·08	0·07	0·12	0·11
Iron.....	98·86	99·39	98·90	99·43

It is necessary to carefully adjust the current to the work in hand, for if the current be too large a portion of the metals is volatilized, and if too small fusion does not take place, because the heat has time to flow away through the body of the metals. This adjustment is provided for by the use of secondary batteries and a suitable regulating switch to vary the number of cells in circuit. In the laboratory above mentioned, there is installed a dynamo giving 120 amperes and 175 volts, which is used for charging 280 accumulators grouped in four parallels. The plates of these cells are constructed in a similar manner to the Khotinsky accumulator, which made a brief appearance and then vanished again some few years ago. They consist of a lead frame, serving as a support for thin lead tapes alternately corrugated and straight, placed side by side within the frame. Since the dynamo is always kept running, storage capacity is not of so great importance in this process as the ability of the cells to discharge very large currents for a short time. The inventors employed at first e. p. s. cells, but finding that their greatest merit, which consists in large storage capacity, was not of much use in this particular application, they reverted to the type above described, which more nearly approaches the original Plante cell. Owing to the reducing action of the carbon, it is possible to weld metals even if they be coated with a slight layer of oxide, and in no case is any cleaning of the joints necessary. To give an approximate idea of the energy required in this process, it might be mentioned that during the experiments above cited a lap joint between iron sheets of 2 mm. thick was welded with a current of 15 amperes supplied at 65 volts pressure. Thin lead sheets can be welded by the use of from two to five cells, the carbon pencil in this case being 5 mm. diameter. It is also possible to perforate metal plates by the arc, the carbon pencil being simply pushed through the plate as fast as the metal melts, and the writer has seen a lap joint of two ⅜ in. boiler plates, in all ¾ in. of metal, thus perforated. It is remarkable that the perforation can also be carried on under water.

One application of this invention is the welding of the heads in wrought iron petroleum casks, and it may also be used for repairing cracks or faulty places in iron or metal castings. Although the apparatus is very much more costly and considerably more cumbersome than that of Professor Elihu Thomson, it has the great advantage of being applicable to almost any kind of welding which may be required in metal work.

HOTEL PONCE DE LEON.—[See first page.] *

American Export Trade.

Our manufacturers have been so accustomed to finding a good market at home for their products that less attention than is desirable has been paid to the extension of their foreign trade; nevertheless, the great superiority of many articles of American make has created for them a wide and rapidly increasing foreign demand. Mexico, South and Central America, South Africa, and the Australian colonies are among our best customers. Canada we already look upon as a home market.

South Americans will probably continue to be more permanent, though at present less important, customers for us than are the Australians, who are too "Yankee" to remain long indebted to any foreign country for what they can themselves produce. They buy our stamp mills and some other articles only to imitate them in their own machine shops; but there is always something which cannot be imitated and which characterizes American machinery, namely, the embodiment of the lessons of experience. In mining machinery and appliances, there can be no set type best adapted to all conditions, and those who simply copy an American stamp mill may be very far from securing American practice. There are modifications from the main type which are suggested by experience in the treatment of each different kind of ore, and it is this varied experience, and the characteristic genius in adopting suitable means in the solution of new problems, which give rise to those variations in details which alone enable the person to attain the best and latest American results.

From the British consular reports, as published in the *Engineer*, we find that American exports to Chili have increased in the ten years, 1875 to 1885, 43·8 per cent, being exceeded in percentage only by the growth of German exports. Among the articles in which we show a large increase are agricultural implements, 356 per cent increase; carpenters' tools, 85 per cent; hardware, 391½ per cent; iron nails, 56½ per cent; machinery, 196 per cent; plows, 35⅓ per cent; thrashing machines, 13½ per cent; wire nails, 800 per cent. These figures show a very gratifying growth in a but slightly cultivated field.

In Australia and South Africa we have made great progress, the more enterprising people being wisely desirous of obtaining "the best" of everything. The pages of the *Engineering and Mining Journal* are constantly telling of the sending of quartz mills, Krom's steel crushing rolls, concentrating machinery, smelting plant tools of all kinds, and American experts to manage these things, to all the Australian colonies—the two great Australian bonanzas, the Mount Morgan gold mine and the Broken Hill silver lead mines, being among our largest customers. South Africa, the rich gold mines of the Transvaal in particular, are getting mining machinery in this country, and from all sides comes testimony to the fact that American machinery, tools, and appliances, when purchased through responsible houses, are more reliable and give far better economic results than those made in any other country.

In the *Australasian Ironmonger* we note long lists of American goods which are highly commended; among these are saws, spades, shovels, picks, weighing machines, Rand rock drills, "the most popular drill in New Zealand and, perhaps, in the other colonies," rackarock, axes, Worthington's steam pumps, mill machinery, American stoves, "always growing in popularity," tram cars, barb wire, lager beer, and innumerable other articles.

There are numerous references in our Australian exchanges to the great mining records, almost equaling our own, made with the Rand slugger drills and rackarock. In fact, we have before us a list of no less than thirty-one different parties in New South Wales, Victoria, Tasmania, and Queensland that are using these deservedly popular American drills and explosives.—*Eng. and Min. Jour.*

Emission of Light by Solid Incandescent Bodies.

It is generally admitted, according to the researches of Draper, that when a solid body is heated it begins, at about 525° C., to emit red rays, to which are successively added radiations more and more refrangible as the temperature increases. The investigations of M. Weber have led to different results.

By observing, in an absolutely dark room, either an incandescent lamp, excited by a current of gradually increasing intensity, or plates of different metals heated by a properly adjusted Bunsen burner, he found that the emission of light begins at a temperature much below that which we have mentioned, with the production of very pale gray rays, whose refrangibility is equal to that of the yellow and greenish yellow rays of the central spectrum. As the temperature rises the light emitted grows yellow and gives in the spectroscope a wide gray band, whose center is tinged with grayish yellow. At low red, a narrow red line appears at one side of this band, and almost at the same time a green band, large and of slight intensity, appears at the other side. The temperature still rising, the spectrum spreads both toward the red and green ends, and M. Weber further ascertained, by means of a thermometric element soldered to the plates, that the first traces of gray light are emitted at a temperature varying with the nature of the plate, about 396° C. for platinum and 377° for iron.—*Revue Scientifique.*

* Views of the Hotel, the Alcazar, and other St. Augustine improvements will be published in the January number of the SCIENTIFIC AMERICAN ARCHITECTS AND BUILDERS EDITION.

ENGINEERING INVENTIONS.

A car brake and starter has been patented by Messrs. Amos M. Vereker and Stephen M. Yeates, of Dublin, Ireland. This invention covers devices which act automatically to store up force while acting as a brake to stop the car, so that it will be available for starting the car again when required.

A railway clamp plate has been patented by Mr. Thomas J. Bush, of Lexington, Ky. This invention covers a special construction of plate in combination with interlocking bolts inserted into diagonal intersecting holes made in the cross tie, being an improvement on a former patented invention of the same inventor.

A car coupling has been patented by Mr. Gustav J. Selk, of Monico, Wis. This invention provides a coupler which can be readily attached to any car, and which can be used in connection with the old pin coupler without alteration, automatically coupling with an opposing coupler, while the cars may be coupled either from the sides or the top.

A safety attachment for railway car heaters has been patented by Mr. Edwin C. Rowe, of Bellefonte, Pa. This invention relates to that form of car stoves in which the jar of the collision or tilting of a car automatically dumps the grate and also the bottom of the stove, dropping the hot coals entirely through the bottom of the car and out upon the ground.

A car coupling has been patented by Mr. Samuel A. Young, of Washington, D. C. This invention covers a novel construction to effect the automatic dropping of the pin on the entrance of the link, and also simple means for adjusting the outer end of the secured link, in order that it may properly enter drawheads of different heights.

A motor for street cars has been patented by Mr. William H. Patton, of Pueblo, Col. Its construction is such that the drive power may be operated at full speed at all times, and its motion transmitted to the axles in any desired degree, or so as to revolve the same in either direction, the power being afforded by either gas or steam engine or other motor, and the invention covering various novel features and combinations of parts.

AGRICULTURAL INVENTIONS.

A coupling for cultivators has been patented by Mr. Peter Rader, of Kirklin, Ind. This invention relates especially to corn cultivators, and covers a device for coupling the shovel beams to the arch of two-horse cultivators, being light, strong, and inexpensive, and adapted to be adjusted horizontally on the arch.

A manure scraper for plows has been patented by Mr. Adolyph Zerrenner, of New York City. It consists of a straight vertical runner with its rear end widened and concaved outwardly to form a deflector, and adapted to be secured to a plow beam with the vertical runner directly below and approximately parallel with the beam, the device being easily attached and detached and adjusted to the beams of different plows.

MISCELLANEOUS INVENTIONS.

A tobacco box has been patented by Mr. Austin L. Gresham, of Kingsland, Ark. It is so made that the tobacco will be in sight and yet be protected from the atmosphere and from dust, flies, etc., while the tobacco will be as readily accessible as in the old style of boxes.

A hand loom has been patented by Mr. Charles N. Newcomb, of Omaha, Neb. It is intended especially for weaving rag carpets, and in its general construction is much as usual, but the invention covers various novel features of combination and the arrangement of parts.

A folding stacker has been patented by Mr. Charles Saunders, of Cape Vincent, N. Y. It is made in sections which may be folded upon themselves for removal from place to place, but the construction is such as to admit of a proper adjustment and support of the stacker sections by a single operating rope or cord.

A broom holder has been patented by Mr. Charles W. Love, of Fairpoint, Ohio. It is made of one piece of wire, so formed and bent as to have a trefoil base and a right-angularly projecting pair of curved gripping jaws or fingers with coils therein, to be secured to the wall and conveniently hold a broom or brush, etc.

A bung has been patented by Mr. Michael R. Mayer, of Zanesville, Ohio. A bung provided with a lug is hinged to the bung hole, a plate being hinged to the vessel provided with a lug and arranged to lie over and upon the hinged bung, a locking bolt engaging the lugs of the bung and plate.

A mail bag has been patented by Mr. Carey F. Kizer, of Westville, Ohio. This invention covers a special formation and construction of the mouth of the pouch, whereby it may be readily and easily closed and opened, requiring no straps and but one staple, the fastening being secure and durable.

A cash box has been patented by Mr. Benjamin C. Foster, of Baltimore, Md. It is made of sheet metal, in two sections, hinged at their edges, the parts being arranged in a novel way, with reference to convenience, safety, compactness, and easy portability, in the keeping of bills and fractional currency.

A fence has been patented by Mr. Jacob M. Bosart, of Sumner, Ill. This invention provides a fence wherein wire may be conveniently used in addition to rails, wherein but few posts are buried in the ground, and whereby the fence may be set up and taken down again with celerity and ease.

A lounge has been patented by Mr. George Hoffman, of Mount Vernon, N. Y. It has a reversible back, so that when desired the lounge may be easily and quickly changed from a right to a left hand lounge, and *vice versa*, and there are various novel features of construction and the combination of parts.

A harness buckle has been patented by Mr. John H. Neill, of Sinclairville, N. Y. It is adapted more particularly for use on the crupper and hip straps of harness, being so made as not to catch the horse's tail, and so the line will not be caught under it, and at the same time to prevent the line from being caught under the end of the hip strap.

A miner's lamp has been patented by Mr. John L. Morris, of Middleport, Pa. Combined with the lamp is a double hook formed of a doubled or looped wire having its ends bent over into outwardly projecting beaks or points, one of which is longer than the other, whereby the lamp is more readily inserted in the hat and more steadily held in place.

A wagon jack has been patented by Mr. Anthony O. Stiveson, of Pomeroy, Ohio. This invention covers a novel construction and combination of parts in a jack having a stationary standard firmly mounted in a base block, making a wagon jack which is convenient and effective and has an extensive range of use.

An apparatus for purifying and separating fatty substances by electricity has been patented by Mr. Heinrich F. D. Schwahn, of Kansas City, Mo. Combined with a closed cylinder provided with steam inlet pipes in connection with a boiler is an electric separator suspended therein, in connection with a battery, with other novel features.

A spring roller has been patented by Mr. Eucher Gres, of Tombstone, Arizona Ter. It is of that class wherein a casing secured to the curtain roller incloses a drum and spiral spring, one end of the spring being attached to the pivot on which the casing turns, the invention covering a novel construction and combination of parts.

A water back for gas heaters has been patented by Messrs. John T. and Errett E. Phillips, of New Castle, Pa. It is applicable for use in connection with the ordinary form of gas heater, and provides for a proper moistening of the atmosphere of the apartment, and also for a decrease in the amount of gas required for heating.

A fire escape and water tower has been patented by Mr. Maurice J. Hart, of New Orleans, La. It is to be located at street corners, and has floors or platforms with movable bridges for establishing connection with the buildings, and is furnished with a stand pipe with lateral branches for conveying water to different heights for fire extinguishing purposes.

A baling press has been patented by Mr. Abijah Simpson, of Lapeer, Mich. It is a simple and inexpensive device for compressing hay, straw, cotton, and similar material, there being combined with the baling box and plunger a shaft in the forward part of the case, with a loosely mounted drive wheel and a sweep pivoted on the shaft, with other novel features.

A tent pin extractor has been patented by Mr. Henry M. Hyde, of Princeton, Ill. It consists in a rectangular box-like frame adapted to engage a tent peg, having its forward end beveled, and a detachable connection between the frame and the handle of a mallet, whereby a tent pin may be readily drawn from the ground.

A buckle has been patented by Mr. William J. Walters, of Prospect, N. Y. It is a suspender buckle in which the frame has a cross bar and a clamp sliding on the side bars and pressing the web of the suspender upon the fixed cross bar, the clamp being connected with the suspender straps, holding the web of the suspender firmly as the pull is increased.

A buckle has been patented by Mr. Charles R. Harris, of Williamsport, Pa. The frame of the buckle has applied to it a sliding roughened or toothed cross bar for holding on a suspender web or band passing through the buckle, there being also a face bar applied to the buckle below the toothed or back cross bar, for use in connection with the latter.

A box loop has been patented by Mr. Martin L. Hickle, of Dyson's, Ohio. It is for retaining the free ends of straps secured by a buckle, the loop being formed with its top plate made to open to enable the strap to be conveniently placed in and removed from it, and provided with a catch or fastening by which it may be secured closed.

A galvanic battery has been patented by Mr. Horatio J. Brewer, of New York City. Combined with the cell is a division plate, dividing the cell into two compartments, one larger at its upper end to form sufficient space for the head of the negative electrode and for conveniently packing the negative material around the negative electrode, with other novel features.

A thill coupling has been patented by Mr. Samuel Forter, of Marysville, Kansas. It consists of a bolt passing through the apertured ears of the clip and through the shaft end, the bolt having on one end an extension on which is formed a bar extending parallel with the bolt, and having on its outer end a curved angular arm adapted to engage the outer face of one of the ears of the clip.

An invertible microscope has been patented by Mr. Edward Rausch, of Rochester, N. Y. The stand has an arm adapted to receive a doubly reflecting prism, the arm being arranged to hold the main tube in two positions, and to receive and hold the prism, making a microscope which may be employed either as invertible or vertical instrument without any material change in the adjustment.

A magic lantern has been patented by Mr. William H. Ridding, of Brooklyn, N. Y. It consists of an extensible frame with a condenser holder and slide holder, and having an objective holder connected with the slide holder by a bellows, there being a centrally apertured cap adapted to fit over the condenser holder and receive the casing inclosing the source of light, with other novel features.

A portable elevator has been patented by Mr. Samuel C. Derby, of Ashley, Mich. Combined with a guide frame having parallel side beams and a car mounted to slide thereon is a stop on the lower part of the guide frame, a part on the car projecting between the side beams and adapted to strike the stop, the device being readily folded up and adapted for use in lieu of the ordinary ladder.

An air ship has been patented by Mr. Charles H. Morgan, of Gunnison, Col. It is constructed with a series of longitudinal tubes adapted to hold concentrated gas, bent to a spherical or bird like shape, secured at their extremities to end ribs, together with a series of transverse oval ribs, between which and the longitudinal tubes is fitted an inner inclosing silk or metallic wall, with various other novel features.

A hand grip tester has been patented by Mr. John M. Reiners, of New York City. It has opposing dials supported by standards, a pinion pivoted between the dials carrying indicating fingers, a rack sliding in the standards, a spring adapted to bear against the standard and arm, making a simple and accurate device for registering the grip of the human hand.

A logometer has been patented by Mr. Charles Sperry, of New York City. It provides a registering mechanism to be operated and regulated by mechanism indicating uniform time, on vessels, in combination with a speed-indicating mechanism, the register showing the distance the vessel has covered since starting, thereby making a complete logometer to constantly indicate uniform time, the speed of and the distance run by the vessel.

A brake for children's carriages has been patented by Mr. James H. Peterson, of Brooklyn, N. Y. Combined with the axle and hub of one wheel is a bracket adapted for attachment to the axle, apertured to receive one end of a brake strap, a brake strap being adapted to encircle the hub, so the brake can be quickly applied from the handle, and the carriage may be left upon an inclined surface without danger of changing position.

Graphite Bushings.—Put them on all loose pulleys.

Patent Rights for Sale. Apparatus for building Concrete Buildings and Walls. County rights, $50. State rights, $500. See descriptive notice in SCI. AMERICAN, May 22, 1886. Send for circulars. Ransome, 402 Montgomery St., San Francisco, Cal.

Best belt hooks are Talcott's. Providence, R. I.

Send for new and complete catalogue of Scientific Books for sale by Munn & Co., 361 Broadway, N. Y. Free on application.

NEW BOOKS AND PUBLICATIONS.

SCREW THREADS AND METHODS OF PRODUCING THEM. By Paul N. Hasluck. London: Crosby, Lockwood & Co. 1887. Pp. 79.

In this little work, which as regards form is strictly of vest pocket size, is given a practical treatise on this important subject, adapted for the mechanic. Dies and die stocks, screw cutting on lathes with chasers and on engine lathes, and tap making are all succinctly and clearly treated. The illustrations are numerous; they are fifty in number. Eight tables of Whitworth and other gauges, decimal equivalents, etc., follow. The book may be confidently recommended as a true *vade mecum* to the thinking machinist.

THE PRESERVATION OF FISH. By J. C. Ewart, M.D. London: Charles Griffin & Co. 1887. New York: Scribner & Welford. Pp. ii, 45.

This valuable and interesting little monograph treats of the prevention of putrefaction in fish. The relative keeping qualities of fish caught in different ways, as by trawl or hook, are examined, and conclusions reached as to the best method of catching fish for market. The general conclusions are in favor of the hook. Some remarkable instances of the disregard fish pay to the hook are quoted. Codfish are cited that after being held for three weeks on a set line seemed as lively and happy after the expiration of the period of captivity as ever. The great point seems to be that the fish needs to have unimpeded gill action. As long as his breathing apparatus is untouched, he seems not to mind the hook. Byron's lines about Izaak Walton,

"I wish the cruel old coxcomb in his gullet
Had a hook fixed with a small trout to pull it,"

lose much of their force in the light of the experiences cited by Mr. Ewart. On the whole, the book may be recommended to all fishers as of very general interest and as disclosing a comparitively new line of research.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(1) H. P., Jr.—For browning gun barrels: Mix 16 parts sweet spirits niter, 12 parts saturated solution of sulphate of iron, 12 parts chloride of antimony. Bottle and cork the mixture for a day, then add 500 parts water, and thoroughly mix. Clean the barrel to a uniform grain free from grease and finger stains. Wipe the barrel with the staining mixture on a wad of cotton. Let it stand for 24 hours, scratch-brush the surface and repeat twice. Rub off the barrel the last time with leather moistened with olive oil. Let it dry for a day and rub down with a cloth moistened with oil to polish. There is an excellent book on gun work, the "Gunsmith's Manual," which we can furnish for $2.

(2) B. H. K. asks addresses of manufacturers of traction engines, for which we refer him to the announcements in our advertising columns.

(3) I. P.—Soundings in the Pacific Ocean have been made to the depth of from 5,000 to 6,000 fathoms. The deepest sounding known was made in the South Atlantic Ocean, being 7,706 fathoms, about 8¾ miles. Iron was used for the sinker; both lead and iron sink rapidly to the greatest depths. The pressure at a depth of 5 miles is 11,000 pounds per square inch.

(4) T. H. writes: I want to fill a cistern with a force pump, a distance or height of nineteen feet. Which will require most pressure—to fill from the bottom or top of cistern, and what is the difference? A. It takes a trifle less power to fill at the bottom, the difference in pressure per square inch being equal to forty-three one-hundredths of a pound for each foot of distance between the surface of the water in the tank and the filling spout at the top of the tank.

(5) W. S. C. asks: What is meant by the crank of an engine being ahead of the steam? A. Crank is ahead of the steam when it passes the center before the steam port opens.

(6) J. C.—You may cast solid Babbitt boxes on an iron spindle turned smooth and with a slight taper. Paint the spindle with whiting and water and heat to thoroughly dry the whiting before inserting in the iron box. Cast, and when cold the spindle will easily drive out. There are machines for repairing valve seats and disks to be had through the machinist supply trade. Make buffing wheels of sole leather. The form of the iron you have to finish should suggest the form of the buff wheel surface.

(7) W. T. P.—Water gauge glasses should not necessarily break oftener after cleaning than otherwise. Iron rods or wire should not be used in cleaning the glasses. Better use a pine stick with a wad of cotton cloth upon the end, not large enough to press the glass, or a string with a wad tied in the middle, so that the wad may be pulled both ways. The peroxide scale on iron rods or wire is hard and liable to make minute scratches upon the inside of the tubes. There is always a strain upon the inside surface from defective annealing, which by the least scratch will cause fracture.

(8) C. M. H.—To compute the centrifugal force of a fly wheel: Divide its velocity in feet per second by 4·01, also square of quotient by diameter of circle. This quotient is the centrifugal force, assuming the weight of the rim as 1. Then this quotient multiplied by the weight of the rim in pounds will give the centrifugal force in pounds. For approximate accuracy the center of the rim may be taken as the point of measurement. Divide the whole centrifugal force by the numbers of arms for the force on each arm, or by the area of all the arms in square inches for the force per square inch in each arm.

(9) H. F. B.—The rubber for band saw wheels should be made in rings and stretched on. You may also wind the rubber in thin strips around the groove with rubber cement. The rubber should be what is called pure gum in the trade. Gum and cement can be procured through the rubber trade. After winding and cementing the strips as a solid piece, and tying the end down, the wheel should be placed in a warm place to dry, for a day or two. Leather is sometimes used when rubber cannot be readily procured. You cannot glue rubber to stand.

(10) I. B. S. writes: In a railway curve say of two miles, the outside rail would be about 150 feet longer than the inside rail; now, how does the locomotive make the above curve, and the outside drivers travel 150 feet more than the inside drivers when the two driving wheels are compelled to make the same number of revolutions? A. The wheels slip on the rails, the slip occurring with the wheels having the least friction as governed by the pull of the engine. As, for instance, when the engine is pulling hard around a curve, the inner wheels slips. When running free with steam shut off, a slight difference in the condition of the rails may make the slip on either side. When two or three pairs of driving wheels are connected, the slip takes place on all alike. With the standard railroad gauge, the difference in the length of the inner and outer rail on a whole circle curve, great or small, will only be about 29½ feet. Very few curves are greater than ⅛ of a circle, which will make only about 44 inch slip for the whole length of a ⅛ circle curve.

(11) C. H. P. writes: I have a well, distant about 300 feet from a stream of water. The bottom of the well is about 10 feet deeper than the stream; the well is used to supply a 15 horse power boiler, but the supply is insufficient. Can I siphon water from the stream? If so, how? A. Provided that you do not have to make the apex of the siphon more than 28 feet above the stream, you can lay the pipe, protected from freezing, from the stream to the highest point. There insert a tee, and continue the pipe to below the surface of the water in the well. Connect the outlet of the tee with the pump. If convenient, place a valve each side of the tee in the main pipe, to control the direction of the supply. Make all air tight, open the valves and pump the air out, when the water from the stream will flow to both pump and well. The pump will always keep the siphon free from air. Use the same size pipe as now used for the well connection.

(12) F. M. P. writes: Is there anything that I can apply to a crank pin bearing of a steam engine to keep it from cutting when it gets hot? The bearing is brass against steel. Also will said bearing have a tendency to wear to an oblong shape? A. Use powdered graphite (black lead) in small quantity, mixed with the oil. The trouble may be due to the poor quality of the oil used. Much of the lubricating oil on the market is unfit for engine bearings. By mixing the best lubricating oil that you can get with sweet lard oil, you will much improve your lubricant, and probably get rid of your trouble. The crank pin has a slight tendency to wear out of round by the unequal pressure and abrasion from heating.

(13) H. M. M. asks how to cook hominy to give it a snow white appearance. A. Use hominy made from white corn only. Boil in a porcelain-lined vessel with water free from iron.

(14) G. H. P.—Naphtha and gasoline are not easily managed in a blowpipe for glass. Use the best lard oil with a wick ¾ inch in diameter. Use a common brass blowpipe fixed to the stand or bench, with a rubber pipe extending down to a tee piece having rubber valves so arranged as to blow with two common house bellows alternately operated by the feet, or you may make a small holder of an India rubber bag with a weight upon it, using only one bellows for filling.

(15) L. P. McC. asks: 1. Is there anything I can apply to the cement coating in my cistern to harden it, or render it so that it will not make the rain water hard? A. Probably your cistern is coated with a poor quality of cement, which is partially soluble in water. There is nothing better than a lining of pure Portland cement. Clean and scrape the walls and bottom of the cistern, and plaster with a thin coat of pure Portland cement. 2. What is the number of asteroids now discovered? A. There are over 280 asteroids known. We have not the complete list to the present time.

(16) D. P. asks about the wages of iron puddlers in and around Pittsburg, and whether any of them receive from $10 to $12 per day. A. Puddlers work hard and get high wages; for a good workman to earn from $4 to $6 in a day is not uncommon, and exceptionally it may go as high for a single day as you mention. 2. Whether there are any coke ovens where coke is manufactured for sale without the gas being utilized. A. Yes; in nearly all of them. 3. Whether coal increases in bulk when transformed into coke. A. The bulk increases 20 to 25 per cent, and weight decreases from 30 to 55 per cent.

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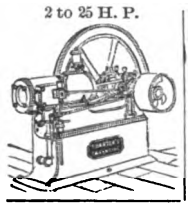

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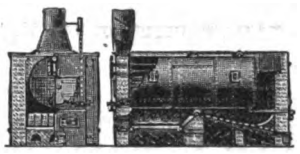

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D. B. HARMONY, *Acting Secretary of the Navy.*

Proposals for Machine Tools for the Ordnance Gun-Shops.—NAVY DEPARTMENT, WASHINGTON, D. C., *November* 2, 1887.—Sealed proposals will be received at this Department, until 12 o'clock noon, on Thursday, the 5th day of January, 1888, at which time and place they will be opened in the presence of bidders, for furnishing the necessary material and labor and constructing eleven (11) 6-inch gun lathes and one (1) slotter, and for the delivery and erection of the same in the Navy Yard, Washington, D. C., in accordance with plans and specifications, copies of which, together with all other information essential to bidders, may be obtained at the Bureau of Ordnance, in this Department. Proposals must be made in duplicate, in accordance with forms which will be furnished on application to the Bureau of Ordnance, and enclosed in envelopes marked "Proposals for 6-inch Gun Lathes and Slotter," and addressed to the Secretary of the Navy, Navy Department, Washington, D. C. The Secretary of the Navy reserves the right to reject any or all bids, as, in his judgment, the interests of the Government may require.
D. B. HARMONY, *Acting Secretary of the Navy.*

Proposals for Machine Tools for the Ordnance Gun-Shops.—NAVY DEPARTMENT, WASHINGTON, D. C., *November* 2, 1887.—Sealed proposals will be received at this Department, until 12 o'clock noon, on Thursday, the 1st day of March, 1888, at which time and place they will be opened in the presence of bidders, for furnishing the necessary material and labor and constructing sixteen (16) 16-inch gun lathes, and for the delivery and erection of the same in the Navy Yard, Washington, D. C., in accordance with plans and specifications, copies of which, together with all other information essential to bidders, may be obtained at the Bureau of Ordnance in this Department. Proposals must be made in duplicate, in accordance with forms which will be furnished on application to the Bureau of Ordnance, and enclosed in envelopes marked "Proposals for 16-inch Gun Lathes," and addressed to the Secretary of the Navy, Navy Department, Washington, D. C. The Secretary of the Navy reserves the right to reject any or all bids, as, in his judgment, the interests of the Government may require.
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