SCIENTIFIC AMERICAN

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THE HORTICULTURAL HALL, CENTENNIAL EXPOSITION PHILADELPHIA.–(See page 404.)

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Contents.

(Illustrated articles are marked with an asterisk.)

THE SCIENTIFIC AMERICAN SUPPLEMENT.

No. 26.

For the Week ending June 24, 1876.

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Crystallized Osmium.

MM. Ste. Claire Deville and Debray have recently obtained osmium in a crystallized state, by making an alloy of the element with tin and treating it with nitric acid. All the tin is separated, and the residue of osmium is finely crystallized. The density of osmium is found to be equal to 22·477, and is greater than that of any other known body.

THE END OF THE VOLUME.

The presence of the index at the close of this number of the SCIENTIFIC AMERICAN will remind our readers that we have reached the end of another volume, the thirty-fourth of the present series. It is not because we fall into that proverbial failing of all humanity which believes the last accomplished work to be the worthiest that we confidently believe that the now finished volume is the best we have ever issued. The assertion is fact—fact in theory, because newspapers as a rule reverse natural laws, and grow better as they grow older; and fact in practice, because the contents of the many pages say so.

Few occurrences of any note in the world of Science or invention have happened during the past six months, but that our readers have been fully posted thereupon. In great engineering works we have described and illustrated the massive anchorage of the East river bridge, the Metlac viaduct in Mexico, the St. Charles railroad bridge in Missouri, the La Vanne aqueduct in France, the New York Elevated and the projected Underground Railway, the Callowhill street bridge in Philadelphia, besides many others. Few new machines of any importance have appeared in the world during the entire six months, but we have published full accounts thereof. Among the more prominent are the Brayton oil engine, the Allen governor, Manes' rotary furnace, Stirling's locomotive-reversing gear, Dean Brothers' pumps, the new English multiple drilling machines, and scores of other fresh and novel inventions. The valuable papers on Practical Mechanism—more reliable and more thoroughly practical aids to the workman than have ever before appeared—have been continued. Hundreds of trade secrets and useful recipes, gleaned from every possible source, have been gathered. The principal scientific discoveries we have fully discussed. Edison's supposed new electric force, Galton's new theory of heredity, the manufacture of dynamite, electrical organs, wells as a source of power, the magnetic spectrum, are a few of the principal subjects under this heading. Lastly, we have published many beautiful illustrations of the Centennial Exposition, with descriptions of prominent exhibits. These descriptions, with illustrations, will be continued through the following volume.

THE SCIENTIFIC AMERICAN SUPPLEMENT

The regular weekly issue of the SUPPLEMENT as a distinctive publication, for a special subscription price, has enabled us to supply our many friends with an immense amount of additional detailed information in all the principal branches of science. It would be difficult to find any fresh subject of note or interest in the scientific world that has not been brought to the reader's notice.

The first volume of the SCIENTIFIC AMERICAN SUPPLEMENT has been illustrated by about one thousand three hundred figures and engravings.

The International Exhibition has formed, and will during the year continue to form, one of the principal features in both of our papers. We have already given in the SUPPLEMENT over one hundred engravings, showing the progress up to date. The next volume will be full of illustrations of new and remarkable exhibits. In presenting the details of this great enterprise, we are specially assisted by able and experienced men of science; and in addition, we aim to avail ourselves of whatever is interesting and reliable, as observed by cotemporaries.

The series of letters on Mechanical Drawing, by Professor MacCord, have proved acceptable to thousands of persons. About one hundred and thirty illustrations have so far been given. The series will be continued in the next volume of the SUPPLEMENT. The peculiarity of these instructions is that they show how any person, even the unskilled—the poorest persons, those who cannot afford to buy instruments—may learn to draw.

Another useful series of articles is entitled "How to Build Cheap Boats." It is accompanied by illustrations of particulars. The series embraces nearly one hundred and fifty engravings, and illustrates the method of boat building, from the humble scow, costing three dollars, up to the graceful Whitehall row boat, costing fifteen or twenty dollars: also sail boats, their rigging, etc., with details:

A number of the most important engineering works and structures have been illustrated and described in the SUPPLEMENT. Among these are the great Jetty Works of Captain Eads, at the mouth of the Mississippi river, by which the seven-foot bar has already been removed to a depth of twenty feet. The illustrations include a complete plan of the works, details of the construction, and measurements and particulars, by Chief Assistant Engineer Corthell.

The great St. Gothard tunnel through the Alps, Switzerland, has been illustrated by many figures. Among these the drilling machines and the compressed air locomotives have been engraved and explained.

In the Department of Mechanics and Engineering, a large number of valuable practical papers, by experienced writers, have been presented with illustrations; the same may be said of all the principal divisions of science, such as Chemistry, Metallurgy, Technology, Electricity, Light, Heat, Sound, Geology, Mineralogy, Natural History, Astronomy, and Medicine: The latest and most interesting intelligence has been sought out and presented.

In the matter of quantity, estimated in book measure, this just completed volume of the SCIENTIFIC AMERICAN SUPPLEMENT contains the matter of over three thousand five hundred book pages, or more than seven volumes of five hundred pages each. Thus the yearly issues of the SUPPLEMENT, costing only five dollars, will equal fourteen ordinary book volumes. The exceeding cheapness of our publication will be appreciated if we consider that all this reading matter is, for the most part, standard in its character, and worthy of preservation for future reference.

For the convenience of readers, the first volume of the SCIENTIFIC AMERICAN SUPPLEMENT, twenty-six numbers, January—June, 1876, has been bound in paper covers, and may be had at this office and at news stores throughout the country, price $2.50. Sent by mail to any address.

INVENTORS MISJUDGED.

The inventors of this country owe Hon. J. H. Bagley, of New York, a debt of gratitude for a very excellent speech, recently made by him in the House of Representatives, in their behalf and that of the Patent Office. A defense of a class and an institution to which the United States owes so large a proportion of its material prosperity might well have been looked upon as a superfluity; but Mr. Bagley on one hand has discerned that, among certain people, inventors, through no fault of theirs, or rather through their misfortunes, are receiving unmerited odium; and on the other, he is aware of the false economy which, for the purpose of making political capital, has induced some of our lawmakers to contemplate crippling the resources of the Patent Office. The speech includes careful research, showing the self-supporting nature of this branch of government service, and the advantages which it has secured, and besides pays a noble tribute to the class for whom the Patent Office is mainly intended, and by whom it is solely maintained. There are a few points in the discourse which Mr. Bagley touched lightly upon, but which deserve more extended remark. We note that he specifies the grangers as being among those most strongly prejudiced against inventors, who, as they imagine, by securing patents, act in direct opposition to public interest, and engender monopolies. If such a notion is prevalent, it is, to say the least, an ignorant one; for without the labor of the inventors, it may well be asked, what would that of modern agriculturists be? If any Western farmer, who is now complacently surveying his hundreds of broad acres of waving grain, and reckoning the profits of his crop, were informed that his harvest had to be gathered with scythe and sickle, without doubt he would protest that such would be impossible, and that all his gains would be swallowed in lost time and injured over-ripe crops. Doubtless he would admit that his reapers and mowers, not to say the machines he used for planting and plowing and cultivating, are worth in direct saving a good round sum. If every granger who objects to patents will make a calculation of this kind for his individual case, and then multiply it by the number of those who use improved machinery, he will find that the value of the inventor's work for a single season's crop probably approaches, if it does not exceed, every cent the inventors have ever earned. He will also discover that the profits are directly turned into the pockets of his class in such a proportion that the inventor's gains are utterly infinitesimal; and if he will look into the future, and consider that these profits will accrue to his posterity for ever, while the returns of the inventor cease, certainly within half a century, perhaps he will see how little basis there is for charges of monopoly and extortion, so freely hurled at men because they ask an absurdly meager return for the benefits they give.

There is another point, based on sound truth; and it is, in a very great number of cases, the inventors are not those who reap the chief reward. There are plenty of wideawake sharp people, who know a good thing when they see it, and are ready to snap at it, with cash in hand. These are constantly on the watch for new inventions; and during the period, when the inventor has secured his patent and is looking about to see how best to realize returns, they are down upon him like hawks. If, as is too frequently the case, the inventor is in financial straits, the offer of cash for an idea of which he, least of all, correctly knows the value is generally a potent temptation. The patent is assigned for a song; Smith's device becomes famous, but Smith gets no profits. Brown, who has purchased it, revels in a plethoric bank account, while Smith gets empty fame diluted with abuse as a monopolist. If Brown happens to be dishonest, and, with Smith's idea as a basis, swindles—and farmers and agricultural implements are peculiarly favored as object and means in this regard—Smith shoulders the odium. No one thinks of denouncing the mere agent; it is the inventor and the grinding patent system that are blindly vituperated. Of course inventors have a right to sell their property to whom and for what they choose; but, as Mr. Bagley, with much truth, suggests, if they would be more persistent in introducing their devices into public use themselves, they would obtain much more sympathy and much greater profits.

Much, however, of the opposition to inventors and their patented devices arises from the misconceived idea that the patent laws are intended solely for the benefit of inventors. Now, as we have repeatedly explained, such is not the case. True, they hold out an inducement which has for its object to make people invent; but that inducement is a monopoly closely limited in point of time, and during the existence of which the inventor developes his idea. Consequently, at the end of the protected period, the invention becomes public property in its improved and not in its crude form. Therefore it is obvious that to denounce the patent system is merely to denounce that which insures great benefits to every one, at an absurdly small cost. As for the means whereby the patent laws are enforced, the fact is undeniable that, in this sad period of official corruption, the Patent Office stands forth pure and unblemished. Instead of its appropriations being exceeded, as is the case in some departments of the government, it has a balance of nearly $900,000 to its credit in the United States Treasury. Its expenses last year were $459,730 for salaries, and $63,216 for miscellaneous matters; and seven and a half times more work was done than in 1865. Had the salary and expense account kept pace with the work, the expense in 1865 would have been over $2,000,000.

A DANGEROUS NEIGHBOR.

Mr. Hardenbergh, of New Jersey, has recently introduced a resolution into the House of Representatives to remove the powder magazine, now located on Ellis Island in New York Harbor, on the ground that an explosion of the powder there stored would destroy or seriously damage an immense number of buildings in New York and Jersey City. Ellis Island is used as a storehouse for powder for vessels of war, and no ship is allowed to come up to the navy yard until the contents of her magazine have there been discharged. At the present time about one hundred and thirty tuns of powder are stored on the island, some of which is old and not up to the full standard of strength.

Authorities differ greatly as to the elastic force exerted by powder at the moment of its explosion. Robin estimates it at 1,000 times the pressure of the atmosphere, or 15,000 lbs. per square inch. Rumford, on the other hand, placed it as high as 54·470 times atmospheric pressure. Other experimenters vary between these extremes. We take, as our present rough calculation, Robin's estimate, because of the possible deterioration of the powder; 130 tuns of the explosive occupies about 4,900 cubic feet, or would form a pile of 17 feet cube. On each square inch of surface of atmosphere bounding this mass, supposing the latter to be suddenly rendered gaseous, there would therefore be, as above noted, a pressure of 15,000 lbs., or a total pressure of nearly 4,000,000,000 lbs. As the vibrations due to this sudden pressure radiate equally in all directions, like those of light and heat, it necessarily follows that the intensity of the force diminished in proportion as the circle of its radiation increases in diameter. Taking the direct distance from Ellis Island to New York city as one mile, an explosion on the former, by the time it reached the nearest walls, would be distributed over 172,846,080 square feet of surface, and therefore the mechanical effect of the shock on the houses first attained would be some 22 lbs. to the square foot of surface. This is equivalent to the wind pressure of a heavy storm travelling at the rate of 65 miles per hour; but in lieu of being a continuous blast, as in the case of a tornado, there would be a sudden shock, due to the condensation of the wave of air generated in the explosion, followed by a reflex and weaker shock due to the rarefaction of the wave, followed by other and shorter vibrations. The result, therefore, would be a jar like that of an earthquake.

Such would be the probable effect did the whole quantity of powder, as above stated, explode at once; but this is not at all likely. Confined as the explosive is in barrels and copper tanks, the blowing-up of a few receptacles would scatter others, and these would either be thrown into the water, as the island is quite small, or might be exploded separately, thus producing a series of light and inconsiderable shocks.

Reducing the result first quoted one half, to allow for powder scattered and unexploded, we still have a mechanical effect of 11 lbs. to the foot on buildings a mile distant, equivalent to the simultaneous explosion of 65 tuns of powder. That amount is very nearly the same as blew up at Erith, near London, England, in 1864, the effects of which were at the time carefully noted; so that from the record of these we can obtain an approximate idea of the results in the vicinity of New York. A circle swept from Ellis Island with the radius of one mile includes only a small part of Jersey City, and an even less area of New York; the first and most disastrous effects would therefore be felt by the shipping in the harbor, and probably few buildings would be left standing in the included city portions. The mechanical intensity of the shock varying inversely as the square of the distance from the center, it follows that, by the time the concussion reached the City Hall in New York, its force would be reduced to less than 3 lbs. per square foot of surface. This would be sufficient to overthrow steeples and probably all of the exceptionally high buildings included in the area. At a corresponding distance from the Erith explosion, the earth heaved and trembled, men were thrown violently out of bed, not a door nor a pane of glass was left whole, and walls were cracked and shaken. Even the more substantial buildings in lower New York would also be badly jarred, owing to the duration of the shock, which, despite its comparatively low pressure, would be (because of the quantity of powder) of long duration. In general, it may be concluded that a complete rebuilding of all New York below the City Hall would become necessary.

At four miles, windows and doors would be smashed, ceilings thrown down, and weak structures injured. The concussion would be violently felt as far up the Hudson as Tarrytown, and the report would be heard at Poughkeepsie, and possibly at Philadelphia. The report of the Erith explosion was heard 94 miles away, a greater distance than that which separates New York from the Centennial buildings. Every church within a radius of 25 miles of Ellis Island would suffer from cracked walls and windows; and if the disaster occurred at night, every gaslight in the cities of New York, Jersey City, and Brooklyn would be extinguished.

The loss of life due to falling buildings would probably be great. People in the streets in the lower part of the city would be thrown down, and many probably rendered deaf. Far less extensive explosions have overthrown horses and ripped off their shoes, a curious result of the inertia due to the differing specific gravities of the animal and the metal. It is likely that not a bird within fifteen miles radius would survive. The iron water mains in the part of the city below the City Hall would also be ruptured, as that effect has followed less extensive explosions.

These results are based on merely theoretical considerations, and on the presumption that a simultaneous explosion of 65 tuns at least would occur. They are of course subject to modifications of circumstances, but are not without the limits of possibility. Thus they will suffice to show the error of allowing so large a quantity of gunpowder to be stored so near to a populous district. If some magazine reasonably near the navy yard is of paramount necessity, there are other situations in the lower part of New York Bay which might be used without incurring anything like the danger; and the peril might still further be lessened by dividing the amount stored, and isolating the portions so that the blowing-up of one part could not determine the explosion of the rest.

THE CENTENNIAL EXPOSITION.

Unless the reader is specially interested in agricultural matters, and therefore has an object in deferring visiting the Centennial until the autumn, when the displays of live stock and fall products will take place, we advise him to make his pilgrimage to Philadelphia now. Nearly everything is in order, and the finishing touches are being pushed forward with great rapidity. No such crowds are present at this time as will be toward the close of the six months; and when the magnificent distance, which is to be traversed merely to pass through the various aisles and from building to building, some twenty-five miles in all, is realized, it will be perceived that sight seeing on such a gigantic scale during hot weather will savor strongly of hard work. To those who are able to spend some time in Philadelphia and so view the Exposition leisurely, the heated term will be of minor inconvenience; but others, whose holiday is limited, will find their enjoyment greatly increased if they will take advantage of the moderate weather of the present month.

For the benefit of the latter, a few hints as to how best to see the display in the shortest time may prove serviceable. The mistake of most people is trying to see too much in too short a time; and this is attended with very disagreeable results. When the mind is on the stretch, the body is not nearly so sensitive to fatigue; and consequently the visitor may never feel that he has overtaxed himself until after the day's work is over, when he will be admonished of the fact by illness, which may incapacitate him for the following day: a serious matter when one's time is limited. Still it is by no means impossible to get a good general idea of the show in two or three days; and this period, we have no doubt, will comprise all that can be afforded by the majority of people coming from a distance to Philadelphia.

As every visitor will naturally prefer to plan his own visit, it is superfluous to offer suggestions for a programme here. Still, we may point out that to hurry is but to waste time, and that the few days will be most agreeably spent if the first be quietly devoted to such parts of the Exposition as it is intended to study, while the mind is fresh and unwearied. Then the subsequent observation of objects to which no particular thought is given becomes a kind of relaxation. It will save much time to procure a good map, giving the names of localities.

THE WOMAN'S PAVILION.

Perhaps the most interesting object—if we may be so ungallant as to use the word—in the woman's edifice is the lady engineer. We do not recollect ever having seen a woman manage a steam engine before; but if Miss Allison may be taken as an example, there is no doubt but that the fair sex is quite competent for the duty. In fact, the lady herself suggests very truly that there is a good field for woman's work in taking charge of the thousands of small motors used in minor manufacturing operation. She thinks that an engine is not half so hard to manage as a baby, and most, of her sex at least, will agree with her. Miss Allison has regularly studied engineering and science, and runs the machine entrusted to her in a manner which elicits general admiration. We wish we could speak as highly of the rest of the woman's display in general; but it must be considered, as a whole, to be disappointing. Still, there are many excellent articles in it which will well repay a visit to the building. Queen Victoria sends a beautifully spun napkin, her own work, and some spirited etchings which give some pleasant glimpses of home life in the royal family. The English princesses contribute some really fine specimens of embroidery. This handiwork of royal fingers silently preaches a lesson of industry which, to judge from the conversation of those who gather about the cases, is invariably heeded. No doubt, however, her Majesty would find a world of amusement, could she overhear, as we did, certain *naive* remarks of the rural damsels, whose impression appears to be that queens do nothing but wear gold crowns and sit on thrones.

If we were asked as to the prevailing characteristic in all the woman's work exhibited, we should unhesitatingly say: patience. And that quality is shown in as high a degree in the embroideries and, to the masculine mind, incomprehensibly intricate patchwork as in the elaborate productions of the Japanese artists in the celebrated collection of bronzes, in the Main Building. If patience always yielded beauty, then our woman's work would be transcendent. But it does not; and therefore while we may recognize the deft persevering fingers, in the innumerable worsted pictures, hair chains, feather and shell ornaments, and marvelous pieces of knitting, let us not be asked to call them beautiful. We will make one exception (we dare say there are others which we do not recall) of a quilt: a wonderful quilt, intricate and yet artistic. Fifteen hundred rosebuds, in each of which there are nine hundred stitches, are embroidered on white and rose-colored satin. No wonder it took eighteen months to complete.

Leaving out fancy work, woman's labor is but poorly represented. There are few inventions, where there might be many. We notice some dish washers and a life-preserving mattress, which, it is said, is to be officially tested, and there is a fine collection of medicines prepared and put up by fair hands. The best woman's work is in the other buildings, and those who are inclined to belittle her part in industrial labor may see the evidences of her skill in the superb coloring of the famous Doulton pottery and in the wonderful Gobelin tapestry—there is one gem of this needle work in the Art Gallery, which only near inspection distinguishes from a painting; in the intricate meshes of the Belgian point lace, in the nice shading and coloring of the German cotton velvets, in the manufacture of the delicate Swedish silver work, in the Italian mosaics, in the decoration of the fragile Bohemian glass. And this is only the beginning. In Agricultural Hall are wines of all kinds prepared by woman, in Memorial Hall her finest works of pictorial art are displayed; and in among the buzzing machinery, she is tending looms spinning raw silk into thread, making and putting togethe the intricate mechanism of watches, and converting coarse leather and cloth into the daintiest of shoes. The severest criticism that can be made on the Woman's Pavilion is that its contents show woman's amusements, not her work.

THE BOATS

The Exposition is notably rich in nautical objects, and in models especially. Every class of vessel can be found, from the full-rigged sloop of war, in the navy department, down to the fishing smacks, which Massachusetts contributes in a collection of probably five hundred. There is a model of the old frigate Constitution, and of a lightship, the latter complete in every part. An ingenious Yankee has rigged a chicken bone with a set of sails, and only close inspection shows the curious conceit. The famous Merriman dress, in which Captain Boyton swam the English channel, is also exhibited. Foreign visitors are displaying much interest in the ice yacht, a superb full-rigged specimen of that vessel, with her sails set, being prominently located in

MACHINERY HALL.

In this building, work has rapidly been carried forward. The immense Krupp 61-tun gun is now in position, and several industrial operations, intended to be exhibited in progress, are fairly under way. In the French section, a toilet soap manufactory is in full blast; near by, an immense press is striking off American flags on continuous webs of cloth; an india rubber factory prepares and purifies the crude material. A set of workmen are busily engaged in making cocoanut sugarplums. Two paper mills are also hard at work; the Coventry silk loom is weaving silk book-marks in wonderful rapidity; and the great Walter press, at certain hours, strikes off its thousands of the New York *Times*

THE ORIENTAL CAFES

have recently all opened, and are by no means the least interesting part of the general display. One is Turkish, and all its attendants are genuine Mohamedans. Here one may have delicious coffee made in the Turkish fashion (that is, in a kind of paste with water, and boiled thick), rose conserves, any number of curious sirups, and real Turkish tobacco in a real Turkish pipe. Prices are cheap; for $1, a taste of almost all the Turkish delicacies can be had. The Tunis *café* is conducted on curious principles. It involves a touch of the harem. It is not so large as the Turkish building, nor so ornate in its style. An individual, posted outside the door after the fashion of itinerant showman, yells at you to enter. You pay 25 cents to a person supposed to be an Arab, although he looks more like a German, and are served with a cup of muddy coffee, and permitted to stare at five musicians. One torments a venerable violin, another bangs a pair of cymbals, the third has a nondescript instrument resembling a lute, and the remainder, a woman and a small boy, drum with their fingers on kettledrums. The music is painful to an advanced degree; and the woman occasionally intensifies the discomfort of the deluded visitor by dancing, if a variety of postures deserves that title. Altogether the show is not uninteresting; but one experience will probably satisfy the most curious of visitors.

Another curious building is devoted to the sale of Hungarian wine. The attendants are dressed in the national Magyar costume. Wines of excellent quality may be tasted in moderation, at quite low prices.

THE AQUARIA.

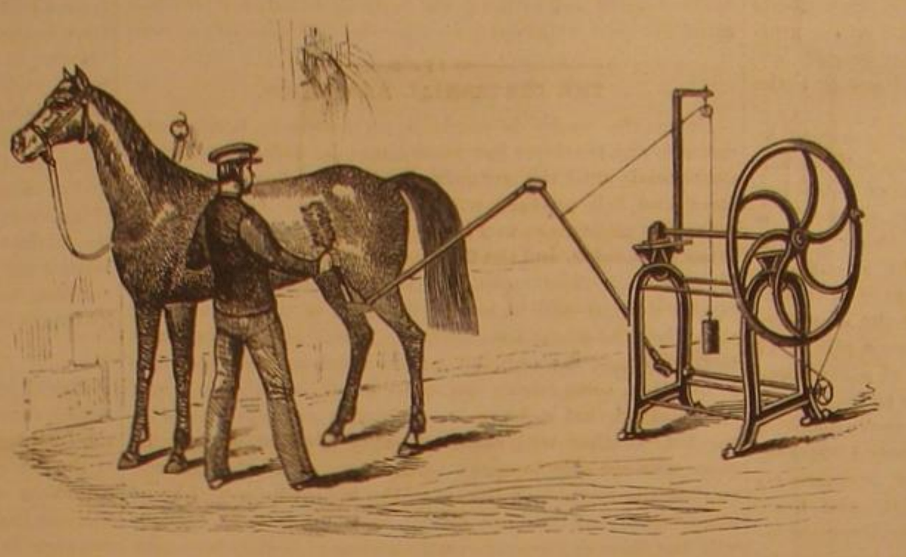
Professor Frederick Mather is busily preparing the aquaria in Agricultural Hall. The display is to be made in thirty-five large tanks, one of which is 23 feet long by 7 wide, and 4 feet deep. The collection is not yet complete, but will be in a short time. The British Commission has despatched a large tank to Bermuda, to obtain angel sharks and other curious fish. Later in the season, when trout and salmon begin to spawn, the hatching process will be illustrated. Several specimen of forcing apparatus are already on exhibition. There is a tank filled with terrapin; and in one aquarium are gathered hundreds of small specimens of California salmon, which have been artificially hatched. We shall allude to this very interesting portion of the Exposition in detail hereafter.

THE most active prolongers of youth are wholesome food, pure air, regular habits, and plenty of exercise for both mind and body. With these, added to a contented disposition and a good temper, Father Time may be long defied.

MECHANICAL HORSE GROOMING.

The benefits of machine grooming are twofold: first the removal of dirt, and, second, the keeping the pores of the skin open. The former only deals with the hair, giving to the animal a clean, shining coat; the latter promotes the health, thereby enabling horses to do more work, and milch cows to yield a larger quantity of finer milk. In both cases the difference is more in favor of machine grooming than some may perhaps imagine. Under a general practice of machine grooming, there would be less scurf and dirt to remove, so that the work would be done in half the time.

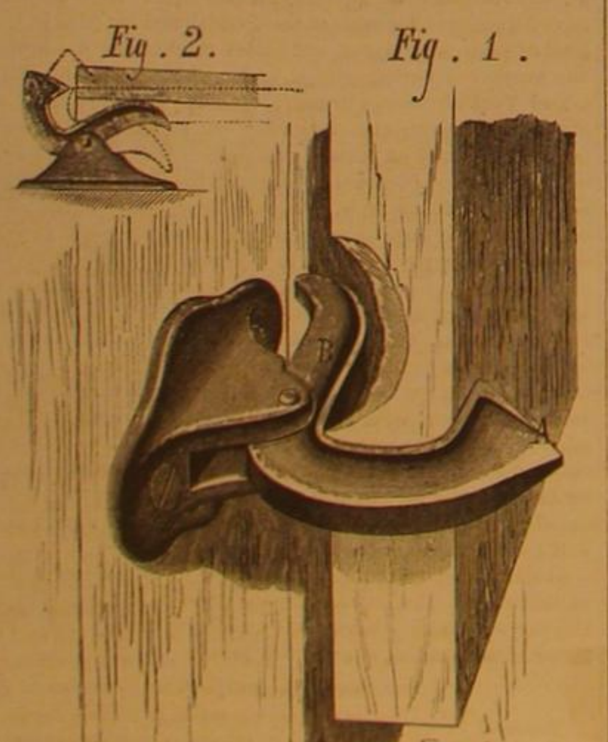
The engraving represents the groomer, invented by Messrs. Newton, of High Holborn, London, England. The winch handle projects from a fly wheel, around the periphery of which an endless gut band passes over a small pulley below. The framing of the machine is bolted to the floor. The three arms shown at different angles are tubes, each having a rotary spindle in it. These are connected to the spindle of the pulley already referred to by miter gear at each articulation, of a circular instead of a conical form, so that the spindles are actuated, whether at an angle or in a straight line. The brush is on the end of the spindle in the tube arm, held in the hand of the operator. The weight, with cord over the pulley, counterbalances the arms, thereby relieving the hand of the operator. The three arms bend in any direction; and by connection with the spindle of the pulley, they have also a rotary motion, enabling the operator to apply the brush to every part of the body, as back, belly, sides, and out and inside of the legs, and so forth. When the operator, holding the brush, turns the spindle of the pulley in the direction in which it is rotating, it is in favor of the person at the winch; but when he turns it the opposite way, it is the reverse. The machine is not more difficult to work than a chaff cutter, turnip pulper, or cake breaker. The brush may be taken off, and a polisher, consisting of a cylinder about the same size as the brush, composed of disks of thick felt material, put on.



MECHANICAL HORSE GROOMER.

IMPROVED BARN DOOR FASTENING.

We illustrate herewith a simple device for holding barn doors open. It works automatically, is composed of but two castings, has no springs, and, in short, is decidedly better than the hook and staple commonly used for the purpose. It consists of a strong hook peculiarly shaped, pivoted in a stand, which is attached by screws to the side of the barn. When not engaged, the hook stands as shown in the horizontal view, Fig. 2. The door, in swinging open, first strikes the beveled nose, A, pushes it back, and then meets the rear curved arm, B. As the latter is carried back, as shown in the dotted lines, Fig. 2, the nose, A, is once more carried forward and caused to engage the edge of the door, as exhibited in Fig. 1. There is a stop in the base to prevent the hook from swinging back too far to be opened by the door.



Patented through the Scientific American Patent Agency, May 2, 1876, by Mr. Perry A. Peer. Agents wanted. For particulars address Mr. H. P. Kauffer, Kalamazoo, Mich.

Cheap Foreign Postage.

It may not be generally known that American postal cards may be sent for an additional one cent stamp to the following countries: Netherlands, Moldavia, Newfoundland, Norway, Poland, Portugal, Roumania, Russia, Servia, Spain, Sweden, Switzerland, Austria, Belgium, Denmark, Egypt, Germany, Great Britain and Ireland, Greece, Greenland, Holland, France, Italy, Turkey, Montenegro, and Wallachia. It will be seen that persons can communicate with their friends in many parts of the world for two cents.

Engravings and Advertising.

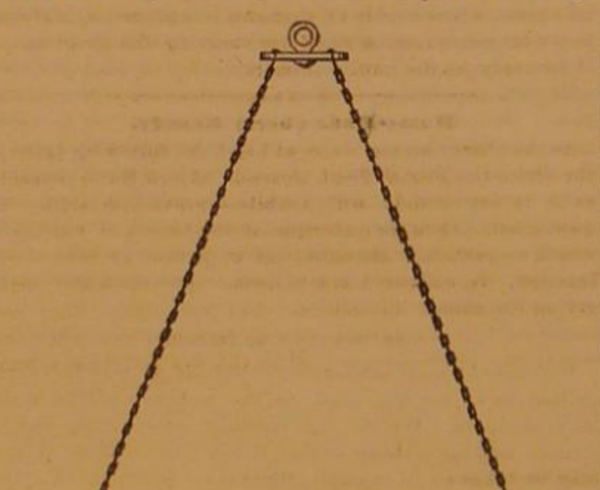
Experience shows that the illustration of inventions by engravings is one of the best means ever devised for the introduction of inventions and the sale of patents. As a means for the circulation of such illustrations, nothing can compare in value with the SCIENTIFIC AMERICAN. Every engraving published therein goes before probably not less than one hundred and fifty thousand persons.

All good business men, before spending their money on advertising, are in the habit of inquiring about the character and extent of circulation enjoyed by the journal that solicits their patronage. In this respect the publishers of the SCIENTIFIC AMERICAN challenge the closest scrutiny; the facts will show that their terms are much lower than those of any other journal of the same class in proportion to the extent of circulation.

Parties who desire to have their machines illustrated can address the undersigned, who are also prepared to send artists to make sketches of manufacturing establishments, with a view to their publication in the SCIENTIFIC AMERICAN. address MUNN & CO., 37 Park Row, New York city.

A NEW STONE LIFTER.

This is a simple and ingenious device, patented through



the Scientific American Patent Agency, April 25, 1876, by Mr. Sidney E. Shepard, of Mineral Point, Wis. It consists of a pair of eccentric lever griping jaws, A, which are pivoted in a frame formed of two parts, as shown in the engraving. These parts are adjustable along each other, and may be secured by pins, E, to shift the jaws nearer together or further apart in order to adapt them for different sized stones. The arms of the jaws are connected by chains to an eye plate, and to the latter the hoisting rope is attached. The device will prove useful to builders and in stone quarries.

Another Chinese Giant.

Land and Water says that the last newspaper from the East inform us that a Chinese giant of extraordinary hight has been discovered. His name is Chiu ki Tszu; he is nearly 7 feet 4 inches high, and weighs 297 lbs.; he is 37 years old, and a native of Shantung Province. He is taller by 2½ inches than Chang, and is believed to be the tallest Chinaman ever on exhibition. He is now on his way to the Centennial at Philadelphia, in charge of an Italian showman. He was picked up in Chefoo, where he worked as a coolie, and has an enormous appetite. On his way down to Hong Kong he was allowed fourteen bowls of rice and vegetables to each meal, and he ate it all without complaining.

PROFESSOR E. T. QUIMBY, of Dartmouth College, N. H., writes to state that J. D. L.'s solution of the Pythagorean problem was published more than 25 years ago, in Professor Alpheus Crosby's work on geometry.

Exhibition of the Applications of Electricity.

The exhibition is to take place in the Palais de l'Industrie in the Champs Elysées, and is announced to open on the 14th of July, and to close at the end of November. As in the case of the Maritime Exhibition held last year, and of that of Brussels, which is to open in June, exhibitors will have to pay for the space they occupy. The amount of interest which will be excited by such an exhibition may be best estimated by reference to the subjects of the eighteen groups which form the programme. The first group is retrospective, including as far as possible the apparatus of all the early discoverers. The second is devoted to laboratory apparatus, and static and dynamic electricity. The third group includes batteries, piles, and generators of all kinds. The fourth is devoted to electro-magnetism and its converse. The fifth group comprises the entire field of electric telegraphy. Others are devoted to electric horology, to the applications of electricity to railway trains, signals, etc.; to electric motors of all kinds; electric lighting, with its applications to photography; electro-chemistry, electro-metallurgy, synthesis, and analysis; electro-galvanic applications to the fine arts; electrotypy and electro-engraving; medical electricity; lightning conductors, and other apparatus connected with atmospheric electricity; the applications of electricity to military and naval purposes; electric toys and curiosities; and lastly, a collection of all the works that can be obtained upon electricity and its applications, whether French or foreign, with an analytical catalogue. The subject is a large one, and capable of interesting illustrations.

The proposal has been supported by the government; and the letters of the ministers of war, of the marine, finance, public instruction, and public works have recently appeared in print: The ministers of war and of the marine have authorized the officers of the army and navy to lend their aid, and have themselves named several officers of both services, and the other ministers have offered similar assistance.

Comte Hallez d'Arros, with whom the scheme originated, has formed a numerous and powerful committee of organization, including many of the best known men of science, engineers, and others in France, for instance MM. Edmond Becquérel, Bréguet, Dalloz, Dumoulin, De la Gournerie, Drs. Lionville, Lœury, Marié-Davy, Tessie du Motay, a large proportion of the members being engaged in the practical applications of electricity.

A SIMPLE KEROSENE-TESTING DEVICE.

Mr. H. E. Mead, of New York city, contributes the annexed illustration of a simple method, devised by himself, for testing kerosene oil with such ordinary appliances as are sure to exist in or about every dwelling. The extensive use of kerosene makes it important that people should understand how to avoid the numerous dangerous compounds sold as illuminating oils under high-sounding names.

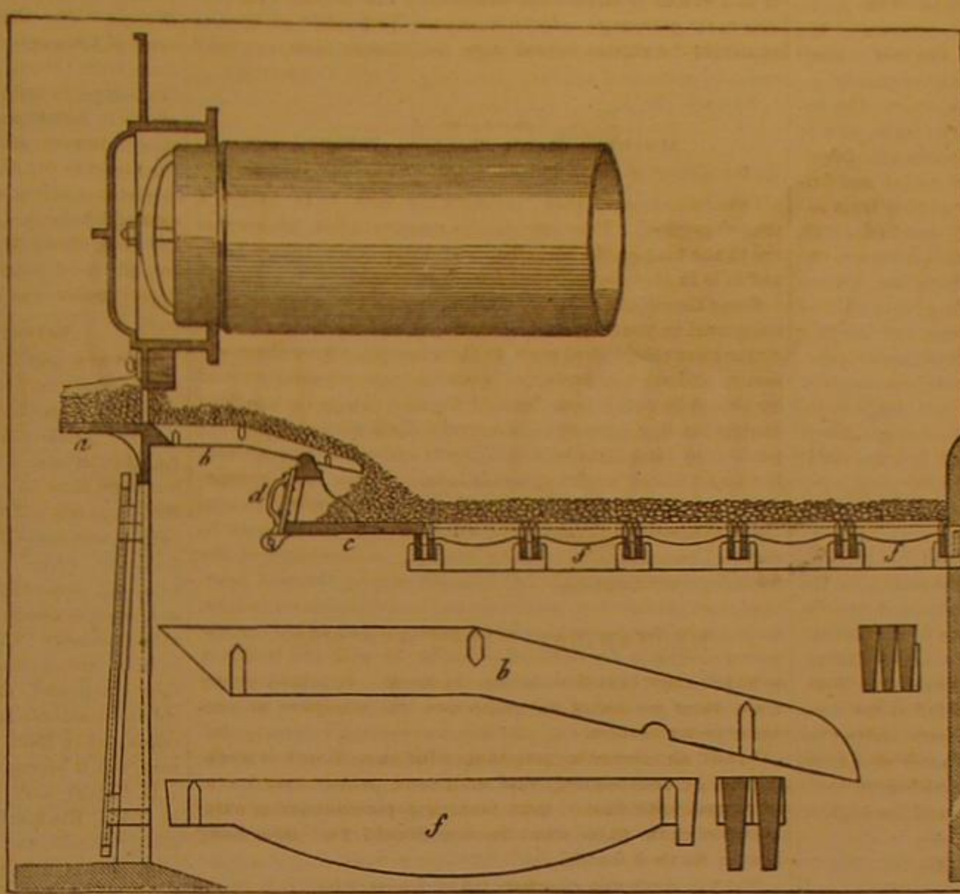
This apparatus consists of a common tin pan of water, set upon bricks at a sufficient hight to allow of a lighted lamp being inserted beneath. In the pan is floated a patty pan containing a tablespoonful or two of the oil to be tested. A thermometer is also placed in the water. The indications of this instrument are noted as the water becomes gradually heated by the lamp, and from time to time an ignited match is applied to the oil. It is safe to advise the prompt throwing of the entire supply of oil into the sink in case a flash occurs below 100°. It is as dangerous as gunpowder. It is also a safe rule not to purchase oil which flashes below 110°; and it should be further understood that the greater the heat the material will endure without flashing, above 110°, the greater is the proportional increase in its safety.

NEWSPAPER and other publishers will be supplied with electrotypes of the Centennial Buildings and most of the other engravings which appear in the SCIENTIFIC AMERICAN and SUPPLEMENT, on very cheap terms. For prices address the publishers, and indicate at the same time what engravings are desired, and the date of the issue in which they appeared.

NEW SMOKE-BURNING GRATE.

M. Jordan, of Augsburg, Germany, has recently devised the new smoke-burning grate illustrated in the annexed engraving. Instead of placing fresh coal directly on the fire, it is shoveled upon an exterior plate, *a*, in order that it may previously undergo a kind of dry distillation. From the plate, *a*, the fuel passes to a front grate, *b*, the inner part of which is inclined at an angle of 20°. From *b* the coal falls upon another plate, *c*, situated on a level with the main grate, and being inclined rearwardly upward at an angle of 7°. The aperture between the front grate and plate, *c*, is closed by hinged doors, which are preserved from over-heating by the unconsumed fuel in their rear, so that they may be easily opened and closed by hand.

In its journey from plate, *a*, to plate, *c*, the fuel disengages the greater part of its gaseous elements; and the latter, mixed with the air which penetrates the front grate, *b*, pass to the flame in the main grate, *f*, and are there completely consumed. The management of the main grate is effected through the doors, *d*, but one of which is opened at a time, so as not to cool the fire. The apparatus is said to be easily worked, and the fireman is not subjected to the radiant heat from the furnace.



JORDAN'S SMOKE-BURNING GRATE.

Roquefort Cheese.

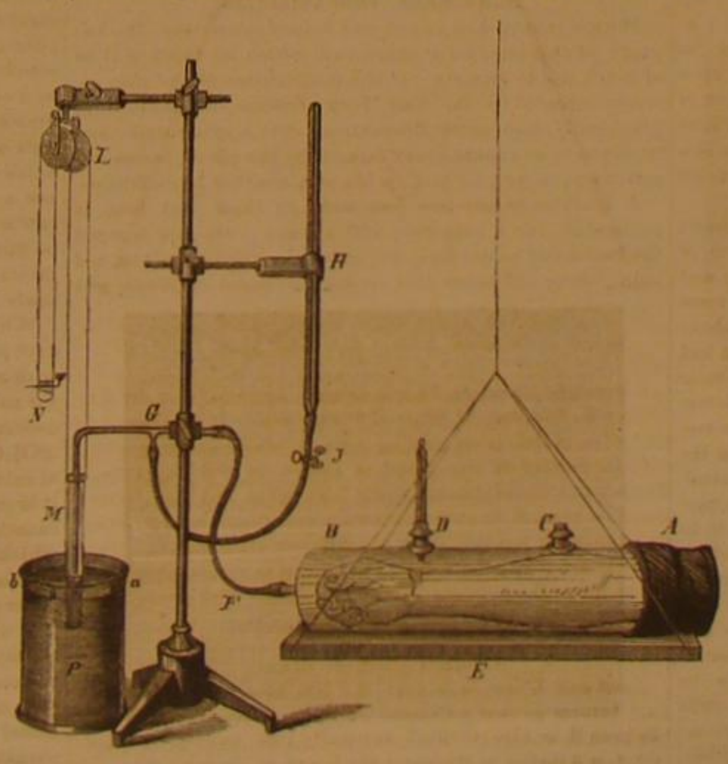
Probably few of our readers know what this very odorous cheese is made from. Its consumption has lately increased, says the London *Grocer*, in an enormous proportion. China itself, it appears, comes in for no mean part in consumption. France, of course, eats more Roquefort than any other nation; and England is acquiring a taste for it. The ewe's milk, from which it is made, is carefully preserved for the special manufacturing of Roquefort; 250,000 ewes furnish this milk, which is poured into large earthen basins, and slightly heated; it is then placed in molds under a slice of decayed bread, which promotes the formation of greenish tints after which the cheeses are salted and piled up in cellars, where they are left for several months before they are edible; and even then it takes the American people some time to acquire the taste necessary for their proper appreciation.

THE PLETHYSMOGRAPH.

Dr. A. Mosso, of Turin, says *La Nature*, from which we extract the annexed engraving, has devised a new method for measuring the movements of the blood vessels, which is destined to acquire very extended usage in physiological investigation and in clinical medicine. It consists in encircling with a rubber ring, A, any member of the body, as for instance the forearm, and inserting it in a glass cylinder, B, which is filled with tepid water. By means of a special apparatus is measured the quantity of water admitted or expelled through the opening, F, in said cylinder, by the contraction or dilation of the volume of the member. The cylinder rests on a plank, E, which is suspended by cords from the ceiling so as to prevent the involuntary movements of the body causing any motion of the arm in its receptacle.

In order to measure the water, the opening, F, communicates by a pipe with glass tube, G, which, bent at right angles, descends to the level, *a b*. A small test tube, M, suitably graduated, is suspended from a double pulley, L, and is equilibrated by the counterweight, N, to which is attached a pen which marks on an endless band of paper (not shown), caused to unroll before it by clockwork or other suitable mechanism. The test tube is so suspended that the pipe, G, is exactly in its axis. Supposing now that the vase, P, placed below the test tube, is filled with water, and that the vessels of the forearm dilate, increasing the volume of the member, a proportional quantity of water will then be expelled from cylinder, B, and will pass into the test tube, M. The latter will then sink in the vase beneath, and so will displace, in its turn, a quantity of liquid exactly equal to that which it has received. The counterweight, N, will of course rise, and obviously a contraction in volume of the arm will produce just the reverse result. In order that the pressure in the cylinder, B, may be constant, it is necessary that the water level in M shall always be in the plane, *a b*, of the liquid in the vase, P To avoid d'splacements of these levels, a mixture of alcohol and water, of less density than water alone, is used in the vase. With this precaution the test tube may fill and empty, rise and descend, without its variation in weight causing any disturbance of the levels, the cylinder pressure thus remaining invariable.

By using two plethysmographs, Dr. Mosso has obtained pen traces representing the varying volumes of the forearms, the pulse of the carotid, and, in general, valuable physiological data leading to the demonstration of the most important phenomena of the blood vessels. He has been able to make researches on the causes of sleep and the action of substances which favor or hinder the same. One curious result noted is that all the minor emotions translate themselves into modification of the state of the blood vessels. The mere entry of a person, interesting to the individual whose arm was being experimented upon, produced a diminution of volume in the member of from 0·25 to 0·75 cubic inch. The work of the brain, during the solution of any difficult problem, is said also to be always accompanied by a contraction of the vessels, proportionate to the effort of thought and to the cerebral activity. Dr. Mosso, says our contemporary, has opened a new field in experimental therapeutics, in giving us a most convenient method for studying the direct action of remedies on the human economy



THE PLETHYSMOGRAPH.

Home-Made Cherry Brandy.

As the cherry season is now at hand, the following description, from the *British Trade Journal*, of how Swiss peasants make cherry brandy will doubtless prove interesting to those possessing large quantities of the fruit and desiring a possibly profitable utilization for a portion of their crop. The soft red-stalked black cherries are principally used, and are gathered as soon as they are ripe. They are preserved in open barrels during fermentation, when the fermenting cherries rise just to the top and form a comparatively thick covering over the cherry liquor. as soon as fermentation has ceased, they sink again to the bottom, and are entirely covered by the liquor. The carbonic acid gas usually escapes with violent precipitation. When the weather is warm, this stormy flight ceases after a few days, but only very gradually; and then, if the manufacturer does not wish to enter into the process of distillation immediately, the cask is hermetically closed. As a rule, distillation is postponed to the winter, not, however, for want of time, but principally because in the meanwhile the cherry brandy acquires a bitter taste, which is the result of the fermentation of the kernels of the cherry stones. This bitter taste is considered of such importance that in some places the cherry stones are specially taken out and pressed, and the results are then infused into the pure liquor.

Distillation among the peasants is effected by means of copper kettles, which have big hollow handles and one or two vapor-diverting pipes. The kettles, in consequence of the rise of the fermenting product, are rneve quite filled. They are very slowly heated, as their contents easily catch fire, and the brandy possesses the best taste when it has been gradually drawn off at a medium temperature This process in the preparation of the *kirschwasser*, as it is called, is managed by professional distillers. The cooling apparatus is generally nothing more than a stone or wooden reservoir into which the icy waters of a spring continually flow, and through which run one or more pipes (communicating with the still) in an oblique direction from top to bottom. Great care is taken that the distilled liquor is well cooled, as otherwise its quality very perceptibly suffers. That portion which runs over—the so-called precipitate—is carefully collected and poured back into the kettle in order to prevent the ether, of which it is partly composed, from concentrating in any one portion of the cherry brandy before the entire mass is properly boiled: perhaps also to prevent the cherry brandy from accumulating verdigris. When, towards the end of the process, the fluid is not found to possess the necessary strength—a *statu quo* which practised distillers can easily detect by the manner in which the atmospheric bubbles rise to the top when shaken—it is specially drawn off and mixed with the next cask. In large distilleries the process is conducted by steam.

Setting Flower Cuttings.

A practical florist gives the following directions for setting cuttings: A healthy plant should be selected, and strong-looking woody pieces cut off: these, with a blossom on the end, rarely fail. Trim off the large leaves and put them in water for a few hours or a day. Cuttings of ivy (*tradescantia*), wandering jew, canary bird flower (*tropæolum peregrinum*), and oleander, should be started in water and kept in water, in the shade, until a little root appears. Each cutting should have a good sized pot, or several cuttings can be put in a wooden box. The best soil for amateurs to use is half good earth and half white sand, well mixed; water well and keep in the shade, but not in damp, until the cuttings have taken, then give full sun. Transplanting geraniums requires skill. An amateur should use pots and keep the geraniums in them, sinking the pots in summer; and if the earth is not rich, they can be watered with fertilizers in winter. A five inch pot will do for a geranium for a year.

The Pictet Ice Machine.

Anhydrous sulphurous a cid, SO_2, is liquid under the atmospheric pressure at a temperature of 14° Fah., and does not give a pressure exceeding four atmospheres for a temperature of 95° Fah. It has no a-tion on metals, or on grease, is not combustible, and at the same time is not expensive. A new ice machine has been devised by M. Raoul Pictet, to produce cold by using anhydrous sulphurous acid.

The experiment which has given the best results, for a type of machine capable of manufacturing 550 lbs. of ice per hour, may be described as follows:

A tubular cylindrical copper boiler, 6 feet $6\frac{3}{4}$ inches long by $13\frac{3}{4}$ inches diameter, is traversed longitudinally by 150 tubes of $\frac{13}{32}$ inch diameter, which are welded at their extremities to each end of the boiler or refrigerator. The vessel is placed horizontally in a large sheet iron vat containing one hundred boxes of $5\frac{25}{100}$ gallons of water. An anti-freezing liquid (salt water) is constantly driven into the interior of the refrigerator by means of a screw. This liquid cools to about 19·5° Fah. for ordinary working, and in returning washes against the sides of the box in which is the water to be frozen. In the reserved space between the refrigerator tubes, the liquid sulphurous acid is evaporated, and its vapors are drawn by a force and suction pump, which compresses them in the condenser. This condenser is a tubular boiler identical with the refrigerator, with this exception, that a current of ordinary water continually passes and repasses through the interior of the tubes to carry off the heat produced by the change from a gaseous to a liquid state of the sulphurous acid by the work of compression. A tube, with a stopcock regulated by hand once for all, allows the liquid sulphurous acid to return to the refrigerator to be again volatilized. The anhydrous sulphurous acid has the exceptionally advantageous property of being an excellent lubricator, so that the solid metallic piston working in the cylinder of the forcing pump does not need oiling. Thus introduction of foreign matter into the apparatus becomes impossible. The force necessary for manufacturing 550 lbs. of ice per hour is at the outside 7 horse power. A temperature of 19·5° Fah. in the bath is more than sufficient for obtaining in the boxes a rapid and entirely economical freezing. The cost of making ice by this process is estimated at $2 per tun.

THE CENTENNIAL HORTICULTURAL BUILDING.

On the front page of this issue we publish an engraving of the interior of Horticultural Hall, a building which will be, to many visitors, the most attractive section of the Exhibition. The lightness and airiness of the structure and the beauty and variety of its contents, added to the fact that all their attractiveness is the work of Nature, will certainly secure a large share of the attention of many visitors. The noble palms shown in our engraving, are, many of them, new to this country; and there is, in nearly every department of floriculture and arboriculture, a good selection of native and foreign species. One hundred species are forwarded from Jamaica alone, all of them rare and interesting, many of which have never been in this country. The ferns indigenous to the United States also number one hundred varieties. Moreover, the following interesting and valuable plants will be shown, growing in the soil, and blossoming and bearing fruit: Ginger, pimento or allspice, nutmeg, alligator pear, bamboo, sarsaparilla, Liberian coffee, yam, cashew nut, *lignum vitæ*, teak, Indian or China grass, betel nut, tea. Also, specimens of the pawpaw, mammee apple, mango, black pepper, indigo, breadfruit, and noseberry. A few beautiful specimens of the orchid may also be found in the west wing of this building.

Illustrations of the Centennial.

We give on our front page an elegant illustration of the interior of Horticultural Hall, for which we are indebted to *Harper's Weekly*. We will take this occasion to say that the picture of the Woman's Pavilion and New Jersey building, given in our number for June 3, were also from that journal, credit for which was inadvertently omitted at the time of publication. The arrangements of the Messrs. Harper for the illustration of the Exhibition have been made on a most extensive scale, regardless of cost, and the numbers of their popular weekly teem with artistic productions of the highest merit.

Correspondence.

The Extraction of Gold.

To the Editor of the Scientific American:

The variety of the elementary bodies found in ores of the precious metals renders it extremely difficult to furnish any single formula that will in all cases meet the requirement of the metallurgist; but a large class of placer gold and auriferous ores will admit of treatment by the following process, which may, by slight alteration, be made to suit others.

Gold is generally found in Nature accompanied by other metals; and those are often in combination with other elementary bodies, such as sulphur and tellurium, in variable proportions. These are subject to decomposition by the action of oxygen, or water, or carbon; in the change, sulphuretted hydrogen is generated, and perhaps a union with sulphur and carbon is effected. The former is readily absorbed by gold, communicating to it a negative quality as regards mercury, forming what is called unamalgamable or rusty gold. The ordinary amalgamating process takes up a large part of the coarse gold. This favorable condition is due to its greater specific gravity, which favors superficial cleaning by the attrition received, while it presents less surface of the gold to chemical action. The finer particles escape amalgamation.

A quantitative analysis of the tailings at any of the quartz mills or placer washings will determine the difference of the assay value and the amount obtained by the mills; and the difference between the two estimates will excite some surprise. To obviate some of the inconveniences above mentioned has long been desirable, and resort has been had to other methods of treatment. Smelting, one of the most perfect processes for the reduction of metals, is unfortunately one of the most costly, and therefore cannot be employed in case of poor ores. The next in importance is the chlorination process, the invention of the celebrated metallurgist Plattner, of Freiburg, Germany. This process presents advantages of economy which have caused it to be adopted in California and elsewhere; yet unfortunately it entails certain conditions, difficult to comply with in many cases, which greatly impair its value. It is necessary that the ore should be free from most of the base metals and earthy bases. The weak attraction for oxygen and want of stability of the former, and the absorption of chlorine by the latter, will defeat the object in view. Under the most favorable conditions, very great skill and attention are necessary to insure success. To avoid the cost of smelting, and the restrictions narrowing the sphere of usefulness of the chlorination process, the following process has been devised:

The auriferous sulphides or fine sulphurets are roasted in the ordinary reverberatory or other furnaces, under the conditions commonly employed. The sulphurous vapors arising are passed through a broad-based chimney, partially filled with ore, rock, or coke, of egg size or thereabouts, resting upon a grating. A small stream of water is introduced and allowed to impinge on the top, and will percolate through the whole mass. The water arrives at the bottom highly charged with sulphurous acid from the ascending vapors; this acid may be converted into sulphuric by the use of hyponitric acid in a similar chimney arrangement. After roasting, the ore may consist of sulphate, sulphide, and oxide of iron, copper, etc. If the roasted ore is treated to a warm solution of dilute sulphuric acid, as above mentioned, there will result the following reaction: $FeS + HO, SO_3 = HS + FeO\ SO_3$. The sulphuretted hydrogen passes off as vapor; the iron sulphate and other soluble salts, if present, may be leached out. The insoluble salts remaining with the gold exert no action in separation by mercury. The addition of a little caustic lime at end of the process, excluding it as much as possible from atmospheric influence, will give rise to the formation of the hydrated protoxide of iron, a powerful deoxidizer, which acts by keeping both mercury and gold clean and active.

JOHN TUNBRIDGE.

Newark, N. J.

Working Men's Reading Rooms.

To the Editor of the Scientific American:

I am happy to see that the working men have in you a true champion. They are to the country what his staples are to the farmer, to be relied on when other things fail; and it is in their behalf that I wish to speak.

Some time since I saw a reading room for working men suggested in your paper, and some of the towns in this vicinity have established such, to their benefit. Now there are many, perhaps hundreds, of working men, especially those employed in watch factories and the like, whose occupations during the day demand such a strain upon the eyesight that reading by lamplight is both difficult and injurious. There is also a class of working men whom my plan is more especially intended to help, namely, those whose limited education has not given them tastes which are calculated more to elevate character than to make money. A mechanic of the humbler class spends his life so much among the real, practical, and prosaic that, unless he has a very spiritual nature, he is apt to become coarse in his perceptions; and if he has no natural taste for instructive books, he will not be likely to acquire one in following his business. In almost every town, there are ladies and gentlemen who can spare at least one evening in the week, and who have enough literary talent to fill an interesting programme for an audience of working men, giving readings and addresses, which may be interspersed with music, thus making a pleasant and profitable evening for those who otherwise would find time hang heavily on their hands.

Many a workman who has yet to know what it is to receive wages that do not necessitate the strictest economy feels a pardonable hesitation in taking his family to any kind of meeting where broadcloth and velvet abound, and where people look askance at his worn clothes and hardened hands; but the entertainment I suggest would be his and his alone, and he and his fellow workers could meet thereat without restraint.

This suggestion is respectfully offered, not in opposition to that of the SCIENTIFIC AMERICAN, but to meet a want which that, in some instances, would not entirely cover. These ideas are, of course, subject to modifications; but I feel sure that such an institution, organized in any manufacturing town, would not be long in existence without a marked change for the better.

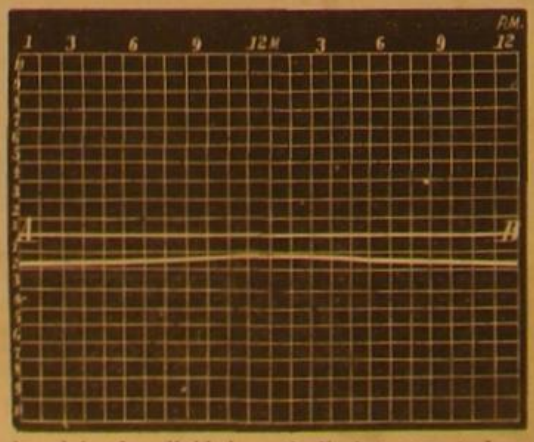
M. P. P.

Rockton, Ill.

HOME-MADE PROBABILITIES.

We are indebted to an old and valued subscriber, Dr. Levings, of this city, for a suggestion which we think will be of much use to farmers. It is a modification of the plan recently adopted by the New York *Tribune*, for exhibiting, graphically, barometric fluctuations over a given time; and its object is to enable every farmer, by the aid of barometer and thermometer, to cast up his own weather probabilities.

A blackboard, say two feet wide by three feet long, is preferable, but a barn door will answer. On this is ruled the horizontal center line, AB, in the engraving, say in red paint; above and below this are ten horizontal divisions, and



the board is also divided vertically into twenty hour sections, numbered to represent the hours as shown. The red line marks a barometric hight of 30 inches, and the other horizontal lines tenths of inches above and below. It is evident that on this the course of barometric variation can be indicated by an irregular line. For example, our engraving shows that at 12 P. M. the instrument registered 29·82, 12 hours later it had risen to 29·88, then it declined to 29·84. The board thus prepared is hung at any convenient place, near the barometer; and at noon or at any other time, whoever may pass it has only to glance at the clock or his watch, look at the barometer, and carry on the line to mark the indication with a bit of chalk. Then in the evening, say, if the farmer is desirous of knowing whether the weather will be fine on the morrow, he merely glances at the board, and the direction of the line tells the story. Being only a chalk mark, the line is rubbed out and made over every day. By observing the weather following changes of barometer, the farmer can soon learn to interpret the indications. As a general rule, however, says the *Tribune*, when the curved line is above the line of mean pressure and varies but little, fair weather may be relied upon; but if there are sudden and excessive fluctuations, a northeasterly storm is likely to follow. The time of its approach is indicated by the frequency of the fluctuations, its violence by the excess of the movement. When the curve is below the line of mean pressure, uncertain weather, mainly from the southward, with increased temperature, will follow. A descent of the curved line from above to below the line (30) evinces a tendency from good to bad weather; while an ascent, from below to above it, points as unmistakably to pleasant weather, which may, however, not be of long continuance. The diagram is the measure for all storms likely to occur. The proportional distance above and below the central line marks the excess of changes. As temperature corresponding to barometric indications is also an aid to predicting the weather, a second board might be constructed to mark changes in the thermometer, and hung beside the one already described.

Solvay's Ammonia Soda Process.

This new method of making soda ash from common salt seems likely to prove as great a success in practice as it is remarkable in theory. In technology revolutions take place slowly. Although this process was exhibited at the Vienna Exhibition and attracted a great deal of attention there, it has been slow in coming into practical use. Professor A. W Hofmann did not hesitate then to prophesy for it a brilliant future, but some details of the operation were not yet perfect, and, while capitalists hesitated to risk on a thing so new, old manufacturers fought it as their direst foe. The operation depends on a principle discovered a long time previous, namely: that bicarbonate of ammonia is able, under certain circumstances, to decompose the much more permanent compound, chloride of sodium, the result being chloride of ammonium and bicarbonate of soda. A patent was taken out in 1838, in England, for making soda ash in this way, but it seems not to have come into practical use.

E. Solvay took out several patents abroad, the first being in 1863. His method, we understand, as now employed, is nearly as follows: In one tank a saturated solution of common salt is first prepared, and then slightly diluted with water until it stands at 67° or 70°. This solution is then filtered and run into a second tank, and ammonia gas forced up through the brine in small bubbles, which are rapidly absorbed. When the brine has become saturated with ammonia gas and its density falls to 16°, it flows automatically into the third tank, first, however, passing through a worm placed in cold water to cool it. This third vessel, called the absorber, is the most important part of the apparatus, for it is here that the carbonic acid is admitted, which seems at first to combine with the ammonia to form a bicarbonate of ammonia, then, gaining fresh power, it attacks the chloride of sodium, driving out the acid and combining with the base. The operation may be represented thus; $(NH_4)HCO_3 + Na\,Cl = NH_4\,Cl + Na\,HCO_3$. The absorber is a cylinder 37 to 53 feet high, provided with numerous perforated, convexed, horizontal partitions, or false bottoms, with teeth-like openings around the edge. The absorber is filled with liquid and carbonic acid forced in at the bottom under 1¼ to 2 atmospheres of pressure; and ascending, it comes into intimate contact with the liquid. The bicarbonate of soda collects as a crust on the false bottom. The liquor is frequently drawn off, and the absorber filled with water to dissolve the soda salt, which can then be evaporated in vacuo and the excess of carbonic acid driven off and caught in receivers for use a second time. The carbonate of soda resulting from calcining this bicarbonate is quite pure if the salt employed be pure, and is at all events free from sulphur, an ever-present and inavoidable contamination of crude soda ash made by the Leblanc process.

What becomes of the waste products? The chief by-product is, of course, chloride of ammonia, which by treatment with an alkali is decomposed, and the ammonia gas liberated for use over and over again. If quicklime be employed to decompose the sal ammoniac, the operation is as follows $2NH_4Cl + Ca\,O,\ H_2O = Ca\ Cl_2 + 2NH_3 + 2H_2O$. The chloride of calcium thus obtained being an article of very little value, it is preferable to decompose the sal ammoniac by means of caustic magnesia, thus obtaining a chloride of magnesia, which can in turn be decomposed very readily by the action of steam into caustic magnesia and hydrochloric acid, the latter a valuable commercial article, the former for use again.

It will be seen that there is no waste, every product being utilized; and the question of practicability rests chiefly on the one question: Is bicarbonate of ammonia able to decompose all, or very nearly all, the chloride of sodium in the brine? Ordinarily, no; but under pressure and by a proper adjustment of conditions it seems to have become possible, else the success of the process reported abroad could not have been attained.

Moths.

This is the period when moths begin to fly, and those who have not packed away winter garments and furs should lose no time in doing so. Beat the articles thoroughly, and expose them to bright sunlight and air for several hours. Seal them up in tight paper cases, or put them away in close trunks, with plenty of gum camphor, pepper, tobacco, chips of Russia leather, or cedar dust.

A GOOD cheap paint for rough woodwork is made of melted pitch 6 lbs., linseed oil 1 pint, brick dust 1 lb.

PORCELAIN AND POTTERY.

LECTURE DELIVERED AT THE STEVENS INSTITUTE OF TECHNOLOGY, BY PROFESSOR CHARLES F. CHANDLER, OF COLUMBIA COLLEGE, NEW YORK CITY.

The object of the present lecture is a brief description of the potter's art in its various branches. The word pottery, which is of Latin origin, is frequently replaced by ceramics, a word derived from the Greek, and having a more comprehensive meaning. The material used in this art is chiefly clay, a hydrated silicate of alumina; and the product differs from glass partly in composition and partly in the mode of preparation. Glass is readily fusible, and can be worked only in a fused condition. Pottery, on the contrary, receives its final form before the fire is applied, and it is then baked only to harden it.

When the molten mass of the earth became solidified, the outer crust was composed chiefly of silicious rocks, such as granite. Granite is composed of three different substances: quartz, which is almost pure silica; felspar, a silicate of alumina and potassa; and mica, a silicate of lime and alumina. After a time the high temperature prevailing on the earth's surface decreased, moisture was precipitated, oceans were formed. These oceans were acid, containing hydrochloric acid, by which the rocky crust was attacked and decomposed. The disintegration of the silicious rocks is still going on, though only on a much reduced scale, and the products of their disintegration maintain the fertility of our soil. The felspar and mica are thus converted into clay, in which the quartz remains imbedded, the whole retaining the original shape of the parent granite until it is washed away by the action of water. Then the heavier and coarser particles of quartz are deposited near by as sand, while the finely suspended clay is carried to some distance into quiet water, where it has leisure to settle. By further chemical action the clay may then be cemented together to form slates and shales, and the sand to form different kinds of sandstone.

Clay is found nearly everywhere on the surface of the earth. It is valuable to us on account of its plasticity, by virtue of which it may be easily molded, rolled in sheets, and worked liked dough, and because it may be baked together to form a solid, compact mass. In its pure state it has the disadvantage of shrinking considerably in the baking, and other substances must be added to counteract this tendency. Sometimes the proper mixture is found ready made in Nature. The purest of all clays is known as kaolin, china clay, or porcelain clay. It is indeed perfectly pure and white, and was formerly found only in China. For this reason the manufacture of porcelain was so long impossible in Europe. Clay containing carbonate of lime is called loam, and, colored with oxide of iron, ocher. Other names are potter's clay, brick clay, marl, etc.

The ware manufactured by the potter varies with the nature of the clay and of the substances added to it. We may classify it under the heads of porcelain, stoneware, and earthenware.

Porcelain is dense, hard, and compact; it emits a ringing sound on being struck, cannot be scratched, and is more or less translucent when held up to the light. When broken, the fracture shows no porosity, and it does not cleave to the tongue. There are three varieties: the hard or real porcelain, in which the glazing is of the same material as the body of the ware, differing only in proportions; the soft or tender French porcelain formerly made at Sèvres, which is not a true porcelain but a semi fused glass-like substance; and the English soft porcelain, which is made with the addition of phosphate of lime or bone ashes to render it more fusible.

Stoneware, in its more common forms, is dark, more or less imperfect, partially fused, and covered with a thin glaze The characteristic of earthenware is its porosity; it is not fused at all.

True porcelain came originally from China and Japan. Its manufacture, according to their traditions, extends back to the remotest antiquity. It was found there by travelers as early as 2,000 years ago. For a time the secret was lost; but about 485 B. C. it was recovered. The first attempt to imitate it in Europe was made in 1695, when they succeeded in making the tender porcelain at Sèvres. In 1703, true porcelain was invented in Germany. Böttger, a Berlin apothecary, somehow acquired the reputation of possessing the secret of making gold. So valuable a person could not be suffered to remain at large by a needy government, so he was kept in confinement and provided with all the materials he asked for. His gold making proved a failure, but he succeeded in producing a red stoneware having the properties of porcelain; and in 1709, when kaolin was found at Schneeberg, he at last produced the true white porcelain and became the first director of the works at Meissen. A history of the early potters and their hardships would be very interesting, if the time permitted. Take, as an example, the case of the Frenchman Palissy, who had sacrificed all he had in his endeavors to make the kind of ware known as *faïence*; and when on the point of succeeding, he made firewood of his furniture and tore up the floor of his room to keep up the heat of his kiln.

After a time the secret of the art leaked out; works were established in Berlin in 1751, and in Nymphenberg, Bavaria, in 1755; and in 1765 they gave up making soft porcelain at Sèvres, and began the manufacture of the true hard variety.

If kaolin alone were used, it would shrink considerably in the baking, and would furnish a very porous product. To prevent excessive shrinkage, quartz is added, while felspar is used to fill up the pores. The kaolin is first washed by suspending it in water, allowing the coarse particles to settle in the first tank, then drawing off to a second, and so on, until the deposit is of the requisite fineness. This process is called elutriation. In the next place, the felspar and quartz are calcined, dropped red hot into water to disintegrate them, and passed through a crushing mill. Fineness of the product is essential to success. Then all the materials are mixed up wet, in a rotating apparatus containing a number of knives. As the mixture would settle unevenly if allowed to stand, it is run into a number of flat bags placed between boards, and the water is readily filtered off. By allowing the mass thus obtained to stand some time before working, it becomes more mellow and plastic.

The process of shaping the plastic mass was illustrated on the platform by a professional potter, who made a number of objects on the potter's wheel, an horizontal disk of wood rotated by means of a larger horizontal metallic disk placed on the same axis and kicked by the foot. Another plan is to mix up the material with water to the consistence of cream and pour it into plaster of Paris molds, a number of which were exhibited. The plaster absorbs the water, and then the very fragile vessels of clay may be taken out and completely dried previous to baking. They require a temperature rather higher than a bright red heat. For this purpose large kilns, two or three stories high, are constructed, the rooms of which are large enough to walk about in. This is necessary, because the greatest care is required to avoid breaking the unbaked vessels, or green ware, as it is called. For the best quality, each object is separately placed on an infusible mold or seggar of the same shape. For inferior articles one seggar is made to serve for many objects, which are then kept apart by little bits of clay. Hence we often see two or three little defects in the glazing. When the vessels are baked, they come out as biscuit ware, which is compact and strong enough to bear handling.

They are next glazed by means of the same mixture with the addition of more felspar, which renders it more fusible. The vessels are dipped into the mixture, dried, and put back into the furnace, first taking care to remove all the glazing mixture from the bottom to prevent their being cemented to the seggars. The decorations are painted on with metallic oxides ground up with oil of turpentine, oil of lavender, or a solution of gum, and burnt in by placing in a small muffle furnace. Chromium produces a green, cobalt a blue, and gold a purple color

Specimens of porcelain from different works were exhibited, the American specimens being from the Union Works at Greenpoint. The latter were made more durable than ornamental, to suit the demand, though some were quite as thin and delicate as Berlin ware. Samples of artificial teeth of porcelain, purely an American enterprise, were also shown.

Stoneware is made from certain natural clays which contain the constituents of the porcelain mixture, but are more or less colored. It is thinly glazed by means of lime, soda, or potassa fluxes. Ordinary salt is often used for this purpose.

Granite ware is an English and American combination of stoneware clay and the porcelain mixture, for ordinary table china. To conceal the natural color, an opaque glaze of borax, lime, and oxide of tin is laid on. Instead of being decorated by the artist's brush, the design is printed on paper, stuck on, and burnt in. This ware is sometimes tinted blue with oxide of cobalt, or buff with oxide of iron.

Earthenware is merely baked without fusing, hence it is very porous and well suited for flower pots and water coolers for warm countries. The red color is due to oxide of iron. Some earthenware is glazed with oxide of lead; but this should never be used, as the glazing is poisonous. Acids readily attack it. It is easily recognized by its very glassy appearance.

Formerly the most famous pottery was the *faïence* (originally from Fajenza, Italy) and majolica (from Majorca), which consist of a cream-colored, porous earthenware covered with a thick glaze.

The lecturer concluded by exhibiting a large number of screen pictures, representing the manufacture of porcelain among the Chinese, the Egyptians, and the moderns, together with some of their choicest productions. C. F. K.

Useful Recipes for the Shop, the Household, and the Farm.

An excellent process for coloring gold is based on the use of the following materials: Nitrate of potassa 6 ozs., common salt 3 ozs., sulphate of zinc 3 ozs., alum 3 ozs. These are reduced to powder and allowed to dissolve slowly in the color pot over a fire that can easily be regulated. The mixture should be well stirred with an iron rod; and as it dissolves it will rise, when the work must be at once suspended in it and kept in continual motion until the liquid is about to sink down in the pot. The objects are then taken out and immersed in clean muriatic acid pickle, which will remove the adhering color. The color in the pot will rise again after the withdrawal of the work, and this opportunity may be taken advantage of for a fresh dip.

The following four recipes for dyeing goods at home are contributed to *Inter-Ocean*:

For orange on cotton goods, take 1 oz. bichromate of potash, 2 ozs. sugar of lead; dissolve in soft water enough to cover the goods, put in goods, simmer a few minutes, rinse in cold water, and dry. For blue, for 10 lbs. of goods, dissolve 10 ozs. copperas in water to cover the goods, put the goods in soak ½ hour; heat soft water boiling hot, and put in 6 ozs. prussiate of potash; put in the goods; let remain half an hour; air a few minutes, then add more prussiate of potash; put in the goods, let remain a short time; air again, and add ¼ oz. oil of vitriol; put goods back; let them remain 3 minutes, stirring them, then rinse in cold water. If wanted very light, do not allow the goods to remain in the dye after adding the vitriol but a moment; the shade can be made darker or lighter by the time it is left in the last time.

Permanent green on cottons: First color blue; then dissolve 5 ozs. sugar of lead in 4 gallons of water. Dissolve in another vessel 4 ozs. bichromate of potash in 4 gallons soft water. Dip the goods first in the lead water a few minutes, then in the potash water; wring out dry; afterwards rinse in cold water. If you wish a dark green, first dye a dark blue; if light green, a light blue.

Permanent yellow and orange: For 5 lbs. goods, 7 ozs. sugar of lead, in which dip the goods 5 minutes. Make a new dye with 4 ozs. bichromate of potash; allow the goods to remain about 10 minutes, or until the color suits. For orange pass it through strong lime water.

Durable brown for 5 lbs. goods: Two ozs. copperas (or alum) in sufficient water to wet the goods. One pound japonica dissolved in water. Take as much weak lye as will wet the goods well (or 8 ozs. bichromate of potash—this is more expensive, but no better); put in the japonica water; dip the cloth first in the copperas water, then in the japonica water, having it hot. Care must be taken to use a weak lye; if it be too strong, the color will be too dark.

We cull the following practical suggestions relative to hop growing from the report of a meeting of the Hop Growers' Union, at Clinton, N. Y.: Hops should be planted on well drained high ground. Land which has been in cultivation at least one year is better than sward land. The hills should be made seven or eight feet apart. Inasmuch as an early start and vigorous growth the first year insures vigor during the second year, it is well to plant as early as possible. Make the holes with a hop bar and plant five pieces of root in each. Do not cut off the first year's growth if the vines spread inconveniently, but wind them about the stake. Always cover the hills with manure before the ground freezes. The vines should be tied as soon as they will reach the poles. Do not begin to pick too early; when fit to gather the seeds will be hard and brown. All hops should be picked within a period of eight days. Farm manure is preferable to prepared fertilizers.

A good and simple furniture polish consists of a little Castile soap scraped into a pint of warm water. Add three tablespoonfuls of sweet oil; heat, and apply while hot.

Ceilings that look very rough and manifest a tendency to peel should be gone over with a solution of 1 oz. alum to 1 quart water. This will remove the superfluous lime and render the ceiling white.

The green outer husks of walnuts contain a yellow brown and remarkably fast dye, which is well suited for dyeing woolen or cotton materials, staining wood, etc. Wool thus dyed requires no mordant, is very soft to handle, and not like that dyed with vitriol. The shades of color obtained are from bright to dark brown. The husks may be simply kept dried till used, or packed moist in tubs, by which means their coloring power is further increased.

During recent experiments on fireproofing materials at Vienna, the following mixtures of salts were successfully employed: To 20 parts by weight of water add 3 of borax and 2½ of sulphate of magnesia. This forms an insoluble borate of magnesia, which surrounds and impregnates the threads or fibers to which it is applied, and renders either the development of gases or the spread of flame very difficult. To 1 part liquid sal ammoniac, add 2 parts sulphate of lime. A single coating of this acts as an excellent preservative for wood structures against burning. Old roofing soaked with tar and oil failed to catch fire after being impregnated with this mixture.

A new waterproofing compound for fabrics is made as follows: In 14 parts of water, heated to 180° Fah., dissolve 10½ lbs. gelatin and 21 lbs. castor oil soap. Then add 10½ lbs. gum lac, shaking the liquid until the last is completely dissolved. Remove from the fire, and add in small quantities 21 lbs. powdered alum until the alum dissolves. This forms an insoluble alumina soap, closely incorporated with the gelatin and the gum lac. Apply with a brush.

A cement suitable for joining metals to non-metallic substances is prepared by dissolving in boiling water 2½ lbs glue and 2 ozs. gum ammoniac, adding in small quantities about 2 ozs. sulphuric acid.

Exterminating Bedbugs.

Where all other means have failed to exterminate bedbugs, sulphurous acid gas has succeeded. Take everything out of the infested room, plug up all the windows tightly, close all chimneys, and empty about 1 oz. of powdered sulphur on a pan of hot coals, placed in the middle of the floor. Shut the doors and cover all cracks; let the sulphur burn as long as it will. Where the room is large, it is a good plan to fasten a bit of tin tube to the bottom of the pan, and to this connect enough small rubber pipe to lead out of the nearest door. By blowing into the end of the pipe with the bellows, the sulphur will be caused to burn more quickly by the draft created, and to give a denser smoke. After the sulphur has burned out, paint all the cracks in the floor and around the mop board with a strong solution of corrosive sublimate, and treat the furniture to the same before replacing it. We have seen a room frightfully infested completely freed by this plan.

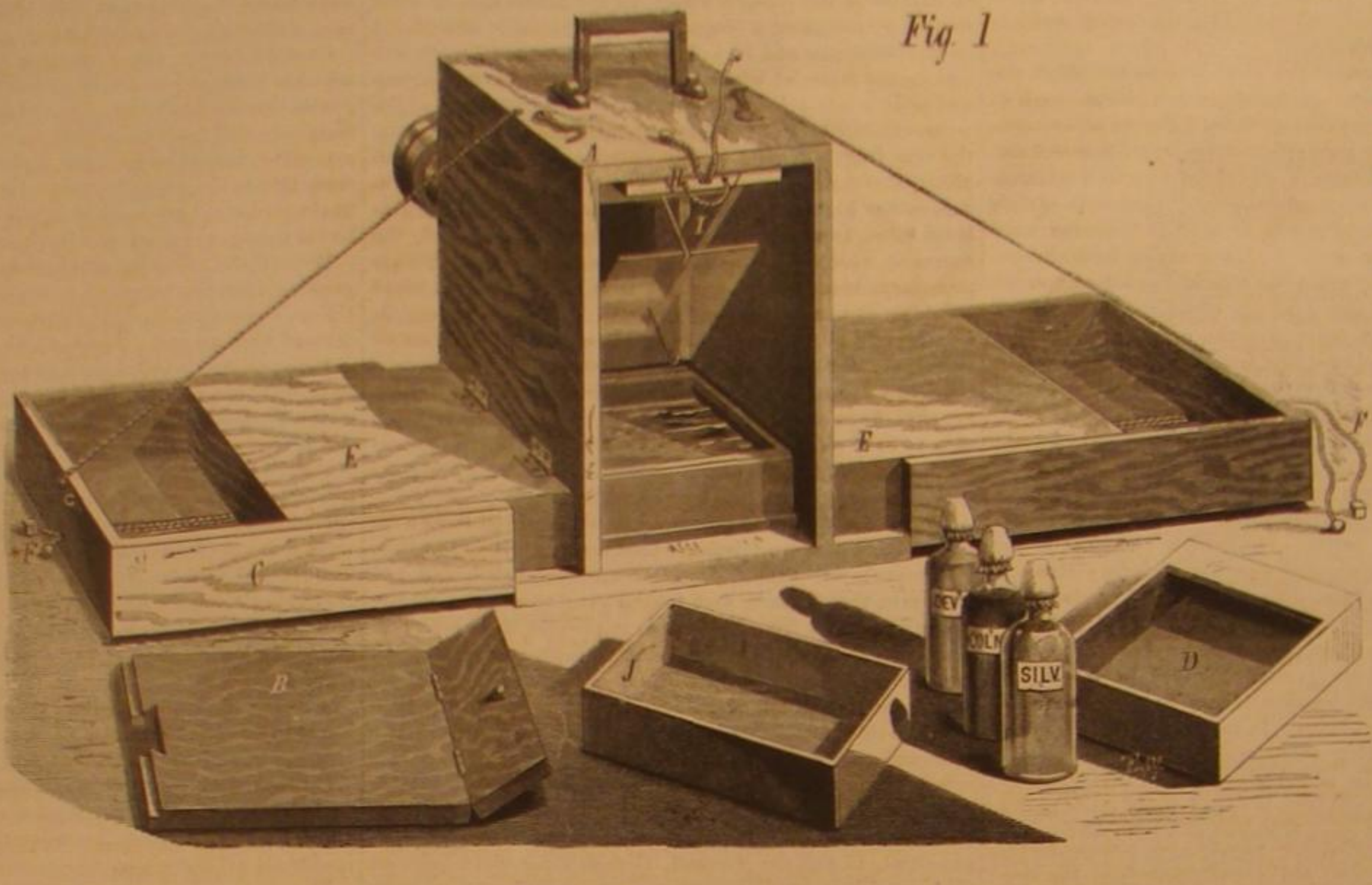
To bleach leaves, mix 1 drachm chloride of lime with 1 pint water, and add sufficient acetic acid to liberate the chlorine. Steep the leaves about 10 minutes, and until they are whitened; remove them on a piece of paper, and wash in clean water.

C. T. S., of Rockland, Mass., claims that the nail-making machine, recently credited by us to the late Jacob Perkins, was the invention of Colonel Jesse Reed.

IMPROVED PORTABLE PHOTOGRAPHIC APPARATUS.

We illustrate herewith a new photographic apparatus of very simple construction and intended to enable persons having little or no knowledge of photography to succeed in producing good pictures. It is equally well suited for the professional artist as for the amateur, and its compact form renders it especially well adapted for out-of-door work. The manipulations required are purely mechanical and require no dexterity or skill. The dark room or tent is abolished, and there is little probability of clothes or hands being soiled with the chemicals.

Fig. 1 represents the invention ready for use; the construction is depicted in the sections, Figs. 2 and 3. The central and main case, A, Fig. 3, is provided in front with the usual lens and cap, and in rear with a removable shutter shown detached at B, Fig. 1. To the bottom of the main case at each side are hinged side cases, C, which, when extended as shown in Fig. 1, are sustained by cords, and, when folded as in Fig. 3, are attached to the main portion by hooks and staples. Openings are made in the lower part of each side of the main casing, as shown in Fig. 3, to allow of inserting therein the trays, D, containing the developing and other solutions. Just above these openings are hinged boxes, E, which inclose the trays when the latter rest on the side cases, C. In this position the two boxes, with the central or main case, form the dark chamber. When the apparatus is folded, the boxes rest, as shown in Fig. 3, against the side walls of the main case. The trays, D, are made of sheet zinc, and are controlled from both sides of the apparatus by the strings, F, by which they are drawn at will from their position in the boxes, E, into the main chamber, or *vice versâ*.

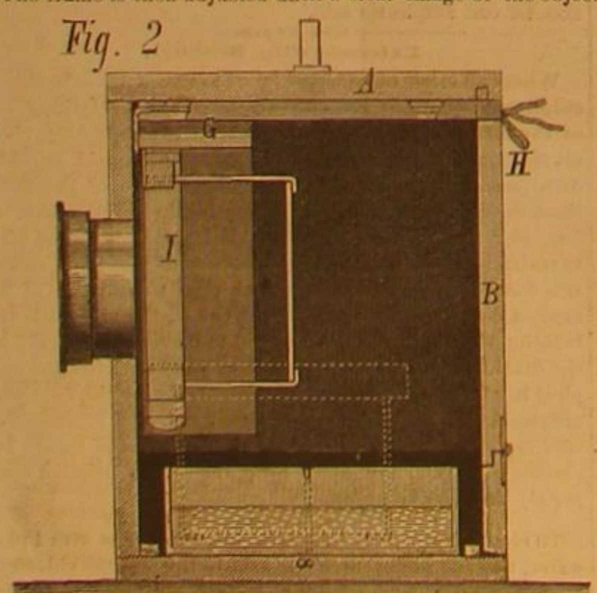


BRICE'S PORTABLE PHOTOGRAPHIC APPARATUS.

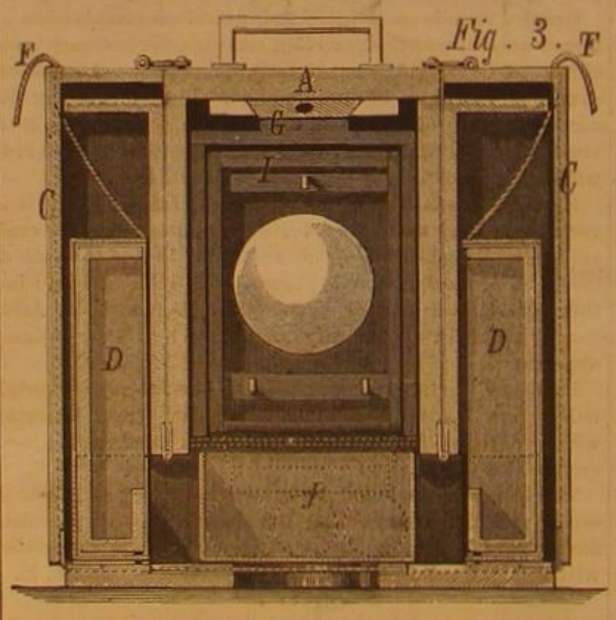
G, Fig. 2, is the focussing frame which slides by a dovetailed piece in guide strips. The sliding piece is graduated above so as to allow of the adjustment of the frame in any position in which it has formerly been set. A loop shown at H, Figs. 1 and 2, serves to move the frame as desired. Inside the latter is pivoted a swinging frame, I, Figs. 1 and 2, which supports projecting wire arms having hook ends to hold the ground glass or sensitized plate. This frame is held above by a suitable catch, which is released at will by one of the strings shown at the top of the case. A second string serves to raise and lower the frame, I, so that the plate may be dipped at will into the different solutions contained in the trap below (dotted lines, Fig. 2).

Besides the two trays in the side boxes there is an additional water tray, which is introduced into the main case through the lower hinged part of the rear shutter. There are also suitable boxes, J, Fig. 3, for storing the bottles of chemicals, etc. The mode of manipulation is as follows, the apparatus being arranged as in Fig. 1:

The focussing frame is drawn out and the ground glass inserted, and the whole pushed back until the catch engages. The frame is then adjusted until a clear image of the object



is obtained on the glass, when the figure marked on the slide piece scale is noted. One of the side trays is next drawn into the main case and filled with the silver solution from one of the bottles shown. This tray being returned to its first position, the other tray is similarly drawn forward, filled with the developing solution, and replaced. The collodionized glass plate is now inserted instead of the glass one, and the frame moved forward. The rear shutter is affixed in position. The swinging frame catch is next released; and the frame is gradually lowered into the silver solution, the tray containing which has previously been drawn into position. The plate is allowed to remain in this bath for about four minutes, to render it sensitive to light. It is then lifted out, and the frame carried forward until the click of the catch is heard. The focussing frame is now adjusted to the mark on the scale already observed, the lens cap is removed, and exposure takes place. The tray with the silver solution being returned to the box, the developing solution is drawn into position, and the glass plate is lowered into this for about ninety seconds. At the expiration of this period it is removed; and the water bath being introduced through the rear shutter, the plate is finally lowered and washed. Nothing further remains to be done but the usual finishing treatment.



Patented in the United States, Great Britain, France, and Belgium through the Scientific American Patent Agency. For further particulars address the inventor, Wm. A. Brice, care of R. Clifford Poulter, 4*a* Middle Temple Lane, London, E. C., England.

A Long Gas Pipe.

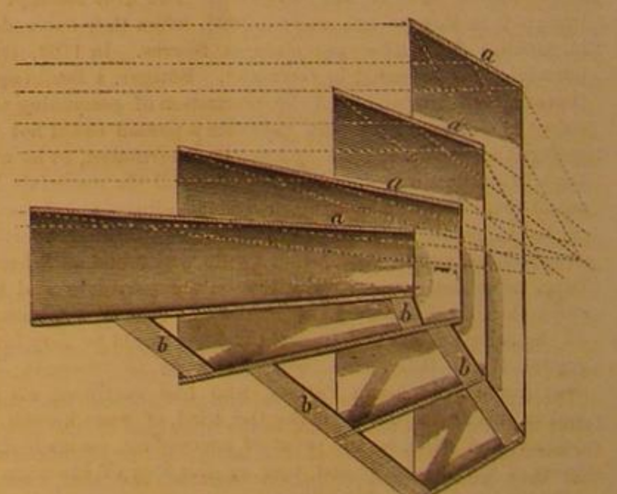
There was, says the *American Manufacturer*, a very interesting and conclusive experiment made with the use of the 3-inch pipes of the Columbia Conduit Company, before they were in use for the transportation of oil, by connecting them with a small gas well at Millerstown. From the time the gas was turned in to the time it ignited at Hammerville, Allegheny county, 32 miles from the well, was 22 minutes; of course it was impeded by the air, which had to be forced out of the whole 32 miles of pipe in that time. The amount discharged was at the rate of 161,000 feet per 24 hours, the noise or roar of the discharge alarming the people living in the vicinity, with no perceptible difference in the flame between the discharge end of the pipe and at the well. The pressure at the discharge was 49 lbs., and at the well 55 lbs., a difference of only 6 lbs. per inch after the connection with the well. This, of course, is not in conformity with the theories and demonstrations of scientists, but the experiment was conducted under the care of two experienced engineers, namely, J. H. McElroy, of Pittsburgh Gas Company, and R. Young, of Allegheny Gas Company, and the facts can be relied upon. It looks as though some facts would have to be changed, or some tables and books on pneumatics and hydraulics will have to be revised.

Six 100-Tun Guns.

Sir W. G. Armstrong & Co., of the Elswick Ordnance Works, Newcastle-on-Tyne, are constructing six 100-tun guns for the Italian navy. They will be muzzle-loaders, and will consist of 19 distinct pieces, bound together by the process usually adopted at the Elswick works. The barrel of each gun will be constructed of two lengths of steel, each length being about 16 feet, so that the total length of the barrel will be over 30 feet. The breech end of the barrel will be 29 inches in diameter, and the muzzle end 25·39 inches. Special machinery has been applied to the manufacture of the guns. The process of boring the barrels, which are made of welded steel, is one of great difficulty and delicacy. The first bore put through the solid steel was 9 inches, the second 12 inches, and the third 15¾ inches diameter. The center tube will be bound by 15 different coils, on the principle introduced by Sir W. G. Armstrong, and the trunnion pieces will be no less than 6¾ feet in diameter. There is no machinery now existing strong enough to deliver such guns, and hence Sir W. G. Armstrong & Co. have for some time past been constructing a crane to lift them in and out of the ships in which they will be fought. This crane is capable of lifting 160 tuns, and its platform revolves upon a line roller frame of 43 feet diameter. It stands upon a masonry and concrete pedestal 20 feet high and 50 feet in diameter, the outer wall of which is made to carry the path in which the line roller ring runs; while the center is hollow and serves as a house for the boiler and the pump supplying the water pressure for working the crane. The process of lifting is achieved by an inverted hydraulic press hung in gimbals, on a new system devised by Mr. Rendal. Motion is imparted to the crane by an hydraulic rotary engine. The foundations for the crane are being laid in the arsenal of Spezzia, where it will be a fixture.

ANOTHER INVENTOR OF THE BALESTRIERI REFLECTOR.

We took occasion, recently, in describing the new lantern alleged to be the invention of Professor Balestrieri, of Naples, to point out that substantially the same device had already been patented by American inventors in this country in 1871. We are now indebted to an old and valued correspondent, Mr. David Shive, of Allentown, Pa., for reminding us that he devised the same apparatus a year previous to the date of the patent above referred to, and used it for concentrating the sun's rays in order to melt refractory sub-



stances. Mr. Shive refers us to our own files, and we find that in 1870 we published the annexed illustration, which the reader will see is almost precisely similar to the Balestrieri invention. Mr. Shive's idea of using the apparatus for heat, and that covered by the 1871 patent, for employing it as a locomotive head light, seem to include all of Professor Balestrieri's applications. So this appears to be an instance of double re-invention

THE CONTENTS OF A COD'S STOMACH.

Mr. Frank Buckland publishes in *Land and Water* the remarkable engraving herewith reproduced. The curious object is a mass of horsehair and string, the fibers of which are matted and intertwined well together by means of no less than ten fish hooks. All these are small hooks except two; these, as can be seen by the engraving, are much larger. It is a remarkable thing that the points of all these hooks are turned upwards. He cannot quite account for the presence of so many hooks in the stomach of this cod, except that the cod who owned the stomach had somehow or another managed to get hold of haddocks or whiting caught on hooks, and in whose bodies the hooks still remained. The flesh of the whitings or haddocks had been entirely digested by the juices of the cod's stomach; the horsehair and metal of the hooks, however, resisted its action. That whiting and haddock have frequently hooks left in them is well known to all those who have the care of seals. Sea fish hooks are very cheap; and the fishermen, rather than take the trouble to extract the hook from the fish's mouth, very frequently cut off the "snood" or line to which the fish is attached, and let the hook remain *in situ*. The seal swallows the fish, hook and all, the hook gets entangled in the poor seal's intestines, and of course proves fatal.

"The cod is what is generally called a voracious fish. I have now in my museum," says Mr. Buckland, "a portion of a tallow candle, about seven inches long, also a pair of sailor's mitts, both taken from a cod's stomach."

FISH HOOKS AND LINES FOUND IN A COD'S STOMACH.

THE MYGALES—DOOR BUILDING SPIDERS.

In the Paris *Jardin des Plantes*, says *La Nature*, there is a curious spider belonging to the mygale species, and commonly known as avicular, owing to the supposition that the insect finds its prey in small birds. Like all spiders, this curious creature has eight eyes. Its mandibles are armed with sharp teeth, and its feet have retractile claws, resembling those of a cat. The cephalo-thorax is of a velvety black with an olive luster; the abdomen and feet are covered with long reddish hair. Its length is about three inches and its breadth seven inches. Only the larger members of the species attack birds, as they overcome their victims by sheer strength and not by poisonous injection; for although they possess venomous capabilities, the quantity of venom is not sufficient to affect large prey. Their favorite food is crickets and insects of large size, which they capture at night, lying torpid during daytime.

The most curious member of the species is a mygale indigenous to Corsica, a light brown spider which lies in tubes dug in clay banks. These passages run in a straight line for two thirds of their length, and then become slightly oblique at their inner extremity. A close examination of these remarkable habitations proves the existence in the spider of an instinct wonderful in its minuteness. The tubes are vaulted from end to end with a hard mortar, and this in turn is lined with a soft, silky web. Before, however, covering his walls with their finest hangings, the spider fastens up a coarse fabric, and on this, as a foundation, the more delicate material is secured. Then he begins the construction of his door, in which operation it would seem that almost reasoning faculties are employed. At a hasty glance, the cover appears to be merely a little disk of mortar lined within with web, hinged to one side of the aperture so as to open outward, and supported by a prolongation of the lining mortar. Close examination, however, shows the door to be far from carelessly constructed. Although scarcely one tenth of an inch thick, it is constructed of upwards of thirty alternate layers of web and mortar, each layer being imbedded in another, like a series of cups.

The web layers are extended to form the hinge, so that the latter is stronger in proportion to the thickness of the door. On scrutinizing the edges of the latter, it further appears that they are beveled obliquely inwards, and that a corresponding bevel exists in the orifice of the passage. The use of this arrangement is obvious; for were the edges of the door straight, the hinge would be the only barrier to breaking in the cover from outside, and its delicate material would quickly yield before a strong attack. With the beveled edges, it is, of course, impossible to force the door inwards. In order to hide his dwelling, the mygale covers his door with rough clay so that it cannot be distinguished from the adjacent soil, while the asperities allow him to open it easily in making a sudden retreat. Once in his den, however, it would be supposed that he would be powerless before an enemy knowing enough to force open his door in the proper direction. But the mygale provides for that contingency, and, being unable to make a lock for his portal, converts himself into that necessary means of security.

The interior of the cover, instead of being perfectly smooth, is pierced with, perhaps, thirty deep holes; and most of these are located just where a lock would be placed, that is, opposite to a hinge. When the spider finds himself besieged, he pokes his claws into these holes and fastens his sharp mandibles into the walls of his dwelling. Then, contracting his body, he pulls his door tightly shut, and so defies the inroads of his enemies.

During the day the mygale closes his portal, but at night he opens it slightly, and watches; should a fly or cricket come within proper distance, he leaps out, the prey is grasped, and the spider is back again in his den, with the door shut, before hardly a fraction of a second can escape.

It is said that only the females build and occupy these marvelous nests, since males have never been found in them. The lords of the spider creation have no fixed habitation, but live under stones and in crevices of trees, and prowl around in search of their precarious existence. It is probable that they meet the fate of all bachelor spiders, to whom matrimony is death; for it is a peculiarity of the arachnid bride to devour her loving helpmate at the earliest possible moment, and unceremoniously to throw the shell of his used-up carcass out of her nest, when she cleans house in preparation for a new husband.

DOOR-BUILDING SPIDERS.

The mygale carries its eggs inclosed in a closely woven cocoon of white silk, forming two rounded pieces, united at their border.

Happy Accidents.

It is a fact, patent to every one conversant with the progress of inventions, that the most useful discoveries are generally the result of accident. These columns have borne witness to a great number of individual cases of this kind. In the May number of *Chambers' Journal*, a writer says:

Seldom do men sit down with a steady resolve, a determined purpose, to discover some new principle or invent some new process. When they do so, there is a lurking idea of the kind of thing they want, a dim perception of the direction in which success may most reasonably be sought. Generally speaking, something is concerned which, for want of a better term, we call accident. An appearance presents itself, or an effect is produced, which the observer neither designed or expected: an accident, certainly, so far as he is personally concerned. It may be a manifestation, until then unknown, of some natural force or property; or it may be an action of one substance on another, susceptible of useful practical application. This is, briefly expressed, the distinction between a discovery and an invention. But the important point to notice is that the value of the accident depends on the kind of man or kind of mind, by whom or by which it is first observed. If the soil is not sufficiently prepared, the seed will not grow. Thousands of men had seen light reflected from distant windows, and variations in the light according to the angle of reflection; but a well prepared mind, on one occasion, suddenly drew from this phenomenon an idea which established the beautiful science of the polarization of light. It is pleasant to read of the manner in which shrewd minds have turned an accidental observation to practical advantage.

The reflecting apparatus for lighthouses arose out of a wager, if the facts are correctly recorded. Somewhat more than a century ago, some one in Liverpool offered to wager that he would read the small print of a newspaper by the light of a farthing candle placed ten yards or thirty feet distant. The wager being accepted, he coated the inside of a wooden board with pieces of looking glass, forming a rough substitute for a concave mirror; placing a small lighted candle in front of this mirror, the rays of light were reflected, and converged to a focus ten yards on the other side of the candle, and the light at that focus was sufficient to enable the experimenter to read a newspaper. An observant practical man was present. The idea flashed upon him that, if the light of a farthing candle could in this way be thrown out to a distance, the light of a large lamp could similarly be projected to a mile or miles away. The idea grew into form, and resulted in the invention of the reflecting apparatus for lighthouses.

One day, Lundyfoot, a snuff manufacturer, was drying some snuff. Through a little neglect, the snuff was allowed to be overheated, till it became charred. Noticing the pungent character of the snuff, and how it tickled the nose, and knowing that some men like to have the nose tickled more than others, he resolved to try whether high-dried snuff could be brought into favor. It not only did so, but proved a source of wealth to him.

The writer has seen a piece of calico being printed at one of the great Manchester establishments, become a little displaced. The effect was very singular. The diagonal repetition of the pattern produced a forked lightning effect, of a kind which a designer would not have been likely to hit upon. The master printer suggested the engraving of a design in which the forked lightning effect should be utilized. It proved to be one of the most successful patterns ever introduced by the firm.

One of the producing causes of prosperity of the Staffordshire pottery manufacture was the discovery of a cheap durable glaze. The discovery was due purely to accident. At Stanley Farm, a few miles from Burslem, a maid servant was one day heating a strong solution of common salt, to be used in curing pork. During her absence from the kitchen, the liquid boiled over. Being in an unglazed earthen vessel, the solution, spreading over the outside, produced a chemical action which she little understood, and which did not compensate her for the scolding she received. Some of the elements of the liquid combined with some of those of the highly heated brown clay surface to produce a vitreous coating or enamel, which did not peel off when the vessel was cold. The humble brown ware vessel acquired historical celebrity. A Burslem potter, learning what had taken place, saw that glazed ware might possibly hit the taste of the public; he introduced the system of glazing by means of common salt, a system at once cheap, easy, and durable; and England has made many a million pounds sterling by the accidental discovery.

When maidens are doing their hair, an important element of daily duty in many a household, they may perhaps be gratified in learning that this process led accidentally to a very useful invention. Joshua Heilman, engaged in the cotton manufacture at Mulhouse, in Alsace, was long meditating on the possibility of inventing a combing machine for long-staple cotton. Brooding over the matter, he watched his daughters combing their hair, and noticed how they drew the long tresses between their fingers, alternately with drawing the comb through them. The thought struck him that, if he could successfully imitate by a machine this two-fold action, so as to comb out the long fibers of cotton, and drive back the shorter by reversing the action of the comb, his long-sought object would be pretty nearly attained

Armed with this new idea, he set to work with renewed cheerfulness, and invented a beautiful machine, which enabled him to comb cheap cotton into moderately fine yarn.

In 1720, a potter named Astbury was journeying on horseback from Staffordshire to London. Stopping awhile at Dunstable, he obtained assistance in regard to a weakness in the in the eyes of his horse. The hostler at the inn, making use of such bits of veterinary knowledge as he possessed, took a piece of flint, calcined it in the fire, pulverized it, and blew some of the powder into the horse's eyes. The change produced in the flint, by burning from a black stone to a white powder, struck Astbury with a new idea. Would it be possible to produce white flint ware, harder and more durable than white ware made wholly of clay? He collected a small stock of flints from the chalk hills of Dunstable, and took them back with him to Staffordshire. The result more than realized his expectations; powder of calcined flint, mixed with pipe clay, produced a most excellent ware, and established a new branch of the potter's art that took firm root in Staffordshire.

Railway from Boston to the Summit of Mount Washington.

It is expected that the extension of the branch of the Boston, Concord, and Montreal Railroad, from the Fabian House to the base of Mount Washington, a distance of about seven miles, there connecting directly with the Mount Washington Railway, extending to the summit, will be completed and opened for public travel by the first of July, at which time passengers by this line from Boston can reach the base of Mount Washington without change of cars, and thence, by direct transfer to the cars of the Mount Washington Railway, reach the summit, making the entire distance by steam power. Passengers will thus be enabled to take their breakfast at Boston and their supper on the summit of Mount Washington at the usual hours of the same day, and without fatigue or the annoyance of change.

The Fast Train Across the Continent.

This remarkable enterprise ended triumphantly on Sunday, June 4, the train reaching San Francisco at 9:23 A. M. The total time from Jersey City to San Francisco was 83 hours 34 minutes, being 4 hours 26 minutes less than the schedule time, 88 hours. At 9:52, on June 4, the passengers alighted in the court of the Palace hotel, dusty and travel-worn, but in good health and spirits. Engine No. 49 brought the train through from Ogden, with the assistance of an additional engine in crossing the Sierras. The time from Ogden to San Francisco was 23 hours and 52 minutes. The actual average running time from Ogden to Oakland wharf was 41½ miles per hour. Considerable trouble was experienced on the Central Pacific from the wearing out of the brake shoes on the Pennsylvania cars; and in the mountains the Central Pacific Company put on two of their own coaches to brake the train. There was no accident of any kind throughout the trip. Shortly after arrival breakfast was served, to which prominent citizens, army and navy officers, representatives of the press and the theatrical profession, railroad officials, and the Mayor of the city were invited.

A salute of thirteen guns was fired from the roof of the Palace hotel on the arrival of the train at the wharf. The remainder of the day was devoted to needed rest. The excursionists were serenaded in the evening.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From April 25 to May 22, 1876, inclusive.

ARTIFICIAL STONE.—W. H. Smith, Philadelphia, Pa.
ATOMIZER.—T. J. Holmes, Boston, Mass.
AXLE.—G. W. Miltimore, Jamesville, Wis.
BLIND ROLLER.—S. Hartshorn, New York city.
BOILER FLUE CLEANER.—A. Wiggin, Rye, N. Y.
BOOKBINDING.—A. Hoyt, Brooklyn, N. Y., et al.
BOTTLE STOPPER, ETC.—N. Thompson (of Brooklyn, N. Y.), London, Eng.
BRICK MACHINE.—W. L. Grigg, Chicago, Ill.
CAB FARE INDICATOR.—M. Runkel, Golden Square, London, England.
CALENDAR, ETC.—M. H. Paddock, East Clarkson, N. Y.
CAPSTAN.—J. H. David, Damaris-Cotta, Me.
CASTOR.—L. P. Lawrence, Port Morris, N. J.
CHARGING GAS RETORTS.—J. F. Rice, Louisiana, Mo.
CLEANING SHIPS' BOTTOMS.—J. C. Seymour, New York city.
COFFEE POT.—G. W. Hubbard, Windsor, Vt.
CONDENSING EXHAUST STEAM.—J. F. Fifield, Brooklyn, N. Y.
CUTTING MEAT, ETC.—W. H. Goodchild, New York city, et al.
ELECTRO-MAGNETIC ENGINE.—L. Bastet, New York city.
EXTRACTING JUICES.—L. F. G. Bouscaren, Cincinnati, O.
FOLDING TENT, ETC.—F. A. Guthrie, Addison, O.
FORK, ETC.—Brown Brothers Co., Waterbury, Conn.
FOUNTAIN LAMP.—R. H. Webb, Brooklyn, N. Y.
GAFF FASTENING.—J. H. David, Damaris-Cotta, Me.
GAS EXTINGUISHER.—V. N. Taylor et al., Springfield, Mass.
GLOVE FASTENING, ETC.—F. G. Farnham, Hanley, Pa.
HAND STAMP.—G. K. Cooke, New York city.
HARVESTING MACHINE.—S. Johnston, Brockport, N. Y.
HYDRAULIC DREDGE, ETC.—W. H. Newton, Chicago, Ill.
IRONING MACHINE.—T. S. Wiles et al., Albany, N. Y.
KITCHEN SAFE.—G. W. Bollenbacher, Bloomington, Ind.
KNITTING MACHINE, ETC.—C. J. Appleton, Elizabeth, N. J.
MAKING PAPER PULP.—J. W. Dixon, West Manayunk, Pa.
MAKING TEA, ETC.—J. Miller, Himrod's, N. Y.
PAPER-CUTTING MACHINE.—J. Vanborn et al., Brooklyn, N. Y.
PIN.—H. M. Jenkins et al., New York city.
PISTON PACKING, ETC.—J. T. Wright et al., Dayton, Ohio.
PREVENTING FALLS IN SKATING.—J. T. Parlour (of N.Y.), London, Eng.
PRINTER'S GALLEY.—J. F. Hannan, New York city.
PROJECTILE.—N. Wiard, Washington, D. C.
PROPELLER.—F. H. B. Babbe, Antioch, Cal.
RAILWAY, ETC.—R. Stone, Vandalia, N. Y.
RAILWAY SWITCH AND SIGNAL.—D. Rousseau et al., New York city.
SACK-SEWING MACHINE.—J. S. Hall, Monterey, Cal.
SASH FASTENER.—N. Thompson (of Brooklyn, N. Y.), London, England.
SASH FASTENER.—W. A. Hopkins, New York city.
SCREW, ETC.—C. D. Rogers, Providence, R. I.
SCREW, ETC.—E. A. Leland, New York city.
SELF-CLOSING VALVE.—E. W. Lippert, Cincinnati, O., et al.
SIGNAL BUOY.—J. M. Courtenay, Cornwall, N. Y.
SOLVING PROBLEMS.—T. Hill, Portland, Me.
STARCHING FABRICS.—T. S. Wiles et al., Albany, N. Y.
STEAM COOKING VESSEL.—S. T. Goodwyn, New Orleans, La.
STEAM ENGINE.—G. McNaughten, Brooklyn, N. Y.
STEAM HAMMER.—P. B. Williams et al., Quincy, Ill.
STEERING PROPELLER.—F. G. Fowler, Bridgeport, Conn.
TELEGRAPHING SOUND.—E. Gray, Chicago, Ill.
THREADING SCREWS, ETC.—C. D. Rogers, Providence, R. I.
TREATING OIL REFUSE.—W. P. Jenney, New York city.
TRIMMING CARDS.—V. E. Mauger, New York city.
TWISTING MACHINERY, ETC.—C. Fletcher et al., Providence, R. I.
UMBRELLA, ETC.—H. Palmiert, New York city.
WHEEL HARROW, ETC.—S. H. Weston, Winooski, Vt.

Recent American and Foreign Patents.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED VALVE-GRINDING MACHINE.

William T. De Luce, Chicago, Ill.—This is an improved device for holding a valve upon its center while grinding it in its seat, which shall be so constructed as to enable the valve to be ground without detaching it from the pipe.

IMPROVED RAILROAD SWITCH CHAIR.

Henry C. Fox and Joseph Hayward, St Joseph, Mo.—This consists of the base and web supports of the rails, extended up to and so fitted under the overhanging sides of the rail head that they are supported against splitting off and hammering down.

IMPROVED WATER MOTOR.

Israel F. Good, Goodsville, assignor to himself and Hiram F. Seiger, Orefield, Pa.—This invention consists of a series of buckets attached to a corresponding series of arms, some of which are made to rise with their buckets empty to an elevated tank by the weight of other descending filled buckets. The empty buckets are filled at the tank, and, in turn, raise the others, the excess of the weight of the filled buckets being applied to the performance of work.

IMPROVED DEVICE FOR STARTING PENDULUM CLOCKS.

Ernest A. Lourdelet, Paris, France.—This consists in the application of an additional axis in any convenient position in the clock dial or its pedestal, which axis is squared at the end to receive a key or its equivalent. It also carries a lever arm whose extremity is made by partly rotating the axis to bear against the pendulum rod and set the latter oscillating.

IMPROVED LEATHER-PUNCHING MACHINE.

Alonzo C. Ricke and Martin D. Norris, Eldora, Iowa.—This is a contrivance or device for punching leather straps of all kinds, but more particularly bars for leather fly nets for horses. It is adapted for punching either by movable or stationary punches, and has a feed mechanism worked by a shaft fixed transversely under the bed, to be turned by hand or other means.

IMPROVED STRAIN EQUALIZER FOR PULLEY ROPES.

Samuel Woolston, Vincentown, N. J.—This is a device for equalizing the strain upon the ropes of a number of sets of pulleys used together for moving heavy masses. It is so constructed as to enable all the ropes, or one or more of them, to be operated at a time without affecting the equalization of the strain among all of said ropes.

IMPROVED PIPE TONGS.

George M. Curry, St. Petersburgh, Pa.—Upon the forward end of the handle is formed a crosshead in which is formed a groove to receive a tenon formed on a curved and pivoted bar. The other end of the crosshead is concaved, and upon it is formed a tenon to enter a groove in the convex side of a pivoted semi-cylindrical jaw. Another jaw is similarly arranged on the inner side of the outer end of the hook first mentioned. The jaws have thus sufficient play to adjust themselves to the object to be grasped.

IMPROVED RELIEF APPARATUS FOR AIR COMPRESSORS.

William F. Tallman, Mineville, N.Y.—This consists of a weighted valve, in connection with the cylinder of an air compressor, to be raised by the air when the pressure exceeds a certain limit. There is a piston to which the air is admitted by said valve, and raised so as to stop the action of the receiving valves of the compressor, with which it is connected for that purpose. It thus prevents the increase of the pressure unduly. The weighted valve falls when the pressure of air diminishes and opens an escape for the air from the piston, which then falls and allows the valves of the compressor to act again. The relief apparatus may be made to work special valves on the compressor instead of the receiving valves.

IMPROVED PAINTER'S WHEEL HORSE.

Albert D. Osgood, Oneida, Ill.—This is an improved horse for painting the wheels of vehicles of all kinds without necessitating the removing of the wheels. It admits the adjusting of the wheel into any position, takes up little room, and facilitates the work. It consists of a base support or stand, with revolving upper part, and an adjustable hub, supporting top arm, and thimble.

IMPROVED ELEVATOR.

Alfred B. Darling, New York city.—The first part of this invention is a contrivance whereby ropes may be used instead of chains for gearing the elevator carriage with the retarder, which is employed to regulate the descent of the carriage. The ropes are claimed to be stronger, less noisy, and more easy in operation, and less wearing. The second part consists of the carriage connected to the hoisting drum by ropes, which wind off and on reversely to the accommodation of the hoisting ropes. The object is, first, to prevent the hoisting ropes from winding off faster than the carriage descends; and, second, to insure the descent of the carriage.

IMPROVED GANG PLANK.

George Malone, Memphis, Tenn.—This is a ladder of ropes and cross pieces, in combination with the stage plank of a steamer, in such manner that it can readily be removed for sliding freight on and off the boat, and is readily applied again to afford foothold for passengers. The said ladder is also applicable for a fire escape.

IMPROVED ADDING MACHINE

David Carroll, Spring Creek, Pa.—The essential feature of this arrangement is a contrivance of a key for each of the figures of the nine digits, arranged for two to be worked by each finger of the left hand, and one by the thumb. Each key turns the unit wheel the number of figures that it stands for.

IMPROVED CHUCK FOR HOLDING METAL DRILLS.

William Frost, New Bedford, Mass.—This consists of a sliding jaw having a triangular notch and a couple of toothed jaws fixed to slide at right angles, and arranged in said notch. These are toothed, so that one meshes in the other, and have a spring between them, for opening them. All are arranged in a stock which is attached to the mandrel, and is so contrived that round, square, or other shapes, either taper or straight, may be held with like facility.

IMPROVED BLACKSMITH'S FORGING HAMMER.

John Koplin, Reed's Landing, Minn.—This is a new arrangement of apparatus whereby a sledge hammer is worked by a foot lever and springs.

IMPROVED WATCHMAKER'S LATHE.

Daniel M. Williams, Calvert, Tex.—This invention consists of a novel contrivance of a bed adjustable for varying the hight of the bed relatively to the centers for different kinds of work: also of an adjusting tail stock, and an attachment for cutting gear wheels and pinions, all of which will be found illustrated on page 194, current volume.

IMPROVED PLAITING MACHINE.

Andrew J. Decker, Fond du Lac, Wis.—This consists of a series of removable needles in a couple of side pieces fixed in a base plate and perforated with numerous holes in a row, in which the needles can be readily put and removed. A clamping plate at one end of the apparatus is adapted for holding the cloth. The cloth is doubled around two or three or more of the wires for plaiting it, and the plaits are fastened by stretching it along the edges after being plaited. The wires are drawn out to release the plaits when completed.

IMPROVED PUMPING APPARATUS.

Wade Couts, Brownville, Neb.—This is a pumping apparatus so constructed that cattle may be made to water themselves. As the cattle step upon a treadle platform, their weight draws down a rope which, by suitable counterpoises, causes the pump to be operated.

IMPROVED LIFTING JACK.

John Y. Thurston, Medfield, Mass.—This consists of a sliding ratchet bar operated by a spring-bolt lever, and retained by a safety spring pawl.

IMPROVED SPARK ARRESTER.

Waldo H. Jordan, New York city.—This is an uninclosed conical annular cap, to cover both the mouth of the chimney and the mouth of the cinder receptacle which is made around the chimney. The interior is provided with a parabolic deflecting surface that begins at the center of the shell, curves upward and outward, then downward to the outer edge of the shell. When the products of combustion rise, they impinge upon said deflecting surface, which serves to turn the solid particles, sending them down into the receptacle which surrounds the chimney, while the smoke and gases pass laterally from the interior to the atmosphere.

IMPROVED PORTABLE SPRING POWER HAMMER.

Ray F. Livermore, Port Henry, N. Y.—This is a contrivance of a lever catch and tripping device, in combination with a hammer having a spring or springs for striking a powerful blow. The hammer may be easily handled by one man, and made to strike a powerful blow. It is designed for breaking large boulders of rock ores, iron, etc.

IMPROVED LIFTING JACK.

George G. Howe, Faribault, Minn.—This consists of legs pivoted to a top support, to which a lifting lever is fulcrumed. A ratchet and guard of the lever serves, in connection with a pivoted locking brace link of the outer leg, to retain the lever in hoisted position.

IMPROVED CAR COUPLING.

Jabez B. Meadley, Davenport, Iowa.—This is a contrivance of spring jaws for opening and receiving the link and securing it self-actingly, together with a cam, chain, and crank, whereby the jaws can be opened from the top or side of the car.

IMPROVED HYDRANT.

John T. Davis, Washington, D. C.—This invention relates to an improvement in the construction of the casing of the hydrant and the construction of the valve mechanism with the plug of the service pipe, also to the provision of a stopcock within the casing, whereby the water may be conveniently shut off at the hydrant itself, and the valve mechanism readily removed, for repair or other purpose, and whereby other operations incident to keeping a hydrant in proper condition may be effected without the necessity of digging up the casing.

IMPROVED ROTARY ENGINE.

Josephus Moore, Mound Valley, Kansas.—This consists of a pair of cylinders, with pistons set opposite each other for one to take steam when the other is not taking it. Abutments slide out and in to let the pistons pass, and are worked by cam disks outside of the cylinders. Two sets of slide valves are provided, for running the engine either way, the valves being worked by eccentrics on the shaft, outside of the case. There are two sets of exhaust ports for use according to the way the engine runs, the valves of which are connected to the reversing valves, so as to shift simultaneously with them. The steamways are constructed in the form of a ring, and the pistons are in the form of a segment of a ring, and are attached to the edge of a disk keyed on the shaft, so as to be fitted with ordinary round piston packing.

NEW CHEMICAL AND MISCELLANEOUS INVENTIONS.

IMPROVED MAIL BAG.

John Boyle, New York city.—The object here is to construct the mail bags that are taken up by the catchers of mail cars in such a manner that they may be more easily and securely taken hold of by the catches without danger of being dropped. The invention consists of a mail bag made with a narrower and contracted throat at the middle part, and provided with a detachable protecting sleeve.

DEVICE FOR REMOVING WIRES FROM BOTTLE CORKS.

John Franz, Croton Falls, N. Y.—A crotched brace arranged in a handle is placed around one side of the neck of the bottle and under the wires. A forked claw engages the wire at the top of the cork and pulls it off by pressing the handle down.

IMPROVED DENTAL PLUGGER.

Cassius M. Richmond and Alexander Warner, Jr., San Francisco, Cal.—The mallet is mounted by a spring on the upper end of a tubular stock adapted for receiving different tools. A cam mounted on a revolving shaft, arranged parallel to the stock, lifts the mallet, and the spring throws it back against the head of the tool to strike the blow. The frame in which the cam shaft runs is mounted on the tool stock, so that the latter has a little endwise motion in the frame for allowing the tool to reciprocate, and a spring in the stock, beneath the head of the latter and the frame, raises the tool after being forced down by the hammer. A joint in the frame of the cam shaft allows the cam to be adjusted so as to strike light or heavy blows, as required.

IMPROVED COMBINED GAS AND CHANDELIER.

George P. Clark, Newton, Mass.—This is a contrivance of oil burners, in the center portion of a gas chandelier. It will be found fully described and illustrated on page 371 of our current volume.

IMPROVED TWEER.

Thomas F. Witherbee, Port Henry, N. Y.—This consists of a partition in the water chamber between the inlet and outlet pipes, to compel the water for cooling the tweer to pass entirely around it.

IMPROVED SHOE.

John C. Weil, Baltimore, Md.—This consists of a secondary insole, held in position by tags of muslin secured between the outsole and insole, and pasted down. The idea is to make the shoe easier to wear and less heating to the foot.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line for each insertion. If the Notice exceeds Four Lines, One Dollar and a Half per Line will be charged.

Agricultural Implements and Industrial Machinery for Export and Domestic Use. R. H. Allen & Co., N. Y.

For Bolt Forging Machines and Power Hammers, address S. C. Forsaith & Co., Manchester, N. H.

For Sale—State and County Rights of Patent on a first class Wash Boiler. Works splendidly. Address Frank Mackll, Jonesboro', Union Co., Ill.

Pure Mineral Lubricating Oil, for oiling machinery or mixing with animal or vegetable oils to prevent spontaneous combustion. Geo. Allen, Franklin, Pa.

Wanted—Manufacturers of Isinglass Boxes to address B. Frank Weyman, Pittsburgh, Pa.

Steam Launch for Sale, 32 ft., new. Address Morgan's Steamboat Works, Noank, Conn.

The Ransom Syphon Condenser will save you 25 per cent of fuel, or give an equal increase of power. Apply to T. Sault, Consulting Engineer, General Agent New Haven, Conn.

Leather and Rubber Belting, Packing and Hose. Greene, Tweed & Co., 18 Park Place, New York.

Patentees—desiring light articles manufactured in Steel, Gray or Malleable Iron, and Brass, address Welles Specialty Works, Chicago, Ill.

Pattern Makers can get Metallic Pattern Letters, to letter patterns, of H. W. Knight, Seneca Falls, N. Y.

A Bargain—Steam Yacht, 30 ft., complete; also 4 h. p. Engine, propeller and shaft. Lock Box 140, Washington, D. C.

Wanted—Address of Makers of No. 1 Cider Mills. P. C. Holmes, Waverley, Illinois.

Wanted—New or second hand Punch, to punch seven eighths plate, inch and quarter hole; or gang drill. J. & T. McGregor, Detroit, Mich.

Best Belt-Pulleys—A. B. Cook & Co., Erie, Pa.

Centennial Exhibition, Philadelphia.—Examine the Allen Governors, Machinery Hall, D. 9, Par. 71.

Machine-cut brass gear wheels, for models, &c. List free. D. Gilbert & Son, 212 Chester St., Phila., Pa.

For Sale.—35 in. 16½ ft. Lathe, $400; 22½ in. 22 ft. do., $230; 20 in. 7 ft. Stover do., $215; 13½ in. 6½ ft. do. and chuck, $125; 9 ft. Planer, $390; 12 in. Slotter, $290; Profiling Machine, 2 spindles, $250. Shearman, 45 Cortlandt St. N. Y.

Rubber Hydrant Hose, Hose Pipes and Couplings, best quality. Send for Prices to Bailey, Farrell & Co., Pittsburgh, Pa.

"Dead Stroke" Power Hammers—recently greatly improved, increasing cost over 10 per cent. Prices reduced over 20 per cent. Hull & Belden Co., Danbury, Ct.

Driving Belts made to order, to accomplish work required. Send full particulars for prices to C. W. Arny, 48 North Third St., Philadelphia, Pa.

Power & Foot Presses & all Fruit-can Tools. Ferracute Wks., Bridgeton, N. J. & C. 27, Mchy. Hall, Cent'l.

Johnson's Universal Lathe Chuck—Awarded the highest Premium by the Franklin Institute of Phila., for "Durability, Firmness, and adaptation to variety of work." Lambertville Iron Works, Lambertville, N. J.

Safety and Economy—Eclipse Sectional Steam Boiler. First Class references. Lambertville Iron Works, Lambertville, N. J.

Woman's Shoes—Patent for Sale, either whole or State Rights. Address C. Steckel, 199 Allen St., N. Y.

For Sale—24 in. x24 ft. Lathe, with Chuck; two 13 in. Lathes; one 7 ft. x24 in. Planer; two 8 in. Shapers. E. P. Bullard, 48 Beekman St., New York.

For the best Patent Self-Opening Gates for Carriages, in any Style of Wood or Iron, address Cottom & Co., Dayton, Ohio.

The Bastet Magnetic Engine for running Sewing Machines, Lathes, Pumps, Organs, or any light Machinery, 1-32 to ¼ horse power. Agents wanted. Address with stamp, 1,113 Chestnut st., Philadelphia, Pa.

Walrus Leather and Walrus Leather Wheels for polishing. Greene, Tweed & Co., 18 Park Place, N. Y.

The French Files of Limet & Co. have the endorsement of many of the leading machine makers of America. Notice samples in Machinery Hall, French Department, Centennial Exposition. Homer Foot & Co., Sole Agents, 22 Platt St., New York.

Trade Marks in England.—By a recent amendment of the English laws respecting Trade Marks, citizens of the United States may obtain protection in Great Britain as readily as in this country, and at about the same cost. All the necessary papers prepared at this Office. For further information address Munn & Co., 37 Park Row, New York city.

Shingles and Heading Sawing Machine. See advertisement of Trevor & Co., Lockport, N. Y.

Solid Emery Vulcanite Wheels—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, New York.

Steel Castings, from one lb. to five thousand lbs. Invaluable for strength and durability. Circulars free. Pittsburgh Steel Casting Co., Pittsburgh, Pa.

For best Presses, Dies, and Fruit Can Tools, Bliss & Williams, cor. of Plymouth and Jay, Brooklyn, N. Y.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, &c.

Hotchkiss & Ball, Meriden, Conn., Foundrymen and workers of sheet metal. Fine Gray Iron Castings to order. Job work solicited.

For Solid Emery Wheels and Machinery, send to the Union Stone Co., Boston, Mass., for circular.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing Metals. E. Lyon, 470 Grand Street, New York.

Spinning Rings of a Superior Quality.—Whitinsville Spinning Ring Co., Whitinsville, Mass.

Rotary Fire or Supply Pumps, belted, two styles built—One, plain, $125; the other, with water gage, safety valve, and air chamber, $175. Capacity, 10 to 500 gals. per minute. M'f'rs, S. C. Forsaith & Co., Manchester, N. H.

For best Bolt Cutter, at greatly reduced prices, address H. B. Brown & Co., New Haven, Conn.

Diamond Tools—J. Dickinson, 64 Nassau St., N. Y.

Temples and Oilcans. Draper, Hopedale, Mass.

See Boult's Paneling, Moulding, and Dovetailing Machine at Centennial, B. 8-55. Send for pamphlet and sample of work. B. C. Mach'y Co., Battle Creek, Mich.

Notes & Queries

M. J. D. will find a description of wire rope transmission on p. 370, vol. 31.—C. F. S. will find directions for bleaching straw on p. 11, vol. 32.—W. H. C. is informed that lightning rods need not be insulated. See p. 144, vol. 31.—G. H. W. will find directions for staining wood black on p. 50, vol. 33.—A. A. H. can clean articles to be plated by following the directions on p. 187, vol. 31.—A. F. B. will find directions for kalsomining on p. 393, vol. 34.—T. E. S. will find directions for making manifold paper on p. 363, vol. 31.—D. C. W. will find directions for converting cider into vinegar on p. 122, vol. 34.—K. K. will find a description of the process of making artificial butter on p. 119, vol. 30.—E. D. will find, on p. 298, vol. 31, directions for cleaning and polishing brass instruments.—A. W. T. will find an answer to his question as to gases evolved from exploded gunpowder on the editorial pages of this issue.—L. D. will find a description of the ditching machine about which he inquires on p. 335, vol. 32.—J. K. B. will find a recipe for birdlime on p. 347, vol. 28.—G. C. P. Jr., will find a description of a means of testing for arsenic on p. 257, vol. 29.—W. F. can clean his bright steel work by the process described on p. 56, vol. 33.—W. H. P. will find directions for making rubber varnish for waterproofing on p. 274, vol. 32.—S. C. M. will find particulars of the lifting power of hydrogen on p. 74, vol. 30.—O. W. J. will find directions for galvanizing on p. 346, vol. 31.—G. E. will find directions for lacquering brass and bronze on p. 240, vol. 34.—R. R. P. will find directions for making a concrete floor on p. 185, vol. 33.—W. K. L. will find directions for tinning iron wire on p. 362, vol. 31.—W. E. J. can cleanse vessels that have had kerosene in them by the process detailed on p. 276, vol. 34.—J. W. F. will find a description of the long and short screwdriver mystery on p. 21, vol. 19.—C. M. C. should read our article on p. 170, vol. 32, on the volume and compression of gases.—A. N. will find a description of chromic cement on p. 395, vol. 34.—E. L. W. will find instructions for putting up a lightning rod on p. 144, vol. 31.—H. K. A. is informed that the dividing 10 1 is an imposition.—H. J. W. will find on p. 362, vol. 31, directions for tinning malleable iron castings.—J. H. S. will find on p. 164, vol. 30, an article on oil in boilers. As to zinc in boilers, see p. 36, vol. 32.—C. W. L. should calculate the horse power of his engine for himself. See p. 33, vol. 33.—C. L. B. can color billiard balls by following the directions on p. 362, vol. 30.—J. H. S. will find directions for putting up lightning rods on p. 144, vol. 31.—C. W. will find a recipe for durable whitewash on p. 133, vol. 34.—H. H. B. will find on p. 11, vol. 32, directions for bronzing gun barrels.—G. B. B., R. H., S. L. H., G. B., and many others who ask us to recommend books on industrial and scientific subjects, should address the booksellers who advertise in our columns, all of whom are trustworthy firms, for catalogues.

(1) J. W. D. asks: Is it possible to obtain lodestone in its natural state? A. Yes. Lodestone or magnetic oxide of iron (magnetite) is a mineral very widely diffused throughout the United States and Canada. It is found in immense quantities in the northern part of New York State, in the Adirondack region, and in Canada. 2. Has a lodestone more attractive power than a steel magnet? A. No; artificial magnets of iron and steel greatly surpass it in power.

(2) W. E. C. says: In your No. 22, current volume, A. McC. says there is an engine in his vicinity of 18 x 24 inches; it runs at 90 revolutions per minute with 60 lbs. steam, cuts off at ⅜ stroke, and is rated 50 horse power; and the company are dissatisfied at the amount of coal burned, namely, 1½ tuns. An engine of this description (throttle wide open) with 60 lbs. boiler pressure, allowing 50 lbs. pressure in the cylinder, would show about 105 horse power, and a consumption of coal of 2·8 lbs. per hour per horse power, which is a very good showing for a non-condensing engine, and better than the average. A. If such a result could be verified by experiment, A. McC. would have very good reason to be satisfied. Our remarks were based on his rating of the power.

(3) R. S. asks: Will a fly wheel running twice as fast as an engine, on countershaft, be any advantage over driving from main wheel of engine? A. Not necessarily.

(4) G. C. S. asks: How much steam space should there be in a boiler for an engine of 2 inches bore and 4 inches stroke, running at 400 revolutions per minute? A. It should be ¼ or ⅕ the water space.

(5) A. D. A. asks: How is a fog horn constructed for attachment to a steam whistle? A. It is usually a whistle with a sound trumpet attached.

(6) A. G. says: We have a dry house, 13 x 20 feet, which is properly provided with about 400 feet of one inch pipe, through which live steam from the boiler passes, and escapes through a cock outside the building. Although the house is nearly boiler tight, and has proper ventilation, we are not able to increase the heat above 170° or 180° Fah. We intend to superheat the steam by means of a coil of pipe in a stove. Will it be best to superheat the steam first, let it pass through the 400 feet pipe, and escape, or should we let the live steam pass through the 400 feet pipe, then superheat it outside the building, and introduce the superheated steam into the dry kiln? A. We would advise you to try a new plan. Heat the air in a separate chamber from that of the drying room by concentrating the pipes therein. Let the air from this hot chamber enter the drying room at the ceiling, and provide for its escape at the bottom, so as to secure a constant change and renewal thereof. Place a steam trap at the end of the heating pipe. Put full head of steam on to your coils, and you will probably improve the drying capacity of your room without superheating. If you should try this plan, please communicate to us the result.

(7) W. T. P. asks: How many cups of Lockwood battery will it take to run a telegraph line two miles long, having 70 instruments of about 60 ohms resistance each? A. Twenty-five or thirty.

(8) P. & W. ask: 1. For an electric light apparatus, would 50 cups carbon battery, using a lamp made after the Dubosc pattern, answer? A. Yes. 2. Would the apparatus illuminate a distance of five blocks? A. Yes. 3. How large are the points used? A. Use ⅜ inch square carbons. They come in lengths of 8 or 9 inches.

(9) W. M. J. asks: 1. Would a copper conductor 1⅛ inches wide, riveted to an iron bar of same width ¼ inch thick and spliced by bolting, allowing the ends to pass 6 or 8 inches, make a good conductor for a lightning rod? A. Yes; but it is better to use copper altogether, and too much care cannot be taken to insure good earth connection. 2. Would insulators be any benefit? A. No, on the contrary. 3. Would black paint affect the conducting power? A. No.

(10) F. E. H. asks: What is the best means of examining the electricity in a lightning rod, when a thunder cloud is passing over? A. Don't try any. You may find it very unsatisfactory work.

(11) I. M. asks: How is the power applied from the pendulum to the wheel work in an electric clock? I am a telegraph operator, and wish to attach one to my battery. A. An electro-magnet is placed in the electric clock and so arranged that each movement of the armature, acting on an escapement, pushes the hands forward. The circuit is made and broken at every swing of the pendulum of the regulating clock, the upper part of the pendulum being provided with the necessary attachments.

(12) H. B. H., of Havana, Cuba, asks: We are putting up a telegraph alarm, worked by Leclanché's battery, using double wire circuits. What proportion of cells to wire should we use? A. Use one cell for every 2 or 3 ohms of resistance in the circuit.

(13) W. H. S. asks: How is the varnish, used on plaster patterns, made? A. We believe paraffin is employed for this purpose.

(14) A. A. asks: What can I put into green ink, made with verdigris, to make it darker? A. Try a little sulphate of indigo.

(15) M. D. C. says: I am rendering tallow in a large oil cask by introducing open steam in the side of cask, near the bottom. I use 8 or 10 lbs. sulphuric acid to each 1,200 or 1,500 lbs. of rough suet. After settling over night, the greater part of the tallow rises to the top and is clear and good, but there is still considerable in the tank that is mixed with the fine particles of meat which has been cut by the acid. Can you help me? A. Digest the fatty matter for about 48 hours with very weak oil of vitriol. Transfer a quantity of this material (the solid) to the cask, and for every 10 lbs. material add 5 pints water and 3 ozs. sulphuric acid (specific gravity 1·845). Introduce a jet of steam and boil for some time. The liberated fatty matter as it floats on the surface may be drawn off; and after the addition of a little oil of vitriol to the residue remaining in the cask, a new charge of material may be introduced and the process repeated. The accumulated residue of animal matters and scrap may be used as a manure, or mixed with sawdust for a fuel.

(16) E. H. asks: What is the relative economy in fuel of the three different kinds of steam boilers, namely, the locomotive, the return tubular, and the upright tubular boilers, for portable engines? A. So far as we know, the difference in economy of the various styles is not very great, if all are proportioned and set equally well.

(17) W. O. P. says: 1. Other things being equal, which will give the best result for a propeller, a double engine of three horse power in each, or a single engine of six horse power? A. The single engine. 2. What size should the boat and screw be to make ten miles per hour, with six horse power? A. Boat 20 to 22 feet in length. Propeller 2 feet in diameter and 3 feet pitch.

(18) E. W. asks: Will a cylinder 1⅞ inches in diameter, of 3 inches stroke, propel a boat 16 feet long, of 5 feet beam? A. No. The engine is scarcely large enough.

(19) The Brethren, of Reutlingen, Würtemburg, say: We want to bend strips of oak or beech lumber 1¼ inches square to a circle of 18 inches diameter, for chair work. We have cut the strips of green lumber and steamed them for different lengths of time; but as soon as we tried to bend them, they break right off. How can we do it, under what pressure of steam, and how long has the lumber to be in the box? A. A low pressure of steam only is necessary; and where the bending is excessive, the operations must be gradually conducted, clamping the wood, and exposing it to the action of steam for several hours each time. It is also necessary to use a very good quality of material.

(20) M. & Co. say: The escape of steam from our engine goes into our brick stack. Is there any danger of the steam injuring the mortar between the bricks, and eventually throwing the chimney down? A. Steam frequently has thus acted under the circumstances stated.

(21) J. S. says: How thick a wire rope and what size of solid round iron do I want to stand the falling weight of drilling tools, the largest weighing about 2,500 lbs.? A. We advise you to address your query to a manufacturer. We could not answer it without knowing more particulars.

(22) J. B. E. asks: 1. What will be the difference in pulling 2 screw tugs, each with a 20 x 24 inches cylinder and 7½ feet wheel, drawing 8½ feet water, or a tug with double cylinders 20 x 24 inches, wheel 9½ feet, drawing 10½ feet water? A. The data are insufficient to enable us to answer this question. In any case, we could only obtain a rough approximation by calculation. 2. I have a tug, cylinder 20 x 24 inches with independent cut-off, working the cut-off on half and full stroke on link. The engine pounds. Is it caused by the lead? A. The pounding may be due to various causes, to improper arrangement of valve motion, lack of adjustment of working parts, or improper fitting of crosshead or crank pin brasses.

(23) J. J. M. says: I have an engine with one pair of cylinders, 6 inches by 8 inches stroke, running at 100 revolutions per minute with 40 lbs. steam in boiler. I wish to condense the exhaust steam in a surface condenser. Please tell me how many square feet I need. A. About 60 square feet will be quite enough.

(24) H. L. B. asks: Will the air contained in an air chamber on a pipe over a faucet escape with the water after a time? Will air remain in an air chamber under a heavy pressure of water, if the water is kept in a state of rest? A. The air is absorbed by the water, under heavy pressure; but in the first case mentioned, the air chamber frequently receives supplies of air from the water.

(25) F. N. asks: 1. Should a chimney be wider inside at the top than the bottom, and if so, why? A. We do not know of any good reason for this mode of construction. 2. Should the inside diameter be equal throughout? A. As the products of combustion grow cooler as they ascend, and occupy less volume, the chimney could be gradually contracted from the bottom to the top, without serious loss of efficiency.

(26) J. D. D. says: 1. I propose to build a steamboat with a keel 112 feet, beam 17 feet, of good model, with side wheels 15 feet in diameter, with paddles 4 feet long x 12 inches wide. Draft, when loaded, is 30 inches. I shall use a locomotive boiler. 14 feet long by 4 feet diameter, with a firebox 42 x 48 inches, having 60 tubes 2½ inches in diameter, and 10 feet long, which I propose to set in a brick arch, burning wood, with fire under the barrel instead of in the firebox, and returning through the firebox and tubes and over the top of boiler. Would there be any objections to setting the boiler in this manner? A. Its efficiency would be somewhat diminished. 2. My engine cylinder (oscillating) is 13 inches x 60 stroke, using steam at 75 lbs. and cutting off at ¼ or ⅛ stroke. Is the cylinder large enough for the boat? A. Yes. 3. Will the boiler make steam enough to drive the engine at 50 revolutions per minute? A. No, not more than 25 or 30. 4. How much slip will the wheels have? A. About 15 or 20 per cent. 5. Are the wheels of proper proportion for the hull? A. They will answer very well.

(27) W. G. H. says: 1. I have made a small engine; size of cylinder is 1⅞ by 2½ inches, running at 200 revolutions per minute. Would a locomotive boiler of the following dimensions generate sufficient steam to run it? Length of firebox 7 inches, hight of firebox 6 inches, width of firebox 6 inches, diameter of waist 6 inches, number of tubes 3, diameter of tubes 2 inches, length of tubes 11 inches. A. The boiler is rather small. 2. What pressure would the above stand, if made of $\frac{1}{16}$ inch copper? A. The safe working pressure would be from 60 to 70 lbs. per square inch.

(28) L. P. S. asks: Has there been any plan for a governor devised on the principle of the gyroscope? A. There have been a number of governors devised on that principle. So far as we know, they have not come into extensive use. One was proposed for the Bessemer channel steamer.

(29) L. R. asks: How can I clean dirty oil from the drip pans under hangers? A. Filter it through plugs of cotton wool.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On Lighting Lamps by Electricity. By W. H. Z.
On a Perpetual Motion. By W. J.
On Flying Machines. By M. K.
On Nitrogen. By E. A. H.
On the Bedbug. By ——.

Also inquiries and answers from the following:
D. H. E.—A. B.—E. J. P.—W. M. C.—J. H. P.—A. B.—G. F.—O. P. B.—L. H. E.—F. F. F.—D. G. W.—G. D.

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Enquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of inquiries analogous to the following are sent: "Whose is the best washing machine, run by steam power? Who sells corrugated iron? Who sells machines for beveling the edges of straw boards, etc.?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL]

INDEX OF INVENTIONS

FOR WHICH

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

May 23, 1876,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

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9,304.—BEER MUGS.—W. C. King, Union township, Pa.

9,305 to 9,308.—CARPETS.—W. Spurway, Kidderminster, England.

9,309.—VALVE HAND WHEEL.—E. G. Burnham, Bridgeport, Conn.

9,310.—FAN.—M. F. Foster *et al.*, Washington, D. C.

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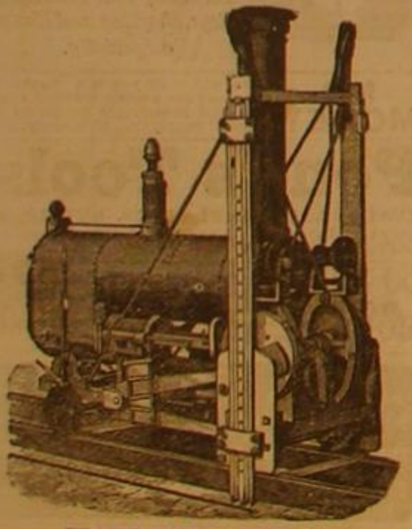

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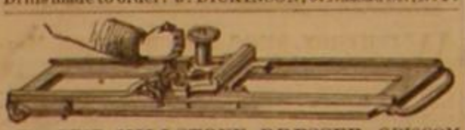

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