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New Process of Embalming the Dead

Dr. Lowell, of Brooklyn, N. Y., has devised a process of embalming bodies which bids fair to revolutionize the business of undertaking. If his plan shall be adopted and succeed, the use of the ice-box and other expensive appliances, generally in request for the preservation of cadavers by the agency of cold, will become entirely unnecessary, and will be superseded by an inexpensive and simple process, which we will briefly indicate as follows: A solution of chloride of zinc is the preservative fluid used; this is contained in a porcelain-lined vessel, which is elevated to a convenient height, so that the contents will be injected into the cadaver after the manner of a gravity-syringe. For the passage of the fluid from its receptacle into a vein of the cadaver, glass and rubber tubing are all that is required. A finely tapered glass tube is held tightly in place in the vein, while a glass U-shaped tube acts as a siphon to conduct fluid from the receptacle. The quantity of fluid will, of necessity, vary in different cases; four or five gallons may be required. This plan will not work when operations have been performed whereby large vessels have been opened. A body thus treated was transported from this city to Richmond, Va., this summer, without odor, and without disfigurement or any external signs of decay. All that is required is that the physician shall expose a vessel, adjust the glass tube, and the fluid will find its own way. Dr. Lowell has let the instrument run all night. There is promise in this of a saving to the City of Brooklyn alone of from $75,000 to $100,000 each year in the one item of ice, in addition to doing away with much unpleasant and cumbersome material in caring for the dead. Dr. Lowell writes: "The injection may be made by either artery or vein. I have tried both with success. I prefer the brachial artery above the elbow as the point for introduction of glass tube, for the primary incision is slighter, and consequently divides smaller and fewer veins than when I expose the femoral artery. I use the gravity method, and introduce about five gallons of the antiseptic fluid. The effects are eminently satisfactory. The color of the integument is improved, even at points where hypotasis has been at work. I inspected a cadaver night before last—a lady. The body was in splendid condition—skin white and clear, and all points of discoloration along spine, nates, posterior surface of thighs, neck, etc., etc., clearing up. The patient died of typhoid fever; post-mortem discoloration rapidly supervened, and decomposition was rife. All changes were arrested, the skin cleared up, and when I saw the body last, its appearance had improved wonderfully.—*Proceedings of the Kings County Medical Society.*

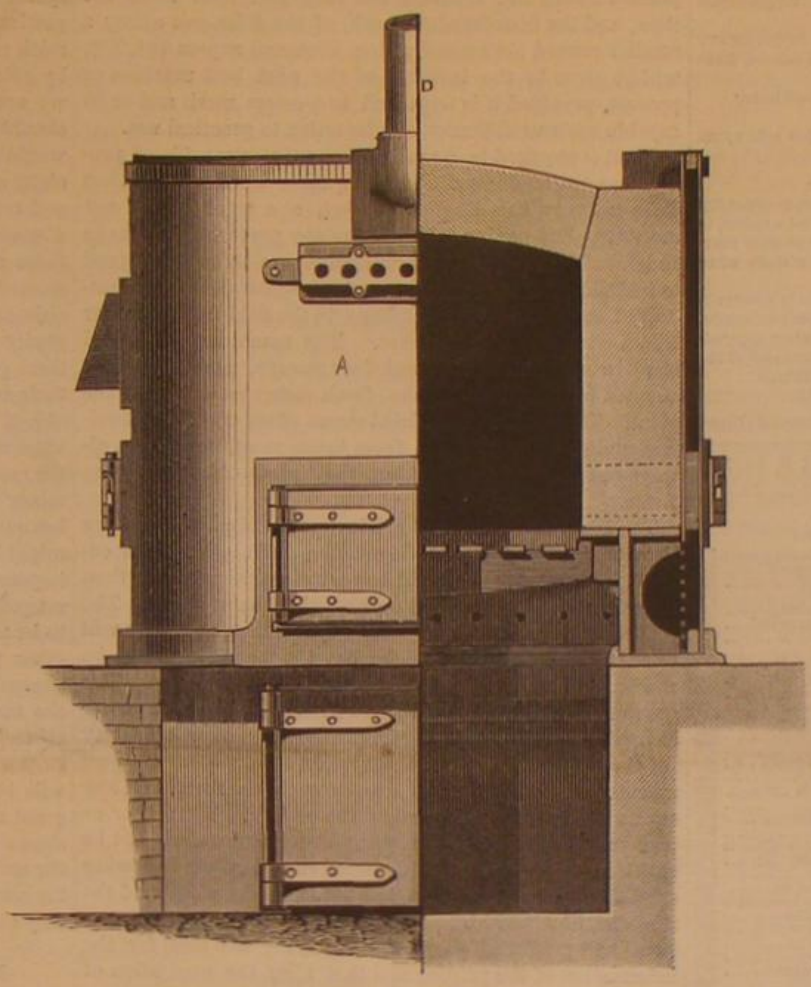

Fig. 1.—CADDICK AND MAYBERY PUDDLING FURNACE.

News from Naples announces an increased activity of Mount Vesuvius. The glow of fire in the crater is so intense that it can be distinctly seen from Naples at night.

IMPROVED PUDDLING FURNACE.

We illustrate from *The Engineer* a furnace patented by Messrs. Caddick and Maybery, which has been at work for some months at the Old Castle Iron and Tin-plate Works, Llanelly, South Wales. Mr. Caddick is a practical furnace builder, while Mr. Maybery is manager of the works.

Before proceeding to describe the furnace or particularize the results, it may be stated that the nature of the system of puddling employed is peculiar, not to the furnace but to the district, and materially affects the results obtained.

The Old Castle Works are employed solely in the manufacture of black, tin, and terne plates. It is scarcely necessary to say that the iron used in making tin plates must be of very fine quality or the plates would be worthless. Two or three different grades or classes of sheet are made. At one end of the scale is found the finest charcoal plates, at the other a very excellent iron made in the puddling furnace. The furnace as illustrated is double. It consists of a chamber or gas generator of fire bricks surrounded by a casing of thin iron plates, say, three sixteenths inch thick, and a puddling hearth. The whole of the plates are of wrought iron, the buckstaves, as we may term them, being cast iron columns, held together at the top by suitable tie rods. It is impossible to imagine a neater, simpler, or more compact furnace than that thus produced. The ordinary sliding firebrick door is used, but outside of this is provided a second door of thin plate iron, in which a suitable aperture is made to admit the rabble; this door acts to perfection in protecting the puddler from radiant heat.

Referring to the engraving, Fig. 1 is a half end view and half transverse section of the combustion chamber or generator; Fig. 2 is a longitudinal elevation; Fig. 3 a longitudinal section; and Fig. 4 a sectional plan. A is the generator; B the inner casing, and C the outer casing. Blast is admitted into the space between the inner and outer casing through the pipe, D; the air becomes heated by coming into contact with the inner casing, and passes into the inclosed space below the grate bars, through holes formed in the lower part of this casing. Here the already heated blast is heated to a further degree by the red hot ashes. A portion

[*Continued on page* 274.]

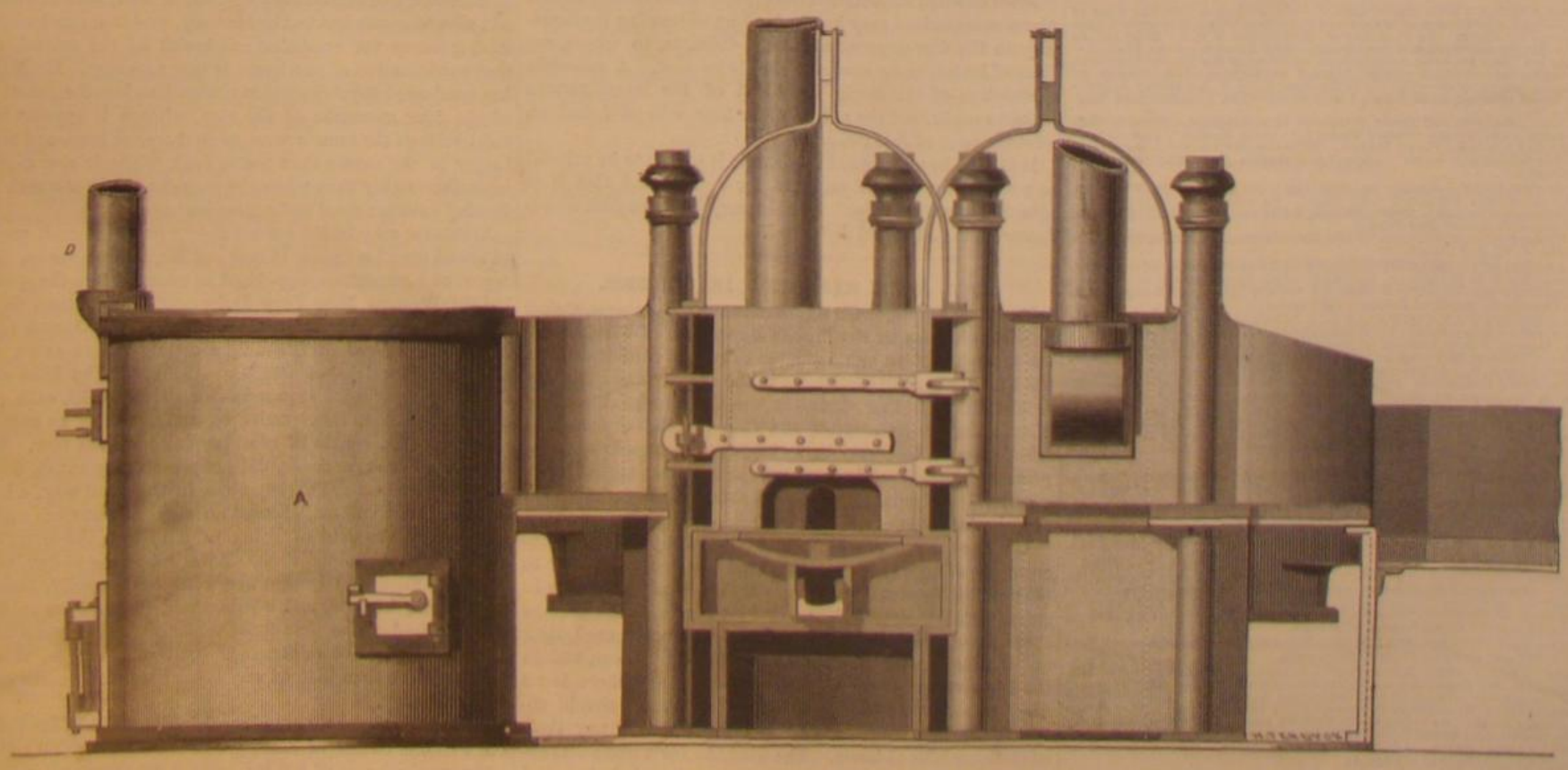

Fig. 2.—CADDICK AND MAYBERY PUDDLING FURNACE—LONGITUDINAL ELEVATION.

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VOL. XXXVII., No. 18. [NEW SERIES.] *Thirty-second Year.*

NEW YORK, SATURDAY, NOVEMBER 8, 1877.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF
THE SCIENTIFIC AMERICAN SUPPLEMENT
No. 96,
For the Week ending November 3, 1877.

AN OPPORTUNITY FOR INVENTORS.—$24,000 REWARD OFFERED FOR A RAMIE CLEANING MACHINE.

The Department of State has received a circular from the Government of India, from which it appears that in 1871 a prize of £5,000 was offered to the inventor of the best machine or process for the preparation of the fiber of the *Böhmeria nivea* (popularly known under the names of Rheea, Ramie, and China grass), and the terms on which machines would be admitted to competition were widely notified in India, Europe, and America, but only one machine was brought to trial, which, having been carefully tested at Sahâranpur in 1872, was found imperfect, and the inventor was adjudged not entitled to the full reward. He was, however, presented with £1,500 in consideration of his partial success. As this machine has not since been adapted to practical use, and no better process of preparing the fiber of the rheea has been discovered, the conditions which induced the offer of a prize in 1871 remain substantially unchanged, and the government therefore offers a reward of about fifty thousand rupees (about $23,110) to the inventor of the best machine or process which will separate the bark and fiber from the stem, and the fiber from the bark, of the *Böhmeria nivea;* a smaller reward not exceeding ten thousand rupees ($4,622), will be given to the inventor of the next best machine or process, provided it is adjudged to possess merit and to be capable without difficulty of adaptation to practical use.

What is required is a machine or process capable of producing a ton of dressed fiber of a quality worth not less than £45 per ton in the English market, at a total cost of not more than £15 per ton laid down at any port of shipment in India. The processes of preparation are to be understood to include all the operations required subsequent to the cutting of the stems from the plants in the field until the fiber is in a condition fit for market. The machinery employed must be simple, durable, and inexpensive, and should be adapted for treatment of the fresh stems as cut from the plant. The treatment of dried stems offers certain difficulties, and the fiber prepared from them must, moreover, always be much more costly than that produced from green stems.

The trials will be held at Saháranpur in the Northwestern Provinces in August and September, 1879. Machines entered for competition should be ready for trial not later than August 15, the competition commencing the next day. The judges will be appointed by the government, and they will watch the whole of the trials; but the machines are to be worked and adjusted by the competitors themselves. The government will provide accommodation and motive power at Saháranpur for all competing machines, and will also pay for the transport from the sea coast to Saháranpur of all machines up to the limit of one ton each, the freight on any excess weight to be defrayed by the owners. The owner or owners of the successful machine or machines shall not be entitled to receive the reward offered except on the following conditions, viz.: That a complete technical description of the machine, illustrated by plans drawn to scale, shall be prepared and published (Government paying the cost) for the information of the public; and that after the expiration of three years from date of award, the public shall have the right of manufacturing similar machines, on payment to the owner of a royalty of 10 per cent on the cost of each machine so manufactured. All persons desiring to compete are requested to make known their intention not later than December, 1878, giving their name, residence, profession, and a brief description of each machine entered for competition. They must also declare themselves bound to conform to all rules which may be prescribed by the judges appointed to conduct the trials.

More detailed information than is contained in the circular above summarized may be obtained by addressing the Secretary to the Government of India, Calcutta, to whom notices of intention to compete should be sent. A complete description of the ramie plant and of the investigations hitherto made into the nature of its fiber will be found on another page of this issue.

It should be understood that ramie is sought to be utilized as a substitute for silk and not for cotton: and that it is already largely employed for this purpose by English manufacturers in Leeds and Bradford.

THE PARIS EXPOSITION IN CONGRESS.

President Hayes, in his recent message to Congress, makes special reference to the French Exposition of 1878, and to the necessity of an appropriation to enable exhibitors from the United States to participate in the show. The President recalls the fact that $200,000 was appropriated for the Vienna Exposition of 1873, and that practical artisans and scientific men, besides commissioners, were appointed to represent the country; from which the inference is that he recommends the granting of a like sum and the organization of a similar corps of officials.

We have so frequently pointed out the objections to Congress devoting any large amount of the people's money to purposes of international shows that it is not necessary to enter into their details here. Public funds should not be spent to advertise private individuals. People send their exhibits across the Atlantic for business purposes, and in the hope of gaining business advantage; and there is no more reason why the United States Government should cooperate to help them, any more than it should pay their advertising bills at home. The $200,000 for Vienna was appropriated before the panic. Since then the whole financial condition of the country has changed, rigid economy is imperative everywhere, and nowhere so much as in the control of government expenditures. Nor did the Vienna $200,000 save our representation from becoming a failure. The American contribution to that show was not representative of our industries, the official management fell into disrepute, and the results of the work of the scientific commissioners and artisans are by no means as highly appreciated as they ought to be.

Official reports on these Expositions, in any event, can hardly be worth to the people the money they cost. The press with its enormous facilities for gathering and promptly presenting intelligence, anticipates them by considerable periods of time, and affords much fuller information at very much less expense to the classes for whose benefit reports are designed.

If a large appropriation and a corps of salaried officials do no good, at least it should be expected that they will not defeat their own object; and we are not sure but that this was the sum total of the Vienna experience. At the recent Leather Exposition in Germany, our representation was a splendid success, and it was managed entirely by private parties. So also in 1851, the exhibits—notably the McCormick reaper and the yacht America—were wholly unaided by official help. On the other hand, it is desirable that, if we are going to have any representation at all in Paris, it should be one befitting our industrial importance; and it would no doubt facilitate this result to have some persons officially authorized to organize and manage the general display and confer with the Exposition authorities. The *Journal of Commerce* pertinently suggests that the Government appoint these commissioners to serve without salary, an idea which seems to us excellent. There are numbers of well known citizens who intend to visit the Exposition, and who would gladly undertake the service for the honor it brings. To these gentlemen the existence of a salary would be a bar to their acceptance of the positions, as its amount would be no object to them, nor would they consent to have their services reckoned on any cash or business basis whatever. In the case of an honorary commission, there would be sundry minor expenses, clerk hire, office rent, etc., which would have to be provided for, and for these a small appropriation might be made, as of course no personal outlay should be imposed upon the members of the commission. This arrangement would leave the bulk of the whole expenditure to be met by private subscription among the exhibitors and other parties directly benefited, and this many have expressed their willingness to do, at present, however, with the tacit proviso, "unless Congress makes an appropriation." The matter is pressing for speedy settlement owing to the very brief time which now remains before the show will be opened. As Congress has already once refused to grant a large specific appropriation, it can easily omit reconsideration of that subject, and can confine its legislation to the authorization of a board of honorary commissioners and the setting apart of a few thousand dollars for their necessary expenses.

IMPROVED METHOD OF WINTERING COWS.

Mr. Linus W. Miller, of Stockton, N. Y., an experienced dairyman, advocates, in a pamphlet entitled "Meal Feeding and Animal Digestion," a system of feeding cows during winter, which involves the use of but three quarts of meal per day. He asserts that this amount of good Indian meal, fed under proper conditions, is more than the equivalent for all the good hay a cow can be coaxed to eat—that the animal does not need to have its stomach distended with a great bulk of woody fiber, which imposes upon the system a large amount of extra mechanical work both in the processes of digestion and remastication—that, in brief, bulk in food is not advantageous but to the contrary, and that nutriment in food governs the condition and health of the animal, and that condensation of nutriment is true economy. Mr. Miller has conducted physiological investigations into the functions of the four stomachs of the cow, whence it appears that meal follows the same course as herbaceous food, and stays longer in the rumen than coarse food, while it also digests more thoroughly than when the energies of the stomach are divided between meal and coarse herbage.

Whatever may be the correct theory in this regard, results of actual practice appear to bear out Mr. Miller's views. The report of a committee, appointed to examine into the system by the Western New York Dairymen's Association, shows the following facts: The examination was conducted upon Mr. Miller's herd of Chatauqua county native cows, the average live weight of which was 900 lbs. The herd were fed exclusively upon corn meal for seven weeks, each animal, according to its digestive capacity, making an average of about three quarts of meal per day for each cow. The animals did not ruminate, did not manifest so much desire for food as cows fed on hay alone in the usual way, a little less than they will eat, showed no signs of unrest or suffering; and at the time of going back to hay, the cows had neither lost nor gained flesh. After returning to hay, their stomachs filled and ruminating went on normally, healthy calves were dropped, and when turned to grass the animals took on flesh faster than those wintered in the usual way. Their daily yield of milk was 29 lbs. 3 ozs., or 1 lb. 11 ozs. per cow more than that of any other herd sent to the same cheese factory.

As regards the economy of meal feeding, Mr. Miller points out that one bushel of corn, ground and tolled, will last an ordinary sized cow of 900 lbs. weight 12 days, and is equal to 240 lbs. of hay. Corn at 60 cents per bushel is therefore

the equivalent of hay at $5 per ton of 2,000 lbs., and where it can be had at that rate the cost of wintering the animal will range from $7 to $10, according to coldness and length of the foddering season. But hay as a rule costs at least $10 per ton, and frequently much more. Hence the estimated saving by meal feeding is placed at from $5 to $20 per animal, according to the respective prices of corn and hay.

THE FORTUNES OF THE OBELISKS.

The Egyptian obelisk, whose launch we discussed last week, narrowly escaped total loss while on its voyage to England. So severe a storm was encountered off Cape Finisterre that the towing steamer Olga was obliged to cast off from the obelisk craft, and, after removing the crew from the latter, to leave it to its fate. Six men were lost during the transhipment. The deserted needle drifted seaward, and finally was discovered by the English steamer Fitzmaurice, ninety miles north of Ferrol, Spain, and taken in tow again. The Fitzmaurice was bound for Valencia, and hence the travels of the famous stone will probably be prolonged.

The sister obelisk to that above referred to has been presented by the Khedive of Egypt to New York city. As we noted last week, it was proposed to defray the expense of transportation across the Atlantic by public subscription, but this course has since been rendered unnecessary by the magnificent offer of a well known citizen, whose name is as yet withheld, to bear all the expense, amounting to $100,000, himself. This proposal has been accepted, and we understand from the New York *World* that the contracts for the removal and shipment of the stone have been signed. At present the question is being discussed where the obelisk is to be erected when we get it; and opinion seems to be about equally divided in favor of establishing it in the center of Madison Square, between 23d and 25th streets, on Fifth Avenue, or in the park into which it is proposed the site of the present distributing reservoir on 42d street and the same avenue shall be converted, after demolition of the now unnecessary reservoir.

In view of the distribution of Egyptian obelisks over the surface of the earth, one being in Rome, another in Paris, another in London, and now another in New York, it has been humorously suggested that the archæologist of a dozen centuries hence will be vastly puzzled to account for the wonderfully wide contemporaneous dispersion of the Egyptian race, which will be indicated by the localities of its monuments.

SPEECH AUTOMATICALLY TRANSMITTED IN SHORT HAND BY THE TELEGRAPH.

In our next issue we shall present an illustrated article descriptive of Dr. Rosapelly's and Professor Marey's recent investigations into the mechanical productions of speech. By means of very ingenious apparatus the movements of the lips, those of the veil of the palate and the vibrations of the larynx, are simultaneously graphically inscribed, so that their inter-connection and succession may at once be seen. The result is a clearly marked phonetic character produced by the voice itself, the corresponding sound to which any one after a little study can at once produce.

The discovery of this automatic phonography may lead to two important results, first, that for which it is directly designed, namely the teaching the deaf mutes to speak, for the mute has only to make the sounds indicated and which previous investigation has determined to be exactly the right one to produce the articulated word, and second, vocal speech translated into phonographic short hand at any distance from the speaker. It appears quite possible with the apparatus of M. Marey aided by well known electrical appliances for the words of a speaker in New York to be taken down in legible short hand in San Francisco. This is an application scarcely anticipated by the investigators and their apparatus is perhaps not the best adapted to that particular end, but still it possesses none the less the "promise and potentiality" of that wonderful result.

ALLEGED POISON IN SUGARS.

Some attention was attracted last year by numerous letters, published by Mr. L. Rossiter, of Chicago, Ill., in the Chicago *Tribune*, with regard to alleged poisonous effects of sugars. Mr. Rossiter suggested that a large proportion of the sugars in the market might contain poisonous impurities arising from the use of chemicals in their manufacture, his opinion being based upon the effects of the use of sugars as food upon persons of weak or deranged digestion. In the *American Journal of Pharmacy*, we find accounts of analyses made by Messrs. J. S. Johnson and S. E. Parkill, of fourteen samples of sugars and syrups furnished by Mr. Rossiter. Neither lead nor arsenic was found, nor did the ash, by ordinary systematic qualitative analysis, reveal other constituents than sodium, potassium, calcium, magnesium, aluminum, and iron compounds, and sulphates, chlorides, carbonates, and silica. No zinc or tin was found. It thus appears that the sugars of commerce do not contain the injurious ingredients suggested by Mr. Rossiter.

The Double Postal Card.

A new style of postal card is now used in Germany. It consists of two cards of the ordinary size attached together, each having a postal stamp. These double cards are furnished by the Post Office, and sent for the purpose of facilitating the return of answers.

DECISIONS OF THE COURTS.

The suit of Northrop *vs.* Adams for the infringement of a design patent for a provision or cheese safe has been decided adversely to the complainant.

The specification of the complainant's patent described "A rectangular base, with a top supported by four corner posts, with an intermediate stile or support, dividing each side into vertical panels, all of which are covered with wire cloth of fine mesh. The front side is made to open as a door, which is single, but folds upon itself, the two parts being hinged together at the center style. Around the base is an ogee moulding, and a similar one is run round the top to serve as a cornice. A lighter moulding of the same pattern is run round the edge of each panel, and a pleasant effect is produced by staining all of the moulding a dark color, varnishing all the rest of the wood work, leaving it in its natural color." The patentee claimed as a design for a cheese safe, the rectangular cage, having two vertical panels on each wall, a moulded top and a moulded base.

The main question involved in the suit was the patentability of the claimed invention. Now, the law applicable to design patents does not materially differ from the law applicable to mechanical patents. The same general principles of construction extend to both. To entitle a party to the benefit of the act, in either case there must be originality and the exercise of the inventive faculty. In the mechanical patent there must be novelty and utility; in the design patent, originality and beauty. Mere mechanical skill is insufficient. There must be something akin to genius—an effort of the brain as well as the hand. The adaptation of old devices or forms to new purposes, however convenient, useful, or beautiful they may be in their new *rôle*, is not invention. Thus it has been held that the use of a small model of the Main Centennial Building, for paper weights and inkstands, was not patentable.

Upon applying these rules to the facts of the case, it was apparent that the complainant's patent could not be sustained. Thus it was shown that rectangular safes essentially similar to the complainant's, covered with wire cloth, had been made and used for many years. Such rectangular safes were formerly used for the exhibition of cheese in shops, but of late years had been supplanted by a round safe, with the top divided and connected with hinges, so as to permit one half of it to be thrown back. When these rectangular safes were constructed of large size, each side was divided into panels by a vertical stile; when of smaller size no such division was made. But as the difference in size would not be patentable, so the division of each side into panels was none the more so. The only novelty, then, in the patent, was the use of an ogee moulding about the top and bottom. Mouldings of this description, however, had been used for centuries, and applied, not by way of ornament in architecture, but to articles of furniture and the decoration of interiors. The embellishment of a provision safe with this ancient design was simply the adaptation of a well known ornament to a new purpose. The result, being neither novel nor original, was not entitled to the protection of the patent laws.

The Potato Bug in Germany.

The Germans are greatly interested in, not to say excited about, our Colorado beetle, and well they may be, for the German potato crop is a valuable one, and in no part of the world have we seen so many fine mealy potatoes as there. The beetle has been seen at Schildau in Saxony and in some other localities, and much attention has been given to a study of their habits and means of destruction. In a recent number of the *Industrie Blätter* is a translation of Professor Riley's article from the SCIENTIFIC AMERICAN (page 198) which is supplemented by remarks by Professor Sell and others. Dr. Sell advises to saturate the soil with sulphurets of potash or lime, then with dilute sulphuric acid, so as to generate the poisonous sulphuretted hydrogen in the soil. In regard to attempts made to burn them out by saturating sawdust with petroleum and sprinkling them over the soil, then igniting them, he says that, although the flames are high and an intolerable heat rises from it, the heat does not penetrate far enough into the earth to kill the larva. He found at a depth of 6 or 7 c. m. (2½ inches) the heat was not over 95° or 100° Fah., which is far too low to kill the single individuals.

At Schildau, in Saxony, where the beetle made its appearance, the fields were first burned over, then plowed up, and finally the sawdust saturated with benzine and mixed with the earth and fired.

In regard to our American remedy, the Paris green and lime, the *Industrie Blätter* remarks: "We are of the opinion that this means will really destroy the beetle, but the lime and Paris green dust might be dangerous to children and that useful animals and plants might be poisoned, and the soil become impregnated with such colossal quantities of arsenic that under some circumstances even the well water would be poisoned." Nevertheless this cure, in a wet form, is recommended by Professor Kuehn, of Halle.

In regard to this pest the *Gesundheit* says that Nature offers some aid. The odor of the hemp plant is so offensive and stupefying as to keep them out of a field. They have also an enemy in the lady bug (*Coccinella*).

Every effort is being made to prevent their importation from here. It is said that specimens of our potato bug have been sent there alive in a paper box without food, showing that it is rather a difficult matter to starve them.

That the farmer and gardener as well as the general public may recognize the insect upon its first appearance and set about its destruction, pictures of the bug, egg, and larva are freely distributed in the papers and by the police.

Models of the bugs at different stages, attached to a green leaf and brightly colored, are put up in little boxes with glass covers for use in the schools. Manufacturers of chocolate, candy, wax, or gums find in the Colorado beetle a convenient model for their wares. Among the latest novelties are sleeve buttons bearing each a full sized potato bug. Voigt has even published an illustrated pamphlet on the subject. In short, the Germans have the potato bug on the brain.

We learn that the Austrian, English, and French Governments have sent representatives to Germany to observe the beetle on the spot, as well as the precautions employed to destroy him. M. Henze, delegate of the French Department of Agriculture in Muehlheim, has shut up 80,000 specimens in little boxes to be furnished to all the communes and schools in France. He also desired, for the museums, large glass boxes in which the nature of the dangerous beetle should be shown by means of an artificial potato field.

An enterprising Muehlheim firm puts up: "Very fine Colorado Bitters," with a beetle on the label.

A patent has been taken out in Prussia for an apparatus to destroy insects and weeds by means of steam. A large apparatus for fields is drawn by horses and operated by two men.

Analysis of Butter Fats.

Hehner says that all methods for detecting foreign fats in butter, which are based upon the physical properties of butter fat, such as its solubility in alcohol, ether, and naphtha, melting point, etc., are useless because it is easy to mix liquid and solid fats in such proportions as to obtain a product totally undistinguishable in its external appearance and physical properties from butter. On the other hand, many a sample of genuine butter is considered to be adulterated because its odor and appearance seem to indicate the presence of tallow. All butter without exception, even the best, by standing a long time in the air acquires a decided odor of tallow and becomes as white as tallow too.

Hehner and Angell have found that the quantity of volatile acids in butter fat is far greater than previously supposed, and further, that this quantity is very constant and almost independent of the race of the cow, the fodder, and the method of making the butter; also the age of the butter has no effect upon it. By distilling the saponified butter with sulphuric acid, they obtained in eight experiments from 4·8 to 7·5 per cent of volatile fatty acids. In this manner no harmonious results could be obtained.

As all animal fats, except butter, consist of tristearine, tripalmatine, and trioleine, they must, when saponified and decomposed by sulphuric acid, yield from 95·28 to 95·73 per cent fatty acids. Hog's lard, mutton suet, and similar fats yielded, by direct experiment, within 0·1 per cent, exactly 95·5 per cent insoluble fatty acids, while pure butter gave from 85·4 to 86·2, on the average 85·5 per cent; others found as much as 87·5. A butter, then, which yields over 88 per cent of fatty acid can be considered as adulterated. To determin the quantity of foreign fats, subtract 87·5 from the percentage found, multiply by 100, and divide by 8 (= 95·5 − 87·5). As butter is never adulterated with a few per cent of another fat, but with at least one third, we can scarcely be in doubt whether it has been adulterated or not.

Hehner recommends to melt the butter and pour off the top through a dry filter, then put 3 or 4 grains of this fat in a small dish, add 50 c. c. alcohol and 1 or 2 grammes of pure potassic hydrate and heat 5 minutes, or until a few drops of water does not produce turbidity. The alcohol is driven off by evaporating to a syrup, the residue dissolved in water, dilute sulphuric or hydrochloric acid added to acid reaction. The insoluble fatty acids separate as a cheesy mass. Heat 30 minutes. Then filter on a tared, thick, moist filter, and wash with boiling water. When the filtrate ceases to show an acid reaction, the funnel is immersed in cold water to solidify the fatty acids, and dried in a weighed beaker in a water bath until the weight at two weighings is constant.

The Coming Winter.

Astronomer Royal Smyth, of the Royal Observatory, Scotland, says that the coming winter is going to be exceedingly cold. From the observations of earth thermometers over a period of thirty-nine years, he finds that between 1837 and 1876 three great heat waves from without struck Great Britain; namely, the first in 1846·5, the second in 1858·0, and the third in 1868·7. The next one will probably come in 1879·5, within limits of half a year each way. The periods of minimum temperature, or greatest cold, are not in the middle time between the crests of these three heat waves, but are comparatively close up to them, on each side, at a distance of about a year and a half. Hence the next cold wave is due at the end of the present year, and very frigid weather may be looked for.

Fertilization of Flowers by Birds.

A curious chain of circumstances, leading to a definite natural result, is noted by a correspondent of *Nature* writing from Mendanao. Certain flowers secrete nectar, which attracts certain insects. These insects are the natural prey of the sun birds and flower peckers; but to capture them the birds are obliged to probe diligently the corollas of numerous flowers. Each bird in so doing brushes off pollen, which adheres to the plumage surrounding its bill, and this pollen is thus conveyed to other flowers, which so become fertilized.

[*Continued from first page.*]

passes up through the grate bars, while another portion is admitted to the combustion chamber above the level of the fire. The result is complete combustion, so that smoke is practically prevented, and saving of fuel is effected. The admission of the blast over the fire is regulated by a valve, F. The frame which contains this valve is provided with a slide having sight holes, through which the holes in the brickwork may be kept free from obstruction. There is a gusset, G, on each side of the furnace opening downwards into the space below the furnace; the waste water from the boshes flows under the furnace, the vapor arising from which, together with the heated air, is drawn up through the gussets, and passes off through the pipes fixed on the same, so that there is a constant circulation of air under the bottom of the furnace, which keeps it cool, and a considerable saving of fettling, as compared with the ordinary puddling furnaces, is effected. Blast is supplied by a fan.

The system of puddling affects the results. This will be understood if it be borne in mind that puddling furnace economy may be dealt with under two heads, namely, economy of fuel and economy of iron. The latter item is measured by the proportion which the weight of puddled blooms produced bears to the weight of pig iron charged. It is evident that cinder being very heavy, if plenty of cinder is left in the iron, the yield will apparently be high. Again, if very rich fettling is used in a large quantity, a portion of this fettling will be actually deoxidized and converted into wrought iron by a species of direct process; and cases are not wanting in which the weight of puddled bars turned out by a furnace in a given time has exceeded that of the pig charged, the difference coming of course from the fettling. Now at the Old Castle Works, and indeed at all the Welsh tin plate works, the iron is puddled on a dry bottom; it is freely bled during the operation, and every possible precaution is taken to expel every particle of cinder. In fact the balls as drawn from the puddling furnaces are so dry that they can only be got to stick together under the shingling hammer with difficulty. It follows of course that the yields must appear to be small as compared with those to be had from furnaces making common iron.

Before an estimate can be made of the value of the furnace, it is necessary to have figures giving the work of the old furnaces, with which to compare them. A careful examination of the books shows that the results obtained are not very uniform, much depending no doubt on whether the furnaces are in good condition or not; but it may be said that the coal used on the old system averages 23 cwt. per ton of stamps, and the stamp average 18 cwt. 2 qr., or perhaps a shade more, per ton of pigs and scrap. From this it appears that the new furnace saves nearly 44 per cent in fuel, while the yield is augmented by 35 lbs. to 40 lbs. of iron per ton. There is 50 also a sav ng of over per cent in fettling.

It may be urged that this economy is due to the double furnace system. Even grant this to be the case, still the credit will remain with Messrs. Caddick and Maybery of producing an exceedingly simple and compact furnace, from which no heat is radiated to the annoyance of the puddler, while it is indispntable that the combustion is as nearly as possible perfect.

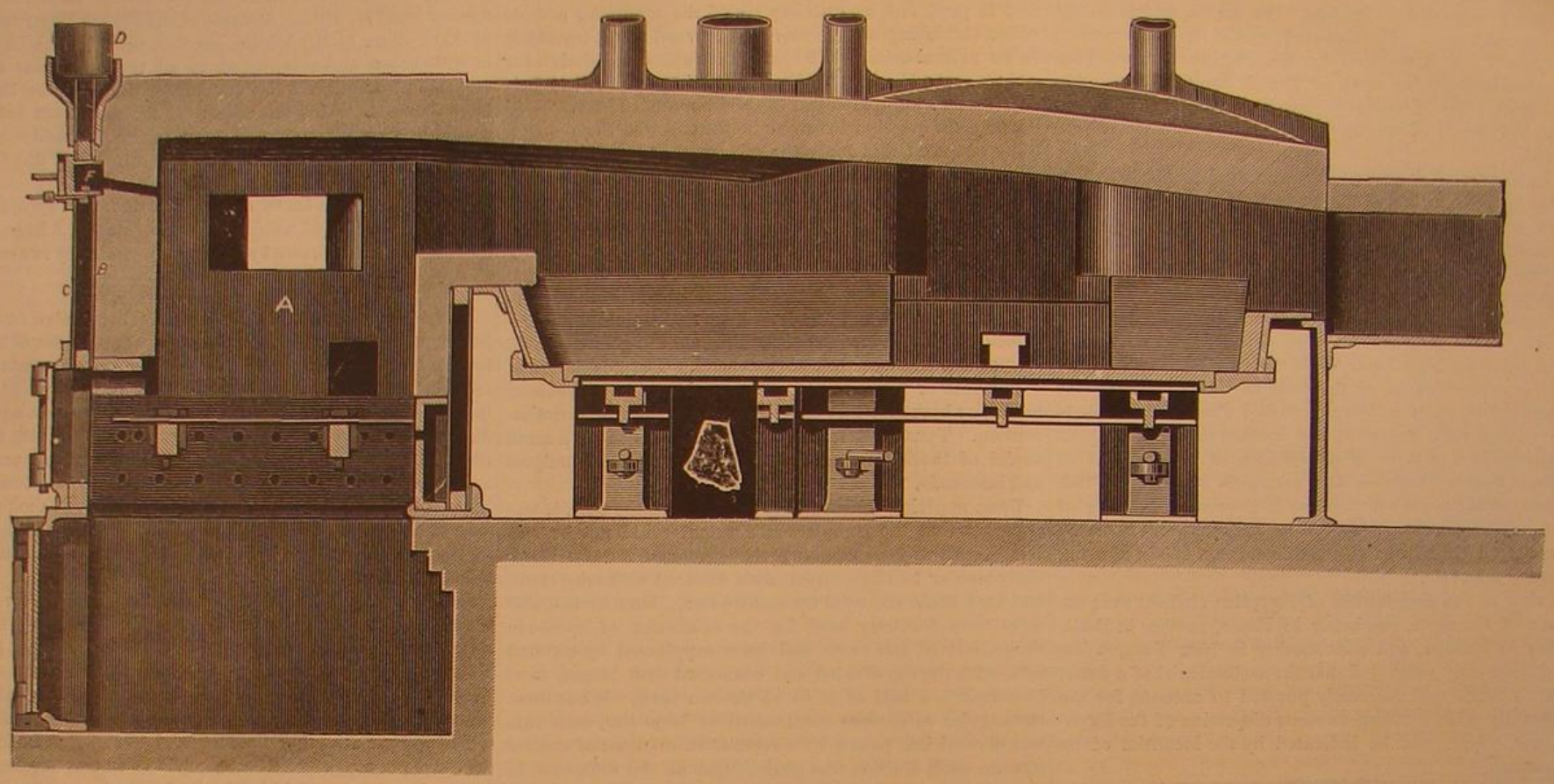


Fig. 3.—CADDICK AND MAYBERY PUDDLING FURNACE.—LONGITUDINAL SECTION.

The Satellites of Mars seen with a 7 Inch Glass.

In striking illustration of the truth of the assertion of Sir W. Herschel, that when a very faint object has been once discovered with a large telescope, it may be seen with a much smaller one, we received, since the above was written, a communication from Mr. Wentworth Erck, of Sherrington, Bray, dated September 8, in which he writes: "The outer satellite has been seen here three times; 1st, on September 2, at 22h. 40m. G.S.T., when the position was about 290°, and distance from limb something less than three diameters of the planet; 2nd, on September 3, at 23h. 0m. G.S.T., when the position was 54°; this position is pretty accurate; on this occasion I watched the satellite for two hours, during which I saw it move from 64° to 55°; at the latter position its distance from limb was equal to two diameters of the planet; 3rd, on September 8, at 22h. 35m. G S.T., when the position was about 78°. It was steadily visible with 7 inches aperture on my Alvan Clark, and was, I should say, something brighter than Enceladus, the second satellite of Saturn."

On comparing these observations with positions calculated from the above elements (which closely represent the Paris observation of August 27), it is evident the object observed on September 2 was a star, the satellite at the time being on an angle of 325°, and only 15 seconds from the limb, but it appears beyond doubt that Mr. Erck observed the outer satellite on the following night, when the position at the time named would be 65°, distance from center of planet 79 seconds, and two hours later the angle would have diminished to 53°, and the distance to 61 seconds, or roughly two diameters from the planet's limb as observed. On September 8 the angle was 71°, distance 85 seconds, so that the satellite may have been seen again this evening. So far as we know these are the first observations of a satellite of Mars in these islands, and it is singular that they have been made with an instrument constructed by the same optician as the great Washington telescope, with which the satellites were discovered.—*Nature.*

In this city, Mr. Rutherford, with his 13 inch glass, we believe, has not yet seen either of the satellites.—EDS.

Vapor Volumes.

In the *Journal* of the German Chemical Society there is a paper by Troost, detailing experiments made to determine the accuracy of Avogadro's theory that "equal volumes of substances in the state of vapor contained the same number of molecules," that is, that the volume of the molecule of hydrogen being called 2, the volume of all other molecules must also be 2; instead of, as happens in certain cases, apparently 4, 6, or 8. The method of experiment adopted was to introduce into the vapor of chloral hydrate a salt containing water having a dissociation tension nearly equal to that of chloral hydrate; if the chloral hydrate vapor undergoes dissociation, and consists of equal volumes of chloral and aqueous vapors, then the vapor volume will remain

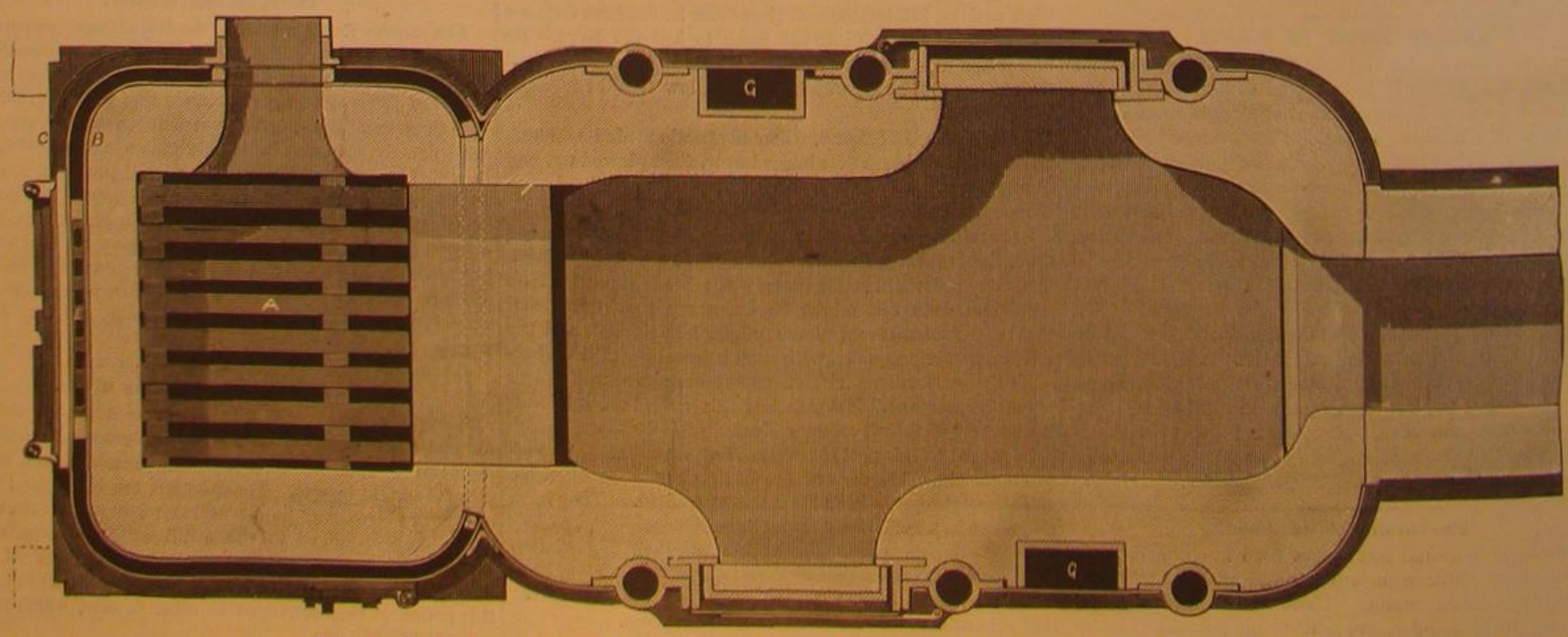


Fig. 4.—CADDICK AND MAYBERRY PUDDLING FURNACE.—SECTIONAL PLAN.

constant; but if chloral hydrate is volatile as such, its vapor will be free from water, and on introducing the salt it will give up water, and the volume of vapor will increase till the dissociation tension is reached. The salt used was potassium oxalate, containing one molecule of water. Troost has found that the volume increases on the addition of the oxalate, leading him therefore to the conclusion that chloral hydrate undergoes volatilization without decomposition.

Curious Phenomena in the Oil Regions.

A correspondent of the *Baltimore American* says that at Titusville, Pa., Senator Anderson's beautiful grounds, on the suburbs of the city, present a splendid sight every clear night during summer. The great attraction is the fact that they are brilliantly illuminated by natural gas from the Newtown Well, about four miles distant. This well yields nothing but gas, and when first opened the roar of the escaping gas could be heard, it is said, for a distance of seven miles. The gas has since been confined so as to be conveyed in pipes to the city and is used extensively for cooking and heating purposes. In the house of Senator Anderson not a stick of wood or lump of coal is used during the year either for cooking or heating. He uses the gas in cooking stoves and in open grates in his parlors, sitting rooms, and chambers. It gives too much smoke to be used for light indoors, and simply takes the place of fuel. There are about twenty standards on the lawns and around the fountain and lake in the Senator's grounds, and one magnificent arch, the innumerable jets from the pipe each throwing out a flame about twelve inches long. There are about twenty standards in all, with about thirty jets, each jet throwing out a fierce flame from twelve to eighteen inches long. The portion of the grounds illuminated is to the extent of about four acres, and is as light as day in every part. The fountain is a magnificent work of art, surmounted by a nymph pouring water from an urn into a goblet, and four swans, each throwing

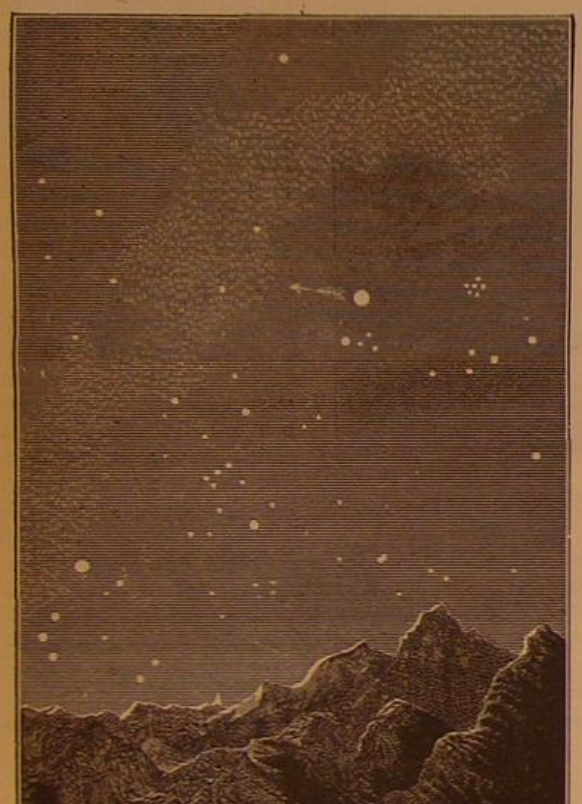


Fig. 1.—VIEW OF THE EARTH FROM MERCURY.

streams into the basin below, while there is a beautiful floral display at the base of the fountain and on the ground surrounding it. The lawn is kept in splendid condition, interspersed with variegated flowers, and the effect of this brilliant illumination may be imagined amid such a scene of floral attractions. The gas is also used for heat in the conservatory, and we are informed by the gardener that the entire cost of the gas used for domestic purposes and illumination of the grounds is but $100 per annum. The force of this gas is so great that recently, in tapping the pipe to put in a service pipe for a dwelling, the particles of iron were forced out with such velocity as to enter the flesh of the plumber's arm. The gas from the Newtown Well is extensively used in Titusville in place of fuel, similar to its use in the mansion of Senator Anderson, and there is some talk of using it for the general lighting of the city.

The *Pittsburgh Despatch* says that situated about four miles southwest of Clintonville, Venango county, is a well which, for volume of production, surpasses anything yet discovered in that county. The well was completed upward of a month ago. No oil was found, but an immense gas vein was encountered at the place where oil was expected. Before abandoning the well the owners resolved to draw out the casing. This was attempted in the usual way, but the casing stuck about a foot above its former resting place. As it was elevated to its present position, the fresh water from the upper part of the hole rushed into the well at the bottom of the casing in great quantity. As it did so, the gas raised it to the surface of the earth after sending it forty feet above the top of the derrick. There it continues to gush, and may for all time. It is estimated that at least twenty thousand barrels of water are thrown out daily. It is truly a remarkable phenomenon.

HOW OUR WORLD LOOKS FROM OTHER WORLDS.

There is no consideration better calculated to exhibit to

Fig. 2.—VIEW OF THE EARTH FROM VENUS.

us how entirely insignificant our earth is as a part of the universe, than that which leads us to realize how our globe would appear to one of its own inhabitants if he could be transported to one after another of the heavenly bodies. The journey of our imaginary celestial traveler need not extend to the fixed stars, for from them the earth is not visible at all. The nearest fixed star is 226,400 times more distant from us than is the sun. Figures convey no idea of this vast interval, for no one can conceive of a trillion, much less of 24 trillions, of miles. A spider thread on that star would blot out the space between sun and earth. Our luminary would appear as a small brilliant dot, our earth, even if it were not lost in the solar effulgence, would be absolutely and mathematically invisible. And this on the nearest fixed star, if we proceeded further into the star depths our sun itself would dwindle smaller and smaller and disappear long before, the stars were reached which now form the limit of our imperfect observations. If any fixed star is inhabited, the inhabitants are not merely ignorant of our earth but of all the other planets of the solar system, all might be swept away by some vast cataclysm and the rest of the universe would be none the wiser.

Restricting ourselves, however, to the planets of the suns family, it is probable that three are more familiar with our

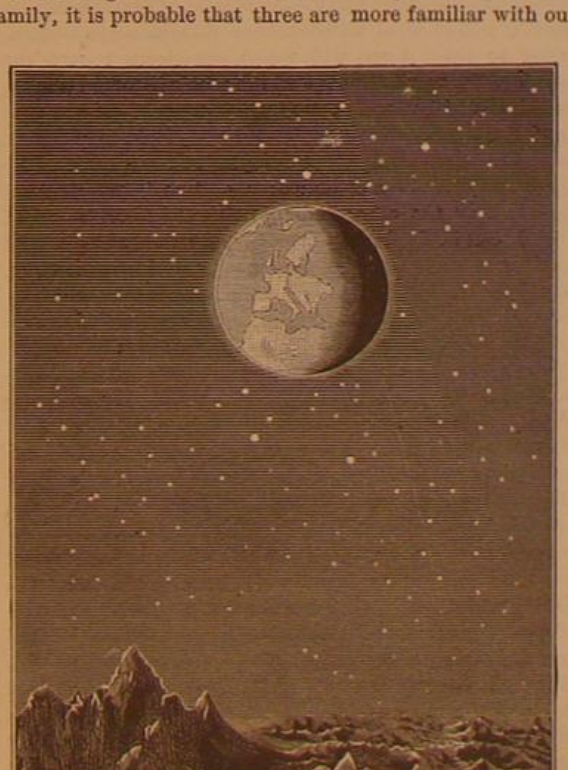


Fig. 3.—VIEW OF THE EARTH FROM THE MOON.

earth's characteristics than we are with theirs, the other three or the people who live on them if we make that violent assumption, probably see no more of us than do the dwellers on the fixed stars. The excursion we have suggested therefore being restricted to the planets, the starting point will be on Mercury, which moves around the sun at an average distance of 42 millions of miles, its year being 88 days and each of its seasons three weeks. Since the earth travels on an exterior orbit to that of Mercury just as Mars and Jupiter move in orbits exterior to our own, the best epoch for its observation from Mercury is when that planet, the earth and the sun are in a right line. Then the earth's side nearest Mercury is illuminated and our globe appears as a large brilliant star moving as shown by the arrow in Fig. 1, from west to east along the zodiac.

From Venus, the earth presents a far more splendid appearance. Every 584 days it approximates most closely to that planet and is only 180 millions of miles distant. Then it appears as a large bluish white and dazzling star, eclipsing in magnitude every other in the firmament, Fig. 2. The arrow again shows the direction of motion.

From the moon, the earth seems a colossal orb. Sun and planets all pass behind it It has phases like the moon itself; and in beautiful accord with the needs of the lunar day (equal to fifteen terrestrial days) the earth is full at midnight, in quadrature at sunrise, Fig. 3, new at noon, and in quadrature at sunset. At full earth, the lunar inhabitant can see the seas and continents, the poles white with snow and the cloud banks floating in the air. A light vapor surrounds the earth which, refracting the light of the millions of stars, make it seem as if our globe were bathed in a pale halo. Probably the view of full earth from the moon when our planet seems fourteen times as large as the sun is one of the grandest celestial spectacles that exist in all the universe.

Continuing our voyage through space, we next reach Mars, 168 millions of miles from the sun. The period when the earth is best visible to the Martial inhabitant is just opposite to the similar period in the cases of Mercury and Venus. Since the earth revolves around the sun in an orbit within

Fig. 4.—VIEW OF THE EARTH FROM MARS.

that of Mars, its greatest proximity to the latter occurs when between Mars, and the sun. But then it turns its shaded hemisphere to Mars and is therefore invisible. It is necessary then to find, before and after this position, situations in which the earth shows to Mars a portion of its hemisphere illuminated by the sun. The further it is separated from Mars, the greater will be the phase, but on the other hand the smaller will be the disk. There is however a moment of maximum brilliancy which occurs near quadrature. Then the earth appears to the Martial eye as a bright star and through a telescope as a large crescent. In fact there is an accurate reproduction of the behavior of Venus as regards the earth. As Venus is our morning and evening star, so are we the morning and evening star to Mars. The Martial inhabitant sees the earth as a larger star than Jupiter appears to us, while the brilliancy is such as to render the earth visible in daytime.

To the inhabitants then of Mercury, Venus, the moon, and Mars, the earth stands chief of the heavenly bodies. To those of Jupiter, however, it becomes suddenly of almost total insignificance. The orbit of Jupiter is 576 millions of miles from the sun. Hence the earth in revolving around the sun never appears further from it than 12 degrees. The earth is therefore not visible during the Jovian night, for there the twilight continues some time after sunset, and when twilight has ended, the earth itself has set. Moreover at the only moments when it might be visible from Jupiter the earth is in quadrature, and only half illuminated, and besides, it is too small to be seen by the naked eye. Astronomers on Jupiter could only discover the existence of the earth by telescopes, and at a suitable epoch, as for instance in the east just before sunrise or in the west just after

sunset, and then only for a few minutes. They would class our globe as an insignificant little satellite of the sun lost in his fiery beams. Happily for our astronomical reputation on Jupiter, there are circumstances when if we are not visible as a brilliant star we may at least be seen. Some Jovian astronomer hunting for sun spots might see a little black dot crossing the solar face, that would be a terrestrial transit, and our earth would be the telescopic speck, which we have attempted to indicate in Fig. 5.

The world of Saturn surrounded by its mysterious rings moves at a distance from the sun nine and a half times greater than that separating the sun and earth; or 1,059 millions of miles. From this magnificent planet our globe is a mere point which swings from one side of the sun to the other, thirty times during the Saturnian year, and never distant from the sun more than 6 degrees. The sun itself seems ten times smaller than it does to us. Fig. 6 is an imaginary view on Saturn (the earth of course is invisible), supposed to be taken at 30° latitude at midnight: the epoch when the sun, fully illuminating the vast rings, causes a brilliant ring light night. The satellites which move around this strange world vary by their motions and rapidly changing phases the marvelous spectacle. The inhabitants of Saturn however know nothing of our earth; and even if by the construction of colossal telescopes they discovered us, they never could tell whether we were an independent orb or were fastened to the sun. The best name they would apply to us would be "minute blemish" on the solar disk. From Uranus, nineteen times the earth's distance from the sun, or 2,130 million of miles, the earth's annual orbit is simply a little circle, of 3 degrees on each side of the sun. The sun itself, nineteen times smaller than it appears to us, transmits to the Uranian inhabitants seventy times less light and heat. Even during its transits the earth is not perceptible to people on that world. From Neptune, most distant planet of our system, three thousand million miles away from the sun, the sun seems a huge star, of diameter thirty times less than that seen by us. Here the earth is absolutely invisible; no conceivable instrument could make it seen. Thus, out of the millions of stars which spangle the heavens, out of the vast infinity of worlds there are only five, at most six, to inhabitants on which, if any there be, the existence of this world of ours can be known.

Fig. 5.—VIEW OF THE EARTH FROM JUPITER.

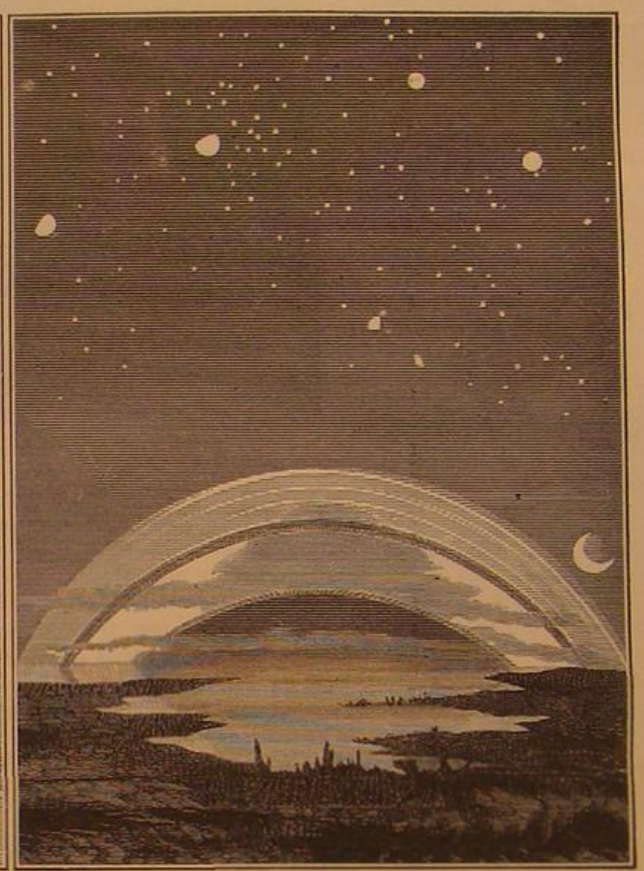


Fig. 6.—VIEW OF THE EARTH FROM SATURN.

Better Times.

The evidences that the hard times have spent their force and that a steady improvement in all branches of business has begun, are now too plainly to be seen on every hand for the most despondent to doubt their existence. The last bugbear of the farmers, the fear that the corn would be ruined by the frost, has now ceased to alarm, as for the most part this crop is too far advanced to be seriously injured, even if cold weather should set in at once, as is not at all probable. As to the harvests generally, they have perhaps never before been equaled; so that the farmers are ensured a good return for their labors, the working masses are afforded food at moderate prices, and the great avenues of transportation are crowded with the eastward flow of the harvests and the return flow of the comforts and luxuries which are sent in exchange. As no small encouragement, we may mention also the fact that our national currency has reached the highest figure it has known—the difference between it and gold having been quoted the other day at less than 3 per cent—so that there is little fear of the terrible results which have been predicted by some in case of specie resumption. One of the very best features of the whole outlook is the fact that the railways have ceased to cut each other's throats, and are all charging reasonably remunerative rates for the immense business which is pouring in upon them. As a consequence, their earnings are showing a marked improvement and afford the cheering hope that the companies will not only be able to pay their employés living wages, but that they will gradually become profitable to their proprietors.—*Railway Age.*

Heat of Combustion of Oxygen and Hydrogen in Closed Vessels.

In a recent number of the *Journal* of the German Chemical Society there are some experiments on the above subject communicated by Than. He has modified Bunsen's ice calorimeter, so as to make it available for heat determinations in chemical action, and by this means he has obtained accurate results of the heat of combustion of electrolytic gases in closed vessels. The terms "heat of combustion," or "total difference of energy," are used by Than to express the quantity of actual energy evolved when the combining gas, in the case of oxygen and hydrogen at 0° and 750 mm., is completely converted in a closed vessel into water. Taking the atom of hydrogen as unity, he finds that a gramme of hydrogen uniting with the requisite quantity of oxygen in a closed vessel to form water, produces 33·982 units of heat, which number agrees closely with that found by Andrews, namely, 33·970.

What Kills the Russians.

The correspondents of the London papers with the Russian armies all speak of the deadly effect of the Turkish fire. It is sickening to read of the slaughter committed on the brave Muscovites in their hopeless assaults on Plevna and the other strongholds of the Turks. No mortal courage, it would seem, could face the pitiless storm of bullets that sweep the slopes up which the assailants press with an ardor carrying the survivors almost over the ramparts and among the unseen foes, until the bugle sounds their recall. The line of these attacks, say the correspondents, is strewn with dead and dying by hundreds from the edge of the glacis back to the point where the troops first ventured upon the open. The Turkish aim is almost sure for 200 or 300 yards. It is only a question of time when the entire Russian army would be melted away in these fruitless rushes. They have now been abandoned, it is said, and the surer and slower system of investment and reduction will be tried, with what success remains to be seen. It adds to the interest with which Americans regard the Russo-Turkish war to know that the whole Ottoman army is or will be furnished with these terrible weapons of our own manufacture. The rifle used in that army is a breechloader, made by the Providence Tool Company, and called the Peabody-Martini. It is a combination of two inventions, one American and the other Italian, uniting the best points of both. It can be fired by an expert hand nearly at the rate of once a second, and the soldier's capacity for killing is therefore only limited by his dexterity and supply of cartridges, of which Turkey, by the way, has an abundance from an American factory also. The Peabody-Martini rifle may or may not be superior in some respects to other arms of precision. There is no occasion for comparing its excellence with that of the Chassepot or the needle gun, or the Gorloff or Berdan rifle (used by most of the Russian troops). It suffices to know that, in the crucial test of war on the large scale, the American weapon does its appointed work, and keeps the Russians at bay wherever the Turks can get behind a cover in strong force. The possession of 500,000 of these rifles—that number having already been supplied by the American contractors, with 100,000 more to be delivered—used by brave men behind defences may not decide the final issues of the war for the Turks, but will protract the conflict, and make it frightfully costly to the Russians. American arms, and the American style of earthworks, which the Turks have copied, will give the Russians even more trouble than that fanaticism and valor which make the Turks foemen worthy of any nation's steel.—*Journal of Commerce.*

Formation of Sulphuretted Hydrogen by Algæ.

From an investigation of those thermal springs which evolve sulphuretted hydrogen, F. Cohn has come to the conclusion that in these waters vegetable algæ are the cause of this evolution of sulphuretted hydrogen, inasmuch as they reduce the sulphates dissolved in the water, some of the separated sulphur staying in their bodies and some being given out to the waters a sulphuretted hydrogen. Further investigations had shown that a number of other microscopic organisms living in bad water have the power of depositing pure sulphur in the form of little grains or crystals. Last year a visit to the Landeck baths gave Mr. Cohn an opportunity to confirm his previous observations. He found that the basin in which the thermal waters are collected was covered on the bottom and sides with a gelatinous mass, which was formed of algæ and thickly filled with numberless little grains of pure sulphur, which strongly refract the light. This separation of sulphur seems at first glance to be a peculiarity without analogy in the vitality of other plants. Hence it must be prominently stated that all plants really have the power of decomposing the sulphates within their cells and liberating sulphur within themselves. It is an established fact that the roots of all plants take up sulphates (gypsum, sulphate of magnesia, of soda, and of potash) in solution in the soil, and that in experiments of cultivation with artificial liquid fertilizers, sulphates must not be omitted if the plants are to exhibit their normal growth. It is no less firmly established that sulphuric acid is reduced in the interior of the plant in an analogous manner to the reduction of carbonic acid in the green cells. For as the carbon liberated from the carbonic acid in the light at once enters into combination with hydrogen and oxygen to form carbo-hydrates, so the sulphur set free by the decomposition of sulphuric acid in the cells at once combines with carbon, hydrogen, oxygen, and nitrogen, to form molecules of albumen or other protein substances contained in the protoplasma. It seems then as if the only peculiarity of the *beggiatoa* in the sulphur springs, and of many purifactive organisms, consists merely in this, that they are able to decompose a far greater quantity of sulphates in their cells, and produce by the reduction of this sulphuric acid a much greater quantity of sulphur than they are able to chemically combine in their cells, and that, consequently, the excess of sulphur is separated in grains.

It may seem somewhat strange that sulphur and carbon are the only elements which plants are able to liberate from their compounds; but it is probable that the list will not stop here, but be filled up by future investigators of plant physiology. Nitric acid and nitrates are reduced by plants, and the nitrogen absorbed. Of the mineral acids these three, carbonic, sulphuric and nitric, are the only abundant ones readily decomposable. Silicic acid is taken up by the plant either as silica or silicates, but silicon is never separated by the plant from its oxygen. It would be interesting to test the power of plants to reduce various other natural and artificial compounds.

Influence of Gaslight upon the Eyes.

The verdict of a scientific deputation for medical purposes has been presented to the Prussian Minister of Education. *Lithographia* extracts the following, which refers to living and study rooms, but is equally applicable to printing offices, factories, etc.:

"According to the previous experiences of oculists no injurious effects of gaslight upon the eyes of pupils has been observed, when it has been used properly, and especially where arrangements are present to protect the eyes from the direct influence of the bright flame. In general, shades and globes serve for this purpose. The dark, totally opaque tin shades are, however, very injurious, and all complaints against the use of gaslight are referable almost universally to these improper contrivances. With these, the eye stays in total darkness, but looks upon a brightly illuminated surface, so that a dazzling and over-irritation or superexcitement of the eye result, with all their attendant injurious results. Very suitable are the globes of milk glass, which diffuse the light more, and the eye is not injuriously affected. Experience shows that more heat is generated by gaslight, hence the gas flames must not be brought too near the head, because the radiant heat which it sends out might cause headache and congestion of the brain. Where several persons are using the same flame, the source of light has to be higher up, so that the unpleasant effect of the radiant heat disappears, especially if the so-called "plate" illumination is used, which consists of a large funnel-shaped globe of milk glass closed beneath by a plate, whereby the descending rays suffer a proper diffusion and loss of intensity, and at the same time the flickering of the flame by breaths of air is avoided and a more steady and quiet source of light is secured. Under special circumstances, where the eyes are particularly sensitive, chimneys of a blackish blue color may be employed. Under such precautions an injurious effect of gaslight upon the eyes is not to be feared in the least.

Communications.

Our Washington Correspondence.

To the Editor of the Scientific American:

The business of the Patent Office is taking its usual course notwithstanding the fire, as the following issues, being those for the past week, will show: patents, 217; reissues, 8; designs, 5; trademarks, 40; labels, 9. If any of your readers are delaying making application for fear they will have to wait, they need do so no longer on that account, but should forward their applications at once, as, owing to other inventors' postponement of their cases, those who apply now will have the best chance, and will not have to wait so long as if they delay until the reaction takes place.

Our Consul General at Berlin has communicated further particulars concerning the American department at the International Leather Exhibition in that city, from which it appears that the highest premium, a gold medal, was awarded to the American firm of Larabee & Co., for their collective exhibit of boot and shoe machinery. Several other American firms received diplomas and honorable mention for machinery and leather exhibits. It is believed that the American hemlock-tanned leather will meet with a large market in Germany; for although greater strength and durability are claimed for the home-made, salt-tanned article, the cheapness of the former will prove a decided advantage in selling. The consul also reports on our general trade with Germany, and states that the most urgent requirement to increase it is that the wants and peculiarities of the German markets should be studied, which he thinks can be most readily accomplished by resident agencies. The superiority of most articles of our manufacture exhibited there is fully acknowledged, but in many cases they are kept for show in the windows, and exorbitant prices asked, thus precluding their sale. With all drawbacks our trade with Germany is steadily on the increase, our exports thereto amounting to $277,000,000 during the last five years, being nearly $50,000,000 more than our imports during the same period. The exports of our manufacturers have increased in the ratio of four to one since 1872, and the Consul General says that by proper efforts a much greater ratio of increase may be accomplished hereafter.

In response to the request of a body composed of the leading merchants and manufacturers of Philadelphia and styled the Associated Industries of the United States, Postmaster General Key has issued a letter of credence to Mr. J. W. Fralick of Philadelphia, who is about to travel in the adjacent South American States with the object of increasing our postal facilities with those countries in order that our trade with them may be extended in a manner which the present limited and uncertain means now forbid. In an interview relating to the same matter which was had with the Secretary of State, it was shown that the Brazilian markets open up a large demand for a number of American manufactured articles, but that owing to the absence of proper facilities the trade is carried on through English houses who buy their goods here and ship them to Brazil, making from ten to fifty per cent on their own account, which advantage might be in the hands of American merchants if our postal and freighting facilities with those countries were as good as are those of the English. Secretary Evarts stated that he believed it to be the imperative duty of this government to do all it can to advance the commercial and manufacturing interests of the country by a more liberal policy regarding our foreign trade, and that this could only be accomplished by the establishment of ocean postal routes under the auspices and fostering care of the government. It has been ascertained that there are now building four iron steamships which are designed for a line between New York and Rio Janeiro, and by the establishment of this line all our manufacturing and commercial centers will be much benefited. For the more certain establishment of proper facilities for trade, the secretary thinks we should have a system of judiciously subsidized postal lines, particularly with those foreign ports which have a demand for American manufactures and products, and is disposed to exercise the influence of his department in their favor.

Postmaster General Key has received a communication from the English Post Office Department stating that it has been found necessary to take precautions against the admission of the potato bug into the United Kingdom through the mails, as several live specimens of this insect had been discovered in mails received from the United States, either surreptitiously inclosed in newspapers or forwarded as specimens. It is feared that, notwithstanding the utmost vigilance on the part of the British authorities, many newspapers and packages containing these insects pass without detection and therefore the friendly co-operation of our postal department is requested in putting a stop to the reprehensible practice of sending these insects in mail matter to Great Britain, whereby the potato crop of the kingdom may be endangered.

Among the documents recently received by the State Department is the first annual report of the Sappora Agricultural College, situated in the city of that name in the province of Nokkaida, Japan. This college was only opened in August, 1876, and now we have the first report, a pamphlet of 148 pages, printed on beautifully tinted paper, with clear type, and giving in tersest English information that bears the most incontestible proofs of the success of the undertaking, and of the practical spirit in which Japan proposes to educate the rising generation of agriculturists, combining all that is good in the old world with all that is best in the new. From it we learn that the college farm contains 250 acres, from which fine crops of a large variety of farm produce were raised; and that the college building contains a library (having a large collection of books in the English language), lecture rooms, chemical laboratory, dormitories, etc. Professor Clark, an American, was appointed director of the college for one year, and much of the credit of the success of the institution is acknowledged by the Japanese to be due to him. All of the farm utensils, machines, most of the seeds, etc., were purchased in the United States, and the surveys, draining, and planting were carried out under the direction of Professor Wheeler.

Since the burning of the model halls of the Patent Office a commission was appointed to examine the various public and other buildings where the Government papers and records are kept. The report of the commission has just been published, from which it appears that the new State Department, the Shepherd and Coast Survey buildings are as nearly fireproof as a building filled with records can well be. Two old wings of the Capitol adjoining the Congressional library are very defective, and have much woodwork under the roof. The War Department records are stored in many buildings which are, in most cases, complete tinderboxes, ready to blaze up from the smallest spark. The Treasury records are in a large degree exposed. Part of the Post Office Department roof is supported on wooden rafters. The National Medical Museum, supposed to contain the finest surgical collection and most extensive medical library in the world, is under a wooden roof and cornice. The Agricultural Department, with its museum, is also unsafe. In fact nearly all the archives of the Government are in constant danger of fire, and an unlucky spark may some time destroy a collection of records that will expose the government to the probability of having to pay many millions of dollars of fraudulent claims that would never have been brought forward had such records not been destroyed.

The United States steamer Guard is about to sail under the command of Lieutenant Commander F. M. Green, on an expedition to Lisbon, Cape De Verde Islands, and across the Atlantic to the coast of Brazil, for the purpose of establishing the longitude of the various places by means of the telegraph. The several cable companies along the route have offered to the Navy Department the gratuitous use of their cables for this undertaking in the interest of commerce and navigation. The Guard will be absent about a year and a half, and the work of the scientific corps on board is looked for with the greatest interest, as the correction of a vast number of charts depends upon the results of the expedition.

Washington, D. C. OCCASIONAL.

The American Middlings Purifier Company.

To the Editor of the Scientific American:

We are accustomed to being traduced by millers' journals catering to suit the taste of their customers, and regarding nothing but their subscription lists; but when we read in your journal the same charges, we are moved to ask your permission to reply to some of them. The original patents of Wm. F. Cochrane were issued, one for an improved process, and four for mechanical improvements. Some of them required to be reissued, generally because subsequent investigation showed that the originals were too broad in their claims. The process patent, however, required reconstruction; and when I tell you that the application was examined by the late lamented Nolan, than whom no abler or purer man has ever ornamented the examining corps of the Patent Office, you will be prepared to believe that these reissues probably rest on a safe foundation, and will at least require *some* proof of fraud; but except in the columns of newspapers and milling journals, nothing has been presented on this head.

Having obtained the reissues, we sued one of the largest milling firms in the United States. The case went through the courts the more rapidly because we had selected parties owning patents claimed to cover the same subject matter, who had made a good deal of money out of their patents, and were as anxious to get through with the case as we were, and all the more that they supposed they were going to beat us easily, as in fact they did in the lower court. Judge Miller said, in his decision in St. Paul, that the case was considered with unusual care in the Supreme Court, and the patents were fully sustained. Now they talk of collusion and threaten to have an examination, but though the Supreme Court is in session they don't move in the matter. We are ready and anxious to meet them, and would bring on the question ourselves, if we could, for the charge is without foundation; but they prefer to raise a clamor, and so encourage their members to stand by their association. Twice they have made the charge in the Circuit Court, and in both instances entirely failed to prove it. Have we not a right to ask you not to take the truth of this charge for granted?

Then they say the invention is old. That is fair ground for defense; but why yell fraud, and hurl all sorts of names at us, because, in the absence of any proof whatever to the contrary, we insist that our patent shall be accepted as valid. It is for them to overthrow it, and they have utterly failed; the patent stands, and up to date has never been shaken; why then do you talk of the patent ring trying to impose a fraud on these innocents?

Call a thing an evil name and all evil is at once accredited to it. How are we a ring? The company is a unit; it has a moderate capital *of only* fifty thousand dollars, and, all told, nine stockholders. Are you really afraid that we are going to override an association of millers representing five thousand mills and at least fifty millions of capital? The danger is to us, not them. Nothing but a cause most just can sustain us against such a combination; and why should we be abused because we have manfully stood up for what we believe to be the right against such enormous odds? What has become of the American sense of fair play? Our cause is in many points that of the whole body of inventors. These associations are formed, in the language of the Minnesota Association, to oppose, by their joint capital and influence, claims made against *any* miller by *any* person on *any* patent. Right or wrong, just or unjust, they claim the privilege of taking any person's patent, and the unfortunate patentee must prepare to fight the combined capital of all the millers. How many, with a cause however righteous, can sustain themselves against such a force? They can break down almost any one by the simple multiplication of expenses, which they can sustain because the amount divided among so many will be small for each; but the plaintiff must bear all the burden unassisted. There is a community of interest among patentees, which entitle us to some sympathy from them at least. We have tried to conduct ourselves squarely in this matter. We have not sued poor men, have struck at the strongest, have made our case, met theirs, and have tried to bear success without exaltation, or defeat without depression. We have beaten them upon every question of law which has ever yet been raised, and on every issue of fact, except in the last trial in St. Louis, when, by reason of our difficulty of obtaining witnesses, they were enabled to outswear us; and even then the court allowed us an order to inspect the mills, which we did, to find that they had succeeded by denying what we found to be the truth; but it was too late to get advantage of it, for one judge had gone and the other was going in a few days, and could not turn aside from the law cases then being tried with a jury in attendance to resume the chancery docket.

Now, having failed at every turn in the courts, they are circulating petitions that Congress shall interfere; and at this point your readers have a very genuine interest in the matter, for they can only hurt us by modifying the rules of recovery applicable to any other patent. It means that we are to have an attempt, backed by most formidable interests and untold money, to obtain legalization of the right of any man to confiscate other people's patents; and if at the end of long and expensive litigation they are held to account, it shall never be more than an ordinary license fee, say a few cents or a few dollars. This is what this appeal to Congress means; they can only strike us by striking at the system.

If we were so minded, we could tell things of the management of these cases for the association which would disgrace those implicated; but we do not care to try our case to the public. We are willing to stand or fall in the courts, and only ask of the public that it will await the development of the trials. If we should perchance fail, it is no new fate, and we will try to be patient; but if we should succeed, as we expect to, we ask the public not to believe that this one little company, with hardly capital enough to run an ordinary grist mill, has trodden under foot, crushed and cruelly oppressed these five thousand innocents, who have simply been trying, and heretofore successfully, to enrich themselves by the use of our property. Are your readers, of all the people on earth, the ones to turn against us in such a contest? Yours respectfully,

The American Middlings Purifier Company.

Washington, D. C., Oct. 13, 1877.

A Rich Silver Mine.

We have recently examined some remarkable specimens of silver ore from the mine of Todos Santos, near Batopilas, Chihuahua, Mexico, which is now being worked by Messrs. Mitchell, Ford & Co. This mine forms one of probably fifty which exist within a radius of five miles around the vicinity. It has been known some twenty years, but was abandoned and re-opened in 1875, since which time it has yielded some $75,000 worth of ore. At present, however, the ore extracted is of astonishing richness, yielding 12 ounces of silver to the pound, and in some cases a hard dollar to every ounce. The specimens exhibited to us were nearly solid silver, nodules and filaments of the metal being interspersed so thickly with the pure white quartz. The mine is situated nearly opposite that of the Batopilas Silver Mining Company, across the Batopilas river, and in the Sierra Madre Mountains at some 1,600 feet elevation, or 2,500 feet above the level of the Gulf of California, from which it is distant about 250 miles. Owing to the almost total absence of machinery—absent because of the inaccessibility of the locality—ore yielding as high as $200 to the ton is thrown aside as non-paying. The rich ore after treatment in the rude adobe furnaces of the country gives silver 993 fine. It is run into bars worth about $1,000 and $1,200 a piece. The cost of transportation of ore to New York is 12½ per cent, inclusive of the 5 per cent Government duty.

THE Cunard Company are constructing a new steamer to run between New York and Liverpool—the Gallia—of 5,000 tons, which will be built on a plan they intend to use on all new transatlantic liners—namely, the carrying of several watertight bulkheads to a deck 5 feet or 6 feet above water line. The Gallia will have seven of these bulk-heads, and will consequently be divided into eight watertight sections. It is to be hoped that the bulk heads will be found really watertight if the emergency should arise.

Test for the Presence of Gold in Solutions.

Protosulphate of iron gives a brown precipitate, which acquires a metallic luster when rubbed. Proto-chloride of tin gives a purple or blackish precipitate, insoluble in muriatic acid. Sulphuretted hydrogen and hydrosulphuret of ammonia give a black precipitate, insoluble in simple acids. Ammonia gives a reddish-yellow precipitate (fulminating gold) with tolerably concentrated solutions, either at once, or on boiling the liquid. Liquor of potassa gives, with neutral solutions of gold, a similar precipitate to that formed by ammonia, insoluble in excess.

AN ANCIENT HAND WARMER.

Our illustration represents a curious old article of comfort, which is almost forgotten now-a-days, but which once formed one of the many objects carried by ladies at their chatelaines. It is a hand-warmer, and consists of a small

spirit lamp hung in gimbals in several circles of metal, so that it stands always horizontal. It is enclosed in two hemispheres of copper, which are hinged together. The contrivance was clasped between the palms of the hands, and thus kept the latter warm.

IMPROVED SELF-FEEDING DRILL.

The annexed engraving represents a new self-feeding drill for boring iron, steel, etc. The feed is adapted for all classes of work and all sizes of drills, and therefore needs no adjustment. A is the drill shaft, having at its upper end the flywheel, B. This shaft is rotated by the bevel gearing shown, which is revolved by hand by means of the crank. On the bevel pinion is a feather which enters a keyway on the shaft, A, so that although said shaft is turned by the pinion it can be moved vertically within the latter. To the upper part of the shaft are attached collars, and between them is a sleeve which is secured for vertical movement upon the shaft by means of the collars, and prevented from revolving with it by the set screws which attach it to the beam, C. It will be observed that the shaft, A, is free to move vertically within certain limits, and that its vertical position is regulated by the beam, C, which is attached to the shaft by the sleeve above referred to. The short end of the beam is connected by a link to the frame. The long arm is notched so that the weight may be adjusted upon it to cause more or less downward pressure on the shaft. This beam is operated by means of a lever, D, the short arm of which is cogged and engages with the cogs of the bell crank shown, which latter is connected to the beam by means of clevises. By raising the lever, the long arm of the beam is depressed, and consequently also the drill shaft. In order to limit the motion of the beam and through it of the shaft, an adjustable stop, E, is provided which may be secured in any desired position. The table is likewise adjustable, and is placed as desired by means of the dog, F, which engages with a rack upon the standard.

The machine is strongly constructed and is in all particulars a very excellent and useful tool, especially adapted to the needs of the general machinist. For further particulars address the manufacturers, Messrs. Combs & Bawden, Freehold, N. J.

The Atmosphere of Mars.

Mr. R. S. Newall, F.R.S., at the observatory, Gateshead, England, states that on August 23, during the total eclipse of the moon, he observed that Mars is surrounded by a whitish envelope, the diameter being about twenty times that of the planet. He saw it again on September 7 and 19 distinctly. It has a well-defined edge, and is densest nearest to Mars. Small stars were seen through it.

A New Dyestuff.

Not long since a new dyestuff made its appearance in the German market, which consisted of a slightly crystalline powder of a light red color, similar to mercuric iodide. According to Professor A. W. Hofmann's experiments it is the soda salt of an organic acid, mixed with a not inconsiderable quantity of alumina. It dissolves quite abundantly in hot water, less so in hot alcohol, with a deep brownish-red color; the solutions, which dye a beautiful orange inclined to red, crystallize on cooling. The salt is insoluble in ether. The salt will endure quite a high temperature without decomposition. At a high heat it swells up almost like Pharaoh's serpents, and leaves behind almost exclusively a mass of carbon, which burns only with very great difficulty.

In order to obtain the acid the commercial product was dissolved in boiling alcohol and the solution treated with concentrated hydrochloric acid. From the deep violet-colored liquid there separated on cooling fine hair-like red needles, to which some of the mineral substance adhered most tenaciously. By frequently repeated crystallization from alcohol and acid the last trace of incombustible matter was at length removed.

The pure dye consists of beautiful reddish-brown needles, which are quite soluble in water, still more so in alcohol, but insoluble in ether. Free alkalies as well as ammonia dissolve it with a brown color. From the last named solution the dye is precipitated in a crystalline form upon the addition of an acid. In this case the liquid acquires a deep violet color. The composition of the dyestuff dried at 100° C. corresponds to the formula $C_{16}H_{12}N_2SO_4$, and that of the silver salt to $C_{16}H_{11}AgN_2SO_4$.

Such a substance could be obtained by the union of 1 molecule of naphtolsulfo acid with 1 molecule of diazobenzol:

$$C_{10}H_8SO_4 + C_2H_4N_2 = C_{16}H_{12}N_2SO_4.$$

In fact the new orange was obtained by the action of diazobenzol upon alphanaphtolsulfo acid. The last named acid was prepared by digesting naphtol with sulphuric acid upon the water bath. The lead salt was first prepared and the lead then removed with sulphydric acid, and the solution of the free acid concentrated and saturated with sodic carbonate. When the solution of this salt was mixed with a solution of aniline nitrate and potassium nitrite, a deep red precipitate was at once formed, of remarkable coloring power, but still impure. It was dissolved in ammonia, when a resinous mass remained undissolved. A purer substance was precipitated by acids; and after re-crystallizing several times from a boiling mixture of hydrochloric acid and alcohol, it was obtained in the same fine hair-like needles which were obtained from the commercial product.

Underground Telegraph Wires in England.

A considerable mileage of overground telegraph in the United Kingdom has been replaced by underground wires during the past year. At the time of the transfer of the telegraphs to the Post Office the total length of underground wire in existence was a trifle under 2,000 miles. On the 31st of March last it had been increased to a trifle over 8,000 miles, being more than four times as much in 1877 as in 1870. A considerable proportion of the increase in the mileage of buried telegraphs during the year has been in London alone. The aerial system was fraught with danger to life and property in the neighborhood of the wires. Under the new arrangement the telegraphic system generally will be less liable to interruption when the frosts and snows of winter set in.

A NEW FLOATING OIL BURNER.

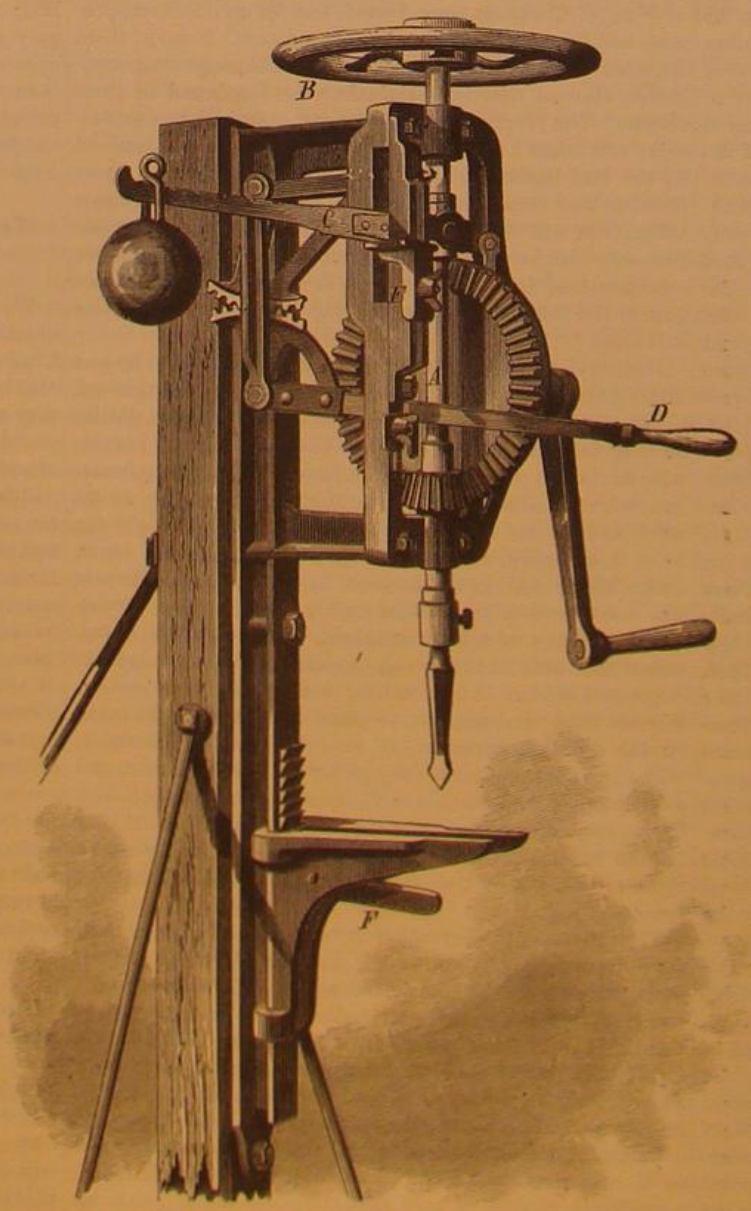
The annexed engraving represents a new floating oil burner for night or other lights in which a long wick may be used. It consists of a cup-shaped float, having a convex top. A tube passes through the float, extending both above and below it. The lower end of the said tube is loaded to

maintain it in a vertical position. A slot is cut in the side of the wick tube, near its upper end, to receive the edge of a serrated wheel, by which the wick is raised or lowered. A curved handle is attached to the top of the flat, for convenience in handling the burner. A ball is placed in the float which may be shifted so as to counterbalance the heavier side and cause the float to set evenly in the oil in which it is placed. The float is airtight and formed of thin sheet metal, and hence does not become oil-soaked.

This invention was patented through the Scientific American Patent Agency, September 18, 1877, by Mr. Oscar Tamagno, of New York city.

Mountain and Balloon Ascents.

In our number for August 9, we briefly noticed the ascent made by Mons. Wiener, of the mountain Illimani, one of the highest—if not the highest—of the Bolivian Andes, which forms a noble object from the city of La Paz, and was formerly reputed (by Mr. Pentland) to have an altitude of no less than 24,200 feet. Mr. Wiener, however, makes its height only 20,112 feet, while Mr. Minchin, as we have already observed, places its altitude at 21,224 feet. If the latter estimate be correct, Mons. Wiener has, we believe, not only made the highest ascent which has been made in the Andes, but has attained a greater altitude than has has been reached *on* the earth out of Asia, and in Asia has only been beaten by Mr. Johnson, who some years ago got to a height of 22,300 feet in Cashmere. As the recorded ascents to the height of 21,000 feet are extremely few, we shall be glad to hear further particulars respecting Mons. Wiener's exploit, and more especially whether he experienced much exhaustion through the rarefaction of the air. Practised mountaineers who have climbed to a height of 17,000 to 18,000 feet have been of opinion that even at such altitudes there is a very important and perceptible diminution of the bodily powers, and think it probable that the height of 25,000 or 26,000 feet will be found to be about the limit which will ever be reached on foot. As a set-off to this opinion we may mention the facts that hunters in the Himalayas frequently pursue their game at heights exceeding 20,000 feet without experiencing any notable inconvenience from the low barometric pressure; and that natives living on the base of Demavend, near Teheran, often ascend to its summit to gather sulphur from its crater without any great difficulty. The height of this mountain, there is reason to believe, also exceeds 20,000 feet, although it has never been accurately determined. If, therefore, severe work can be done with impunity at such elevations, it seems not unreasonable to suppose that much greater heights might be attained by men who had previously accustomed themselves to life at high altitudes. Aeronauts, anyhow, have



SELF-FEEDING DRILL.

proved that life can exist at 30,000 feet above the level of the sea, and that at 25,000 feet, and upwards, one may positively be comfortable if sufficiently warmly clad. That such is the case is sufficiently remarkable, for "travelers in the air" have to sustain incomparably more rapid variations of pressure and temperature than mountain climbers. Mr. Glaisher, on his memorable ascent on September 5, 1862, left the earth at 1 P.M., and in less than an hour shot up to a height of 30,000 feet. At starting the temperature of the air was 59°, and at its greatest altitude it was 61° lower! Mountaineers experience no such extreme variations as these. They rarely ascend more rapidly than 1,000 feet per hour, never so much as 15,000 feet in a day, and become to some extent acclimatized as they progress upwards. On the whole we are inclined to think that man will not rest until he has at least attempted to reach the loftiest summits on the earth, though we will venture to assert that it will be long before any one crushes down the snow on the summit of Mount Everest.—*Nature.*

Some Experiments with Diamonds.

It is not everyone who has an opportunity to conduct a series of experiments upon diamonds of various kinds, and we hope our readers will be interested in the results of Von Baumhauer.

Diamonds are not found exclusively in the form of more or less perfect, colorless or slightly colored, crystals. In washing diamondiferous sand there are frequently found rounded, and sometimes angular, masses, which are brilliant black on the surface, but when broken are dull and of a gray or violet color. These are known in the trade under the name of "carbonado," or "carbons."Under the magnifying glass they exhibit a great number of pores, and, if heated in water, give off a great many air bubbles. Although these carbons differ greatly from the real crystallized diamonds, yet E. H.Von Baumhauer found by examining a large number of carbons and diamonds, that there is an unbroken series of intermediate conditions between the carbon and diamond. It is remarkable that the carbon, which frequently accompanies the diamond in Brazil, has not been found in the diamond fields at the Cape.

Besides these two modifications of the diamond there is still a third, which is known to the dealers in stones as "bord." They consist of translucent, but not transparent, colorless or grayish spheroids, from which small octahedra can be split out, which are much harder than the well crystallized diamond, but are inferior to the "carbon" in this respect. Von Baumhauer determined the specific gravity of 17 different varieties, and his table of results shows that the highest specific gravity of 3·5225 to 3·5197 belongs to the purest diamond, that the "bord" comes next, being not much over 3·50, while the carbon has a considerably lower specific gravity, 3·3493 to 3·1552, probably because it is porous. The colorless diamond can be heated to a white heat in dry hydrogen gas, by excluding the air, without showing any change. Colored diamonds, on the contrary, change their color when ignited; a dirty green became pale yellow, a dark green turned to violet, the brown diamonds lost the greater part of their color, while the yellow remained unchanged. A colorless diamond acquired an intense rose color in consequence of being heated, and retained the color a long time in the dark, but soon lost it in the light.

If diamonds are heated by access of air, they become dull and opaque on the surface, they burn with loss of weight, but retain their transparency within. In oxygen the diamond comes to a lively glow, and burns with dazzling light long before the platinum crucible gets red hot. Small diamonds burn completely up after the lamp has been removed from under the crucible, while in larger ones the heat of combustion is not sufficient to support any farther combustion.

Although Von Baumhauer repeated these experiments several times, he never saw anything more than a quiet burning with dullness and cloudiness of the surface; a sight of blackening, conversion into coke, change of its state of aggregation, swelling up, fusion or softening, rounding of the corners or edges, was never vouchsafed to him.

By combustion of the diamond, it is perfectly established that the diamond is surrounded by a small flame whoseexterior color is a bluish violet. When heated in superheated steam the diamond does not change at all, even for 10 minutes. The temperature employed was, however, only a moderate one. Heated to whiteness in an atmosphere of dry carbonic acid, the diamond became dull on the surface and lost in weight; hence it must have decomposed the carbonic acid and united with its oxygen.

[It is very rare that an element is able to drive out another atom of its own kind from a compound and take its place. The atomic condition of carbon in the diamond seems to differ from that in its compounds from its greater condensation, but it has not hitherto been considered to be in a very active state. Is the diamond perhaps when highly heated a kind of ozone carbon?—TRANSLATOR.]

Deep Mining.

Connection has been made between the Gould and Curry mine on the 1,900 level and the joint winze on the Savage line. This gives a fine circulation of air at that depth, the draft being southward through the Curry and up through the joint winze. It is a very important connection, as it opens up in the Curry mine for cross-cutting and prospecting 460 feet of new ground. Before this connection was made the drift was fearfully hot, the heat at the face being 126° Fah.

The benefit derived from such a connection is not instantaneous; on the contrary, when the opening is first made the miners get out of the place as soon as possible, as the heat and smell are such as to be unendurable, and frequently produce asphyxiation. It is the same air that the men breathe before an opening is made, but when it is set in rapid motion it appears to acquire some new and noxious quality. But for this the miners might drill ahead a great number of feet when drifts are being run to make such connections. A drill hole so run, however, would so sicken the men that they would be unable to work. When a connection is made it is desirable, therefore, to knock out as large a hole as possible with the last blast, then let the men employed retire for some hours until the foul air shall have passed out of the drift and level.—*Virginia City (Nev.) Enterprise, October 9.*

THE RAMIE PLANT AND ITS UTILIZATION.

In our editorial columns will be found the particulars of the recent offer by the British Government of large rewards to the successful inventors of a machine capable of preparing the fiber of the ramie plant for textile uses. In the following article we propose to explain what the plant is, and to summarize what has hitherto been done towards its utilization.

Ramie is the Indian name for the plant producing the fiber called China grass. It belongs to the *urticaceæ*, or nettle family, and is nearly related to the true nettles. It is found either in a wild or cultivated state throughout the greater part of tropical and eastern Asia. In 1867 it was introduced into this country from Mexico, and its cultivation has since been carried on chiefly in Louisiana, with but partial success. The plant itself is perennial and somewhat shrubby, growing to a height of about four feet. Its character is well shown in the annexed engraving, Fig. 1. Numerous stems, each about as thick as a man's little finger, bear opposite pointed serrate leaves, each 6 inches long by 4 inches broad, on long hairy petioles. There are two principal types of the plant bearing the specific names *nivea* and *tenacissima*; both are utilizable, but the latter is much the better for industrial purposes. The first has leaves green on one side and silvery on the other, and yields a fiber which is greenish, stiff, and brittle. The other is the true ramie, or East Indian rhea, and it is for the utilization of this variety that the reward is offered. The useful portion is the fiber of the inner bark, which must be bleached and picked apart into threads. The Chinese have for centuries accomplished this by hand, skinning the stalk and cleaning off the outer bark with a knife. This is exceedingly slow, as one man can produce but from one to two pounds per day of marketable raw product, which should be in the form of clear ribbons of a light yellow color. This is ungummed and bleached, dressed, and combed smoothly, and becomes a strong and brilliant staple now used for the manufacture of "Japan silk," "Canton goods," "grass cloth," "Nankin linen," and similar goods.

Fig. 1.—THE RAMIE PLANT.

The nature of this fiber has been microscopically and otherwise investigated by Dr. Ozanam with the following results. Under a magnifying power of 80 diameters he finds: (1.) The fiber of ramie is, so to speak, of any length, as it has been traced throughout a length of nearly 10 inches on the field of the microscope, without any break being found in it, whether it be constituted of a continuous cellula, or whether the different cellulas which succeed each other have lost their points of separation by reason of a more intimate fusion, one with the other. Hence the ramie fiber possesses great strength. (2.) Taking the ramie fiber as a unit in comparison with other fibers, the following relative results were obtained:

	Thickness.	Traction.	Elasticity.	Twist.
Ramie....	1	1	1	1
Flax.....	1	1	1	1
Hemp	1	1	1	1
Cotton....	1	1	1	1
Silk.. ...	1	1	4	6

Thus the fiber of the ramie is longer and more uniform than all the others, except that of silk. It is stronger, offers greater resistance to traction and to torsion, and is more elastic than hemp or flax, and even than cotton, which is more flexible in twisting. Ramie in these respects only yields the palm to silk. To these advantages are to be added the sparkling whiteness and brilliant luster of the fiber, the easy cultivation of the plant, and its rapid reproduction and excessive multiplication. It yields three crops yearly and as many as 500 pounds of fiber to the acre. This last varies with the density of growth, a plantation with regular thick stands producing the above maximum. A mowing machine with thick short blades suffices to gather the plants, which are gathered in sheaves like wheat and are left in stacks. After a few days the leaves wither and fall under the handling and shaking they undergo while they are being carried to the machine. The plant should be cut from eight to fifteen days, according as the weather is dry or damp, before it is decorticated.

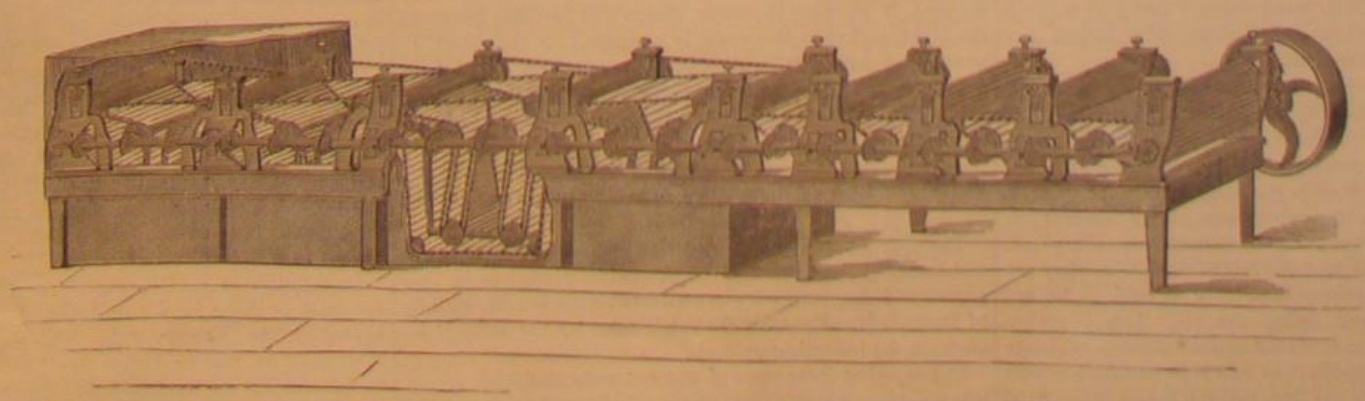


Fig. 2.—COLEMAN'S MACHINE FOR PREPARING RAMIE.

Persons familiar with the treatment of textiles know the impossibility of cleaning thoroughly any fiber, dried or green, by the continuous action of machinery. Either with drums or beaters the cleaning instruments cannot turn out the filaments without a certain amount of chaff and other refuse entangled in the fiber. All ex

periments on this point have failed and proved the insuperable difficulty of expelling, by continuity of friction, all the particles of pith that have penetrated into the fiber. It is only through a scraping process, acting in a backward and forward direction, that a perfect cleaning can be obtained.

In a pamphlet entitled "The Culture and Manufacture of Ramie and Jute," Mr. Emile Lefranc, who has extensively studied into this subject, states that the true principle to be adhered to in a ramie-cleaning machine is as follows: "Revolving cleaners, provided with a peculiar sort of knives, receive gradually, by means of a circular carrier, bunches of stems, which are doubled down and hooked in the middle. The carrier withdraws them from the rotary action of the cleaners and delivers them in the form of clear yellow ribbons." The yield of the machine will be in proportion to its size and power. The cleaning is incessant if the machine

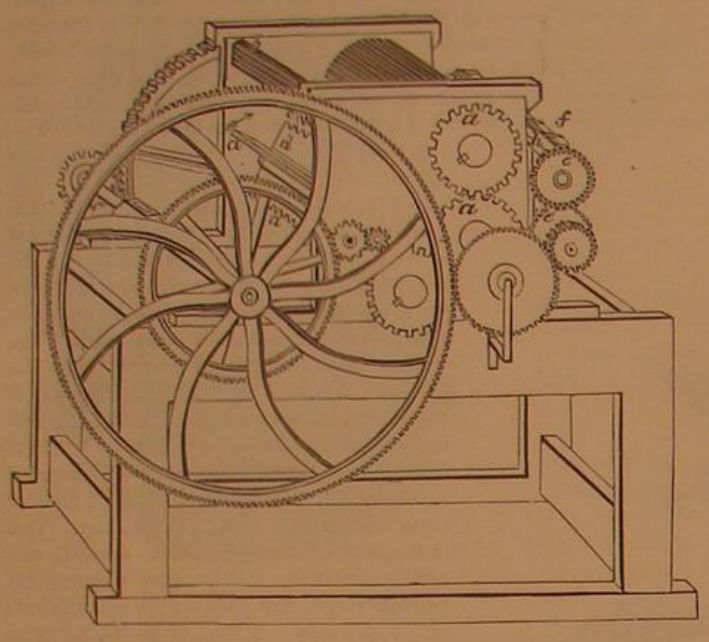


Fig. 3.—LEFRANC AND NAGOUA'S MACHINE.

is fed constantly by a quick handling. This principle, the same authority goes on to explain, offers the facility of such an expansion that the apparatus can be made large enough to clean one ton of fiber per day with a twenty horse motive power. It is not only to ramie, but also to jute, flax, hemp, and all strong textiles, in green plants, that this new machine can be successfully applied. It is demonstrated by theory and practice that the textiles extracted in a green state retain all the natural qualities of strength and color, which lose always 50 per cent by the ordinary process of rotting in stalks. The avoiding of that loss is one of the great advantages of the machine, besides the economy in labor. Now comes the disintegration of the decorticated fiber.

The yellowish ribbons produced from the plant engaged in the machine are the crude fibers. Albumen keeps them undivided, but being dried in the shade they acquire in that state a marketable value, which will double and triple by subjecting the filament to the bleaching treatment. The best method is that of Berthollet, which has been the most extensively used. It consists in first steeping the fibers or vegetable tissues in boiling water, and then in rinsing them in a copious supply of water in order to disengage them from soluble matter. When the water has entirely dropped off they are plunged into a bath of alkaline lye, which is raised to the boiling point; they are then immersed in a solution of hypochlorite of lime or an alkaline hypochlorite. The tissues are washed in a copious supply of water, and then immersed in water acidulated by sulphuric acid; washed with soap and water; then rinsed in water and dried. Now, much labor is spared by bringing the chlorite into immediate contact with the fibers washed in hot water and still damp, or by plunging them into a bath saturated with chlorate.

Some machines for preparing ramie have already been patented in this country. Fig. 2 represents the invention of Mr. C. C. Coleman, of Honolulu, Sandwich Islands, which the inventor claims will clean the fiber at a cost of $20 to $30 per ton.

The plant, freshly cut at its full ripe stage, is passed through a series of rollers, being carried along by moving wire screens. It dips into tanks filled with steam, hot water, and bleaching chemicals.

The rollers crush the plant and squeeze out the glutinous matter, which is absorbed by the water and steam. The mass is passed through the machine as often as may be necessary to dissolve and remove all the extraneous gum and other elements and to bleach the fiber itself. After each submersion it is passed through rollers, which squeeze out the water with the matter it has absorbed from the plant. It is not even necessary to remove the leaves, as they are separated by the machinery. The fiber is said to be not broken or even weakened by the process. This is an immense reduction of labor from the manual process of India and China, where a workman does well if he secures a pound and a half of clean fiber per day, making it cost about $150 per ton.

In Figs. 3 and 4 we illustrate an improved machine for treating ramie and other textile plants, devised by Messrs. Emile Lefranc and Joseph Nagoua, of New Orleans, La., and patented August 23, 1870, which embodies the construction advocated, as already stated by Mr. Lefranc.

Fig. 3 is a perspective longitudinal, and Fig. 4 an end, view of the machine. *a a'* and *b b'* are crushing and feeding rollers, having their peripheries grooved correspondingly, as shown. *c* is a toothed support for the plant while moving into the rollers, *a a'*, and *d*, revolving beaters. *e e'* are cylinders, furnished with a series of knives, *f*, which said knives may be either spiral, curved, or elliptical in form, cushioned by a rubber or other elastic surface, *h*, adapted, as shown, to the periphery of the cylinders, *e e'*. The motive power is applied to the axis, *g*.

The operation is as follows: The ramie, or other plant, is first fed between the rollers, *b b'*, from whence it passes between the rollers, *a a'*, and thence between the knives, *f*, of the cylinders, *e e'*. The speed of the surface of the rollers, *a a'*, is a little slower than that of the rollers, *b b'*, better to avoid the tension of the plant, which might break the fibers; but the speed of the cylinders, *e e'*, is much higher than that of the rollers, *a a'*, in order that, when the plant is crushed, the knives, *f*, should strip off the bark and the pith of the stalk, leaving only the fibers in a ribbon-like state; while rollers, *a a'*, revolving comparatively slow, hold firmly the same, and deliver between the knives, *f*, as gradually as the necessity may show.

It is obvious that there would be left uncleaned one end of the plant, equal in length to the distance between the centers of the rollers, *a a'*, and cylinders, *e e'*, because, as soon as the rear end of the plant is past the crushers, *a a'*, the cylinders, *e e'*, instead of stripping the plant, would simply roll it out. To avoid this, revolving toothed beaters, *d*, and a toothed support, *c*, are employed.

The plant is crushed first, by the rollers, *b b'*, and, secondly, by the rollers, *a a'*, and while the forward part of the plant reaches the latter, the rear end of the plant, when past the former, falls on and between the arms of the beaters, *d*, which, revolving at a high velocity in the direction of the arrow shown in the drawing, bend and divide the plant over the toothed support, *c*, and, jointly with it, strips the bark and the pith off the end of the plant before it reaches the crushers, *a a'*, so that the plant, after passing through the machine, is cleaned from end to end, the fiber alone being left.

Fig. 5 represents a machine for the same purpose patented May 2, 1871, by M. Adolph Bouchard, of New Orleans, La. The plant is placed upon the table, F, and introduced by the lower end of the stalk through the rollers,

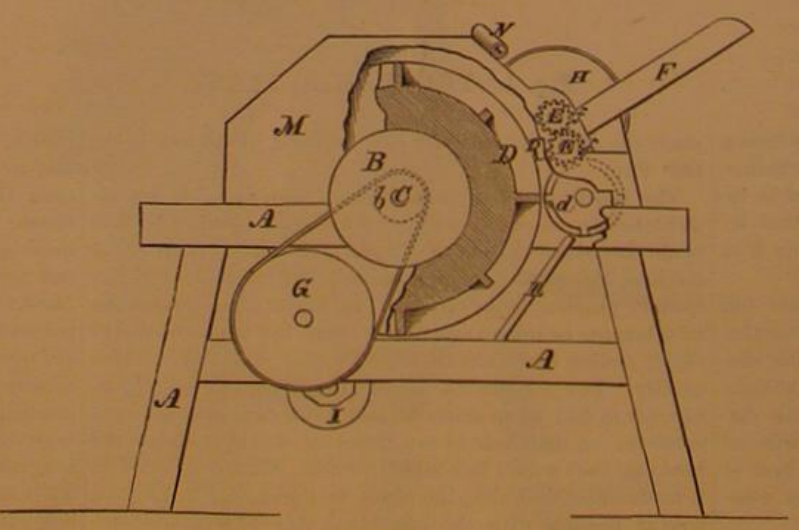


Fig. 5.—BOUCHARD'S MACHINE.

E E, and then the machine is set in motion, the supply being maintained. The small drum, *d d*, does the decortication, the pipe, N, supplies the water, which will partially macerate the plant, and then the mass is projected by the lever, P, toward the drum, D, which, in its revolutions, will totally disintegrate it and pass it through the rollers placed below, fibrated, filamented, and deprived of all its gummy and glutinous substance.

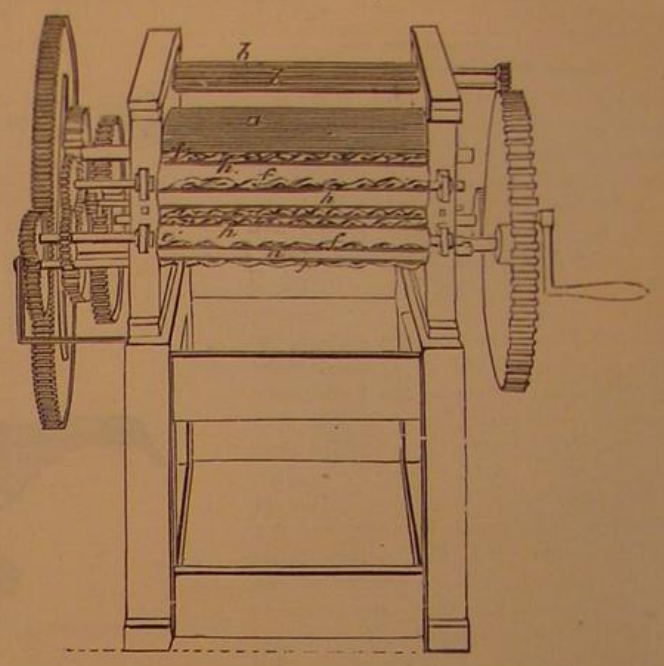


Fig. 4.—LEFRANC AND NAGOUA'S MACHINE.

Prize Method of Preparing Plaster Casts that can be Washed.

The prize offered by the Prussian Minister of Commerce and Industry for a method of preparing plaster casts that permit of being washed was conferred upon Dr. W. Reissig of Darmstadt. From Dr. Reissig's essay on the subject we abstract the following points:

In preparing these casts it was not only desirable to obtain a surface which should not wash away, but also to include a simple process for preventing dust entering the pores and render them more easily cleansed. Laborious experiments convinced this gentleman that the only practical method of accomplishing this and retaining the sharpness of outline was to convert the sulphate of lime into

1. Sulphate of baryta and caustic or carbonate of lime, or

2 Into silicate of lime by means of silicate of potash.

Objects treated in this way are not affected by hot water or hot soap solutions, but, from the method of preparation, they remain porous, catch dust, etc., and when first put into water eagerly absorb all the impurities. To avoid this evil, he subsequently coats the articles, now rendered water proof, with an alcoholic soap solution, which penetrates more easily, deeper, and more freely into the pores than an aqueous solution. After the alcohol evaporates a layer of soap remains which fills the pores, and when washed it is converted into a suds which easily removes the dust without allowing it to penetrate.

1. Process with baryta water. This is the simplest, easiest, and cheapest method. It depends upon the fact that gypsum, or sulphate of lime, is converted by baryta water into sulphate of baryta (which is totally insoluble), and caustic lime which is converted by contact with the air into carbonate of lime. The practical method of carrying this out is as follows: A large zinc vessel is required with a tight-fitting cover. In each vessel is a grating made of strips of zinc, resting on feet 1¼ inch high. This vessel is two thirds filled with soft water at 54° to 77° Fah., and to every 25 gallons of water is added 8 lbs. of fused or 14 lbs. of crystallized, pure hydrated oxide of barium, also 0·6 lbs. of lime previously slaked in water. The solution stands about 4° Beck. As soon as the baryta water gets clear it is ready to receive the casts. They are wrapped in suitable places with cords, and after removing the scum from the baryta bath are dipped in as rapidly as possible, face first, and then allowed to rest upon the grating.

Hollow casts are first saturated by rapid motions, then filled with the solution and suspended in the bath with the open part upwards. After the cords are all secured above the surface of the liquid, the zinc vessel is covered. The casts are left in it from 1 to 10 or more days according to the thickness of the waterproof strata required. After taking off the cover and removing the scum, the plaster casts are drawn up by the strings, rinsed off with lime water, allowed to drain, carefully wiped with white cotton or linen rags, and left to dry, without being touched by the hands, in a warm place free from dust. The same solution which has been used once can be used again by adding a little more barta and lime.

Of course this process can only be applied to casts free from dust, smoke, dirt, colored particles of water, rosin and varnish, soap, animal glue from the moulds, or sweat from the hands. To prevent the casts getting dust upon them, they should be wrapped in paper when taken from the mould and dried by artificial heat below 212° Fah. If in spite of every precaution the casts when finished show single yellow spots, they can be removed in this manner: The perfectly dry, barytated casts saturated with carbonic acid are painted over with water and oil of turpentine, then put in a glass case and exposed to the direct rays of the sun. All spots of an organic nature will then disappear; but, of course, rust, smoke and mineral spots cannot be removed in this way.

In the place of cold baryta water the casts may be placed for half an hour in a concentrated solution of baryta heated to 104° to 122° Fah. This has the advantage that casts may be put in before drying. As the casts treated in this way are not hardened very deeply and are still porous, it is well to place them subsequently in a cold bath for a longer time.

The casts are now ready, as soon as perfectly dry, for the soap solution. For cheapness he selects a pure, good, hard soap, shaves it up, dries it and dissolves it in 50 or 60 per cent alcohol; 10 or 12 parts of alcohol to one of soap. Such a solution of Marseilles soap, known as "spiritus saponatus," can be had at any drug store. The finest appearance, as well as a high degree of durability, is obtained by the use of a solution of stearate of soda in strong alcohol. Both the solution and cast should be warm so that it may penetrate as perfectly and deeply as possible. It is no harm to repeat the operation several times, as long as the liquid is absorbed by the cast. When dry the cast is finished.

2. Process with silicate of potash solution. This process depends upon the conversion of the sulphate of lime into silicate of lime, an extremely hard, durable, insoluble compound, and is accomplished by the use of a dilute solution of silicate of potash containing free potash. To prepare this solution he first makes a 10 per cent solution of caustic potash in water, heats to boiling in a suitable vessel, and then adds pure silicic acid (free from iron) as long as it continues to dissolve. On standing, the cold solution usually throws down some highly silicated potash and alumina. It is left in well stoppered glass vessels to settle. Just before using it is well to throw in a few bits of pure potash or to add 1 or 2 per cent of the potash solution. If the plaster articles are very bulky, this solution can be diluted to one half with pure water.

The casts are silicated by dipping them (cold) for a few minutes into the solution, or applying the solution by means of a well cleaned sponge, or throwing it upon them as a fine spray. When the chemical reaction, which takes place almost instantly, is finished, the excess of the solution is best removed with some warm soap water or a warm solution of stearin soap, and this finally removed with still warmer, pure water.

The casts which can be immersed or easily moved around may be treated as above when warm; a very short time is required, but some experience is necessary. In every case it is easy to tell when the change is effected from the smooth dense appearance and by its feeling when scratched with the finger nail. It is not advisable to leave them too long in the potash solution, as it may injure them. A little practice renders it easy to hit the right point. The fresher and purer the gypsum and the more porous the cast, the more necessary it is to work fast. Castings made with old and poor plaster of Paris are useless for silicating. These silicated casts are treated with soap as above.

In washing plaster casts prepared by either method, the author recommends the use of a clean soft sponge, carefully freed from all adherent sand and limestone, wet with lukewarm water and well soaped. They are afterwards washed with clean water. They cannot, of course, be washed until thoroughly dry and saturated with carbonic acid. The addition of some oil of turpentine to the soap is useful, as it bleaches the casts on standing. The use of hot or boiling soapsuds must be avoided.—*Industrie Blatter.*

ASTRONOMICAL NOTES.

OBSERVATORY OF VASSAR COLLEGE.

Position of Planets for November, 1877.

Mercury.

Mercury may possibly be seen early in November, as it rises on the 1st at 5h. 57m. A.M., at a point several degrees north of that at which the sun rises. It cannot be seen after the first few days. On November 30 it rises at 8h. 6m. A.M., and sets at 4h. 52m. P.M.

Venus.

On November 1 Venus rises at 10h. 27m. A.M., and sets at 7h. 3m. P.M. On the 30th, Venus rises at 10h. 46m. A.M., and sets at 7h. 42m. P.M. It keeps nearly the same diurnal path through the month, increasing some in brilliancy.

Mars.

Although Mars is farther and farther from us, it will be very brilliant through the November evenings, as it has higher declination and comes to the meridian between 7 and 8 P.M.

On November 1 Mars rises at 2h. 47m. P.M., and sets at 1h. 44m. the next day. On the 30th, Mars rises at 1h. 13m. P.M., and sets at 12h. 54m. the next morning. Mars is moving rapidly toward the east, among the stars, and Saturn's apparent motion is toward the west; they are therefore approaching rapidly. According to the *Nautical Almanac* they will be in conjunction November 3 at midnight, Mars being the higher in altitude.

Jupiter.

Jupiter can be seen in the southwest. It rises on November 1 at 10h. 51m., and sets at 7h. 49m. P.M. On November 30, Jupiter rises at 9h. 22m. A.M., and sets at 6h. 21m. P.M.

Saturn.

On November 1 Saturn rises at 2h. 48m. P.M., and sets at 1h. 48m. of the next morning. On November 30, Saturn rises at 0h. 54m. P.M., and sets at 11h. 54m. P.M.

Saturn and Mars will be very nearly together on November 3, at midnight; they will diverge rapidly, as Mars rises higher in the sky and passes to the east of Saturn. Saturn is the most interesting planet at the present time; the ring which surrounds it seems exceedingly narrow, as the sunlight strikes almost in its plane. Through a good telescope the ring seems almost like a belt, running across the ball of Saturn and extending beyond the sphere on each side.

Saturn has eight satellites. A large telescope will show many of them lying around the planet, some at the distance of several times its diameter, and some skirting along the edge of the ring. On October 13 one of these moons was seen to pass across another, so that the two were seen as one for a few minutes. Saturn is so far off that few of these satellites can be seen with an ordinary glass; but Titan, the largest, can be found with a telescope whose object glass is two or three inches.

Uranus.

On November 1 Uranus rises at 0h. 36m. A.M., and sets at 2h. 8m. P.M. On November 30, Uranus rises at 10h. 41m. P.M., and sets at 11m. after noon of the next day. It has passed to the east of Regulus and a little below it in altitude.

Solubility of Sulphur in Acetic Acid.

Liebermann ("Wien. Anz.") finds that sulphur is soluble to no inconsiderable degree in warm concentrated acetic acid, and that a trace is taken up even by the dilute acid. If the concentrated solution be diluted with water, much of the sulphur separates as milk of sulphur; if it be evaporated with the Sprengel pump, fine long prisms of sulphur separate; when cooled, moreover, the liquid deposits sulphur in a crystalline form. All modifications of the element appear to be taken up by acetic acid. The author refers to analytical methods where these changes occur, and are apt to mislead the operator.

Inventions Patented in England by Americans.

From September 18 to October 5, inclusive.

COMPRESSED AIR.—T. F. Rowland, Brooklyn, N. Y.
ERASERS.—A. S. Mills, Brooklyn, N. Y.
FIRE ARMS.—E. Remington & Sons, Ilion, N. Y.
LOCKS.—M. A. Dalton, Cincinnati, O.
LOOM.—B. J. Stowe, New York city.
MATCHES.—E. B. Beecher, Westville, Conn.
PAPER CUTTING, ETC.—G. L. Jaeger, New York city.
PAPER FASTENERS.—P. H. Sweet, Washington, D. C.
PESSARIES.—W. H. W. Campbell, Norwich, Conn.
POSTAGE STAMPS, ETC.—J. Sangster *et al.*, Buffalo, N. Y.
PRINTING PRESSES.—T. S. Bowman, St. Louis, Mo.
PULP MACHINE.—A. H. Elliott, New York city.
RAILWAY CROSSINGS, ETC.—J. S. Williams (of Riverton, N. J.), London, England.
TREATING BLOOD.—W. L. Palmer, New York city.
WATER CLOSETS, ETC.—J. E. Folk, Brooklyn, N. Y.
WINDOW SHUTTERS, ETC.—A. Bijar, New York city.
WOOD SCREWS.—A. L. R. Monson, New York city.

Recent American and Foreign Patents.

Notice to Patentees.

Inventors who are desirous of disposing of their patents would find it greatly to their advantage to have them illustrated in the SCIENTIFIC AMERICAN. We are prepared to get up first-class WOOD ENGRAVINGS of inventions of merit, and publish them in the SCIENTIFIC AMERICAN on very reasonable terms.

We shall be pleased to make estimates as to cost of engravings on receipt of photographs, sketches, or copies of patents. After publication, the cuts become the property of the person ordering them, and will be found of value for circulars and for publication in other papers.

NEW MISCELLANEOUS INVENTIONS.

IMPROVED COMPOSITION FOR PAVING BLOCKS.

James S. Wetnered, New York city.—This invention relates to a compound for paving blocks and other purposes, and it consists in a composition formed by mixing pulverized slag with asphaltum and heavy petroleum or other non-drying oils. The inventor says: In carrying out my invention I take 17 parts of asphaltum (Trinidad preferred) and subject it to a slow heat until it becomes liquid. I then add 3 parts of heavy petroleum or other fixed oil, and thoroughly mix them together, and while this mixture is still hot I add 80 parts of broken, granulated, or pulverized iron or other slag, or its equivalent, which has been previously heated. I then, by aid of suitable machinery, thoroughly incorporate the ingredients while in the heated state, and form the composition into blocks, which I subject to heavy pressure in molds. I do not confine myself to the exact proportions herein stated, as the proportion of oil may be varied to suit the quality of the asphaltum, the oil being one of the most essential ingredients, as it renders the block elastic and durable.

IMPROVED SAP SPOUT.

Francis E. Lord, Readsborough, Vt.—This invention relates to a sap spout for maple and other trees, by which the sap is taken up in superior manner, and the bucket suspended therefrom without the use of nails or other iron material, which is injurious to the tree. The invention consists of a centrally perforated spout, whose end that is driven into the tree is made longer and provided with a rim, and annularly recessed and perforated or mortised to take up the sap. The outside of the spout is provided with side recesses for attaching a hanger or hook, from which the pail or other vessel is suspended. The connection of the spout and hanger or hook dispenses with the iron spouts and nails, which are so injurious to the trees.

IMPROVED METHOD OF PURIFYING RAW ANIMAL FAT.

Isaac Mayer, New York city.—The object of this invention is to furnish a superior machine tallow, by a quick, cheap, and convenient process, from raw animal fat without the use of special machinery; and it consists of treating the raw fat with diluted nitric acid, then boiling the fat, and finally separating the tallow from the heavier fibers by cooling. The raw animal fat is first cut up in small slices or blocks of about one inch in size, and then treated in a wooden vessel with diluted nitric acid of about 2° Baumé. The acid has to cover entirely the fat, and is allowed to remain in the vessel for from thirty to forty-eight hours or more, the liquid being then poured off, and the so-prepared fat exposed to boiling in an iron vessel for from fifteen to thirty minutes, the fat being stirred up from time to time to prevent the burning of the fibrous and tendonous parts. The fat is then removed and allowed to cool under addition of water, the fibrous parts settling on the bottom of the cooling vessel, while the tallow is obtained at the top, and readily drawn off or removed. The fibrous sediments form a valuable food for pigs, while the tallow is of clear and superior nature, and obtained in a cheap and convenient manner, without the use of expensive presses, etc., and without producing any obnoxious odors.

IMPROVED MEAT BLOCK.

Newton Wells, Painsville, O.—This invention consists of a meat block having a roughened plate detachably applied thereto, so that it can be used for tendering meat, and by removing said plate the block is left with a plain or flat surface, upon which meat may be cut or dressed. The block is provided with a cover to protect it from flies and dirt. The block is designed for use in families for chopping, pounding, or tendering meat. It is also provided with an attachment consisting of a plate of iron of suitable thickness, the upper surface of which is roughened or provided with pyramidal projections, and upon the lower side of which lugs are formed that project over the edge of the block for retaining the plate in position. Meat may be tendered upon this plate by means of an ordinary plain mallet. The block is so small that it is easily moved from place to place, and may be washed without difficulty.

IMPROVED TRANSFERABLE BARREL COVER.

Sylvester W. Sheldon and Daniel Dunscomb, New York city.—This invention consists in the combination of an adjustable fastening device with a barrel cover that is made in two parts and hinged together. The cover is attached to a barrel by placing it upon a barrel with brackets or fasteners outside and the block inside of the rim of the barrel, and forcing the block outward by turning the thumb screw until the edge of the barrel is firmly clamped between the brackets and the block.

IMPROVED COFFEE ROASTER.

John H. Bankston, Pulaski, Tenn., assignor to himself and T. J. Wells, of same place.—This invention relates to an improved device for roasting coffee, baking bread, meat, cakes, and other articles in perfect manner by the radiated heat of an open fireplace, so as to utilize the heat in convenient and economical manner; and the invention consists of a conical reflector with fixed cap or apex, being supported in suitable manner, with the open base or mouth toward the fire, and provided with flanges and supports for the baking pans, roasting cylinder, etc. The device is used by placing either the roasting cylinder or baking pan in position in the reflector, and then placing the reflector before the fire. The roasting cylinder is then slowly turned by the crank or handle of the cylinder shaft, the roasting being accomplished by the heat of the radiated and reflected rays of the open fire. The bread, cakes, meat, etc., are baked in the same manner by placing the mouth of the reflector at proper distance from the fire, the same being readily moved by a top handle.

IMPROVED METHOD OF SETTING ARTIFICIAL GEMS.

Henry Pic and Maurice Nelson, Paris, France, assignors to Veit & Nelson, New York city.—The object of this invention is to substitute for the soldering and gluing or cementing on of glass, enamel, or other imitation stones on their metallic mountings, an improved method of setting the stones in articles of jewelry for mourning or fancy purposes, by which the breaking off of the stones from the metallic parts is prevented, and a more durable and neater style of such articles obtained. The invention is intended to overcome the objections to the methods heretofore employed, and consists of glass and enamel melted on stems, which are riveted, screwed, soldered, or otherwise affixed to the perforated metallic mountings. The stones are thereby firmly connected to the metal parts without any danger of breaking off and marring the appearance and effect of such articles. A substantial and durable class of ornamental jewelry is thus furnished, which gives thereby greater satisfaction, and may be used for a large number of different applications.

IMPROVED MAINSPRING ATTACHMENT FOR WATCH BARRELS.

Edwin H. Flint, Cincinnati, O.—The winding of the watch is effected by turning the arbor, which carries the outer end of the spring around, and coils the inner end of the spring around the boss of the barrel wheel. The advantages claimed for this improved watch are that it is perfectly dust proof, it does away with the usual retaining mechanism, and obviates injury to the watch in case the spring breaks.

IMPROVED LAMP BRACKET.

Thomas J. Jury, Spencer, Ind.—This invention has for its object the combination, with a sectional jointed bracket and clamp, of a rotary spool stand and a lamp holder. The bracket is composed of sections jointed together, so that they will articulate freely, and can be extended or contracted at will. A clamp is applied for the purpose of fastening the bracket to the edge of a table. The spool stand is free to rotate on a post that is secured to the section, and into the upper side of which stands are fixed a number of pins, intended to receive spools of thread and allow the spools to rotate freely while the thread is being unwound from them. The lamp is held in its place on a shelf by means of fixed lugs and a movable lug, which latter is confined by means of a clamp screw, and allows the lamp to be removed from the shelf.

IMPROVED FAUCET.

William S. Lempert, Fort Davis, Tex.—The object of this invention is to furnish an improved faucet, which shall be so constructed that it will not be liable to be injured by being screwed into and out of the cask, which will not be liable to leak, which will have the button of the valve stem protected from accidental injury, and shall be simple in construction and easily operated. The invention consists in the combination of the inner part provided with the square or octagonal flange, the outer part provided with the valve seat, the spring chamber, the channel, and the nozzle, the cup or flange, the valve, valve stem, and button, and the spiral spring. This faucet can never be left open by carelessness, accident, or manipulations of children, as the moment the pressure is taken from the button it closes itself securely.

IMPROVED SMOKE-EXCLUDING MASK.

George Neally, New York city, assignor to himself and Charles W. Bloomingdale, of same place.—A great many persons perish by being suffocated by the smoke and gases in attempting to escape from burning buildings, while also a large quantity of valuable property is destroyed by the inability of the firemen to determine the location of a fire on account of the smoke, so that it gains such headway that it is impossible to check it before a great deal of damage has been occasioned by throwing the water in localities where the fire does not really exist. The invention consists of a novel combined mask and cap, of suitable elastic material, that fits tightly to the head, and whose mouth and nose are connected, by a mouthpiece and one or more tubes with suitable filters containing moistening sponges, which filters are again connected, by one or more tubes, with an elastic water receptacle strapped around the neck or body, so as to resupply from time to time the filters with the required degree of moisture by a slight pressure on the receptacle.

IMPROVED WRENCH.

Jacob Eiseman, Galena, Ill.—This invention relates to an improvement on monkey wrenches, and the nature of the invention consists in the combination of a detachable serrated jaw with the fixed jaw of a monkey wrench, whereby the common nut wrench can be made to serve as a pipe wrench. The movable jaw is confined in its place on the wrench by a hook that passes over the nose of the jaw and the pin that passes through the ends of the jaw back of the shank. This affords a very strong attachment, and enables a common monkey wrench to be converted into a pipe wrench.

IMPROVED ADDING MACHINE.

William L. Hofer, Deposit, N. Y.—This invention has reference to an adding and subtracting machine, by which these arithmetical operations may be accomplished in quick and accurate manner by mechanical means; and the invention consists of a revolving wheel or disk, provided with the figures from 1 to 99, and with a corresponding number of holes or notches, that are engaged by a centrally pivoted spring arm and pin for working the disk. A raised circular rib, at the under side of the revolving disk, engages, by the end points of the rib, which are a small distance apart, a sliding and toothed bar, so that the slide moves at every revolution of the disk, and indicates the hundreds and thousands on the face plate of the machine, while the tens and units are read off in a side recess of the face plate.

IMPROVEMENT FOR DRYING FERTILIZERS, ETC.

Asa P. Meylert, Brooklyn, N. Y.—This apparatus consists of a large drying chamber, having a series of sectional spaces at both sides, which are divided by partition walls, having communicating openings at alternately opposite sides of the main chamber. A series of cars are made to pass on a tramway through the drying chamber. These are constructed with inclosed vertical partitions and closed ends, having horizontal platforms or trays intervening between the partitions, which platforms communicate with the sectional side spaces, and the linear space between the vertical inclosed partitions occupied by the series of platforms is similar to the length of a side section in the drying chamber. The platforms or trays within the cars are placed in successive series, one platform being put above another in a series, with an intervening space between each two platforms in a series. Each of these platform spaces is open on both sides, to let the heated air pass through below and above the material to be dried, thus providing a free transit for the air from one side section of the apparatus to another opposite.

IMPROVED HEDGE-FENCE LAYER.

Ferdinando Poole and Wilson A. Pendergraft, Augusta, Kan.—The object of this invention is to furnish an improved machine for bending down and pressing together the Osage orange and other hedge plants, and holding them until tied, so that the hedge may be narrow and the upright shoots close together, making a close hedge. As the cent and compressed hedge plants come out at the rear end of the machine they are bound by a wire or tarred cord carried upon spools pivoted to the rear end of the frame work of the machine. The wire or cord is passed around the plants with a needle, through the eye of which it passed, and is then tied and cut off, the said wire or cord being never withdrawn from the said eye, but being slipped through the eye as each knot is tied. In this case the wire or cord is continuous, is secured to a plant or stake at the place of beginning, and is fastened with a half hitch each time it is passed around the plants. The hedge plants may be laid the first time close to the ground, and afterward laid one or more times at a higher level, so as to form a thick, close hedge with comparatively few plants.

IMPROVED GATE.

Aaron Hyre, Churubusco, Ind.—The object of this invention is to furnish an improved gate, which shall be so constructed that it may be readily opened and closed by a person in a vehicle or upon horseback, and which shall be simple in construction, convenient in use easily operated, and not liable to get out of order. The gate slides open and shut upon a bar attached to the upper parts of the post, and which passes between the adjacent edges of two horizontal bars of the said gate and between the cross-bars attached to said horizontal bars. A series of levers are so arranged and placed in connection and pivoted to the upper ends of two posts, placed upon the opposite sides of the rear part of the gate, and at such a distance from it that a person sitting in a vehicle can reach and operate the levers, the forward ends of which project toward the roadway, to open and close the gate before the horses have come in contact with the gate, and after his vehicle has passed through the gateway.

NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.

IMPROVED WAGON BRAKE.

Christopher Heinen, Leavenworth, Kan.—The object of this invention is to furnish an improved brake for wagons, which shall be simple in construction, conveniently applied, and reliable in operation. To the end parts of the brake bar are secured the castings, upon the forward side of which are formed slightly wedge-shaped grooves to receive the wooden rub blocks, which are thus forced more firmly to their seats by the friction of the wheels. To the brake bar are attached the rear ends of two rods, which pass forward through the spaces between the rear axle and its bolster, and their forward ends are pivoted to the upper ends of short arms formed upon or rigidly attached to a shaft which works in bearings attached to the rear axle, and to one of its ends is rigidly attached, or upon it is formed, a longer arm, which projects upward at the side of the wagon box or body, and to its upper end is pivoted the rear end of a rod that extends forward along the side of the wagon box or body, and to its forward end is pivoted the lever, by means of which the force of the brake is applied to the wheels.

IMPROVED THILL COUPLING.

Frederick C. Potter, Poughkeepsie, N. Y.—The object of this invention is to furnish an improved thill coupling which shall be simple in construction, safe and noiseless in use, and easily coupled and uncoupled. To disconnect the thill irons from the clips the thills are raised to a vertical position, in order that the lugs may be drawn out of the notches in lugs. The function of a rubber block is to prevent rattling of the thill iron in the socket when the parts are in working position, the projecting end of the thill iron being then in contact with a leather plate. A cam projection comes in contact with the leather plate when the thills are thrown up into vertical position, and the friction serves to hold them in such position out of the way.

IMPROVED SHUTTER BOWER AND FASTENER.

Thomas B. Rogers, Jr., Brooklyn, N. Y., assignor to himself and Peter Cooper, New York city.—The object of this invention is to provide a convenient and reliable shutter fastener and adjuster. The shutter is adjusted by loosening a thumb screw, releasing a catch, and swinging the shutter open to the desired point, and clamping it by means of a screw. The engagement of the convex portion of the screw with the concavities of the bar insures the fastening of the shutter in any desired position. When the shutters are wide open the bar is engaged by a catch, which is pivoted between ears that project from a plate attached to the shutter. This catch is provided with a shoulder, which prevents it from dropping below a horizontal line drawn through its pivot, and the same shoulder projects sufficiently to touch the bar when the shutter is open, and throw the catch over in case the catch should remain in a vertical position when disengaged from the bar. A plate is attached to the window stool to receive the end of the screw when the shutters are closed.

IMPROVED COMBINED AWNING AND SHUTTER.

William A. Hoyt, Paris, Tex.—This invention relates to an improvement in the class of awnings which are hinged to a building front and supported at their outer ends upon pivoted posts, the awnings being thus adapted to fold against the side of the building to protect the same in case of fire. The improvement consists in the construction of the posts for supporting the awning and the means for attaching them to the awning and securing them to the pavement. The hooks are affixed to the outer sides of the posts, and the upper ends of the latter are cut off at an obtuse angle, to adapt them to fit against the under side of the awning, and thus support the same in the inclined position required. By this construction, when the posts have been attached to the awning and brought into vertical position, they are secured rigidly in place by pushing down sliding bolts. In case of fire in front of the building or upon the opposite side of the street, the two outer posts are first removed. The bolt is then drawn in the central one, and the awning is allowed to drop. By means of this improvement the glass and wooden portions of the front are covered, so that the fire cannot affect them. This device may be used instead of ordinary shutters, as it renders the front burglar-proof, and as an awning it is more durable and serviceable than those of canvas or wood.

IMPROVED CARRIAGE.

Warren H. Hancock, Augusta, Ga.—This is an improved carriage for agriculturists' implements, such as stalk cutters and the like. To the frame of the carriage are fitted the axles and the wheels. With one wheel is connected a friction drum of conical form, and provided with a clutch that engages with teeth on the wheel. A conical drum on the crank shaft is arranged with its larger portion opposite the smaller portion of the friction drum. An intermediate wheel is placed on a rod that is supported by a vertically sliding frame, whose lower end passes through a mortise in the platform, and is connected with a lever and a ratchet bar, projecting through the platform. A spring bolt engages with ratchet, and has a disengaging lever that projects through platform. The intermediate wheel is grooved and provided with a clutch, moved by a lever acting through a lever and rod. The intermediate wheel is forced between the drums by pressure on a ratchet bar, and the motion of conical drum transmitted to friction drum and the wheel. The relative speed of the drums is varied by means of sliding the intermediate wheel on the rod.

NEW HOUSEHOLD INVENTIONS.

IMPROVED CHURN.

William H. Sterns, Humboldt, Neb.—The object of this invention is to furnish an improved churning apparatus which shall be so constructed that the milk may be thrown into violent agitation, so as to bring the butter in a very short time by the movement of the churn body, and which shall be simple in construction, effective in operation, and not liable to get out of order. The invention consists in a frame work to adapt it to receive the operating mechanism; in the combination of bars and hooks with the frame, and with a platform upon which the churn body stands; in the combination of bars, pivot, and a crank with the driving gearing, and with the platform that carries the churn body; in the combination of pivoted bars and a swinging bar with the frame and the platform upon which the churn body stands; and in the combination of pins with the base frame and with the platform upon which the churn body stands.

IMPROVED BAKING OVEN.

Samuel Axford, Freeport, Ill.—This invention relates to baking ovens, and it consists in a baking oven of circular form, having a revolving shelf or table, and constructed with a furnace outside of the main wall, and with three flues leading one each from the furnace door, the oven door (outside thereof), and the body of the oven. The heat and unconsumed products of combustion then pass into the oven through an opening in the furnace side thereof, thence out through opening and flue into the chimney.

IMPROVED IRONING TABLE.

Charles W. Barber and George Lenox, Lindleytown, N. Y.—The object of this invention is to furnish an improved device which shall be so constructed as to serve as a receptacle or basket to receive the clothes to be ironed, as clothes bars to air or dry the clothes, and as a table and a shirt board for ironing them, and which may be folded into small compass for storage and transportation. To the bars at one end of the device is hinged the end of a board, which forms the shirt board, and which is supported in place, when raised, by bars, the upper ends of which are hinged to the lower side of the outer part of the board. The lower ends of these bars are notched or have hooks formed upon them to hook upon the hooks or pins attached to the lower parts of the bars hinged to the end of the board.

IMPROVED WASHING MACHINE AND CHURN COMBINED.

Wiot H. Clarke and William Collins, Council Grove, Kan.—The object of this invention is to furnish an improved machine which be so constructed that it may be used as a clothes washer or as a churn, and which shall be simple in construction, convenient in use, and noiseless and effective in operation. When the machine is to be used as a churn, a churn body is placed within the suds box to receive the milk. The churn body is provided with a closely fitting cover, through the center of which the dasher shaft passes. This construction allows hot or cold water to be put into the suds box, around the churn body, to temper the milk as required. When the machine is to be used as a washer, the dasher and the churn body are removed.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED DRAFT-EQUALIZING DEVICE FOR HORSE POWERS.

John R. Dickinson, Ida, Mich.—The object of this invention is to furnish a draft attachment for horse powers which shall be so constructed as to compel all the teams to draw equally, which may be so adjusted as to prevent a weak horse or team from being drawn too far back, and which shall be simple in construction, easily applied, and reliable in use. In case a weak horse ar team be used, a pawl is pivoted in the outer part of the box, to which is attached a short chain, a part of which is formed by a spiral spring, and which has a hook attached to its outer end, to be hooked into the main draft chain, so that if the weak horse or team is drawn back by the said chain the pawl may be drawn against the chain to clamp it, and prevent the said weak horse or team from having to draw against the others. The spring is designed to prevent the chain from being broken should the pawl slip upon the chain. The chain passes round a pin attached to the box, and which is provided with a ferrule or tubular washer to prevent wear. The chain can be readily detached or allowed to hang, and the pawl turned back or detached when not required for use.

IMPROVED LIFT PUMP.

Emory Barnes, Mount Pleasant, Mich.—This invention has relation to means for raising water, and the nature of the invention consists in combining, with a submerged cylinder, a piston which is depressed by a helical spring and raised by means of a treadle and a chain, which is attached to the piston rod and passed over a pulley attached to the discharge pipe. By depressing the treadle the piston will force water up through the discharge pipe. At the foot of this pipe is a check valve, which allows piston to force water up the pipe, but prevents it from returning.

IMPROVED CARPET-SEWING MACHINE.

Joseph Hesse, San Francisco, Cal.—The object of this invention is to furnish an effective and readily operated hand sewing machine, by which carpets may be readily and evenly connected by a loop stitch formed of one thread. The invention consists of a bent main plate or saddle straddling the edges of the carpet, and having a rectangular plate, to control the distance of the stitch from the edges and compress them for the needle. A presser spring, with a lifter and feed roller, is attached to the inside of the main plate. The feed bar, needle bar, and devices for imparting motion to the reciprocating hook receive their motion from a hand crank wheel and driving shaft geared therewith, the feed bar operating two feed pawls and rollers, working independently of each other. The compound motion of the thread hook is imparted by a top plate with guide grooves and the beveled upper end of the hook stem, in connection with pins and a bevel plate of the connecting rod of needle bar and driving shaft.

IMPROVED VALVE.

Seth Lloyd, Conshohocken, Pa.—Hitherto it has been the experience in valves for steam and water pipes that, by the frequent screwing and unscrewing of the same, the screw portions are worn out while the other parts of the valves are still in good condition. The valves need also repacking from time to time, which is troublesome and expensive. Valves are also frequently placed at points which are reached only with difficulty for the purpose of packing. Now, the object of this invention is to furnish a valve with improved stem, that produces a steam or water tight fitting without requiring any packing for the stuffing box, and which has no parts that wear out by use, being capable of application directly for use as they are furnished by the manufacturer. The invention consists of a compound and spring-acted valve stem, of which the upper handle section is connected to the lower valve-operatingsection by a kind of coupling or clutch, both sections having conical valves that are forced by an interposed spring against seats of the casing or box to produce the tight fitting of the stem.

IMPROVED HORSE POWER.

Thomas C. Churchman, Sacramento, Cal.—The object of this invention is to furnish an improved horse power for working pumps and other machinery, which shall be so constructed as to give two motions at each revolution of the traction wheel, which shall be free from the jerking motion which always accompanies the action of a crank, and which shall be simple in construction and convenient in use. The invention consists in an improved horse power, formed by the combination of the step, the spindle having a bearing or box upon its upper end, the guide standard provided with a ring at its lower end, the grooved disk, the sliding T blocks, and the pitman bent twice at an angle, with each other and with the shaft and the traction wheel.

IMPROVED HORSE POWER.

Isaac D. Albin, Sr., Chilhowee, Mo.—The object of this invention is to furnish an improved portable horse power for thrashers, separators, and other agricultural machinery, the power having the advantage of being run with double reversible draft and any desired number of horses, from two to fourteen, according to the machinery to be driven. The horse power may also be as a single power, and the transmitting shafting be arranged in elevated position above the horses, or in a position near the ground, as desired. The double reversible draft frames of the power produce the balancing of the apparatus so as to dispense with the staking or chaining down of the same, and admit, therefore, a lighter construction and its mounting on a wide truck or common farm wagon, all of which serve to render this horse power of great advantage for the various applications. The invention consists of a master wheel and frame, having a number of draft levers that are driven in one direction, and of a pinion frame, with levers that are drawn in opposite directions, the draft levers of the pinion frame being elevated to admit the horses of the master wheel to pass under them, inside of the track of the horses attached to the pinion frame. The pinion frame transmits the power by suitable gearing to a crown wheel, and by an intermeshing speed pinion to the driving line shaft, that is supported in a triangular top frame.

IMPROVED CAR COUPLING.

James R. Lamb, St. James, Minn.—This invention refers to that class of car couplings that may be coupled without danger automatically, the link being held in a horizontal position for entering the approaching drawhead, and the pin dropped on the entrance of the link. The entering of the link pushes the follower back and drops the pin, so as to couple thereby the cars. The follower presses on the link and forces it against the pin, holding the link by the curved and concaved top part in horizontal position for the coupling, so as to readily enter the mouth of the drawhead to be coupled. The follower gives the link the necessary play, so as to work free in the drawhead when coupled. The pin is supported stationary in the curved end of the slide piece without being released by the forward motion of the follower, so as to allow the backing of a lot of loose cars on side track, or other operations in which cars are not required to be coupled.

IMPROVED CHANNELING MACHINE.

George W. Bacon, South Groveland, Mass.—The object of this invention is to produce an effective cutter for sole-channeling machines. The channeling knife has a chisel-shaped cutting edge at its projecting end, near which the grooving knife is placed, its cutting edge projecting below the channeling knife. When in use this knife is prevented from springing downward and backward by a grooved block which receives the tongue of the knife. The knife thus secured cuts evenly and forms a uniform groove and channel.

IMPROVED NUT-TAPPING MACHINE.

Samuel L. Worsley, Taunton, Mass.—In front of the mandrel that carries the tap there is a nut holder, having in it a mortise of the thickness and width of the nuts to be tapped, which extends horizontally through the holder at right angles with the mandrel. A follower is fitted to the holder, and is forced by a spring against the nut in the holder. The nut blanks are fed to the mortise in the holder through a chute, and are carried by a follower. The feeder has in its upper edge a groove, which receives the nut blanks from the hopper when the feeder is dropped down, and delivers the blanks to the chute when the feeder is raised up. The time of the movement of different parts is governed by cams and by change wheels on the machine, which are proportioned to the different sizes of nuts. The blank holder is provided with the removable portions, which are changed when the holder is adapted to different sizes of nut blanks.

IMPROVED STEAM ENGINE.

Jacob J. Anthony, Sharon Springs, N. Y.—The object of this invention is to furnish an engine that is simple in construction, compact in form, and efficient in operation, which may be adapted to any of the purposes for which ordinary engines are used; but it is especially designed for locomotives and steamboats. The operation of this improved engine is as follows: Steam is admitted to the chest through an opening, whence it passes through ports to the steam chest and through one of the ports into a cylinder. The valves, by their connection with a lever, are made to move in opposite directions, so that when one of the supply ports is opened the exhaust port below it in the same end of the cylinder is closed, while at the opposite end of the cylinder the exhaust port is open and the supply port is closed. The piston is propelled by the steam toward the end of the cylinder until it strikes one of the ribs, when the valves are shifted and the piston is moved toward the opposite end of the cylinder. The reversing of the engine is effected by admitting steam to the valve chest to start the engine on one side of a partition, and afterward admitting it to the other side. All of the cylinders may be used in connection, or by disconnecting the coupling they may be used in pairs. When the engine is applied to steamboats one pair of cylinders may be connected with each wheel, and by the action of the engine alone the boat may be steered.

IMPROVED CAR HEATING APPARATUS.

James F. Callaway, Louisville, Ky.—A steam pipe leads from the dome of the locomotive back to and through all the cars of the train. It is laid in convolutions over the floor of each car, and valves control admission of steam and escape of water of condensation. Suitable flexible couplings connect the pipe sections between the cars.

IMPROVED DITCHING AND EXCAVATING MACHINE.

Samuel A. De Force, Crockett, Tex.—The object of this invention is to furnish an improved machine for making ditches and other excavations, which shall be so constructed as to separate the slice from the soil, raise it and deposit it at the side of the cut, which will feed itself forward automatically, shall be simple in construction, and easily guided and controlled. The invention consists in the combination of a rotating cutter and a reciprocating holder with the shaft upon which they are hung and with the frame work of the machine; in the combination of segmental gear wheels and bevel gear wheels with the shaft and the bevel gear wheel that carries the holder and the cutter; in the combination of a spout with the cutter, a holder, and an endless carrier; in the combination of a spring and arm with the shaft, to which the spout is attached, for moving the spout forward to receive the dirt; in the combination of an arm, lever, and stop pin with the cutter and the shaft, to which the spout is attached, to move the spout back to allow the cutter and holder to pass; in the combination of stops, a latch, and stop pins with the shaft, the frame, and the cutter, for controlling the movements of the holder from the movement of the cutter; in the combination of a tooth, sliding rod, spring lever, and gear wheel with the bevel gear wheel and the axle of the carriage; in the combination of gear wheel, a clutch, sliding bar, and lever with the driving shaft and frame.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion.

Notes & Queries

(1) J. R. asks how to bleach human hair? A. Gaseous chlorine is the most effective agent. Cleanse the hair in a warm solution of soda, and wash with water. While moist, put in a jar and introduce chlorine, until the air in the jar looks greenish. Allow to stand for 24 hours, and if necessary repeat the operation.

(2) E. W. M. asks how to make celluloid? A. See reply to G. R. (73) p. 204, No. 13, present volume SCIENTIFIC AMERICAN.

(3) J. H. H. asks: What is used to make gold leaf adhere to the letters cut into a granite monument? A. Apply a coat of size and then two or three coats of size and fine powdered whiting. Let each coat dry and rub down with fine glass paper before the next is applied. Then go over it thinly and evenly with gold size, and apply the gold leaf.

(4) J. L. S. asks: 1. If coal oil will percolate through glass? A. No. 2. Also, if there is any known material which can percolate through glass without destroying it? A. No.

(5) C. W. & S. ask how the marbling of paper is done? A. A mucilage of gum is prepared, about the thickness of sweet oil, and placed in a shallow trough. The colors are sprinkled on the gum and disposed as fancy may dictate. The sheets of paper are taken, one by one, bent in the form of a bow, and gradually let fall on the composition in the trough. The colors, which float on the surface, and a portion of the mucilage adhere to the paper, which is then taken up and hung on racks to dry. The paper is then finished by burnishing.

(6) W. H. S. & F. D. ask for a recipe for making liquid solder, to be used without heat? A. Mix together bismuth ¼ oz., quicksilver ¼ oz., block tin filings 1 oz., spirits of salt (muriatic acid) 1 oz.

(7) K., B. & L. ask how to ebonize hard wood in durable color? A. Black may be produced by means of copperas and nutgalls, or by japanning with two coats of black japan, after which varnish or polish, or use size and lampblack previous to laying on the japan. Another method is to pour two quarts boiling water over one oz. powdered extract of logwood, and when solution is effected, add one drachm of yellow chromate of potash, the whole being well stirred. Repeat on the wood with general applications until the desired depth of color is produced.

(8) M. J. G. asks for information in the art of "marbleizing" or imitating the colored marbles on inferior marble? My chief difficulty lies in the preparation of the water and in the colors. A. It is necessary to heat the marble hot, but not so hot as to injure it, the proper heat being that at which the colors nearly boil. For blue, use alkaline indigo dye, or turnsole with alkali; for red, dragon's blood in spirits of wine; for yellow, gamboge in spirits of wine; for gold color, sal ammoniac, sulphate of zinc, and verdigris, equal parts; for green, sap green in spirits of potash; for brown, tincture of logwood; for crimson, alkanet root in turpentine. To stain marble well is a difficult operation.

(9) F. H. S. asks how rubber stamps are made? A. See SCIENTIFIC AMERICAN, present volume, No. 6, p. 91 (33), and No. 17, p. 267 (17), and SCIENTIFIC AMERICAN SUPPLEMENT No. 83.

(10) J. W. W. asks for a black composition or cement to fill in zinc work that will stand exposure to the weather? A. Use pitch 11 lbs., lampblack 1 lb., turpentine sufficient. Mix with heat.

(11) H. G. asks for a recipe that will show the twist on gun barrels? A. Spirits of niter ¾ ozs., tincture of steel ¾ oz., or use the unmedicated tincture of iron if the tincture of steel cannot be obtained; black brimstone (sulphur vivum) ¼ oz., blue vitriol ½ oz., corrosive sublimate ¼ oz., nitric acid 1 drachm, copperas ¼ oz.; mix with ½ pint of rainwater, and bottle for use. Clean the barrels and apply as directed in (36), p. 203, current volume.

(12) J. B. asks for a recipe for tempering millpicks? A. Select good cast steel. Forge carefully, using a low heat, and light blows. To harden get two gallons of rain water, add 2 lbs. of salt. Take off the chill of the water by plunging a hot iron into it. Heat the pick gradually from the center, and plunge the point vertically into the water, letting the heat toward the center draw the temper. Draw to a "red" or "copper color."

(13) C. R. & F. S. ask if the price of gold as a metal is higher than that of platina? A. Yes.

(14) A. T. B. asks how to drill a ⅝ inch hole through glass ⅛ inch thick? A. Use a sand blast or a revolving cylinder of wood, brass, or copper, of the desired size of hole, supplied with emery and water.

(15) W. B. asks: What is Zeiodite, and how is it made? A. It is made by mixing 20 to 30 parts roll sulphur with 24 parts powdered glue or pumice, which forms a mass as hard as stone. It is said to resist the action of water and acids.

(16) E. A. J. asks how to fill the engraved parts of plated ware, that after plating with gold the designs may appear like burnished silver? A. Cover the parts not designed to be plated with wax, deposit the metal by electro-plating, and finish by burnishing.

What is used as a body for filling the texture of silk goods used in banner making, that will keep the silk flexible and elastic? A. A thin size of bleached shellac and alcohol is used. For inside work the white of an egg makes a good size. If gold is to be laid, put it on while the size is still wet. A little honey, combined with thick glue, is sometimes used.

(17) C. N. N. asks: When is the greatest strain upon a bridge? Is it while a train is moving slowly or while running at a high rate of speed? A. When moving at a high speed.

(18) E. B. D. asks how to color gold plate Roman or Etruscan color? A. See SCIENTIFIC AMERICAN, present volume, No. 5, p. 75 (27).

(19) J. S. H. asks: What is the best method of making an oil belt for finishing or polishing hard wood? A. If a wide belt is desired, use canvas, if a narrow one use leather, running over pulleys the same as common belts are run, one pulley, of course, being the driver. Coat the belt with glue and sprinkle on fine sand, the fineness of which must be appropriate to the finish required. Let the glue get thoroughly dry before using.

(20) E. C. C. says: I wish to make moulds to cast a few badges of soft metal. How can I best succeed in so doing? A. See No. 17 SCIENTIFIC AMERICAN SUPPLEMENT, p. 272, for directions for such work.

(21) C. H. W. asks how to prepare the paper matrix for stereotyping? A. Take thick soft unsized paper and paste upon it two or three sheets of tissue paper, or until it is about the thickness of pasteboard. Cover the under side with fine powdered French chalk, and lay it upon the form of type, and beat with a stiff brush so as to force the soft paper into all the interstices of the type. Add other sheets of adhesive paper until a sufficient thickness is obtained. Cover with a woolen blanket and place in a press, the bed of which has been moderately heated. Screw the press down and the heat will dry the matrix, which may then be removed for casting.

(22) A. A. K. asks if there is a patent on engraving glass by means of the sand blast? A. Yes.

(23) M. A. C. says: 1. With an engine running at 54 revolutions per minute, turning the main shaft 200 revolutions per minute, if the speed of this shaft be reduced to 25 revolutions by increasing the size of pulleys, will it tend to economize steam? A. You do not give sufficient details to give an answer. 2. Will you give a rule to reduce or increase the size of pulleys to give any required speed? A. See p. 181, No. 12, current volume SCIENTIFIC AMERICAN. 3. Also a rule to line a shaft of any length, supposing the building not to be square? A. Use a level and plumb. See No. 2, p. 24, last volume SCIENTIFIC AMERICAN. 4. Also a rule to find the points where a belt will pass through floors running over different sized pulleys? A. Lay out a diagram to any convenient scale and then transfer the points to the floors where the belt is to pass through. 5. Suppose the valve of an engine be set a little back, what effect does it have on the diagram as made by the indicator? A. The diagram will show that the valve does not open as soon as is desirable. 6. How is the power of an engine computed from an indicator diagram? A. Find the mean effective pressure in the piston in lbs.; multiply this by the speed of the piston in feet per minute, and divide by 33,000.

(24) A. Z. asks for a recipe for waterproofing heavy manilla paper? A. Melt in a vessel 30 ozs. good glue and 3 ozs. gum arabic in 10 pints hot water. In another vessel 20 ozs. soap and 4 lbs. alum. Mix the contents of the two vessels. Call this composition No. 1. In another vessel heat ½ gallon benzole and 1 gallon paraffin, and melt it in 24 ozs. resin. Boil until it attains a good degree of consistency. This is called No. 2. Dip the paper to be waterproofed in composition No. 1 while in a heated state, and then dry it. Next apply composition No. 2 in a cooled state, with a brush, in any convenient manner.

(25) C. H. C. asks how to remove the taste of hydraulic cement, that at first permeates the water in a cistern when first filled? A. The presence of lime in water is a source of great trouble, and to those using it for steam boilers, of the greatest danger, in crusting either as a sulphate or carbonate; and preventing contact between the water and the iron. The only absolute remedy is to distil the water; but this is expensive and inconvenient. If you breathe slowly, through a common clay pipe stem, into a tumbler of lime water, the water will become clouded with carbonate of lime, produced by the carbonic acid of the breath combining with the lime; a deal of this carbonate will gradually settle to the bottom of the tumbler; you might be able to use the water by burning a bushel of charcoal in a clay stove, suspended just over its surface; stir the water occasionally with a stick, and it will absorb a large quantity of the carbonic acid; be careful not to fall in the cistern, as the gas would cause immediate suffocation and death.

(26) C. W. asks how to make a good cement for glass and china ware? A. Soak 2 drachms cut isinglass in 2 ozs. water for twenty-four hours, boil down to 1 oz., add 1 oz. alcohol and strain through a cloth. Mix this while hot with a solution of 1 drachm mastic in 1 oz. of alcohol, and triturate thoroughly with ½ drachm powdered gum ammoniac.

How can I make glycerin soap? A. Take any mild toilet soap and intimately mix with it about one twentieth of its weight of glycerin, while the soap is in a liquid state. It may be tinged red or rose color with a tincture of orchil or dragon's blood, or orange yellow with a little annatto. It may be variously scented, but oil of bergamot or rose-geranium supported with a little oil of cassia, or cassia supported with oil of almonds, appear to be the best perfumes.

(27) A. S. G. asks: 1. What is the calcium light? A. It is commonly called the Drummond light, and is produced by the action of the oxyhydrogen flame on perfectly pure lime, made free from silica by precipitation and afterwards calcined and pressed into moulds. 2. Is it practical to use for lighting a dwelling house? A. No.

(28) R. K. S. asks if water will act as well as oil for lubricating journals, when iron is run on Babbitt metal? A. No.

(29) K. asks: What is meerschaum, and where is it obtained? A. Meerschaum is a hydrous silicate of magnesia. It is a mineral of soft earthy texture somewhat resembling chalk. It is found in Spain and several countries at the head of the Mediterranean, but chiefly in some parts of Greece and Turkey.

(30) H. B. K. asks how to dye horn a black color? A. A deep black may be produced by boiling the horn for some time in a strained decoction of logwood, and then steeping it in a solution of red sulphate, or red acetate of iron.

(31) A. T. R. asks how to color iron wire cloth a blue tint? A. Grind Prussian blue in shellac varnish and use as a paint.

(32) C. H. H. asks: 1. How patent leather is made? A. See SCIENTIFIC AMERICAN No. 4, p. 60 (47). 2. How is the polish given to morocco leather? A. By varnishing with white of eggs and burnishing. 3. How can I make liquid blacking that will give a gloss without the use of a brush? A. Gum arabic 4 ozs., coarse moist sugar 1½ ozs., good black ink ¼ pint; strong vinegar 2 ozs., rectified spirit of wine and sweet oil, of each 1 oz.; dissolve the gum in the ink, add the oil, rub them in a mortar until thoroughly united, then add the vinegar, and then the spirit. Apply with a bit of sponge.

(33) E. O. H. asks: What is the best preparation for removing inkstains from collars, cuffs, etc.? A. Stains may be removed by the application of a little lemon juice, citric acid, diluted muriatic acid, oxalic acid, or tartaric acid; or by means of chlorine water or solution of bleaching powder. The linen should be free from starch and soap, and should be afterwards thoroughly rinsed in warm water before using soap. Marking inks are variously removed by ammonia water, solution of bleaching powder, chlorine water, dilute iodine tincture, or cyanide of potassium—this latter is very poisonous.

(34) W. J. asks: Is there anything that can be mixed with melted paraffin in order to thin it without depriving it of its quick chilling property? A. We know of nothing.

(35) C. D. N. asks: 1. What is dextrin, such as is used for mucilage? A. Commercial dextrin, or "British gum" is obtained by heating dry potato starch to a temperature of 750° Fah. in sheet iron trays or revolving iron or copper drums, similar to those used in coffee roasting, whereby it is transformed into semi-transparent, brownish lumps, which are converted into a pale yellow powder by grinding between millstones. It is completely soluble in cold water, from which it may be precipitated by addition of excess of strong alcohol. 2. How can I keep away the skin or mould that collects on such mucilage? A. Add a few drops of oil of cloves, and exclude dust and air by a suitable cover.

To make a good solution of carbolic acid, what proportion of crystals and water must be used? Must the water be hot? The solution is needed for healing sores. A. Pure (crystalized) carbolic acid dissolves in 20 parts cold water. For use in surgery and medicine it is usually dissolved in diluted glycerin; the strength of solution depends upon the application; for ordinary external healing purposes dissolve one drachm of the carbolic acid in a mixture of one oz. of glycerin and eight ozs. of water.

Why does black ink get ropy like molasses, and what is the remedy? A. Usually from the evaporation of the water, accumulation of dust, or decomposition of the excess of tannin.

(36) B. A. W. asks: How is the dilute solution of terchloride of gold prepared for coloring brass chain? How much soda must be added? A. Dissolve the gold chloride in about 40 parts of water; add 10 parts of the alkali and boil; dip the articles to be colored in this while boiling.

(37) P. O. S. asks how to prepare potassium or ammonium sulpho-cyanide? A. To prepare potassium sulpho-cyanide, mix together 48 parts of anhydrous potassium ferrocyanide, 17 parts of potassium carbonate, and 32 parts of sulphur; introduce the mixture into an iron pan provided with a lid, and fuse at a gentle heat: maintain the same temperature until the swelling of the mass which ensues at first has completely subsided, and given place to a state of tranquil fusion; increase the temperature now to dull redness. Remove the half cooled and still soft mass, pulverize it, and boil with alcohol. Let the alcoholic solution cool, when a part of the salt in the pure state will crystallize out, and the remainder may be obtained by distilling the alcohol from the mother-liquor. Ammonium sulpho-cyanide may be obtained by mixing ammonium cyanide with yellow ammonium sulphide, and digesting this for some time with finely divided sulphur; by boiling the filtered solution the excess of ammonium sulphide may be expelled, and the sulpho-cyanide crystallized out.

(38) J. T. S. asks: What is the gum used on the United States postage stamps composed of, and how is it made and how is it applied? Also whether it can be bought in a gum state? A. Gum dextrin, 2 parts; acetic acid, 1 part; water, 3 parts; dissolve in the water and acid by heat, and add ½ part alcohol. Heat moderately in a covered vessel for some time with occasional stirring. It is applied hot by suitable rollers. It is not sold prepared.

(39) W. T. K. asks: What is honey dew as found occasionally on leaves of trees? A. The saccharine liquid phenomenon has been the subject of much discussion. By some it is supposed to be the secretion of insects; by others not. That plant lice, or aphides, do secrete a saccharine liquid is well established; on the other hand it seems to be equally well established that sometimes the liquid is exuded by the leaves of trees without insects being concerned in the operation. Dry weather is most favorable to its production. It is especially frequent on certain kinds of trees, such as linden. The rain or dew has nothing to do with its formation.

(40) E. T. S. asks: 1. How to make a permanent magnet, horseshoe shape? A. Use hardest crucible steel, wrought into form and tempered nearly to straw color. It may be magnetized by bringing its poles in contact with those of a strong magnet, or by winding it (in one direction) with covered copper wire, and then passing through the wire a strong current of electricity from a galvanic battery. 2. Will it still be a permanent magnet if the horseshoe is straightened out, or can a straight rod be made a permanent magnet? A. Yes; tempered steel of any form can be magnetized.

(41) T. W. asks: 1. What is the easiest and simplest way of finding the horse power of any engine? A. The power of a steam engine is calculated by multiplying together the area of the piston in inches, the mean steam pressure in lbs. per square inch, the length of stroke in feet, and the number of strokes per minute; and dividing the product by 33,000. 2. Was James Watt the first inventor of the steam engine? A. No. 3. What kind of an engine did he produce? A. A low pressure condensing engine. 4. We have a well that always had plenty of water in it, but this summer it has dried up. A well adjoining has always plenty of water. Our well is open at the top and the other is not. Is there a remedy so we can get water? A. Perhaps the following will start the flow: Introduce several hogshead of water, seal the mouth of the well around a tube reaching to the bottom, and apply a pump. 5. An engineer says that a suction pump when put in to feed a boiler against 60 lbs. pressure, the pump would always stop and stick. I said it was the strain put on it, he said the pump contained more water than it could force. Which is right? A. You are probably both right.

(42) R. S. asks: I have a recipe for silver plating which reads thus: Dissolve 1 oz. nitrate of silver (crystal) in 12 ozs. water, then dissolve in the water 2 ozs. cyanuret of potash, and shake; then add ½ as much whiting as there is of the fluid, and it is ready for use. Is this a good recipe and safe to use? A. The bath will probably work well without the addition of whiting. The double cyanide of silver and potassium is the best

bath for electro-plating, but it is well to observe that the materials are extremely poisonous when introduced into the human system.

How can I make soft solder in thin sheets? A. By rolling.

(43) B. & S. ask how to detect the presence of benzine in turpentine? A. The presence of any notable quantity of benzine in turpentine can readily be detected by the sense of smell. Place a little of the suspected oil in a small test tube, pour over it an equal quantity of rain water, cork, and shake once or twice; then let rest. If, after standing a minute, the parted fluids still remain opalescent, adulteration is provable.

(44) R. L. F. asks of what the ink with which postage stamps are printed is made of? A. For the three cent stamps the ink is made of a mixture of Prussian blue and chrome yellow of a standard grade (made only for the government) ground in a compound oil, the precise nature of which is not made public. For the one cent denomination the color is ultramarine—sulphides of sodium and iron, and silicate of alumina. For two cent stamps sulphide of mercury is used, and for the 90 cent, carmine.

(45) N. C. L. asks how to copper plate leaves of trees, insects, feathers, and other perishable things, so as to preserve the form? A. Brush the leaves or other objects over with black lead. Insert a pin, and to this attach a wire that is connected with the zinc of the battery. It may be placed in the solution and the whole arrangement completed by the insertion of a piece of copper, which is to be connected with the silver of the battery.

How can I cast a medal, and what composition can I use? A. You can make the mould of calcined plaster of Paris. Old type metal is a good material to use for casting.

(46) G. R. G. asks: Is such a thing as a hydraulic ram without an air chamber practically possible? A. No.

(47) J. C. asks if there is a preparation or paint that, when applied to a building, will render it fireproof, and withstand the heat of a burning building adjoining? A. No.

(48) J. B. asks for a process for engraving on brass? A. Cover the plate with a film of wax and surround it with a border made of beeswax 1 part, pitch 2 parts, and tallow 1 part. Cut through the film of wax with sharp instruments, leaving the outline of the design clearly shown in the metal of the plate. Flow the plate with a mixture of equal parts of aquafortis and water. When the acid has eaten sufficiently into the plate, wash thoroughly in warm water to prevent its further action.

(49) A. S. asks for a recipe or composition for beeswaxing floors? A. In a hot solution of 5 lbs. of good pearlash, in soft water, is stirred 10 lbs. of good yellow wax, shaved or rasped fine. Stir the mixture while boiling, and when effervescing, add, while stirring, 5 lbs. dry yellow ocher. Pour into cans or boxes and let it harden. When wanted for use, diffuse 1 lb. of the mixture in 5 pints boiling hot water, stir the mixture well, and apply, while hot, to the floor with a paint brush. It dries in a few hours, when polish with a floor brush and wipe with a coarse woolen cloth.

(50) L. P. S. asks for the quickest and best method of making vinegar from cider, and also which makes the best vinegar, early or late cider? A. Take, say 10 gallons, new cider, and suffer it to ferment fully, which will probably be in about two weeks if the weather be warm; then add about 8 gallons of new cider for producing a second fermentation, and in about two weeks add a like quantity to produce a third fermentation. Stop the bunghole of the barrel with an empty bottle with the neck downward, and expose to the sun. When the vinegar is come, set in a cool place. When making, let there be a moderate degree of heat and free access of external air. The process is hastened by adding to the cider a quantity of mother of vinegar, as it is called, a whitish ropy coagulum, of a mucilaginous appearance, which is formed in vinegar and acts as a ferment. The strength of vinegar depends on the amount of sugar or starchy matter to be ultimately converted into acetic acid. Cider made from late apples is esteemed the best for vinegar.

(51) Orator asks if the drug cucu possesses the power to make the bashful bold, as some persons claim for it? A. No; but a whiff or two of ether is said to allay "stage fright" and similar forms of nervousness.

(52) N. Y. asks: What is butter of antimony? A. It is liquid chloride of antimony. It is made by dissolving crude or roasted black antimony in muriatic acid with the addition of a little nitric acid.

(53) S. E. N. says: I want to prevent iron rollers from rusting that are used on wet and dry linen? A. Heat your rollers with steam if practicable.

(54) D. A. R. asks for a recipe for red ink, to be used with a rubber stamp? A. Mix aniline red 2 to 4 drachms, alcohol 15 ozs., and glycerin 15 ozs.

(55) J. M. W. says: I send you a worm that I found in an old rotten log; there were several of the same kind in said log. Can you tell me the name of it? A. It is the *Julus multistriatus*, belonging to the group *millepedes*. It is commonly found under sticks, etc. It is long, cylindrical, hard, with numerous feet, short and weak, attached to the under surface of the body nearly at the middle of the abdomen. The antennæ are short and filiform. They crawl rather slowly, and at rest curve the body into a ring. They live on vegetable substances or eat dead earthworms or snails.

(56) A. W. P. says: I send a box containing a bug or fly; what is the name of it, and the product of the egg laid? You will observe it was captured in the act of pregnating a piece of bark. The probe that is pierced in the bark belongs enclosed in the sheath under the belly, which divides in halves to receive it. A friend says that the egg forms a grub between the bark and the wood. A. It belongs to the family of "horntails," *sroceridæ*, Leach, so called from the long prominent horn on the abdomen of the males, while the ovipositor or "saw," resembling that of the true saw flies, is attached to the middle of the abdomen and extends considerably beyond its tip. The larvæ are "cylindrical fleshy grubs," of a whitish color, with a small rounded horny head and pointed horny tail. They are provided with powerful jaws, wherewith they bore long holes in the trunks of the trees they inhabit. They are wood eaters, and often do great damage to trees—mostly of pine and fir.

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

S. L. S.—No. 1, sample of clayey soil in small bottle, contains silica, alumina, lime, magnesia, oxide of iron, silicates, traces of sulphates, phosphates, and sulphides, organic matter, and about 15 per cent of water. It is not a rich soil. No. 2 is a deposit of carbonate of lime, with much carbonate and oxide of iron, in a trap rock. —W. H. W.—From the examination made, it appears to be a clayey deposit, containing a large percentage of iron, moisture, and an oily or waxy substance somewhat resembling ozocerite—if the latter proves to be the case it may be of more value.—W. G. B. H.—It is semi-decomposed ferric sulphide—white pyrites—mixed with earth and iron oxides. The partial desulphurization may have been occasioned by heat.—A. D.—Dark greenish-blue powder. It is probably a mixture of sperm oil and aniline blue, with traces of copper and iron. The amount of substance was too small for a complete examination.

COMMUNICATIONS RECEIVED.

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

On the Carolina Mantis. By C. F. S.

On a Magnetic Railway. By J. W. C.

Also inquiries and answers from the following:

J. M. B.—W. W.—A. M. R.—A. T. O.—M. M.—E. H. —A. A. F.—M. M. S.—W. V. P.—A. W. P.—B. & N. —Mrs. L. N. C.

HINTS TO CORRESPONDENTS.

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

Correspondents whose inquiries 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.

Inquiries 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: "Who publishes text books on journalism? Who makes well augers and drills?" 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

September 25, 1877,

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.

Animal trap, J. H. Morris 195,632
Bale band tightening machine, S. Hughes 195,449
Barrel head, W. H. Murphy 195,634
Barrel head, J. L. Thomson 195,675
Barrel-hoisting apparatus, S. A. Bates 195,475
Bath apparatus, vapor, J. V. Hirley 195,448
Bath shower, J. R. R. Morford 195,523
Bed bottom, W. M. Ward 195,550
Bed bottom and fire escape, R. O. Collis 195,484
Bed pan, C. S. Merriman 195,521
Bedstead, J. W. C. Peters 195,641
Bedstead, A. Hausen 195,506
Beehive, Hollingsworth & Walcott 195,636
Bell-striking apparatus, G. M. Stevens 195,461
Blacksmith's nippers and clincher, N. Brown 195,441
Bottle stopper, C. S. Barnard 195,473
Bottle stopper, F. Doll 195,597
Bottle stopper fastener, F. J. Seybold ..... 195,4[illegible]
Brake, car, L. T. Pyott 195,647
Brewers' grains, H. & S. H. Chapman 195,573
Broom, W. H. Paton 195,639
Buckle, composition-covered, O. Weiner 195,682
Buildings, joint for, C. Marcotte 195,452
Burial case, J. Askins 195,556
Burial casket, C. F. Spencer 195,609
Can for preserving food, A. S. Lyman 195,620, 195,621
Candy, W. H. Towers 195,464
Cane and umbrella, T. F. Darcy 195,492
Cane juices, apparatus for, etc., J. Miller 195,522
Car axle, E. Danford 195,491
Car heater, C. A. West 195,679
Car tongues, B. McDevitt 195,519
Car wheel, W. Y. Cruikshank 195,503
Cars and vehicles, propelling, C. A. Gustafson 195,504
Carpet lining package, Cobb & Evans 195,575
Carriage curtain fastener, W. B. Gould 195,499
Carriage tops, loop for, F. A. Neider 195,637
Cellar bottom, J. R. Anthony 195,471
Chair, J. H. Rodebaugh 195,454
Chair, G. A. Waterhouse 195,468
Chair, folding, A. B. Cogswell 195,576
Chair, folding, C. H. Sutherland 195,545
Chair, folding, J. B. Wakefield 195,547, 195,548, 195,549
Chimney cap, E. Hawkes 195,601
Chimney cleaner, S. H. Dickerson 195,445
Cigars, packing, J. W. Shaeffer 195,540
Closet for rooms, S. N. Stewart 195,670
Cloth-folding machine, J. D. Elliott 195,493
Cock, J. M. Graham 195,500
Cock, C. Jarecki 195,611
Coin detecter, E. Kronenberg 195,451
Coin wrapper, R. L. Ryan 195,658
Commode, J. Kutscher 195,514
Corkscrew frame, J. L. Hyde 195,450
Corset, C. A. Griswold (r) 7,895
Cultivator, J. W. Sohn 195,459
Cutlery strop safe, A. E. Hively 195,604
Distilling petroleum, H. C. Wood 195,652
Ditching and tile laying machine, R. E. Nevin 195,527
Door fastening, E. Felge 195,595
Dumb waiter, J. Murtaugh 195,526
Electroplate molds, W. B. Closson 195,443
Evaporating pan, C. McCauley 195,517
Eyeglass support, F. H. Moore 195,629
Feather renovator, T. J. Adams 195,554
Feed water heater, G. Kratz 195,614
Fence, A. O. Corell 195,487
Fence, N. B. & T. Gunn 195,503
Fence post, T. L. Pope 195,533
Fence post, H. J. St. John 195,671
Fence wire stretcher, N. Burnham 195,568
Fire arm, breech-loading, B. O. Fasoldt 195,496
Fire arm magazine, E. R. Quimby 195,690
Fire arm, revolving, T. W. Bearcock 195,562
Fire arms, sight for, M. L. McCord 195,518
Fire fender, R. R. Crouse 195,582
Fishing line reel, G. T. Copeland 195,578
Flower vase, C. H. Crater 195,580
Food for animals, Bowker & Sturtevant 195,479
Freight chute, Crompton, Nicol & Hawley 195,489
Fringe, E. Greasly 195,599
Furnace, English & Burr 195,498
Furnaces, S. C. Salisbury 195,659
Furniture spring, E. A. Turner 195,676
Gas engine, F. Dieckmann 195,585
Gas regulator, Fenn & Groeninger 195,596
Gate, K. E. Rudd 195,538
Gate, J. S. Winsor (r) 7,897
Grain drills, J. S. Bogle 195,477
Grappling hook, Johnson & Hanson 195,612
Gum, preparation of, R. Cotter 195,579
Hair-curling device, R. M. Rose 195,455
Harrow, See & Simonson 195,661
Harrow, cultivator, etc., G. E. Cooke 195,486
Harrow, planter, etc., J. B. Wall 195,677
Harvester, T. D. McCormick 195,625
Hat bodies, machine for, W. H. Behrens 195,476
Hay elevator and conveyer, I. S. Krick 195,615
Hay press, G. Ertel 195,592
Heat-conducting media, A. Densmore 195,584
Hen's nest, T. W. Russell 195,655
Hinge, C. B. Clark 195,574
Hoisting apparatus, R. O. Pierce 195,640
Horse collar, S. Reynolds 195,649
Horse collar, A. Rutherford 195,657
Horse detacher, Respess & Lumley 195,534
Horses from cribbing, preventing, Snead & Burns 195,667
Horses, fly net for, E. Crebs 196,488
Horseshoe nail machine, J. Roy 195,653
Hose coupling, F. Stewart 195,543
Hose nozzle, Poh & Shoop 195,643
Hosiery goods, crocheting, J. M. Merrow 195,520
Hot air registers, W. R. Lafourcade 195,617
Hydrant valve, J. F. Neall 195,626
Inkstand, E. W. Stiles 195,462
Ironing table, G. Nason 195,635
Ladder, M. Foss 195,497
Ladder, J. Berg 195,563
Ladder, L. C. Boyington 195,440
Lamp, C. Capel 195,571
Lamp bracket, J. W. Birch 195,564
Lamp, H. Wellington 195,551
Lantern, E. B. Requa 195,648
Lantern, T. Wigley 195,683
Lard cooler, H. Rieman 195,535
Letter box, etc., combined, C. B. Geer 195,598
Lifting jack, E. T. Carswell 195,572
Lock, J. H. P. Inslee 195,608
Loom-shedding mechanism, H. Wyman 195,686
Looms, weft fork for, S. Cook 195,485
Mail bag crane, F. W. Bridenbecker 195,567
Medicinal compound, M. C. Peden 195,531
Milk, machine for creaming, Lefeldt & Lentsch 195,515
Milk cooler, O. S. Prindle 195,646
Milk pail, W. Heuermann 195,507
Millstone-dressing machine, A. E. Smith 195,666
Miner's drill, Powell & Seddon 195,645
Nut lock, R. A. Kelly 195,513
Nut lock, W. Lyon 195,516
Oakum, making, C. M. Winter 195,684
Ore-roasting apparatus, A. B. Crosby 195,581
Organ stop action, H. H. Winger 195,469
Packing, adjusting piston, J. Varon 115,546
Painting machine, J. S. Mills 195,628
Pantaloons, shaping, E. B. Viets 195,467
Paper bag machine, T. W. Grinter 195,501
Paper box, H. L. R. Wolf 195,685
Paper, H. F. Evans 195,593
Paper or board, J. M. Cobb 195,483
Paper pulp, grinder for, Bowers & Curtis 195,478
Piano, W. B. Tremaine 195,691
Picture frame, A. Greenwood 195,600
Picture frame, L. Pattberg 195,530
Plane, bench, H. M. Clark 195,481
Plane, circular, H. M. Clark 195,480
Planter, T. T. Butler 195,442
Planter, J. Campbell 195,570
Planter, J. K. Taylor 195,465
Planter, Oberholtzer & Wilcox 195,528
Plow, J. J. Platt 195,642
Plow, J. T. Speer 195,668
Plow, D. M. Funk 195,498
Plow point, M. M. Bowers (r) 7,894
Plow, G. A. Ellis 195,494
Plow, frog plates for, T. Meikle 195,627
Post hole auger, H. P. Haskin 195,446
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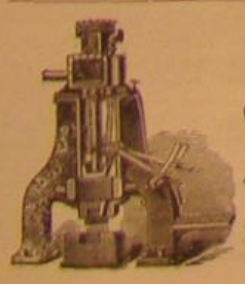

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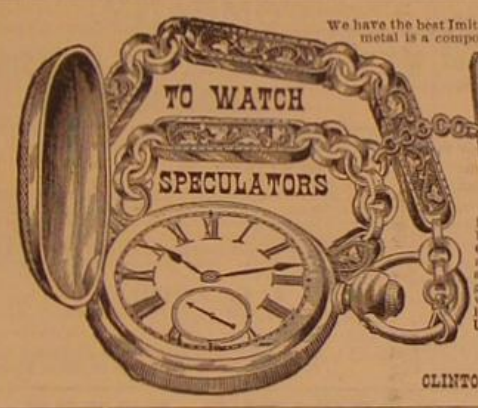

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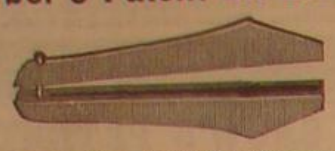

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