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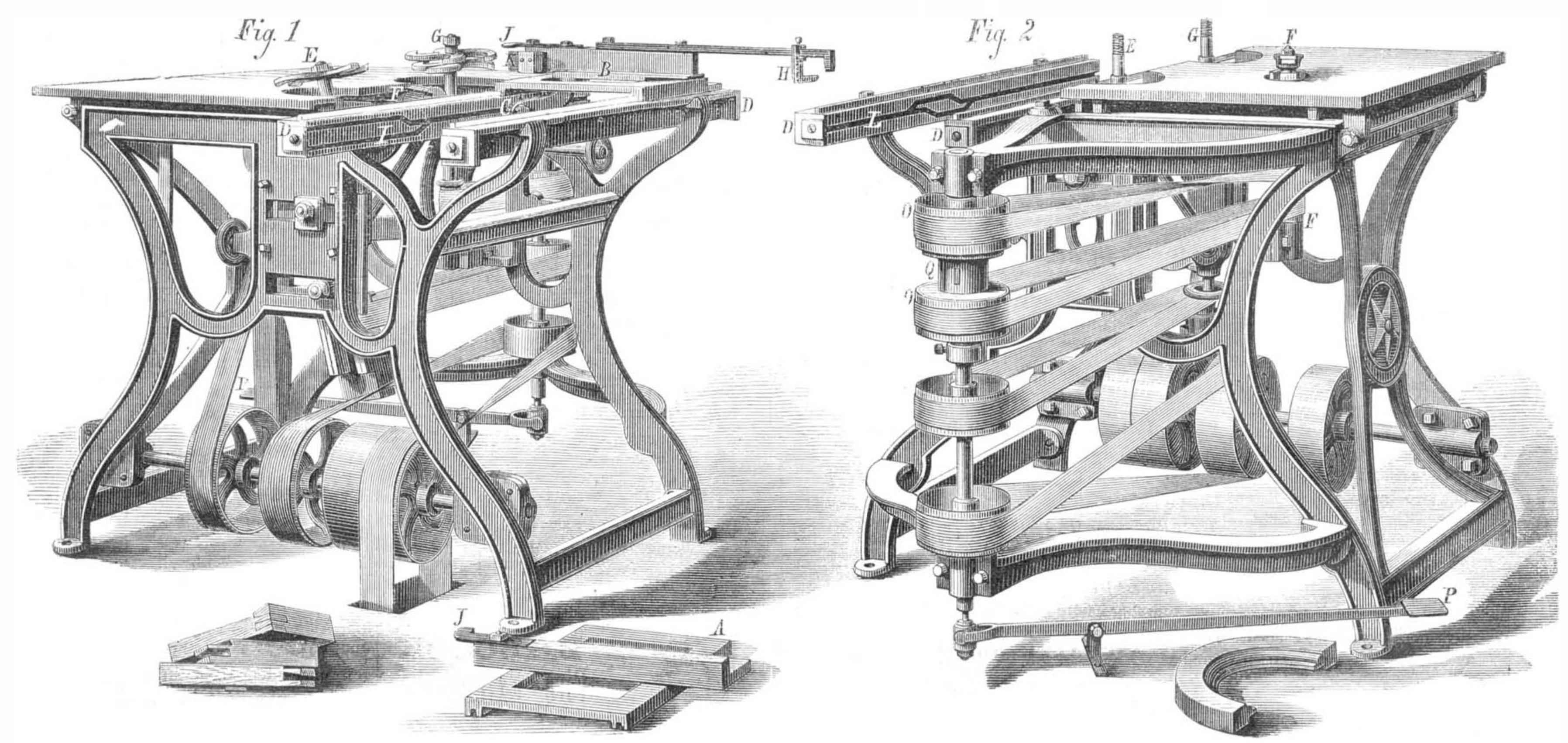
The Pennell and Zimmer Dovetail and Shaping Machine.

This machine is designed to supply a want long felt by all sash makers.

The formation of the dovetail mortises on the stiles, and tenons on the check rails, of sash have heretofore been the most tedious and expensive parts of sash making, requiring skilled labor, and the use of at least four different machines, as well as from six to ten times handling the material to accomplish the purpose. With this improvement, the work is all done on one machine, and more perfectly than is possible by any method we have seen employed. An ordinary hand can, it is claimed, make at least ten dovetail mortises or tenons per minute, or the joints for 1,500 windows per day, being the work of some twenty skilled men.

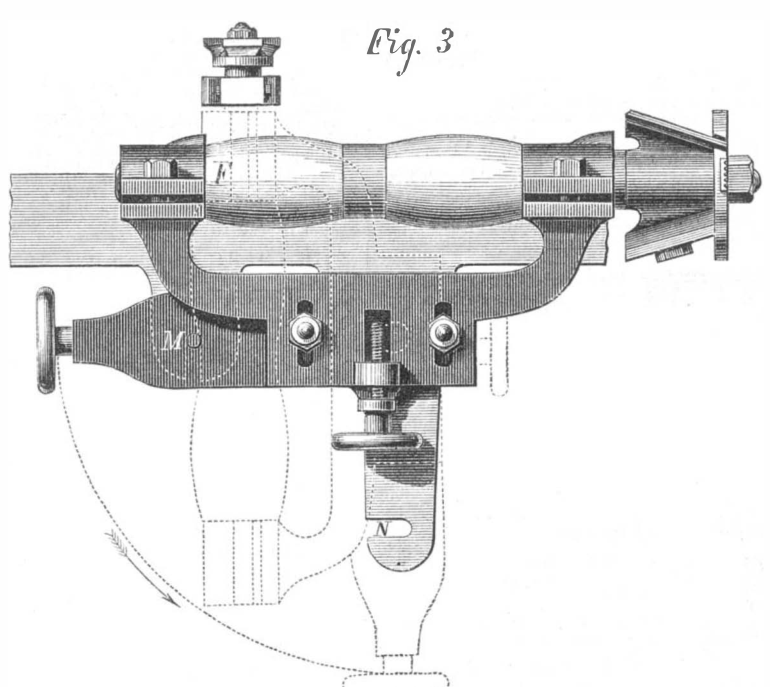


THE PENNELL AND ZIMMER DOVETAIL AND SHAPING MACHINE.

The rapidity of production, in comparison with the old modes, is sufficient to attract attention to this machine, yet there are other advantages quite as important.

A shoulder is formed on the side of the stile, which makes a perfect fit, and a much better and stronger joint. By a slight change, which requires but a few minutes, it is made to do the work of a shaping machine for circular sash or any irregular molding, thus obviating the necessity of a separate machine for that purpose.

Figs. 1 and 2 are front and rear views of the machine, and Fig. 3 is a detail view, showing the arbor, F, referred to below.



For dovetailing bottom stiles for check sash, the carriage, A, is placed on the rails, D. The arbor, E, is adjusted to the bevel desired for the dovetail. On the arbor, G, are placed two cutters, which form the straight side of the dovetail and the shoulder on the side of the stile, which is then laid on the carriage and passed through the cutters on E and G.

For top stiles, the cutters on the arbor, F, Figs, 1 and 3, are adjusted to form the shoulder on the face side of the stile. The upper cutter on the arbor G being removed, the stile is passed through as before.

For bottom, check, and common meeting rails, the carriage, B, is placed on the rails, D, (as shown in Fig. 1) with the lever pin, C, in the *lower* branch of the slot, I, and the arbor E is adjusted to a perpendicular position. The rail is placed between the chipbreakers, K, and passed through all the cutters. When returning, the carriage lever, C, is guided into the *upper* branch of the slot, I, and the rail is reversed, with the shoulder placed to the gage, H, (which gives the length desired) and the operation is repeated.

For top check rails, the carriage, B, is reversed, and the lever pin, C, is placed in the slot, L, (Fig. 2) and operated as for bottom rails.

For shaping circular sash or irregular moldings, the bolt, M (Fig. 3), is loosened, and that end of arbor, F, is dropped to the position indicated by the dotted outline bringing the bolt, M, into the hook, N, which places the arbor in a perfectly upright position. The belts are then put on the clutch pulleys, O, (Fig. 2) the upper belt being crossed. The motion of the arbor is reversed by a slight pressure of the foot on the lever, P, which connects with the clutch, Q. The cutters are so constructed that the work is done equally well with the arbor running in either direction to cut with the grain of the wood. It is claimed that by this machine are gained the advantages of rapidity of work, the obviation of the necessity of skilled labor, perfection and strength in the joints, and the means of manufacturing check rail sash as cheaply as common sash, with uniformity of work, so that parts may be made and laid away for future use and easily put together at any time, and an appliance for shaping circular sash and moldings.

The machine is on exhibition at the S. A. Woods Machine Co's. salerooms, 91 Liberty street, New York, and 67 Sudbury street, Boston. For further particulars, address Van Gilder & Goodlander, agents for the United States, Williamsport, Pa.

CHEMICAL EXPERIMENTS FOR YOUTHFUL READERS.

From the British Photographic Journal Almanac.

The series of experiments here presented are intended for the younger readers, for whose benefit they are presented in as attractive and even sensational style as possible, in the confident belief that no experiment here indicated will be performed by a youth without gaining by such trials an insight, however small it may be, into some chemical action of which he previously may have been quite ignorant; and they will thus serve an educational purpose as well as conduce to the occasional spending of a pleasant hour. All the chemicals to be mentioned can be obtained readily.

1. To make a milky liquid by the admixture of two colorless ones.—In one vessel, which ought to be made of glass, pour a little water, so as to half fill it, and add to it a few grains of common salt, which will speedily dissolve. In another vessel, also half full of pure water, dissolve a few grains of nitrate of silver. Both liquids will be bright and colorless. Now pour one of them into the other, and the resulting mixture is thick and white like milk. When a solution of common salt, which is the chloride of soda, is mixed with a solution of nitrate of silver, the nitric acid of the latter salt combines with the soda of the former, forming nitrate of soda, which is soluble in water, leaving the silver in combination with the chlorine, forming chloride of silver—a white powder which is insoluble in water, to which it therefore gives the appearance of milk. If paper were washed with one of these solutions, and then, after being dried, were brushed over with the other, the chloride of silver would be formed on the surface or in the texture of the paper. In this way is sensitive printing paper prepared.

2. To produce a yellow, cream-like liquid from two colorless ones.—To make cream instead of milk, it is only requisite to substitute for the common salt in the previous experiment a little iodide of potassium or any other soluble iodide. The resulting precipitated powder is iodide of silver. When an iodide of a soluble kind is dissolved in a clear varnish, such as albumen or collodion, a plate of glass coated with such a body becomes of a dense yellow color when immersed in nitrate of silver. This is what takes place whenever a plate is sensitized.

3. To make smoke issue from two empty tumblers.—Moisten the inside of one of the glasses with strong ammonia, and treat the other in a similar way with strong hydrochloric acid. Keep the glasses thus prepared at a distance of two or three feet from each other. Now, taking a juggler's li-

cense with facts, direct the attention of the spectator to the perfect emptiness of the glasses, and, taking one in each hand, hold them up and bring them together slowly mouth to mouth. When a few inches apart from each other, smoke will be seen to issue from them; and if they are held closely together, they will be seen to be filled with a dense white vapor, which will soon condense in the insides of each glass in the form of a white powder. This is a capital experiment for astonishing a few friends; but in performing it as a "trick," care must be taken that the previous preparation of the glasses is not shown. *Rationale:* The vapor from the hydrochloric acid, which is invisible, combines with the ammoniacal vapor, also invisible, and produces, by their combination, chloride of ammonium, or sal ammoniac, in the form of a white powder. If, instead of being moistened with the hydrochloric acid, the glass be filled with chlorine gas, the effect will be somewhat better.

4. To make a liquid that is blue when the bottle containing it is open, and colorless when corked.—Fill a small bottle with liquor ammonia, and place in it a few turnings or filings of copper, corking it immediately. It will remain colorless as long as it is closed, but after the cork has been removed for an hour or two, the liquid will have become of a blue color. Recork the bottle and it soon again becomes colorless; reopen it and it becomes blue as before. Ammonia has no action upon metallic copper; but when the copper is oxidized by exposure to the air it becomes soluble, the blue color being the result of a solution of oxide of copper in ammonia. When the bottle was again corked, the remainder of the metallic copper extracted the surplus oxygen from the portion that had been oxidized and dissolved. It is only when copper is highly oxidized that it produces a blue color in the above circumstances.

5. To produce fluids by the rubbing together of solid bodies.—Triturate an amalgam of lead with an amalgam of bismuth, and a fluid like mercury is immediately produced. By the trituration or rubbing together of any of the following pairs of solid bodies, a fluid will also be formed: Sulphate of zinc and acetate of lead; sulphate of soda and nitrate of ammonia; or sulphate of soda and carbonate of potash.

6. By the mixture of two highly odorous bodies to produce an inodorous one.—The pungent odor of ammonia is too well known to need comment. Into a bottle containing some of this liquid pour, some hydrochloric or nitric acid. The odor of each vanishes, the resulting mixture being quite inodorous. Muriate or nitrate of ammonia is formed by the admixture, and these salts are quite free from smell.

7. By mixing two inodorous bodies to form a highly odorous one.—Mix together in a mortar equal parts of sal ammoniac and quicklime. Ammoniacal gas is disengaged, which has a powerful and pungent odor.

8. To produce a very hot liquid by mixing two cold ones.—Half fill with water a small bottle capable of being easily held by the grasp, and then pour sulphuric acid slowly into it. The mixture will soon become so hot as to compel the person holding it to set it down. The bulk of the liquid, too, will be found to have diminished.

9. A fine solid green pigment made by mixing together a blue and colorless solution.—Have two solutions made, one of them being of sulphate of copper and the other of carbonate of soda. Pour a little of the latter into the former, and the richly colored paint known as French green will be immediately formed and precipitated. Remove the liquid by filtration. By this mixture, subcarbonate of copper, the pigment above named, is formed.

10. To convert two clear and colorless liquids into a solid mass.—There are several ways of performing this experiment, which never fails to excite intense wonder in those who are unacquainted with the working of chemical miracles. Here is the appearance presented by one of them, as I once saw it performed by a parlor magician. On the table stood two bottles containing apparently water, a glass tumbler, and two glass rods for stirring with. The "Professor" first poured into the tumbler a portion of the contents of one of the bottles, and then followed with some from the other, stirring the mixture briskly for a few seconds, when, to the surprise of all present, it became an opaque and almost solid mass. After this had been thoroughly examined by the astonished spectators, the "Professor," uttering a few meaningless words from the jargon of jugglery, touched the mass with the end of one of the glass rods, and immediately the whole was converted into a clear liquid. Explanation: One bottle contained a saturated solution of chloride of calcium, and the other a saturated solution of carbonate of potash. When they were mixed together, they were decomposed, chloride of potassium and carbonate of lime being formed; and as the latter absorbs the whole of the water of solution, a solid body is maintained. The cause of its becoming fluid on being afterwards touched with the glass rod is simply this: One of the rods was a hollow tube, and contained in its interior a little nitric acid, which, having been adroitly poured on the solid mass, immediately converted the insoluble carbonate of lime into the soluble nitrate of lime. There are other compounds by which results of a similar nature can be produced. To a saturated solution of chloride of calcium, add a few drops of sulphuric acid. Sulphate of lime (plaster of Paris) is formed by the reactions. One other method we give: Pour a saturated solution of caustic potash into a saturated solution of Epsom salts, and a similar result will follow. In this case, the sulphuric acid of the Epsom salt (which is sulphate of magnesia) leaves the magnesia to combine with the potash, the magnesia being precipitated as a white powder.

11. To produce an exceedingly intense light.—Into a dish like a child's saucer, put a small heap of saltpeter (nitrate of potash) that has been finely powdered and well dried. In the middle of this make a nest, in which place a bit of phosphorus the size of a small marble. Now turn down the lights in the room, and apply a lighted match to the phosphorus, which will then burn with a light so intense as to dazzle the eyes of those present. The heat caused by the burning phosphorus decomposes the nitrate of potash, and the oxygen thus liberated causes the flame of the phosphorus to become intensely luminous. The room in which this experiment is tried must be well ventilated, as the fumes of phosphoric acid are noxious.

12. Experiments with iron.—(*a*) Write or draw on paper with a solution of sulphate of iron. When dry, it will be invisible; but if a sponge moistened with a solution of gallic acid or pyrogallic acid be passed over it, the previously invisible writing is made as visible as if written with ordinary black ink. The sulphate of iron and the gallic acid react on each other, forming gallate of iron, which is of a black color. Writing ink is made from this mixture. (*b*) If, instead of the gallic acid mentioned in the former experiment, a solution of prussiate of potash be employed, the invisible image will be developed as a fine blue color. By mixing solutions of sulphate of iron and prussiate of potash, Prussian blue is formed; hence the blue color as the result of the experiment. (*c*) Make a rod of iron very hot (a white heat), and then apply the end of the rod to a piece of sulphur. The iron will immediately be fused and fall down in large drops, which must be caught in a vessel of water. If some of these drops be placed in a little sulphuric or nitric acid, they will readily dissolve, but in doing so a smell of an extremely offensive character will be emitted. This smell will be immediately recognized as similar to that for which decayed eggs are so justly noted. The hot iron combines with the sulphur when melting, forming sulphuret of iron. This dissolves in the acid with great readiness, attended by a copious liberation of sulphuretted hydrogen, the offensively smelling gas alluded to. To the presence of this gas in mineral waters is due their medicinal properties, and yet few gases are more poisonous. Before leaving this gas, here is a pretty experiment that can be performed with it: Draw on paper any invisible figures with sugar of lead, nitrate of bismuth, or nitrate of silver. These are invisible at first; but if a current of sulphuretted hydrogen be passed over the surface, everything is brought to light with the utmost distinctness in a beautiful dark brown color. If a current of the gas be passed into a bottle of ammonia, the liquid is converted into sulphide of ammonium—a substance of much use in chemistry.

Progress of Submarine Telegraphs.

Among the cables brought to a completion in 1871 are the China cables. These were, first from Singapore to Saigon and Hong Kong, and again from Hong Kong to Shanghai, from Shanghai to Nagasaki, and from there to Wladiwostock, where the company's lines join the Russian system. It will be seen that by these extensions we have two routes to China, the one by the Great Northern line through Russia, and the other by the various cables and lines to India, thence to Singapore and China.

The completion of the submarine cable from Java to Port Darwin, in Australia, has been too recent to admit of our obtaining details; but it is unquestionably the fact that we are at length telegraphically connected with our antipodes. How soon it will be before communication is established with the southern and most inhabited portions, we are unaware, but in all probability the difficulties of erecting the overland line have been found greater than was anticipated.

Among the other completions are the Holyhead and the several West India cables. The majority of the islands have been connected, and are now in telegraphic working order, but the largest extension, that from Jamaica to Panama, is still incomplete. It may be remembered that, in the attempt to lay this section, the cable broke, and, after some time spent in grappling, was temporarily abandoned, while the further extensions were proceeded with.

The principal of the new cables manufactured and laid during the past year are the German cable from Borkum (Emden) to Lowestoft, a four wire cable (Willoughby Smith's improved gutta percha) of very heavy construction; the cable in the Grecian and Turkish Archipelago, 564 knots; and the several cables for the French Government.

The Channel cable, it may be remembered, was prevented from departing by the Government, who had the opinion that it was a breach of the neutrality law. The cable and ship were, however, released, and the cable was laid for the French Government; but some little time after the war was over, a part of the cable was picked up to be used elsewhere. The Mediterranean cable was a greater undertaking, and was successfully laid between Marseilles and Algiers, over the route of the old cable, which had been speechless for some years. A fault, however, occurred after the laying and after some trouble the cable was successfully repaired by Mr. F. C. Webb. On this occasion, grappling was done in 1,000 fathoms, and the cable recovered, a great feat, considering the rough bottom of the Mediterranean.

A small amount of cable was laid in the Hebrides by the Post Office. This amount would have been increased but for the disastrous fire, which took place at the Silvertown Cable Works and destroyed a large amount of cable and machinery. The damage, however, was soon repaired, and the factory has been for some time again in working order.

A large amount of cable will be noticed as being manufactured for the Anglo-American and Falmouth and Malta Telegraph Companies; this was for repairs and alteration of routes. The Atlantic cables (both) were broken down during the early part of the year, and were not repaired until June. The 1866 cable, being found to be in very bad ground, as was imagined, was removed further south, and an extra amount of cable expended; they have since remained in good working order, and it is hoped they will remain so. The only other Atlantic interruption occurred on the Duxbury section of the French Atlantic cable. This was soon repaired, no interruption to communication being caused by it.

The repairs to the Lisbon and Gibraltar section occupied some time, and they not only included the removal of a portion of the cable from bad ground to a better place nearer the shore, but also laying a duplicate cable from Gibraltar, some little distance above the coast towards Lisbon.

Of the other lines, no interruptions have occurred except to the Great Northern, China, and Japan extensions, the Hong Kong cable having to be repaired; and the Japan section is now again in working order.

The Spanish Government have had their connection with the Balearic Isles renewed, and the Dutch Government have had a cable laid in the Straits of Sunda. The traffic from the West Indies to America has been found sufficient to allow of the duplication of the International Ocean Company's line from Punta Rossa to Key West (Florida).

From present appearances, the progress of submarine telegraphy this year will be small. A company appeared for the extension of a cable from Spain to the Cape de Verde Isles and to Brazil, but as several parties appeared to lay equal claims to the concessions, the project has for the present fallen through.

The silence for so long of two of the Atlantic cables seems to give talk of the laying of a fourth cable, and also of the possible acquisition by the British and American Governments of the existing cables. The laying of a fourth cable, we believe, is very likely to come to pass.

Pyroligneous Products.

One hundred kilogrammes of wood subjected to destructive distillation give 50 kilogrammes of a crude product containing: 2 kilogrammes of methylic alcohol, 3 of crystallizable acetic acid, 10 of tar, 15 of water, 20 of carbon remaining in the retort.

To obtain from this the acetic acid, requires a long and tedious process, consisting in saturating the acid with lime, precipitating this lime as sulphate by the use of sulphate of soda, which leaves acetate of soda, crystallizing this out and igniting it to drive out the tar, crystallizing and recrystallizing; and finally distilling with sulphuric acid, which gives the acetic acid. In manufacturing pyroligneous acid, the product of distillation is simply allowed to remain in contact with iron turnings until the acid is saturated. To purify the crude article, the author offers a new method, by which the acid may be sufficiently purified to be made to unite with soda, alumina, copper, etc., while the alcohol is saved. By distilling the wood with ten per cent sulphuric acid, the acetic acid may be readily separated; also by this method a yellow compound, insoluble in water cooled below 15°. On distilling dry wood at a high temperature (about 700°), gaseous products and an oil of extraordinary illuminating power are obtained. The method to be used is not precisely stated, but the author claims that a profit of over 18 francs can be made on every 100 kilogrammes of wood, by his process.—*M. Maiche.*

How to Bend Glass Tubes.

It is well known that it requires some tact to bend a tube with an even curve and without collapsing its sides, and many chemists never do succeed in bending them skillfully. Although having no particular skill in this matter, I never fail to bend them perfectly satisfactorily by using a flame different from the one usually employed; the flame is one given by the Bunsen burner, described in my article on alkali determination in silicates. (See *American Chemist,* Vol. I, page 407.) Use a Bunsen burner, having the extremity flattened out so as to give a short and thin but broad flame, something like the flame of an ordinary gas burner. The tube is placed in this flame and turned round and round until a good heat is given to the tube; it is then withdrawn from the flame and bent, when it does so with a perfect curve and no collapse of the sides of the tube. Of course this is only intended for the smaller tubes, but a tube of one third of an inch and more can be thus bent very readily.—*J. L. Smith.*

The San Gregorio Meteorite.

Six meteorites from this region have been thus far noticed five of which have been analyzed by the writer. Of the sixth, no specimen has as yet been detached. They were found within or very near the boundaries of the Mexican Desert, which is about 400 miles in width by 500 miles in length, and situated in the provinces of Cohahuila and Chihuahua.

Professor J. Lawrence Smith advances the conjecture, based upon his analysis and examinations, that five of these meteorites were derived from the same original mass, moving over the territory from northeast to southwest. Two of these meteorites are estimated to weigh three and four thousand pounds respectively.

The San Gregorio meteorite has an extreme length of six and one half feet, is five and one half feet high and four feet thick, and is estimated to weigh about five tons. An analysis gave: Iron, 95·01, nickel, 4·22, cobalt, 0·51, copper, a minute trace, phosphorus, 0·08.

THE WEST BLOOMFIELD GAS WELL.—Prof. S. A. Lattimore, of Rochester University, has recently made a careful photometric test of the illuminating power of the gas of the West Bloomfield well, and found it to be 14·42 candles. He estimates the flow of the well to be 800,000 feet per 24 hours. The main to convey the gas to Rochester is being rapidly laid down, and it is thought that the city will, before long, derive all its light from this well. Who knows but gas wells are to play a more important part in the world than oil wells?

STATE EDUCATION AND THE LABOR QUESTION.

There is every probability that these two subjects will occupy a large share of the attention of our legislative bodies for some time to come. Rudimentary education is free to all in this country, and the opportunity afforded to every one to acquire an education sufficient to read and write is a result of which we have some right, as a nation, to be proud. But technical education is sadly wanting in most of our States; and owing to this, and to the want of some good system of apprenticeship, the supply of native skilled labor does not keep pace with the demand, and the result is that our shops and manufactories are filled with mechanics and artisans from abroad, who bring with them the prejudices, existing among the laboring classes of the countries they come from which are antagonistic, in some respects, to our notions of free rights.

These truths are acknowledged by all our best thinkers and writers on the questions of labor and education, and recently Governor Washburn, of Massachusetts, in his inaugural address to the legislature of that State, has spoken candidly and sensibly on the subject. We are unable to give more than a few extracts from his excellent address; these are as follows:

"We shall not reach our highest development as a commonwealth until our elementary and classical schools are supplemented by institutions for instruction in the industries on which our prosperity so largely depends. Of our present population, probably two thirds are engaged in mechanical or manufacturing pursuits, or dependent upon those so engaged. The State has established an agricultural College for her farmers, and from the beginning of her history has dealt generously with such of her sons as aspired to knowledge of the higher branches of learning; but has done little for the education of her mechanics in their particular field of labor. Her duty to encourage and promote the special education of these classes rests upon two grounds; first, the welfare of the individuals directly concerned; and, second, the preservation of our manufacturing supremacy. A great part of the work of many manufacturing establishments is so dependent upon scientific attainment that it must ultimately take rank as a learned profession. Not only are a knowledge of chemistry and a somewhat extended acquaintance with mathematics highly desirable to the mechanic who aims at an advanced position in his trade; but skill in drawing is universally important and valuable, and it is with pleasure that I notice the introduction of teachers of drawing into some of our public schools."

On the subject of the condition of the working population, the Governor spoke to the following effect:

"I commend to your candid and cordial consideration the varied interests of those who are denominated the laboring portion of our citizens. The question of practical concern is not so much whether the condition of this class is better or worse here than in other sections of the country as whether that condition is satisfactory—whether it is what it might be made by honest and resolute endeavor, what it should be made by those who have the well being of the commonwealth deeply at heart. To this question I am sure no one will venture an affirmative reply. Neither is it of paramount importance to determine whether the situation of this large body of persons is better or worse than it was formerly. Our view should be forward and not backward. Many seem to hold the opinion that if the working men and working women, as they are commonly designated, receive constant employment and are adequately remunerated: if they gain the needful bread and meat in exchange for their labor, if they have comfortable homes and enough for the decent support of themselves and their families, it is their duty to be therewith content. But this is a narrow judgment of the matter in issue. They ought not only to perform their daily tasks faithfully, but be so circumstanced that they will perform them cheerfully. In so far as lies within our power, we ought to remove every just cause of complaint. Every human being should have higher and nobler aspirations than merely to provide food and clothing for the body. This should never content him. The head of a family ought to have time for study, thought, reading, recreation, innocent pleasure; he properly desires to give his children a better education than he had, and furnish them advantages superior to those he himself enjoyed.

The fact that there is unrest and dissatisfaction when man is confined to unremitting toil, is one of the brightest and most healthy omens of the times. It is an indication that his better nature is struggling for emancipation; it is a hopeful sign of finer and nobler manhood in the future. Such efforts for improvement should never be discouraged, but always encouraged. That there ever have been and ever will be grades of society, is true enough; the statesman should seek to diminish the distance between the extremes by elevating the lower. It has been said that as soon as the materials for the construction of society were brought together, they proceeded forthwith to arrange themselves in layers—the stronger, more nimble and more cunning of the living constituents climbing to the higher places, and forcing upon those below the office of upholding them in their elevation. As the pyramid was originally built, so it remains in its general design. Within the heaving mass of multitudinous life, individual atoms are constantly changing places, but without destroying, however much disturbing, the primitive distribution into layers. These are still disposed one above the other, in a gradually diminishing series.

Standing still is not the province of society; it must either advance or retrograde. Especially under such a government as ours, change is almost a normal condition and an inherent necessity. The pyramid continues to uplift itself as an entirety; but atoms in the bottom layer of to-day may be in top layer of to-morrow. Hence one reason why it becomes us to fairly and honestly examine the conditions of the laboring classes, upon whom the whole superstructure of the social organism rests. Because they are a part of ourselves, it devolves upon us to relieve them, as far as possible, from the grievances to which they are subjected. Their existence is not separate from the existence of the State; what tends to to their welfare is calculated to promote the general welfare; in the last analysis their interest is identical with the interest of the upper classes; the least addition to their comfort is a gain to the whole community; and if their case is considered in the right spirit, there is no good cause for antagonistic feeling.

The question raised by them and in their behalf can never be adjusted by the two extremes—those anxious to secure the greatest possible amount of pay for the least possible work, and those anxious to obtain the greatest possible amount of work for the least possible pay. Nor will relief come with the determination how many hours shall constitute a legal day's work. For no period can be fixed which should be applicable alike to all. The ingenious, skilled laborer who uses mind as well as muscle cannot apply him self the same number of hours to his task as he who merely handles the hoe or shovel, holds the plow or drives the oxen, uses the trowel or weaves at the loom. The great *desideratum* is to determine what would be a fair division of profits between the employer and the employee. Settle the question as to compensation per hour, and there will be no serious difficulty about the number of hours. Let us not expect to adjust the issue confronting us by lecturing the laboring classes. We must be willing to meet them on their own ground and discuss the matter at stake from their point of view."

Artificial Milk.

M. Dubrunfant contends that milk is simply an emulsion of neutral fatty matter in a slightly alkaline liquid, such as can be artificially imitated; and that the process of churning consists in hastening the lactic fermentation, thereby acidifying the serum of the milk, and at the same time agglomerating the fatty matter which the acidity sets free from its emulsion. He further controverts the cellular theory, by showing that the fat globules of milk do not display any double refraction, as do all organized membranous tissues.

Having thus examined the theoretical constitution of milk, he proceeds to the practical method of imitating it, and gives the following directions: Add to half a pint of water, an ounce and a half of saccharine material (cane sugar, glucose, or sugar of milk), one ounce of dry albumen (made from white of eggs), and 20 or 30 grains of subcarbonate of soda. These are to be agitated with an ounce or more of olive oil or other comestible fatty matter until they form an emulsion. This may be done either with warm or cold water, but the temperature of from 50° to 60° C. is recommended. The result is a pasty liquid, which, by further admixture with its own bulk of water, assumes the consistency and general appearance of milk.

Luxuriously minded people, who prefer rich cream to ordinary milk, can obtain it by doubling the quantity of fatty matter, and substituting 30 or 40 grains of gelatin for the dry albumen. The researches of Dumas and Frémy having reinstated gelatin among the nitrogenous alimentary materials, M. Dubrunfant prefers gelatin to albumen; it is cheaper, more easily obtained, and the slight viscosity which it gives to the liquid materially assists the formation and maintenance of the emulsion. He especially recommends this in the manufacture of "siege milk" on account of the obviously numerous articles from which gelatin may be obtained.

The uses of artificial milk need not be limited to supplying the wants of the residents of besieged cities. As an ordinary element of the human breakfast table, it is not likely to supersede the product of the cow, but calves are suggested as being superior to vulgar human prejudices. In the ordinary course of rearing, these animals demand a large proportion of the milk of their mothers, and are commonly ill fed or prematurely sacrificed on that account. By feeding them luxuriously on artificial milk (which may be still further cheapened by using colza oil, which has been rendered tasteless and alimentary by the frying process), the milk, butter, and cheese of the cow may be considerably economized, and the supply of veal improved, both in quantity and quality, by keeping the calves a much longer time before they are killed.

I might make further suggestions in the direction of "dairy fed pork," etc., but this is unnecessary; the commercial instinct is sufficiently strong to avail itself of all such cheapening applications of science. Those who are professionally engaged in detecting the adulterations of food will do well to study the physical peculiarities by which M. Dubrunfant's milk may be distinguished from that of the cow, both in ordinary and condensed form. By substituting vegetable albumen for the white of egg or gelatin, the vegetarian may prepare for himself a milk that will satisfy his uttermost aspirations.—*Nature.*

The *Milk Journal*, commenting on the foregoing, says:

Prejudice, *Nature* appears to think, would prevent this excellent concoction from being taken at breakfast times instead of the produce of the cow. But our contemporary believes that calves would rise superior to human prejudices, and accept it with thankfulness, or greediness which, in such cases, would be a calf's substitute for thankfulness.

Such of our readers as are familiar with the composition of milk will be amused with the expedient of substituting carbonate of soda for the phosphate of lime and salt, which form the mineral constituents of real milk, and will suspect that "the strictly scientific manner" which governed this procedure consisted in falling into the vulgar error which was exposed in our pages some time ago. The albumen derived from white of egg is a very different thing from caseine chemically considered, as we have pointed out, and as Hlasiwetz and Habermann have also shown still more recently. Butter fats, too, we think, may easily be distinguished from olive oil.

Marble Dressing and Carving Machine.

This machine consists in a tubular stock or case, containing a drill or carving tool capable of reciprocating or rotating, or both, jointed, to the end of a rod or shaft mounted in a tube pivoted in the top of a stand, so that it can oscillate, around the vertical axis of the stand and also on its own axis, while it can slide freely endwise.

This rod carries at one end a pulley and crank or eccentric shaft for actuating the drill for causing it to strike blows, while it is slowly turned by the hands of the attendant. Or the shaft may gear with the shaft of the drill by bevel gears, to give it a constant rotary motion while being held in contact with the work by the attendant; and motion is imparted to said shaft by a belt working from a driving pulley below, over a guide pulley in the top of the stand, under the rod, and thence in one direction to the pulley working the drill, and in the other direction on a guide pulley in the opposite end of the drill holding rod, in such manner that its action is not interfered with by the shifting of the drill holding rod endwise.

When this machine is run at a high speed—say two thousand strokes per minute—it is claimed to be very efficient in carving and sculpturing upon marble, being perfectly manageable and capable of having the drills pointed in any direction, and will do the cutting required in lettering marble as fast as the tool can be properly guided and directed on the surface by an expert,

The inventor and patentee is Mr. Greene V. Black, of Jacksonville, Ill.

Professor Tyndall and the Boys.

Professor Tyndall—the best of all living *savans* for making the truths of science familiar to the meanest understanding—signalized the Christmas anniversary in London by a talk to the boys. A correspondent says of him:

Dr. Tyndall, talking to boys, is more like an older and better informed boy than the others, chatting with them, than I thought it possible for a Professor to be; while his illustrations and asides take his address completely out of the dull and dry category, and put his young audience completely at their ease. Why, he lit a cigar in one of his experiments, and positively smoked it for a second or two; telling us all that when he did the same thing some years ago at Cambridge, he astonished the dons there very much. "I don't suppose any one had ventured to light a cigar in the Cambridge Senate house before," remarked the Professor, "and the great people assembled in it looked as if they thought I oughtn't to have taken the liberty." This said, while a cigar is being lit, and as a prelude to its being put between the professional lips and puffed at, delighted the boys and girls. One professor outraging the conventional susceptibilities of other professors, and telling the story as a good joke, is just the thing to hit boy nature, and if Dr. Tyndall had wanted volunteers for a desperately forlorn hope, my opinion is that he might have counted upon half the lads present.

Again, when explaining the process by which frost and snow had been produced on one of the vessels before him, and scraping the snow from its sides, the lecturer won all hearts. "There's more snow than I expected to find; enough, you see, to make a snowball; and if I were very wicked, I could actually (doing it) make a snowball out of what is here, and pelt Mr. Blank (the lecturer's assistant) with it." Professor Tyndall suited the action to the words, and having compressed the snow until it was hard and compact, took elaborate aim at the gentleman assisting him (whose back was turned), and sent the snowball spinning past him and within a foot of his head. It may be imagined how the boys roared at this; and though these illustrations were exceptional, the pleasant, friendly, and familiar manner and speech maintained throughout were equally noteworthy, as were the surprising pains taken to follow each chain of reasoning fairly out. The boys or girls who fail to master the principles of what is being put before them at the Royal Institution must be singularly obtuse.

The Air in Wells.

Mr. J. S. Kessler, of Allentown, Pa., writes as follows: "I was sent, to an ore bed in the vicinity, to examine or repair a pump in a well about 80 feet deep. The well was open, with a temporary shed over it; it was close to the engine house. The sky was cloudy, and the atmosphere very damp. On descending, the light was extinguished at about 20 feet from the surface; and a similar thing occurred on a second attempt, which was made after throwing several buckets of water into the well. As I did not feel inclined to go down, the engineer assured me that he had been down on several occasions under the like conditions; whereupon I agreed to see him go down. Finding him to be all right after an interval of a few minutes, I ventured down, having previously opened the roof directly over the well to admit the light. Nearly an hour was spent in repairing the pump, during which time the engineer made several attempts to strike a light, but had no success. I did not experience any inconvenience other than the very fast breathing caused by any physical exertion, and on coming out I felt as well as before. Being somewhat acquainted with natural philosophy, which teaches that air which does not support combustion cannot support animal life, I am puzzled at the apparent contradiction. What could have been the cause of it? I cannot entertain the opinion that it was carbonic acid gas."

REMOVAL OF OIL FROM WOOL.

This method of separating oils, fats, and resins, from the solid substances with which they are mechanically combined has been heretofore in use for the purpose of removing the animal oil from wool, and also for the purpose of cleansing and restoring to use those portions of fleeces which have been made unavailable by marking the sheep with tar or other resinous material. It has been employed for supplementing the mechanical process of separating oil from seeds or olives by operating on the solidified residues which are known under the name of oil cake, *marc*, etc. At the International Exposition of 1862, Mr. E. Deiss, of Paris, exhibited specimens of superior oils extracted in this manner from the *marc* of olives. Mr. Payen, in his report on that exposition, has described the process as originally applied successfully to the cleansing of wool by Mr. Moison, of Mouy, Department of the Oise, in France; and as this process illustrates the principle of the operation in other cases, though the details may be different, Dr. Barnard, in his report, gives it in abridged form.

It is to be observed, in the first place, that the case of wool presents a difficulty, which is not encountered when the object in view is only to obtain the oil which the substance operated on happens to contain.

The wool itself is in this case the important material, and the value of the oil separated from it is a trifle of secondary consequence. In the original experiments the point of difficulty in the practical problem was found to be how to expel the bisulphide from the wool after the operation of solution had been completed, without injury to the wool itself. Too great heat, in whatever manner applied, was found to have the effect of hardening the fibers, making them cohere, and giving them a tinge of a yellowish brown color, which was variable in intensity according as the material had been a longer or shorter time in contact with the fatty matters removed. The mere volatilization of the bisulphide was effected without difficulty. It sufficed for this to introduce, into the vessel containing the material to be operated on, either boiling water or steam; but the injurious effects above described invariably followed. Mr. Moison discovered at length that with proper arrangements a current of air heated to a temperature considerably below that of boiling water, 70° or 80°C=160° to 175° F., would remove the liquid entirely, and leave the fiber of the wool wholly uninjured.

The apparatus employed in conducting this process is shown in the engraving. The wool to subjected to the operation is introduced into a cast iron cylinder, A, surrounded by a jacket into which steam may be conducted when it is necessary to raise the temperature. One hundred kilogrammes, say two hundred and fourteen pounds, of wool are placed in this cylinder at once.

There is within the cylinder a false bottom perforated with numerous holes, with a small free space beneath it. Upon the top of the wool is placed a circular follower or compressor, fitting the interior of the cylinder, and perforated also with holes like the false bottom. Three rods connected with this follower pass through stuffing boxes in the lid, and may be driven downward by means of fixed screw nuts, the rods having screw threads cut upon their prolongations above the cylinder. The object of this arrangement is to compress the wool to a certain extent, since the success of the operation is always most satisfactory when the mass of the material is reduced in advance to about one half its original volume.

The lid is secured air tight by means of bolts and screws, a leaden washer being introduced into the joint. Matters being thus prepared, liquid bisulphide of carbon is thrown into the cylinder beneath the false bottom by means of a forcing pump, C, which draws the liquid from a reservoir, D. This liquid rises through the perforations and completely immerses the confined wool, reaching at length a point above the perforated follower, where it finds a lateral overflow tube. This conducts it into the still or alembic B. Here the bisulphide is volatilized by the heat of steam, which is introduced into the double bottom of the vessel and also into the midst of the liquid mass itself by means of a spiral tube within the alembic, not shown in the figure. When the process is complete and the oil in the alembic is entirely free from the bisulphide, the stopcock beneath permits to withdraw the product. Before this is done, however, steam is introduced into the mass of the impure oil by means of a second spiral tube, which is also not shown, and which is perforated with numerous holes. The design and the effect of this part of the process is to remove the last traces of the solvent.

The vapor of the bisulphide is conducted from the alembic to the refrigerator J, where it is condensed in the spiral L, and is finally returned to the reservoir D.

There is a stopcock in the overflow tube which leads from A to B, through which may be withdrawn at any time a few drops of the liquid passing through the tube. When the specimen thus withdrawn, on evaporation upon glass, leaves no trace of oil or other residuum, the operation of the pump C, may be suspended. For a short distance, this tube is of glass for the purpose of enabling the attendant to observe the color of the passing liquid.

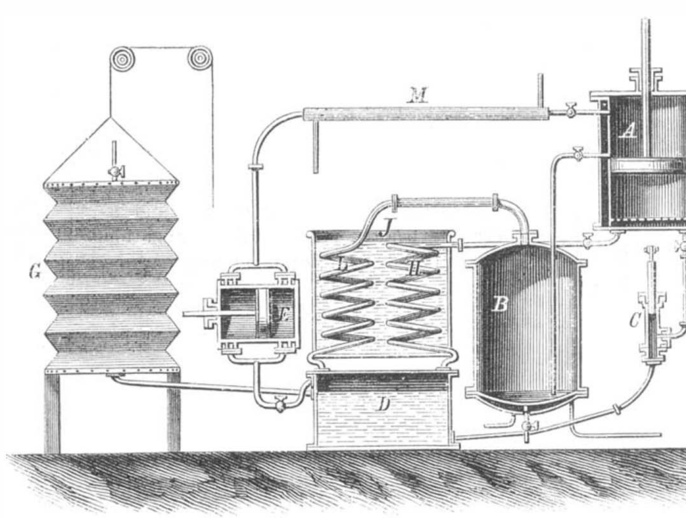
The process of solution being complete, communication with C, is cut off by means of a stopcock, and two other stopcocks are opened. One of these permits the liquid, in A, to descend through the spiral H, to the reservoir D. The other allows air to be introduced into the upper part of A by means of the double acting piston blower, E. The air, as the figure shows, may be drawn from D; but the stop cock beneath E is a three way cock, and it allows the supply to be taken also from the atmosphere. In passing from E to A, the air is conducted through the jacketed tube, M, and steam is introduced into the jacket to heat it to a degree sufficient to complete the volatilization of the bisulphide in A. But the first part of this operation, which consists in the mechanical expulsion of the bulk of the liquid in A, may be conducted without heat. The cock in the tube leading from A to H is a three way cock, as well as that beneath E. At the close of the operation, the air blown through may be discharged into the atmosphere without passing through H. In that case it is conducted, by a long tube not shown, out of the building, in order that any disagreeable odor which may accompany it may not annoy the attendants. The two spiral tubes, H and L, pass out of the refrigerator J, before entering the reservoir D. At these points they are provided with small stopcocks not shown, to permit the examination of the substances passing through them. Into each of these tubes, also, as into the one leading from A to the alembic, is introduced a short glass tube as a part of its length, so that the interior of any one of them may be inspected.

There remains one additional portion of the apparatus to be mentioned, which is the gasometer G. While the process is proceeding without any communication with the atmosphere, the volume of the confined air may vary with the temperature, or with the compression in A, and the volatilization of the bisulphide will also add something to the bulk of the aeriform mass. The gasometer, which may be as represented of the bellows form, or may be the ordinary bell and cistern, will serve to keep the capacity of the apparatus properly adjusted to the varying volume of the contents.

The boiling point of the bisulphide of carbon is 48°C=118° F. If the air introduced into A is therefore heated to 70° or 80° C., the volatilization will be rapid; and this temperature does not effect injuriously either the structure or the color of the wool.

A considerable economical advantage is obtained by this process, in the mere recovery to use of considerable quantities of wool which have been ruined by the pitch employed in marking. The animal oil separated has also some value.

But the same process employed to dissolve the oils contained in the strippings of machine cards in factories, which amounts to one third of the entire weight, is the source of a considerable saving. This oil is what has been added in



previous stages of the manufacture; and, after being thus recovered, it may be used again.

The wool which has been freed from oil by the process above described, on being subjected to the operation of the picking and beating machines preliminary to carding, yields a large proportion of fine fragments, or what may be called wool dust, said by Mr. Payen to amount to forty-two per cent of the total weight. This is valuable as a fertilizer in in agriculture, and is so turned to account. Under former modes of treatment, it was a total loss.

But the application of the process above described has been more recently extended to a great variety of purposes. Thus, when the pitchy glycerin deposits formed during the saponification with sulphuric acid—which is made a preliminary to the distillation of fatty bodies—are acted upon by the bisulphide, they yield a considerable quantity of stearin amounting to eighteen or twenty per cent of their weight. The waste grease of the kitchen, the exudations which take place from the axles of vehicles or the journal boxes of machinery, and all similar forms of oils and fats, contaminated by impurities which, though they form but a small part of the weight, destroy entirely the value, are completely restored by this process, which recovers the valuable portion, and leaves the impurities behind. Rags, swabs, and fibrous materials of any kind, which have been employed in cleaning machinery or the parts of locomotives which it is necessary to oil, soon become saturated to such an extent that they are commonly thrown aside as useless; but these give up a large amount of oil to the solvent employed in the new process, which is in itself a gain; and the process also gives to the rags themselves a value which they had lost, since it permits them to be re-employed for the same purposes as before, or to be used in the manufacture of paper.

In the direct extraction of wax by pressure, there is left in the solid residue a proportion of twenty per cent of valuable material which may be recovered by solution in bisulphide of carbon. This does not render the residue unfit for use as a fertilizer (the purpose to which it is commonly applied), but rather improves it. Sawdust, which has been used for the filtration of oils purified by sulphuric acid, yields to this process fifteen or eighteen per cent of its weight. The acid impurities separated from oils in the process of purification by agitation with a small proportion of sulphuric acid, furnish by proper treatment with bisulphide of carbon half their weight of pure oil.

Bones of animals obtained from shambles, from the streets, from kitchens, and from various other sources, are used to the extent of many millions pounds annually in every country, for the manufactures of glue and of animal charcoal. These are usually to some extent exhausted of their oils by boiling, before being used in the manufactures for which they are intended; but the boiling separates only six or seven per cent, while the bisulphide process extracts ten or eleven. The oil cakes, which are formed in the mechanical process of the expression of oils from seeds of various kinds, furnish, as mentioned above, a large proportion of oil which the press has left behind. These cakes are sometimes broken up, reduced to powder, and pressed again with the aid of heat. But the labor of the second compression is greater than that of the first, and the product is less, while it still leaves the residue unexhausted. The cakes have a value as food for animals. It was at first supposed that the complete removal of their oil would injure them for this use, but experience has shown this impression to be an error. It is asserted by Messrs. Schlinck and Rutsch, the exhibitors, to have been fully proved by experiments on a large scale already made, that in regard to the production of milk, butter, and flesh, the residua from which the oil has been thoroughly extracted are far superior to the pressed cakes, and that they retain their good qualities as food for animals though kept long in store.

The compacted masses, left in the extraction of tallow or lard by pressure, furnish twenty per cent additional when treated with bisulphide of carbon. The residue from the compression of cacao gives a similar increase of product on similar treatment. Finally, the *marc* of olives, as exemplified in the exposition of Mr. Deiss, furnishes quantities of excellent oil, which the press fails to separate.

The peculiarity of the industry of Messrs. Schlinck and Rutsch is that they do not take the trouble to use the compression process at all in their treatment of the oleaginous seeds from which their oils are obtained; that is to say, they do not first extract a portion of the oil by pressure, and then subject the residuum to the action of the solvent, as has been done by others before them.

Cleaning Watches and Clocks.

This invention consists in immersing the "movements" of clocks and watches in naphtha or some equivalent volatile liquid, and exposing them to heated air, thereby, it is claimed, saving much time and expense.

The inventor thus describes his process: "In carrying out my invention and discovery, I in the first place take the "movement" of the watch or the clock from its case; and in case the watch has a "dust-proof cap," that also is removed, so that the liquid will have a free circulation through the works. I now hold the movement with a pair of pliers or other instrument, and immerse it in pure naphtha or other pure volatile liquid of a similar nature. While the movement is immersed it is moved about or twirled in the liquid, so that all parts will be exposed to its action, and so that the liquid will pass rapidly through the works, and wash the dust and clean away the old oil. This operation is completed in a few minutes, after which the movement is exposed to air heated to a temperature a little above that of the surrounding atmosphere.

The evaporation of the naphtha or other volatile liquid is so rapid, after the movement is taken from it, that, unless it is exposed to artificial heat, the moisture of the common atmosphere will be condensed upon it, giving it the appearance of "sweating." From this higher temperature, the movement is cooled down gradually to that of the surrounding atmosphere. The pivots or frictional points are touched with lubricating oil, and the work is done.

The whole process necessarily occupies not more than six or eight minutes of time. The result is satisfactory in every particular, as frequent experiments have proved, while the actual cost is almost nothing when compared with the price ordinarily charged for cleaning watches and clocks. No taking to pieces and brushing can make the parts more perfectly clean and bright than my process."

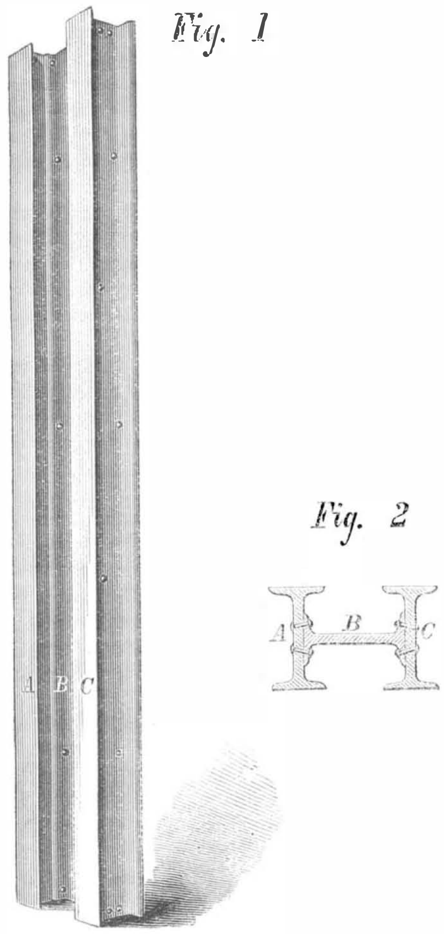
Mr. William W. Thompson, of Smithville, Ga., has just patented this invention through the Scientific American Patent Agency.

BLEACHING.—The residues from the manufacture of chlorine, consisting chiefly of chloride of manganese, are treated with chalk to precipitate the iron; after separating the liquid from this precipitate by decantation, the manganese is precipitated as sesqui-oxide by lime. This last, by heating with soda in a current of air, gives the green manganate of soda. The mass contains 50 to 60 per cent of pure manganate. On mixing it with sulphate of magnesia and adding water, a solution of permanganate is obtained. The principle on which the bleaching depends is the deoxidation of the permanganate in contact with the coloring matters accompanying vegetable or animal fibers. A deposit of oxide of manganese is formed on the goods, which, by the action of sulphurous acid, is converted into sulphate of the protoxide, and may be washed out, leaving the goods white. The sulphurous acid is prepared by heating dry copperas with sulphur to a low red heat.—*Tessie du Motay.*

WROUGHT IRON AND STEEL POSTS.

The accompanying engravings show the construction of a wrought iron or steel post, for which a patent has just been obtained by W. A. Gunn, of Lexington, Ky., through the Scientific American Patent Agency. It is intended to take the place of cast iron columns, and box, cylindrical, and other forms of posts, chords for bridges, and columns for buildings, for which it is claimed to be a very economical device.

It consists simply of three I beams united in the form of



the letter H. The inventor claims for it the following advantages: All the material is useful to sustain the weight, no loss being incurred to obtain stiffness; the component parts of the post, being among the most rigid forms of wrought iron, may be regarded as perfectly stiff for longer distances than the parts of boxes or columns, and hence less riveting is required than in others, less cutting of the material, less labor, and less weakening of the post, so that, it is claimed, one fourth the rivets used in the ordinary forms will be sufficient in this; as a post yields by flexure, it is strong in proportion to its ability to sustain a cross strain; the I beam being considered the strongest form to resist a cross strain, and this post being really an I beam in both directions, the inventor adopts it as adapted to this purpose; it will also, on this account, be useful for girders and bridge chords; the riveting, being on the interior part of the post, weakens it less than when on the exterior part; it is also adapted to the parts of bridges which may be subjected to tension as well as compression; as different sizes of beams may be used at will, the dimensions of posts may be easily graduated to any size required; the parts being quite a common form of iron, no special machinery is required for their construction; the whole surface is exposed and can be painted readily, while hollow posts are liable to be injured by rust on the inner surfaces.

In the engravings, A, B, and C represent I bars or beams of wrought iron or steel. The bars, A and C, are placed with their sides against the edges of the bar, B, and are riveted as shown, the rivets passing through the flanges of B, and through the webs or bodies of A and C. The rivets are not placed opposite each other in the different bars, and, as above stated, are placed further apart than in ordinary beams.

Patented January 2, 1872. For further particulars, address the patentee as above.

Elevators for Private Houses.

This is a small, light, cheap, and economical elevator, principally adapted for use in private houses, the "cage" or "car" of which is constructed of wire, the elliptical shape being preferred, and attached and detached at pleasure, by suitable means, to an up and down, continuously moving, endless chain.

The chain passes around pulleys at the top and bottom of the passage, and is propelled by a motive power competent to pull up and down about one half the maximum weight proposed to be elevated or lowered. The cage is guided up and down by a suitable number of wire rods or ribs, which press outward against the guides, in which are gaged suitable slots for retaining the rods.

The counterpoises are so attached as to pull against the weight, which causes the ribs of the sides to spring inward, away from the guides, so as to move freely up and down. Whenever disconnected, the ribs of the cage spring outward and bind against the guides, the friction bei g increased, if necessary, by short bends in the rims at the top, which, when not pulled by the counterpoises, will enter notches cut at the back of the slots. One of the ribs has a bend or two to catch in notches in that guide which is between the up and down running parts of the chain, and has a hook on each side, so that by springing the rib inward and sidewise a hook will catch in the chain, and the rib will be released from the guide.

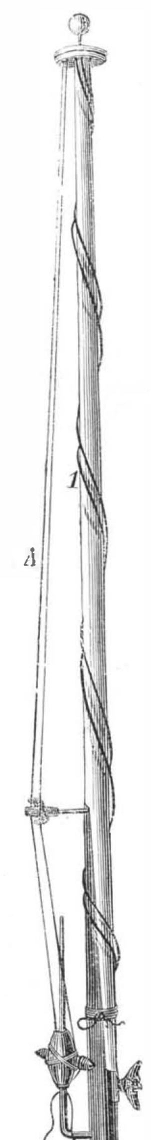
The hook on one side will, at pleasure, catch on that part of the chain running upward and thus pull the cage up; or the other hook, at pleasure, will catch on the down running part of the chain and pull against the counterpoises and lower the cage. There is on each side of the rib an eccentric button, held in one position by suitable springs; by pulling properly attached cords or wires the buttons are turned so that either one, at will, will pass behind the rib, and first press it inward and then sidewise until the hook catches the chain on the opposite side; by turning the other button, it will be released, and the rim will then fly back into position and hold the cage stationary. There are suitable projections arranged—one at the top, the other at the bottom—which will catch upon a button and release the rib which is attached to the chain, and prevent the cage from being pulled against the ends of the passage way. If the chain should break, the hook being released will allow the rib to fly back into its normal position and hold the car stationary.

Although an endless continuously moving chain is employed, the inventor does not limit himself to it, for it may, at pleasure, be varied, and the cage be moved in both directions by one part; or a chain winding on and off drums at each end of the way, and having reversible driving gear, will be applicable to the apparatus without any material change of the latter.

Mr. James D. Warner, of Brooklyn, N. Y., is the patentee of this invention.

ALBERT'S METHOD OF SECURING FLAG HALYARDS.

Flags are used in the aggregate not more than one month in twelve, yet, in the usual way of securing halyards, they are subjected to constant strains during wet weather, and are whipped by the winds in dry weather, so that they are worn fully as much when out of use as when employed. On the ferryboats, they are usually wound spirally about the pole, forming by their attrition a stripe where the paint is worn away, making the staff appear like a veritable barber's pole. When flags are used on buildings, the halyards are usually wound so tight on the cleats that when wet they are either parted, stranded, or weakened by the contraction of the rope, and are unable to support the flag when again hoisted. To repair and readjust them requires some one to climb the flagstaff, a kind of operation for which few are fitted except telegraph pole climbers, who, with their artificial spurs, mar the pole and injure its beauty. Now, by the invention illustrated in the accompanying engraving, all these evils and inconveniences may be avoided, and the halyards, which are the most expensive kind of rope of equal weight used on shipboard, may be preserved for a long time in perfect order, and at all times ready for use.



The invention consists of three pieces, namely, a bent bar having a footstep which is attached by three screws to the flagstaff, or having this part modified in form so as to be conveniently seized to the backstays on shipboard, a traveller or weight which slides up and down on the vertical part of the bent rod aforesaid, and, third, a fair-leader, which keeps the bite of the halyards separate in all weathers and prevents them from whipping the mast. When the flag is up, the halyard is belayed to the cleat. When the flag is down, it is belayed to the traveller.

The traveller has a belaying pin to which the halyard is belayed, as shown, the pin being wound with tarred cord to prevent wear of the rope, as is also the fair-leader. This simple and common sense invention can be applied at small expense, and would, if employed, save much money and trouble to the users of flags.

The invention was patented September 26th, 1871, by Captain William Albert, an old sea captain, who has learned by experience the value of a better method of securing halyards than existed before his ingenuity supplied the deficiency.

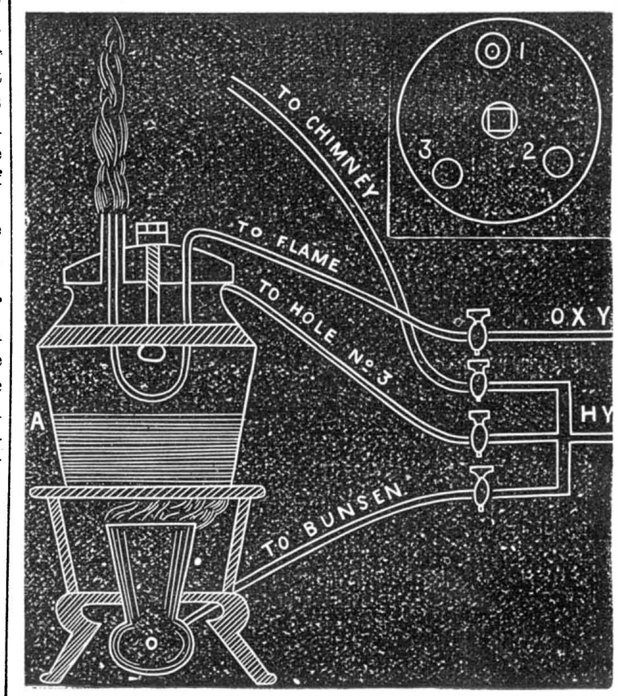
Further information may be obtained by addressing Capt. James Borland & Co., Ship Chandlery, No. 53 South street, New York.

SULPHIDE OF BISMUTH.—Bismuth, in the presence of or in combination with sulphur, yields a beautiful red coating, when passed before the blowpipe on a large piece of charcoal, upon the addition of a little pulverized iodide of potassium. A finely pulverized mixture of equal parts of sulphur and iodide of potassium is best kept for such purpose and makes an excellent test material for bismuth. In making these investigations, V. Kobell met a green mineral which occurs associated with joseite at St. José di Madureira, Brazil, and which proved to be bismuthite, not previously noticed at that locality.

THE PHOSPHORIC LIGHT.

The apparatus consists of an iron vessel, A, into which sticks of phosphorus are introduced. That used at the Manchester Photographic Society's meeting was five inches in its largest diameter and three and a half inches in depth, having a capacity of twenty-eight fluid ounces. This vessel is fitted with an iron cover of substantial thickness, ground so as to fit air tight to it, and secured in its place, when required, by a cross bar inside, fastened with a bolt and nut. Three other holes are also bored through this cover, as seen in Fig. 2, that marked No. 1 being half an inch in diameter, and having a piece of brass tube about an inch long screwed into it, with a narrower tube inside. This is the jet through which the phosphorus vapors issue, and the smaller tube conveys the oxygen required to supply the flame, the oxygen passing through the tube, entering the hole 2, and being conveyed, as seen in Fig. 1, through the vessel, A, containing the phosphorus, up through the middle of the jet at which the phosphorus vapors are burned. It is indispensably necessary that

FIG. 1. FIG. 2.



the oxygen should not escape into the vessel, A; for, if it did combustion would take place in the vessel itself, and would probably lead to an accident. The other hole, 3, is for occasional use, and is fitted with a pipe for the introduction of common coal gas under such circumstances as will be hereafter mentioned. The vessel, A, is placed upon a stand over a large Bunsen burner, and with it is enclosed in a capacious lantern, furnished with plain glass front, and with silvered reflectors behind. The lantern is also supplied with a chimney communicating with the outer air, and having a gas burner inside it to produce a strong up draft before commencing to experiment.

When all is arranged, three or four ounces of the element phosphorus are thrown into the chamber, A, and the lid screwed down. The apparatus is then placed in the lantern, and the Bunsen burner beneath it is lighted. The phosphorus inside soon melts and inflames, burning until the oxygen in the chamber is consumed, and causing the emission, at the jet, of a small quantity of white smoke (phosphoric anhydride). After a while ebullition takes place, and bright flashes of flame spontaneously appear at the nozzle. If the heat be sufficiently applied, the flame becomes continuous, and extends in hight in proportion to the rapidity with which the gaseous phosphorus is evolved, burning with considerable brightness. If, however, sufficient heat be now applied to make the flame quite continuous, and a current of common coal gas be passed directly into the chamber through hole 3, this gas and the phosphorus become associated together, and burn at the jet with a brilliant flame entirely under the control of the experimenter. When the experiment was performed before the Manchester Photographic Society, this flame varied between fifteen and twenty inches in hight; and upon the introduction of the oxygen, its brightness became so greatly augmented as to render it almost unbearable to the eye. The readers of this journal may judge for themselves whether or no a room is not brilliantly illuminated by a flame eighteen inches in length, and so bright throughout the whole of that eighteen inches as to be almost unbearable to the sight. When the writer says the illumination of a room by this light is far greater than is possible by a single oxyhydrogen light as ordinarily employed, he is not making any idle boast of one inflated with his own idea, but is simply stating what was proved to be the fact at the most numerously attended ordinary meeting ever held by the Manchester Photographic Society.

In making use of the apparatus here described, the writer found it convenient to have all his taps near together, as shown in the diagram, so that, without moving about, it would be possible to increase or diminish the heat beneath the phosphorus chamber, accelerate or lessen the draft in the chimney, augment or suppress the supply of hydrogen to the chamber, and add to or take from the quantity of oxygen introduced into the flame.

What efforts have been made for the commercial introduction of the phosphoric light have, thus far, been unavailing, because of the strong prejudices which are entertained against the use of phosphorus. It is true, an accident with this substance might prove a very disastrous affair, as accidents with gunpowder and steam have proved; but gunpowder, steam, and phosphorus, may all be used, in suitable appliances and with ordinary care, with a very small amount of fear of any mischance.—*British Journal of Photography.*

Correspondence.

The Editors are not responsible for the opinions expressed by their Correspondents.

Condition of the Models at the Patent Office.

To the Editor of the Scientific American:

Permit me to call your attention to the condition of the models in the Patent Office. For want of room to properly store them, these models, in many instances, are left around on the floors, piled on the tops of the cabinets and on each other on the shelves, so that it is almost impossible to make an examination of them; many are also broken from this cause. In some cases, there are bushels of broken pieces of models, the uses of which can only be guessed at.

The present efficient head of the model room is doing all that he can in properly arranging and classifying the constantly accumulating models; but with the limited amount of space at his disposal it is impossible to do all that should be done. Some space has been made by disposing of parts of the rejected models, and also by placing small shelves between those already in the cabinets, but in many instances these shelves hide the models and interfere with their proper examination, thus necessitating a frequent handling where sight alone would be sufficient but for the second set of of shelves. Even with the most careful handling, models are frequently broken.

To remedy this, two things must be done immediately. More room must be provided, and the models dispensed with in all new applications not absolutely requiring them to explain the invention sought to be patented. To continue the present system, a new set of model halls as large as those now used would be required every seven years at the present rate of accumulation, which amounts to about twenty thousand annually. At this rate, without counting any increase in the number of patents granted, the number of models now in the office would be doubled in the period mentioned. You can thus see the necessity of some immediate change.

Some additional space might be obtained by building more galleries on the top of the cases in the north and west halls, which could be lighted through the roof. This would help for a year or two, but sooner or later the present system will have to be abandoned—useful as it is to point out what has already been done—and so prevent inventors from wasting their time, money and talents on machines that are already patented by others.

In every case where the model is dispensed with, as proposed, the applicant should be required to furnish drawings in perspective, where the case could be properly illustrated in this manner, a copy of which, at the patentee's expense, should be mounted on card board and varnished, and placed with its appropriate class in the model cabinets. Such a drawing would last a long time, and should it be defaced or worn by handling, it could be easily replaced by one of the photo-lithographs issued with the patents. The necessity for perspective exists in the fact that a majority of non-professional people cannot readily understand a mechanical drawing.

If some such system as this is adopted at once, it will be comparatively easy to find room for the models of such applications as absolutely require them for the proper illustration of the invention; but under the present style of proceeding, the halls are being filled with a large number of models of devices that drawings would show just as well, without taking up a tithe of the room, and at the same time save inventors the difference between the cost of the drawings and models.

The present Commissioner has been too short a time in his office, or too busily employed in his other duties, to appreciate the difficulties caused by the present limited space in the model halls; and I, therefore, appeal to you, as "the power behind the throne" and the special guardian of the rights of inventors, to see that some remedy is applied immediately.

There are now about seven hundred and fifty thousand dollars in the Treasury belonging to the Patent Office, nearly all of which has been taken from poor inventors who could ill spare it; and the least that should be done is to provide sufficient room, for the models that applicants are compelled to furnish, and to so arrange them that they shall be readily accessible for examination; and if space cannot be found, then the inventor should not be required to go to the expense of a model which the Patent Office cannot find room properly to exhibit.

Washington, D. C. INVENTOR.

Expose of the Tricks of the Davenport Brothers.

To the Editor of the Scientific American:

As Dr. Vander Weyde has finished what he considers to be an expose of the Davenport Brothers, I submit for the consideration of your readers a totally different view of the matter: they can judge who is right.

The Davenport Brothers do not depend on their ability to untie the cords with which they are bound; in almost every case, this would be impossible for them to accomplish in time to satisfy the spectators. A statement of what I have witnessed will serve to illustrate and prove what I assert. I have seen the brothers tied by experts, with such a number of ropes and complexity of knots, all drawn as forcibly as a strong man could pull them, that it would have taken at least thirty minutes for the most dexterous manipulator to have loosened one hand, the knots of the ropes on the wrists and legs being sealed with wax. In five seconds by the watch, after the doors were closed, a naked arm and hand were projected from the hole in the middle door, grasping a large bell and ringing it. The doors were opened upon the indrawing of the hand, and the fastenings on both wrists and legs examined critically and found to be secure, and the seals unbroken. The fact is they perform all of their tricks with free hands and at the same time do not untie a single knot. Dr. Vander Weyde says that the smallness of their hands aids them to undo the fastenings; this is true, but not in the way the Doctor understands it. They have false hands and wrists these are made of gum, and so closely resemble nature, both in form and color, as to mislead all who are not expecting deception in that way; the feeble light in which they perform their tricks assists to secure them from detection. The wrists of these counterfeit coverings extend up the arm a sufficient distance to be covered by the sleeve of the shirt, and have flat hoops or rings of thin sheet metal embedded in the substance of which are composed, so as to keep them open and prevent a collapse under the pressure of the cords. These counterfeit hands and wrists are of ordinary size, and yet are large enough to permit of the ready insertion, or removal of the hands of the Davenports, owing to the remarkable slimness of their natural members. The position in which the hands are placed, and the tying of the ropes on the under side of the seat after they are passed through the holes made for their reception, aid greatly in keeping them in proper position for the easy insertion of the hands. The coat sleeves above the wrists are padded to make the arm of a relative size in proportion to the hands. In the trick of exhibiting five arms and hands at one time extending out of the window in the cabinet, they employ four counterfeits made of thin gum, capable of being inflated, the fifth and smaller one being one of their own arms. They do not open the door after this performance until they have had time to exhaust the air out of the frauds, and roll up and deposit them in their coat pockets. In regard to freeing themselves of the fastenings, they simply cut the cords off; others of a proper length are produced from their capacious pockets to throw on the floor; the cut fragments are put safely away in those same pockets. A moment's reflection will convince any one that it is simply impossible for the Davenports to endure, for three fourths of an hour, the torture of tightly knotted cords upon their naked wrists; try it for five minutes and see if it will not convince you of the truth of my demonstration.

Harrisburg, Penn. WM. P. PATTON.

C. W. Williams on Coal and Smoke.

To the Editor of the Scientific American:

Is Mr. Charles Wye Williams the latest and best authority upon the consumption of coals and the prevention of smoke? I have read his book, and he seems to make these remarkable points:

1st. That the prevention of smoke is impossible. He enters into very learned statements and calculations, which, as he leaves them, condemns us poor inhabitants of bituminous regions to the unrelieved prospect of endless carbonization—in being lined inside and outside with smoke.

2d. He learnedly thinks he shows that smoke isn't worth much, and that its prevention wouldn't be much of a saving.

3d. He states that Mr. Charles Wye Williams has invented the only useful mode of approximating the prevention of smoke; and that any other invention shows either that the inventor deceived himself, or intended to deceive others, that is, is either a knave or a fool.

The arguments of the book do not seem, to the present writer, satisfactory; and its tone savors more of magisterial self conceit, than of that humility which science, like every other great subject, ought to engender in minds above mediocrity.

Is there not a better book on the subject? B. F.

[The criticisms of our correspondent upon C. W. Williams' works are not without foundation, whether relating to matter or manner. That author's views contain, in our opinion, so much admixture of error, that he is hardly entitled to be styled an authority in the strictest sense of the term. As our old readers are well aware, we have had occasion to differ from Mr. Williams in many points besides the ones enumerated.—ED.

Mississippi Bridge at Rock Island.

To the Editor of the Scientific American:

The new iron bridge over the Mississippi river, from Rock island to the city of Davenport, is being hastened to completion, and will be ready for travel in about six weeks. It is a Whipple truss bridge, and is built to accommodate wagons, with a foot way below and a railroad overhead.

The bridge consists of five spans and a draw; the spans vary from 200 to 210 feet in length, and weigh six tuns to the linear foot. The draw span is the longest on the Mississippi river, and the heaviest in America; it is 366 feet in length, and weighs 871,784 pounds. The draw is built in reverse way of the fixed spans, that is, the Whipple truss is inverted, bringing the top chord into tension, and the bottom chord into compression, and carrying the entire strain from the ends to the center or main posts. In the fixed spans, the strain is transmitted from the bottom of the posts to the top chords by means of the tie bars. This throws the top chord into compression.

The turntable, on which the draw span rests, is indeed a novel affair, and is the invention of C. Shaler Smith, President and Chief Engineer of the Baltimore Bridge Company. The bed circle, which is 32 feet in diameter, with a 12 inch upper surface, and weighs 36 tuns, rests on the pivot pier. The top surface is beveled, the inner side being the highest. The rotary table, five feet in depth, and resting on 36 cast iron wheels 30 inches in diameter, is placed on the bed circle, the 36 wheels resting on the beveled face of the circle. Each wheel, which has a 12 inch face, is beveled, the outer side having the greatest diameter. Thus each wheel, from its formation, tends to travel in a segment of a circle, and avoids the tendency, which square faced wheels have, to travel on a tangent. From the center of each of the above wheels runs a rod to the center pin, which is 32 inches high, with a base four feet in diameter, which pin is mounted on the radial center of the masonry. The rotary power is not yet finished, but will consist of an iron reservoir containing about three barrels of pure glycerin, which will flow into four hydraulic pumps worked by a steam engine. The glycerin will be forced by the pumps into two large rams on each side of the center of the draw span. An iron cable will be led from the plunger of each ram one quarter around the circle, and there made fast to an iron eye let into the masonry. The machinery is so arranged that, while one ram winds in on its cable, the other will be laying out its cable, ready to pull in, or when it is desired, to reverse the motion of the draw.

This huge draw was recently swung into position for the first time, the united muscular power of twelve or fifteen men being amply sufficient therefor. Three persons only had the honor of being on the draw while it was making its first swing, one of whom was your correspondent,

Davenport, Iowa. LUKE COPPERTON.

[For the Scientific American.]

VARIANCE BETWEEN HYDROSTATIC AND STEAM PRESSURE IN BOILERS.

The hydrostatic force is the only force present in applying the water test to ascertain the strength of steam boilers. But, if heat be applied to a boiler to generate steam, two constant forces are present:

1st, the expansive force of steam, and 2d, differential expansion.

Besides these, two inconstant forces: 1st, repulsion of the water from the metal, and 2d, dissociation of the water arising from expulsion of the air by continual ebullition, sometimes make their appearance.

If the drift pin has been used, the damage it has done will be increased by heat.

One or more of these forces, combined with the expansive force of steam, becomes irresistible; and when in operation to that extent detracts from the possibility of working steam at the pressure of the previous hydrostatic test. The presence of these additional forces in a steam boiler is clearly attributable to extraneous causes, and not to any destructive but hidden agency inherent in steam. For, while no force will rebel at a violation of its laws sooner than steam, yet its controllability in conformity with its laws is not exceeded by that of any other active force. In proof of this, we find that when steam has been generated in one boiler and forced into a second one, it requires a greater steam pressure than water pressure to rupture the one containing steam only, owing to its greater fluidity and elasticity.

Further proof, of its controllability and even harmlessness when isolated, is seen in its easy confinement in every variety of vessel and under varying circumstances, extending even to rubber hose at high pressure. The thinness of a plate capable of confining isolated steam is surprising.

On comparison of two boilers tested, the one by water pressure and the other by steam forced into it, their conditions will be found to be the same in kind, and different only in degree of temperature. Every part of each being of uniform temperature, the force of differential expansion is absent from both. The plates not being heated above 600°, the point of maximum vaporization, the force of repulsion is absent from both; therefore the only remaining force left is the steam pressure in the one case and the water pressure in the other. The behavior of steam, isolated in one boiler, being identical, then, with that of water isolated in another, and the two being convertible, the one into the other, according to temperature, it is presumable that there can be no antagonisms due to their contact and union in the same boiler engendering other and additional forces besides those above enumerated.

This inference is fortified by the fact that there is not known an instance where the forms, in which the elements of water present themselves, whether in that of gas, vapor, liquid or solid, manifest any antagonisms, the one to the other, in any possible combination. To assume therefore that the contact and union of steam and water in the same boiler can possibly engender a dangerous force, is not only an assumption without foundation, but is contrary both to reason and analogy. It appears, therefore, that there are known to exist in some boilers, besides the expansive force of steam, other illegitimate forces which are not resistible by any strength of material, and are consequently capable of producing all the phenomena of explosions; and it further appears that these illegitimate forces cannot be present in those boilers possessing uniformity of temperature not exceeding 600°, and containing water from which the air has not been expelled.

The question now arises: Can these conditions be permanently maintained in boilers generating steam?

No problem in mechanics is more simple. By an application of the law of gravity, the water will flow from the cold end of a boiler (in a properly adjusted pipe) to the hot end, and the water in the hot end will flow in the barrel of the boiler to the cold end, thus interchanging places with such rapidity as to insure a temperature substantially, if not theo retically, uniform. The greater the heat, the greater the speed of flow. The constant force of differential expansion being thus practically obviated, it remains to dispose of the inconstant force, repulsion. But there can be no repulsion of the water until the plates are heated above 600°, the point of maximum vaporization, an excess of which degree of heat it is well known metal cannot receive while a current of water is flowing over it.

It follows, therefore, that neither differential expansion nor repulsion can be present in a boiler having rapid and perfect longitudinal circulation.

The salutary consequences of this action of water in steam boilers are not limited to their immediate safety only, but extend to their cleanliness, economy, and efficiency and regularity in generating steam.

The flow of water from the fire box to the cold end of the boiler will produce a current adequate to sweep into the mud drum all deposit on the sides and bottom. This mud drum may be so constructed as to form an eddy, retaining the sediment while passing the clarified water again to the fire box.

The efficiency of the steam will be increased by freedom from priming, which is occasioned by the throw of the water into the steam pipe, in consequence of the conflict between the descending water to take the place of that water which is ascending with the steam from the bottom. But if this conflict is avoided by the return of the water to the bottom of the boiler through a different channel, a more quiet separation and delivery is made of the steam into its pipe leading to the engines, lessening by that much its tendency to prime. The violence of this conflict may be ascertained by measuring the temperature of ebullition at various pressures. In a vacuum it occurs at 98°, at great elevations, as the top of Mont Blanc, at less than 200°, and, at ordinary levels of atmospheric pressure, at 212°. But in a steam boiler with a pressure equal to eight or nine atmospheres, the automatic separation of the steam from the water is not only more difficult, but the difficulty is magnified by the multitude of tubes and narrow water ways through which both the ascending and descending columns of water must travel at the same instant. Hence, when sudden relief from pressure is given by a supply of steam to the engine, the violence of the ascending column must occupy the water spaces to the exclusion of the descending one, with resulting damage, sometimes greater than that of priming.

The economy is promoted by the maintenance of that temperature most productive of the greatest amount of steam. This point fluctuates slightly above or below 600°, according to circumstances. As an increase in the temperature of the plates, slightly in excess of that figure, say to 800°, will render them nearly eight times less efficient in the generation of steam than a temperature of 600°, and as the circulation of the water will prevent the possibility of their rise in temperature above that of maximum vaporization, it follows that, in so far as this is effected, the circulation of water in a boiler, longitudinally, contributes to its economy by utilizing a heat which otherwise may become a source of disaster.

Again: Regularity of steam cannot be maintained in a boiler, while a part of the water contained in it (that around the fire box) is heated excessively, and another part (that in the lower legs and lower part of the barrel) has not attained a temperature above that of fever heat. But, by longitudinal circulation, all the water having been brought nearly to one temperature, it is in a condition to yield steam with the greatest regularity.

It is, moreover, maintained that groovings and corrosions are impossible in a boiler with longitudinal circulation of the water sweeping among the superheated steam, which is their cause.

But the weakest place of a locomotive, and that which first gives way, is the point of union between the flue sheet and the flues. The difference in the thickness of their materials exposes them to the greatest strains of contraction from the chill occasioned by opening the furnace doors. The effect is visible in the varying shades of color, like that passing over steel in the act of tempering. But if the heat on the inside is made constant by the rapid circulation of water of uniform temperature, the strain of contraction is in a measure counteracted by diminishing the chill.

There being therefore no force inherent in steam itself, so far unmanageable as to destroy by sudden violence a boiler containing aërated water, nor to affect its integrity by gradual deterioration, it appears that the variance between the pressures of water and steam in producing these ruptures is due to other disturbing forces, whose presence is wholly prevented by the rapid and perfect longitudinal circulation of the water. ONSLOW.

Lecture at Sea by Agassiz.

During the recent outward passage of Professor Agassiz' exploring ship to St. Thomas, the venerable chief made a sensation one day by delivering a scientific lecture on the deck of the vessel. A correspondent of the New York *Herald* says that a blackboard was improvised, a portion of the ship's crew was invited to be present, and a most attentive audience listened to the Professor's descriptions of the animals which they had found living in, on, or about the Gulf weed.

"On examining a fresh specimen carefully, it is found to be a floating colony of animal life. It has inhabitants which are bound up with it, and depend on continual contact with it for their very existence. Others, which use it for shelter and protection, are still free to make occasional excursions beyond its limits; and still others—suburban residents—independent in disposition and predatory in character, cruise around its borders and descend upon unwary "carpet baggers." Among the lower classes, the acalephs are represented by the hydroids, animals living in a community, having a common stem, with a central cavity communicating with numerous branches. These branches support little cup like projections, in each of which resides an individual of the species.

Each has a mouth in the center, a digestive cavity extending into the common canal, and a number of radiating tentacles. There are two varieties of the Gulf weed, the narrow and the broad leaved, and it was noticed that one species of these hydroids was found only on the narrow variety. It was the campanularia; and even where, in large masses of the weed, the two varieties were intermingled and in direct contact, this species was never found in the other.

The crustacea were well represented by crabs, shrimps, and lobsters, a great number of species being found, about half of which are entirely new. It was found that the crabs were represented by members of the highest order—the decapods furnished with five pairs of legs, the anterior being better developed than the others, showing that tendency to differentiation of structure which is characteristic of the higher groups and reaches its perfection in man. The earlier stages of life correspond to the similar stage of society; and, as in savage tribes, each man is his own lawyer and physician, builder and architect, so in the lowest animals, each portion digests and assimilates, respires and contracts. It is not until we ascend in the scale of creation that we find separate organs with distinct functions.

In one of our hauls, we captured a curious instance of the physical inferiority of the male sex, which generally increases as you descend. It was in the person of the male of a pipe fish, belonging to a curious genus in which the jaws are prolonged and surrounded by the integument, forming a tubular mouth. He was encumbered with a mass of eggs, which he was compelled to carry around in a sort of abdominal pocket until they were hatched.

It seems to some so called "practical" minds that there is no utility in such investigations, and that such lives can have no important connection with our vastly superior human existence. A single, rather trite, but very applicable instance to the contrary may be adduced.

There is a little mollusk—the *teredo navalis*—which was at one time the terror of all ship owners. It would quietly and unsuspectedly pierce with thousands of holes the hardest timbers. Ships were rendered valueless, docks destroyed, and at one time all Holland was in consternation at the discovery that the piles of her embankments were bored through and the country in imminent danger. A distinguished naturalist discovered that at certain seasons the female of this species carries her eggs in the folds of her respiratory organs. They remain there until they are fecundated by the milt of the male floating in the water. He also found that a weak solution of mercury thrown into the water destroyed the milt and so prevented the fecundation; and thus, in a few seasons, ship owners were enabled to clear their docks of this hitherto unconquered marauder.

This is but one of hundreds of cases; but it serves to show that size is no criterion of importance in the study of zoölogy.

Lasche's Improvement in Decorative Oil Painting.

Jean Marie Laschè, of Paris, France, has invented and patented, through the Scientific American Patent Agency, certain improvements in decorative oil painting, the object being to replace the painting in oil executed directly on surfaces for buildings, ships, carriages, carpenter's work, cabinet work, furniture, ornaments, etc., and also the gilding by a portable oil painting or gilding already executed, finished, and dry, which is applied by sheets, strips, or pieces upon said surfaces by the aid of a sticky varnish or waterproof cement. The invention consists in executing, or in other words, to execute, such painting in oil, either in plain tones, imitations of wood, marbles, in ornamental subjects, or the gilding on tin foil, whereby the work may be performed in special workshops by skilled workmen, either by hand or by machinery, in a manufacturing and commercial manner, and afterward be transported, so as to be used and applied where it is required, thereby preventing delays, dirt, smell, and all the annoyances occasioned by the presence of painters in a dwelling.

The invention also includes the applying of tin foil upon which oil painting has been executed, or tin foil which has been gilded, upon surfaces by the aid of a sticky varnish or waterproof cement, to replace the gilding or the oil painting of such surfaces. The invention then, is to oil painting and oil gilding what paper hanging is to fresco painting, with the great difference and advantage that, while paper hanging interposes paper (a hygrometric substance) between the surface and the painting, this system of interposing tin foil and a waterproof cement between the surfaces and the painting will protect said surfaces with greater efficacy than ordinary oil painting. The process is as follows:

Tin foil of the greatest thickness—that is to say, foil of tin or composite metals therewith, which are rolled very thin and known as tin foil in the trade—is spread evenly upon a hard and smooth surface, which, by preference, is slightly moistened to assist in the process of spreading the tin foil. Upon this tin foil any desired effect of oil painting is executed, from the plain oil painting in flat tone, to the most elaborate ornamentation in all its branches; and this can be done either by hand or by processes of printing, stenciling, through the aid of machinery, in whole or in part, imitation of costly woods, stones and marbles, subjects in flowers, birds, shells, landscapes, subjects of interior, imitation of carving as well as plain gilded, ornamental gilding, and a combination of gilding and oil painting. In short, anything which is executed in oil paint may, it is claimed, be executed upon this tin foil.

The work, when finished, is varnished; and when thoroughly dry is removed from the hard surface upon which it was sheathed. It is then ready to be transported from the shop, and for that purpose it may be rolled like wall paper.

To apply this portable paint, the surface or object upon which it is to be placed is coated with a sticky varnish or hydraulic cement; the portable paint is cut of the suitable size and applied, carefully pressing in against the surface or object, so as to drive away all intervening air. The sheets may be applied to irregular surfaces, carving, sculpture, moldings, etc., as the tin foil and the oil paint and gold thereon are each very pliable.

New Railway Bridge at Albany.

The new railway bridge over the Hudson at Albany, N. Y., begun in June, 1870, has lately been completed. The main bridge is 1,525 feet long from Quay street to Van Rensselaer island, and the whole length, including approaches, 2,250 feet. It is 30 feet in the clear above low water mark of 1857. There are two bridges above Van Rensselaer creek, (the first comprising three spans 62 feet 6 inches each) one connecting with the New York and Boston railways, and the other for Troy local trains. The portion of the bridge across the basin descends three feet from the pier to Quay street. The trusses in the superstructure are 26 feet apart. All the tension bars of the bridge are of double refined iron, and it is calculated that the bridge will stand a load of 6,000 pounds per lineal foot, exclusive of the weight of the structure, the strain of which will not exceed one sixth of the breaking weight. The draw weighs 350 tuns, and is to be worked by a ten horse power engine placed beneath the roadway. Clark, Reeves & Co., of the Phœnixville Bridge Works, Phœnixville, Pa., were the contractors for the superstructure.

Housatonic River Bridge.

The new iron bridge over the Housatonic river at Stratford, Conn., on the New York and New Haven Railroad, is completed. This bridge is one of the handsomest in the State. It was commenced in March, 1871, and has been pushed, in spite of the cold weather of the early winter, to completion in a wonderfully brief time. The bridge is 1,091 feet long, 27 feet wide, with two tracks, and the hight of the iron work is 24 feet. It has five spans, three on the east side of the draw and two on the west, and the draw is 206 feet feet long. Five piers and two abutments of solid masonry support the iron work of the spans; and the hight of the piers, except the draw pier, is 36 feet 8 inches, they being 7 feet wide at the top and at the bottom. The draw pier is 30 feet wide at the top and 35 at the bottom, and rests upon 427 piles, sawed off by divers, level with the river bottom. Total cost, about $300,000. The contractors were F. C. Lowthorp, of Trenton, N. J., patentee; John Beattie, of Stony Creek, stone work; S. A. Hammond, of Bridgeport, piling and timber work, and George Everett, of Allentown, Pa., superintendent of the iron work. The frame work of cast iron came from Birmingham, Conn., and the tension rods from Trenton, N. J.

Patenting Small Articles---The Result to Manufacturers.

The advantage of patenting small articles is forcibly illustrated in the success of the Meriden Malleable Iron Co., whose works are located at West Meriden, Conn.

They are constantly obtaining patents on small articles of utility and ornamentation in their line of manufacture and, however small the improvement, they consider it a paying investment to incur the trivial expense attending a patent.

Among the last novelties of their production is a very ornamental drawer pull, made of gilt and ebony or other hard wood, so constructed that the knob drops down out of the way when not in use. To the knob or handle, which is hinged to an ornamental gilt base, is inserted a piece of india rubber, which prevents the pull knob from defacing the bureau or furniture, to which it is attached, by constantly dropping against it. Such handles are more convenient than ordinary knobs, and their application renders an ordinary piece of furniture very attractive.

If manufacturers of all kinds of small wares would devote more study and ingenuity in getting up new and original designs, like trimmings for harness, wagons, furniture, household implements, and articles of every kind where it is possible to display taste, they would be astonished at the increase of their business and profits.

What one Firm has Done, others may Do.

We will not occupy the space of a page, which we might fill, with complimentary letters received from our friends and patrons since the new year. But the following, from the manufacturers of the fire extinguishing apparatus illustrated in the last volume, we beg space for. How many other manufacturers will take our subscription list and go among their employees and get subscribers? We pause for a reply.

MESSRS. MUNN & Co.

Gentlemen: We take pleasure in enclosing you a small list of subscribers to your valuable paper, with check for the same. We have ourselves received so much benefit from the articles published by you, on our system of sprinklers that we feel it our duty to at least canvass our building in your behalf. We shall endeavor, as opportunities occur in the future, to extend our limits and help swell the list of your subscribers.

Tendering to you the compliments of the season, we are,
Yours truly, HALL BROTHERS.
Boston, Mass.

ICE HARVESTING ON THE HUDSON.

It has been estimated that the domestic consumption of ice in New York, Brooklyn, and vicinity is a tunnage equal to that of the domestic consumption of coal. Whether this estimate be too large or too small, it is certain that ice has become an article of almost as universal demand as coal. The comfort, economy, and convenience secured by the use of ice is so great that it may now be classed as one of the indispensable articles of city consumption. Its harvest and supply has grown into an enormous business, which at times assumes the attitude of a merciless monopoly, and, in the absence of effective competition, is enriching the companies that conduct the business. It has also called into existence the use of improved appliances for cutting and storing ice, by which advantage, can be taken in even short seasons, to secure the quantity needed. It has been proposed to use steam appliances for cutting the ice, but at present the ice plow drawn by horses is the principal method employed.

Our engraving shows the way in which the ice is cut into suitable blocks for storing. In our next issue, we shall give engravings of the method employed for elevating and placing the ice in the large buildings employed for its storage.

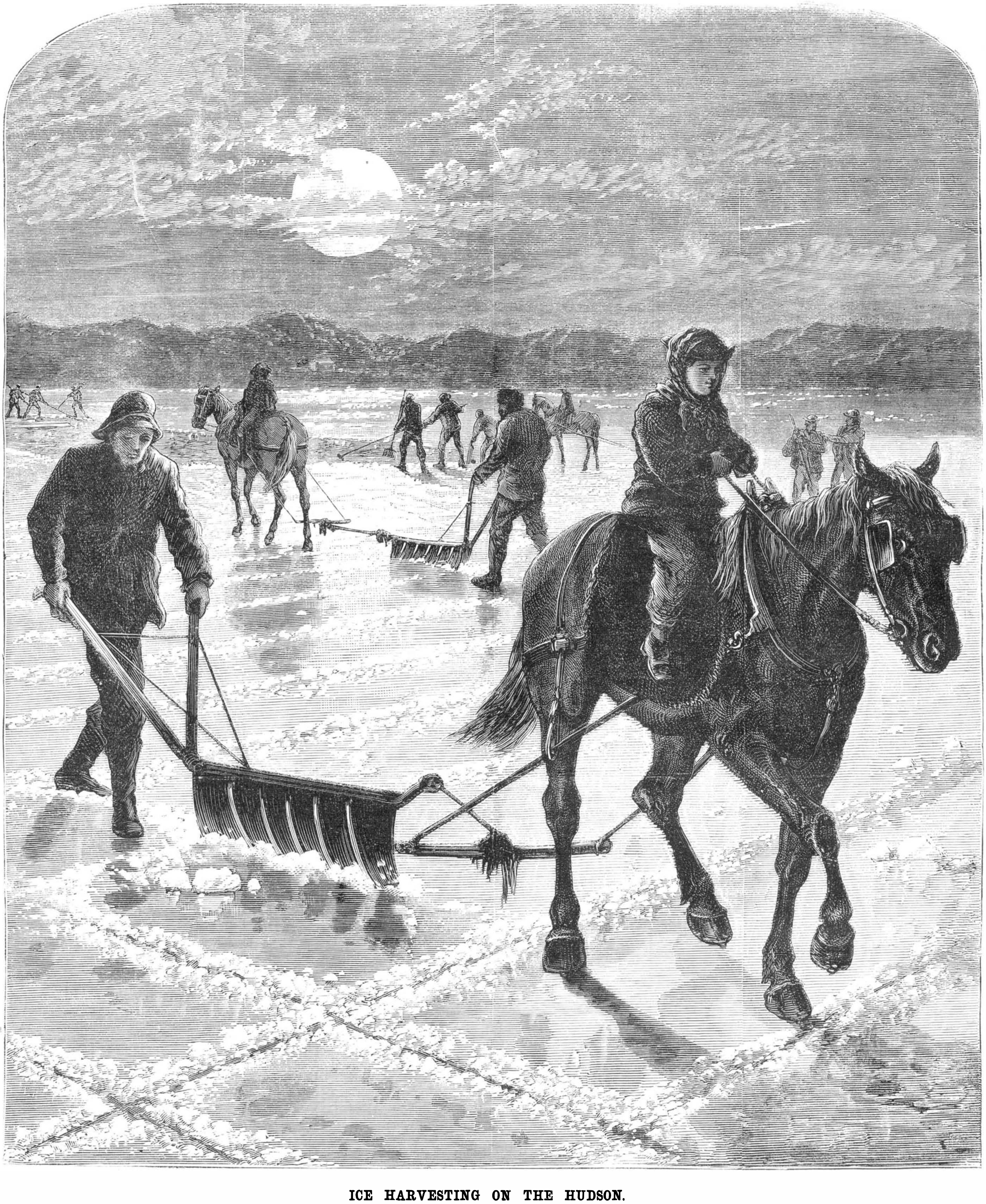
The harvest this year is late; but if the present cold term continues during February, there will be no difficulty in securing a crop.

There have been some difficulties, between the employers and workmen, which have retarded work, but these have been settled, we believe, and ice of fine quality is now being rapidly housed. Horse power cutters, steam elevators, and an army of laborers are busily at work, and the houses will undoubtedly be filled before the opening of spring.

The ice plow used for cutting the ice is not very unlike an ordinary plow. For the solitary pointed blade are substituted several long, sharp prongs or teeth, which act saw fashion, and are so adjusted that the ice is cut but half through. When thus cut, the blocks are easily separated from each other. The furrows are opened in parallel lines, giving a surface dimension to the blocks of two and a half feet by two feet. As the plow passes over a small area, the men, furnished with long poles terminating in strong iron hooks for the purpose, haul the blocks to the source of the canal, where, after twenty-five or thirty blocks are collected, attachments are made, and another horse tows the blocks to shore through the channel previously cut. This channel often extends a mile from the shore, and forms a canal for the transport of the ice rafts.

While the harvest is going on, the ice field presents a busy scene, being dotted all over with laborers. The work is often, in short seasons, pursued by moonlight, and pushed unremittingly to secure the crop before a thaw destroys it.

When the ice reaches the bank, it is hoisted up inclined planes and down others, into the storehouses. These, as well as the methods of hoisting, etc., will form the subject of the article promised for our next issue.



ICE HARVESTING ON THE HUDSON.

Scientific American.

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Contents:

(Illustrated articles are marked with an asterisk.)

WHAT SHALL BE DONE WITH THE MODELS AT THE PATENT OFFICE?

It is to be presumed, that, at the time the Patent Office Building was erected, and inventors were required to deposit, with their drawings, models of the devices for which they solicited patents, the steady growth and ultimate magnitude of the collection was not anticipated. A letter, published in another column, informs us that many of these models now lie about on the floors, there being no room to store them elsewhere. Others are piled on the tops of cabinets, and on each other, so that the original purpose of the collection is defeated, so far as the public is concerned, while it is difficult for the examiners to perform their duties. Many of the models are broken and thrown in heaps of promiscuous rubbish.

The head of the model department, who is represented to be very efficient, is doing all he can to bring order out of chaos; but it is painfully evident that there must, sooner or later, be a clearing out of useless and broken models. There are a great many that it is of no consequence whatever to keep. There are others so dilapidated that their inspection reveals nothing without the drawings, and the latter are sufficient to guide the examiners. The rubbish might as well be removed at once, and space made for the well preserved and important models. It is also certain that more room will be needed, if the present system is maintained; and this might well be supplied by buildings erected from the money, now in the Treasury Department, belonging to the Patent Office.

It will, however, be useless to expect that it will be possible to continuously supply space to store models. At the present rate of accumulation, to arrange and store them properly will require an addition equal to the present accommodation once in about seven years. What, then, shall be done with the models, is a question that must in some way be answered. We say, do without them; that is, do not attempt to preserve them in a public collection. It has been wisely suggested that, for purposes of general information, good perspective drawings, reproduced by photography and cheaply obtainable on application, would be far more efficient than a great central museum of models that not one in ten will ever visit, or, if they should, could ever find time to examine a tithe of its contents.

Of course, models would be needed to assist the examiners with probably about one fourth the applications made; these, after each case had been attended to, might be returned to the applicants. It is certainly folly to attempt their preservation in a collection. As the coral insect, particle after particle, builds islands of vast extent, so the constant accumulation of models will result in an enormous reef of ingenious contrivances, which will wreck the patience of any who attempt to explore it. Better at once abandon the attempt to preserve models, and only endeavor to keep the drawings and specifications. This is our view of the subject. If any one has anything better to suggest, we shall be glad to consider it.

DRYING BY COLD.

Most people have an idea that to dry anything rapidly requires the agency of artificial heat. This is a mistake. Chemists are cognizant of many methods of drying substances where heat, above the ordinary temperature, is not employed.

One of these consists in placing the substance to be dried in a close compartment, in which is also placed an open vessel containing strong sulphuric acid. Sulphuric acid has a strong affinity for water, and takes water from the air surrounding it. The air, which also has a strong affinity for water—though weaker than the acid—thus dried, takes moisture from the substance to be desiccated. This moisture is seized by the sulphuric acid, and so the air, acting as a conveyor, goes on taking water and giving it up to the acid till the desiccation is completed. In this way, substances may be dried that could never be made to yield their moisture under the action of heat in an ordinary atmosphere, or which would be injured by heating.

Moist gases may be dried by passing them through the interstices in a collection of fragments of chloride of calcium, quicklime, fused potassa, or soda, each of which has stronger affinity for water than gases have.

Whenever any substance has a greater attraction for water than the expansive force of heat can overcome, it cannot be dried by heat; and the converse is also true. In the process of evaporating a liquid in an open vessel, or in the desiccation of a solid in a common kiln or oven, the moisture driven off by the heat is seized upon and absorbed by the air. If the air has less water than it has capacity to hold in suspension, the water evaporated disappears from sight and assumes the condition of a transparent vapor intimately mingled with the gases of the atmosphere. If, however, the capacity of the air be satisfied, the moisture assumes the form of a cloud of fog or mist, or is even deposited in the form of rain, perhaps in the form of snow or hoar frost, if the temperature be sufficiently low.

The capacity of air to hold suspended water vapor increases as its temperature rises, and *vice versâ*, so that by heating it, it may be made to take from substances moisture which it will deposit on cooling, thus becoming a conveyor of moisture, as in the process mentioned above where sulphuric acid is employed.

We have seen the moisture so far extracted from air admitted into a chamber, the walls of which were surrounded by a refrigerating mixture, that the weight of the volume was considerably diminished.

By thus continually extracting its moisture through the agency of cold, air at low temperatures might be made the vehicle for rapidly desiccating many substances that heat would injure; and there is no doubt this principle might be applied to advantage in some industries. We have ourselves employed it with excellent results, in an experiment, using the same air over and over, as previously explained, and have thus satisfied ourselves of its utility in some delicate operations.

TO OUR READERS.

It is with pleasure that we inform our readers of the large and gratifying increase in the circulation of the SCIENTIFIC AMERICAN. During the single month of January, we received upwards of ten thousand new subscribers, and they are still pouring in upon us from all parts of the country.

This unparalleled increase has exhausted our large stock of back numbers, and of late we have been obliged to commence all subscriptions with the date of their receipt by us. This is the best we can do under the circumstances; but if there is any considerable number of our subscribers to whom this arrangement is not satisfactory, and who really desire to receive the back numbers, we propose to have them reprinted.

To enable us to determine as to the propriety of thus reprinting, we respectfully request all persons who desire to receive the back numbers and have their subscriptions correspondently dated back, to inform us of the fact by mail without delay.

If any of our friends have any of the first five numbers of the present volume, for which they have no use, we should esteem it a favor if they will return them to this office, and we will add to their subscriptions accordingly.

THE EDUCATION OF THE DEAF AND DUMB.

In ancient times, the Hindoo pundits decreed that any one born deaf, or any one dumb from whatever cause, should be incapable of succeeding to property; though the same law arranged for the sustenance of the sufferers by making it a charge on the person who superseded them in the inheritance. It has been stated that, among the oldest nations of the East, the destruction of such children as useless burdens on society was connived at, if not authorized, by the governments. But instances of the care and sympathy of individuals for these poor creatures begin to occur after the advent of Christianity; and in the writings of the venerable Bede and elsewhere, we read of the partial success of attempts to teach the deaf and dumb to communicate by signs. The first noticeable attempt at a plan for this purpose is the publication, by a Benedictine monk named Bonet, of a treatise called "The Reduction of Letters and Arts for Teaching the Dumb to Speak." In this book, the author professes to have invented a system of finger talking or "dactylology;" and he published engravings of the one hand alphabet, now used nearly everywhere. The desirability of such means of communication subsequently caused many physicians and other scientists to bestow great attention and ingenuity on the subject; and, among many treatises publishing suggestions, one of the best was written in the year 1680, by one Dalgarno. He was a Scotchman by birth, and a school teacher in England; and his work, called "Didascalocophus, or the Deaf and Dumb Man's Tutor," even goes so far as to assert the superiority of written language and a finger alphabet over reading and talking by the organs of speech. Professor Porter republished this treatise in the year 1857, and states that it is "a work of such preëminent ability, and so replete with sound principles and important suggestions of practical value, that it ought to be familiarly known to every instructor." A German named Heinicke did good service to this cause by giving his time and attention to teaching a few deaf mute pupils; and his success was rewarded by the Sax on government inviting him, in 1772, to Leipsic, to superintend a school which is in existence and prosperity to this day Without, however, enumerating all the various advances made in this branch of education, by mingled science and philanthropy, we come to the labors of Americans in recent days.

In the year 1815, the deprivations of all the pleasures of life, which deafness and dumbness visited on a young lady of Hartford, Conn., interested some gentlemen of the same city in the subject; and they despatched a clergyman to England, to learn the system taught by some persons named Braidwood, who had met with much success and some celebrity. With a narrowmindedness strangely out of place in such a connection, these people declined to instruct the visitor except on terms at once exorbitant and burdensome; and the clergyman journeyed to France, accomplished his mission, and returned to the United States with M. Laurent Clerc, a well educated deaf mute, and one of the best teachers, on the system of Abbé Sicard in use in his country, then to be found. In 1817, the American asylum at Hartford was opened, the Rev. Mr. Gallaudet, the clergyman above mentioned, taking the post of principal, and M. Clerc that of assistant. From this small beginning, which, like many other noble and useful works, originated in the sense and liberality of a few private individuals, has grown up an extended system for the education and improvement of these unfortunates, whose claim to our wisest, best, and most strenuous efforts needs no recapitulation. A column might be filled with the names of deaf and dumb persons who have become valuable and useful members of society, some of whom have obtained eminence in art, science and literature.

But the greatest success in teaching those born deaf to speak has been recently attained, in the United States and in Germany, by the use of a system of lip talking. By this method, the language is communicated to the pupils solely by the motion of the speaker's lips; and such excellent results have followed the introduction of this method that, in an asylum at Northampton, Mass., general conversation is carried on with such rapidity and vivacity that it is at first difficult to induce a spectator to believe that the little pupils have been, many of them, stone deaf from their birth, and that the observation of the movements of the lips is the only opportunity for instruction that they have ever had. So thoroughly efficient is it that education is being carried on, through its means, up to the higher branches, many of the pupils being proficient in physiology, botany, and mental philosophy, as well as in drawing and other arts. Such results indicate the great superiority of the new system, and encourage us to hope that the terrible afflictions of deafness and dumbness may be soon deprived of their worst evils.

PRODUCTION OF STEAM IN BOILERS.

The economical and safe production of steam in iron boilers is, in this steam using age, a matter of primary importance; notwithstanding which, it is somewhat astonishing how little is generally known of the principles which must be observed to secure both safety and economy. The theories and speculations, indulged in by various authors in regard to the precise nature of the molecular motion produced in solid, liquid and gaseous bodies by the agency of heat, have—at least until they are subjected to experiment—no practical value. We must seek light alone from such facts as are demonstrated, and be guided solely by that light.

The only motion that takes place in heated water, with which the steam maker has to do, is that caused by the difference in the specific gravities of the molecules by unequal heating. The motion in steam which the steam user needs to comprehend is that caused by the mutual repulsion of the heated particles of water in a gaseous state.

When heat is first applied to water, the heated particles rise because their specific gravity is lessened. Other particles are in turn heated, and give place to others, and so successive strata of particles are heated over and over, till at last some of them arrive at the required temperature to expand into gas. In assuming this form, that portion of water so converted takes suddenly, under atmospheric pressure, a little more than four and one half times as much heat as it previously had, which heat disappears as temperature or sensible heat, and, becoming latent, imparts its expansive energy to the steam, a small part of which energy is subsequently converted into work in the engine to which the steam is supplied. In thus suddenly absorbing so much heat, it as suddenly expands to a much greater volume than it previously occupied, causing upheaval of the superstratum of fluid; and, rising to the top, it escapes with such rapidity as to cause bubbling, a state of things we call ebullition or boiling.

Now in the construction of steam boilers, we have to consider only these simple and elementary facts, with such modifications as arise from pressures above that of the atmosphere, and the expansion of metals by heat, and we must provide that the movements which take place naturally in steam generation shall not be artificially interfered with. Neglecting these provisions, we fail in economy, and increase the danger of steam production. The water must have free circulation and the steam must have ample avenues of escape from the liquid. Then if the boiler can withstand safely a given pressure and the strains caused by unequal expansion, and if the steam finds a ready escape from the boiler before that limit of pressure is reached, we have, so far as the boiler proper is concerned, the required conditions for economy and safety.

But to generate steam we must generate heat, and here the element of economy is the one most important to be considered. To get the greatest available amount of heat from the combustion of a given quantity of fuel, we must obey the law that governs all chemical combinations, the law of definite proportions in the union of substances to form other substances. Combustion is only such a chemical combination. Every pound of carbon in the coal, wood, peat, or other combustible, will require for its perfect combustion two and two thirds pounds of oxygen. Every pound of hydrogen will require eight pounds of oxygen to form nine pounds of water, and to develop in the combination all the available latent heat of the two substances. If not enough oxygen be admitted in the draft, there will be imperfect combustion and the loss of carbon in the form of smoke which passes into the uptake.

Again, it is important that the carbonic acid, caused by the burning of the coal, and the steam which arises from the union of the hydrogen of the coal with the oxygen of the air should have the heat as far as possible extracted from them and passed through the shell of the boiler into the water and steam confined therein, and that as little as possible should be wasted through the uptake or by radiation from the furnace or boiler. But now a little thought renders it evident that, as heat always passes from a warmer to a colder body, if the gases in the uptake are cooled down to the temperature of the steam on the other sides of the plates over which they pass, that must be the extreme limit to which their heat can be economically extracted. Steam at 60 lbs. above atmospheric pressure has a temperature of 307° F.; therefore if a boiler carries steam at this pressure, and its circulation is perfect, it is useless to attempt to get any heat from gases at the temperature named. Practically it is impossible to work down the gases of combustion to the extreme theoretical limit at which they will pass into the chimney at the same temperature as that of the steam in a well constructed boiler.

But to insure perfect combustion, it is necessary not only to admit oxygen in the right quantity, but to give the combining materials the proper temperature, and to so commingle them that they shall combine and develop their heat before they have passed over the surfaces to be heated. Combustion in the chimney is waste, and a waste too often to be observed with ill-constructed and arranged furnaces. The oxygen entering in the usual way is cold, and, before it will support combustion, has to be heated. To effect this in the most thorough manner, it is far better that the draft should be diffused, that is, enter at many points rather than at one. This accelerates both the heating and the commingling of the air with the unconsumed gases.

Now what we have written has been, in substance, often repeated in these columns, and we have often gone into details of setting, as well as the discussion of various forms and designs, of boilers, but it seems so difficult to keep the mass of our readers educated up to the true principles of steam generation, that it is probable we shall have to repeat "line upon line and precept upon precept" so long as our paper is sought for instruction in such matters. If those young readers who of late have so often besought us to answer queries relating to boilers, will endeavor to apply the principles we have laid down, they will soon be able to decide for themselves the points upon which they solicit information.

IMPERFECTION IN LAMPS, WICKS, FLUIDS.

To those who, dwelling in cities, enjoy the blessing of paying exorbitant prices for impure gas, and who, in consequence of large bills and inferior illumination seek a refuge in the next best resource, lamps, and to that less favored portion of the human race who, beyond the reach of gas mains and monopolies, are obliged to use lamps, and to those who are struggling to devise improvements in these useful household utensils, these remarks may prove useful.

The primary object sought in the use of lamps is light. Some of them are used for heating, but of them we do not speak at present. That lamp which gives the most light with the least consumption of illuminating material will, if it be safe, cleanly, and convenient, be the best. Safety is best secured in the use of safe materials, and no consumer of petroleum oils should be without the means and knowledge requisite to determine those which are safe from those that are unsafe. Cleanliness and convenience are matters of considerable importance. Lamps for ordinary use should be portable and free from the liability to get out of proper adjustment in carrying them about. But details of this kind need not be dwelt upon at length. Of much more importance is the correct knowledge of the principle of illumination by hydrocarbon fluids consumed in lamps.

No one who has paid much attention to the subject has failed to discover that wide irregularities in efficiency exist in lamps of different construction, and even in lamps of the same general style and finish. In fact no single lamp will perform its office with perfect uniformity. The cause of these variations will appear upon an examination of the common elements of lamps which burn liquids such as animal oils, melted fats, or the products of petroleum distillation.

The essential parts of all lamps are a receptacle to hold the material which is burned, and a means of conveying this material to the place of burning as it is needed. To these essential parts may be added the chimney, which in most lamps is necessary in order to bring the air which supports the combustion to the flame in sufficient quantity to secure perfect burning.

Any known compound of hydrogen and carbon burns with a luminous flame, but, in order that the greatest illumination with the most economy may be secured, it is necessary that the amount of oxygen supplied to the flame should be nicely adjusted. If too much is given, the flame supplies too much heat and too little light; if not enough oxygen is furnished, a part of the carbon is not consumed at all, but passes off as smoke.

Now, in stoves and furnaces we make provision for regulating the amount of air supplied to the fuel; but in the majority of lamps used for lighting purposes, the amount of admission is adjusted at the outset, the only change being that caused by the clogging of air passages by dirt, oxidization, etc., so that lamps, which when new work well, often fail to give a good light after a little time, and require frequent attention to keep the draft free from obstruction. There have been some fine lamps provided with dampers, yet, notwithstanding the scientific and practical value of such an attachment, we know of no lamp in general domestic use that has it.

The quality of wicks is also a matter of no small importance; for, although most lamps provide for regulating the flow of oil by raising or lowering the wick, this alone will not insure a good result. Some wicks do not burn evenly, so that a portion will be too high while other parts will be too low, and the flame streams up from the high parts. This arises partly from unequal admission of air, and also from the want of uniformity in the texture of the wick. If the threads which, through their capillarity, convey the oil to the flame be twisted unevenly, so that some are hard while others are soft, it will be impossible to make use of them with satisfactory results. Wicks, also, which in burning throw off branches of charred material instead of burning squarely down in all parts, always give trouble.

The burning of petroleum oils in lamps without chimneys is a problem presenting many difficulties. It has been solved by the use of mechanism to produce a current of air directed to the flame, but such machinery adds so much to the cost of lamps, and is attended with so many inconveniences that it probably will never come into such general use as to supersede the old method. It is, however, so desirable to avoid the use of chimneys that, barring its difficulties, the problem is a tempting one to inventors. It is needless to say that a device which would accomplish such a result, and not add materially to the cost, or necessitate greater attention than ordinary lamps do, would be second in value to scarcely any invention ever produced.

Every year brings forth some new invention pertaining to lamps, which shows, that though the field has been long worked, there yet remains something to be gathered. The direction that any study to improve lamps must take hereafter is toward the better application of general principles of construction, as it is not probable any new principle will be developed. It is, however, very desirable that the inconveniences attending the use of most lamps in use should be obviated. Among these are the accumulation of oil upon the outer surfaces of lamps, which renders them uncleanly to the touch; the frequent trimming and cleansing required; the accumulation of soot on the chimney; the liability of lamps to smoke when left unwatched and unattended, or when carried about; the very disagreeable smells emitted, etc. While these defects remain, there will continue some desire and effort to remedy them; and we believe that, by a thorough investigation of the causes of the annoyances specified, the means to avoid them would ultimately become apparent.

RELIGION AND SCIENCE.

Genuine truth being uncontrovertible, the truths taught by religion and by science must agree in the end. Where discrepancy appears to exist, it is only because either the theologian takes the individual opinions of a certain class of scientists for the teachings of science itself, or the scientist, in his turn, takes the individual opinions of certain theologians for the teachings of religion. In this way, a kind of antagonism is cultivated, which would not exist if the training of those destined for religious teachers was less one sided, and if, in place of confining their preparation chiefly to literary pursuits, they were also trained in the knowledge of those scientific principles, the application of which, during the last half century, has produced the most stupendous changes in the relations of man to his fellow man.

On the other hand, the training of many prominent investigators of science of the present day has been not less one sided; the unwise antagonism, displayed by many religious teachers against scientific pursuits, has reacted on several of the prominent leaders of science, and, in their writings and teachings, they accordingly ignore religion; thus, a class of scientific scholars has sprung up, chiefly in Germany and France, who, to speak mildly, do not consider religious training to have any important value.

Herbert Spencer, whatever opinions many may have of him, has the merit of having clearly pointed out the demarcation line between the knowable and unknowable, between that which science can demonstrate, and that which is beyond the field of science, and which pure science can never reach. Certain minds appear to be constituted in such a manner that they can be satisfied with adhering to the knowable, to only that which science teaches, keeping that which science cannot determine out of their thoughts. But such a condition of mind is only temporary; sooner or later, there grows in them a desire for light in this direction; and happy are those who obtain it—happier in proportion that their work in obtaining it was more laborious. A simple mind may feel happy with a faith accepted without mental labor; but such an individual has no conception of the enjoyment and supreme happiness of the cultivated mind, that finds the truth by searching and working, and whose cares and doubts at last come to rest in the consciousness of having found that precious gem, which all intelligent beings are interested in searching for—*Truth*.

For many ages, the teachers and priests of religion constituted the most influential class of human society. With the progress of knowledge, however, this influence has grown less and less, and, at the present day, it is only very prominent where civilization is least advanced. This undeniable fact, however, must not be construed to mean that civilization is antagonistic to religion. We maintain the contrary; but it has been caused by the neglect of the priests of religion to remain at the head of civilization and in the vanguard of the searchers after positive knowledge, as was the case with the ancient Egyptian priesthood. Those men, supposing that the knowledge of the truth, by the mass of the people, would be dangerous to the maintenance of the existing order of affairs, instituted secret rites, to guard jealously, for the benefit of the few initiated, their precious knowledge; of these rites, certain degrees of the Masonic order of the present day are the degenerate descendants. In proportion as the influence of abstract religious dogmatic teachings, on the mass of the people, was growing less, the influence of the discoveries of science, of the increase of positive knowledge, concerning the material universe, grew stronger and stronger. The invention of printing has, for more than four centuries, been flooding the world with books, so that now almost every man may possess his own library, at a less cost than in ancient times a single book could be obtained for; to this is added, in our day, an unparalleled development of journalism, scientific, political, and religious. Not only our stock of knowledge has increased; its diffusion has increased in a still greater ratio; and, if our religious teachers and leaders only take this into account, and provide such measures as will cause their profession to be at the head of civilization, as well scientifically as in other respects, as was the case with the ancient Egyptian priesthood, there is no doubt that their useful and necessary influence will become greater than ever before, for the simple reason of the immense moral power which must be the necessary result of the combination of scientific knowledge with a religious mission and strict morality.

THE NAVY OF THE FUTURE.

"When the Navy estimates for 1872-3 are laid upon the table of the House of Commons, we understand it is very probable that they will be found to contain provision for the construction of a vessel the armament of which will consist of torpedo artillery carried below the water line. Some time since, trials were made with the Whitehead fish torpedo, under conditions, entered into between the inventor and the Government of this country, that if the torpedo proved to be as effective upon trial as it was asserted to be by its inventor the latter should recieve the sum of £15,000, the Government obtaining the right to the use of the torpedo as part of the national armament. Upon its trial, the torpedo exhibited powers exceeding those which had been claimed for it by its inventor, and he received from the Government the sum agreed upon. As it is to further test the torpedo as a new form of sea artillery that the new vessel will be constructed, we may presume that she will, as a test vessel, be of very limited dimensions.

The facts of the great success which attended the trials of this torpedo, that the Government has paid so large a sum for it, and that the Admiralty are about to construct a vessel to test its merits as a new form of submarine artillery for our fleets, would appear to indicate that little or no doubt is entertained of its successful application. If it should be found in practical work that a ship can thus carry her battery of torpedo guns at any required distance below her water line, or say from seven to 12 feet below her line of flotation, the nation will be committed to another reconstruction of its navy. Armor plating will have to be extended to ships' bottoms and not cease at their top sides, while chain cables, coals, provisions, etc., will then, in all seeming probability, have to be stored above the level of the ship's water line, and in about the positions where she now carries her guns."

The foregoing from the London *Times* indicates that a wide field for invention in the naval line is open for ingenious minds. The London *Engineer* in a recent number makes the following frank avowal concerning the British navy: "It is certain that we have not a single ironclad afloat that cannot be penetrated by shot and shell at close range, while the majority of our ironclads are not invulnerable save at a range of a mile and a half. Such a thing as an absolutely impregnable ship or turret has at this moment no existence."

What is true of the British navy is also true of every navy in the world.

Now, where is the new invention which, shall remedy this state of things, to come from? It can only be developed by the persevering study of ingenious persons. Not power, position, influence or riches can bring out a new discovery. Thought, persevering thought, is the true mother of progress. For the revelation of the most brilliant secrets, we most generally look to obscure persons of simple habits, humble minds, in lonely places. But the comfortably situated, well-to-do individual, having conceit of knowledge, is rarely original. The poor inventor has a clear road before him.

HOW TO SHAVE.—As you strap your razor, strap the two sides alternately, and keep the back of your razor always on the strap, as you turn it from side to side. You thus avoid cutting your strap and turning the edge of your razor. As you shave, keep your razor almost parallel with the skin, and not at a great angle with it. Give your razor also a slight lateral motion. In fact, to borrow the simile of the artist, "the more you can make your shaving like mowing grass with a scythe, the better." Do not make faces as you shave, with the object of making a better surface for your razor to act upon. The skin when strained is easily cut. Adopt these hints and you will bless the unknown giver.

SCIENTIFIC AND PRACTICAL INFORMATION.

NEW PROCESSES OF WATERPROOFING.

The desirability of rendering cloth waterproof without interfering with its permeability by air has attracted a great deal of attention; and a somewhat elaborate process for the purpose has just been published. The mixture is prepared as follows: Place, in a metal vessel of about six gallons capacity, 20 lbs. sulphate of alumina cut in thin slices; and, in a similar receptacle, 8 lbs. of oleic acid, and six quarts of alcohol. Thoroughly dissolve the latter compound, and stir it with a wooden stick for twenty minutes, gradually adding the sulphate of alumina. Leave the whole for about twenty-five hours to settle. The oleic acid and the spirit will then be at the surface, and can be decanted; the remaining deposit should be filtered through flannel, and pressed into a cake. This can be dried by heat, and ground to a powder. For use on silken or linen clothes, one pound and a half to 20 gallons of water will be ample; wool will not require more than one pound. It is as well to strain these solutions, and the fabrics require only to be thoroughly saturated and dried in the air.

Another mode of applying the sulphate of alumina is as follows: Thirty grammes of acetate of lead is dissolved in a pint of water, and a similar solution is made of twenty-four grammes of sulphate of alumina. The two solutions are blended, and the fabric, after being soaked in the compound for twenty minutes, is dried by the atmosphere.

DYEING WOOL.

An eminent French authority recently gave the following directions, in a paper read before the Association of Commerce at Roubaix:

Good dyeing is not possible, unless the wool has previously been thoroughly purified from all fatty matters, and from animal moisture. Bleaching—that is to say, this thorough cleansing and purification—therefore, constitutes an integral part of dyeing, and it is of the utmost importance that it should be most efficiently carried out; in fact, the dyer should watch this part of the process constantly. The next point to be attended to is mordanting. Nearly all the colors used in dyeing require, in order to form a stable dye, that they should have for their base some metallic substance, the bodies used for this purpose being the mordants. Now, if the compounds formed between the coloring matters and the dyes are insoluble, the compounds formed between the mordants and many of the impurities in the wool—the soap in badly washed wool, for instance—are not less fixed and insoluble. If the mordant be a salt of iron, for example, it forms an insoluble iron soap, which effectually prevents the wool from taking a good pure tone of color. In order to get a good result under such conditions, dyers are constantly in the habit of evading the obstacle, and dyeing without any mordant whatever; so that mismanaged cleansing gives rise to fraudulent dyeing, colors thus put on being merely superficial and valueless.

THE COMMUNICATION OF DISEASE.

A further contribution to our knowledge of this subject has recently been made by M. Chauveau, a member of the French Academy. He states that contagion depends, not on virulent humors in a state of solution, but on solid matters held in suspension by gases; and he cites, as evidence of the truth of this theory, the facts that the inoculation with dissolved substances remains without result, and that with corpuscles is followed by the appearance of disease. He also proves, by experiment, that miasms in the air are not disengaged gases, but solid corpuscles. A person may be inoculated, with a fluid formed by the condensation of the vapor of evaporation of a virulent liquid, without danger, while the primitive liquid contains all its contagious properties. These results were observed in experimenting with the virus of small pox, epizoötic typhus, and other diseases.

DISCOVERY OF GOLD IN SIBERIA.

Accounts from the river Amour, which divides eastern Siberia from the northeastern provinces of Chinese Tartary, report the discovery of large and rich gold deposits in that region of country. Washers and diggers are at work in the tributary streams of the Amour, and gold to large amounts has already been extracted. The Olakonta and Sega, two of the small streams, appear to flow through valleys of surpassing wealth in this metal, a gang of men having obtained as much as 170 pounds of gold in a day from the banks of the latter river. A company has been originated, at St. Petersburgh, for carrying on extensive mining operations, as well as for the ulterior object of opening up trade with China and Japan, and with Western North America. A large influx of Chinese population into Siberia may be predicted.

SOUND PRODUCED BY THE MOLECULAR MOTION OF MAGNETIZATION.

Professor Tyndall, in a recent lecture, made the following statement:

"The effect I wish to make manifest was discovered by Mr. Joule, and was subsequently examined by MM. De la Rive, Wertheim, Marian, Matteucci, and Wartmann. It is this:—At the moment when the current passes through the coil surrounding the electromagnet, a clink is heard emanating from the body of the iron; and, at the moment the current ceases, a clink is also heard. In fact, the acts of magnetization and demagnetization so stir the particles of the magnetized body that they, in their turn, can stir the air and send sonorous impulses to our auditory nerves. The sounds occur at the moment of magnetization, and at the moment when magnetization ceases; hence, if a means be devised of making and breaking, in quick succession, the circuit through which the current flows, we shall obtain an equally quick succession of sounds. I do this by means of a contact breaker which belongs to a Rhumkorff's induction coil. A thin bar of iron stretches from one of the bridges of this monochord to the other. This bar is placed in a glass tube, which is surrounded by copper wire; the contact breaker is placed in a distant room, so that you cannot hear its noise. The current is now active, and every individual in this large assembly hears something between a dry crackle and a musical sound issuing from the bar, in consequence of its successive magnetization and demagnetization."

THE CRYSTALLIZATION OF IRON AND STEEL.

The various qualities of iron and steel may be compared by observing the forms of their crystals through a microscope. Cast steel of fine quality exhibits fine crystals of a needle-like shape, parallel to each other; and the axes of these crystals are in the direction of the hammering to which the metal has been subjected. The surface of iron exhibits crystals of the shape of a double pyramid, the proportions varying with the quality of the metal. The pyramids more nearly approach a cubical form as the carbon in the metal is increased in quantity.

VACCINATION.

There are three methods of inserting the vaccine lymph in the human body. One is effected by drawing the skin tight, and making four or five punctures quite through it with the proper lancet, taking care to penetrate to the *cutis vera* or true skin, the innermost of the several integuments of which the covering of our bodies is composed. The lancet should have a groove, down which the lymph can flow, running to the point, and should be held in the wound for two or three minutes to give the lymph a certainty of being absorbed. In the second manner, the ordinary phlebotomy lancet is used, and two or three scratches, parallel to each other, are made, care being taken that the abrasion is only just sufficient to allow the slightest exudation of blood. The third process is by vesication; three small blisters are raised raised a few hours previous to the vaccination, and the lymph is inserted under the skin after the serum of the blisters has been pressed out. Dr. Richard Wilson, of London, gives most emphatic testimony to the superiority of the second method, but deprecates its use on persons advanced in years or of an unhealthy condition of body. The results in such cases are frequently large swellings and considerable inflammation of the parts; and frequently sloughing sores follow, which are to be healed only by the slow process of granulation.

EDITORIAL SUMMARY.

HYDROSULPHURIC ACID.—When sulphur acts upon paraffin, at a temperature a little above the melting point of the sulphur, this gas is evolved in large quantities, and this method may be advantageously used for its generation in the laboratory. A flask, holding about a pound of the material, is fitted with a tube, bent at right angles, about one half inch bore and 12 to 18 inches long, containing cotton wool, and to this is attached the small tube for precipitation. The production of gas may be stopped by removing the heat. Heavy paraffin oil, stearic acid, or suet may be used as a substitute for paraffin.—*John Galletly.*

A NOVEL ADDITION TO THE DINNER TABLE.—The *Brewers' Gazette* says, and it ought to know, that we are to have a revolution, it appears, in wine glasses. London porter requires pewter, and hock a green glass, and it has now been discovered that sherry is not sherry unless drunk out of wood, so that we shall shortly have our dining tables laid out with tiny carved cups, instead of the orthodox wine glass with which we have long been familiar. At present the idea is only in its infancy, awaiting the artists who have under consideration the design of the new sherry cups. We may, however, mention that they will be larger than the present wine glass, more like the old port glasses which our grandfathers used.

CAMELS IN NEVADA.—The Virginia city (Nevada) *Enterprise* says that a train of over a dozen camels recently arrived in that city, having journeyed from the Carson River valley, below Dayton. These "ships of the desert" were loaded with hay, in bales, for Adam's hay yard on North D street. The huge, ungainly beasts presented quite a picturesque appearance as they filed into town with their cumbrous freight. Upon arriving at the hay yard, at the word of command they all knelt down to be relieved of their loads. These animals appear to thrive quite as well in this country as in the wilds of Sahara. There is an abundance of deserts here, if they are necessary to the comfort of the beasts.

PRUSSIAN TORPEDO BOATS.—These boats are cigar-shaped and shot-proof against the rifle and mitrailleuse. In the bow is the rudder, and in the stern, an observatory, with a peep hole about the size of a thaler; the funnel is hardly three feet above water and of very small diameter. The whole boat is about forty feet long, and the only parts above water are the funnel and observatory. The bridge is on a level with the water and protected by a double shield. It is of a gray color and very fast. It will carry torpedoes whose construction is unknown, dash into an enemy's fleet, especially at night, blow up the ship and make away again. Should it prove a good sea-going boat, and England ever dared to thwart Germany, the prediction in the "Battle of Dorking," will probably be realized. Three are already finished and in the port of Dantzic; three unfinished, destined for Kiel, and a number more under construction.

DETECTION OF ARSENIC IN PAPER HANGINGS, DYED AND PRINTED FABRICS AND IN COLORS.—The arsenical copper colors may best be detected by Bettendorf's process. The sample is covered with pure hydrochloric acid containing 25 per cent of real acid, in such quantity that after it has been digested for 15 or 30 minutes, 20 drops of the clear liquid can be poured off. If the liquid is dark or turbid some more hydrochloric acid must be added, and the solution filtered. About 20 drops are poured into a test tube in which a knife-point full of chloride of sodium and the same quantity of protochloride of tin (stannous chloride) have been placed. When these salts have become a thin paste, pure concentrated sulphuric acid is quickly but carefully added to about double the volume, so that the mixture grows hot, and fumes of hydrochloric acid gas escape. After the first violent reaction is over, more pure hydrochloric acid is added. Arsenic, if present, separtes in the metallic state, rendering the liquid a dark grey brown or brown and turbid, and is readily deposited in diluting the liquid.

BOSTON FIREMEN.—The dormitories of the Boston firemen are model apartments, as are all the engine houses. They are carpeted and furnished with the best of furniture. The firemen have a parlor or sitting room, and here the stranger is surprised. There are Brussels carpets, black walnut furniture, ornamental book cases well stocked with useful volumes, facilities for writing, a piano, and the walls are ornamented with choice paintings backed by handsome paper. The department supplies all necessary comforts; but so great is the rivalry between the respective companies to show up the most inviting quarters that the firemen themselves make heavy outlays, and respective friends aid them in their work of refinement with liberal hands. Among the many good regulations of the department is the strict observance of the Sabbath and prohibition of intoxication and profanity, discharge following the breaking of the rule.

F LUDWIG had just published, in the *Wiener Anzeiger*, p. 220, 1871, an account of some researches on the action of chromic acid on certain common gases, namely, carbonic oxide, hydrogen, marsh gas, and olefiant gas. Even at ordinary temperatures, and in contact with dilute as well as with concentrated solutions, carbonic oxide is transformed into carbonic acid. Hydrogen gas, on the other hand, is oxidised with tolerable rapidity by concentrated solutions, but either not at all or very slowly by dilute solutions. At common temperatures, marsh gas is unattacked. Olefiant gas is oxidised to formic and possibly to acetic acid, as well as to carbonic acid and water at ordinary tempe ature. Operating at higher temperatures, Chapman and Thorp found only carbonic acid and water.

MR. J. W. Baughman, of Baltimore, Md., writes to inform us that a lady recently ran a needle into her flesh, about three inches above the knee, breaking it off under the skin. She preferred to risk the consequences rather than to have it extracted by a doctor. Mr. Baughman thought of using a magnet, and applied one of the horse shoe shape, 8 inches in length. She wore it for two days, more or less, and then found the point end of the needle protruding from the skin, one inch from where it entered. The needle was easily removed. Our correspondent is curious to know how the needle could come to the surface point upward, having thus turned round in a space less than its own length, which was $1\frac{1}{16}$ inches, and he suggests that the muscles may have turned it about.

HEATING WINES.—To destroy the germs in the wine which may produce deterioration of its quality, M. Tellier proposes to pass steam into a double copper helix which is introduced through the bung hole of the cask containing the wine. This steam, condensing, is forced up in the form of water through the interior tube by the pressure of the fresh steam boiler, and thus gotten rid of. The wine may by this means be heated to a temperature sufficiently high to destroy any germs in it, and at the same time its volatile constituents preserved.

BROWN TINT FOR IRON AND STEEL.—Dissolve in four parts of water, two parts of crystallized chloride of iron, two parts of chloride of antimony and one part of gallic acid, and apply the solution with a sponge or cloth to the article, and dry it in the air. Repeat this any number of times, according to the depth of color which it is desired to produce. Wash with water and dry, and finally rub the articles over with boiled linseed oil. The metal thus receives a brown tint and resists moisture. The chloride of antimony should be as little acid as possible.

A DRESSING for goods, according to Finckh, may be made by boiling two parts of caustic soda, with four to five parts of palm oil to a soap, which is then dissolved in more water and mixed with thirty parts glycerin of 30° Beck. The mixture should then be cooled, and eight parts of wheat starch stirred in, and water added to bring the weight of the whole up to 1,000 parts. The addition of a little carbolic acid will protect this from fermentation. Of this mixture, add 6 to 8 pounds to every 100 pounds of potato starch used.

SPECTROSCOPIC REFLECTOR.—A slightly convex mirror is fastened on a stand, in such a way as to receive the rays from a Bunsen burner near the operator, and reflect them to the prism or slit of the spectroscope. The introduction of any substance into the flame may be easily accomplished by this arrangement, and the lines are said to appear much brighter than in the ordinary instrument. Prof. Fleck tested, with this apparatus, lime which he had obtained in five different quantities by partial precipitation, and states that different lines appear in different portions; this may be owing to the presence of different elements in the precipitates.

A NEW SCIENTIFIC WORK.

We have received from Professors R. H. Thurston and Richard H. Buel, their prospectus, issued from the Stevens' Institute of Technology, Hoboken, N. J., for a new and popular work, to be descriptive, in detail, of some of the most important of recent inventions and discoveries in mechanics and engineering. The idea is an excellent one, and we have no doubt, from the eminent ability of the editors, that the work will be of much value. If it were to be a sensation novel it would go with a rush, and a hundred thousand copies would quickly be called for. But, confined as it is to subjects that require study and intelligence in their mastery, no such rapidity of demand is, in the ordinary course of things, to be expected; scientific books generally have but a limited circulation. The editors have, however, adopted a special expedient to secure large sales. They propose to publish descriptions of good improvements, provided the holders thereof will furnish, at their own cost, first class essays accompanied by the best possible engravings. In addition thereto, each applicant is expected to pay to the editors, in cash, the sum of seventy-five dollars for each page occupied by his essay—which is equivalent to six hundred dollars, besides the cost of essay and engravings, for a space equal to one page of the SCIENTIFIC AMERICAN. At first blush, this outlay seems large; but it is only a seeming, for in return, the applicant is to receive twenty-five copies of the work free of charge, for every page of space he has paid for. Thus he receives the full *quid pro quo* for his money, and secures the additional benefits of the publication. We wish every possible success to the editors in this novel undertaking.

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Will subscribers to the SCIENTIFIC AMERICAN, who have duplicate copies of No. 1, 2, or 3, of this volume, or others who do not preserve their numbers for binding, re-mail back to this office what they are willing to spare?

At the commencement of the year, we printed several thousand more copies of each number than we had subscribers for, and as many as we anticipated a demand for; but subscriptions have come in so much faster than we expected that the first three numbers are nearly exhausted. The publishers will be obliged to any of their patrons if they return all or either of the above numbers. Address SCIENTIFIC AMERICAN, New York.

Business and Personal.

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

Notes & Queries.

1.—PRESERVING NATURAL FLOWERS.—Will some one furnish me with directions for preserving natural flowers?—R. A. L.

2.—COPPER DIP FOR IRON CASTINGS.—Will some one give me a recipe for making this fluid?—S. D. R.

3.—HYDRAULIC CEMENT.—Will some one tell me how hydraulic cement is made, and of what material?—J. A. T.

4.—CEMENT FOR CROCKERY.—Will some of your readers inform me how to make a permanent cement for mending broken crockery.—B. F. T.

5.—HARDENING STEEL.—In the process of hardening steel, does a chemical change take place in the nature of the steel? If so, what is that change?—A. K. S.

6.—CRACKING OF LEATHER.—What is the cause of the leather, used for the front boards of wagons, cracking? I have tried to find a solution of this mystery and also a remedy for it.—E. G. V.

7.—MELTING GLASS.—Can any one tell me how I can melt glass in small quantities, getting it sufficiently liquid to pour freely?—C. F.

8.—MIXING PAINT.—Could any one inform me how to mix up paints, and what varnish is best to use in getting up Venetian blinds, so that they will neither blister nor crack?—D.

9.—EXPANSION OF MILLSTONES.—Can any one tell me if, and how much, French burr stones are expanded by the heat generated by friction in grinding?—J. C. B.

10.—IRON SHIP BUILDING.—I wish to know who made the first iron boat, and when it was constructed.—W. C.

11.—CONCRETE FLOOR.—I wish to know what will make the best concrete floor for a cellar, without the use of gravel.—J. A. S.

12.—IGNITION OF COTTON YARNS, ETC.—What degree of heat, created by dry air from a furnace, will cotton yarns or cloth stand before igniting, the yarns or cloth being placed in a chamber, and the hot air driven through by a fan?—J. R. K.

13.—RHUMKORFF COIL.—What is the method of constructing the coil of a Rhumkorff induction apparatus? I particularly wish to know the sizes of wire when covered, and the method of securing the most efficient insulation. I have seen described the Ritchie method of winding the wire, but it was very unsatisfactory, being too indefinite for any one, not already well informed, to understand.—J. J. S.

14.—JOURNAL BOXES.—What is the best material for journal boxes for a water meter, where the pressure is against the end or small point of the shaft, which is of brass or some other material that will not corrode? The lubrication is with the water. How do brass and hard rubber run together?—I. C.

15.—RELATIVE WEIGHT TO HORSE POWER OF ENGINE.—Can any one tell me the lightest weight of engine, to each horse power, that can be obtained by the best modern construction?—O. T. H.

16.—ELECTROPLATING WITH ALLOYS.—Can an alloy be deposited by electricity, on a metal surface, as gold, silver, and other metals are done, if the ingredients of the alloy are good conductors?—R. T.

17.—STEAM ENGINE PHENOMENON.—Last summer, I was running my engine after dark. The boiler was well filled with water, and the steam gage indicated 30 pounds pressure. Casting my gaze toward the top of the boiler, I saw a pale yellow light, at a small leak in a connection of the steam pipe; being alarmed lest the building was on fire in the story above, I seized my lamp, hastened up stairs, and satisfied myself that all was safe up there. I returned to the engine room and saw the light as before, not only where I first saw it, but at different points where steam was escaping in jets. The lights disappeared when the lamp was brought near them. When my hand or some other substance was brought in contact with the jet of steam near the point of issue, the light seemed to attach itself to the hand or other substance. This continued for about forty minutes. What was the cause?—J. A. L. A.

18.—PRESERVING RUBBER BOOTS.—Is there any preparation to preserve gum boots from cracking? I find that always, after wearing awhile, they lose that fine gloss which they have when new, and get full of fine cracks. Can any one tell me how I can patch them in case they get torn, so as to make them waterproof again?—J. R. M.

19.—COKE FOR IRON MANUFACTURE.—Has coke, similar to our gas house coke, been used for melting iron in this country to any extent, and, if so, with what results? Does it melt iron as rapidly as coal, and does it have any chemical action on the metal? I am aware that it has been used in England, but I would like to know whether that coke is similar to our gas house coke.—G. W. C.

20.—VALVE FOR MINING ENGINES.—Can any reader, who is using Davis' piston valve, tell me if it is suitable for an engine used in the shafts of deep mines? I am using the common slide valve, and the empty car, in descending, acquires considerable velocity and overcomes the friction of the engine, causing an unpleasant rattling of the valve and wear on the threads of the spindle. I think Davis' valve will answer the purpose, but it is comparatively unknown in this country; and I should like the opinion of some one well acquainted with it.—F. L.

21.—TRISECTION OF AN ANGLE.—Mr. N., of Ind., sends us the construction of a geometrical problem to trisect any angle of less than ninety degrees; and he ends his communication with the question, customary in such attempts, "if not, why not?" The point which has so long defied the powers of the best geometricians is the solution and demonstration of the problem by elementary geometry, and this Mr. Naylor leaves to his readers. The practical trisection of an angle has long been understood; the demonstration Mr. Naylor leaves just where he found it.

22.—SEPARATION OF GASES.—I wish to know if there is any simple way of separating the different elements of the air from each other.—L. M.

23.—TRANSIT OF THE PLANET VENUS.—Is there any reliable rule for computing the transits of Venus?—C. E. P.

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at 1·00 a line, under the head of "Business and Personal."

ALL reference to back numbers must be by volume and page.

GEARING FOR SAWS.—In reply to query No. 2, January 20, I beg to say, for the information of A. K., that it is practicable to run circular saws with bevel gearing. There is a circular saw mill in our town running at the present time (and has been for the last ten years) with bevel gearing, a crown wheel, on upright water wheel shaft, four feet six inches diameter, 2 inch pitch, 6½ face, pinion 1 foot 6 inches diameter. I have made several mills on the same principle by substituting a mortise crown wheel and chipping and filing cogs in pinion.—W. H., of Ontario, Canada.

BLUEING IRON.—"Gun Barrel" will find the information he requires in this column.

GENERATING STEAM.—J. H. McC. is referred to pages 55 and 88 of our current volume.

S. T. A. E., C. E.—You will find an answer to your question in any elementary work on physics.

FACE WORMS.—Let H. E. A., query No. 4, January 20, try the water cure and keep his face washed clean.—K., of N. Y.

J. M. C., of Honolulu.—We know of no reason why the albumen from sea birds' eggs should not be as good as that of domestic fowls: Dix & Morris, 58 Cedar street, are dealers in the albumen. The price is about $1·25.

STAINING CANES.—Query 10, January 6, 1872.—Dragon's blood dissolved in water or alcohol, with burnt umber added until the desired shade is obtained, is the right thing. Apply with sponge. To get a matted appearance, make a second application in spots. Polish with shellac.—E. F. H., of Iowa.

WEARING OF SLIDE VALVES.—I would state, for the benefit of W. C., that the concavity is attributable to two causes: First and mainly, to the center of the seat being in constant wear, while the ends are worn only alternately; secondly, to the unequal distribution of the wearing surface.—A. K. S., of Neb.

COPPER SALTS.—L. H. B. is in error in stating that copper salts have been recommended for cleaning statuary. A wash of nitrate or sulphate of copper on stone work has been suggested as a preservative the object being to fill the surface pores of the stone with the metallic copper. The salt should be dissolved in water, and the hands kept from contact with it.

CRYSTALLIZATION OF HONEY.—Strained honey, if scalded and skimmed, will keep any length of time without change. The scalding will slightly alter the flavor, but will not impair it materially.—J. H. P.

A. W. P. S., of O.—A fall of 17 feet will give a rise, in a fountain, of 17 feet, *minus* the loss of head due to friction and the resistance of the air to the jet. The material of the conduit will not make very great difference in friction, but the larger it is the less will the friction interfere with the hight of the jet.

RED SPIDER.—How can the minute red spiders, which are found upon house plants and around windows in great numbers, be destroyed?—A. F. W. Answer: It is very difficult to get rid of the red spider. The florists sell certain soaps, intended for that purpose, which are to be dissolved in water and applied with a syringe. These insects flourish where it is warm and dry. But they cannot stand wet. Treat them to as much moisture as possible.

CAUSES OF CHANGE OF COLOR IN THE STARS.—C. B.'s theory is probably correct, but it is no new discovery. Mr. Proctor, we believe, has already written to the same effect.

TENSILE STRENGTH OF SWEDISH IRON.—H. L., of Ind.—The breaking weight per square inch of Swedish iron ranges from about 70,000 lbs. to 112,000 lbs., but 85,000 may be taken as an average. This information will answer your other questions, if you calculate the area of the cross sections of the round rods, by multiplying the radius by ·7854.

S. S. B., of N. Y.—Coke, like other forms of carbon, absorbs more or less of all gases floating in the air to which it is exposed. In burning, it liberates such of these gases as are not combustible, and by its own combustion produces mostly carbonic acid with traces of gases from substances which have been imperfectly removed in the process of coking.

SONOROUS STONE.—To W. S. R., page 138, Vol. XXV.—The stone near Pottstown, Pa., must be of volcanic origin, known as trachyte. An island in the West Indies, elevated 310 feet above the ocean, contains masses of the same character of rocks. Livingston, in his "South Africa," page 101, speaks of the Bamangwato Hills of the Bakaa Range, 700 or 800 feet above the plains: "The rocks, in falling, produce a ringing noise, which leads many to fancy that they contain abundance of iron. In many places, the lava streams may be recognized."—C. H. K., of the West Indies.

INDELIBLE INK.—Ink for marking linen can be made by dissolving five cents' worth of lunar caustic (nitrate of silver) in half an ounce of water. Equal parts of starch and saleratus must be used to stiffen the linen. Iron it smooth, write on it while hot, dry and iron again and if there be any blots, cover them with lard. Then lay it in the sun for several hours, and immediately wash in very strong hot suds.—E. E. S., of O.

BLUEING IRON.—On page 42 of the current volume, I find that J. C. C. wants to know how the peculiar blue surface is put on gun barrels. Let him apply nitric acid and let it eat into the iron a little; then the latter will be covered with a thin film of oxide. Clean the barrel, oil, and burnish. A very pretty appearance is given to gun barrels by treating them with dilute nitric acid and vinegar, to which has been added sulphate of copper. The metallic copper is deposited irregularly over the iron surface. Wash, oil, and rub well with a hard brush.—R. T.

GUN SCATTERING SHOT.—Mr. Abraham Heaton, of Ada, Mich., states that a gun will always scatter if the barrel be crooked. As a gunsmith of experience, and being now retired from the business, he thinks he can give H. W. good advice, and has no hesitation in imparting trade secrets. To straighten a barrel: Let it rest on the backs of two chairs to keep it level; take the breech out and lay a fine needle in the muzzle. Look in at the breech and turn the barrel round; and if the needle can be seen plainly all round, there is not much the matter with the straightness of the tube. But the barrel may be smaller in the middle, a frequent cause of scattering. To correct this fault, take a wooden rod, about six inches longer than the barrel, fit it snugly to the barrel from end to end. The end of the rod is to be the handle to draw it through the tube. The rod should have a small float file fitted in, about one inch from the end, even with the wood. If the middle of the barrel's length be smaller than the muzzle, it will be discovered on drawing the rod in and out of the barrel, and then the latter should be held in a vise, and the rod worked in and out till it passes easily. Then withdraw the rod, pry out the file, raise the latter by putting a piece of thick paper underneath, and proceed as before. After filing away the tight part, sand paper should be used to finish it with. Keep the breech pin in, so that the thread cannot be injured. The file must be of the best cast steel, with the temper drawn to a straw color.

PROPORTIONS OF ENGINE.—On page 42, Vol. XXVI., J. R. L. wants to know whether the builder's idea of increasing the power of his engine is correct, and the true cause of the engine's not doing one fourth more work with 80 pounds of steam than it will do with 45 pounds. I think if the builders will put on a 1,500 pound fly wheel instead of a 4,200 pound one, and enlarge the steam pipe as well as the governor, the engine will do the work. There is trouble with the governor, which causes the phenomenon of the engine doing three fourths of the work with 45 pounds and not the whole with 80 pounds.—S. F., of Pa.

FACE WORMS.—To H. E. A., query No. 4, January 20. The best remedy for the eradication of flesh worms that I have ever seen tried is the following: Rub with dry sulphur at night before retiring; at the same time, take internally a tablespoonful of sulphur and magnesia mixed with molasses (measured after mixing). In the morning, wash off the face with bran water and afterwards with pure cold water. Repeat this treatment on alternate nights till a cure is effected.—J. B. Jr., of O.

LIGHT ENGINES FOR SAW MILLS.—In answer to NEMO, query No. 16, January 20, I would advise him to try a saw with inserted teeth, and take out the teeth at equal distances, until he has power enough to run it. Of course he must replace the teeth with worn out ones, to keep the strain on the saw equal, so that it will run true. A saw will bear feed much better with only a few teeth that cut a good kerf than it will with many of them, each scraping out a little dust.—E. K., of N.Y.

PAINT BRUSHES.—Query 5, January 1, 1872.—If the brushes are not hard, wash them with soft soap and water, or turpentine; if hard soak in a moderately strong solution of concentrated lye.—E. F. H., of Iowa.

Declined.

Communications upon the following subjects have been received and examined by the Editor, but their publication is respectfully declined:

ARTIFICIAL FUEL.—J. J. C.—E. F. L.
BOILER EXPERIMENTS.—W. H.
CANAL NAVIGATION.—C. B.
DIAMONDS.—A. D. R.
THE DAVENPORT TRICKS.—C. B.
TO SMOKE OR NOT TO SMOKE.—F. H.
WORMS IN TIMBER.—J. O. M.
ANSWERS TO CORRESPONDENTS.—Y. S.—J. A. C.—E. A. D.—G. S. & Co.—J. R.—C. O.—J. P. N.—R. E. O.—L. S.—E. H. G.—P. C., JR.—E. W. K. P.—W. S.
QUERIES.—W. A. A.—J. H. P.—J. D.—S. C. P.—J. O.—J. L.—S. G. S.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

GIN GEARING.—Harris R. Easterling, M.D., Bennettsville, S. C.—This invention relates to the combination of two gins, placed diametrically opposite each other, and gearing with a master wheel driven by horse or other power, the connection between said gins and the pinions that gear with the master wheel being effected by means of sliding clutches, so that either gin may be stopped without stopping the other gin or the master wheel.

MACHINE FOR POLISHING AND VARNISHING MOLDINGS.—Charles and John Gschwind, of Union Hill, N. J.—This invention has for its object to devise a reliable apparatus whereon moldings, to be gilt, silvered, or otherwise ornamented, can be automatically and rapidly polished and, if desired, also varnished. This object is attained partly by a novel and ingenious arrangement of polishing tools and mechanism for moving the same over the moldings, and the combination therewith of an adjustable table on which the moldings are secured. It is also partly attained by a new system and arrangement of brushes, mechanism for dipping the same, and means for increasing their pressure upon the moldings in equal ratio to their distance from the varnish reservoir, and by further items of invention of greater or less importance.

HARNESS BUCKLE.—John H. Morris, Normal, Ill.—The invention consists in constructing and shaping the frame and tongue so that the buckle is held by pressure on heel and point in a very ingenious manner that gives great security. The device is a most useful one in connection with harness.

DITCHING MACHINE.—George W. Nevill, Richmond, Va.—This invention consists in a ditching machine which gradually cuts down to the depth desired, carries the excavated soil up over a flanged wheel, and discharges it at the side. Practical experiment has demonstrated its peculiar adaptability to the Western prairies.

CARPET STRETCHER.—William P. D. Claybrook, Palmyra, Mo.—This invention relates to an improved device for stretching carpets and for holding them in position while being fastened, the same being of a simple and convenient form or construction, and adapted for operation in rooms of various sizes.

SULKY PLOW.—John H. Robbins and Samuel Robbins, Bethel, Oregon.—The invention consists in a very ingenious method of adjusting the depth and pitch of plows in a sulky carriage frame by a peculiar and simple construction of beam and graduating mechanism.

WATER ELEVATOR.—John L. Burch, Franklin, Tenn.—This invention relates to an endless chain water elevator, of simple and convenient arrangement of parts whereby they may be readily taken apart for transportation, or more easily placed in or removed from a well than others heretofore employed.

CANAL BOAT.—William Henry Newell, Jersey City, N. J.—This invention relates to a new fender attachment for canal boats, whereby the lateral disturbance of the water is prevented, and undue friction during the propulsion of the boat avoided. It consists in hinging fenders to the sides or at the ends of the boat, so that they will protect the propellor or wheel and tend to prevent the disturbed water from reaching the banks. It also consists in the application to side fenders of extension pieces. The fenders may, on their hinges, be swung out or in more or less, according to the amount of water acted on by the propeller and depth of draft. To one or both the ends of the fender, are or may be applied extension fenders, which permit the proper lengthening or shortening of the main pieces. Instead of extension sections, there may be hinged sections at the ends of the fender, which may be folded against the main fenders, when to be carried out of the way. These hinged end pieces may also be used as rudders if desired. Canal boats having stern propellers may have fenders hinged only to their stems and bows, or either, and none at the sides. Where the fenders are caused to meet forward of the boat, they will, it is claimed, increase the speed by cutting through the water with less friction.

ROTARY STEAM ENGINE.—Thomas B. Van Pelt, of Spring Hill, Kan.—This invention relates to improvements, in rotary steam engines, intended to secure the full power of steam. A single rotary shaft, with cylinders, connecting with the steam chest, disk pistons, eccentrics, cams, yokes, sliding heads, levers, rock shaft, and cut-off valves, are employed to secure the object sought, and are covered by the claims allowed in the patent.

SASH HOLDERS.—Oscar W. Noble, of Darlington, Wis.—A bolt having a slot and pin, and a plate having a pin and slot applied in combination to the recess of the sash, also a cam bolt having a slot and pin, and a plate having slots and a pin, applied in combination to the recess of the sash are the features embraced in the claims upon which a patent has been obtained. By applying a projecting tongue to the cam, the same can be made to lock into mortises provided for its reception at proper intervals in the window frame, and thus constitute an absolute support for the sash; and the device, locks the sash when the latter is closed.

ELECTRO-MAGNETIC ENGINE.—Claude Victor Gaume, Williamsburg, N. Y.—This invention has for its object to furnish an improved electro-magnetic engine, simple in construction and effective and reliable in operation, being so constructed as to be free from the "pull back" or retardation which is a great objection to such engines as usually constructed. The armatures consist of a central bar, attached at its center to the face of a wheel, and having cross heads formed upon them about midway between their centers and end, the cross heads having short bars formed upon their ends parallel with the central bar, and the ends of which project to equal distances upon the outer and inner sides of said cross heads. Armatures thus constructed are claimed to be free from the retardation or "pull back" which was the great difficulty to be overcome in making electro-magnetic engines practical as a motive power.

MEDICAL COMPOUND OR BITTERS.—Richard G. Turner, Columbia, Texas.—This invention consists in a compound, more especially designed as a remedy for miasmatic fevers, but is claimed to be valuable in many other diseases and ailments of the human system, as general debility, torpid liver, dyspepsia, constipation, jaundice, and many others.

MARBLE POLISHNG MACHINE.—Michael Mallon, Rahway, N. J.—This invention consists of a horizontally swinging polishing stone holder, with driving gear and supporting apparatus therefor, adapted to be mounted on the surface of a large stone to be polished, and adjusted along it from one position to another and secured at any point, or to be used on a stationary table or platform. The machine may be used to polish metal and other substances. Sand may be carried upon the top of the stone and fed down through passages, from time to time, to the working surfaces.

EXTINGUISHER FOR STREET LAMPS.—George S. Dunbar, of Pittsfield Mass.—This invention has for its object to improve the construction of a gas light extinguisher, for which Letters Patent were issued, to the same inventor, October 3, 1871, so as to make it more satisfactory in operation, enabling the lights to be extinguished by a slightly increased pressure of the gas. It consists in the construction and combination of a lever, catch, shoulder or flange, with a flexible diaphragm and its attachments; also a combination of a pin with the catch, flexible diaphragm, and a case; also a combination of a pin or slide, with the lever and a slot in the case in which the said lever works. The invention is extremely ingenious, the gas being instantly extinguished by a pressure upon a pin passing through the case.

THILL COUPLING.—Lyman Derby, of Franconia, N. H.—This invention pertains to an improvement in the class of thill couplings in which rubber or other suitable elastic substance is employed to prevent rattling. The invention consists in a construction and arrangement of parts, whereby provision is made for causing two coupling screws to retain a secure hold, under all circumstances, by a single block or piece of rubber inserted between their adjacent inner ends, special provision being made for expansion of the rubber or compression of the same without material change in its elastic force, as applied to or exerted upon the screws; so that, if the block of rubber should be of undue size or firmness, the screws may notwithstanding be easily screwed home without injury to the rubber.

HARROW.—C. Hairgrove, of Jacksonville, Ill.—Two central bars are hinged together in the usual way of hinging harrows, or any other convenient way. To these bars are pivoted cross bars which are again pivoted to longitudinal bars at the outside, so that they may be inclined at an angle to the middle hinged bars. A clamping device holds them fixed when thus inclined. It is obvious that the more the cross bars are inclined from a right angle with the central hinged bars, the nearer will the teeth which they carry be brought together, and *vice versa*, the object being to construct a harrow in which the teeth may be adjusted in a simple manner, at a greater or less distance from each other.

TIRE SETTERS.—Joseph Pailca, of Ledyard, N. Y.—This invention consists of a bench, whereon the wheel is laid, with the tire adjusted upon its face at one side, and held by a holder suitably adapted therefor, while the other side of the wheel, on which the tire is to be forced, rests against a curved bar at the end of the frame, and a lever with a hook engaging the upper edge of the tire, while the end takes under the frame, which contracts the wheel and stretches the tire down upon the face or the hub in such manner as to allow of setting the tire without heating it at all.

EARTH CLOSET.—Hamilton Sherman, of Waverly, Pa.—This invention relates to that class of earth closets wherein the soil is transferred forward and dropped automatically at every raising of the cover by a carrier having an opening and closing bottom; the object being to improve the construction and the mode of operating grate bar slides with hinged metallic flaps underneath, closed by entering a narrow channel as the cover is raised and opened, successively, by their own gravity.

TRAVERSE MOTION.—Duncan Walker, of East Hampton, Mass.—This invention consists of a three pointed star wheel, combined with a pair of inclined faces or cams, arranged on said bar reversely to each other, and on opposite sides of the wheel at one end of the traverse bar, in such manner that said faces are alternately acted upon by the said star wheel, and the bar alternately moved in opposite directions, the movement in one direction beginning as soon as the movement in the other ceases, and the said movement being uniform in speed throughout the whole length, which is the essential object of the invention, and distinguishes it from those arrangements in which the bar is moved by eccentrics, which give a variable motion to the bar, and allow it to rest or move so slowly at each end that the wear of the threads or "ends" on the leather rollers is very much greater at the extremes of the movements than between them. The traverse bar assumes the form of a wide plate at one end, in which is a large hole whose walls are perpendicular to the bar and have each an inclined plane or cam which, beginning at a corner of said hole, inclines toward the center of it to some extent, and stops at a line parallel with the bar and passing through the center of said hole. One of the cams is on the same side of the center that the bar is, and the other is on the opposite side. The three pointed star wheel revolves horizontally in the hole on the axis of a worm wheel below which is turned by a worm on the shaft of one of the draft rollers. This star wheel and the cams are so adjusted relatively to each other that one of the points will begin to act on one of the cams to move the bar in one direction at the moment another point escapes from the other cam, and ceases to move said bar in the other direction, These cams will not be straight inclines, but will have such form that the motion imparted to the bar by the revolving points will be uniform in respect of speed throughout each movement.

AIR SUPPLYING ATTACHMENT FOR STOVES.—Wesley Wright, of Lee's Summit, Miss.—This article is proposed for manufacture and sale in the market as a suitable attachment to stoves, by which the air (required to furnish oxygen) may be drawn from the outside of the chamber, and its supply to the fire graduated according to circumstances. It is a compound metallic hearth and air chamber constructed in a single piece and adapted to the use set forth.

WASHING MACHINE.—Isaac J. Wells, of Spring Valley, N. Y.—This invention has for its object to furnish a simple, convenient, and effective washing machine which shall be so constructed as to wash the clothes quickly and thoroughly and without injuring them. It consists in a washing cylinder and boiler, the washing cylinder being provided with buckets, and also a combination of stirrer pins with the washing cylinder.

ORGAN ACTION.—John H. Odell, New York city.—This invention embraces the employment of a pneumatic tube action for organs, in which the valves of the organ pipes are opened by the inflation of a pneumatic lever, which is inflated by the admission of air through a pneumatic tube, whereby the key board may be removed from the organ and placed at a considerable distance therefrom, and the usual arrangement of squares, levers, rollers, trackers, and electric wires, may be dispensed with. The invention also embraces the combination of a self acting exhaust valve with the pneumatic lever, and the employment of certain other novel devices in connection therewith, so as to produce a quick return movement of the pneumatic lever. The pneumatic lever may be operated by air pressure; but it may be also operated by an air exhaust or suction, in which case the pneumatic lever and connected parts would need to be specially arranged for the use of such exhaust. The inventor does not limit or confine himself to the particular form construction, or arrangement of any of the parts herein described, as they may be varied in many ways to suit the requirements of the construction without departing from the invention.

ELEVATOR.—William Livingstone and William F. Holske, Brooklyn, assignors to William F. Holske and William H. Silberhorn, New York city.—The first part of this invention consists of a combination of toothed eccentric wheels or pawls and weighted levers gearing with them, with the carriage, its actuating rope, and wood or other elastic guides, in such manner that the said toothed eccentric wheels will be caused to engage or bind against the wood guides by the gravity of the levers, or by the same and a spring to lock the carriages and prevent falling in case of accident. The essential object of this invention is to avoid the expensive toothed or notched iron bars and the iron pawls now used, which, besides being expensive, are also objectionable on account of their liability to break for want of elasticity by the sudden shock when catching the car. The second part of the invention consists of a system of intermediate driving and reversing gearing between the driving belt, by which the carriage is actuated, and the drum of the hoisting rope, whereby the carriage is operated at will in either direction by the said driving belt constantly moving in one direction, the shifting being readily effected by suspended cords, such as are commonly used in elevators for actuating the reversing gear. This part of the invention also comprises a novel friction brake device, which, being also worked by the reversing cords, comes into action at that moment when in the reversing of the clutches the drum is entirely disconnected from the driving belt, and retains the drum until, by the continuation of the action of the shifting gear after the clutch has been released, the drum becomes completely disengaged and the connecting one fully engaged, thus positively holding the carriage during the time of changing the connection and while both clutches are disconnected to allow the carriage to rest. The essential object of the second part of the invention is to provide a simple and efficient system of connecting reversing gear, whereby elevators may be worked from shafting of factories, etc. continuously moving in one direction, and thus save the necessity of employing special engines for reversing the carriage by reversing the valves. Thus the inventors are enabled to drive the carriage in either direction by a power constantly moving in one direction, and to hold said carriage while shifting from one connection to the other, so as to insure the entire disconnection of one clutch and the cessation of the motion of the drum and carriage before the other reversing connection is formed, so that there is no clashing of any counter forces; also to allow the carriage to stop as required by apparatus set in motion by the same act by which the reversing is effected.

SELF-ACTING MULE FOR SPINNING.—Joseph P. Sweet, Hebronville Mass.—This invention relates to a new arrangement of apparatus constituting a positive "wind" motion, and the gearing and ungearing devices therefore adapted for the Franklin mule, which we regard as a positive improvement upon this class of machines. A ratchet wheel, pawl, tapered pin, disks, combined with a cylinder shaft, a lever, spring, spring catch, dagger, and tripper, constituting the mechanism embraced in the patent which has been obtained upon the invention.

TRUNK LOCK.—Joseph Stanton, New York city, assignor to Adolphus Hagelin, same place.—This invention has for its object to furnish an improved trunk lock, so constructed that the lock itself will act as a guide to bring the parts of the lock into proper position for locking, thus counteracting any bad effects from the springing or warping of the side of the trunk body, and preventing any damage to the lock should the cover be accidentally dropped, even though the locking bolt be thrown forward.

SALVE.—Louisa Masters, Jackson, Miss.—This preparation has for its object to furnish an improved salve for the cure of sores, cuts, bruises, etc., whether they be of long standing or not. It is prepared of various ingredients, in specified proportions, and in a peculiar manner.

LIVER INVIGORATOR.—William L. Simmons, M. D., of Weatherford, Tex.—This preparation has for its object to furnish an improved medical compound, called "Liver Invigorator and Cholagogue," which is claimed to be very effective as a corrective of biliousness, indigestion, etc., caused by miasmatic influences, torpor of the liver, headache arising from disordered stomach, bowels and liver, or produced by malarious poisons, etc.

BIT BRACE.—James Rice, of Prairie Creek, Ind.—The first peculiarity in this brace is that it may carry several bits at once, those not in use being turned up out of the way. Second, a very ingenious device enables the sweep or leverage of the brace to be increased or diminished as may be desired. The precise form or arrangement of any of the parts described is not claimed, as they may be varied in many ways without departing from the invention.

ACCOUCHING GARMENT.—Harris R. Easterling, M.D., Bennettsville, S. C.—The invention consists in two corsets, leg pieces, and certain intermediate connections by which a lady is enabled to manage the whole business of parturition without the assistance of midwife or physician.

[OFFICIAL.]

Index of Inventions

For which Letters Patent of the United States were granted

FOR THE WEEK ENDING JANUARY 30, 1872, AND EACH BEARING THAT DATE.

Accouching garment, H. R. Easterling 123,249
Band tightener, G. Brodie 123,228
Barrel heads, machine for making, G. Schloemer 123,201
Bed bottom, etc., spring, C. Rich, (reissue) 4,728
Bed bottom, spring for, W. H. Miller 123,279
Bee hive, C. R. Isham 123,104
Blacking box, H. Smith 123,204
Blacking machine, boot, N. Eisenmann 123,160
Blower, J. A. Svedberg 123,304
Boat chimneys, lowering and raising steam, W. Weaver 123,314
Boiler flue scraper, J. H. Dann 123,115
Boiler, hot water, P. Lesson 123,269
Boiler, wash, E. E. Brewster 123,266, 123,227
Boilers, preventing incrustations in steam, P. V. Vigier 123,310
Bolts, die for heading, J. B. Clark 123,084
Bolts, machine for cutting off, H. M. Powers 123,121
Book, pocket, F. Busch 123,232
Boot, P. West 123,316
Boot crimping machine, R. H. Dorn 123,158
Boots and shoes, machine for burnishing the heels of, R. C. Lambert 123,112
Brake, steam or air, S. N. Goodale 123,098
Brine, evaporator for, R. G. Leckie 123,181
Brine, apparatus for evaporating, R. G. Leckie 123,181
Broom or mop clamp, E. Chapman 123,083
Brush, paint or varnish, A. Randol 123,293
Brush and mixer for stove blacking, G. S. Goodspeed 123,099
Buckle, J. H. Morris 123,281
Building blocks and method of forming the same, A. Derrom 123,156
Burning hydrocarbons, I. Kendrick 123,109
Button hole cutter, W. W. Egnew 123,250
Button, imitation, W. H. Shurtleff 123,299
Cabinet and bed, R. F. Clayton 123,085
Cable chain stopper, E. R. Cheney 123,152
Candy, manufacture of, W. J. Burns 123,149
Car brake, J. Temple 123,133
Car coupling, J. Temple 123,134
Car coupling, H. C. Swan 123,207
Car coupling, J. A. J. Chapman 123,150
Car, hand, L. J. Cathell 123,322
Car truck, W. B. Rogerson 123,126
Car truck, L. I. Fleming 123,163
Car loading machine, S. J. Bingham 123,146
Car, refrigerating provision, J. J. Bate 123,077, 123,078
Cars, air brake for, T. O. Ward 123,312
Cars, device for changing the gauge of, D. Todd 123,308
Carpet stretcher, W. P. D. Claybrook 123,239
Carriage body, E. M. Williams 123,213
Carriage, children's, I. Cole 123,241
Carriage curtain fastener, J. Taynton 123,132
Carriage seat, corner post for, S. S. Stanley 123,302
Carriage spring clips, manufacture of, H. M. Beecher 123,079
Caster for furniture, W. I. Blackman 123,147
Chair, A. Taylor 123,131
Chair, opera, A. Abel 123,140
Chair and step ladder, combined, A. Liesche 123,183
Chisel for pointing pickets, A. Damitio 123,243
Cheese vat, Jones and Faulkner 123,167
Churn, S. M. Palmer 123,289
Cock, valve, J. Walsh 123,311
Comb, O. Johnson 123,177
Composition for tanning hides, J. M. Müller 123,118
Confectionery paste, soap, etc., machine for cutting, M. Laemmel 123,265
Copper welding, Schurr and Rehbein 123,296
Corn sheller, hand, W. H. Wilson 123,319
Countersink, W. H. Dodge 123,246
Cultivator, M. Schwartz 123,128
Cultivator, A. F. Carlson 123,235
Damper and pipe collar, combined, A. S. Shontz 123,298
Desk, school, H. L. Andrews, (reissue) 4,723
Ditching machine, G. W. Nevill 123,286
Dovetailing machine, D. Whitlock 123,137
Drawer pull, W. E. Sparks 123,301
Drawing knife, A. M. Steele 123,206
Dikes, core for, W. A. Thompson 123,306
Elevator, freight, W. F. Morrow 123,189
Elevator, hydraulic, H. L. Ensign 123,161
Engine, rotary, J. B. Bennett 123,144, 123,145
Engine, rotary steam, G. R. Winkler 123,320
Engine, gun powder, J. S. Foster 123,095
Engine, link for steam, D. A. Woodbury 123,138
Engines, valve for steam, J. W. Hopkins 123,174
Excavating and ditching machine, Stewart and Russell 123,303
Fastener, shutter, J. Andrews 123,074
Fastener, shutter, Keffer and Reazor 123,179
File, paper, C. M. O'Hara 123,288
Fire extinguisher, E. Jones 125,106
Fire regulator, automatic, G. M. Eldridge 123,252
Fire arm, breech loading, J. Duval 123,159
Fishing apparatus, O. M. Fuller 123,164
Flour bolting, Burk and Trussel 123,082
Forge, blacksmiths', M. Scott 123,202
Furnace, J. W. Smith 123,300
Furnace for heating and puddling iron, etc., J. Morrison 123,282
Gas, manufacture of, G. Eveleigh 123,255, 123,093
Gin gearing, H. R. Easterling 123,248
Gold, &c., saving float or fine, E. J. Fraser 123,096
Harrow, R. W. O'Neal 123,193
Harvester, T. Plumleigh 123,291
Harvester cutters, apparatus for grinding, J. H. Curran 123,088
Harvester, pitman for, J. M. Mourer 123,283
Hat boxes, die for cutting, F. Schoettle 123,127
Hat br'ms, machine for forming, C. T. Rowe 123,200
Hay loader, T. Giffin 123,166
Head block, T. Douglass 123,091
Heating apparatus, hot water, E. C. Clay 128,153
Hedge trimmer, J. Black 123,224
Heel cutting machine, O. G. Critchett, (reissue) 4,724
Hook, releasing, J. L. Cathcart 123,236
Horse collars, machine for stuffing, L. P. Woods 123,139
Horse power, G. Brodie 123,229
Horseshoe toe calks, die for welding and forming, J. Flynn 123,256
Horseshoeing apparatus, J. B. Brusoe 123,231
Hose coupling, A. F. Allen 123,070
Ice cutter, E. Bacher 123,076
Injector, feed water heater, and condenser, combined, E. Korting 123,264
Inkstand, J. C. Sparr 123,205
Iron, sad and polishing, F. Myers 123,119
Iron and steel, manufacture of, C. M. Nes 123,191
Iron and stand combined, sad, F. Myers 123,120
Iron castings, malleable, A. F. Andrews 123,072
Iron castings, apparatus for treating malleable, A. F. Andrews 123,073
Jack, lifting, L. M. Lusk 123,270
Kettle spout, tea, J. Ash 123,215
Knife cleaner, A. B. Clarke 123,238
Knitting machine, H. V. Hartz 123,100
Knitting machines, &c., electromagnetic stop for, Wells and Moran 123,315
Knobs to their shanks, attaching, J. Hoeflinger 123,102
Ladder, step, E. M. Norton 123,287
Lantern, C. J. Sykes 123,208
Lanyard, elastic, J. E. Jones 123,178
Last shoe, W. J. B. Mills 123,116
Latch for gate, G. W. Large 123,267
Lock, alarm, G. J. Swingle 123,305
Loom, A. Urbahn 123,210
Loom shuttle, J. Martin 123,184
Loom picking mechanism, J. C. Fisher 123,094
Lubricator for steam engines, M. Hawkins 123,259
Mail bag, T. J. Lamdin 123,113
Measure, tailor's, G. W. T. Harley 123,170
Medical compound or salve, T. Kuhn 123,180
Milk cooler, N. W. Miller 123,278
Milk strainer, W. H. Johnson 123,261
Milk vat, Willard and Pope 123,318
Mirrors, manufacture of silvered, D. Durand 123,247
Molded articles from plaster materials, A. C. Estabrook 123,254
Movement, mechanical, E. Chapman 123,237
Nail plate feeder, H. B. and E. C. Perkins 123,290
Needle threader, S. L. Mercer 123,277
Nut, lock, C. F. Brush 123,148
Oven, D. S. Coburn 123,086
Oven, steam, E. Brown 123,230
Overshoe, J. Evans 123,162
Paper feeding machine, D. Dick 123,157
Pavement, concrete, G. H. Moore 128,280
Pavement, wood, G. A. Beidler 123,219
Pen, fountain, L. M. Knisely 123,263
Photographic paper, sensitized, J. G. Coffin 123,240
Piano frame, upright, J. Whitney 123,212
Pipe, tobacco, C. A. Wright 123,214
Pitman connection, A. Neer 123,285
Planter, corn, Bradt and Otis 123,080
Planter, seed, E. F. Ballard 123,216
Planter, walking, L. D. Noble 123,121
Planter and cultivator combined, E. B. and J. F. McLellan 123,186
Plants, machine for treating fibrous, Hopkins and Shedd 123,103
Platen gage, H. Byxbe 123,233
Plow, E. G. Matthews 123,272
Plow, ditching, Kelly and Hennis 123,262
Plow, wheel, W. H. and J. G. Parrish 123,194
Plow, wheel, J. H. and S. Robbins 123,294
Pot, coffee, C. D. Goodrich 123,258
Preserving meats and vegetables, apparatus for, W. Maxwell 123,273
Press, cheese, W. H. Ragan 123,125
Press, cotton and hay, J. C. McCurry 122,275
Press, pressure accumulator for hydraulic, W. D. Grimshaw 123,169
Printing press, M. Laemmel 123,266
Propeller, G. L. McCay 123,274
Pruning shears, T. Campbell 123,234
Pruning shears, E. L. Yancey 123,321
Pump, R. T. and R. T. Smart, Jr 123,203
Pump, J. W. Hopkins 123,175
Pump, rotary, N. P. Sheldon 123,130
Pump, steam, Maxwell and Cope 123,185
Pump, steam vacuum, J. M. Morehead 123,117
Pump, steam vacuum, W. E. Prall 123,292
Rake, horse hay, F. Brown 123,081
Rice cleaner, D. L. Geer 123,165
Ruling machine, paper, J. Tregurtha 123,309
Saddle tree, gig, S. E. Tompkins 123,209
Safe, milk, J. M. Perkins 123,123
Safe, provision, Sanford, Dunnington, and Weed 123,295
Salve or plaster, compound, H. J. Bendall 123,220
Sash holder, A. H. Allison 123,071
Sash holder, R. R. Ball 123,141
Sash holder, W. H. King 123,110, 123,111
Sash pulley, J. Andrews 123,075
Saw filing machine, T. M. Chapman 123,151
Sawing machine, W. Weaver 123,211
Sawing machine, G. S. Birge 123,223
Screw machine, wood, C. B. F. Tingley 123,307
Screw cutting lathe, chuck for, Plimpton and Taylor 123,197
Sewing machine, braiding attachment for, H. C. Goodrich 123,167
Sewing machine, cloth cutting attachment for, J. L. Coles 123,242
Sewing machines, feeding mechanism for, R. Leavitt 123,114
Sewing machines, gathering attachment for, J. W. Lyon 123,115
Sewing machines, ruffling attachment for, H. C. Goodrich 123,168
Shoe fastening, J. F. Coppock 123,087
Sifter, flour, A. C. Selleck 123,129
Signal for railroad trains, speed, W. L. Needham 123,284
Slipper, web, L. K. Washburn 123,313
Soap, cooling and mixing, J. D. Sturges (reissue) 4,729
Soap, apparatus for cooling and mixing, J. D. Sturges (reissue) 4,730
Soldering tool, L. McMurray 123,276
Sower, seed, J. R. Gilbert 123,257
Spinning machine, G. Bernhardt 123,221
Spinning machines, applying bobbins in, G. Bernhardt 123,222
Spinning, self acting jack for, P. Keane (reissue) 4,725
Spinning, self-acting mule for, F. O. C. Robinson 123,199
Stand, show, J. R. Palmenberg 123,122
Steel in crucibles, manufacture of cast, C. M. Nes (reissue) 4,727
Stone, machine for sawing, V. G. Barney 123,217
Stone, composition for artificial, J. N. B. De Pouilly 123,090
Stone, machine for dressing, drilling and finishing, Daniels & Willett 123,244
Stove, cooking, N. O. Bond 123,225
Stove, heating, P. D. Beckwith 123,142
Stove pipe damper, R. Hillson 123,171
Stuffing box, I. H. Giddings 123,097
Stuffing box, metallic, W. H. Holland 123,173
Table, W. Hoese 123,172
Tanning hides, composition for, J. M. Müller 123,118
Tanning leather, vacuum tank for, D. F. Noyes 123,192
Tanning in vacuum and other tanks, K. M. Jarvis 123,105
Teeth, artificial, C. H. Mack 123,271
Telegraphic insulator and bracket, J. Robertson 123,198
Thill coupling, G. W. Pilson 123,196
Thrashing machines, grain separating attachment for, Z. Miller 123,188
Tiles, laying drain, Divelbiss and Brasfield 123,092
Tire bending and shrinking machine, J. Naugle 123,190
Tobacco, curing leaf, J. D. Culp 124,154
Tool box, blacksmiths', Devoe, Rogers and Beals 123,245
Toy gun, A. I. Lenhart 123,268
Trap, animal, G. H. Davis 123,089
Vaginal irrigator, M. Mattson (reissue) 4,726
Valve, safety, Jewell and Steele 123,176
Valve seat, D. Wiehl 123,317
Valve, balance slide, T. H. Hollis 123,260
Viaduct, iron, E. W. Serrell 123,297
Vise, J. Peace 123,195
Wadding, batting, etc., and machine for making, M. D. Whipple 123,136
Wagon spring, J. Kieser 123,108
Wagon axle and thimble skein, E. H. Wheeler 123,135
Wash stand, curtain frame, and towel rack combined, A. McFall 123,187
Weighing machine, A. H. Emery 123,253
Whiffletree clevis, revolving, W. Beers 123,218
Winding machine, F. C. and T. Ehrenberg 123,251
Wire, machine for swaging and reducing, C. F. Hendee 123,101

DESIGNS PATENTED.

5,496.—Shawl.—H. Boot, Philadelphia, Pa.
5,497.—Label.—C. H. Collins, Cincinnati, Ohio.
5,498.—Cupboard Turn.—O. F. Fogelstrand, Kensington, Conn.
5,499.—Coat and Hat Hook.—O. F. Fogelstrand, Kensington, Conn.
5,500.—Chain Bolt.—O. F. Fogelstrand, Kensington, Conn.
5,501.—Window Catch.—O. F, Fogelstrand, Kensington, Conn.
5,502.—Drawer Pull.—O. F. Fogelstrand, Kensington, Conn.
5,503.—Door Latch.—O. F. Fogelstrand, Kensington, Conn.
5,504.—Cupboard Catch.—O. F. Fogelstrand, Kensington, Conn.

TRADE-MARKS.

640.—Refined Petroleum.—F. M. Backus & Co., Cleveland, Ohio.
641.—Emery.—Tully & Davenport, New York city.
642.—Commercial Fertilizer.—Walton, Whann & Co., Wilmington, Del.
643.—Boot or Shoe.—F. Winslow and J. W. Rogers, Boston, Mass.

APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

19,988.—Burnisher.—C. G. Frampton. April 3, 1872.
20,100.—Drawer for Closets, Bureaus, etc.—H. R. Taylor. April 10, 1872.
20.0?3.—Breech Loading Firearm.—T. Lee. April 10, 1872.
20,106.—Warm Air Register and Ventilator.—E. A. Tuttle. April 10, 1872.
20,111.—Apparatus for Damping Paper.—C. A. Waterbury. April 10, 1872.
50,051.—Cotton Gin.—J. Du Bois. April 10, 1872.
29,056.—Pencil Sharpener.—W. K. Foster. April 10, 1872.

Inventions Patented in England by Americans.

From January 4 to January 8, 1872, inclusive.

[Compiled from the Commissioners of Patents' Journal.]

Binnacle.—J. Low, Boston, Mass.
Furnace.—G. H. Sellers, Philadelphia, Pa.
Furnace.—W. & G. H. Sellers, Philadelphia, Pa.
Lubricator.—C. Mettam, New York city, and J. S. Sanson, Morrisania, N. Y
Printing Machinery.—R. M. Hoe, New York city.
Self-Releasing Hook.—J. L. Cathcart, M. Ezekiel, and E. F. M. Faehtz Washington, D. C.

NEW BOOKS AND PUBLICATIONS.

Science Record for 1872. Being a Compendium of the Scientific Progress and Discovery of the Past Year. 400 pages, octavo. 100 Engravings, Steel Plate and Wood. Handsomely bound in muslin, $1.50: extra binding, half calf, $2. Munn & Co., Publishers, 37 Park Row, New York, Office of the Scientific American.

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British Journal Photographic Almanac. London: H. Greenwood. New York: E. & H. T. Anthony.

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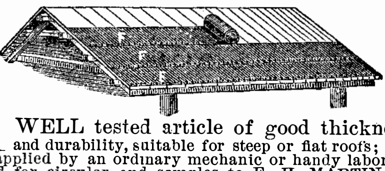

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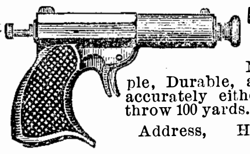

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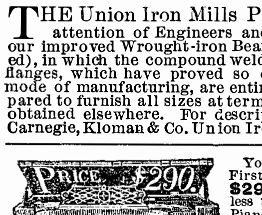

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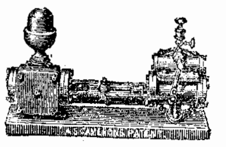

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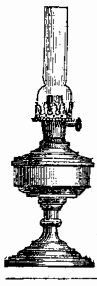

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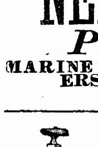

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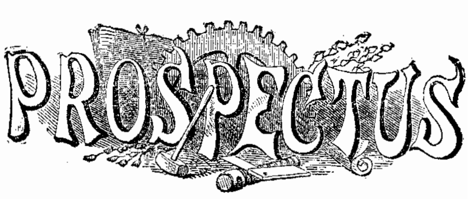

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