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Improved Horse Power.

An objection, to portable horse powers now in use, is the loss of power in transmitting rotary motion along the shafting with angles connected by couplings, these angles being necessary to place the shafting near the ground, so that the horses can step over it. These couplings and angles cause friction and wear, the result of which is loss of power, and a lack of durability which it is very desirable to obviate.

While overcoming these objections, the inventors of the machine herewith illustrated have succeeded in simplifying its construction so that the levers and other detachable parts may be easily carried on the axles of the wheels, that support the principal part of the machine, and between the sills. This is a great advantage, as other powers require extra appliances, to render the transportation of these parts convenient; which appliances increase cost, and are more or less troublesome in use.

The main feature of this improvement, which secures the advantages named, is the arrangement whereby the toothed wheel that drives the tumbling shaft, with its vertical shaft, and the pinion upon the upper end of the shaft may be raised together from the position shown in Fig. 2—the working position—up to, and held in, the position shown in Fig. 1, during transportation from place to place.

In working, the wheel that drives the tumbling shaft is thus brought down to the level of the shaft, and the objectionable angular transmission of motion is avoided. Another advantage is that the power may be transmitted from the front or rear, or from either side of the machine. The cost of construction is also lessened by dispensing with parts used in other more complicated powers.

When the wheel under consideration is raised, the whole under side of the vehicle is left clear, so that obstructions like low stumps or protruding rocks do not interfere with the progress over rough and uneven roads or fields.

The inventors state that they thoroughly tested the invention during the last season, and that its operation is very satisfactory in all respects.

The framework of the wheel that drives the tumbling shaft is sustained by four strong upright beams, which slide up and down in strong sleeves cast upon the framework of the upper driving gear, and which is held in the working position by nuts running upon threads cut on the bearers, the nuts abutting against the under ends of the sleeves, and the collars on the upper ends of the bearers being brought down against the upper ends of the sleeves.

The improvement is simple and practical, and, we judge, will add much to the convenience of this class of machines.

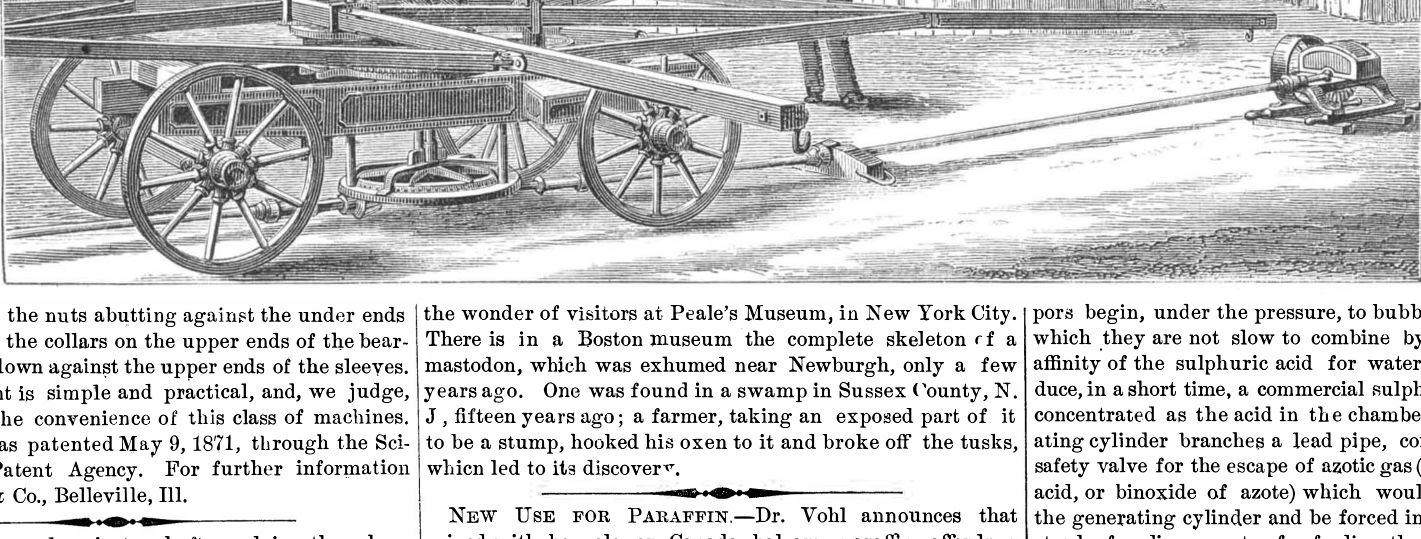
The invention was patented May 9, 1871, through the Scientific American Patent Agency. For further information address Harrison & Co., Belleville, Ill.

Jesse Meyers leaned against a shaft revolving three hundred times per minute, in a slaughter house, Muncy, Ind. He undressed in about ten seconds, but strange to say he was not at all injured. Not a stitch of clothing remained upon him.

Mastodon Remains.

A farmer in the town of Mount Hope, Orange county, N. Y., digging recently in a swamp on his premises, exhumed from the muck, about eight feet below the surface, a number of bones which, from their size and formation, are supposed to be those of a mastodon. There are two ribs nearly five feet long, and two sections of vertebræ six inches wide.

HARRISON'S MOUNTED HORSE POWER.



What would give strength to the supposition that the bones are a portion of the skeleton of one of those old time monsters, in the absence of other proof, is the fact that several discoveries of mastodon remains have been made in this county during the past thirty or forty years. In 1841, an entire skeleton was exhumed, in the vicinity of Scotchtown, from a marl pit. Its tusks were over five feet in length, and with the head bones weighed nearly 600 pounds. It was found near the surface, lying at an angle of about forty-five degrees, head uppermost. Previous to this, portions of over twenty skeletons of mastodons had been found in the Wallkill Valley. One of these was the monster that for years was the wonder of visitors at Peale's Museum, in New York City. There is in a Boston museum the complete skeleton of a mastodon, which was exhumed near Newburgh, only a few years ago. One was found in a swamp in Sussex County, N. J., fifteen years ago; a farmer, taking an exposed part of it to be a stump, hooked his oxen to it and broke off the tusks, which led to its discovery.

New Use for Paraffin.—Dr. Vohl announces that mixed with benzole or Canada balsam, paraffin affords a glazing for frescoes much superior to soluble glass. By covering the interior of wine casks, with a film of pure white paraffin poured in melted, he has effectually prevented the spoiling of the wine and its evaporation through the wood.

Sulphuric Acid---New Mode of Manufacture.

The large and constantly increasing demand for this chemical product gives interest to any information as to its character and the best modes of preparing it; we therefore translate the following article from *Le Génie Industriel*, a well known Parisian scientific magazine, the new process being the discovery of M. M. Langlois and Thomassin, of Paris:

"This new method of manufacturing the sulphuric acid of commerce has for its object, first, to permit a more rapid fabrication of the acid, and, secondly, to dispense with a large number of the leaden chambers. The apparatus by the aid of which these results are obtained can be applied in any sulphuric acid factory, whether the process be with sulphur or with pyrites, furnaces being employed. To obtain the proposed object, the vapors of sulphurous acid (SO_2) are first produced by the customary methods, and by the aid of the ordinary furnaces, from sulphur or from pyrites; to which is added, by the combustion of a nitrate (ordinary nitrate of soda, for instance), in or out of the furnace, the third equivalent of oxygen which is necessary to transform the said sulphurous acid vapors into sulphuric acid (SO_3.)

The vapors of the sulphurous acid are collected in a small chamber or drum of lead, into which, if it be necessary, a small jet of steam can be turned. The combustion of the nitrate can be replaced by a spray of nitric acid which would operate in the chamber itself or, if convenient, in a separate one.

Thus far the process is known and understood by the public; but, to oxydize the sulphurous acid, MM. Langlois and Thomassin use ozone or active oxygen; first, by substituting it for the spray of nitric acid or the combustion of the nitrate, and secondly in using the ozone conjointly with the following nitrates or the products of their decomposition: hypoazotic acid, nitrous acid, or binoxide of azote.

A pump constructed of material indestructible by acids, such as lead, gutta percha, caoutchouc, etc., exhausts the sulphuric vapors, which form and collect in the chamber, and compresses them in a cylinder. This cylinder is a closed utensil, capable of resisting a pressure of at least five atmospheres. It is similarly constructed of material which resists acids, and is furnished with appliances, such as valves, manometer, etc., arranged purposely to ensure safety. This cylinder contains water, of which the quantity is determined approximately, according to the desired concentration of the acid. The sulphuric or sulphurous acid vapors begin, under the pressure, to bubble in the water, with which they are not slow to combine by reason of the great affinity of the sulphuric acid for water; and thus they produce, in a short time, a commercial sulphuric acid, at least as concentrated as the acid in the chambers. From the generating cylinder branches a lead pipe, communicating with a safety valve for the escape of azotic gas (hypoazotic or nitrous acid, or binoxide of azote) which would create pressure in the generating cylinder and be forced into the chamber. Instead of ordinary water for feeding the generating cylinder, oxygenated water (binoxide of hydrogen), prepared by well known processes, can be used; this substitution will have the recommendation of dispensing not only with the return pipe, but also with the combustion of the nitrate in or out of the furnace, or with the nitric acid jet in the chamber. The pump can be worked by manual or steam power, according to the extent of the manufacture, as the process, as applied to sulphuric acid apparatus, can be used for making so small a quantity as five or six carboys of acid in twenty-four hours, if desired; and superficially it occupies but little space."

The inventors have taken out letters patent which cover the novel features of the above described method, namely: the use of the pump for exhaustion and compression, and of the cylinder or generator furnished with valves and safety appliances, the employment of ozone or active oxygen, alone or in conjunction with combustion of a nitrate or the jet of nitric acid, and the employment of oxygenated water (binoxide of hydrogen.)

THE LAW OF TRADE MARKS IN ENGLAND.

We believe this much debated question will have a practical settlement in the forthcoming session of Parliament; and it is, indeed, time that something was done to prevent even the most innocent infringements. Very properly, the Vice Chancellors are not disposed to strain the laws in favor of any particular houses, when it is shown that the copying of a trade mark has been purely accidental, yet, at the same time, it is extremely hard upon a firm to be told "I bought some of your brandy or champagne"—as the case might be—"the other day, and it was so inferior that I shall not purchase any more." Messrs. Martell & Co. had occasion, in 1871, to complain very seriously, not only that their trade mark had been infringed in a general way, but that a country printer had actually struck off a number of labels for brandy in bottle, in direct imitation of those so well known in the trade as connected with the genuine article. Of course an injunction was immediately granted by a Vice Chancellor, but we must say, that unless we can get an Act of Parliament, with penal clauses to be rigidly enforced in all these cases, very little good, in the shape of reform, will ever be done. Relative to the Chancery and common law rights anent trade marks, it will not now be at all out of place to quote one or two opinions that have been given in reference to existing statutes.

The Lord Chief Justice says—"An action for counterfeiting a trade mark is, in law, an action for fraudulent misrepresentation. Courts of equity exercise a jurisdiction for the protection of rights to trade marks upon the ground that they are rights of property. In law, no exclusive right of property in a trade mark in the abstract is recognized; but the exclusive right, to use such a mark for the purpose of authenticating a vendible commodity, is one for the invasion of which a remedy is given by an action in the nature of deceit." This is substantially what we have urged for so long; and we fancy, after all, that the common law courts would be the best tribunals to deal with these matters, provided a fine could be added to the damages; for not only is the owner of the trade mark damnified by the action of piracy, but the public also come in for a share of the wrong. In the case of Rodgers *vs.* Nowill, it was ruled that "as there is, therefore, no abstract right to trade marks recognized, the plaintiff in an action at law must show that the defendant had an intention to deceive and make the goods pass as his. The questions in such a case for the jury are: "Is the resemblance such as to deceive ordinary persons? Was the mark adopted by the defendant with that intent and in order to supplant the plaintiff's goods?" And in the case of Blofield *vs.* Payne, it was decided that "it is not necessary to show that defendant's goods are inferior to plaintiff's." By section 22 of 25 and 26 Vic., c. 68, it is provided that "in every case in which any person shall do, or cause to be done, any of the wrongful acts following (that is to say) shall forge or counterfeit any trade mark; or, for the purpose of sale, or for the purpose of any manufacture or trade, shall apply any forged or counterfeit trade mark, to any chattel or article, or to any cask, bottle, stopper, vessel, case, cover, wrapper, band, reel, ticket, label or thing in or with which any chattel or article shall be intended to be sold, or shall be sold, or uttered, or exposed for sale, or for any purpose of trade or manufacture, or shall enclose or place any chattel in, upon, under, or with any cask, etc., to which any trade mark shall have been falsely applied, or to which any forged or counterfeit trade mark shall have been applied: or shall apply or attach to any chattel or article, any cask, etc., to which any trade mark shall have been falsely applied, or to which any forged or counterfeit trade mark shall have been applied; or shall enclose, place, or attach any chattel or article in, upon, under, with or to any cask, etc, having thereon any trade mark of any other person: every person aggrieved by any such wrongful act shall be entitled to maintain an action or suit for damages in respect thereof against the person who shall be guilty of having done such act, or causing or procuring the same to be done, and for preventing the repetition or continuance of the wrongful act or the committal of any similar act." In the above quotation, the law of trade marks seems to be very clearly laid down, and when the words forged or counterfeited are inserted in any clause in an Act of Parliament, something like a criminal motive or intention is implied. While foreign houses are contending so strongly for their rights on this side of the Channel, they might in their own courts do something for the English manufacturer, who has often been a great sufferer through the cleverness (or something worse) of talented French and German copyists. Whatever happens, it cannot be denied that the English Government is bound to protect the trade, and we must all keep a sharp look out for those very clever gentlemen, who imagine that, so long as there is a handsome binding, it matters not what is in the book.—*Grocer.*

A Wonderful Curiosity.

Under this heading, the Virginia newspapers have raised an excitement over a slab of curious stone, lately brought to Wheeling, Va., and put on exhibition in front of one of the stores. The editor of the Wheeling *Intelligencer* pronounces it "the most wonderful curiosity it has ever been our privilege to examine," and describes it as "a slab of common white American marble, thirty-eight inches long, seventeen inches wide, and two inches in thickness, which is as flexible as a piece of soft rubber of the same size. It was cut for and used as a hearthstone in the Moundsville Seminary Building which was destroyed by fire about three years ago. Now the question arises, what strange chemical action took place, or in what manner precisely the intense heat, to which the slab was subjected without its calcination at the time of the burning of the building, and its subsequent burial among the *débris* for the period above named, produced so remarkable a change in the character of the stone. This mystery no one has yet been able to answer or explain. Surely if this knowledge were given to mortals, there is no telling the amount of valuable aid that art would derive therefrom. The same chemical process, if understood, might give us flexible glass, the real value of which could never be told,

The oldest workmen in stone and marble declare that they have never before seen anything like it, and we doubt if a similar specimen was ever before discovered. In all the ruins of Chicago, nothing of the kind has been found or reported. Since the slab has been taken indoors and placed near the stove, it has daily become more and more flexible, a fact which all the more mystifies its character. We hope our scientists will give Mr. Holliday a call and see for themselves the wonderful curiosity, and that at least some one of them shall be able and willing to tell us all about the process of making a marble slab as yielding as a sheet of bonnet pasteboard."

"Yesterday," says the same editor, "several gentlemen from Pittsburgh, also two or three from Cincinnati, came to see it, and they confessed to be not less puzzled, as to the whys and wherefores, than the wisest of our own citizens who have, up to this time, fruitlessly attempted to explain the process by which a slab of common white marble may be made as flexible as a piece of india rubber of the same size.

We understand that Mr. Holliday has refused an offer of $500 for the slab, also several tempting inducements to visit other cities with the stone. We suppose he is waiting for better offers than have thus far been received."

The *Intelligencer's* book on mineralogy must have been absent from the library when the above was written. The stone is undoubtedly itacolumite; flexible slabs of which may be seen, in several college cabinets, without going to Wheeling. It is extensively developed in Stokes county, North Carolina. When cut into slabs, it might be very easily mistaken by the uninformed for marble. The itacolumite of different localities (as the Brazils and Carolinas) differs somewhat in constitution; but the flexibility in all cases is doubtless due to the disseminated *laminæ* of talc, mica, or chlorite, which bind together the grains of quartz. A more full account of the mineral will be found in the SCIENTIFIC AMERICAN of April 22, 1871.

European Field Artillery and Small Arms.

If the Prussian artillery is to be regarded as the model, it possesses three features which are indispensable to its efficiency. These are loading by the breech, firing the shells by percussion, and the employment of steel in the partial if not the entire manufacture of the gun. Experience has shown that the deterioration of a bronze piece frequently commences soon after six or seven hundred rounds, and that it becomes nearly *hors de combat* when the firing is prolonged to the twelve or fifteen hundredth. Besides, the friction between bronze and lead is productive of bad results. The rifling becomes affected, and the accuracy of the shooting seriously diminished. It has been asserted on good authority that during the last continental campaign, a week's continual firing was more than sufficient to render a bronze gun perfectly useless. A material which will resist the action of the injurious friction is to be found in Krupp's steel. A Belgian gun which is constructed of that metal is enabled to be fired from six to eight thousand times without evincing any signs of weakness or damage. M. Nicaise says so, at least, to our no small surprise. There is no doubt that the French would be very much disinclined to draw upon a German establishment for a supply of steel to manufacture their cannon from, but there is no other resource unless they are prepared to make the material themselves. It is not too much to assert that a considerable time must necessarily elapse before they could rival the productions of the great workshops of Essen. Had the French guns been upon the same principle as their small arms, they would never have displayed the manifest inferiority they have done. The Chassepot is superior to the needle gun, both in accuracy of fire and length of range. But while the Prussian and Belgian guns and shells are merely enlarged imitations of the Chassepot small arm and ball, the French guns resemble equally closely the needle gun, with the additional misfortune of magnifying its disadvantages. With regard to small arms, the Belgians are better off than the Prussians, since their infantry rifle is nearly identical with the Chassepot. The principle of rifling and the length of bore of the barrel are the same, and the same similarity prevails with respect to the weight of the arm, the charge, and the shape and size of the ball. It is to be hoped, in the interests of peace and humanity, that the last continental struggle may never be repeated; but should future years cause the strife to be renewed, it is evident the French must re-model their field artillery before they can expect to cope with their northern neighbors.—*Engineer.*

Applying Plaster to Walls and Ceilings.

The object of this invention is to provide means for utilizing plaster and other similar compositions in a more full and satisfactory manner for building purposes than heretofore. It consists in the use and manner of applying molds against the walls or ceilings, to permit the casting of the plaster or other matter to its place. This, it is claimed admits of economical application, and in more or less elaborate or artistic style, bringing the finest productions of genius to the humblest homes.

The artistic advantage of this method of applying plaster or other composition to walls or ceilings is, it is claimed, surpassed by the utilitarian benefits arising from its adoption. Building fronts can be provided with cheap and durable coatings, and wooden structures can be made fireproof by having the walls on both sides and also the ceilings lined with heavy coats of plaster or cement. The old mode of applying such substances by means of trowels, makes it very costly to use them otherwise than very thin, and to obtain nicely finished surfaces. With the aid of molds the question of greater or less thickness is only one of cost of material, and the surface finish is spontaneously obtained by the very act of application.

To cover the surface of a wall, either inside or outside, a bertical mold or false wall is used, which is placed at the requisite distance from the surface to be coated. The plaster or other composition is then, from above, poured into the space between the false and real walls until the space is entirely filled. The outer surface of the coating will, when the false wall is removed, be an exact impression of the mold. The finest wood graining, as well as moldings, carvings, etc., of most difficult make can thus be cheaply multiplied. Thus the inner or outer sides of walls can be covered in sections of greater or less extent until perfected.

On ceilings, it is proposed to use a pendent ceiling, which is supported or suspended a suitable distance under the beams or laths, according to the thickness of the plaster to be obtained. The surface of the pendent ceiling may be ornamented in suitable manner or quite plain.

The plaster is, from above, poured upon the pendent ceiling. It will adhere to the beams and laths, while the surface of the pendant is so prepared, by the application of glycerine or other material, that the plaster cannot adhere to it. The plaster may, on such ceilings, be so thickly applied as to coat the flooring beams, and thus make the floors fireproof. The application of glycerin or other material to prevent adhesion of the mold is also used for facing the walls. Mr. Andrew Derrom, of Patterson, N. J., is the inventor of this improvement.

The Sun.

A correspondent of the Oneida *Circular* says that Professor Young, of Dartmouth, in a recent lecture at New Haven upon the great luminary, imparted much interesting information. The theory which he most seemed to favor respecting the sun's constitution, he illustrated very simply thus: Put a pail of water in a room, the temperature of which is below the freezing point; the temperature of the water settles slowly till it reaches 32°, and there remains till every drop is frozen. The sun may be a vast quantity of merely gaseous matter, which is gradually liquefying, and accordingly will not change its temperature till this process is entirely accomplished; then the temperature will fall, perhaps thousands of degrees, till solidification begins, when it will again remain stationary. One authority believes the sun to be surrounded with a liquid coat already, and the sun spots are places where the surrounding metallic clouds have opened, and we see the liquid surface below it. The theory that the sun's heat is kept up by matter constantly falling into it, he doubts, arguing that, if such masses of matter existed outside of the sun, they would exert some slight influence on the surrounding planets, no evidence of which is discernible.

Speaking of iron, he said that if the word were written in great letters across the sun's face, the proof of its existence there would not be so satisfactory as that afforded by the spectrum. He pointed out lines in the spectrum made by metals which exist in the sun, though entirely unknown to us.

He gave several illustrations of the heat of the sun. If a pillar of ice covering nine square miles extended from the earth to the sun, and all the heat of the latter should be directed upon it, the whole mass would be melted in exactly one second. If an icicle forty-five miles in diameter were to be thrust into the sun with the velocity of light, say twelve million miles a minute, it could never touch the sun; it would melt as fast as it came. Still, physicists are as yet unable to determine the exact temperature, one placing it at 67,000° Fahr., another at 20,000,000° Fahr.—some difference.

How to Use a Grindstone.

1st.—Don't waste the stone by running it in water; but if you do, don't allow it to stand in water when not in use, as this will cause a soft place.

2d.—Wet the stone by dropping water on it from a pot suspended above the stone, and stop off the water when not in use.

3d.—Don't allow the stone to get out of order, but keep it perfectly round by use of gas pipe, or a hacker.

4th.—Clean off all greasy tools before sharpening, as grease or oil destroys the grit.

5th.—Observe: When you get a stone that suits your purpose, send a sample of the grit to the dealer to select by; a half ounce sample is enough and can be sent in a letter by mail.—*Franklin Journal.*

EFFECT OF ANIMAL EXCRETA IN WATER.

BY PROFESSOR CHARLES F. CHANDLER.

The products of the decomposition of animal matter in water, are the most objectionable impurity. Organic matters, produced by the decomposition of vegetable substances, are not especially dangerous, but the products of decomposing animal substances are highly dangerous, even when in minute quantities. These impurities do not make themselves apparent to the taste. On the contrary, such waters are frequently considered unusually fine in flavor, and persons go a great distance to procure them. Nevertheless, they contain an active poison. Many diseases of the most fatal character are now traced to the use of water poisoned with the soakage from soils charged with sewage and excremental matters. Sudden outbreaks of disease of a dysenteric character are often caused by an irruption of sewage into wells, either from a break in the sewer or cesspool, or from some peculiarity of the season. Such contamination of the water is not indicated by any perceptible change in the appearance of the water. The filtered sewage, clear and transparent, carries with it the germs of the disease. At a convent in Munich, 31 out of 121 of the inmates were affected with typhoid fever. It was found, upon investigation, that the well was polluted by sewage, and the disease disappeared as soon as the proper repairs were made.

At Pittsfield, Mass., the typhoid fever suddenly broke out in a large boarding school for young ladies. The water was found to be contaminated with sewage owing to a leak in the cesspool.

At Edgewater, on Staten Island, in 1866, the inmates of a small block of houses were afflicted with typhoid fever, several deaths occurring. On making investigation, the health officers found that a neighbor, through whose land the underground drain passed, had taken the liberty of closing up the drain, thus sending its contents back upon this block of houses, contaminating the well, and actually murdering the unfortunate victims with sewer poison.

Dr. Stephen Smith, one of the health commissioners of this city, describes an interesting case that came to his knowledge. He visited an old schoolmate, a clergyman, in the country, and in the course of conversation his friend told him of a family in which typhoid fever had made its appearance, five members having already died, while another was then fatally sick. The physician called the attention of his friend to the fact that typhoid fever is now attributed to the poisoning of the water by animal refuse. This was new to his friend, the clergyman, who had not thought of attributing it to anything else than to the visitation of Providence. They went together to visit the locality, and found the house situated on an elevation, with all its surroundings admirably arranged for health. One readily believed the statement that there had not been a case of sickness in the house for twelve years. A few weeks before the fever appeared, when the laborers on the farm were busy taking in the crops, one of the valves of the pump got out of order. Being unable to get their usual supply of water, and being too busy to send for the pump maker, they sent a man down to a neighboring spring to draw water, who, finding that it was not easy to dip the water from the spring, owing to the shallowness of the pool, drew his supply from a brook near by. From this source the family was supplied for two or three weeks. This stream, higher up, ran through several farm yards and received the surface drainage. The first symptoms of poison by this water were a slight nausea and mild diarrhœa; after several days, typhoid fever in its worst form was ushered in. Of the entire family, but two escaped an attack, and they did not use the water.

This city, during the last century, and before the introduction of sewers or the Croton water, was ravaged every few years by deadly epidemics, which are now believed to have been favored and invited by the defilement of the wells then in use, by sewage and fæcal soakage. No such visitation has occurred since the introduction of the Croton water, and the completion of the very perfect system of sewers.

Cholera, though it does not originate from polluted water, is disseminated chiefly by the aid of wells and other impure water supplies.

At Exeter, England, in 1832, 1,000 deaths occurred from cholera. A purer supply of water was then introduced from a locality two miles higher up the river, above the point at which it received the sewage of the town. When the cholera again invaded the city in 1849, only forty-four cases occurred, and in the cholera season of 1854, there was hardly a case.

In London, in 1854, the water supplied by the Southwark Company contained much sewage, while that supplied by the Lambeth Company was very pure. Both companies had pipes in the same streets, supplying water indiscriminately on both sides. Among those who used the Southwark water, the deaths amounted to 130 in 10,000, while among those who drank the Lambeth water, they amounted to only thirty-seven in 10,000; 2,500 persons were destroyed by the Southwark water in one season. On the previous visitation of 1848-9, the case was the reverse. The deaths from the Lambeth amounted to 125, while those from the Southwark amounted to 118 in 10,000. At that time, the Lambeth company took their water from a point lower down the river.

Another very striking instance occurred in London. The famous Broad street pump supplied water in one of the most fashionable localities of the West end. During the visitation of 1848-9, this pump killed 500 persons in a single week, by disseminating cholera. The wealthy people of the west end went to Brompton, a fashionable summer resort, about five miles up the Thames, and soon the cholera broke out among them there. The health officers soon discovered, on investigation, that these people had been in the habit of sending to the Broad street pump for tea water, and had brought the cholera with it. A curious case was that of an old spinster who had moved to Hampstead, three miles from the pump, but who sent her maid daily, for a kettle of the highly prized tea water. She and her maid were the only persons who suffered from cholera at Hampstead.

A similar story might be told of an outbreak of cholera in a shanty village, west of Central Park, and another in a shanty village on the hights across the river. In both cases, it was clearly shown that the cholera germs were distributed among the unfortunate squatters by the waters of the single well in each village. There is a famous pump in the twelfth ward of Brooklyn, at the corner of Van Brunt street, from which over fifty families obtained their water supply. In 1866, cholera broke out in five or six of these families, but the spread of the disease was prevented by the prompt action of the health officer, who removed the pump handle.

From these facts, it is seen that water aids in disseminating two of the most fatal diseases which affect the human race, the typhoid fever and the deadly cholera. During the ten years from 1856 to 1866, there were 21,000 deaths from cholera in England and Wales, and 150,000 deaths from typhoid fever. There is every reason to believe that at least three fourths of these deaths might have been prevented had proper attention been paid to the purity of the water supply. This poisoning by bad water is now fully established, and must awaken communities to the vital importance of securing a pure and unfailing supply of this indispensable beverage.

In Iceland, it is stated that one sixth of the deaths are caused by hydatids in the liver. These are the larval forms of the tænia or tapeworm of the dog. Young leeches, contained in drinking water, sometimes fix themselves on the pharynx. In a march of the French in Algiers, 400 men were in the hospital at one time from this cause.—*American Chemist.*

ASBESTOS PISTON ROD PACKING.

[From the Engineer.]

Few engineers who have to do with the steam engine are ignorant of the trouble which is met with in obtaining a really good piston rod packing. Sound hemp, properly "laid up" and copiously lubricated, makes a tight joint enough for a time, especially if the rod is in first rate condition; but the period of tightness is usually short, and the gland requires constant screwing up, and much friction results, which is very prejudicial in small engines. If hemp is bad in the case of low pressure engines, it is infinitely worse when we have to do with high steam, especially if the steam is slightly superheated. A process of slow carbonisation appears to go on, the hemp packing loses its elasticity, and becomes nearly useless for its intended purpose. All manner of schemes have been tried to get over the difficulty; combinations of cotton, india rubber, and wire gauze, such, for example, as Crickmer's patent packing, have hitherto given on the whole the best results. One inventor, indeed, dispenses altogether with cotton and rubber, and uses copper wire gauze alone. In this case, the tightness of the joint is no doubt secured by the presence of water and oil lodged in the meshes of the gauze; and we have received very favorable reports from those who have tried this packing. It is still certain that something, better than anything hitherto in use, is required, and we have a strong belief that this something is supplied by asbestos.

Asbestos is a mineral fiber consisting of silicate of magnesia, silicate of lime, and protoxide of iron and manganese. In mineralogical parlance, it is a fibrous variety of actinolite or tremolite. It exists in vast quantities in the United States, also in the Tyrol, Hungary, Corsica, Greenland, Wales, Cornwall, Banffshire, and in the north and east of Ireland. It is found under various forms, from that of soft silky fibres to that of a hard block capable of taking a polish. As a rule, the lumps or blocks taken from the vein are easily broken up and separated into fibers extremely flexible, elastic in the sense that each fiber admits of great extension in the direction of its length without contracting again, greasy to the touch, and very strong. The fibers vary in length from a couple of inches to about two feet. They can easily be spun or woven if proper precautions are used. Furthermore, asbestos is an admirable non-conductor of caloric, and is practically indestructible by heat. All these conditions are just those which are required in a material for piston rod packing; and it is therefore somewhat strange that, until a very recent period, no one thought of utilising asbestos for this purpose. The credit of suggesting it as a piston rod packing is due, we believe, to Mr. St. John Vincent Day, C.E., who on the 5th inst. read a very interesting paper, on "Asbestos, with special reference to its use as steam engine packing," before the Institution of Engineers and Shipbuilders in Scotland. The new packing, we learn from this paper, was first used in America with much success, and it has since been tested in this country with results of which we shall speak in a moment. In referring to the value of the new packing, Mr. Day said: "The packing used for piston and valve rods or spindles has, as we all know, three prime elements of destruction to contend with, namely, an elevated temperature, friction, and moisture; and one of them only, namely, friction, has any appreciable effect on asbestos packing when the mineral is pure and properly prepared. No matter how high the temperature of the steam, how rapid the stroke of the piston, or how great the pressure of the steam, the packing seems to be unaffected by those conditions. In America, where the new packing was first used, some of it was taken from the piston rod stuffing box of a locomotive engine, after having been in, and the engines at constant work, for three months, with steam at 130 lb. pressure per square inch, and making an average daily run of 100 miles, including Sundays; and, as you can see by the sample shown, the fiber, with the exception of being discolored by oil and iron, is just as flexible and tenacious as originally. After having been once disintegrated, it appears impossible to so pack or mat the fibers together that they are not easily separable by the fingers."

Asbestos packing was first used in Great Britain by Mr. Benjamin Conner, locomotive superintendent of the Caledonian Railway, and Mr. Day exhibited to the members of the Institution the packing of a locomotive stuffing box which had been used on that line from the 27th of July to the 18th of November, 1871. The engine in which it was used has outside cylinders, and single drivers 8 feet in diameter. The piston stroke is 2 feet. The engine was employed in working the fastest train on the Caledonian line: to wit, the 10 A. M. express from Glasgow, reaching Carlisle at 1 P. M., with three stops on the journey. The best ordinary packing lasts, under these conditions, two months at most, rarely so long, and the gland requires constant screwing up. The asbestos packing was apparently as good as when it was put in, and the engine had run a distance of 2,000 miles in three weeks, during which the gland screws had never been touched. The following letter from Mr. Conner to Mr. Day contains valuable testimony to the excellence of the packing:—

"The box herewith contains the asbestos packing put into a piston rod stuffing box of one of our main line service passenger engines on 27th July, and taken out on 18th November; in that time the engine had run 14,070 miles.

As the packing was put in coiled instead of being cut into rings, the gland was nearly home on 12th September, and an additional ring was put in at that date."

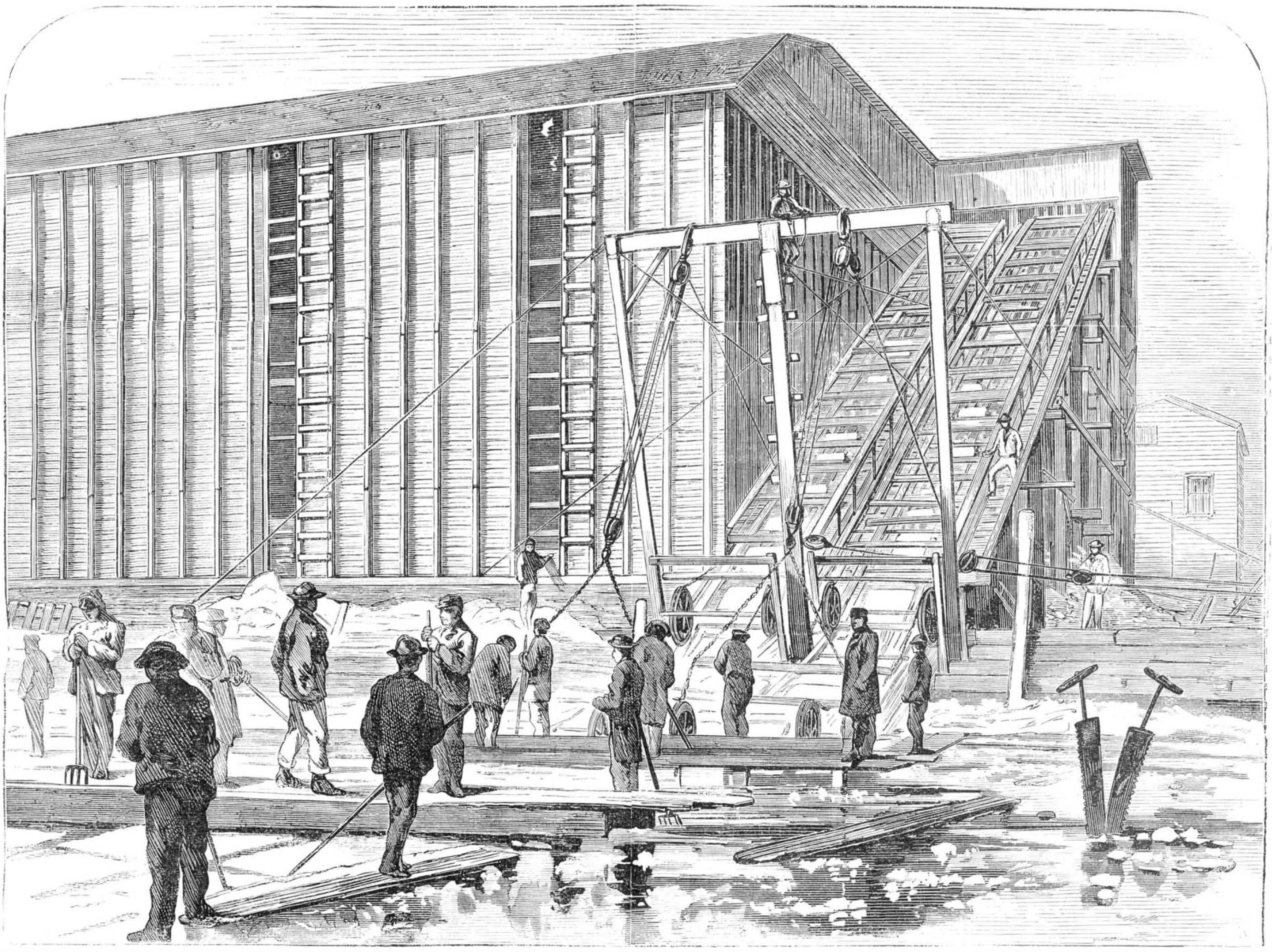
In the course of the discussion Mr. Conner stated that: "The advantage of the asbestos packing over the soapstone packing was that, with the latter, at the high temperatures of steam from 125 lbs. to 130 lbs., the lower portion of the packing got thoroughly charred, and another ring had to be put in after the first week; so that in course of a month the packing had almost entirely changed. The asbestos packing, being practically incombustible, did not waste; and I suggest that the covering of the packing should be made of incombustible material also. At first I had applied it coiled round the piston rod continuously; but I think it should be applied in rings. The inside of the packing seemed to me as fresh as when first put in. I believe it takes less oil to lubricate the piston rod, for the oil remained on the rod, not being absorbed by the packing. It kept the rod beautifully polished, more so than any other packing."

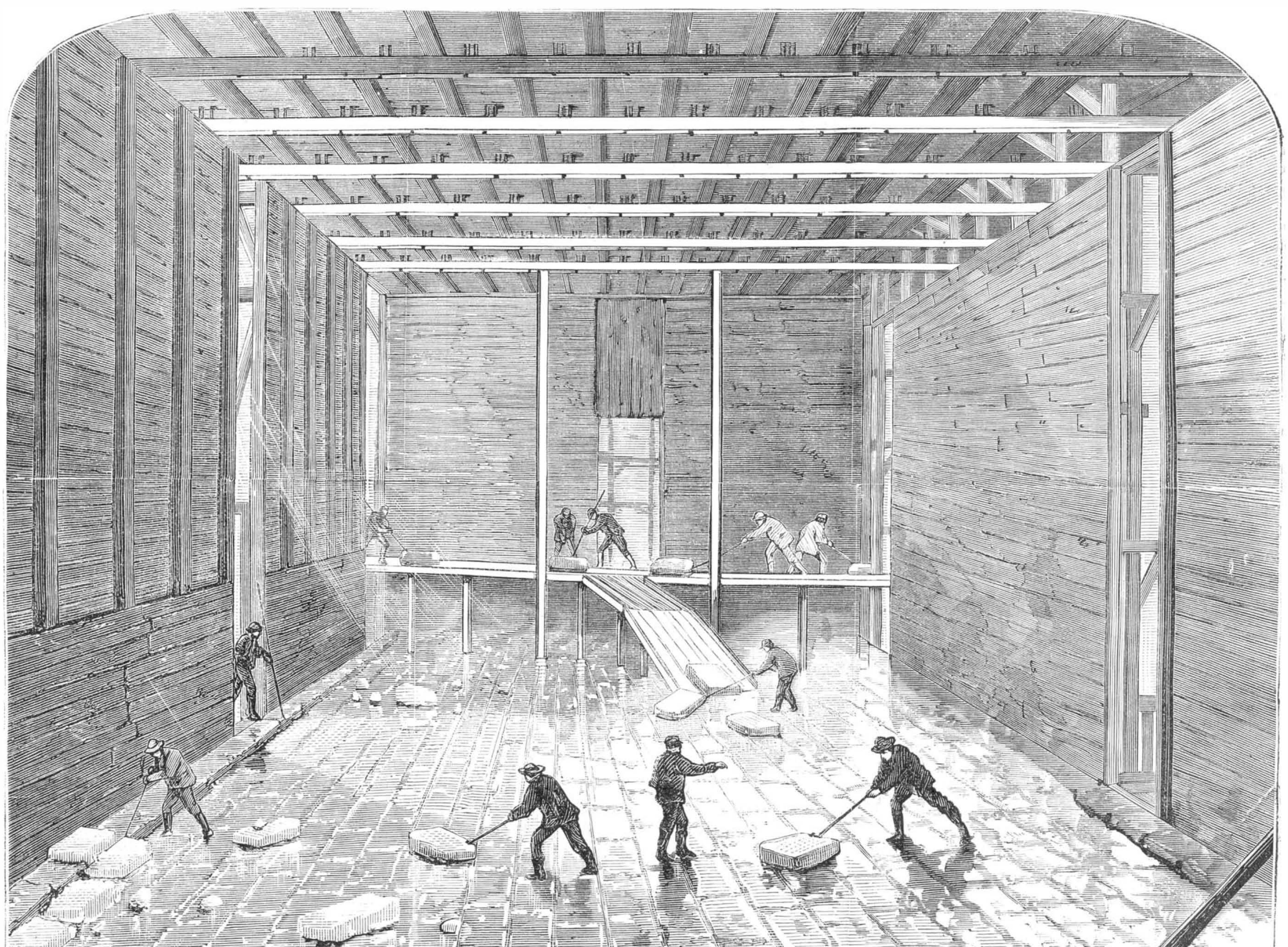
We think that with such testimony as this before us, supported further by that of Mr. David Rowan, who spoke to the value of asbestos packing for marine engines, we are fully justified in holding the belief that this mineral will supply a way out of one of the most troublesome obstacles to the use of very high pressure steam. There is, furthermore, not the slightest chance of the supply being exhausted; on the contrary, it is likely to last as long as our coal fields. We are unable to say at present what the price of the asbestos packing is, or where it can be obtained. It is probable, however, that when once the value of the material as a packing is recognised, its regular manufacture in this country will follow.

Action of Heat on Germ Life.

Dr. Crace Calvert, in a paper "on the action of heat on protoplasmic life dried on in cotton fabrics," published in the London *Chemical News*, relates a series of experiments which have a direct bearing on the question of the disinfection of fabrics and wearing apparel by exposure in heated stoves with the object of destroying contagion or animalcule life. To carry out these views, a piece of ordinary gray calico was treated chemically, and washed until free from any sizing material, and dried; this prepared cloth was then steeped in a solution of putrid albumen, containing abundance of animalcule life, wrung out, and dried at the natural temperature; it was then cut into small pieces five centimeters square. Each of the pieces was rolled up and introduced into a strong glass tube which was hermetically sealed. Some of these were exposed to temperatures raised successively to 100°, 200°, 300°, 400°, 500°, and 600°F. Other pieces were placed in pure distilled water, and another series of pieces were placed in tubes containing an albumen solution, each being successively subjected to temperatures varying from 100° to 600° F. In all cases it was found that, at 300° F. vibrios were present in small numbers, while in the water series bacteria were also detected. At 400° F., no evidence of life was found. In order to ascertain what changes the calico had undergone, one of each of the small tubes which had been heated to the different temperatures was broken, and its contents carefully examined. The pieces heated to 200° were quite sound; that heated to 300° was of a slightly brown color, much injured, and for practical purposes completely spoiled. At 400°, the cloth was very much charred. These results show that the temperature which will not destroy germ life is quite sufficient to materially injure cotton fabric; hence, it is concluded that no beneficial results can be obtained by the employment of public stoves as a means of destroying germ life and contagion.

THE total annual circulation of newspapers printed in the State of New York is 492,770,868 copies, being more than twice the number issued in any other state. The next greatest number of issues is in Pennsylvania, where 233,380,532 copies are annually printed. Massachusetts prints 107,691,952 copies, Illinois, 102,686,204, Ohio, 93,592,448. Next comes California with 45,869,408 newspaper sheets per annum.





ICE HARVESTING ON THE HUDSON

HARVESTING ICE ON THE HUDSON.

As we promised in our last, we herewith give engravings of the interior of one of the many great ice houses on the banks of the Hudson river, and of the method employed for raising the ice from the river and storing it in these buildings. As the ice accumulates near the shore, being towed thither by horses as described in our former article, it is hoisted as described below. The ice houses are constructed with every regard for atmospheric changes, and are models of simplicity. The large one shown in our illustration contains six rooms, four of which are 75x50 feet in area, and of an altitude sufficient to allow a packing of ice 30 feet high, and an open space of 20 feet for air. The two remaining rooms are 150x50 feet in dimension, and the entire building has a capacity of 48,000 tuns of ice. The walls of the houses are double, and filled in with sawdust and tan. At the end of the houses nearest the canal, the apparatus for raising the blocks is constructed, extending from the water to the roof. From a distance this looks like two heavy ladders laid upon an inclined plane, each furnished with a pair of hand rails. At the base of each are two pairs of wheels, over which pass endless chains, stretching to the summit. To these, bars are attached, at a respective distance of six feet, which with the chains form the "apron." On a level with each floor of the building, a platform connects the plane and door sill, on which the blocks are deposited in order to fill each story in succession.

As the ice reaches the base of the plane, the blocks are pushed one by one close to the lower pairs of wheels. Then the o ffedges are depressed, and, as the chains force the bars along' they catch the blocks—like the safety cars that grasp the passenger trains on the famous switch-back railroad leading to the summit of Mount Pisgah, at Mauch Chunk, Pa.—and carry them up to the second floor, where the removal of several slats, forming the surface of the plane, allows them to fall on the platform before mentioned. A strong staging is built in the interior of the house, extending to the different rooms, on which the blocks are pushed to the apartment intended for their storage. From this staging an incline extends to the highest layer of ice. As the blocks are deposited on the platform, the first is pushed towards the incline in the nearest apartment, the second in the next, and so on, the entire floor filling up evenly.

In order to prevent the blocks crushing against each other, as they slide from the plane, a number of large headed nails called "scatchers" are driven in it, and greatly diminish their velocity and render their "shooting" of short range.

When the first story is thoroughly packed, the slats are replaced in the plane, and those by the second platform removed, when the rooms are filled like those below.

Five per cent of all ice received into the building becomes useless by cracking and scratching. After a layer of blocks is completed, the workmen shovel from the surface all the loose pieces and the snow, and throw them out of the building through the high, narrow air passages, shown on its sides.

Railway Tunnel under the British Channel.

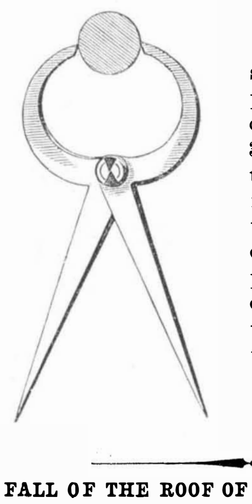
The successful completion and operation of the Mont Cenis railway tunnel through the Alps has given new impetus to the project of establishing railway communication between England and France, by means of a tunnel under the British Channel. The distance is 22 miles. If a railway tunnel can be carried seven miles through the hard schist and quartz of the Alps, why not for three times seven miles, through the softer chalks under the Channel?

A joint stock company has been formed in London for the purpose of solving the problem. It is called the "Channel Tunnel Company," and the tunnel is to extend from Dover, England, to Calais, France. The capital of the company is $150,000, which is being privately subscribed with the immediate object of making a trial shaft and driving a driftway on the English side about half a mile beyond low water mark, with the view of proving the practicability of tunnelling under the Channel. The completion of this work will furnish data for calculating the cost of continuing the driftway from each shore to a junction in mid-channel, and capital will then be subscribed for that purpose, or for enlarging it to the size of an ordinary railway tunnel, as the engineers may deem most expedient. The engineers are Messrs. John Hawkshaw, Thomé de Gamond, James Brunlees, and William Low. The tunnel will be made through the lower or gray chalk, chiefly, if not entirely; and by the adoption of machinery, of which the promoters of this company have recently made practical trials, it is expected the passage can be opened from shore to shore within three years from the time of commencing the work, and at a cost very considerably less than any previous estimates.

COST OF TUNNELLING.

The Mont Cenis Tunnel cost $975 per linear yard. The three most costly tunnels made in England have been the Kilsby, the Saltwood, and the Bletchingley, each of which was executed in treacherous strata, giving out large quantities of water. The Kilsby tunnel cost $725 per yard. The Saltwood tunnel cost $590 per yard, and the Bletchingley, $360. The cost of the railway tunnels in France has varied from $150 per yard, being that of Terre Noire, on the Paris, Lyons, and Mediterranean Railway, to $475 per yard, that of Batignolles, near Paris, on the Chemin de Fer de l'Ouest. In Belgium, Braine le Compte tunnel cost $230 per meter, and the tunnels on the Liège and Verviers line $250 per meter. In Switzerland, the very difficult Hauenstein tunnel, between Basle and Berne, cost $400 a yard. In America, the Hoosac tunnel in Massachusetts, through mica slate mixed with quartz, has up to this time cost $900 per yard, and the Moorhouse tunnel, in New Zealand, through lava streams and beds of tufa, intersected by vertical dykes of phonolite, cost $345 per yard. It will be a convenient standard of comparison for these amounts if we remember that $125 per yard would represent very nearly $5,000,000 for the 22 miles. Any estimate for the Channel tunnel must at present be purely conjectural, and an estimate professing to embrace contingencies must be more conjectural than any other; but it is reckoned that the work, if practicable at all, could be completed within five years of time and for $25,000,000.

Caliber Compass.



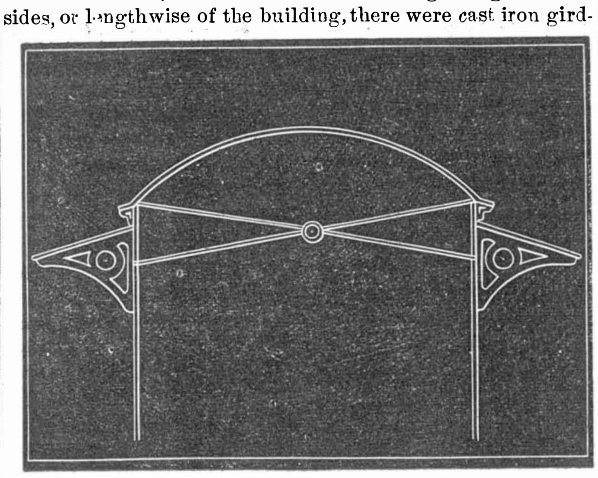
M. J. Koch explains the construction of his caliber compass, illustrated, as follows: The distance of the lower points is 3·1416 times as great as that of the upper points. (This number is the well known π used in the mathematical calculations of circles.) Hence, if the upper points are adjusted to any circular bar or other object, so as to measure its diameter, the distance of the lower points gives the circumference without any further calculation.

FALL OF THE ROOF OF THE RAILROAD DEPOT AT SARATOGA SPRINGS.

We are indebted to our old friend E. J. Huling for the sketch and brief account of the destruction of the new passenger depot, at Saratoga Springs, N. Y., on December 18, 1871.

The iron depot of the Rensselaer and Saratoga railroad, at Saratoga Springs, was a beautiful structure; but, in planning it, the builder seems to have sacrificed everything to make it airy in appearance and beautiful to the eye, neglecting plain rules which the architect of a common shed should have borne in mind. Because the materials used were iron, the builder seemed to think that such ordinary things as internal bracings were unnecessary.

The following is an illustration of one bent of the structure as it stood. The structure was an open arcade, supported by cast iron columns, four inches in diameter, standing fifteen feet apart on the sides, and thirty feet apart across the building. The roof was of corrugated iron, arched, the base of the arch resting on the top of the columns. The columns were tied together crosswise by iron rods five eighths of an inch in diameter, crossed as shown in the engraving. On the sides, or lengthwise of the building, there were cast iron girders of a light and ornamental character between the columns;



but there was no internal bracing to prevent the columns from falling in, unless the five-eighth tie rods were considered as such. Along the side of the building was a shed ten feet wide, supported by light cast iron brackets fastened to the columns; these brackets extended ten feet from the side of the column, and their bearing on the column was about six feet ten inches, or, in some cases, three feet ten inches below where the lower ends of the cross tie rods were fastened into the columns. These brackets are reported to have been tested to sustain over ten tuns; and by their combined weight, with the iron roof which they sustained, they must have exerted a heavy and continuous pressure inwards on the sides of the iron columns. The iron columns were anchored at their foot into square blocks of stone. There was a solid rock, underlying the whole depot and parts surrounding, only a few feet below the surface. The railroad track ran along beside the structure, partially beneath the piazza or shed, supported by the brackets.

On the day of the fall of the structure, the ground was hard frozen, and there had been a light fall of snow. A heavy freight train ran up so that the locomotive stood about against the first column, and stuck there, the snow obstructing it so that the wheels turned without going ahead. After some abortive efforts to go along, the engine driver reversed his machine and backed down. He had scarcely got below the corner of the arcade when the column, near which his machine had stood, crumbled inwards, and the whole affair fell nearly together. Three men who were under the roof escaped, but one lad was caught and crushed, his back being broken so that instant death seemed to have occurred. An inquest was held on the boy killed, and, among others, Mr. Cummings, of Troy, the architect employed by the railroad company to supervise the building, was sworn, and testified that he relied upon the experience of the builders, the American Corrugated Iron Company, Springfield, Mass., and did not make the plans or drawings for the building; that he had feared somewhat that the wind might lift the roof, but had not thought that it would fall inwards. The opinion of other builders was that the leverage of the heavy brackets, bearing upon the outside of the columns, without anything inside to counteract them, had caused the columns to break. The locomotive, running up beside the column and stopping there, had seemed to cause a vibration; and, as the train backed down, the first column, where the vibration commenced, was pushed inwardly, and then the others fell nearly together. The coroner's jury censured the builders for not properly doing their work.

Now that the building has fallen, it is considered somewhat wonderful that it stood as long as it did.

Correspondence.

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

The Davenport Tricks.

To the Editor of the Scientific American:

Allow me, in answer to the note of Mr. W. M. Patton, page 84, in No. 6 of this paper, to state that when the Davenports stick their hands and naked arms through the hole of the center door, they are no more tied down by the knots made by persons selected by the spectators, but have got loose, shown this, and then tied themselves again in their own way, as described by me on page 68. The spectators are very apt to overlook this, and not to notice that, ordinarily, very few tricks are performed as long as the brothers are tied down by others, and less in proportion as this has been done more thoroughly.

In regard to the number of hands shown, I have heard persons in the audience who assured me they saw five or six of them, while I am sure there were only four, having carefully watched the whole proceeding; but when four hands and arms are rapidly moving about through a hole, one may be easily mistaken and count five. If there really were more, it would only prove that they had one or more false hands hidden in their sleeves, but I think this improbable, because, when I tied one up, I carefully examined his arms and sleeves, and am sure there was nothing hidden about the individual. The ringing of the bell is not more wonderful than the taking off of their coats, which I explained on page 68.

Mr. Patton asserts they use no teeth in their execution; how does he know? And why should they not use them if expedient? To satisfy himself, let him tie up two school boys, of ordinary intelligence, opposite one another, so that each, by stooping forward, can reach with his teeth the knots wherewith his fellow is tied down, exactly as is the case with the Davenports, and let him see how expertly they will use their teeth for mutual delivery.

On page 100, Mr. Patton gives, as *his explanation*, that the Davenports "have false hands and wrists, made of gum and so closely resembling nature as to mislead by the feeble light," and says further that these are inflated and have hoops or rings imbedded, "so as to prevent a collapse under the pressure of the cords," that these are tied down, and that they slip their real hands out of them to perform the tricks. This explanation is very ingenious, but rather far fetched and unfortunately not in agreement with the facts. When I tied up one of the Davenports, I am sure I was not deceived in such a way, as the hall was fully lighted with some 300 gas jets; and besides I felt the pulse of both of them, before and after the tying up, in order to find if the individuals got excited by my careful watching, and I doubt if even those whose confidence in M.D.s is least, would suppose that I would be so obtuse as to be cheated by a gum arm when feeling the pulse, or not able to distinguish true skin, flesh and bone from gum, extended with hoops and painted flesh color. The sealing up of the knots at the ends of the rope does not amount to anything, as they can slip their hands out of the loop just as well, whether the knots are sealed or not, when only they have tied themselves in the manner described by me on page 68. They do positively not cut the cords, but unfasten every knot, for I used my own hemp ropes, and got all back in the original condition; while finally, in justice to them, I must state that they have no "capacious pockets," and no ropes either whole or cut in them. I have examined also this point.

If Mr. Patton had seen and watched the performance as closely as I have done, he would be satisfied that his hypothesis is untenable.

New York city. P. H. VANDER WEYDE, M.D.

Motion.

To the Editor of the Scientific American:

What is motion? This question might be confronted with another, namely: What is not motion? The latter would be the most difficult to answer. It is certain that we do not know of any condition of matter wherein there is no motion. Until the universe comes to a standstill, everything must be in motion. The idea of cessation of motion is inconceivable, as much so as is a limit to infinity, or similarly, an end to eternity. Motion is universal, so is matter, and motion and matter are inseparable; one cannot exist without the other. Motion is the primordial condition of matter, and Herbert Spencer, in his "First Principles," invests even nebulous matter—that which is sometimes denominated chaotic, such as was "void and without form"—with the function of motion, or that of possessing the power of contraction and expansion.

Physical or mechanical forces can only be the result of a transfer of motion; and this transfer of motion can only be made at the expense of matter. The combustion of the fuel under the steam boiler is only a transfer of the force which had been employed in the formation of the wood and coal; and it is so with every other motor that can be used. The ball propelled from the cannon had its force-equivalent transferred from the labor of the manufacturer of the powder. Not only the powder but the ball as well, in its rounded or elongated shape, had to contribute its part in the play of projection. This system of compensation, as manifested in the correlation of forces, holds its equivalents to as strict a measure of relation as the fulcrum of the scale beam does the things that are weighed in the balance. The seven or eight per cent of the units of heat, which are all that are at present utilized in the transfer of motion from the fire under the boiler to the machinery in the mill, so far from invalidating the science of mechanical forces as correlated, only goes to prove that we are far behind the constructive perfection which ought to give us much more, and which ought to stimulate the inventive genius of all mechanical engineers. The conduction and conveyance of power, that is the transfer of it from the fuel to the propelling wheel, is much, in the condition as to economy, as that of carrying water in a sieve. There is too much lost on the way side. The bushel of oats put in the horse's combustion chamber does a great deal more work than the bushel of oats (with its steam included) will do when burned under the steam boiler; and yet the force-equivalent in both cases must be the same.

The economizing of motion is a good deal like going a fishing. He that understands the nature and the habits of the fish that he goes for will be likely to succeed the best. So in the mechanical profession: he that understands the law of motion and mechanical forces will be most likely to get the most work out of a certain expenditure of motion-transferring appliances. There is yet a broad domain and a wide track for the exercise of mechanical and engineering skill; and the man who adds a single increment of improvement in the economy of the transfer of motion becomes a benefactor to the human family.

The *inertia* of the old doctors has given way to the *vis viva* of modern scientists. The old *inertia* was defined to do and not to do: not a very comprehensive definition. The ball, when it stops rolling on the philosopher's board, goes only to show that it has played out the motion that was transferred to it by the motor, whatever that motor may have been.

There can be no such thing as increasing the amount of force in a given quantity of matter; but there is such a thing as economizing that power, that is to say, enabling it to do more work through one instrumentality than through another; and the perpetual motion makers ought to take it to themselves that they will not succeed in the solution of their problem by simply adding wheels and levers, unless they hope to move them by the psychic force; a force whose existence can be called into action somewhat in the way that the sailor whistles up a wind. Mr. Crookes is of the opinion that a force, without the intervention of cognizable matter, does exist and that it can be called into action. Mr. Dauskin, an estimable gentleman and spiritualist of Baltimore, told the writer of this article that he had witnessed such phenomena with his own eyes; but Mr. Coleman Sellers. President of the Franklin Institute, gave an illustrated lecture, at the Philadelphia Central High School the other evening, on "the Science of Delusion," in which he demonstrated that it is not altogether safe to trust implicitly to our eyes.

Motion, like matter, is constant and universal. It cannot be annihilated, nor can it be increased or diminished; but it is transferable, and the best we can do is to devise means through which this transfer can be accomplished by the least cost of labor and material.

Philadelphia, Pa. JOHN WISE.

London International Exhibition.

To the Editor of the Scientific American:

It may be of considerable interest to many of your numerous readers to be informed that articles for the London International Exhibition of 1872, which opens May 1st, must be delivered at the buildings at South Kensington, London, if belonging to the class including "Machinery and Raw Material," on the first day of March, and, if included in the class comprising "Recent Scientific Inventions and Discoveries" on Saturday, March 2. Other classes have other specified days for the delivery of the articles for exhibition, but the list would be too long to trouble you with in this letter. The above information is officially promulgated by Major General Scott, Secretary of Her Majesty's Commissioners.

HAMILTON E. TOWLE.

COLORED CANDLE LIGHT.—Wax candles are made of different colors, but they all emit a white light. Why may not candles be manufactured, by introducing certain chemicals into the material from which they are made, so as to show a variety of colors, such as blue, red, green, etc.? By arranging such candles in tasteful groups, beautiful effects may be produced in illuminating buildings. If some ingenious chemist will devise a way of embracing a cheap chemical with any of the material used for illuminating candles so as to render the light emitted from them of any desired color, he will make a fortune by his discovery.—*Commercial Bulletin.*

[This is what we told our chemists several years ago, and still no advance has been made in this direction. If chemicals could be introduced into any safe illuminating material so as to produce a variety of colors, the discoverer would reap a rich harvest for his invention.—ED.]

[Correspondence of the Scientific American.]

JAPAN.

Interesting Letter from Professor Griffis--Establishment of a Scientific School at Fukuwi--General View of the Japanese Status--Rapid Progress of the Japanese in European Knowledge and Arts --Mineral and Agricultural Resources of Japan.

FUKUWI, Province of Echezen, Japan, Nov. 25, 1871.

One of the constant readers of the SCIENTIFIC AMERICAN, responding to the invitation extended by you to the American citizens to keep you informed of the progress they are making, would send greetings to you from this end of the earth, and would hope to point out a few signs of progress among the people now beginning their "second life in the history of nations."

The writer, who had been an instructor in chemistry in America, and had among his pupils thirteen of the Japanese students, received an invitation from the Prince of the Province of Echezen, to come to Japan, organize a scientific school, and give instructions in the physical sciences. It seemed rather a discouraging place to go to (nearly the antipodes of New York); but, being earnestly urged by the young men from Japan, the writer came to Fukuwi, arriving here March 4th. To a pioneer in the interior of Japan (foreigners not being allowed to penetrate more than twenty-five miles from the treaty ports) it seemed at first like beginning in the stone age. However, we found that several of the young men had been diligently studying medicine and chemistry through the Dutch language, which has been for centuries the language of high culture in Japan. As fruits of this, I found that vaccination was practiced, dissection slily carried on, a powder manufactory with a national reputation established, also a gun factory in which very fair specimens of smooth bores and rifles were made and finished, and even a creditable attempt made to construct a breakwater at Mikuni, the sea port of this city.

In visiting the mines, we found that blasting was known, but not yet fully applied. Pumping was not in vogue, though it has been estimated that fully one third of the profitable mines of Japan have been abandoned by reason of the invading water. The Japanese are very quick to apply machinery, however, and in several provinces we know of pumping machines, driven by steam, being applied. In several of the provinces, foreign engineers are engaged on contracts of three years, and are revolutionizing the old methods of mining. There seems to be abundance of copper, mercury, zinc, tin, and iron, the latter being mainly in the form of magnetic iron ore.

Manufactures are not backward. The Japanese, while welcoming the foreigner and eager to get his knowledge, his inventions and productions, are yet anxious to be independent and to "do it themselves." They not only run their own steamers, and drive their own factories, but each mechanic seems desirous of trying his skill at something foreign, when said foreign thing is undoubtedly worth making. Hence, glass blowing, drug manufacture, wood carving, leather working, furniture, silk winding machinery, etc., etc., though in their infantile stages, are yet striding on towards perfection.

In fitting up our own laboratory, many pieces of apparatus and peculiarities of building, etc., requiring great patience and considerable mechanical skill, were furnished by workmen who were eager to learn; and, considering their rude tools and appliances, they succeeded remarkably well.

It must be remembered that the normal Japanese house, not excepting those of the Daimios and rich men, are excessively plain, walls and neatly matted floor under a roof being the main necessities; no furniture, no chairs, nothing suggests the luxurious civilization of Europe or America. In the city in which we dwell, the only chimneys are those upon the chemical laboratory, and our own dwelling house—a house, by the way, built by a Japanese carpenter under our directions, and exceedingly American and complete in every respect.

We do not propose to speak of the railroads now building, or of those projected, or of the telegraphs and steamships owned and worked by the Japanese. These evidences of advancing civilization are most visible at the sea ports, and will be duly chronicled. We speak only of the pulsings of the new civilizations in the interior, two hundred miles from any foreigners. We may say in passing, however, that we have seen the "report" or "Blue Book of the Department of Civilization" of the Imperial Government, and find in their schedules full preparations made for light houses, railroads, telegraphs, a postal system, introduction of machinery, cattle breeding, scientific farming, navy yards, coast and inland survey, road making, and numerous other enterprises. Of course, it will require years even to fully organize these plans; but when it is remembered that all this apparatus of civilization has been suddenly grafted on a nation hitherto hermetically sealed to the world, the marvel will be that such gigantic enterprises can be entertained. The Japanese, while liberally engaging professors, engineers and agents, are yet determined not to let Japan become as India, nor be passive recipients. They have now at least three hundred picked young men studying in America and Europe, and on their return they will personally engage in the business of superintending the great public works of the country.

The timber of Japan is marvellously rich and abundant, and is mainly grown on the mountains. Indeed this is the land of "the everlasting hills," and the practically waste land is in very great proportion to the cultivated soil. The latter, however, is very fertile, and the whole country is cultivated like a garden. The tools are pretty much the same as those used ten centuries ago. The plows are simply sticks pointed with iron. The rice is cut by hand with a small hook, and threshed by drawing it through iron teeth. They get very good crops on their irrigated lands; but much reclaimable soil exists neglected, and scientific farming is entirely unknown as yet, except in one or two provinces in which American farming machinery has been introduced. Cattle breeding claims much attention, and we can assure your readers that the superstitious fanaticism concerning beef and pork is rapidly vanishing.

In many provinces beef is eaten, and in the large cities it is sold at the corners of the streets as a delicacy, and devoured with gusto by gray heads and urchins. Whenever our cook slaughters a cow, he has no trouble to sell the meat; and five magnificent specimens of California cattle, recently brought here, promise to leave offspring more promising than the stunted native cattle. Several sharp Japs, who read the signs of the times, have herds of swine, and our local government is very desirous of having works on cattle rearing and breeding translated, and have imported the cattle spoken of.

We are trespassing on your crowded columns, and will, therefore, hasten to a close. We forgot to mention the coal which is found here near Fukuwi; it is not very abundant, nor of first class, though extended exploration might reveal formations of a better quality. However, were you to come to our house, Mr. Editor, and see our sparkling grate heaped with the black diamonds of Japan, you would think civilization had really begun.

As Rome was not built in a day, nor our country settled in an hour, we must have patience to await fully the flowering of this nation. Patient toil and faith are needed, but even in the everyday prose of the pedagogue we feel something of the glow of poetry, while reading the faces of our Japanese scholars. We have nearly 125 promising pupils in chemistry and physics, and with two good interpreters, apparatus from America, a printing press up, and earnest young men to help in translating and applying the knowledge gained in school, we hope to make the "Fukuwi Scientific School" one of the centers whence shall radiate the new civilization. In conclusion, I cheerfully acknowledge the great help in practical hints, etc., from your valuable paper, which we are glad to tell our pupils is the SCIENTIFIC AMERICAN.

WILLIAM E. GRIFFIS,
Professor of Chemistry, Fukuwi, Japan.

[Reported for the Scientific American.]

MEETING OF THE SOCIETY OF ARTS OF THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

HELD IN THE INSTITUTE IN BOSTON, JANUARY 11, 1872, THE PRESIDENT, J. D. RUNKLE, IN THE CHAIR.

AUTOMATIC REGISTERS.

Dr. Sternberg, U. S. A., exhibited and described a new application of electromagnetism. He uses this subtile agent for the automatic regulation of temperature. His apparatus is applicable wherever artificial heat is employed, as in the warming of buildings, and also in various processes in the laboratory and the arts.

To watch a thermometer and operate a damper or register by following its indications, is, to say the least, unscientific, besides requiring more time and attention than can ordinarily be given. The attempt has frequently been made to effect the automatic regulation of temperature by using the expansion of a metallic bar or of a volume of confined air to operate a damper; but satisfactory results have never been obtained by these methods, and their application is limited, as the regulator must be placed near the furnace, and the expansion of a metallic bar for a variation of a few degrees of temperature is so slight that it would be impracticable to use a bar long enough to regulate the temperature to a nice point. The use of confined air for this purpose is still more unsatisfactory, as the air is affected by barometric changes. And though such an apparatus might regulate the temperature of the hot air chamber of the furnace with sufficient exactness, it could not control the temperature of distant apartments, which is far more important.

Dr. Sternberg's invention is intended to obviate these difficulties, and is at once simple and efficient.

The battery wires are so adjusted in connection with a thermometer that when the temperature reaches the desired point, the mercury in the thermometer establishes a circuit, by which the register or damper is shut; upon the slightest reduction of the temperature, the mercury falls, the circuit is broken and the register or damper opened.

It is obvious that the thermometer may be placed at any distance from the furnace, and may regulate the temperature of an apartment by controlling either the register or the damper of the furnace.

If the wires from the thermometer be made to operate a damper which controls the supply of air to the furnace, fuel will be saved.

Automatic ventilation may be secured by the same apparatus—electricity controlled by a thermometer.

Where a number of rooms are warmed by one furnace, he would let the thermometer in the room most used control the damper of the furnace; and the temperature of other rooms would be regulated by automatic registers controlling the flow of heated air to them.

The mechanism for operating the registers and dampers is simple and requires but little power; one battery cup being sufficient to perform any of the operations.

The point of contact between the wire and the mercury is easily adjusted to any required temperature, and a change of a fraction of a degree will make or break the circuit and cause the apparatus to act.

ELECTRIC CLOCKS.

Mr. James Hamblett addressed the Society upon the subject of electric clocks. He said: One of the first attempts to propel clocks by electricity was made by Alexander Bain about 1842. His battery consisted of a plate of copper and a plate of zinc buried in the earth. The pendulum rod was of wood, with a large coil of copper wire for a bob; the ends of the wire were carried up the pendulum rod to its point of suspension, and were there connected with wires from the buried plates; two brackets, about half way up the rod, supported a sliding breakpiece, which was so situated that it would be pushed a little at every vibration of the pendulum, and by this means an electric circuit was made and broken. The operation of these clocks was not satisfactory, as they were liable to error from fluctuations of the battery power.

Batteries have always been a source of trouble to electric clock makers, for upon their constancy the accuracy of the clocks in a great measure depends. Mr. Hamblett uses the Smee battery; the elements are pure zinc and platinum; the solution consists of pure water and chemically pure sulphuric acid. He uses no screw cups, as they are liable to become loose and are frequently the source of much annoyance. The wires connecting the elements of his battery are soldered together.

An electric clock invented by Mr. Charles Shepard has been much used in England. In these clocks the impulse is given to the pendulum by the falling of a lever, which is raised at each vibration of the pendulum by an electromagnet. As the weight of the lever and the distance which it falls are constant quantities, the impulse imparted to the pendulum will be constant, and the accuracy of the clocks will not be affected by fluctuations of the battery power.

The mechanism of these clocks is such that an electric circuit is established and broken once every second, which operates dials at distant places.

Electric contacts are usually made of platinum or of an alloy of platinum and iridium. When the circuit is broken, an electric spark passes between the contact points, which causes a slight oxidation of the platinum, and, where an electric current is established every second, this oxide may accumulate and become a cause of error.

In Mr. Hamblett's clocks, this difficulty is obviated to a great extent by establishing the circuit, which moves the dials only once in a minute. The dials are made very simple and tick once in each minute; and all the dials controlled by one clock will move together, indicating exactly the beginning of each minute.

Clocks cannot only be propelled, but may be controlled and corrected by electricity. Clocks controlled by electricity have two small magnets, placed at the lower end of the pendulum, which are so arranged in relation to two stationary coils of wire that at each vibration of the pendulum one of the magnets will pass into the opening in one of the coils. Once each second an electric current is sent through the coils from the controlling clock, and if the controlled clock be inclined to go slow, the current from the controlling clock, acting upon the magnets, will tend to accelerate it, and *vice versâ*.

Mr. Hamblett believes this to be the best method yet devised for distributing time.

One standard clock may control many other clocks at different points, and if an accident happens to the wires the controlled clocks will not stop, but will go on at their own rates. Methods similar to this have been adopted in Edinburgh, Glasgow and St. Petersburgh.

A clock, erected by Mr. Hamblett in the observatory at Allegheny City, Pa., controls all the clocks of the Pennsylvania Central Railroad, and those of connecting lines westward to St. Louis.

This is the longest line of time distribution in the world. He made brief mention of the various time signals and time balls used in different countries, and explained at length the distribution of time and the operation of time signals in England by the mean time clock in the observatory at Greenwich.

LIGHTING GAS BY ELECTRICITY.

At a meeting, held January 25, Dr. Van Zandt of California brought to the notice of the Society an invention of his, the object of which is to light the gas in street lamps by electricity. The gas is not only lighted, but is also turned on and off by electricity. All the lamps are connected by underground wires with a central station, where the apparatus consists of a galvanic battery, an induction coil, and a switch to throw the current on or off the wires in any portion of the city, so that all or any part of the lamps may be lighted or extinguished as required.

Two independent circuits are necessary, one for operating an automatic apparatus in each lamp by which the gas is turned on and off; the other for conveying the current which lights the gas.

The wire for the last circuit passes across the slit in the burner, where it is broken so that the passage of the electric current produces a spark which ignites the gas. The wire near the burner cannot be insulated by caoutchouc or cloth, as these are destroyed by the heat; it is insulated by winding it around non-conducting trunnions on the burner. Above these insulators, the wires are of German silver tipped with platinum.

He has made a successful trial of his apparatus in this city, using thirty-seven burners and over a mile of wire. He illustrated his remarks with drawings, and by lighting and extinguishing a gas jet before the Society.

ETHER ENGINE.

Professor Watson then made an interesting communication on the ether engine.

The idea of utilizing the heat of waste steam, by using it to vaporize some liquid more volatile than water, is as old as Humphrey Davy

In 1830, Mr. Ainger suggested ether as a suitable liquid for this purpose, but the idea was first practically worked out by M. du Tremblay in France.

The engine of M. du Tremblay was, in most essential particulars, similar to the engine constructed by Mr. Ellis of this city, with the exception that he used sulphuric acid instead of sulphide of carbon.

His engines were used on screw steamships by the French Government, and were of seventy horse power. A considerable saving of fuel was effected by the use of these engines; when using the ordinary steam engine alone, 95 lbs. of coal per horse power per hour were required; but with the vapor of ether and steam engines combined, 25 lbs. of coal were found sufficient to produce the same result, showing a saving of nearly seventy-five per cent.

The great difficulty in the construction of these engines, and that which caused their final abandonment, was the practical impossibility of making tight joints. It was found that the tightest joints were obtained by using true metallic surfaces and numerous bolts; between the surfaces was placed paper soaked in a solution of gum arabic; but even these joints would leak. In consequence of the leakage, one of the ships caught fire and was burned.

The Professor then, by means of mathematics on the blackboard, demonstrated the superior efficiency of the ether engine compared with the ordinary steam engine, and showed that the adoption of some volatile liquid—as sulphide of carbon—not liable to produce explosions or conflagrations was an important step toward the complete utilization of the heat now wasted by the steam engine.

W. O. C.

The Phosphorescence of Marine Animals.

Professor Panceri, of Naples, has been studying for some time past the phosphorescence of marine animals. He has examined *Noctiluca, Beroe, Pyrosoma, Pholas, Chœtopterus,* and has lately published a paper on the phosphorescence of *Pennatula*. He finds in all cases that the phosphorescence is due to matter cast off by the animal—it is a property of dead separated matter, not of the living tissues. In all cases (excepting *Noctiluca*) he also finds that this matter is secreted by *glands*, possibly special for this purpose; but more probably the phosphorescence is a secondary property of the secretion. Further, the secretion contains epithelial cells in a state of fatty degeneration, and it is these fatty cells and the fat which they give rise to which are phosphorescent. Hence the phosphorescence of marine animals is brought under the same category as the phosphorescence of decaying fish and bones. It is due to the formation in decomposition of a phosphoric hydro-carbon, or possibly of phosphoretted hydrogen itself. In *Pennatula* Professor Panceri has made phosphorescence the means of studying a more important physiological question—namely, the rate of transmission of an irritation. For when one extremity of a *Pennatula* is irritated, a stream of phosphorescent light runs along the whole length of the polyp colony, indicating thus by its passage the rate of the transmission of the irritation. This admits of accurate measurement, and furnishes data for extending Helmholtz's and Donder's inquiries to animals so widely separated from their "Versuchs-thiere" as the *Cœlenterata* It is also a proof of the thoroughness of Professor Panceri's investigation that he has made use of the spectroscope for studying the light of phosphorescence.—*Nature.*

A Marine Novelty.

A new iron steam vessel, of peculiar design and novel arrangement, constructed by Messrs. W. Simons & Co., has just been launched from the London Works, Renfrew. It combines in itself the respective properties of a powerful dredger, a steam hopper barge, and a screw tug steamer. It is intended to keep the harbors and rivers of North America clear of silting and obstructions at a moderate expense, as it has, in one bottom, all the properties of the more expensive dredge fleet usual in extensive operations; and by its use ordinary rivers and harbors can be deepened and improved at much less expense than is customary with dredgers, barges, and tug steamers, with their crews and necessary detention. The mode of working, as described by the *North British Daily Mail*, is as follows: "The vessel propels itself to the place requiring dredging; it is then moored by the steam winches to the guide buoys at both bows and quarters; the dredging girder is then lowered to the bottom by steam; the machinery connected therewith is then set in motion, and drives a range of steel mounted buckets, which cut, lift, and deposit, into the vessel's own hopper cavity, about 200 tons of spoil. The vessel being now loaded, the girder is then raised flush with the deck, the moorings are disconnected from the buoys, and the vessel assumes the properties of a screw steamer. Another connection of the machinery is then put into gear, driving the propeller. The pilot takes his station at the rudder, and the captain takes his station on the bridge, the dredging crew convert themselves into sailors, and the vessel steams away to deep sea water, say from 10 to 20 miles, at a speed of eight knots per hour, where, by another arrangement of the steam machinery, the bottom hopper doors open and the 200 tons cargo is in a moment dropped in thirty or fifty fathoms depth of water. The bottom doors are then closed and the steamer returns for another cargo and becomes again a dredger, the process being repeated. This vessel is consequently well suited for exposed localities, and is capable of lifting, conveying, and depositing 500 to 1,000 tons of spoil per day; and by its use, in limited operations, the cost of dredging is greatly reduced. There are many rising seaports and rivers, which can be deepened by this system, whose trade and prospects would not warrant the heavy expenditure of an entire dredge fleet. We understand Messrs. Simons have patented the arrangements of this vessel, and that after a trial on the Clyde it will shortly steam itself across the Atlantic to its destination.—*Mechanics' Magazine.*

An Expedition in Search of Dr. Livingstone.

At a recent meeting of the Royal Geographical Society, London, Sir Bartle Frere, Vice President, explained the grounds on which the Council had determined to despatch an expedition from England for the search and relief of Dr. Livingstone. He said it was now more than two years and a half since anything in the shape of written communication had been received from Livingstone. In one of his last letters he had described himself as in great want of men, stores, clothing, and medicine; in short, of everything that was necessary to enable him to continue his explorations. It was necessary to remind the meeting that, on the receipt of those letters, Her Majesty's Government and the Geographical Society took immediate action to supply the wants of our great traveler, a grant of money being made by the Treasury, and the amount entrusted to our Consul at Zanzibar to be expended, in the hire of men, purchase of stores, and their transmission into the interior. Various causes had intervened to prevent some portion of this assistance reaching Livingstone; and, lately, disturbances had broken out in the district about midway between Lake Tanganyika and the coast, which, without affecting him personally, had increased the difficulty of communication. That Livingstone was alive, and had been pursuing the great plan of exploration which he had marked out before leaving England, was to be concluded from the rumors that had reached Zanzibar from the interior; and that plan was the tracing of the sources of the Nile and the limits of the great lake region of the African interior. His latest letters gave a vivid picture of his destitution as regards the commonest necessaries of a traveller. It would be in the last degree disgraceful to them, not only as a body of geographers, but as Englishmen, if they allowed him to perish without making an effort to relieve him. The fortunate chance of a private steamer preparing to leave London in the course of the month, direct *via* the Suez Canal for Zanzibar, had compelled the Society to act rapidly in this matter. The expedition was being organized, and an appeal had been made to the public for funds to defray the expenses. Already subscriptions had been received to the extent of twelve hundred pounds.

News from the Navigators.

The people of the Samoan group, known as Navigators Islands, in the Pacific Ocean, have sent to the Secretary of State at Washington a request for annexation to the United States, signed officially by all the chiefs and many foreign residents of the islands. These are the only valuable islands in the Pacific Ocean not absorbed by France, England, Germany or Russia, and the natives say they are more favorable to the United States than any other country, because they believe that the American religion is the same as theirs. The islands in question contain three thousand six hundred square miles, and a native population of thirty thousand. The people are copper colored, and the productions are cotton, coffee, sugar cane, dye woods and every species of tropical fruits and plants. The Australian mail steamers have selected the islands as a port of call for coaling purposes, and men have gone there to erect buildings and construct wharfs. The natives are friendly and Christianized, American missionaries having been there twenty years.

Water Power by Telegraph.

The large establishment of James Richmond, at Lockport, N. Y., the well known maker of bran dusters and grain cleaners, is driven by water power from the waste of the Erie canal. Mr. Richmond also supplies a considerable amount of power to other establishments in Lockport, some of which are over half a mile from his water wheels. This he does by means of endless wire cables, carried on telegraph poles, to neighboring factories and mills. A very simple arrangement of cogs enables any number of endless wire cables to run to central points in the city, and thence in all directions. In this way, the printing presses of the *Journal*, the *Times*, and the *Union* are run by deputy, at a cost of so much per hundred feet per annum. Mr. Richmond also furnishes power to a whip factory, a cabinet shop, a glass factory, 2,500 feet away, a shirt factory 2,000 feet in the opposite direction, a foundery, and a machine shop. He has some valuable patents in connection with this distribution of power, and has lately fitted up a series of distributing wires at Fulton, in Oswego county.

Scarlet Fever Non-contagious.

Dr. E. H. Lewis, in an interesting article published in the *Northwestern Medical and Surgical Journal*, states some striking facts bearing upon the contagiousness of scarlet fever. From data, gathered during an epidemic in 1870, the doctor concludes that scarlet fever is not caused by sewer gases, or marsh miasms, or decaying vegetable matter, impure water, or the habits of people; for in the cases observed by him all these causes were absent. The epidemic traveled directly and rapidly through well drained and elevated regions of country, sweeping everything before it. In the cases observed, the doctor could find nothing to enable him to believe in its contagiousness. He says: "I have not the slightest doubt that the causes of scarlatina depend upon some peculiar condition of the atmosphere favorable to the propagation of the scarlatina poison, and that it travels in a manner similar to epidemic cholera, the principal feature of which it simulates, the difference being that in cholera the force of the disease is spent upon the bowels, while in scarlatina it is expended upon the skin and throat."

Improved Gage Cock for Steam Boilers.

Our engravings illustrate an improved gage cock for steam boilers, which is extremely simple, though quite unique in design. We judge it is not likely to get out of order, and that it must be very convenient in use.

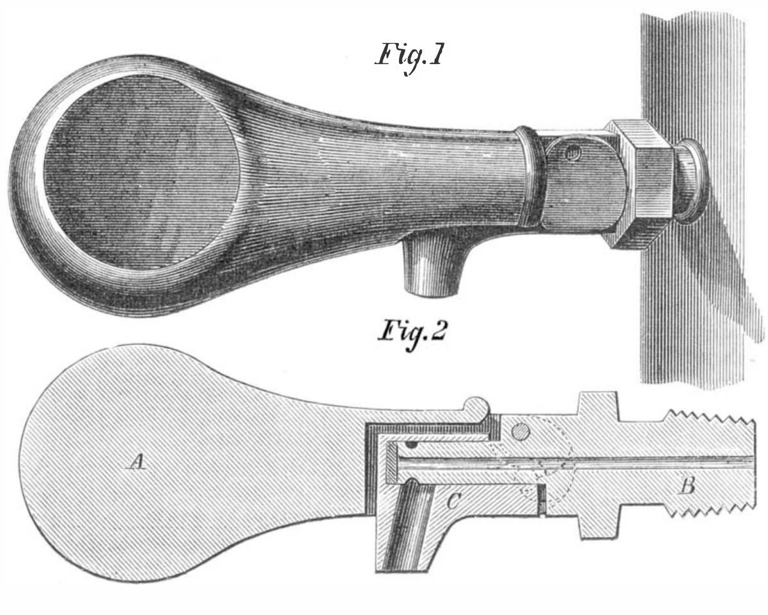
It consists essentially of only three parts, a weight lever or ball, A, Fig. 2, a barrel, B, which screws into the boiler in the usual manner, and a nozzle, C. The nozzle, C, telescopes over the barrel, B; the barrel has a straight steam passage through it, closed by the nozzle which abuts against the end of the barrel, and has a gasket on its interior to make the joint formed steam tight. The use of the weighted lever or ball is to hold the nozzle against the end of the barrel, when the cock is shut, and to withdraw the nozzle when it is desired to open the cock. This is done in the following manner:

The weighted lever is pivoted to the barrel. It also has a recess that shuts down over the outer end of the barrel. On the inside of each of the two lateral walls of this recess is formed a cam groove, into which lugs, on the sides of the nozzle, enter, so that when the weighted lever or ball is turned upward on its pivot, the cam grooves force the nozzle outward, and when the weight descends, force it inward again, so as to bring the gasket firmly down against the end of the barrel. The cock thus automatically closes itself.

A small annular groove is turned about the outer extremity of the barrel, and collects any steam or water that may escape through between the barrel and the enveloping nozzle, and directs it downward out of the mouth of the nozzle. This renders a tight fitting of these parts unnecessary, and they may work with scarcely any friction.

The gasket may be renewed if desired, when the boiler is under pressure, by raising it up to and a little past the perpendicular, where it will remain. The nozzle can then be slipped off the barrel, the latter being plugged with wood while the repair is made. Upon withdrawing the plug, the nozzle may be replaced while the steam and water are escaping.

Patented, Jan. 16, 1872, by William Painter. For further information address Murrill & Keizer, Baltimore, Md.



PAINTER'S GAGE COCK FOR STEAM BOILERS.

GERHART'S IMPROVED WAGON BRAKE.

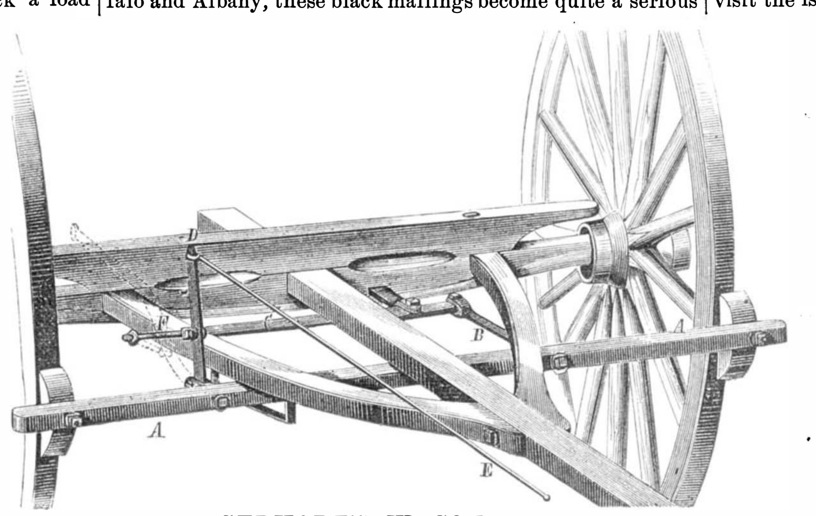
It is nearly as severe labor for horses to hold back a load in descending a hill as to draw it up the same grade. The use of a good brake upon uneven roads, therefore, both in economy and convenience, so strongly recommends itself to men of good sense as to scarcely need a word of argument. A great many forms of brakes have been made and used with advantage, but it appears that the useful combinations of devices adapted to this purpose have not yet been exhausted.

Our engraving illustrates a new combination of levers and links, by which the wheels of vehicles may be very effectively braked.

The brake bar, A, is supported by keepers attached to the under side of the rear hounds of the wagon, the keepers being sufficiently long to give the bar play to and from the rear wheels. About midway between the middle and the end of the brake bar is attached the link, B, which joins the brake bar to the lever, C. This lever is pivoted to a support extending forward from the rear axle, as shown, its short arm being on the side of the link, B. Its long arm is joined by the link, F, to the lever, D. The lever, D, is joined at its lower end with the brake bar, and is actuated by the connecting rod, E, which, when drawn forward, causes both ends of the brake bar to move backward, bringing the brake shoes very forcibly against the wheels to be braked. It will be seen on close inspection that a very powerful leverage may be thus obtained.

The dotted outline shows a mode of placing the lever, D, so that it shall drop back down on the bolster, in which case it is actuated in a slightly different way from that described.

The invention was patented through the Scientific American Patent Agency, Dec. 12, 1871, by John A. Gerhart, of Easton, Pa., whom address for further information.



GERHART'S WAGON BRAKE.

The Erie Canal Locks.---Lockport.

An enlargement of the locks is urgently demanded, so as to permit the transit of steam canal boats carrying 600 tuns of cargo, instead of 200 tuns, the limit of most of the present boats. It is said that it will cost no more to propel a boat with 600 tuns cargo, if the locks are made larger, than it now costs to tow the 200 tun boats. A writer in the New York *Times* gives an interesting description of the locks at Lockport, N. Y.:

On approaching Lockport, the eye is at once attracted by a sort of giant's staircase in the Erie canal, of even more imposing dimensions than the celebrated Giant's Staircase in the Doge's palace at Venice. Immediately the exclamation involuntarily escapes one: "Ah! *Lock*port! I see." It is at this point that, by an extensive system of lockage, the heavily laden barges are enabled to ascend and descend the low range of hills down which the canal takes its course, and on the extreme edge of one of which stands the active little city of Lockport, looking over one of the most extensive level plains in the State of New York.

There are five double locks, ten in all, at Lockport, each lock being 110 feet long by 20 feet wide. They have a uniform rise of a little over 12 feet, making the total rise about 64 feet. The two head locks have 20 feet, the four lower tiers 18 feet of water. The time occupied in the passage or the boats from one lock to another varies according to their construction and running. Going east, a boat will pass through all the locks in from fifteen to twenty-five minutes; going west, more time is occupied, as the boats have to be pulled through by horse power on a rising tow path, instead of being forced through by the subsiding water, as is the case in going east. The boats have a tonnage of 200 to 240 tuns, and going east generally carry about 7,500 bushels of grain, or from 140,000 to 170,000 feet of lumber.

There are no lock fees whatever, the State government including all charges in the State toll of two cents per mile on the boat. Still there are what amount to charges, and it is against these demands that the boatmen call out so loudly. The lock officials will get a boat through in fifteen minutes or be half an hour about it, according to the receipt or refusal of a quarter of a dollar from the captain of the boat. Considering the number of locks on the canal between Buffalo and Albany, these black mailings become quite a serious tax, and, when refused, involve a still more serious loss—the loss of time.

QUINBY'S GEOMETRICAL ARCHING BRICKS.

Represented in the accompanying engraving is a new form of bricks for the construction of arches, without the use of

FIG. 1.

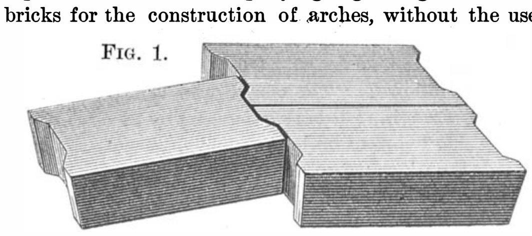
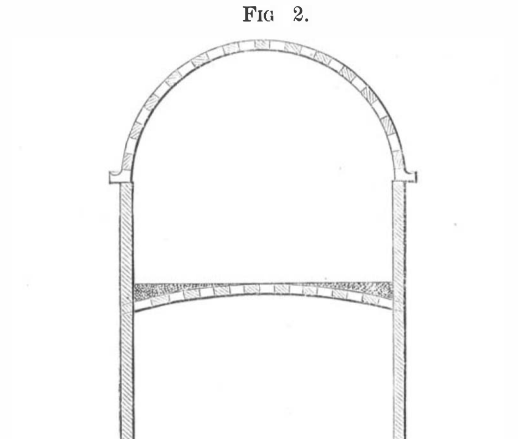


FIG 2.



forms, and which, it is claimed, will be of great use in the construction of the bases of concrete bridges, fireproof roofs, etc.

The form of the bricks is shown in Fig. 1. It will be seen that they have a concave inner surface and a convex outer surface, as laid in the arch, and the sides are straight and parallel in their vertical planes. The ends are inclined, to correspond with the radii of the outer and inner curved surfaces. Each end is recessed vertically, so that each brick interlocks at the ends with two others, as shown, and is thus held from lateral movement, the entire arch, made by successive courses, being thus bound together.

This interlocking enables forms to be dispensed with after the first course is laid, as this course will give the same curvature to, and sustain, the next while it is laid and so on.

For arched roofing, as shown in Fig. 2, the bricks may be made lighter by being made hollow, or their composition may be modified, by the admixture of coal or other combustible substances, in the formation of the bricks, in ways familiar to brickmakers.

Floors will be made by first building an arch of low spring, as shown in Fig. 2, then leveling up the top with mortar, and, lastly, covering with cement.

Where light porous bricks are used for roofing, an outer coating of some waterproofing material will be needed. Cornices and gable ends can be made with ornamental bricks to give an appropriate finish.

This invention was patented through the Scientific American Patent Agency, August 9, 1870, by Watson F. Quinby, of Wilmington, Del. Address as above for further information.

Seals of Alaska.

The islands of Alaska are the summer resort of seals in immense numbers, but where they spend their winters is an unsolved mystery. Sufficient search has been made for their winter abodes, with a view to taking their skins, to show that they do not land in any considerable numbers on any known ground. They begin to leave the islands early in October, and by the middle of December have all left, and none are seen again until April or May. A few hundred, mostly young pups, are taken by the Indians around Sitka, 1,200 miles east of the islands, during the month of December, again in March, on their return to the islands, and in February off the coast of British Columbia; but in such small numbers as to make no appreciable difference in the immense number that visit the islands annually. It is claimed by the natives that the seals return invariably the second year to their places of birth, and, when not too often disturbed by driving, continue to do so. In order to test the truth of this story Mr. Bryant, Special Agent of the Treasury Department at St. Paul's Island, has instituted an experiment of an eminently practical character, although it might not command the entire approval of Mr. Bergh, whose jurisdiction, however, does not extend to Alaska. He had one hundred male pups selected before leaving, on a rookery one mile north of the village, and marked by cutting off their right ear; and a like number by cutting off the left ear, on a rookery to the south of the village. This has been done for two years, and next year the first will be old enough to be taken, when the result will be ascertained.

It is evident that sharks or other voracious fish prey on the young pups while in the water, from the fact that of more than a million pups annually leaving the islands, not one third return to them in the spring.

Walrus Hunting.

Probably not less than fifty thousand walrus, with their young, were killed and destroyed last year by our arctic whalemen. Three fourths of the fleet were engaged in the business, but the walrus had gone far into the ice, and they did not do so well. The arctic walrus, says the New Bedford *Mercury*, "never forsake their young, but will take them in their flippers and hold them to their breasts, even when their destroyers are putting their sharp lances through and through them and the blood is streaming from every side, uttering the most heartrending and piteous cries until they die. The walrus averages about twenty gallons of oil and four pounds of ivory. But the worst feature of the business is that the natives of the entire arctic shore are now almost entirely dependent upon the walrus for their food, clothing, boots, and dwellings. Twenty years ago whales were plenty and easily caught; but they have been driven north, so that now the natives seldom get a whale. This is a sad state of thing for them. The question now is, shall our whalemen keep on taking the walrus, and eventually starve and depopulate these arctic shores? It will certainly come to that soon."

The Knoxville Cave.

Evidences multiply to show that Knoxville, Tenn., is built over an immense cave. The *Chronicle* of that city says that, in digging cisterns at the hotels, "the bottom fell out," and what were intended for cisterns made excellent sewers. Similar results followed excavations on other premises. The other day a public cistern, designed to hold 3,500 barrels of water, had been completed; and seven feet of water had been measured, but it had all disappeared. Further investigation showed that part of the bottom had fallen in, and the water had run off somewhere into the interior of the earth.

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THE HEATING OF BUILDINGS BY STEAM.

Our articles, published on pages 55 and 88, current volume, appear not to have cleared up some points, connected with this important subject, in the minds of all our readers. Of the difficulty those not thoroughly acquainted with the theories of heat and steam find in comprehending these principles, the following quotation from the letter of a correspondent may stand as a fair specimen. He writes: "I am heating two drying rooms with about 2,000 feet of pipe in each. Am I to understand by what I read on page 55, present volume, that I get as much heat from 40 lbs. of steam as I do from 80? If not, how much do I gain by doubling the pressure? Is there any way I can bring the steam back into the boiler after it has passed through the drying rooms?" We propose to answer these questions in their order, not as to the single correspondent from whose letter we have quoted, but to numerous inquiries of similar import which we constantly receive.

The first question shows that our correspondent does not understand the difference, made by writers on steam, in the terms *pound of steam* and *pound pressure of steam*. Our assertion was that one pound of steam (saturated steam, of course), that is, one pound of water converted into steam,—one pound weight of steam—not one pound pressure, always contains the same amount of heat, at any pressure. The entire heat in a body of steam cannot be measured by its pressure, but only its sensible heat—its temperature—is so measured. Thus steam at 20 lbs. pressure has a temperature of 307° Fahr.; but this multiplied by the entire weight of steam gives a product representing only a little more than one fourth the entire heat the steam will impart before it congeals to ice, or less than one third the heat it will impart before condensing to water at 212°.

Now what we say is that, by taking the same weight of steam and increasing or lowering the pressure to which it is subjected, we shall not practically alter the amount of heat it contains, which is specific and constant at all pressures; and that the amount of fuel required to produce this amount of steam will be a constant, except that, in producing steam at high pressures and temperatures, there is greater waste by radiation from the furnace and boiler, and a larger waste through the uptake. This waste is more than compensated in the use of high pressure steam in engines, because of the increase of work obtained by using steam expansively; but in heating buildings it is an unnecessary waste, for which there is no recompense except that heat will radiate more rapidly from pipes carrying high pressure steam, and consequently a less extent of radiating pipe will be required to heat a given space. Hence the cost of the pipes would be less at the outset; but this would in most cases be offset by the increased cost of a boiler constructed to withstand high pressures. The use of high steam for heating is then a fallacy, which increases danger and lessens economy.

The third question is: How can I get the steam back to the boiler? We answer you cannot get it back as steam, unless you pump it or force it back by some other mechanical means, and this leads us to the consideration of another popular fallacy, namely, that steam circulates in pipes precisely as air does.

The difference between steam and hot air is this: Air is a mixture of gases that at any temperature known to science remains a gaseous mixture. Saturated steam is a gaseous compound, that *never loses any portion of its heat without a change of a part of it to water.*

Let us see if we can make this plain. A pound weight of steam, under a pressure of 60 lbs. to the square inch, contains 307 units of sensible heat, and 711·5 units of latent heat. Now, these quantities of sensible heat and latent heat being specific for steam at the pressure named, it follows that the subtraction by radiation of a single unit will result in the condensation of a portion to water, which can exist at atmospheric pressure as water with 966·5 less units of heat per pound weight than steam can. So if we go on subtracting heat we go on condensing; and if we maintain the pressure by new accessions, we are constantly condensing steam by robbing it of its latent heat; and the water thus produced gravitates toward the lowest part, which, if properly connected with the water space of the boiler, will allow the water in the system of pipes to seek and maintain the same level as that in the steam generator. Coming from the boiler as steam, it returns only as water. If the steam be used at atmospheric pressure, every 1,640 cubic feet will, by its condensation, be reduced to only one foot of water. This enormous reduction of volume creates, so to speak, a vacuum into which the live steam rushes with a velocity far exceeding that which could be created by the difference in the specific gravity of heated and cold air.

This is the secret of the rapidity with which heat is carried by steam to long distances from the boiler, a rapidity so great that we once saw, in a large dyeing establishment, sixty hogsheads of water in one vat raised to the boiling point in five minutes. No possible application of heated air, circulating by virtue of differences in specific gravity, could accomplish such a result in five hours, if indeed it could do it at all. The fact is, that there is no vehicle for heat known to science that, in rapidity, can at all compare with steam. But there is for this purpose no need of high pressures. So long as we have *steam*, it is enough. Condensation will produce the partial vacuum, which the steam will expand and swiftly fill, and thus the circulation, of steam outward from the boiler and water returning, will be steadily maintained. This is true, of course, for all cases where the temperature of a substance, to be heated or dried by steam pipes, does not require to be heated above 212°. If higher temperatures than this are needed, the pressure of the steam must be increased accordingly.

SUBSTITUTING OTHER VAPORS FOR STEAM.---ETHER AND BISULPHIDE OF CARBON.

The consideration that the latent heat of watery vapor is greater than that of the vapor of any other substance (see the table, page 5 of the current volume), and that, consequently, more heat is consumed by the evaporation of water than by the evaporation of any other fluid, has given rise to the idea that it would be more economical to use another fluid than water for the production of steam and the transformation of heat into power. Thus the amount of heat required to evaporate one pound of turpentine is scarcely one seventh of that required for water, but then the boiling point of turpentine is so much higher that the advantage might be counterbalanced by the stronger fire required; but it is especially alcohol and ether which have attracted attention, as these liquids, besides requiring for evaporation respectively only about one third and one sixth of the latent heat required by water, combine with this property that of possessing the low boiling points of 176° and 95° Fah. As ether in particular appeared very advantageous in this respect, it has been extensively and thoroughly tried; and we remember to have seen, among other attempts, a very large ether engine, built at the Novelty Works, New York. The execution of this undertaking was as thorough and perfect as can be expected only from a workshop possessing the superior capabilities of that excellent establishment, now, alas! suspended by the results of our unwise legislation on shipbuilding. The engine worked, of course, on the condensation principle, as ether is too expensive not to be used over and over again; and the method of surface condensation was here especially advantageous. Experience proved that there was no advantage in the supposed lesser amount of latent heat consumed, the only advantage being the lower boiling point, and this was largely overbalanced by the disadvantages in the practical working of the machine, the ether being a powerful solvent for the fats and oils, used for lubricating, and the ether vapors would pass through seams, cracks, and stuffing boxes which were perfectly steam tight, so that it was found next to impossible to keep it any length of time in the boiler; and, last but not least, anywhere this hot vapor escaped it was in great danger of taking fire, and would cause local heat, generate undue pressure, and become totally unmanageable; and it alarmed the experimenters repeatedly to such a degree that finally they threw up the ether experiment in utter disgust, and sold the machine for old iron.

The reason that there was found to be no advantage, in the fact that ether vapor contains less latent heat than water vapor, was simply in overlooking that these amounts of latent heat are always given by weight and not by volume; as, however, in driving a piston by means of a vapor, we have nothing to do with the weight of the vapor used, but only with its volume (for, by every stroke, we must fill the cylinder, whatever be the weight of the vapor), we see at once that, in order to come to a correct conclusion in regard to the economy of the latent heat consumed, we must compare this latent heat for equal volumes, and not for equal weights. In order to do this, we may reconstruct the table (given on page 5) for the latent heat of equal weights, into one for the latent heat in equal volumes of vapor; and this we may easily do by multiplying the latent heat of each vapor with its specific weight. The figures contained in the third column of the following table representing the relative amounts of latent heat in the vapors of different substances which are there reduced to the standard of water=1000, by dividing each of these products by 0·433.

TABLE OF LATENT HEAT OF VAPORS FOR EQUAL VOLUMES

Name.	Units of latent heat of vapor. for equal weight.	Spec. grav. of vapor. (Air = 1.)	Product of latent heat with spec. gravity.	Units of latent heat of vapor for equal volume. (Water=1000.)
Water	962	0·45	433	1000
Alcohol	385	1·25	481	1111
Ether	162	2·26	365	840
Oil of Turpentine	133	3·21	487	1125
Bisulphide of Carbon	210	2·60	546	1261
Ammonia	900	0·59	531	1226
Carbonic Acid	300	1·53	459	1060
Chymogene	140	4·00	560	1293

It is seen from this table that, in consequence of the fact that the vapors which possess the least latent heat are the heaviest, and therefore possess, for the same weight, the smallest bulk, the relative amounts of heat for equal bulk do not differ materially; or at least it is seen that the difference of the extremes, in place of one being more than seven times the other, as is the case with ether and water, are inconsiderable, when we compare equal volumes, differing less than one third part in the most extreme cases; in fact they are so small that some investigators have come to the conclusion that in all cases the same volume or bulk of vapor is produced by the same expenditure of latent heat, and consequently of fuel, whatever be the liquid which is evaporated, asserting that the differences in the figures of the last column are only due to the errors of observation consequent upon experiments of so delicate a nature as the determination of the specific gravity of gases and vapors, and of the latent heat absorbed by their evaporation—a conclusion of a cognate nature to that in regard to the same amount of specific heat, which the atoms of all elementary bodies appear to possess, and which was spoken of on page 389 of our last volume.

A liquid as volatile as the ether being thus almost uncontrollable over fire, in a steam boiler, the next question is: Can it not be heated in another way, say by means of the escaping steam of a high pressure engine? Or may it not be inclosed in a tubular boiler, through the tubes of which, in place of the flame and heat of coal, the exhaust steam is passed before going to the condenser? There is no doubt that in this way we may utilize the exhaust steam, without producing any back pressure, as has been the case with most other contrivances suggested for this purpose. As the exhaust steam may have a temperature of some 240°, and must have at least 212° (otherwise it can be no more steam), we may develop considerable pressure in a boiler containing ether, heated in this manner. According to Régnault, the pressure of the ether for different temperatures is as follows:

TABLE OF REGNAULT FOR THE PRESSURE OF ETHER AT DIFFERENT TEMPERATURES.

Degrees Fahrenheit.	Degrees Centigrade.	Pressure of ether in atmospheres.
240	116	9·25
230	110	8
212	100	6·50
194	90	5
176	80	4
185	70	3
140	60	2·5
122	50	2
104	40	1·33
86	30	0·8
68	20	0·6
50	10	0·33

It is seen from this table that the heat of exhaust steam is amply sufficient to develop considerable pressure by the intervention of ether in a separate condensing engine; but as ether is a quite expensive substance, being a product of chemical action on organic growth, the next question is: Can it not be superseded by another cheaper ingredient? And the answer is affirmative. We find in the table, on page 5 of this volume, bisulphide of carbon mentioned; this substance being simply a product of the combustion of charcoal in an atmosphere of sulphur vapor, CS_2, as carbonic acid is a product of charcoal in an atmosphere of oxygen, CO_2, can be, and is now manufactured very cheaply, while its boiling point (113° Fah.) is only 18° higher than that of ether. The above table, given for the pressure of ether, is approximately correct for that of bisulphide of carbon, if we add 18° Fah. or 10° Centigrade to the temperatures mentioned.

We are happy to find that the idea has been realized, and that at present, in the city of Boston, a steam engine* is successfully in operation, in which the heat of the exhaust steam heats bisulphide of carbon, and so originates a new pressure in another boiler even surpassing the first pressure, that of the steam in the boiler heated over the fire. Such a bisulphide of carbon engine may, of course, be separated from the steam engine, or may be so connected as to act on the same shaft and to form a single engine, in which the great problem, of changing as much of the heat as possible into power, will be much nearer to solution than was ever the case before.

THE INDIRECT INFLUENCE OF INVENTION UPON MANUFACTURES, ARTS, AND COMMERCE.

In a recent editorial, we spoke of the direct beneficial influence of patents upon general business. We propose now to notice some of the ways in which business is indirectly benefitted by invention, the latter having undeniably been greatly stimulated by our patent system.

In the first place, business is helped by the increased facilities for its transaction afforded by such inventions. Communication, transportation, printing, all of these have been

*This engine is fully described and illustrated on page 31 of the current volume.

improved so much during the last fifty years that even we who live in the days of the telegraph, ocean steamers, railroads, and steam power presses, do not at all realize the magnitude of the change. Fifty years ago such a business as is transacted by more than one firm in New York could not have been created even by the greatest business capacity. In creating these immense concerns, the proprietors have had the aid of cheap printing to advertise them, of railroads to bring them customers from distances that fifty years ago would have occupied months to traverse, of the telegraph to transmit orders, and of a hundred of other improvements. The steam elevators, that raise their numerous customers to the acres of floors in the upper parts of their buildings, are patented machines. The bills and forms, which enable them to transact their business without confusion, are executed cheaply by patented machinery. The paraphernalia of their counting rooms include numerous patented helps to business. The very goods they sell are mostly manufactured by patented looms, driven by patented water wheels or steam engines.

Even the currency is so improved that the counterfeiter finds his deception more difficult and more easily detected.

But there is a still more indirect way in which general business is benefitted by the patent system. In this Yankee land, where the masses are constantly enlightened by the agency of the common schools and newspapers, every lad before he is fourteen knows something of the nature of patents, and has heard of money made and to be made in the invention or in the business manipulation of some patented improvement. The most ambitious often see, or think they see, that this way lies fortune. Many are thus induced to interest themselves in machinery, and to acquire some knowledge of mechanism. We thus have become a nation of mechanics, ready at the moment any exigency of agriculture, manufactures, commerce, or war, suggests a want, to act upon the suggestion, and the needed improvement shall be forthcoming. The farmer's boy invents his churn, his dog power, his washing machine, before he is twenty, and, by the time he reaches middle life, understands enough about machinery to run a saw mill, or even something more complicated, if necessary.

It is this universal, although partial, knowledge of mechanics that has rendered the introduction of agricultural machinery so successful in this country, and has so increased the production of the soil, that every commercial artery is now plethoric with the teeming harvests of our inland domain. Who, fifty years ago, would have thought of cultivating a thousand acres of wheat? The chances of harvesting without serious loss this amount, by any help attainable at that time by a single farmer, would not have been one in a hundred. The modern harvester, the threshing machine, has changed all that, and no one now thinks of impossibility in connection with harvesting a thousand acres.

What has caused the unprecedented growth of this great commercial center, New York? New York, as it now is, would have been an impossibility without the improvements we have named. Not a bushel of wheat from Illinois or Minnesota could ever have found its way to this port; not a tithe of the large business houses which now crowd the lower part of the city would have been heard of; the busy manufacturing towns that fill their establishments with wares would have been nothing but hamlets, and the vast prosperity, that has made America the wonder of the old world, would never have been one of the most brilliant chapters in history.

AGRICULTURAL CHEMISTRY AND CHEMICAL MANURES.

The researches of that veteran chemist, Baron Liebig, and others in the analysis of soils and the use of artificial manures did not result in such extensive progress in agriculture as was anticipated. As the effort to apply the knowledge gained by these researches was made throughout the world by intelligent agriculturists, it became evident that there was still some lack in agricultural chemistry, some mysterious circumstance, relation or element, that defeated this endeavor. As a consequence, the idea of chemical farming became a thing to be ridiculed, and fell into an ill repute which still attends it. The prejudice thus created will for a long time impede progress; but there cannot be a doubt that the missing link, which, if found in Liebig's researches, would have resulted in success instead of failure, has at last been discovered.

In the light of this revelation, the cause of the failure to apply chemical principles to agriculture is plain. We find it fully explained in the lectures of M. Ville, a translation of which, as delivered at the experimental farm of Vincennes, France, now lies before us.* These lectures are, we believe, the most important contribution to agricultural science that has appeared during the last half century. In our review of them, which we shall not attempt to make exhaustive, we shall extract some passages which will give a glimpse of their character to such as have not yet read them. In the third lecture, M. Ville remarks:

A priori, one would think that a chemical analysis which has been pushed so far in our day, and whose methods have acquired at the same time so much delicacy and certainty, ought at least to give us a means of estimating with certainty the richness of the soil, and so guiding us in the choice of the manure best suited to its nature. There is none, however, and I defy the most skillful chemist to say in advance what will be the return from earth submitted to him, and what manures are most appropriate.

A few words will explain the reason why chemistry is powerless to furnish us with these indications: you must recall the distinctions we have drawn between the different elements of which the soil is composed.

Let us suppose a soil containing both quartz sand and felspar sand among its mechanical elements. For vegetation these two sands are equivalent, although the first is from silica and nothing but silica, while the second is a silicate based upon lime, potash and soda, besides containing phosphate of lime in very feeble but appreciable quantities.

Here, then, are two bodies whose composition, in spite of similitude of exterior, have no analogy; and which, however, are equivalent in an agricultural point of view, because, the felspar being insoluble in water, its *rôle* in regard to vegetation descends to that of the quartz sand, that is to say, to a simple mechanical element. But for the chemist, there are no insoluble bodies, so he confounds in one whole the potash, lime and phosphate of lime that the felspar sand contains, though they are of no use in vegetation, with the products of the same nature which we have ranged under the class of active assimilable elements. Thus is explained the insufficiency of the signs with which chemistry can furnish us.

In order to understand fully the meaning of this quotation, it is necessary to say that M. Ville includes all the essential constituents, of soils in which plants can grow, in the category of fertilizers; but he divides them into two classes, the first of which is azotic or nitrogenous matter, and the second of which includes ten mineral substances, only three of which, phosphate of lime, potash, and lime, are so directly connected with the growth of plants that they need occupy the attention of the agriculturist in his attempt to restore to soils what has been drawn from them by the growth of crops. The other minerals act mechanically and are hence called mechanical fertilizers; but M. Ville maintains that they exist naturally in sufficient quantities, and that it is not necessary to provide them. So far as the mere growth of plants is concerned, this is probably correct, but there are doubtless many cases in which it is desirable to add some material not directly concerned in plant growth, for the purpose of modifying stiff soils, or tempering light ones.

The most favorable conditions of soil for plant growth being the presence of azotic matter, phosphate of lime, potash, and lime, M. Ville calls a mixture of t ese substances "th complete fertilizer." The non-assimilable elements are considered as purely mechanical in their effects.

The following experiments are given to illustrate these facts:

In burnt sand, free from all additions but moistened with distilled water, wheat acquires but a rudimentary development—the straw hardly attains the dimensions of a knitting needle. In this condition, however, vegetation follows its usual course; the plant blooms, bears grain, but in each head there are but one or two dwarfed, badly formed grains. Thus, without soil, the wheat finds in the water it receives and the carbonic acid of air, aided by the substance of its grain, resources sufficient—sorrowfully, it is true, but at last—to run through the entire cycle of its evolution.

From 22 grains of seed, weighing nearly 18 grains, we obtain 108 grains of harvest. Add the ten minerals (phosphorus, sulphur, chlorine, silicium, calcium, magnesium, potassium, sodium, iron and manganese) to the sand, excluding the azotic matter, and the result is but little more.

Under these new conditions, the wheat is a little more developed than in the preceding case, but the harvest is still more feeble; it reaches 144 grains. Suppress the minerals and add only azotic matter to the sand; the growth will still be mean and stunted, but the harvest will slightly increase, as it reaches 162 grains. Let us follow the changes. In pure burnt sand, 108 grains; with minerals without azotic matter, 144 grains; with azotic matter alone, 162 grains.

In this last case, a new system is shown. As long as we operate only with minerals the plants are diseased, the leaves show a yellowish-green color. As soon as we add azotic matter to the sand the leaves change their color, becoming ing a dark green. It seems as if vegetation would take its usual course, but the appearances are deceitful; the harvest is still feeble.

Let us attempt a third experiment, which will, in a measure, be a synthesis of the three preceding. Unite azotic matter and the minerals in the burnt sand. This time you will be tempted to believe in the intervention of a magician, the phenomenon so far surpasses those preceding it. Just now the growth was languishing, doubtful, diseased; now the plants shoot up as soon as they break the ground; the leaves are a beautiful green; the straight, firm stalk ends in a head filled with good grain; the harvest reaches from 396 to 450 grains.

You see, gentlemen, relying upon experience, which is our guide by choice, we have succeeded in artificially producing vegetation to the exclusion of manures and all unknown substances.

You will acknowledge that this is an important and fundamental point. No more mystery, no undetermined power; some chemical products of a known purity, distilled water perfectly pure in itself, one seed as a starting point, and the result, a harvest comparable in all points to the best obtained in good earth.

We are, therefore, justified in saying that the problem of vegetation here receives its solution, for we have not only defined the conditions necessary to the production of vegetation, but the degree of importance of each of the concurring agents.

Azotic matter in its decomposition furnishes ammonia, and nitrates; and the clay constitutes a receptacle which holds and gives out gradually as may be required these important ingredients. M. Ville divides plants into two classes, according as they draw their nitrogen from the air or the soil. Thus wheat is a type of plants which prefer their nitrogen in the form of salts of ammonia, and take it from the soil. Beets prefer it in the form of nitrate and take it from the soil. Peas and the other leguminous plants prefer to take it as a gas from the air. The consequence of this distinction is that plants which take nitrogen from the air will flourish in a soil containing only the other elements of the complete fertilizer, namely, phosphate of lime, potash and lime. Therefore, by planting in a soil one of each of the two classes of plants, it is possible to tell whether the soil contains the azotic and mineral matters or not. Thus, if peas and wheat be planted in the same soil, and the peas yield well while wheat yields little, the land has the mineral elements but lacks the azotic or nitrogenous matters.

At Vincennes, previous to the fertilization of the soil, the land produced nothing, and hence was proved deficient in all the elements of the complete fertilizer, by the addition of which it has been made extremely productive.

As chemical analysis of soils fails for reasons above stated the richness of the soil is determined as follows:

Suppose you institute seven cultures of the same plant—it may be of the beet or wheat, as you will.

To the first give the complete fertilizer; to the second, the same fertilizer excluding azotic matter; to the third, the complete fertilizer deprived of phosphate of lime; to the fourth, the complete fertilizer less the potash; to the fifth, less the lime; to the sixth, less all the minerals—that is to say, reduced to the azotic matter; the seventh not having received any manure.

It is very evident that if, in the complete fertilizer, the effect proper to each component is manifest but as it is associated with three others, the comparison of the returns obtained from the seven strips of the little field ought to indicate what the soil contains and in what it is wanting.

In this system of investigation, the culture with the complete fertilizer becomes, in a measure, the invariable standard of comparison to which are referred the returns of the other strips of ground; and, according as they approach or recede, we conclude that the earth contains or does not contain the element which has been voluntarily excluded from the fertilizer.

To put the value of this method beyond doubt, M. Ville reports the results given under three different conditions.

At the experimental farm at Vincennes were obtained, in 1864, the following proportional returns from wheat:

With the complete fertilizer	5644
" " " without lime	4333
" " " " potash	4044
" " " " phosphate	3466
" " " " azotic matter	1888
Without any fertilizer	1588

The conclusion is evident. At Vincennes, the complete fertilizer was necessary; the azotic matter was most deficient.

An eminent agriculturist of the department of the Somme furnished a second example, which is upon the beet:

With the complete fertilizer	4504
" " " without lime	4103
" " " potash	3703
" " " phosphate	3208
" " " azotic matter	3200
Without any fertilizer	2202

You see here, also, the earth is wanting in azotic matter, and, to put it under high culture, we must have recourse to the complete fertilizer.

The third example is from a culture of sugar cane, instituted by the Hon. M. de Zebrun, of Guadaloupe, a former delegate from that colony:

With the complete fertilizer	50666
" " " without lime	44444
" " " potash	32111
" " " phosphate	13333
" " " azote	49777
Without any fertilizer	2666

If I add that sugar cane particularly draws its azote from the air, you will conclude that the soil is particularly wanting in potash and phosphate of lime.

Here are, then, two methods of knowing the richness of the land. The first is founded on the culture of two different plants without any fertilizer, and the second, on the culture of the same plant with five different fertilizers. These two applications of the same principle lead to the same results, and verify and complete each other.

I need not add, that for each of these trials to have its full signification, the earth must not be used until the effect of each fertilizer has been spent.

By the aid of our experiments in burnt sand, and with only chemical products, we have realized a theoretic scale of culture whose progressive returns have shown us the laws which regulate vegetable productions. By the light of the collection of ideas, we were enabled to conceive and to realize practical processes of analysis accessible to all, whose testimony is of almost absolute certainty, and by means of which we can always say what a land contains, what it needs, and can consequently determine the nature of the agents to which we must have recourse to fertilize it.

In subsequent lectures, M. Ville gives tabulated statements of results from the use of what are ordinarily called chemical fertilizers, that is, such as are not directly of organic origin. These statements indicate that the chemistry of plant growth is destined to pass from under the odium of previous failures, and take its place in the sciences as a splendid collection of established facts, which will inaugurate a new era in agriculture.

We cannot extend our remarks and quotations further, but we will say that we have rarely examined a work more replete with interest, or perused a record of experiments in which the true scientific method has been more closely followed.

*Chemical Manures. Agricultural Lectures, delivered at the Experimental Farm at Vincennes, by George Ville. Translated by Miss E. L. Howard. Third Edition. Atlanta, Ga.: Plantation Publishing Co.

SHORT EXTRACTS FROM A FEW LETTERS.

An esteemed correspondent from Fort Concho, a remote spot in western Texas, forwards us a long list of subscribers, and states as follows: "This post is far west of any organized county, cultivated land, or signs of civilization of any kind. The citizens, if such they can be called, are mostly refugees from Mexico or outlaws from the States. Every one goes around armed to the teeth, homicides are common, and horrid shooting affrays are more so. Military law is the only law we have, and that has no control over these outside 'citizens.' When we reflect on the kind of men who recruit the army in time of peace, and what reckless men are willing to drive the mails, by stage, through these wild regions among hostile Indians and more dangerous 'citizens' (though the stage is always escorted by a soldier), we cannot wonder that there is no safety for money in the mails."

Another says: "I live in a small village, where there is more taste for whiskey than for science. It is hard to form a club of ten without cutting a club to break my own head. I have received five names by advancing the money for three, the fourth being a present to my brother in Nebraska; for the balance of the club, I am "going it alone. I hope

I won't lose more than my trouble. I will try to circulate them and get my money back if possible."

The following is gratifying to any who feel interested in the education and mental improvement of the young: "I cannot express to you what amusement your paper gives to my boys, nor what interest it awakens and fosters in them. The subscription is from their purses, and they prefer your weekly to any other they have received."

A Chicago friend writes as follows: "I have been burned out in the great fire (October 9, 1871), to the tune of ten thousand five hundred dollars, besides suffering many consequent inconveniences resulting from my losses, but I can go hungry a whole day and be merry; yet if I fail to get the SCIENTIFIC AMERICAN at its proper time, my equanimity is disturbed and I become a piece of broken machinery, "out of gear." I hope you will see to it that my paper is sent from your office as early as possible after it is printed."

SCIENTIFIC AND PRACTICAL INFORMATION.

THE RECENT ECLIPSE.

One section of the English expeditionary party in India chose Bekul, on the western coast of the Madras Presidency, as the point of observation. The chief results are published, and the existence of radial lines, well marked and distinct, in the corona is now established. These seem to demand our acknowledgdment of the existence of forces extending outwards from the center of the sun. Their exact position and narrowness, says Mr. Proctor, force this conclusion upon us.

PYROLIGNEOUS ACID.

Professor Cox, State geologist of Indiana, has recently experimented with pyroligneous acid, and claims that his results give us some new light on its nature and constituents. The acetic acid of the drug stores is usually derived from crude pyroligneous acid, and the latter has thus been erroneously spoken of as an impure acetic acid; but in the experiments of Professor Cox, acetic acid burned, steadily but not raipdly, with a reddish purple flame full of scintillations, while the pyroligneous acid of commerce boiled away without sparkling. In another experiment, the Professor found that the vapor of pyroligneous acid extinguished the flame of burning paper, while that of acetic acid left it undisturbed, but did not itself ignite.

These facts do not appear to us to show that the two acids are different in their natures, as it is well known that acetic acid will burn, and that when diluted with water, as in pyroligneous acid according to the usual theory, it will not.

A RESISTING MEDIUM IN SPACE.

The retardation of Encke's comet, amounting to about two and a half hours in its period of three and a half years, has been frequently cited as a proof of the existence of a medium in space, of sufficient weight to resist a body of such extreme tenuity as a comet. This explanation of the mystery of space has been objected to by Professor Asaph Hall, who gives his reasons in the following words: "So far as the motions of comets have been determined, the evidence is against the theory of a resisting medium in space. Thus far, the observations of the planets lead to the conclusion that their motions are in strict accord with the law of gravitation; and in the disputes about the acceleration of the mean motion of the moon, no one has thought to seek its cause in a resisting medium, but much more probable causes are at hand. Encke's comet, therefore, stands alone in the strange anomaly in its motion which the calculations have shown. If it be proved that the diminution of the periodic time actually exists, this anomaly must be considered as a peculiarity of Encke's comet, and its cause must be sought for in something which distinguishes this comet from all others. It was early pointed out, by Olbers, I think, that this comet moves through those regions where the zodiacal light is seen. Possibly, also, the numerous meteoric streams which are moving around the sun, and which are closely connected with the orbits of some of the comets, may exert an influence on their motions."

BALANCING SLIDE VALVES.

A correspondent states that it is the common practice, with western engineers, to calculate only the areas of ports, in estimating the pressure upon slide valves with a view to balance them. We can scarcely credit this statement, and think our correspondent must be mistaken. If the faces of valve and seat are fitted steam tight, the entire pressure will be the product of the entire area of bearing surface and ports, in inches, multiplied into the pressure per square inch maintained in the steam chest. This, multiplied into the coefficient of friction existing between the surfaces, will give the force required to move the valve under such pressure when unbalanced. Practically, there are few valves that are perfectly fitted, or that remain so if properly fitted at first. Any sure method of balancing slide valves for general use should therefore provide for experimental adjustment.

THE SUN'S EFFECT ON THE MAGNETIC NEEDLE.

It was observed by D. Müller that the variation of the magnetic needle pursued its regular course till the commencement of the recent eclipse. It then began to retrace its steps until it reached its minimum declination at 1 h. 58 m., which was the instant of totality. After that moment, the ascending motion towards the west recommenced, and continued until the needle regained the exact position it had occupied when the eclipse began.

LE GÉNIE INDUSTRIEL.

We regret to learn that the journal of the brothers Armengaud, published under the above title, is discontinued. Forty volumes have been issued during the twenty years of its existence, and it had till lately an extended circulation and a justly acquired celebrity; but the recent disastrous war on French soil has paralyzed so many industries and impoverished so many mechanics and manufacturers that its publication became no longer a source of profit to its esteemed proprietors and editors, who look hopefully for the resuscitation of mechanical and industrial science in France at no very distant date.

WILL YOU FAVOR US?

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.

A GOOD MONTH'S WORK.

Since the first of last January up to February 5th inst.—a little over one month—201 United States patents have been issued to inventors whose specifications and drawings were prepared at the office of the SCIENTIFIC AMERICAN. This number, as large as it is, does not include a considerable number obtained through this office in foreign countries.

Death of Mr. Joseph B. Lyman.

Mr. Joseph B. Lyman, lately deceased, was for the last four years of his life agricultural editor of the New York *Tribune*, having previously filled a similar position on the New York *World*, and having edited at one time *Hearth and Home*. He had traveled much in many parts of the United States, and was thoroughly acquainted with agriculture in all the localities he had visited. Among the many friends who mourn his untimely death are most of the eminent men in journalism and agriculture on this continent.

THE submarine telegraph cable from Florida to Cuba, as we noted some time ago, was supposed to have been injured either by the bites of the sea turtles, or of some kinds of fish; and we now learn that in China a similar difficulty has been experienced in consequence of the attacks of a minute crustacean. This is so small as scarcely to be perceptible to the naked eye, but can be readily defined under the microscope. Various breaks have been satisfactorily referred to the agency of these animals, which had embedded themselves in the gutta percha. It has become necessary, therefore, to envelop the cables in certain localities with an external supplementary layer of metallic wire, in order to prevent injury in this manner.

PATENT INFRINGEMENT SUITS.—Francis and Loutrel *versus* Mellor and Rittenhouse, and the same *versus* Godfrey & Co., for infringement of plaintiffs' patents for making printing rollers of glue, glycerin and sugar. Judge McKennan, in the United States Circuit Court at Philadelphia, has rendered a decision adverse to the claims set up by Francis and Loutrel, and holds that they are not entitled to any broad claim as the first users of these ingredients, but are limited to the proportions substantially as described in their specifications.

MR. THADDEUS HYATT, formerly of this city, and the inventor of the glass covered gratings now so commonly used, has patented some new improvements connected with buildings, having for their object to render them fireproof. As a substitute for iron beams and brick arches for floors, he proposes wrought iron tubes, placed side by side. Other improvements consist of hollow bricks filled with plaster of Paris or alum, or other mixtures, which, like them, hold considerable water. Wire laths covered with similar compounds are also suggested, together with plasterings of the same materials.

THE experiments on beet root sugar made at the Amherst (Mass.) Agricultural college, during the past year, have been so successful that it is intended to ask the Legislature now in session to grant a charter to a company contemplating the manufacture on an extensive scale. They ask ten years immunity from taxation on account of the experimental nature and public importance of their enterprise. We hope the Legislature will grant the charter as asked for, and thus encourage a new industry in the old Bay State.

THE business address for the American Road Steam, George W. Fitts, inventor, illustrated in No. 6, is: American Road Steamer Company, 24 South Front street, Philadelphia, Pa.

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.—PURIFICATION OF ZINC.—How can old zinc be made pure, or nearly so?—E. M. D.

2.—APPLICATION OF GUTTA PERCHA.—How is the gutta percha, which surrounds the helices in most telegraph instruments, put on?—E. M. D.

3.—GALVANOMETER.—How can I construct a cheap and effective galvanometer for galvanic electricity?—E. M. D.

4.—CLEANING BRONZE.—Will some of your readers give me a receipt for cleaning bronze chandeliers, etc?—T. E. L.

5.—SCENE PAINTING.—What kind of paint, that will not rub off, is the best to use for painting scenery?—Q. R.

6.—CEMENT FOR CAST IRON.—How can I make a cement or stopping cracks in cast iron pots, to make them water tight?—C. C.

7.—MEASURING ALTITUDE BY BOILING WATER.—Is there any way to tell the elevation above the sea, by the boiling point of water, with the aid of a thermometer?—F. A. C.

8.—GALVANIZING SMALL IRON CASTINGS.—I want to know the cheapest and simplest way of effecting this.—J. E.

9.—BREAKING UP OLD IRON.—I would like to know the best method, to be operated by one man, of breaking up old car wheels.—W. L.

10.—SPEED OF SHAFT.—How many revolutions per minute s it safe to run a shaft containing two cast iron arms, 20 inches long, and 4 inches square? As the work is to be done by the speed, it is a question as o how fast it is safe to run it.—W.

11.—POLISHING WOOD.—Will some one of your correspondents inform me how to construct a polishing wheel to polish boards of both hard and soft lumber?—W. M. H.

12.—STEAM ENGINE CONSTRUCTION.—If two engines are set quartering, so that they both work on one crank, will one eccentric do o work both valves, and do it as well as one eccentric to each valve?—M. H. A.

13.—VOLTAIC PILE.—Will some correspondent please inorm me how to make a cheap voltaic pile?—T. F. G.

14.—GINGER BEER.—Will some one give me a receipt to make ginger beer, that will keep good for a month, and also, the best mode of fermenting, filling bottles, corking, tying, etc?—F. L. C.

15.—PRESSURE IN STEAM BOILER.—Which make the greater pressure on a steam boiler, steam of one hundred pounds to the square inch, or hydrostatic pressure of one hundred pounds to the square inch? Which strains the boiler most?—D. R. R.

16.—BORING CONICAL CYLINDER.—How can I bore out a hole in a cylinder 40 inches long, tapering truly from end to end, 12 inches in diameter at one end, and diminishing one eighth of an inch in the 40 inches? I am to do the job with ordinary tools of a machine shop, on a lathe with a boring bar 10 feet long.—J. F. W.

17.—VARIATION OF THE COMPASS.—Will some one please inform me, through the SCIENTIFIC AMERICAN, what the variation of the compass is, this year, at Portsmouth, N. H., and whether, and how much a year it is increasing or decreasing?—F. A. C.

18.—RINGING GOBLET.—Will some reader please inform me what is the cause of a goblet ringing when the wet finger ends are rubbed on the upper edge of the glass?—W. H. R.

19.—DIVIDING A CIRCLE BY RADII.—Is there any method, other than the tedious one by repeated trials, of dividing a circle into a given number of equal parts, when the number is a large prime number, say 61 or 73?—R. C. W.

20.—HARDENING IRON BY ROLLING.—Can thin—say one xteenth inch—iron be cold rolled as hard and elastic as if hammer hardened? And if so, what kind of rolls should be used? Would a roll of large diameter, and a flat, movable bed do?—W. S. H.

21.—HYDRAULIC CEMENT.—Will some one kindly furnish, through your columns, a formula for manufacturing hydraulic cement, and a description of the stone used for that purpose?—J. A. T.

22.—METALS UNDER STEAM PRESSURE.—Which of the metals, iron, steel, brass, copper, or any other, excepting gold, that will resist the action of steam, will expand most when immersed in steam, say at 100 pounds per inch?—J. A. T.

23.—GASOLINE.—Will some of your readers please answer the following questions? What are the chemical constituents of gas evaporated from gasoline? Is it explosive when mixed with common air, and, if so, in what proportion? What is the cost per 1000 feet, not counting interest etc., on machinery? An early answer will oblige.—J. A. G.

24.—SAND IN DRIVE WELL.—I have a four inch drive pipe well, 75 feet deep. There is a rock bottom at a depth of 81 feet. When opened, an abundance of water was freely pumped; but having no use for it he pump stood a week or so, at the end of which time pumping was resumed, but little water came. The cause was found to be no less than ten feet of solid sand in the bottom of the pipe. Will some of your readers tell me how to get the sand out?—W. L.

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.

S., of Tenn.—The largest steam hammer in the world is, we believe, the 100 tun hammer at Krupp's steel works in Prussia.

FRICTION PULLEY.—Will a friction pulley with six inches face have as much friction power as one twelve inches face with the same pressure? Answer: If similarly constructed, yes.

RUBBER PACKING TO PREVENT FRICTION.—The device described by J. W. S. is neither new nor patentable.

CEMENT FOR SHEET IRON AND RUBBER PACKING.—Let J. M., query 8, January 20, 1872, try a white lead paint on the iron. Leather or rubber can be glued on to an iron surface thus prepared.—D. B., of N. Y.

VOLUME OF HYDROGEN.—To W. W., query 1, Februuary 3, 1872: One ounce of hydrogen measures 22,371 cubic inches.—D. B., of N. Y.

BENDING GAS PIPE.—This may be done by filling the pipe with molten resin. When the resin hardens, bend the pipe, and it will retain its round form. Remove the resin by heating.—W. H. R., of N. J.

WATERPROOFING COTTON CLOTH.—H. W. U., query 3, January 20, 1872, is evidently not a steady reader of your journal. Many recipes for this purpose have been given, and two new ones appear on page 105, current volume.—D. B., of N. Y.

A. D. N., of O.—Increasing the diameter of cylindrical boilers increases the strain resulting from steam pressure upon them, directly as the increase of diameters.

M. H. B., of Mass.—Your queries cannot be answered properly in any space we can give you in this column. You ought to obtain a good work on the steam engine, and read it for the information you seek.

SAW MILL GEARING.—To T. B., query 13, January 20, 1872: The weight of the saw has nothing to do with the question. You have to counterbalance the lower end of the pitman only. Therefore lay the pitman in a horizontal position and weigh the end which connects on the face plate, including the wrist pin; and you have the weight to counterbalance.—P. B.

FACING OIL STONES.—Your correspondents, who have written on this subject, have not yet described the best way of doing it. I go to a foundery and take any flat casting from which the scale has not been removed; by rubbing the stone on it, as on a board with emery, I can true an oil stone in one fourth the time needed for any other method, and I have tried them all.—J. E.

PRESERVING NATURAL FLOWERS.—R. A. L., query 1, February 10, 1872, should dip the flowers in melted paraffin, withdrawing them quickly. The liquid should be only just hot enough to maintain its fluidity, and the flowers should be dipped one at a time, held by the stalks and moved about for an instant to get rid of air bubbles. Fresh cut flowers, free from moisture, make excellent specimens in this way.—D. B., of N. Y.

COPPER DIP.—S. D. R., query 2, February 10, 1872, is informed that sulphate of copper is soluble in four times its weight of water at 60°, and that this proportion furnishes the strongest pickle. A coating of the required thickness may be produced by dipping the articles several times.—D. B., of N. Y.

R. M. C., of Mass., says: "I would like to inquire, through your paper, if there is any way to bleach ivory, and if so, how it is done?" Answer: Ivory is bleached by exposure to sunlight. For piano makers and others, it is prepared by first sawing it into thin sheets or plates, These are placed on suitable frames, under glass, and exposed to light for several months. The frames are of peculiar construction and patented, They are so arranged as to shift, thus reversing the exposure of the ivory, so that both sides may be duly acted upon by the light.

C. G., of N. J.—It is probable that the draft of your chimney is insufficient. The gases you detect, by smell, as escaping therefrom are certainly deleterious. It may be also that you use a damper between the fire chamber and chimney to regulate combustion. This would be wrong, and sure to result in the forcing of gases out into the room. The damping should be done at the throat of the stove, never in the uptake. If the stove is not made so that this can be done, it is not fit for use.

COLORING BAND FOR HOUSE'S TELEGRAPH.—Reply to R. I. H., query 6, page 90. The coloring band of the House printing telegraph is a common narrow silk ribbon, saturated with a mixture of lamp black, ivory black, sweet oil, and turpentine. The ink sold for hand stamps answers the purpose very well. Electro-chemical telegraphic paper may be prepared in several ways. Bain used a solution of yellow prussiate of potash in water, to which was added two parts nitric acid and two parts ammonia. With an iron style, this gives a dark blue mark on the passage of the electric current. Another formula consists of one part iodide of potassium, 20 parts starch paste, and 40 parts water. This gives a brown mark which, however, is not permanent, fading out in a few hours.—F. L. P., of N. Y.

STEAM ENGINE FOR SAW MILL.—I would say to NEMO, query No. 16, of January 20th, that it is very doubtful if he can ever obtain "satisfactory results" in running a circular saw mill with a ten horse power thrasher engine. He might increase the size of his mandril pulley, and run his engine faster, but even then he would lack in steam making capacity. He had better not attempt it at all, but procure a portable muley mill. They are made especially for engines of that class; can be run with one half the expense, and are said to do nearly or quite as much as a stationary muley.—A. D. N., of O.

SAFETY GUNPOWDER.—Would it not be an infinite saving, to property holders in cities and to insurance companies, if a plan could be invented to make gunpowder perfectly safe from explosion, so that the merchant's house and stock and the surrounding neighborhood and human life would be perfectly protected?—INVENTOR. Answer: Any plan for making gunpowder inexplosive, while in stock, will meet with general approval.

AIR PRESSURE AND SUCTION.—P. D. asks how to prove that the pressure of the air, and not suction, raises the water in a pump. Let him take a straight lead pipe forty or more feet long, fill it with water, and plug both ends tight. Then, holding it perpendicularly, let him immerse the lower end in a pail of water and remove that plug. After all the water that will has drained from the pipe, let him replace the plug; and, on examination, he will find water enough remaining in the pipe to fill it to about thirty-two feet above the water in the pail. Then ask any unbeliever to explain why the water did not all run out. After he has done it satisfactorily on the suction theory, then ask him to explain why it would all run out if the upper plug were removed?—M., of Mass.

COMPOUND GEAR FOR SCREW CUTTING.—Some time ago R. H. S. asked for a simple rule for cutting threads by compound gearing, Since that time I have anxiously waited, and still wait, for such a rule. Many of your correspondents don't seem to know what compound gearing is, and give rules for simple gearing, and such rules as would be of very little use to a practical machinist. Imagine a machinist being ordered to cut a three eighth set screw two inches long for an engine ready to go out, and attempting to find his gear by the rule given by C. F., of N. Y., while, in reality, he need only multiply the number of threads in the leading screw and the number of threads to be cut by the same number. For instance, the screw is 6, and he wants to cut 8. Multiply by say 3, which gives 18 and 24, or by 3½=21 and 28, or by 4, which gives 24 and 32; any of these pairs will cut the required thread. By this method, you can see that in a few seconds many sets can be found to cut the required thread without the use of pencil or chalk. Even if he wants to cut 8½ threads, or any bastard thread, the rule holds good, and is what I call a practical rule for single gears.L. —J. P. M. C.

SAW FILING.—In query 7, Jan. 27, C. M. B. wants to know how to file a cut off hand saw. I find by the practical use of said tool (which any one who pretends to file a saw should not be without) that the saw should be filed as follows: Put the saw into the clamp with the handle to the left hand always; run a file lightly across the teeth, as this will keep it straight, and give the filer a chance to see clearly the points of each tooth, which is necessary to a good job. Take the file and commence at the point of the saw, holding it (the file) at an angle of about 30° by lowering the right hand, and about 15° towards the handle of the saw. The file is to be so held as to file the front side of the tooth that is set from him and the back side of the one that is set towards him; and the point of the tooth should be but a trifle forward of the middle of the base. A saw to do nice work should have the least possible set in it, and must be a good tool in every respect. I have had over twenty years practical experience in the use of the saw, and have filed many saws in shops where I have worked; and I do not recollect ever having a fault found with one that was filed in this way. It is my experience that this is the only right way. When he has filed one side, he will see that he must reverse the saw in the clamp to file the other side. In filing in this way, the front edge of the tooth will be the thinnest.—A. D. W., of Mass.

Recent American and Foreign Patents.

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

GOPHER TRAP.—William W. McKay, of Frankville, Iowa.—This invention consists in constructing a trap that may be inserted lengthwise into the burrow of the animal. In watching the habits of the gopher, it is observed that, in coming to the light or from his burrow, he always pushes earth before him, so that the common trap is sprung before he reaches it, or is prevented from springing by the earth which would be forced under the pan. This elongated trap prevents the first result, and the covering over the pan prevents the last. As the trap is carefully covered in the hole, the jaws are made to close past each other, so that earth will not be caught between them when the trap is sprung.

LAYING SHINGLES.—Sherman G. Castor, of Orwell, N. Y.—This invention relates to an improvement upon a method of laying shingles which was long since proposed, and which consists in securing the shingles by nails having enlarged heads, so that an air space shall be formed between the courses by reason of each course resting on the heads of the nails of the course below, or beneath it. This plan has, however, never been practically adopted, on account of the liability, evidently existing, of splitting or cracking the shingles in laying them, or by subsequent imposition of weight, in the form of snow or otherwise. Another important objection also exists in the want of any means of preventing snow, or even rain water, from penetrating upward between the courses of shingles, and thus finding access to or beneath the sheathing of the roof, and thus effecting more or less damage. To remedy these and other practical objections to said plan, the inventor employs strips of wood between the courses of shingles, and nails the latter thereto.

IMPROVEMENT IN CORN SHELLER TEETH.—Herman R. Rueter, of New Hope, Mo.—This invention relates to a new and useful improvement in teeth for corn shellers, whereby the ordinary corn sheller is, it is claimed, rendered more effective than heretofore. The tooth is made in two parts, one being the tooth proper, or part with which the corn comes in contact. This part is locked to the other, and the formation of the parts is such that a recess is left, within the lock, in which a spiral spring is placed. The tooth proper is made, by this arrangement, elastic, which allows it to give and conform to the size of the ear of corn. The teeth are placed in the machine so as to act together with inclined upper surfaces arranged to act as a screw to draw the cob through while taking off the kernels.

AIR BLOWER.—James W. Newcomb, of New York city.—This invention consists in a double acting blower of two flexible sides and ends, of leather or other like substance, two opposite rigid immovable sides, and a movable dividing plate or board at the center of the flexible part, moving back and forth between the immovable sides, alternately inflating and exhausting the spaces between it and the said immovable sides, the air being driven from both sides into branches leading to an exhaust pipe, which is alternately opened and closed to the respective sides by a valve moved by the shifting currents of air coming from the blower. It is claimed that this apparatus furnishes a very efficient blowing apparatus of great power. When the plate begins to move in one direction to exhaust one side and inflate the other, the valve is tilted over by the first part of the blast coming against it, opening the passage for the air arising from one side and closing the exhaust to the other.

PLOW.—Richard J. Miller, of Sherman, Iowa.—This invention consists of a vertically swinging arm at the end of the plow beam, to the swinging end of which the whiffletree is connected, which arm has an eccentric pulley or a segment thereof connected to its axis; and a chain extends from said pulley to another on a hand lever near the rear of the plow in such manner that, by pulling the lever backward, the arm to which the whiffletree is connected will be forced downward, which will cause the plow to run shallower, and, by allowing the lever to swing forward by the action of the draft, the said arm will be raised by the draft and the plow caused to run deeper. A graduated notched plate and a holding pawl are provided, in connection with the lever to hold the latter in the required position.

IRON TELEGRAPH POLE.—Richard D. McDonald, of Jersey City, N. J., and Edward M. Crandal, of Marshalltown, Iowa, assignors to Richard D. McDonald.—The lower section of the pole or the part which enters the ground is provided with a winged supporting socket. The end of this section may be pointed or made sharp in any manner, so that it may be driven into the ground; or the end may be split, with the parts turned out in either direction, where a hole is made to receive the pole. This section is supported upon the socket by shoulders. In "planting" the pole this lower section is either driven into or placed in the ground, with the supporting socket around it, the top of which socket is designed to be at or near the surface of the ground. The second section of the pole connects with the first section by a slip joint limited by shoulders. The third and fourth tubular sections of this pole are of diminishing diameter from the base section up, and each is connected by a slip joint limited by shoulders. In the upper end of each of the lower sections is a recess, and on the lower end is a lug, which fits into the recess. By this arrangement the sections are prevented from turning, and are held in proper position. There may be bands around the ends of each section, which will come in contact at each end of the joint, if desired. These tubular sections are made of gas or steam pipe, and are banded to form the shoulders or enlargements. Rounds pass through holes in the pole for convenience in ascending and descending the pole. Arms for supporting the wires, with insulators thereon, are provided. In the top of the upper section there may be an insulator, with provision for supporting a telegraph wire. The pole being a tube, a conducting wire (one or more) may be carried down through it to the ground, and thus be secured from injury, tranverse bars being arranged, with proper glass insulators, to guide the wire within the pole.

DRAWING KNIFE.—Albert M. Steele, of Danbury, Conn., assignor to himself and Frederick A. Hull, of same place.—The object of this invention is to render drawing knives more convenient for packing and carrying, not only for the manufacturer, but also for the mechanic in packing away his tools; and it consists in joints in the handle shanks and a mode of tightening the handles; the latter being arranged to fold over, to protect the blade, and admit of being packed in a small space.

RICE CLEANER.—David L. Geer, of Lake City, Fla., assignor of one third his right to Jesse Carter, of same place.—This invention has for its object to produce a machine whereby rice can be rapidly and thoroughly cleaned, after having been hulled in the ordinary manner. It consists in the employment of a shaft carrying projecting wings or friction blades within a stationary drum or cylinder, the motion of which causes the rice to circulate in the space around them, and by its own weight and pressure a friction is produced that cuts off the germs and membranous coatings or skin, producing what is called rice flour. When the process has been continued until the flour has been removed, the rice presents a flinty, white, smooth appearance. The breaking of the grain, so frequent with the use of the ordinary mortar and pestle, is prevented. The friction will also clear the rice of any hulls or chaff that may have adhered to it after the hulling process. In act, it is claimed that the machine may, if proper time is allowed, be used or hulling as well as cleaning.

PUMP.—Robert T. Smart and Robert T. Smart, Jr., of Troy, N. Y.—This invention consists of a double acting pump with a hollow piston rod, through which the water is discharged, the cylinder being fixed below—or it may be above—the water, in which both of the valves are arranged on the upper side of a plate in a hollow piston, in such a manner that they both close downward self actingly, irrespective of the direction in which the piston moves, and they retain the water above them in such manner that it cannot pass back to either chamber of the pump barrel, thereby avoiding the necessity of a stuffing box to keep the discharge tube full, so that there is no loss while the pump is standing still. In case the pump is to be used horizontally, the relation of the plate and the chamber and passages with the horizontal piston will be so changed that the plate will still be horizontal to hold the valves so as to close by gravity.

CARRIAGE WHEEL.—Charles W. Fillmore, Marengo, Ill.—This invention consists in a peculiar construction of hub and clamp, by which the liability of wheels to give way at the junction of spoke and hub is entirely obviated and prevented.

TELEGRAPHY.—William C. Barney, Washington, D. C.—This invention consists in a discovery by which the ground current of a telegraphic circuit may be utilized and messages repeated at the point from which they were sent without any additional expenditure of fluid or money. It also discloses the unvarying uniformity of the earth as a conductor, and its adaptation to be used under all conditions of the atmosphere.

PLOW CARRIAGE.—Mark A. Melvin, Washington Court House, Ohio.—This invention pertains to improvement in the class of gang or wheel plows wherein a lever, rock shaft and connecting rod, are arranged to be operated from the driver's seat to cause the elevation or depression of the front end of the plow beam, for the purpose of governing the depth of furrow.

BELT TIGHTENER.—Louis Funke, of Champion Mills, near Belen, Territory of New Mexico.—This invention consists in a toothed segment for working the moving jaw of a clamp or belt tightener by gearing with a toothed bar, and being revolved by a hand lever or crank, so mounted in the said moving jaw that it can be readily lifted out of gear with the bar, to allow of moving the jaw away from the fixed one, and yet be properly maintained in gear with the said bar when required to force the movable jaw toward the fixed one for clamping anything between them, or drawing the ends of the belts together.

EXTENSION TABLE.—George H. Henkel, of Germantown, Ohio.—This is a new extension drop leaf table, which can be used either with a circular, oval, or extended top, as may be desired. The invention consists in the leaves so constructed that, when arranged at right angles with their position in an extension table, they combine with other leaves to form an oval table.

BLACKING BOX.—Hiram Smith, of Newton Mills, Haddonfield, N. J.—This invention has for its object to furnish an improved box for shoe blacking, so constructed that the blacking can all be removed with the brush, which will not cut the bristles of the brush when removing the blacking, and which will keep its place wherever it may be placed while being used, without its being necessary for the operator to keep it in his hand. The body of the box receives the blacking and is made hemispherical in form. With this construction there will be no angles or corners for the blacking to get into, and where it cannot be reached by the brush. With this construction also the sides of the brush cannot come in contact with the edges of the box while removing the blacking, thus preventing the bristles from being cut by said edges. To the edges of the hemispherical body is attached the upper edge of a cylindrical case band or rim. To the lower edge of the rim is attached a bottom which is perforated outwardly, so that the burs of said perforations may project outward, and thus serve as teeth to prevent the box from slipping around upon its support while being used. This same thing may be accomplished by forming teeth upon the lower edge of the rim. In this case the bottom need not be used. The cover is made and fits upon the top of the box in the ordinary manner.

INKSTAND.—John Charles Sparr, of Irondequoit, assignor to himself and Julius Schneider, of Rochester, N. Y.—When the inkstand, with its rack or without it, is overturned at right angles to its pivots, it will quickly right itself, being balanced to be vertically suspended. When the inkstand, with its rack, is turned in any other direction, the cover will slide down immediately and close the mouth of the bottle. When the latter is again in its normal position, the cover can be readily moved back to bring its circular aperture over the mouth of the bottle. The inkstand is balanced on pivots, and has a neck and is provided with the sliding cover above referred to.

ARTIFICIAL TEETH AND DENTAL PLATES.—Robert E. Burlan, Lewisburg, Pa.—In this case block teeth are first firmly secured to a platinum plate by a peculiar wire attachment, after which a porcelain body is packed over the wire and between the blocks, so that when properly packed there shall be a continuous although sectional block, presenting an artistic and natural appearance. This mode of mounting teeth is applicable in many kinds of work, or to various base plates.

ELECTROMAGNETIC RAILROAD SIGNAL AND SWITCH TENDER.—Hugh S. L. Bryan, Liberty, Mo.—This invention relates to an electromagnetic apparatus whereby the flags and lights of a signal stand or a railroad switch can be operated from a point at any distance therefrom, and whereby the flag, light, or switch in passing out automatically transmits to the operator the signal O K, and in passing in, the signal K O, by which signals the operator is informed that the flag, light, or switch is working properly.

FENCE.—Israel L. Landis, Lancaster, Pa.—The invention consists in a new way of putting up posts and rail or picket fences with wedge clamp metal, so that the panels may be detachable and used on different lines, the mortising of posts dispensed with and the cost of construction greatly reduced.

THILL COUPLING.—Clement St. James, of Pittsfield, Mass.—This invention has for its object to improve the construction of an improved thill coupling patented January 18, 1870, so as to make it simpler and less expensive in construction, more convenient in use, and more effective and reliable in operation; and it consists in the construction and combination of various parts of the coupling, as hereinafter more fully described. The combination, in a thill coupling, of the axle, with clips, and an U shaped bar with a one piece yoke plate, made up of two parts, constructed of different hights, so as to receive the said U shaped bar in a recess, formed by said yoke plate and the axle, are the features embraced in the claim.

WATCH CHAIN FASTENER.—William C. Edge, of Newark, N. J.—This invention provides a fastening for watch chains or guards, easy of attachment to and removal from the button hole of a vest or waistcoat and yet not liable to accidental detachment, and forming an ornamental termination or appendage of the watch guard, the means of fastening not being visible exteriorly. An S shaped or double hook, whose outer sections or arms are about half the length of the main inner section, is used. This hook is fastened to a curved bar secured in the under or flanged side of a button, which is ornamented on its top. The loop, for connecting the watch guard to the button, is swiveled to the hook. The hook is applied by first fitting the one end through the button hole or eyelet in the garment, then, by reversing the motion, carrying the central section, and, finally the inner end through the same. Secure fastening of the stud, button, or chain, to the garment is thus obtained. This invention does away with the necessity of using the short end of common chains now required in connection with the ordinary bar.

CAP FOR BOOTS AND SHOES.—Benjamin F. Sage, of Beverly, N. J.—This invention relates to a new toe protector or cap to be applied to the worn ends of boots or shoes. The invention consists in the use of a flexible detachable cap or toe piece, which can be prepared as an article of manufacture and supplied to the market to be supplied to the wearers of boots and shoes, who can easily apply the caps themselves. The cap or toe piece is made of leather, rubber, or equivalent fabric, and has backwardly projecting side pieces. The side pieces have eyes or hooks at their ends. The boot or shoe to be supplied with such a cap or toe piece is provided with a screw or eye bolt in the soles on both sides, so that the eye or hook at the end of the cap may be secured thereto; or else the side pieces have hooks that may be forced into the sole, or between sole and upper to hold in the leather stitching. To insure greater strength, the wire or metal, of which such hooks or eyes are formed, may be extended along the under side of the cap.

DEVICE FOR MOVING PIANOS.—Samuel D. Reynolds, Rochelle, Ill.—This is an improved device, the use of which will enable pianos to be conveniently moved. It consists of frames with wheels, which are used as follows: The piano to be moved is turned upon its rear edge upon the benches or horses in the ordinary manner, and the legs and treadles are removed. The frames are then passed over the ends of the piano and secured by screws passing through the bars and screwing into the bottom of the piano. Longitudinal bars are then secured to the frames, and the piano can be easily and readily moved wherever desired.

HORSE SHOE.—Silas Sloat, Morgan, Ohio.—This invention has for its object to improve the construction of an improved horse shoe patented October 22, 1867. It consists in the construction and combination of various parts of the shoe, by which the rear parts of the shoe are held against the rear part of the hoof by a lever pressure, so as to hold the shoe firmly to its place. This construction also enables the shoe to be conveniently tightened as may be required. This construction also enables the shoe to be attached to and removed from the hoof, and does not require the front part of the eather band, referred to in the former patent, to be slit or made open.

CHURN.—Thomas J. Wilson, of New Lisbon, Ind.—A rectangular case holds the cream. It has a broad base, adapted to set on a table or bench, in which case is a dasher, consisting of a vertical stem, large horizontal arms, and smaller ones, and arranged perpendicular to each other, and a suitable distance apart vertically. The smaller arms are arranged at short distances from each other on the large ones, and perpendicular to each other, and have angular top and bottom sides, for dividing the cream readily in passing through it. These two sets of parallel arms, crossing each other in this manner, are adapted to agitate the cream in the most thorough manner, and alike throughout all parts of the case. The lower arms are notched at the ends and fitted with vertical guides, on the side of the case, to keep the dasher in proper position, and the stem is guided at the upper end by the cover, through which it passes. The cover is made in two parts, one of which covers about two thirds of the top, and is detachably fastened by a yoke, hook and beam. The other part of the cover simply rests on the top of the case, and is provided with a cover for lifting off readily, to note the progress of the work.

CIGAR MACHINE.—Frederic C. Miller, Cincinnati, Ohio.—This is a new machine for pressing the filling of cigars in molds prepared for their reception, and has for its object to facilitate the rapid manipulation of the molds in order to provide for an economical and perfect production of the cigars. The molds are arranged in a circular track in considerable numbers, and therein moved, by proper novel mechanism, so as to be brought in a line with a table for filling, emptying, and refilling, and then moved around and kept under pressure until again brought in line with the table. The invention consists in the new manner of arranging the molds, and in the new mechanism for moving and detaining the same, which seems well adapted to secure the objects intended.

THILL COUPLING.—J. Cugnier Racine, of Appleton, Wis., assignor to himself and M. H. Lyon, of same place.—This invention provides means for properly securing the bolts with which the shafts, thills, or poles of carriages, wagons, buggies, or other vehicles are held in place. Usually the coupling bolts are secured by nuts, pieces of leather, or similar devices. This invention consists in holding the bolt by a pivoted plate, which is drawn against the bolt by a spring, and has projecting lugs or spurs at the sides, whereby it is prevented from swinging out of place.

REED ORGAN.—George Woods, Cambridgeport, Mass.—This invention consists of an arrangement of an additional wind chest reed and sounding box, such as is described in a patent issued to the same inventor, September 13, 1870, relatively to the common wind chest, whereby the apparatus for working the valves of the said attachment is simplified and improved. The invention also consists of a combination, of a sheet or web of india rubber coated cloth or other equivalent substance, with the sounding board of the additional wind chest for varying and improving the tones.

LOW WATER ALARM FOR STEAM BOILER.—Linus Savage, Ashtabula, Ohio —A lever is pivoted to some suitable support near its upper end, and, at its upper end, is connected with the feed pipe, or with a bar or plate, in contact with said feed pipe, by a connecting rod, which should be made adjustable to enable the alarm to be set as may be desired. To the side of the lower end of the lever is pivoted a small friction roller, upon which rests an arm or bar, pivoted at its lower end to some suitable support, and to which, near its upper end, is attached a hammer. The upper end of the arm rests upon a stop attached to or formed upon the side of the lever. A bell is suspended from some suitable support in such a position as to be struck by the hammer as it falls when the arm escapes from the stop. With this construction, while a supply of a water is passing through the pipe, the pipe will be cold; but should the supply of water from any cause cease, the pipe will become heated and expand, and will heat and expand the bar or plate connected with the said pipe. This expansion, by means of the connecting rod, will operate the lever, and cause the hammer arm to slip from the stop, sounding the alarm. When the supply of water is again started, the water will cool the pipe, which will contract, and, by its contraction, draw the arm back to its place upon the stop, ready to again sound the alarm. In substantially the same way the expansion of the supply pipe, upon the failure of the supply of water, may be used for blowing a whistle, causing an explosion, or giving other alarms.

SAFETY WATCH POCKET.—Hermann Fritsche, Newark, N. J.—The object of this invention is to produce a safety watch pocket, which will be entirely reliable and prevent the fraudulent abstraction of the watch. The invention will first be fully described, and then clearly pointed out in the claim. A pocket is made of leather, or other fabric, of suitable size and shape. It is closed on all sides except on top, where it has a swinging flap, which can be opened and closed. The edge of the flap is lined with wire, which forms a projecting loop in the middle. This loop, catching over a pin that projects through the wire lining of the pocket proper, serves to hold the flap closed. The pin projects directly from the end of a spring which is fastened to the under side of the wire. A knob also projects through the lining, rests with its lower end on the spring, and will, when pressed upon, carry the pin down out of the loop and open the flap. When it is desired to guard against even this mode of opening the pocket, a slide can be moved by a projecting knob and fitted with its end into a notch of the knob. The latter can then no longer be depressed, and the pocket consequently not opened until the slide has been withdrawn from the knob. The pocket is provided with two wings, formed of V shaped wires, inclosed in the leather or fabric. The wires have prongs at their outer parts, which, as they are held out by the spring of the wires, will enter the fabric of the vest pocket into which the pocket has been put. The inner ends of the wires bear against the watch. While the watch is in the safety pocket, this pocket cannot be removed from the vest pocket, since the wires cannot be contracted to clear the prongs from the vest.

CONSTRUCTING BUILDINGS.—Andrew Derrom, Paterson, N. J.—The object of this invention is to protect buildings that are in process of construction, or of thorough repair, and also the laborers, engaged at the work, from the inclemency of the weather. The invention consists in the use of a vertically adjustable cap or cover, which is placed over the walls to be erected, and gradually elevated as the walls go up, meanwhile keeping them, the flooring, material, and laborers always under roof. The advantages of this method of constructing buildings are manifold. Not only are the men kept in healthy condition, but also material is economized, and the application of artificial heat is made possible, whereby frost can be kept out and building in midwinter continued. The invention is equally applicable to the erection of new buildings as to the repair of such as are burned partly down.

GATE.—Garret S. Spragg and Gilbert Mott, Tabor, Iowa.—This invention consists of the combination of a rocking frame with a counterpoise and the gate, in that class of gates which are arranged to have the free end swing up vertically and be held so by a counterpoise to swing clear of ice and snow in the winter, the said rocking frame being pivoted on the top of the gate post, and operated in such manner as not to be obstructed by freezing in the winter, and so as not to acquire readjustment if the post leans, as the cord and weight heretofore used to do. The weight is suspended so far from the post that they will not interfere with each other in case the post is pulled out of the vertical line by the gate, as they do when the weight is suspended from the pulley close by the side of the post. This apparatus works much easier than the cord and pulley, and does not draw the post with as much force as they do.

COMBINED POCKET KNIFE AND ENVELOPE OPENER.—Aaron S. Pennington, Paterson, N. J.—This invention consists in forming a notch in the division plate, between the several blades or springs of a pocket knife, so as to convert such division plate into an envelope opener. The edge of this plate has a notch formed in it, which produces a point and cutting edge that can be used as an envelope opener, the notch being placed either between the blades or at the back of the knife, between the springs. In either case, it is claimed, the combined knife and envelope opener will constitute a convenient and desirable article of manufacture.

BELT TIGHTENER.—Josiah W. Batcheller, Oregon, Mo.—This invention consists of a tightening pulley mounted in the end of a bar, which is fitted in a place for holding it so that it can be adjusted forward and backward, and the plate is arranged to be fastened to any suitable support to hold the tightening pulley in front of the belt. The invention is more particularly adapted for sewing machines. The ends of the plate are adapted to be fastened to the under side of the sewing machine table or other support by screws or any equivalent.

[OFFICIAL.]

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Sewing machine, W. A. Mack	123,493
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Sewing machines, tucking device for, J. W. Wharton	123,529
Shaft coupling, W. P. Dugdale	123,464
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Steel for casting in green sand molds, manufacture of, J. Millwood	123,503
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Stove pipes, hot water reservoir for, C. Lauby	123,489
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Table, extension, S. E. Wales	123,372
Table, extension, A. Hanson	123,397
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Telegraphy, W. C. Barney	123,441
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Trap, steam, C. Schmandt	123,515
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Wagon, dumping, J. F. Applegate	123,440
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Washing machine, M. and F. Way	123,431
Washing machine, A. J. Rogers	123,512
Washing machine, H. S. See	123,426
Washing machine, C. Milner	123,354
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Wood, preserving, L. Feuchtwanger	123,467
Wringer, clothes, J. Makechney	123,495
Wringing machine, M. and F. Way	123,432

DESIGNS PATENTED.

5,505.—PRINTED FABRIC.—F. Christie, Philadelphia, Pa.
5,506.—SHAWL.—H. Erbs, Philadelphia, Pa.
5,507.—TYPE.—A. Gilbert, Boston, Mass.
5,508.—LEECH JAR.—W. Neidlinger, New York city.
5,509.—SODA FOUNTAIN.—G. F. Meacham, Newton, Mass.

TRADE-MARKS.

644.—UMBRELLAS.—Dawes & Fanning, New York city.
645 to 647.—FERTILIZERS.—Maryland Fertilizing and Manufacturing Company, Baltimore, Md.
648.—SOAP.—J. Oakley, New York city.
649 to 651.—WHISKY.—James M. O'Donnell, Staten Island, N. Y.
652.—WHISKY.—C. H. Ross & Co., Baltimore, Md.

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:

20,091.—FLY TRAPS.—W. Riley, April 10, 1872.
20,564.—MANUFACTURE OF ROUND BELTING.—M. Jewell, May 29, 1872.
20,180.—HARVESTER.—L. Miller, April 17, 1872.
20,181.—HARVESTER.—L. Miller, April 17, 1872.
20,182.—HARVESTER.—L. Miller, April 17, 1872.
20,142.—WATER CLOSET.—W. S. Carr, April 17, 1872.
20,345.—CUTTER HEADS, ETC.—J. P. Grosvenor, Lowell, Mass.

EXTENSIONS GRANTED.

18,871.—HARVESTER.—T. I. Stealey.
19,191.—BLADE FOR PENCIL SHARPENER.—W. K. Foster.
19,222.—SEED PLANTER.—J. D. Willoughby.

Inventions Patented in England by Americans.

From January 10 to January 18, 1872, inclusive.
[Compiled from the Commissioners of Patents' Journal.]

ARTIFICIAL TEETH.—C. H. Mack, Portland, Oregon.
BRONZING MACHINES.—E. F. Benton, Buffalo, N. Y.
CARTRIDGE BOX, ETC.—J. W. Frazier, New York city.
CASTING METAL, ETC.—W. Sellers, Philadelphia, Pa.
COMBINED TOOL.—J. Dixon, New York city.
COTTON GIN.—T. Bourne, New York city.
GAS AND WATER PIPES, ETC.—W. Radde, New York city.
GUANO BAG.—B. R. Croasdale, Philadelphia, Pa.
HORSE COLLAR.—Z. C. Robbins. Washington, D. C.
MARINE STATE ROOM.—L. D. Newell (of New York city), London, England.
NEEDLE THREADER.—S. L. Mercer, Washington, D. C.
PRINTING PRESS.—A. Campbell, Brooklyn, N.Y.
REFINING OILS AND FATS.—C. Morfit (of Baltimore, Md.), London, Eng.
RELIEF VALVES, ETC.—A. F. Allen, Providence, R. I.
STEAM ENGINE.—E. Cope, J. R. Maxwell, Cincinnati, Ohio.
TINTING PHOTOGRAPHS, ETC.—H. Vander Weyde, New York city.
WATER METER.—G. Sickels, J. H. Thorndike, Boston, Mass.
WATERPROOFING LEATHER, ETC.—W. Morris, Philadelphia, Pa.

NEW BOOKS AND PUBLICATIONS.

A TREATISE ON ACOUSTICS IN CONNECTION WITH VENTILATION, and an Account of the Modern and Ancient Methods of Heating and Ventilation. By Alexander Saeltzer, Architect. New York: D. Van Nostrand, Publisher, 23 Murray Street and 27 Warren Street.

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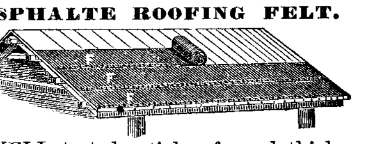

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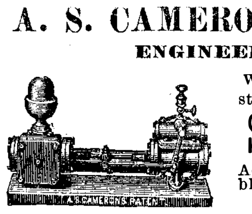

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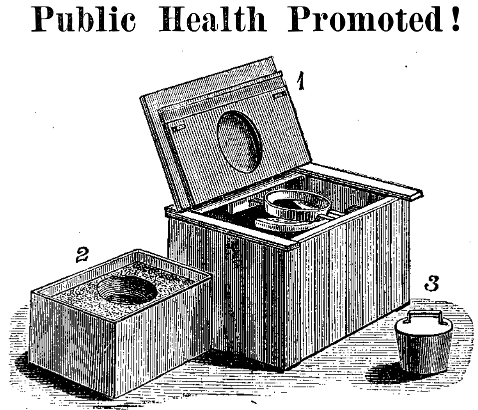

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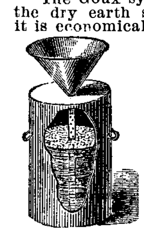

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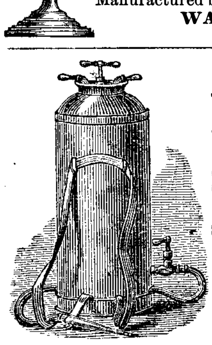

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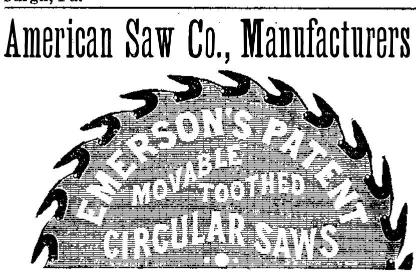

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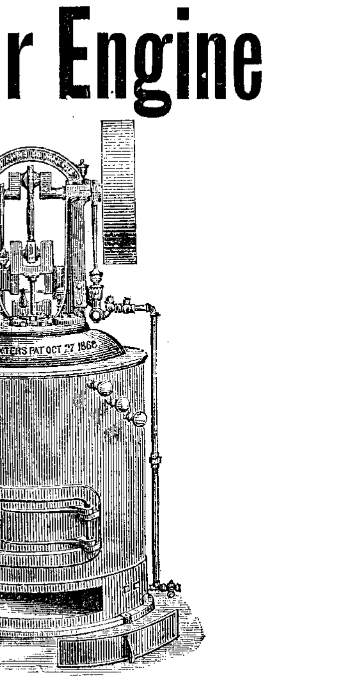

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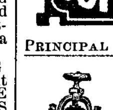

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