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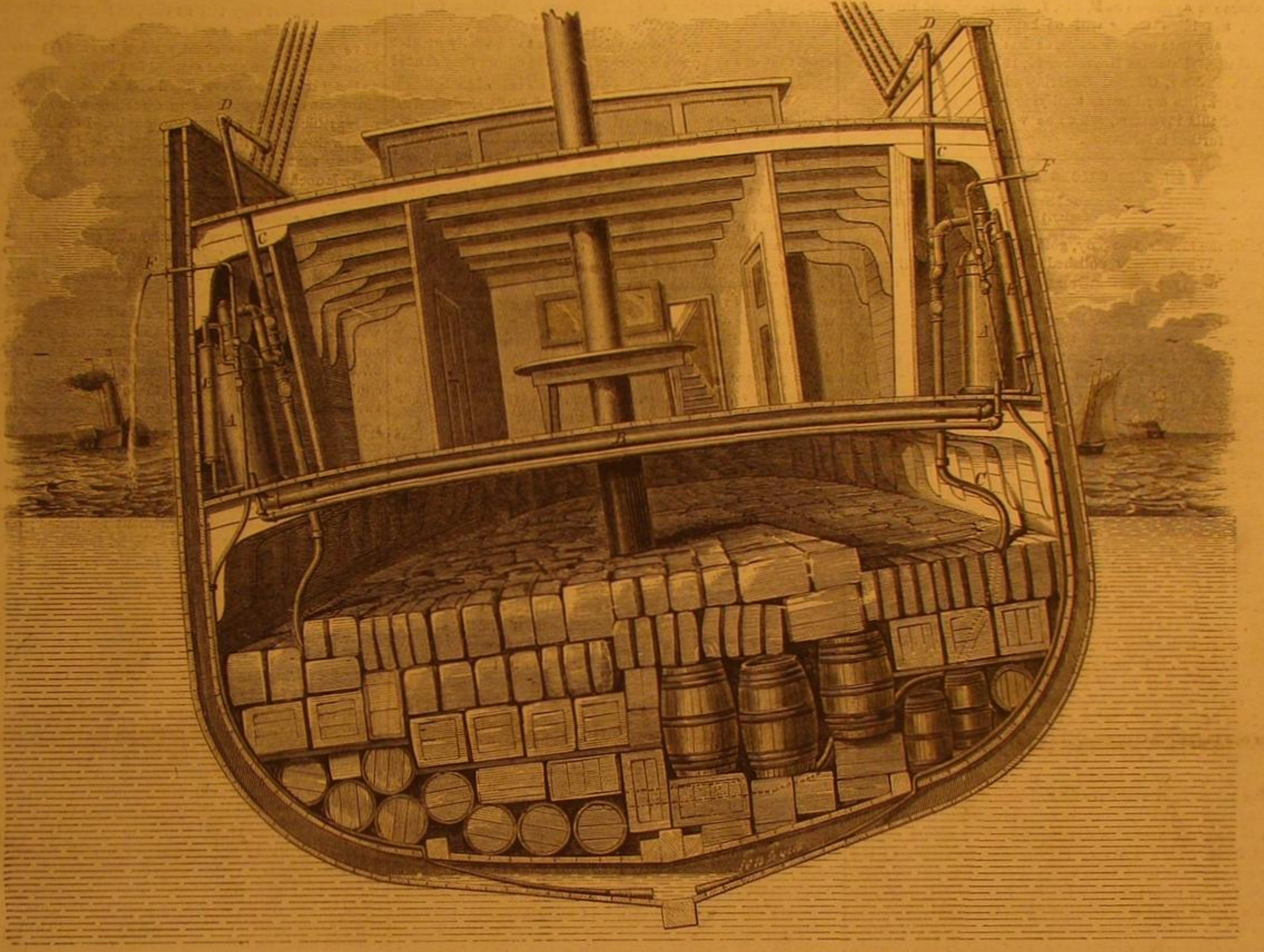
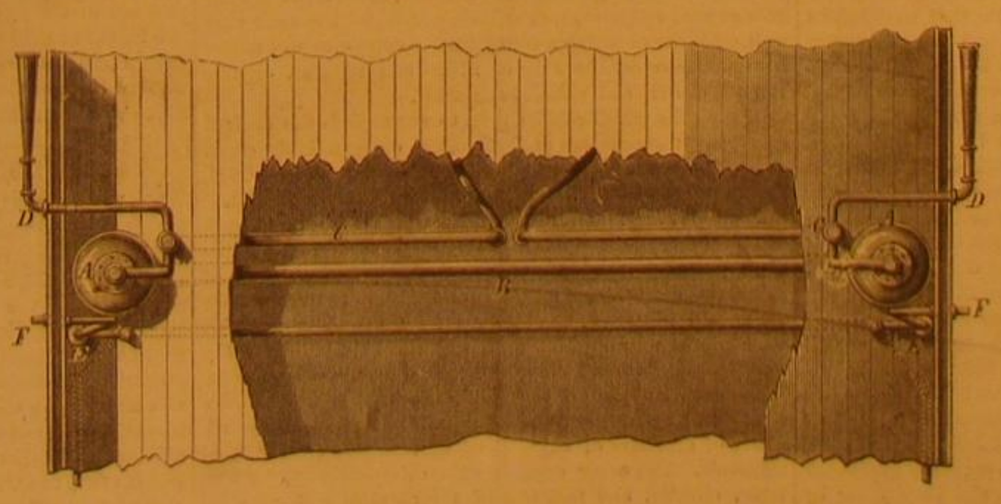


THIERS' PATENT SHIP VENTILATOR, FOG ALARM, AND BILGE PUMP.

Ship Ventilator, Fog Alarm, and Bilge Pump.

We regard the invention which we herewith illustrate as one of great importance, especially in a sanitary point of view. It has, however, advantages, besides its power of keeping ships in clean and healthy condition, which will be noticed in their proper place.

It may be necessary to explain to the general reader that beneath the hold of vessels is left a space, the primary object of which is to collect and hold the water which enters the vessel through leakage, and from which this water can be removed by pumping. This space is continuous with a space left between the outer and inner planking of the sides of the vessel. The water which collects in the bottom of the vessel is called bilge water. During a voyage, this water always becomes contaminated more or less with decaying organic matters, which get into it in all manner of ways, such as slops from the cook's galley, pieces of meat and bread, dead rats, etc., which decay and taint the water, giving off foul, fetid, and noxious effluvia that oftentimes taint all the air in the vessel. It is well settled that the deadly disease known as ship fever is caused by the foul air thus engendered, and also that this favors the progress of contagious di seases, especially yellow fever, remarkable outbreaks of which have been observed in people exposed to the sm ell of bilge water when pumped from vessels. The apparatus, when once introduced will, indure as longas the vessel without expense for repairs.



Perhaps, in the whole range of disgusting odors, there is none more intensely nauseating than this, and the effect of such foul air, even when distributed throughout a vessel in small quantity, cannot be other than dangerous to the health of crew and passengers.

The complete and constant removal of this foul air, accomplished by the invention under consideration, not only greatly improves the sanitary condition of vessels, but gives the air, in all parts, a sweetness and purity which has elicited the highest praise from those who have experienced the superior comfort of ships to which it has been applied.

Freights are often seriously damaged by heating in the holds of vessels which would be saved could a constant circulation be maintained through them. Especially is this the case with grain in bulk, to the aeration of which this improvement is admirably adapted. These, and other advantages which will appear in our explanation of the operation of the device, are the grounds upon which we base our opinion of the improvement.

The principle of pumping out the foul air from the bottom of the vessel, allowing pure air to percolate down through the interstices of the cargo to supply the place of that pumped out, is undoubtedly better than that of forcing down air to displace the vitiated atmosphere below decks. This principle is adopted in Mr. Thiers' invention, the device being automatic in its action, and working by and with the slightest rocking motion of the vessel.

Fig. 1 is a cross section of a vessel with the improvement attached, with a perspective view of the apparatus. Fig. 2 is a top view with a part of the deck broken away.

Two metal chambers, A, Figs. 1 and 2, are connected at the bottom by a pipe, B, which is filled with water. From the tops of these chambers proceed pipes, C, which penetrate to the lower part of the hold. These pipes have check valves, which permit air to flow through them into the chambers, A, but keep it from returning by the same route, while other check valves allow it to issue upward and out of the mouths, D, of the pipes, into the external air.

To the mouths, D, may be attached fog horns, as shown, which can be taken off or put on, as may be desired. When these horns are in the position shown, they sound a continuous and powerful alarm, which may be heard miles away from the ship.

The motion of the air is effected by the rocking of the vessel, as we have stated above; for whenever the vessel rolls to one side, the water column in B runs, by its gravity, to the lower end of the tube. This creates a partial vacuum in the chamber at the higher end, which the pressure of the atmosphere in the hold acts to supply through the lower part of the pipe, C. When the vessel rolls again to the other side, the air which ascended into the chamber is pressed upon by the water column; and, as it cannot return downward, through C, on account of the check valve, it is forced upward and outward through the upper part of the pipe, C. The rapidity with which the air will be changed in the vessel, by this simple means, depends solely upon the capacity of the apparatus. A change of one inch or even less, in the relative hights of the sides of the vessel above the water line, sets the apparatus at work, so that there could rarely be a sea so calm as to prevent its action.

The efficiency of the apparatus in ventilating ships has been fully proved by actual use in vessels making long voyages, and thus the value of the improvement is attested by both theory and practice. By substituting, in a smaller but similar apparatus (the chambers of which are marked E in the engraving), a column of quicksilver for the column of water which in the ventilating apparatus connects the bottoms of the chambers, a depression of fifteen inches of either side of the vessel will, with the corresponding elevation on the other side, raise water to the hight of nearly thirty-four feet, and discharge it as shown at F, Fig. 1. By the use of this apparatus, the bilge water will be kept constantly discharged without any care or attendance, as has also been proved by actual use. Patented November 29, 1870.

P. D. Roddey, General Superintendent, 127 Pearl street, New York, has certificates testifying to the practical importance of this invention, which he will exhibit to parties requiring further information.

ON THE COLORS OF METALS.

(Read before the New York Lyceum of Natural History, by Professor C. A. Seeley.)

Of all the metals, two only, gold and copper, are distinctly colored. When nicely polished, the surfaces of all metals become nearly perfect mirrors, reflecting almost all the light, whatever be its tint, which falls upon them, and the chemically clean matte surfaces of all metals except gold and copper appear white to the eye. Yet the white light from such surfaces is invariably contaminated with a small amount of colored light, and this colored light is without doubt the result of a normal and ordinary decomposition of the incident white light. If the greater part of the incident white light were in the same way decomposed, the metals instead of appearing to us white, would shine with splendid colors. The colors of natural objects are always mixed with white light, that is, the white light falling on the surfaces of natural objects is never completely decomposed; and in this regard the case of the metal shows a difference in degree and not in kind. To the eye of the scientist, then, all the metals may be colored; the colors are ordinarily invisible simply because they are diluted or overpowered by the white light with which they are mingled. With the explanation thus given, I assume in this paper that all metals are colored.

The most satisfactory method, of rendering the colors of metals apparent, heretofore proposed consists in repeatedly reflecting a beam of white light from the metallic surface under examination. A convenient arrangement is two parallel plates of the metal, between which the light is reflected from one to the other at a small angle of incidence.

At each incidence the white light is partially decomposed, and if the number of incidences be sufficiently multiplied, all the white light will have disappeared, and only the pure colored rays be visible. In this way the colors of most of the metals have been exactly determined. The actual experiment, however, is not a very brilliant one, inasmuch as the larger part of the light with which it begins is lost by gradual diffusion; especially the colored light is lost, probably for the reason that the decomposition of the white light takes place within the reflecting surface.

Another method of developing the true colors has recently occurred to me, and it is the main purpose of this paper to describe it. I present first a few theoretical considerations.

When white light is decomposed by a colored body, the reflected colored ray is complementary to that part of the white light which is transmitted or absorbed; if a colored body be seen both by reflected and transmitted light, the colors so seen should be complementary, or an approach to being so.

These statements seem to have many exceptions, as, for example, the colored transparent salts of metals show the same color by reflected as by transmitted light. But I am persuaded that a careful discussion of the case would show that such exceptions are not well taken, and that this apparent discrepancy with the statements may be consistently explained away; thus it may be shown that the supposed reflected light of the exceptions is really a part of the transmitted light which has been returned by internal reflection; such mixture of the transmitted with a reflected light implies a considerable degree of transparency of the substance under test. The luster and whiteness of metals have a close relation to their opacity and density; perhaps the relation is that effect and cause. If the opacity and density of metals be progressively decreased, the optical metallic character will in the same ratio be diminished; the true color by reflected light would become brighter and freer from white light till it came to be contaminated with more and more of the returned transmitted light. Such changes are beautifully exemplified by the gradual additions of a solvent to fuchsin or other aniline colors in crystals. Aniline colors, Prussian blue, indigo, carmine, and all other dye stuffs which have very great tinctorial powers, have the metallic lustre, and their color by transmitted light is nearly complementary to that by reflected light.

In their relation to light, I suggest that metals are closely analagous to those dye stuffs which show a bronzed surface by reflected light. Metals are more perfectly bronzed because their opacity and density are greater, or, in other words their tinctorial powers are greater.

It will be seen that the above theory requires for its demonstration a transparent diluent or solvent of metals, which shall have no chemical action on them. Such a solvent, for a few of the metals, is anhydrous liquid ammonia. If this menstruum be gradually added to the silver white alkali metals, the whiteness disappears and is replaced by copper redness, which at last gives place to the blue of transmitted light. The changes of tint in this case from copper redness to the transparent blue may be exactly repeated by treating pure aniline blue with alcohol. The alkali metals are then copper red in reflected light, and, by transmitted light blue. In this connection, the fact that the salts of copper are blue is, perhaps, of some significance. The solution of metals without definite chemical action is almost a new idea in chemistry. Faraday made the first approach to it by showing that the color of ruby glass is due to metallic gold; and it received a final and definite shape in a demonstration of the solvent properties of anhydrous liquid ammonia, which I made at the late Troy meeting of the American Association for the Advancement of Science.

The tinctorial power of metals appears to be vastly greater than that of any known dye stuff, and the colors they should yield are very brilliant. There is reason, then, to hope that these facts about metals may some day receive some useful application.

KEITH'S IMPROVEMENT IN NICKEL PLATING.

The object of this invention is to prepare solutions for depositing nickel by electricity, to be used as a coating to other metals, and which will produce a deposit sufficiently flexible and tenacious for practical use.

The objection to nickel plated goods thus far has been that the deposit is so brittle that it cannot be bent, nor, on many articles, stand necessary wear even if not bent, and that it will also scale or peel off.

All these objections the inventor of the process under consideration claims to have overcome by his improvement, which produces the nickel plating so elastic and, at the same time, adhesive, that it may, he states, be advantageously employed even on the blades of knives or tools.

The nature of the invention consists in adding, to the various solutions of nickel, whether formed of single or double salts, materials which, by their presence, prevent the decomposition of the solution of the plating bath, and the decomposition of oxide of nickel and other impurities upon the articles receiving the coating of nickel.

The greatest care is necessary in the management of the solutions of nickel now used for plating, and in graduating the strength of the electric current to prevent decomposition of the solution, and consequent failure of the deposit. Even with the greatest care the coating of nickel is always brittle, and easily cracks and peels off when exposed to usage, on account of decomposition of the solution by the electricity causing the deposit.

For preventing this brittleness and otherwise improving the deposit, there is added, to the solution of nickel, one or more salts, either single or double, acid or neutral or associated, formed by the union of organic acids, acetic, citric, and tartaric, with the alkalies and alkaline earths, ammonia, soda, potassa, magnesia, or alumina. These additions will, it is asserted, counteract the tendency to decomposition of the solution by action of the electric current. The result is a deposit possessing elasticity, toughness, and all the hardness, brilliancy, and other qualities of pure nickel, with the property of adhesion, to the article upon which deposited, not possessed by nickel deposited from solutions not containing these additions.

The deposit made is particularly suited to polished steel and iron surfaces—for instance, cutlery and tools—though equally good for all other metallic surfaces.

These various organic acid salts may be added interchangeably and collectively, though the inventor prefers to use, in case of the double salts of nickel and alkalies and alkaline earths, the organic acid salts, which have for their bases the alkali or alkaline earth which is associated with the nickel in its double salt.

Thus, when using a solution of nickel and ammonia, an organic acid salt of ammonia is preferred, though the similar salts of soda and potash, or soda or potash will answer very well. In case of using a solution of a double salt of nickel and potassa or double salt of nickel and soda, an organic acid salt of soda and potash is selected.

Of the salts which can be used to accomplish the desired effect, the tartrates are preferable. A comparatively small quantity of the organic salts is necessary to be added, though more will not change the character of the deposit.

The following is an illustration, which the experienced electro plater can apply to all solutions of nickel. To twenty gallons of a solution in water, of the double sulphate of nickel and ammonia, of a gravity of 7° Baumé, add about one gallon of a solution of an equal gravity of neutral tartrate of ammonia in water. Mix well, and the bath will be ready after standing a few hours.

More or a little less of the addition does not injure the solution. This solution may be reduced, if necessary, by the addition of solutions of sulphate of ammonia and tartrate of ammonia. The other organic acid salts—namely, the acetates, citrates, and tartrates of the alkalies and alkaline earths—may be used instead with beneficial results.

These solutions may for some purposes be made alkaline by the addition of an alkali—for instance, in the electroplating of brass and iron, wherein local action would interpose—provided the solutions were left in an acid condition.

This invention was patented through the Scientific American Patent Agency, November 28th, 1871, by Mr. N. Shepard Keith, of New York city. If in practice it justifies the claims made for it, it will prove a most important addition to the science of electro metallurgy.

Celestial Engineering.

There are very few intelligent individuals in this country who are not aware that the inhabitants of the Celestial Empire—otherwise China—are an extremely ingenious and industrious people; but it is just as certain that accurate information, concerning the progress recently made in the arts and sciences by the Chinese, is confined to a very few. We believe, therefore, that the facts which we are about to place before our readers will possess the charm of novelty if of nothing else.

Recent advices which we have received from a perfectly trustworthy source go to show that the Chinese are determined that their nation shall not be left behind in the great race of improvement. Our dispatches are not sufficiently detailed to enable us at present to enter into very minute particulars, but they tell us that, as regards the construction of all the implements and munitions of warfare, the Chinese have recently made great strides towards perfection. At Shanghai, a large naval arsenal has been established, known as the "Kiangnan Naval Yard and Arsenal," in which many Europeans are employed in directing and instructing Chinese artificers and engineering pupils. In this establishment the liveliest activity has prevailed for the last two years. During that time, the government has built and successfully launched five gunboats, one with paddles and four with screws, having a gross measurement of 3,500 tuns, and propelled by engines of 550 nominal collective horse power. These gunboats are very well built, and the machinery is effective and good. Their construction is a great feat for a nation still looked upon as nearly barbarous by only too many in Europe.

But the five gunboats represent but a small part of the work done and being done at the Kiangnan yard. There is now, far advanced towards completion, a fine screw frigate of 2,700 tuns burden and 400 horse power, and the keel of a similar vessel has been laid; these frigates will each carry twenty-eight 40 pound and two 100 pound guns, all of wrought iron, and now in course of manufacture. All the marine engines for the boats and ships we have spoken of are made in the arsenal and dockyard. Besides several dredging machines, a large dry dock has also recently been constructed there.

Nor is the small arms department neglected; on the contrary, even more activity is displayed here than in the building yard. A staff of officers from our own Enfield factory has charge of the department, and we understand that the Martini-Henry rifle is now being turned out in quantities with great success. The head of the department, an English gentleman of much experience, has also invented and introduced a novel breech loader, intended to use a peculiar species of cartridge much in favor with the Chinese; and this weapon bids fair to give a very respectable target. Negotiations, we may add, are now in progress for the supply of rolling mill plant from England, and the best known machinery for the manufacture of gunpowder.

Although foreigners have at present almost the sole control of the various manufacturing departments at Kiangnan, the Chinese government are determined that this shall not be always the case; and in order to supply themselves at no distant date with a competent native staff, they have established a college, where Chinese students are instructed in the Western languages, engineering, navigation, naval architecture, and chemistry, by able professors. This college has already done good service, all the gunboats to which we have referred being entirely officered and manned by natives, who have acquitted themselves very respectably.

It is quite possible that China may yet play a very important part in the affairs of the world. Nothing stood so much in the way of her progress as the prejudices of the people. The wars which forced her to open some of her ports to the "barbarian" English conferred the greatest possible benefits upon her. Through these ports the nation acquired information that never could have been obtained under the old exclusive rule. The ingenious Chinese have not been slow to profit by this; and when we bear in mind the indomitable patience of the people, their intense thirst for learning, and the imitative skill which, as displayed by them, has almost passed into a proverb, it becomes difficult, if not impossible, to fix a limit to the material progress which the nation may make within the next few years.—*The Engineer.*

Machine for Making Wire Nettings.

Mr. Frederick C. Charles Weber, of Brooklyn, N. Y., has invented a new machine for bending wire into a zigzag form and interlocking successive strands, to produce a fabric or netting of superior or ordinary kind. The invention consists principally in the use of a stationary cylinder, having an internal spiral thread or groove, and in an arrangement therein of a rotating flat or round rod, which carries the wire around, and brings it in contact with the spiral surfaces. In this manner the wire is brought to the desired shape. The invention also consists in the application to the machine of adjustable friction rollers, a lubricating device, and a guide, which cause the wire to issue in the required shape from the end of the cylinder, and deposit it on a table. When the desired length has been formed, it is cut and moved slightly aside, so that the next course from the cylinder will enter and pass through the meshes of that last finished, and thus complete the netting by interlocking the several strands. In this manner, netting of suitable length and width can, it is claimed, be rapidly produced at a small expense. Such netting can be used for all purposes to which wire work is now applied, and will, for larger surfaces, being made in large sheets or pieces, be much more acceptable than ordinary wire netting, as it has not to be joined in narrow widths.

HYDRAULIC CEMENTS—THEIR ADAPTABILITY FOR USEFUL AND ORNAMENTAL PURPOSES.

A Paper, read before the Polytechnic Association of the American Institute, by Adolph Ott.

PART 1.

There are few branches of industry which to-day present more practical interest than that pertaining to the application of hydraulic cements. They are not only of the greatest importance for all constructions under water, but they are also capable of replacing the natural stone for superstructions in most, not to say in all, instances. Unless the use of mortar be abstained from altogether, and large and carefully prepared building stone used instead, it would be impossible to erect a building under water without having recourse to hydraulic cement. The enormous expense and the difficulties of the latter method would undoubtedly reduce the number of such constructions to a minimum. "Where, for instance, we now see imposing light houses boldly defying the threatening pressure of the waves, the mariner might be exposed to all the dangers of the coast without a warning signal or a guiding beacon. Where splendid ports, with massive docks and bulwarks, most effectually protect trade and commerce against the indomitable action of a powerful elemen', we should probably find no trace of the lively intercourse and international commerce which animate our principal seaports, had not chemistry given us means to replace, by ar', what nature has either refused or granted only at a few exceptional places.

"For the security of commerce, for coast defence and protection, for the intercourse on our water roads in the interior, and for a thousand other purposes, hydraulic cements are of the highest importance. Concerning their use for buildings above water," says Michaëlis, "it may safely be asserted that they have made a remarkable impression on our modern architecture, and have replaced the old stiff and clumsy masses by elegance and boldness of conception. One need but compare the columns, arches, and lofty balconies of European capitals with those of former periods, to see how much more ease and freedom characterize our modern style. It seems as if the architect knew how to influence his design by his genius; yes, as if he had succeeded in freeing himself, as by magic, from the fetters of gravitation to which all matter is inevitably subjected."

Hydraulic mortars are all mortars which, in contradistinction to common or lime mortar, resist the action of water. These mortars were already known by the Romans, and applied by them on a very extensive scale. We will only call attention to the harbor dams of Puteoli, the aqueducts of Claudius in Rome, near Segovia in Spain, of Metz, in the Eifel (between Cologne and Treves), and to the Tiburtinian gate, which, to this day, have resisted the vicissitudes of time. However, when it is considered that hydraulic mortars occur in the volcanic districts of South Italy, the merit of this knowledge is considerably lessened; a mere accidental observation of the same, it being perhaps mixed with sand instead of lime, may have led to its application.

Vitruvius, in the fourth chapter, second volume, of his work *De Architectura* says: "There exists a kind of dust which produces strange things; it is found near Baja and the Vesuvius. When mixed with lime, it forms a mortar, which not only imparts great strength to buildings, but also to waterworks."

The natural cement in question is a volcanic earth, mostly of an ash color but sometimes yellowish and brown, which is still found in the environs of Naples. At a less remote period of time, when the Romans invaded the valleys of the Lower Rhine, they easily recognized the volcanic nature of the Brohl valley. Here, among the long extinct Rhenish volcanoes, they found another natural cement—the trass—in such considerable quantities that the quarries which they opened are still in existence. The use of hydraulic cement in ancient times could therefore have only been a limited one, as it was found only at the places mentioned. Its artificial preparation was not understood. However, the Romans had made very fine observations on the properties of this natural product. They cast, for instance, immense blocks of stone from it, which they applied as ballast for the erection of docks. Upon this topic, Vitruvius expresses himself, in the third chapter, fifth volume, of the above named work, as follows:

"If there is a place, not suited by nature to protect vessels against storms, it seems that it is the most proper to throw up walls and dams on one side, provided there be no river in the way, and a good anchoring ground on the other side. But, if piers are to be erected in the water, I proceed in getting earth from the dominion that extends from Cumæ to the promontory of Minerva, which I mix with lime in the proportion of two to one. Boxes are then submerged in the selected spot, and are united by strong piles and clamps in order to keep them in their original position. Next, the boxes are filled with a mixture of rubbish, or broken stone, and the above described mortar. But, if the waves or the violence of the sea does not permit of keeping the boxes in their position, a solid platform must be thrown up from the land or shore dam, which is to be constructed for one half of its length in such a manner that it will form a level with the sea, while the outer half should be sloping. Walls should then be erected along the platform of one foot and a half in width, and of the same hight as the latter. The intermediate space is then filled up with sand. On the surface thus produced, a block of the necessary dimensions is formed, which, after its completion, is left to dry for not less than two months; but after that, the breast wall, which affords a hold to the sand, is torn down, the submerging of the block being left to the waves that wash the sand away."

From the time of Pliny (who reproduces the report of Vitruvius) up to the fifteenth century, no further mention is made of hydraulic mortar. During the fifteenth and sixteenth centuries, Leon Battista Alberto, the founder of the Renaissance, Palladio Scamozzi and Philibert De Lorme made precisely the same reports as the Latin authors. Since the later part of the seventeenth century, the Dutch, the condition of whose country renders hydraulic constructions especially desirable and necessary, first used domestic (in place of Italian) cement, from the neighborhood of Coblenz. Next to Holland, the application of water mortar was first resorted to in France and England; but up to the middle of the eighteenth century, nothing further became known about its use and application than what had already been familiar to the Romans; for the work of the celebrated engineer and architect Bélidor (*Architectura hydraulica*, Paris, 1753) contains nothing of interest except that which had before been explained by Vitruvius. Since the end of the last century, however, a lively and general interest in the subject has manifested itself.

The impetus to new experiments with hydraulic mortar was given in 1791, by the celebrated John Smeaton, the builder of the Eddystone lighthouse. "The Eddystone lighthouse," says Michaëlis, in his excellent treatise on hydraulic mortars, 'is the corner stone on which the knowledge of hydraulic mortars has been built; it is the main pillar of modern architecture. Not only to mariners, but to the whole world, this *pharos* has become a landmark of most beneficent effect."

Smeaton was required to solve the problem of constructing a high and colossal structure, exposed to the fury of a tremendous sea; for which he had to select a mortar, capable of permanently resisting the action of water. For this purpose, he subjected the best specimens of English limestones to chemical tests. Upon finding that, in treating them with dilute nitric acid, an argilliferous residue remained, he was able to declare that "all limestones which leave a residue of clay on dissolving them in acids will, if calcined, solidify under water, while all limestones not deporting themselves in this manner are unavailable as hydraulic mortar."—[*John Smeaton: "A Narrative of the Building, and a Description, of the Eddystone Lighthouse, etc." 2d edition, London*, 1793.]

In the year 1796, the so-called Roman cement was discovered by James Parker; and regardless of its cost, it was for a quarter of a century nearly exclusively used in England for building on land and in the sea. The same was prepared from the spheroidal concretions of marl, occurring in the so-called London clay; in composition, it is similar to the volcanic earth of the ancients.

In 1822, two Frenchmen, Girault and St. Leger, and in 1824, Joseph Aspdin in England, produced for the first time artificial cement of decidedly superior quality. The latter, a common mason, secured on October 21, 1824, a patent for a new improvement in the making of artificial stones. He first gave to his cement the name of Portland cement, from the fact that it was very similar in appearance and quality to the Portland stone, the uppermost strata of the English chalk formation, from which the most beautiful and imposing buildings of Great Britain have been erected.

The making of artificial cements, in spite of the patents secured by Aspdin and others, would probably have remained a mystery for a long time, had not scientific men begun to examine into the process of solidification, the composition and the requirements of hydraulic mortar. How difficult these investigations were is proved by the fact that numerous examinations by the most skillful chemists were necessary to establish a few facts, which might be related to you in one tenth of the time occupied by my paper. We may pardon the manufacturers for their caution, since they acquired, almost exclusively by long study and great sacrifices, the necessary certainty in the fabrication. Should they freely lay before the world their costly experience? This was certainly not in their interest.

Great merit is due to the French engineer Vicat for making the most extensive use of the hydraulic limestones of France, of which he discovered numerous deposits. The savings, caused by their application in the building of bridges, locks, viaducts and canals, were in his time enormous; and only to mention one instance, France saved, in the cost of bridge building until 1845, almost seventy millions francs. The credit, however, of having established the first scientific explanation of the process of solidification and of having indicated the way of composing hydraulic cement, from materials occuring almost everywhere, in the shortest and most certain manner belongs to the German chemist and academician, Justus Fuchs. His investigations are published in two memoirs, both of which were published in 1828, in "*Ueber Kalk und Mörtel*," (On Lime and Mortar) and in "*Ueber die Eigenschaften, Bestandtheile und chemischen Verbindungen des hydraulischen Mörtels*," (On the Properties, the Composition and the Chemical Combinations of hydraulic Mortar). The results of the later essay being of the utmost importance for Holland, the Dutch Academy of Science resolved, a few years later, to award him their golden medal. The credit for further valuable information on this topic is due to the Frenchmen, Berthier, Frémy, Mène, Rivot, Chatoney, to the Englishmen Pasley, White & Sons, and Macleod, and to the Germans Pettenkofer, Winkler, Feichtinger, Manger, Heldt, Michaëlis, and others.

THE supply of India rubber is said to be inexhaustible. Each tree can be tapped for twenty successive years, and yields on an average three table spoonfuls a day; 43,000 of these trees have been counted on a tract of land thirty miles long by eight wide.

Leather Dressing.

Of all the triumphs which have been achieved by chemical science in arts and manufactures, it has been over and over admitted that chemistry has done comparatively little to advance the art of tanning; for nothing has been introduced to replace good oak bark, though many substances, of great value as aids to oak bark in the preparation of leather, have been introduced. However, it must be admitted that the art of leather production is better understood now than it has been in former years; but that has been owing to other causes besides the aid of chemical knowledge. Chemistry has certainly aided the tanner in substituting for oak bark substances containing a great amount of tannin, and which produce their effect in half the time, but the leather is not so durable as that from oak bark. The art of tanning consists in converting the skins of animals into leather by effecting a chemical combination between the gelatin, of which they principally consist, and the astringent principle, tannin, which is contained in oak bark, which, irrespective of our great progress in arts and science, is the only known substance that is capable of converting the gelatin of hides into really good and serviceable leather. Of the substitutes for the bark of the oak, valonia comes first, for it produces leather of great solidity and weight, and which is more impervious to water than leather produced by the old process. Next comes catechu, or *terra japonica*, which has been used for some considerable time; but the leather produced by this astringent is not so durable, is of a spongy nature, and very impervious to water. Of late year, divi divi, a substance much used in dyeing, has been brought into requisition by the tanner; but though it produces its effect in less than half the time that is taken by oak bark, the leather partakes of the porous nature of that which is produced by *terra japonica*. With sumach, light skins may be tanned in less than twenty-four hours, and with the aid of alum even in one hour; but, for obvious reasons, well known to tanners who have tested the process, the old system has been found to be far more preferable. It will be seen from the foregoing that chemical science has not effected much towards the art of the tanner. Where chemistry has failed, mechanical power has been introduced, but the effect produced by atmospheric means has been such that men of science assert, and that with much truth, that the resulting leather is too porous; and with respect to leather resulting from hydrostatic power, that it is too hard, and not sufficiently durable.—*British Trade Journal.*

Johnson's Improvement in the Manufacture of Soap.

Mr. William Johnson, of the city of New York, has invented and patented certain improvements in the manufacture of soap, the object of which is to produce an economical and easily made soap, suitable for all ordinary washing operations.

In the manufacture he takes four hundred pounds of tallow and two hundred pounds of resin, and boils them with a solution of caustic lye or potash. When sufficiently boiled, he allows the mixture to cool down to the temperature of about 85° Fahr. Then he adds five gallons of spirits of turpentine, eight pounds carbonate of potash, and fifty pounds French chalk, or the same quantity of American talc. These substances are then thoroughly mixed or crutched in the boiled mixture. He next sifts into the mass, ten pounds powdered sal ammoniac. The mass, still warm, is then well mixed or crutched, so that the various ingredients may be thoroughly diffused and mixed together. This crutching operation should be carefully performed, and care should be taken that no greater heat be used at this time than 85° Fahr., as the turpentine is very susceptible to evaporation, and some of the otheringredients will degenerate if a higher heat be used, and injure the soap.

The soap thus made is allowed to cool in suitable receptacles, and is then ready for use.

Sprinkel's Stone Puller.

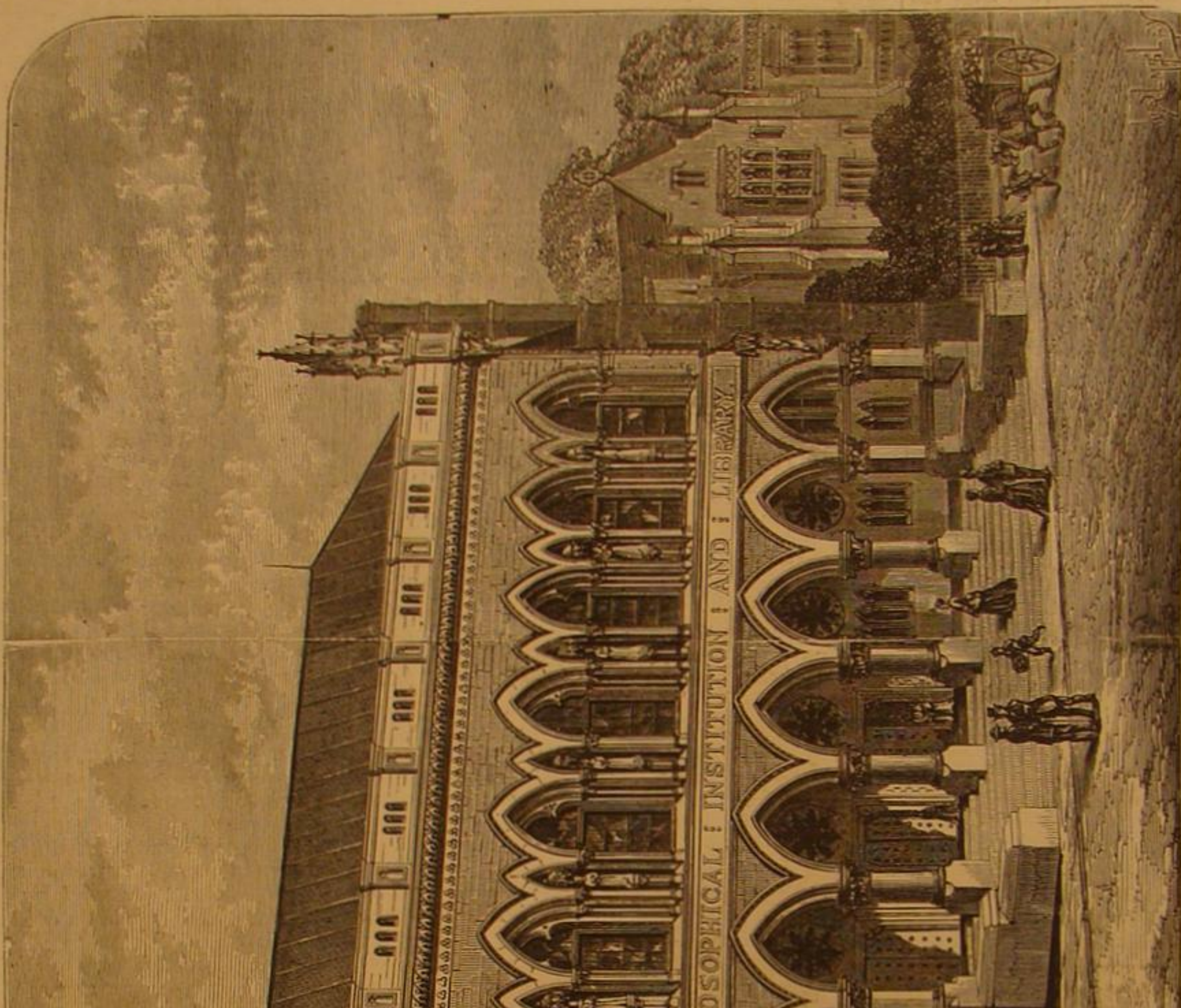
This is a new vehicle for lifting heavy stones and other things from the ground and conveying them a suitable distance. When the machine is to be used for lifting, blocks are placed in front of the wheels to prevent them from turning. The animals which are yoked to the tongue are then started ahead, and swing a lever whose long arm was first in a vertical position. In being thus moved, the lever causes a chain to hang on the end of its short arm, and thereby carries it up with the load. A very powerful leverage is thus obtained. When the long arm of the lever has been swung down, it is caught and the load locked in its elevated position by means of a spring catch. The tongue slides outward without drawing on the axle, while power is thus applied for lifting, but is otherwise locked in the bar by a suitable bolt or pin. George Sprinkel, of North Leverett, Mass., is the inventor and patentee.

NEW USE FOR ELECTRICITY.—Electricity has achieved a new triumph. Already employed to restore vigor and nimbleness to the gouty limbs of decrepit *bons vivants*, the recent discoveries of Dr. Bernier, a French physician, show electricity to be an efficient remedy for the evil effects of excessive drinking on the human nose. The doctor maintains that, by the application of an electric current to noses even of the most Bacchanalian hue, the flesh may be made "to come again as the flesh of a little child;" and he supports his assertion by a case performed on a female patient of his own, a woman of high rank.

THE Thames tunnel, thought to be such a novelty, was anticipated by one under the Euphrates at Babylon, and the ancient Egyptians had a Suez canal.

THE PHILOSOPHICAL INSTITUTION AND LIBRARY, BRISTOL, ENGLAND.

The building for these amalgamated institutions, at the top of Park street, is close to several other important edifices. The cost of the building was $50,000. Farley Down red stone stone is used for the exterior. The style is French Gothic. A flight of steps, 32 feet wide, leads to an open portico, having columns, with carved capitals and bases, from which spring seven pointed arches. The portico is laid with Coalbrookdale tiles, and is built throughout of freestone. The front wall is divided into the same number of bays, each one corresponding in dimensions with the arch which faces it. The three middle ones are devoted to doorways, and the remaining four to windows which light the entrance hall and offices. These windows each consist of three lancet headed lights, surmounted with a traceried light, the whole inclosed in a pointed arch, resting on carved shafts, with foliated capitals. The entrance doors slide on iron rails, and open into the entrance hall. There is a committee room to the left, and directly in front of the entrance, is the door to the ground floor museum. This is a large apartment 22 feet in hight. Running down the middle of the room is a series of octagonal freestone shafts, from which spring arches, for the support of the floor above. The room is lighted by five windows on one side, of geometrical tracery, exactly the same as those described in the front, and four, on the opposite side, which look into a small yard. From the entrance hall access is also gained to a spacious library, and a reading room, librarian's room, curator's room, and all necessary offices. The reading room and library are lighted by means of a lantern roof. The hight from the ground floor to the eaves of the lantern is 36 feet. A gallery runs round both rooms, communicating with a ladies' reading room, and is on the same level as a mezzanine floor. A flight of steps from the entrance hall takes us to the first floor, whic!. is devoted to a larger museum, covering an area of 4,864 square feet, and 24 feet high. The building is an admirable design for the purpose intended, and the engraving we give will form a useful hint to projectors of similar structures in this country.



THE PHILOSOPHICAL INSTITUTION AND LIBRARY, BRISTOL, ENGLAND.

Edward G. Kearsing's and Leonzo Kearsing's Processes for Preparing Gold for Dental Purposes.

The above named gentlemen, of Spring Valley, N. Y., have invented an improved process of preparing gold for dental purposes, and a new method of making blocks of gold from prepared foil. It consists, first, in making the foil pliable, by subjecting the same to heat between layers of paper or other fabric. It also consists in forming the prepared gold into blocks, by superposing a suitable number of sheets of foil, and annealing them, cutting, when soft, spongy blocks of suitable size from the collected material. In the treatment of gold foil, they proceed as follows: They place the sheets of foil into a suitable box or frame, sufficiently close to protect its contents from direct action of the fire. Between every two sheets of foil, they interpose a sheet of paper or other soft fabric. A weighted cover is placed upon the contents of the box to prevent them from expanding in a vertical direction. The box, with its contents, is then subjected to a degree of heat which will suffice to shrink the paper. The motion thereby produced in the various particles of paper is conveyed to the foil, which is drawn and shriveled so that its smooth surface is broken, and it becomes sufficiently soft and pliable for practical purposes. The paper is then removed and the foil ready for use. The foil thus prepared (or it may be in any other manner) is, according to the second part of the invention, placed in layers, one upon another, and then annealed under slight pressure to form a spongy mass of gold, which can be cut into minute blocks for practical use, each block being of a size to be used whole. The tearing of gold and consequent injurious handling by the dentist is thus made unnecessary, and the material furnished to market in a form claimed to be of a superior and most convenient shape.

Mosaic.

Mosaic is a species of decoration composed of numerous small lozenges (*tesseræ*, they are technically called) which may themselves be colored clay or glass, and which are arranged in arabesques, or even in grouped imitations of human beings and natural scenery. Its most usual employment is for pavement, a discovery which Pliny attributes to the Greeks. Sosus, the most celebrated of the Greek mosaic workers, composed such a pavement representing the remains of a supper left carelessly on the floor. Perhaps the most interesting of all the ancient mosaics is one which was discovered at Pompeii. It represents, as is supposed, the battle of Issus; its composition is simple, energetic, and graceful, exhibiting in many respects merits of the highest order. The march of art, as of civilization which it adorns, was from the East. The Orientals, from time immemorial, have been noted for those masterpieces of patience and ingenuity which we gaze upon to-day with wonder—boxes, tables, and ornaments of inlaid wood. In this marquetry, says the *British Trade Journal*, Hindoos far surpass anything which can be produced by European artizans. The Chinese, however, fashion curious inlaid work in relief much like the mosaic work of Western climes, save that it excels in delicacy and careful execution. This is, for the most part, composed of hard stone, agalmatolite of different shades, ivory, bronze, and different kinds of wood. It is most probable that it was from an Eastern source that the Grecian mind received that impulse which bore fruit in their mosaics, an art differing from the Oriental inlaid work in its greater durability and cheapness, as in increase of effect. The universality of its employment in the Grecian world may be gathered from the fact that, in the third century B. C., the floor of the great ship of Hiero the Second was composed of stone cubes representing in mosaic the whole history of the siege of Troy, a work which occupied 300 artists an entire year. Imagine a mosaic, or even a parquetry floor, laid down in a modern ironclad! From Greece, mosaics passed naturally to Rome, where they soon acquired high favor. Wherever in the Western world Rome spread her conquests, she likewise left imperishable memorials of herself in mosaic. Our own country is full of such remains, testifying to the refinement of Anglo-Roman life, and the secure hold which the officers of the legions fancied they had obtained on the land. It is needless to specify instances of tesselated pavements, when every county town, and specially the British Museum, contains admirable specimens of the art. One fine piece of this kind of pavement was exhumed last year in London; and, indeed, hardly a year passes without the plow in some part of England striking against the foundations of a Roman villa and disclosing fragments or, it may be, uninjured slabs of mosaic work. A good floor of this character is shown in Lincoln Cathedral, and the excavators at Uriconium, in Shropshire, discovered tesselated work let into the walls, a specimen which is deemed unique in England, though such were common enough in ancient Italy.

Improved Safety Governor.

The accompanying engraving illustrates a governor, invented and manufactured by Augustus P. Brown, 57 Lewis street, New York.

It was patented some time ago, but has been improved from time to time, till the inventor thinks he has attained a degree of perfection not before attained in a governor.

More than one thousand of these governors are stated to be in use, and the most flattering testimonials have been received in regard to their delicacy of action and reliability, even under the most trying circumstances, such as are found in engines driving mills for crushing ores, and other work where the labor required of the engine is liable to very sudden and wide changes in quantity.

The prominent features of this governor are that it positively and instantly stops the engine upon breakage of the governor belt, and that when the belt is mended and again run on to the pulley, the governor is at once ready for work without any attention on the part of the engineer. The governor may be put on any engine, and its pulley be brought into line with the driving pulley, without any alteration of parts and with the utmost facility, all of which will appear upon referring the following description to the engraving which illustrates it.

A is a sleeve, provided with a box at the top for lubrication, and joined by a crotch to a vertical sleeve, which covers another fixed sleeve, through which the valve stem ascends to jam nuts inclosed in the cap, D.

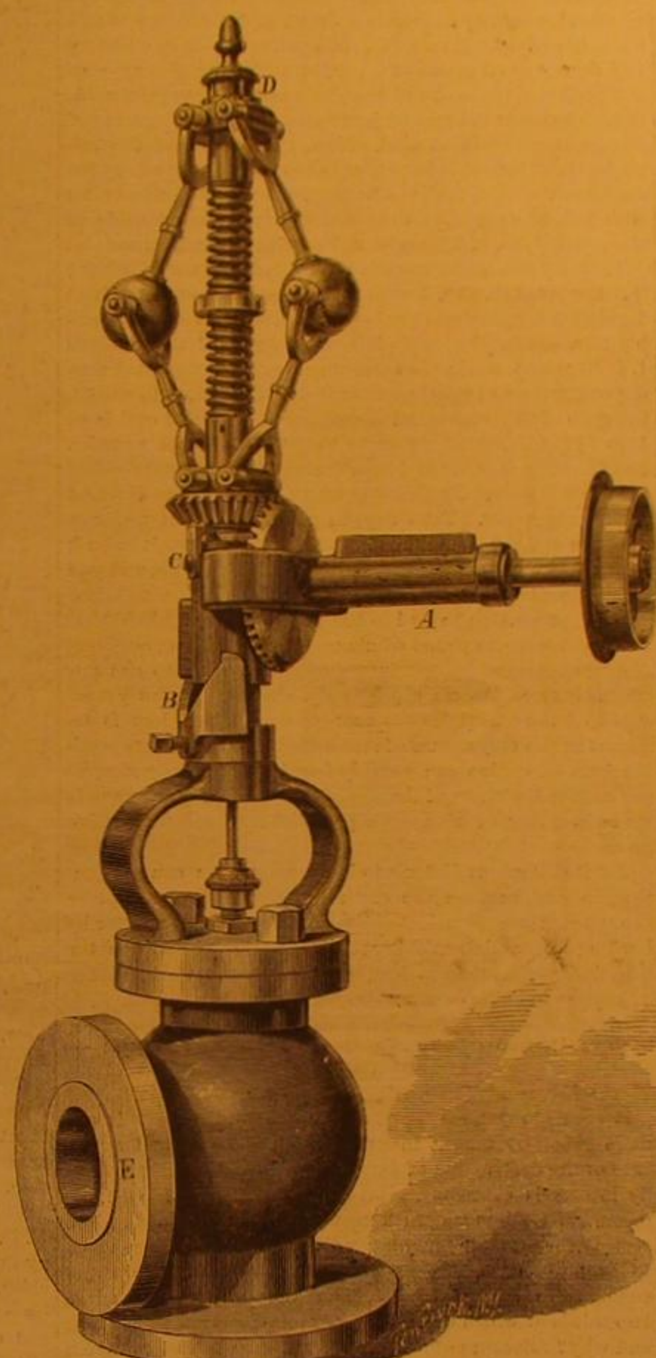
The removal of the cap, D, the angle iron C, and the jam nuts allows the whole to be taken apart for cleaning.

Through the sleeve, A, passes the pulley shaft, which, by bevel gearing, revolves the governor balls. The expansion of the orbit of the balls causes the stem of the valve to descend, as the lower arms are prevented from rising by a grooved collar and an angle iron, C, which fits into the groove of the collar. The descent of the valve stem closes the valve more or less, and thus regulates the supply of steam, the stem being raised again by the action of springs when the speed of the balls decreases. B is a fixed cam, held by a set screw when properly adjusted.

On the exterior vertical sleeve, with which the sleeve, A, is rigidly connected, there is a projection, which, when the belt is off, slides up or down the inclined face of the cam, B, according as the sleeve, A, with its shaft and pulley, are rotated partly about the vertical axis of the governor; the amount of rotation being limited by a vertical shoulder rising from the inclined face of the cam. The adjustment of the governor, after its attachment to the induction pipe by the flange, E, consists in simply setting this cam properly, to regulate the degree of opening of the valve, by turning it about the vertical axis of the governor, so that when the projection on the vertical sleeve abuts against the vertical shoulder of the cam, the governor pulley shall be in line with the driving pulley. The moment the belt breaks, the pulley and its shaft, with the sleeve, A, and the vertical sleeve to which A is rigidly connected, slide by their own weight down the cam, making a partial revolution about the vertical axis of the governor; and the valve stem and valve are lowered so as to entirely cut off the supply of steam to the engine, thus preventing the engine from "running away" and the serious accidents likely to result from such an occurrence. This action may, however, be limited by setting the fixed cam in such a way as to allow the passage of enough steam to keep the engine slowly running when it is desirable that a full stop should not be made. By thus setting it, the motion of the engine will, on the breaking of the belt, be at once reduced so much as to avoid all risk and the inconveniences of a sudden full stop.

The whole arrangement is so simple as to not increase the cost of this governor beyond that of ordinary governors without the safety attachment, while it is much easier to apply and adjust, affords absolute security, and is an efficient and sensitive regulator of power.

For further particulars address A. P. Brown, as above.



BROWN'S SAFETY GOVERNOR.

A Pleasant Incident---Employer and Employed.

The annexed extracts from the London *Spectator* exhibit a relationship between employer and employed which, at this time, is pleasant to see. The celebrated firm to which it refers is among our oldest patrons in England. The records of the Patent Office show that their enterprise has not been confined entirely to the manufacture of farm implements.

"Most of our readers have heard, we imagine, of Messrs. Ransome, Sims & Head, the great Quaker firm on the Orwell, which turns out so large a proportion of the agricultural machinery used throughout England, and is always coming to the front with new inventions and appliances, like the road steamer now being so largely ordered for India. This firm, now ninety years old, is remarkable in industrial history for the amity and long continuance of its relations with its employees.

"Some thirty-five years ago, work was slack, money was scarce, and the firm was compelled to take the men into council, and ask for concessions which, in many places, would have been the signal for a determined strike. The masters, however, explained their situation frankly, the men entirely believed them, and, after a single meeting, the whole body agreed to work three quarters time, at reduced wages, that is, in fact, to put up with 12s. or 13s. in the pound of their usual receipts till better times came round. 'That matter rested in my mind,' says the present head of the firm, speaking so many years after the occurrence, and doubtless tended to deepen so remarkable an amity that the firm, though noted for the strictness of its discipline, has now 456 hands in its employ whose services average 20 years, 328 who average 25 years, 51 who average 36 years, and 14 who exceed 46 years.

"In fact, departure has become, among the more experienced hands, as unusual as dismissal, a fact all the more remarkable because similar works are now in existence all over England, and Messrs. Ransome's men express, in their speeches about the Nine Hours movement, complete sympathy with their order throughout the country, and are evidently not disposed to surrender any of the advantages generally enjoyed. Immediately after the termination of the Newcastle strike, the men, more than 900 in number, decided that it would be 'discreditable to Ipswich to remain behindhand, in such a reform; but instead of striking or threatening to strike, they held a meeting in the Lecture Hall, at which doctrines were propounded that would have made a communist white with rage. One was that it was to the workman's advantage that his master should get rich—a statement made, not, indeed, by a workman, but received by them with unanimous applause; another, that 'workmen had duties as well as rights;' and a third, that, if they were 'courteous and reasonable,' their employers would, in all probability, be so too. There was a bit of a fight as to the best hours for beginning and leaving off, but it ended in a unanimous decision to ask for a full half holiday on Saturday, that is, from noon instead of from two P. M., and such a reduction on other days as would bring the weekly stint of labor down to fifty-four hours. A deputation, accordingly, waited on Messrs. Ransome, with the men's request, and were, it seems, not only told that it would be granted, but that it was granted with pleasure, as a partial repayment of the ancient obligation conferred by the hands upon the firm. So touched were the men by this reception and the instant concession of their demand, that they could not be content without some public exhibition of their feeling, and accordingly resolved to present their employers with an address at a public *soirée*."

Regulating Watches.

A writer in the *Watchmaker and Jeweler* thus discourses on regulating watches: Many of our best watchmakers take great pride in educating themselves in the art of horology, and in cultivating a taste for the work bench, which is furnished with the latest and best improved tools, and these are arranged and kept in the neatest possible order. Skill is indispensable, to understand at a glance all the difficulties which may arise in the thousand different kinds and grades of watches, and more especially to exercise it equally to every emergency, to cure every ill, master every difficulty, however intrinsically complicated it may be. The ear is attuned to dissect the most delicate "vibrations of air" (sound), and to read the life of the living machine by the beating of its little heart; the hand as well, to the delicate touch and solid firmness; the eye, to the mechanism in its correct and scientific proportions and finish, to take in every defect of the most minute character which may hinder uniform action; the foot, to the steady movement of the lathe; the endless breath, to the blow pipe; the muscle and will—yes, all must work in harmony in executing the plans of the great motive power—the mind. There must be with all, to give success, a good compensated regulator, or fine rated chronometer, or both, can they be afforded; and, above all a watchmaker's transit, so that the variation of the fraction of a second may be detected—every day in the year if necessary—but let all of these necessary things be at hand, and further attention or requisites and appliances neglected, and the result is—our watches go out to give dissatisfaction.

It is at this point that the majority of our best workmen are in fault. Our watches—even the best ones—are delivered imperfectly rated; the inevitable result is, our customer returns his watch, after carrying it a few days, compares it, finds it "off time." We only answer (in an important manner), "it must be regulated to your pocket, sir;" when the truth is, we did not half regulate it as it should have been done; we were too lazy or too busy to give it the necessary attention, or did not have the facilities which every good workman should have; the watch perhaps has been suspended by the pendant on a small pin or careless hook; in this position the balance will generate a pendulous motion—to a greater or less degree—which will accelerate its vibrations and cause much variation in the time; or it may have been put away at night, and carelessly allowed to lie upon its face or back, or in a sideways position, which will be as fatal to its correct performance, more particularly with the cheaper grades of ordinary priced watches. Should any one who carries a timepiece subject it to such an abuse, we would scold him at once, as he is expected to know better, if he knows anything at all.

Every good watchmaker knows that there is nothing connected with his business of so much importance, in giving satisfaction to his customers, as to have his watches keep good time when taken from the shop; and anything but this will give the workman a bad reputation (even if he be a first class mechanic, and has done his work faithfully); and in order that a watch please, it must be regulated as near as possible to an approximate point. By giving it the position and rest which it will—or should—receive, when carried by its owner, it must have careful and continued attention.

Psychic Force.

The Davenport Brothers lately gave some of their psychic exhibitions at Ithaca, N. Y., but their tricks were sadly disarranged by some of the Cornell University fellows. A private letter tells us that some of the students, having a scientific turn of mind, provided themselves beforehand with pyrotechnic balls containing phosphorus, so made as to ignite suddenly with a bright light. During the dark *séances*, when the Davenports purported to be, and as the audience supposed were, bound hand and foot within their closet or cabinet, and when the guitar was floating in the air and playing musically around, the aforesaid students struck their lights all of a sudden, when the "spirits" were found to be no others than the Davenports themselves, who were dodging about the stage, brandishing the guitars, and playing the tunes. The music suddenly ceased, the committee declared the performance a humbug, and the players departed from Ithaca by the earliest train.

Do your own thinking. Yes, that is the idea. Think for yourself. It is well to listen to the expressed thoughts of others, and it is an agreeable pastime to give expression to your thoughts. But when alone, weigh what you have said. What you thus gain from surroundings, you will unwittingly transmit to the rising generation, and the result will be that you will do your share in elevating the human family.

MONGOLS *versus* DEEP SEA CABLES.—A novel obstruction to the spread of civilization in China is reported. A branch of the new system of cable telegraphy has actually been taken up and stolen by the Chinese. This is the very latest style of ways that are dark and tricks that are vain which we have had of the heathen Chinese.

Correspondence.

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

The "Working Man" of the Magazine Writers.

To the Editor of the Scientific American:

At the risk of increasing the impatience which the public is beginning to show at the mention of the everlasting question of the condition of the working classes, I ask you to give me a little of your valuable space, that I may make an earnest protest against one phase which this subject is frequently made to assume.

Almost every writer in a popular periodical has had something to say on this question, and most of them have some nostrum, generally a political one, to propound. The ground covered by the various methods of dealing between capital and labor is a very wide one. In Russia, the paternal owner of the soil buys tenants and laborers with his new estate, and kindly takes charge of their liberties; while the other extreme is found in the communism recently displayed in Paris, the programme of which was made up of murder, arson, and destruction of everything that had any value to anybody. We are not likely to approve the autocratic view of the rights of property which obtains in the empire of our potent ally in Eastern Europe; and, although popular lecturers are going about this country, applauding the Commune, the people of the United States have no sympathy with insensate and wanton pillage of factories, laboratories, libraries and museums. While, therefore, we are in no danger of an industrial war for or against either of these conditions, the working men are being grossly misunderstood and insulted by some would-be philanthropists, who are anxious to play Providence over a class of society whose capability of taking care of itself cannot reasonably be doubted. Many writers of the present day, who are for ever telling us of the talents, merits, and virtues of working men, seem to forget that we are not proper objects for public charity, that we want no public funds voted for our support, and that any special legislation, on the subject of the status of labor as distinguished from other occupations, such as commerce and the professions, must end in being fatal to our independence.

It is perhaps too much to insist that writers on the question now before us shall be logical and consistent; but there is a blank in most of the talk on this subject. We have not been told why a workman should not dispose of his labor as a farmer does of his potatoes, that is, get the best price he can for it; but we now hear constantly that a desire to get higher wages (surely no novelty in this world), is a fearful portent, that a new era is about to be inaugurated, and property is to be taken from one man to be given to another, and other very desirable results are to be achieved when labor resolves to make itself heard. This is the style of the writer who is in the new era business; then another comes with ideas of homes for workmen, built out of the public funds. Why the national or local taxation, heavy enough already, should be augmented to further a supply of what will surely be provided, in the ordinary way, by the creation of a demand, I do not know; and why homes should be built, by our much loved and long suffering Uncle Samuel, for workmen, and not homesteads for farmers and country villas for merchants, I must leave to be explained by the new political economy, and its bastard offspring, class legislation.

After all the expression of good intentions of the wise men who protect and patronize us, we can surely ask them to give us credit for a little principle, honesty, and common sense. I am sure that I am speaking the opinions of an irresistible majority of workmen in this country and in Europe, when I say that an era of communism, of the destruction of some classes of property, and the division of the land into lots large enough for good sized pig pens, would be a blow to the interests of the classes who live by their manual labor from which they would never recover till science, art, and commerce had once more accumulated sufficient wealth to provide the splendid institutions for education and employment, which are now the pride of all men who desire to see the toilers of the world well employed and well instructed.

In this country the question assumes an aspect different to the one it wears in Europe, and especially in England. We have no titled aristocracy to hold up as a bugbear; but we have among us large territorial proprietors and accumulated fortunes, which the new era men may be assured have not yet excited our cupidity or undermined our honesty. We know well that the law (or rather the anarchy) which takes away one man's property because it is large, will take away another's because it is better than nothing; and that the real genuine communist is as ready to avail himself of John Blacksmith's purse as of A. T. Stewart's palace, or the Duke of Bedford's acres. These things are almost too trite to lay before your readers; but while our would-be friends are attributing all sorts of evil to us, we must repudiate them wherever we find them, even at the risk of being somewhat tautological. The respect of working men for the laws of their native country is not surpassed by the loyalty of any other members of society; and so long as the man who has little can least afford to share with the idle, the worthless, and the scoundrel, so long will working men be the most zealous wishers for the security of property. And if there be some among us, ignorant of their own interests, whose cupidity and selfishness are excited by large estates or accumulated wealth, the great majority are well aware that it is only by capital that extensive operations in the industrial world can be carried on; and it is by these undertakings that commerce is attracted to a country, and maintained in the fierce rivalry which now exists in the business world.

I think, therefore, that the better and wiser of the world's workers are convinced that the existence and maintenance of property is essentially important to their interests, and I am sure that the large majority are quite prepared to resist a raid upon the capital that employs them, the factories, mines, and estates on which they work, as much as if it were on their own pockets and bank balances.

There are other points in this question to which I will, with your permission, call attention in another communication.

New York city. PRINTER.

The Mechanical Equivalent of Zinc.

To the Editor of the Scientific American:

A short time ago there appeared in your columns a very interesting scientific discussion in regard to the value of zinc as a substitute for coal. As the discussion came to an end without apparently exhausting the subject, I propose to submit a few additional remarks. 32·7 grains of zinc in a battery will decompose 9 grains of water, of which 8 grains are oxygen (23·3 cubic inches) and one grain is hydrogen (46·6 cubic inches) being at the rate of $\frac{1}{4}$ grain oxygen and $\frac{1}{32}$ grain hydrogen to one grain of zinc. Now, assuming that the mechanical equivalent is in proportion to the amount of oxygen consumed, we find that, in a battery, one pound of zinc unites with $\frac{1}{4}$ lb. of oxygen, at the positive plate, forming oxide of zinc; and $\frac{1}{32}$ lb. of hydrogen unites with (8 times its weight) $\frac{1}{4}$ lb. of oxygen, at the negative plate, forming water, being $\frac{1}{4}$ lb. oxygen to 1 lb. zinc. But as the ratio of the amounts of heat developed by the combustion of equal parts of zinc, sulphur, carbon and hydrogen is equal to that of the numbers 1, 4, 16 and 64, while the amounts of oxygen consumed during combustion of equal parts are respectively 1, 4, 16 and 32, the ratio of the mechanical equivalent of zinc and coal is as 1 to $3\frac{1}{2}$ (3,080,000 foot pounds to 10,808,000 foot pounds). But the oxygen consumed in a battery is in what is called the nascent state. By this we mean that it is quite different from oxygen gas. Take oxygen gas and place it under a pressure of 7,000 lbs. to the square inch, and reduce it in bulk to $\frac{1}{600}$ of its normal state, then liberate it suddenly, and you have nascent oxygen.

If the proportion be as 1 to 600, then we have 1,848,000,000 foot pounds to one pound of zinc. There is also an additional consumption of oxygen in reducing the oxide to the sulphate of zinc. As we obtain only about $\frac{1}{10}$ of the actual value of the coal (1,000,000 foot pounds) which loss is inherent in the very nature of steam itself, and which no possible form of engine can remedy (our best engines giving 93 per cent of the value of the steam), a favorable comparison is made in favor of zinc as a possible material for motive power.

But it still seems difficult to believe that zinc can ever supersede coal, because the earth probably does not contain enough zinc; and even if it did we shall probably do better by burning coal and furnishing carbonic acid to carry on the negative system, than to lock up for ever the world's share of oxygen in oxide of zinc. J. C.

The Influence of the Moon---or rather of Worms---on Timber.

To the Editor of the Scientific American:

It seems to be a matter of regret that entomology is not more generally taught in our schools. The annual aggregate of the destruction of farm products and other property by insects is enormous. But what do we hear? Oh! the moon. Let all moonstruck mechanics go to the moon for a remedy for all their troubles, unless they can be persuaded to listen to reason. To-day there are piles of saw logs and timber in the forest and before the thousands of saw mills, two thirds of which will be more or less damaged by worms; and why? Because of the moon's influence? Let us take a more scientific view of the case.

Your correspondent cuts two sticks of hickory early in May and before the insect has deposited her eggs in the seams of the bark of forest trees; a few days later (or in the full of the moon), after the moth has deposited her eggs, he cuts two sticks more. The worms devour the latter, but touch not the former. Wonderful, is it not? What a wonderful moon! Oh, if we had such another, what would escape the ravages of the all devouring worms? But the first of May is too early to cut timber; what shall we do? Why, strip the timber of bark as soon as cut, by all manner of means, if you do not want it worm eaten. This is your remedy and your only remedy, the moon's influence to the contrary notwithstanding. CHARLES THOMPSON.

St. Albans, Vt.

Influence of the Moon on Timber.

To the Editor of the Scientific American:

It seems that your correspondents disagree in the result of their experiments with timber and worms. I too have tried such an experiment, and get a result different from either of them.

On the 12th of September, 1870, I cut a hickory stick, and again on the 27th I cut another; I marked them carefully, and placed them together in a dry place. After a year I examined them, and found just the opposite of the experience of D. A. M. The one cut three days after the new moon was badly worm eaten, and the one cut after full moon showed no trace of worms.

This seems to me, Mr. Editor, to be a still further proof on your side of the question—that "the moon has nothing to do with the worms." I have often heard it said that the best time to cut timber to make it last, and also to keep worms from injuring it, is in "the old of the moon in February;" but this is something like the other. It is my opinion that the sap has something to do with it, both in regard to the worms and to its durability. X. PERRY MENTOR.

Sans Souci, O.

To Smoke or not to Smoke.

To the Editor of the Scientific American:

Having waited to hear an answer to the remarkable proposition, as it appears to me, of V. B., in your issue of December 16, in favor of smoking, allow me, through your valuable journal, to point out some of the mistaken positions assumed by the writer, not as a controversialist, but to allay the pernicious effects which such a line of argument is calculated to produce, in encouraging the use of tobacco. He attempts, in the first place, to make us believe that nicotin, although a poison to animals, is not so to man, but immediately abandons that idea by saying, "but granted that tobacco contains matter poisonous to the human system, what does not? Potatoes, cereals, and nearly all vegetables, contain alcohol and other matter, which, if taken alone, or in overdose, may kill a man in two minutes and a quarter." Now alcohol is not found in potatoes nor any other vegetable, as nature furnishes it for our use; this is as well established as any other of the well known scientific facts.

When vegetable matter begins to decay, then alcohol is produced. But suppose we had alcohol ready furnished to our hand, as V. B. seems to think, it would in no wise strengthen his position on the use of tobacco. Again, he says, "tobacco can safely be considered a benefactor in the same line as muscular or mental activity"; that is, narcotizing or stupefying by means of a drug has the same healthy reaction that labor has. I do not think this assumption needs much argument to refute it; it cannot be considered very dangerous.

And he is unfortunate, in his selection of subjects to illustrate the marvelous health-giving power of tobacco, when he refers us to the Shakers and Chinese; for it is well known, and acknowledged, by those living in the vicinity of those singular people, the Shakers, that they have as healthy, stalwart men amongst them as are to be found in the whole country; and, if he has seen the wonderful feats of strength exhibited by Chinese athletics, he would undoubtedly have left that out of the argument altogether.

In conclusion, he says if he thinks proper to smoke he will not consider himself a hypocrite, a corrupt man, or a fool. No man, I think, after reading his article will think the writer a fool; but if he should ever commence the practice of smoking, on so unstable a foundation as his argument furnishes, every unprejudiced person must believe he had done a very unwise thing. L. P. S.

New Britain, Conn.

To Know or not to Know.

To the Editor of the Scientific American:

Whether potatoes, cereals and nearly all vegetables contain alcohol, seems now to be the question, after smoke has passed away. If one's competency to advise people on the important subject of smoking is to be measured by the carpenter's rule applied to one's knowledge of alcohol and its production, then all hail to the smokers. For my part, however, I must protest against the enforced title of "adviser to the people." Far be it from me to entertain such high aspiration. My object is to observe things on all sides, and my detestations are one sided arguments. If my former statement did not carry conviction in its train, it may at least have served to show the weak points in the deductions of the other side.

This, however, does not reach the question at issue. If N. D. will squeeze an apple, and thereby produce cider, and, by evaporation or congelation of the water contained in the cider, obtain alcohol, I, for my part, will pardon him should he say, that the latter substance was contained in the apple; and the same with regard to potatoes, cereals and nearly all vegetables, which, if converted under the influence of air or warmth into sugar, can thence readily be made into alcohol, as potato and rye whiskey, etc. Such conversion, be it known, is called fermentation: saccharine, when the starch or gum of organic substances is changed into sugar; vinous, when sugar is transformed into alcohol. Sugar, no one will deny, is contained, directly or in form of starch, in the organic substances cited; its chemical constituents are subsequently found in alcohol. Thus an atom of grape sugar is composed of 12 atoms of carbon, 12 of hydrogen, and 12 of oxygen ($C_{12}H_{12}O_{12}$), and is, by vinous fermentation, converted into 4 atoms of carbonic acid, (CO_2), and two atoms of alcohol, making 4 atoms of carbonic acid, C_4O_8; 2 atoms of alcohol, $C_8H_{12}O_4$; making together, $C_{12}H_{12}O_{12}$.

The above I hope may suffice; if not, let a cabbage head be brought me, and I will try to show what spirits it contains. V. B.

Congressional Library and Copyrights.

The Congressional Library now contains 236,848 volumes of books, and about 40,000 pamphlets. The provisions of the copyright law, which make it obligatory that a copy of every publication copyrighted be deposited in the Library of Congress, have brought to its shelves during the year, in addition to the books and pamphlets, 3,401 periodicals; 5,085 musical compositions; 70 dramatic compositions; 769 photographs; 4,571 prints, engravings, and chromos; and 331 maps and charts. The whole number of copyrights entered was 12,688. The wisdom of transferring the coyyright records to the library is now apparent to all, as it is more than self-sustaining, and it secures to the great Library of the government a complete representation of the literary product of the country as it comes from the press. Copyrights are procured through the SCIENTIFIC AMERICAN PATENT AGENCY. Address MUNN & Co., for particulars.

ONE house in Birmingham, England, consumes three tuns of brass wire a week in the manufacture of pins.

[For the Scientific American.]

LATENT HEAT OF DISSOCIATION.

BY P. H. VANDER WEYDE.

It was reserved for quite recent investigation to discover another kind of latent heat, besides that to which bodies owe their fluid or gaseous condition; it is the same heat which becomes latent when, at a very high temperature, all chemical affinities are destroyed, and every elementary substance exists in its separate uncombined condition, notwithstanding its being intermingled, in its gaseous or fluid condition, with any other substance also in the same gaseous or fluid state. It is the condition of all the material which makes up the mass of our sun; this has been proved chiefly by the latest spectroscopic observations of this mighty luminary, and the deductions to which these observations have driven the investigators. We know now, therefore, three kinds of latent heat; first, that of fluidity; second, that of the gaseous condition; third, that of dissociation; and as the second surpasses the first considerably, so the third surpasses the second, in amount.

As this new subject is of the most intense interest, explaining, as it does, many points thus far quite obscure or totally inexplicable in physical science, the reader is requested not only to read carefully what is to follow, but to study it, to ponder over it, till the facts have become so familiar to his mind that he may call them his own. I will only state, as an illustration of this importance, that the origin of the heat of combustion, thus far a profound mystery even to the most advanced philosopher, is now perfectly explained by the theory of the heat of dissociation, in combination with the theory of the conservation of forces. The latter theory considers heat as a mode of motion, as most readers well know; and the present series of articles, weekly prepared for the Scientific American, is intended to lead the student gradually into the knowledge of the laws governing *matter in motion*, which is the only true and intelligible definition of that mysterious agency which we call force, and of which heat, light, electricity, magnetism, and gravitation are only different phases.

It is scarcely necessary to remark that this subject is not only interesting in a theoretical and abstract point of view, but has a direct practical bearing in all cases where heat is transformed into motion, as is the case in the steam, the caloric, and the solar engines, etc., the theory of which will be the culminating point of the present series.

The term "dissociation" meaning thus a condition of matter of so high a temperature as to be, not only gaseous and incandescent, but beyond the power of chemical affinity, it is clear that when the temperature descends, a point must be reached where the chemical affinities will manifest themselves; in the same way, as by an ascent of temperature, from a very low degree of heat, the other extreme point of this range of chemical affinity may be reached. It has been found that these affinities manifest themselves in a comparatively limited range of temperature, below and above which they do not exist. As at an extreme cold, no chemical combination can be made, so at an extreme heat, say of 8,000° Fah., not only no combination can be made, but all compound bodies are separated into their elements, or dissociated. On cooling them and reaching, say 4,000° or 3,000°, the substances will again combine, the chemical affinities will come into activity at once, combustion will ensue, a comparatively enormous amount of heat will be developed or set free; it is the heat which before was latent in the dissociated elements, and is driven out by the play of the chemical affinities, even as the latent heat of gases is driven out during their condensation into a liquid, and the latent heat of liquids is driven out during solidification.

It is as yet impossible to give a table of the latent heat of dissociation for different substances, as no reliable data have yet been published; there is only one substance of which the latent heat of dissociation has been definitely determined (by St. Claire Deville); this substance is steam. This investigator has found that when steam is heated to 5,072° Fah., it is changed into a mixture of its component gases, oxygen and hydrogen. In the same way, when water is evaporated, or, in other words, when changing water of 212° into steam of 212°, 962 units of heat are consumed or made latent, so by dissociating steam, or changing steam of 5,072° into a mixture of oxygen and hydrogen of 5,072°, not less than 8,000 units of heat are made latent. Further, in the same way as steam of 212°, when condensed into water of 212°, gives off its 1,000 units of latent heat, so, when dissociated oxygen and hydrogen of 5,072°, combining into steam of 5,072°, giving off its 8,000 units of latent heat, of course combustion ensues; and this heat produced by combustion is nothing but the latent heat of dissociation.

If this dissociation has taken place by heat, it is of course impossible to obtain the gases afterward in a separate condition, and therefore impossible to cool the mixture without passing this point of combustion; but fortunately there are other ways to communicate, to the elements of water, this heat of dissociation, without which they cannot exist in the separate gaseous condition. One of these means is that other form of matter in motion, which we call electricity; if we discharge a voltaic current through water, we decompose it, as is well known, into its elements, which we may then collect as separate gases or as a gaseous mixture. This will then possess about the temperature of the surrounding air and the water from which it originated; the thermometer will not indicate the 8,000 units of latent heat, which the electric current has stored up in the gaseous mixture, as the same instrument does not indicate the 962 units of latent heat in steam of 212°. But let us raise the temperature of the minutest portion of this gaseous mixture to the point required for the play of affinity between oxygen and hydrogen, that is, to about 1,000°; and, in this minutest portion, the combination which takes place will expel its latent heat of dissociation, and this, in its turn, is enough to produce more than 1,000° of heat, and ignite the whole of the mixture, which then, by suddenly giving off all of its 8,000 units of latent heat, changing this into sensible heat, produces that enormous expansion or detonation of the gaseous mixture, of which the powerful effect is so well known among experienced chemists that none of them can ever believe that a bursting steam boiler ever contained any such explosive mixture. If such indeed were the case, the worst explosions would not be so comparatively mild, as was that of the *Westfield*, for instance. Such a boiler, when it bursts by the ignition of oxygen and hydrogen, would have done infinitely more damage, and would surely have knocked the bottom out of the boat, and perhaps have shivered the whole into splinters. A mere soap bubble, filled with this mixture in the right proportion, two volumes of hydrogen to one of oxygen, gives, when ignited, a report like a pistol; and the ignition, of larger or confined portions of this mixture, which occasionally takes place in laboratories, has always been infinitely more destructive, in comparison, than the explosions of steam boilers. The details of the explosions of the latter are perfectly identical with those accidental explosions or rather burstings, also sometimes occurring in laboratories, when non-combustible gases are pumped into cylinders, and at last a pressure is reached, surpassing the strength of cohesion of the weakest part of the cylinder, and an explosion or violent bursting also ensues, which, however, in its distinctive result, does not compare with that produced by the ignition of the dissociated elements of water.

[Reported for the Scientific American.]

SOCIETY OF ARTS OF THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

MEETING, HELD IN THE INSTITUTE IN BOSTON, DEC. 14, 1871.

The President, J. D. Runkle, in the chair.

An interesting paper, by the Secretary, Dr. S. Kneeland, on the Upper Mississippi, was the first thing in order. The paper had special reference to certain changes in the bed of the river, between Dubuque and St. Paul.

In 1870, the water, though shallow, did not obstruct navigation, but this year it was a rare thing for a steamer, if a large one, to make the trip between Dubuque and St. Paul without getting aground more or less frequently.

The water was so low that the heavy freight was shipped on flat barges, which were attached to each side of the steamer, to lessen the draft. And yet the surface of the water was four feet higher than in the summer of 1863, when the river was remarkably low, but the actual difference between the depth of the water in the summer of 1863 and that of 1871 is only five inches. This seems to show that the bed of the river is three feet and seven inches higher than it was eight years ago.

Generally there is a June or summer rise in the tributaries of the Mississippi and Missouri, which scours out, to a certain extent, the beds of these streams; the general drought which prevailed throughout the northwest last summer, drying up vegetation and preparing the country for those terrible conflagrations which have laid waste large portions of Michigan, Wisconsin and Minnesota, prevented the rise in the river this year. An immense amount of sediment must be washed into these rivers annually from the thousands of acres of cultivated land in Iowa, Minnesota, Wisconsin and Illinois. This will be readily understood by any one who has seen the turbid Missouri, or any of the tributaries of the Mississippi after heavy rains. The bottom of the Mississippi is now six and a half feet higher than it was in 1846.

The final overflow of the country, by the river, from the rising of its bed, will be prevented by two causes; first, the valley on each side of the river is gradually filling up, by the deposition of sediment from a multitude of streams, large and small, draining immense tracts of cultivated land, making a broad, natural levee; second, it is obvious that the volume of water flowing in the channel is decreasing annually. This last phenomenon is accounted for by the extensive destruction of forests and the cultivation of the land, which increases its absorptivity, and the consequent comparative desiccation of the country by the sun's heat. This has always been the case with rivers flowing through highly cultivated districts. The Danube, in Europe, is gradually becoming unfit for commercial purposes; and even our own Connecticut can be forded nine months in the year, where formerly there was a large volume of water during the whole year, and it is hardly navigable for ordinary vessels, even as far as Hartford. The rivers of the country are gradually drying up, and steam is being substituted for the former ample water powers. There seems to be a conflict between agriculture and water transportation, the former rapidly gaining the victory. It is remarkable that within a single generation man should so modify the physical configuration of the country—drying up its rivers, changing the course of trade, destroying important manufacturing interests, and, as has been seen, threatening the existence of the very "Father of Waters" as a means of communication between the great North West and the Gulf, and modifying the physical features of the Mississippi valley to such an extent as would seem impossible, except by long continued geological agencies. At the falls of St. Anthony, nature herself is opposed to man's manufacturing industry, and all the means which human skill and capital can command are employed to arrest a process of natural destruction. These falls were twenty-seven feet high forty years ago, and now they are hardly twenty. The time was when the falls were at Fort Snelling, seven miles below. They have worn their way back seven hundred feet within forty years, averaging seventeen feet a year in their backward march. The danger has become so imminent that a company with a large capital has been organized to preserve these falls by every contrivance known to engineering science.

Professor Watson said that the river Rhine had been made to flow in a regular channel with a sufficient depth, where formerly it was very unstable, by the use of fascines and other engineering devices.

Professor Gross then made a communication upon the methods employed in illustrating lectures on physics, by means of photographs projected upon a screen. The oxyhydrogen or lime light is used for the purpose. After giving a short sketch of the history of the oxyhydrogen blowpipe, the Professor exhibited a new and superior burner, used by Mr. Black; the inner tube of the jet is perforated with small holes, which issues a more perfect mixture of the gases, and consequently finer results than are ordinarily obtained. The theory of projecting images upon the screen was explained, and then the applications of the light to lecture purposes was taken up. The decomposition of water by electricity was illustrated in a most striking and vivid manner. The evaporation of ether, at the ordinary temperature, was shown, the heavy vapor slowly rolling over the edge of the vessel. Also the convection of currents of air was well illustrated. A cylinder of steatite, being substituted for that of lime in the oxyhydrogen flame and its image magnified and projected upon the screen, it could be plainly seen that the steatite was partially fused; it was a good illustration of the intense heat developed in the oxyhydrogen flame.

The Professor then exhibited the aphongoscope, an instrument intended for the projection upon the screen of opaque objects. Two lime lights are made, by means of condensing lenses, to illuminate the object to be shown, which may be a card photograph, coin, cast, or almost any opaque object; and a magnifying lens forms the image upon the screen. This instrument was brought from London by Mr. Waldo Ross.

Mr. Stimpson made a few remarks, drawing attention to the fact that the intensity of the calcium light permitted the presence of a considerable amount of common artificial or sunlight in the room, without impairing the clearness of the image; and therefore without the fatigue, to the eyes, experienced in a short time when bright pictures are represented in a very dark room. He explained that the greater comfort to the eyes, in using semi-transparent instead of opaque shades on ordinary lights, was due to the same principle.

R. O. C.

Recipe for Curing Hams.

To one gallon of water, take one and a half lbs. of salt, one half lb. of sugar, one half oz. of saltpeter, one half oz. of potash.

In this ratio, the pickle can be increased to any quantity desired. Let these be boiled together until all the dirt from the sugar rises to the top and is skimmed off. Then throw it into a tub to cool, and when cold, pour it over your beef or pork, to remain the usual time, say four or five weeks. The meat must be well covered with pickle, and should not be put down for at least two days after killing, during which time it should be slightly sprinkled with powdered saltpeter, which removes all the surface blood, etc., leaving the meat fresh and clean. Some omit boiling the pickle, and find it to answer well, though the operation of boiling purifies the pickle by throwing off the dirt always to be found in salt and sugar. [Having tried this recipe, we know it to be excellent. Ed.]

Death of Mr. Sidney E. Morse.

Sidney E. Morse, a well known inventor and journalist, widely known and respected for his benevolence and philanthropy, died on December 23rd, at his residence in New York city, in the 78th year of his age. He was a native of Charlestown, Mass., and was educated at Yale, afterwards studying law and theology. For many years he was the editor and proprietor of the New York *Observer*, having, at the early age of 16, connected himself with journalism by writing on various political subjects. His inventions were ingenious and useful, and comprised, among others, the flexible piston for pumps, patented in 1817, a process of printing maps on an ordinary press, patented in 1839, and a bathometer, an ingenious device for making deep water soundings. In the latter invention, he was aided by his son, and up to the day of his death, it engrossed his attention. He was three years younger than his distinguished brother, Samuel F. B. Morse, and, like him, has lived a long life of hard work for the benefit of his countrymen and humanity.

Golden Ink.—Gold ink is prepared as follows: Grind, upon a porphyry slab with a muller, gold leaf and fine white honey, till the former is reduced to an impalpable powder. The paste is then carefully collected and diffused through water, which dissolves the honey, causing the deposition of the precious metal. The water must now be decanted and and the sediment edulcorated to free it from the saccharine matter; the powder exsiccated is very brilliant, and, when required for use, is suspended in mucilage of gum arabic. After the writing executed with this ink is dry, it should be burnished with ivory. Silver ink is made in the same manner by substituting this metal in leaf for gold.

We hear from Germany of the invention of a new alloy for making imitation jewelry. It consists of copper, 58·86 parts, zinc, 39·24 parts, and lead 1·90 parts. We cannot vouch for its success, but it is so simple that any of our readers can try it for himself.

Read's Oil Can.

This is an improved attachment for oil cans, so constructed as to rise above the mouth of the can when the can becomes nearly full, to indicate the progress of the filling, and to prevent the overflowing of the oil, which is the usual indication that the can is full. A small frame is made rectangular or nearly so in form, the upper part of which is soldered to the upper part of the interior of the body of the can, which is of the usual form. Directly beneath the mouth of the body is a rod passing vertically through the top and bottom bars of the frame, so that, when the rod is raised, the upper end may project above the mouth of the can. To the upper end of the rod is attached a small cap, to enable the upper end of the rod to be more conveniently seen, and which may also close or partially close the spout of the supply can, and wholly or partially interrupt the flow of the oil. Upon the lower end of the rod is placed a disk, to prevent the bottom of the body from being injured by the end of the rod, should they come in contact. A small float or ball, made of cork or other suitable material of sufficient lightness to float in oil, is attached to the rod in such a way as to carry the latter with it in its movements. The cap of the rod is made so much smaller than the interior of the part of the nozzle through which it moves that it will not interrupt the outflow of the oil. By this means the hight of oil in the can is indicated, so that waste, by overflow in filling, with its attendant uncleanliness, is avoided. Mr. Frederick W. Read, of Marquette, Mich., is the patentee.

STEAM TOWAGE ON CANALS.

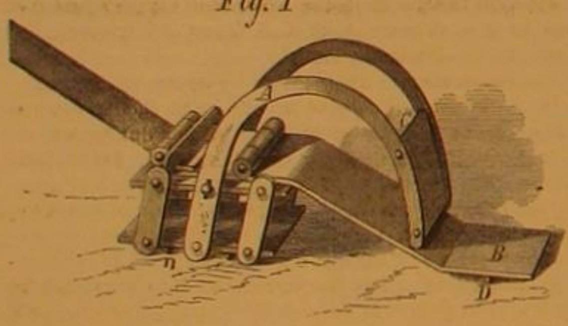
An economical substitute for towage on canals, applicable to all boats at present in use and securing a higher rate of speed, has long been a desideratum. The inventor claims that this is now furnished in the device herewith illustrated in Fig. 1, which, with the one shown in Fig. 2, was patented by Mr. Harvey Fowler, of Washington, D. C., Dec. 12, 1871.

It consists in the employment of stilts or setting poles connected with an oscillating crank shaft, to be worked by steam or otherwise, having feet of a peculiar construction at the extremity of the said stilts.

Fig. 1 represents the stilt in the act of pushing, and Fig. 2 shows the position of the parts as the stilt is withdrawn to take a new step.

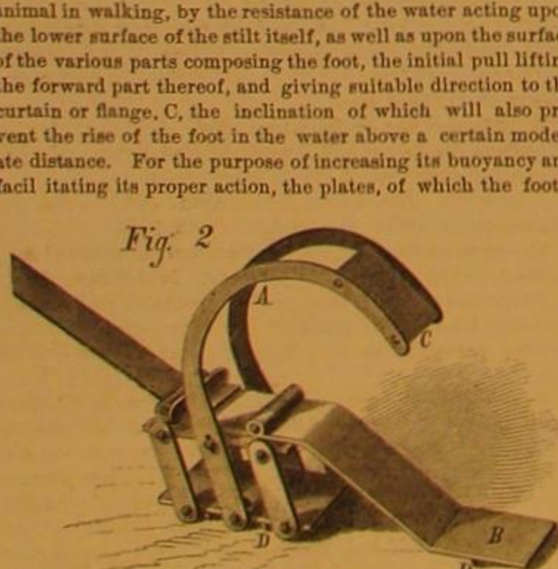
It will be evident, on examination, that no considerable disturbance of the water can take place in using this apparatus, and it will be equally apparent that but very slight disturbance of the ground is occasioned, whether the same be hard or soft, far less, indeed, than that produced by a submerged screw propeller. The push is obtained by direct downward pressure, as is shown in the engraving, the clasp, A, falling upon the flat, B, and pressing directly downwards; and, when the stilt is drawn forward, it does not drag upon

Fig. 1



the ground at all, but is lifted therefrom as the foot of an animal in walking, by the resistance of the water acting upon the lower surface of the stilt itself, as well as upon the surface of the various parts composing the foot, the initial pull lifting the forward part thereof, and giving suitable direction to the curtain or flange, C, the inclination of which will also prevent the rise of the foot in the water above a certain moderate distance. For the purpose of increasing its buoyancy and facil itating its proper action, the plates, of which the foot o

Fig. 2

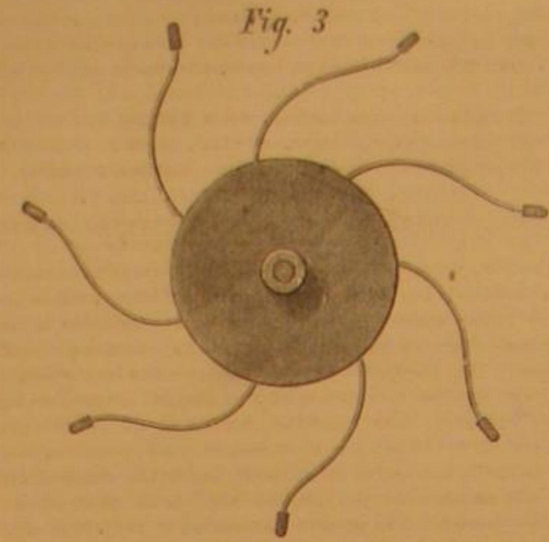


claw is composed, and also the curtain or flange, are to be hollow. When the slit is projected for giving a forward motion to the boat, the foot descends and rests firmly and immovably on the ground, its hold being increased by ribs, D. The jointed oscillating connecting rods between the stilts and the crank shaft being of spring steel, there can be no concussion and no jar.

The stilts are to be worked by steam power, or by Fowler's hand propeller, and may be attached to any boat now in use, or placed in a boat for towing, or in a section of boat, fitted upon the front of an ordinary boat, to be detached therefrom at pleasure.

The wheel, Fig. 3, with flexible spurs, is designed to be used as a side wheel (a pair, of course, for each boat, removable at pleasure), the spurs reaching to and taking hold upon the ground at the bottom of the canal. This kind of wheel will be found more suitable than any other as a means of propulsion, when the bottom of the canal shall have been made uniformly level and hard; an improvement which forcibly commends itself to the attention of the Canal Commissioners and the Legislature.

Fig. 3



The sharp or pointed bow construction of the boat using these propellers, will render protection of the banks unnecessary, as no considerable wave will be formed; and it is confidently affirmed that a speed of eight or ten miles an hour may be attained.

Core Retainer for Tubular Rock Drills.

Charles J. Stevenson, of Hazel Green, Wis., assignor to himself and Martin H. Duckworth, of New York city, has invented a reliable detainer for any broken sections of core, and one that will not injure soft matter passing through the tubes of rock drills. The invention consists in the application of spring jaws within the tubular shank of the drill, in place of the adjustable wedges heretofore in use. The springs are by the entering cores crowded outwardly, allowing them to pass, but spring against the ends of entered sections when dropping down. In rock drills now in use, the wedges, for arresting the core and preventing it from falling out when the motion is reversed or arrested, are of such nature as to crumble soft material, and make the obtaining of a perfect core almost impossible. In boring for veins of valuable minerals, it is necessary to obtain a perfect core in order to ascertain not only the quality and kind of material, but also the distance from and between certain veins. Therefore, the preservation of the core is an absolute requisite. This desirable result will be secured by Mr. Stevenson's improvement.

Fruit Dryer.

The object of this invention is to obtain pure air for the evaporation of water from fruits, berries, milk, juices, and solutions of as pure a quality as possible, so that the mass or solution may not be contaminated by impure matter carried to it by heated air. It consists in a combination of a caloric engine with a fruit dryer or evaporator, in such a manner that the engine will exhaust into the dryer or evaporator and thereby furnish the mass or solution with a supply of pure air. The exhaust pipe of the engine leads into the lower part of the fruit dryer or evaporator, and supplies the latter with the requisite quantity of hot air. The temperature may be lowered by causing a stream of cold air, driven by a pump or fan operated by the engine, to mix with the exhaust from the engine. Mr. Charlie H. Martin, of Chapinville, N. Y., is the inventor of this improvement.

The Behavior of Cements and Metals in Conjunction.

At a meeting of the Institution of Civil Engineers in 1865, when Mr. Grant's first paper on "The Strength of Cement" was read, Mr. G. Dines, in the course of the discussion which followed, said he feared that Portland cement had a corrosive effect upon iron; therefore, when cement had to be in contact with iron, he always used Roman.

Mr. Scott Russell said Portland cement had been extensively used in the insides of ships to preserve the iron from corrosion; and after eighteen years' use, he had seen Portland cement dug out of an iron ship, when the red lead paint and the skin of the iron were as sound as on the day they were put there.

Mr. H. Maudslay thought this fact appeared to show that the cement had not been in actual contact with the iron, as it was protected by the red lead paint to the extent, probably, of two or three thick coats. The caution raised with reference to the effects of Portland cement in contact with wrought iron had been made upon the supposition of a fact which did not appear to exist.

Mr. Scott Russell suggested that the inference to be drawn from Mr. Maudslay's observation would be that, wherever cement was used with iron, the iron should be painted with red lead.

Mr. F. J. Bramwell said that a question had been raised with respect to cement placed in contact with iron, which turned out to be a question of cement upon oil. He might say, that having occasion to form a deck upon a floating dock, which deck he did not wish to be combustible so as to be in danger if a hot rivet fell upon it, nor to be liable to rot if temporarily immersed in water in a tropical climate, and which therefore did not admit of the use either of creosoted or of unprotected timber, he had made every inquiry he could as to the behavior of Portland cement concrete in contact with iron; and he was then having prepared a Portland cement deck, three inches thick, but he was afraid that experiment would not settle the question at issue, because, after all, it would only be cement upon oil, all the iron having been steeped in oil when hot.

Soon after this discussion had taken place, a piece of stout iron piping was bedded part of its length in mortar brickwork and the remainder in cement brickwork; but whether it was Portland or Roman cement, we are unable to state positively. Within the last two days we have examined the pipe, and find that, where the cement was used, the iron is destroyed and full of holes, while the other portion of the pipe remains as sound as it was at first.

We give this fact for what it is worth, and do not wish any general inferences to be hastily drawn from it. It may be that particular conditions are requisite to lead to this result or that certain precautions will prevent it. At any rate, however, it inculcates the necessity for inquiry. Probably a special examination of one of our ironclads in which cement has been used would not be out of place.

Touching the preservative power of a coat or two of red lead, we should not be very sanguine, and for this reason: In a certain set of houses the external wall forms the back of the cistern, and the front and sides are of wood. The wall is rendered with Portland cement to form a flat surface; and the lead lining is dressed over cement and wood alike. We have recently examined several of these cisterns, and find that, while the lead on the wood front and sides is perfectly sound and good, the lead on the cement has been entirely destroyed, and, indeed, is so changed in character that, from sight alone, it would be difficult to say what the material is.—*Condensed from the Builder.*

BARTHOLOMEW'S SELF-ADJUSTING SUSPENDER.

Having ourselves tested the superior comfort and convenience of this brace, we can recommend it as a decided improvement upon anything we have tried, for ease and comfort.

Fig. 1

The feature of the invention is the self-adjusting back slide obverse and reverse sides of which are shown in Figs. 2 and 3, Fig. 1 being a perspective view of the brace as it appears when worn.

The two parts of this slide are pivoted together in the center, each part being a keeper through which one of the webs of the brace passes. The inner one is made in the usual oblong form, with a straight crossbar. The outer one is made circular, the crossbar being also expanded into a circle, the two crossbars being pivoted together as shown.

Fig. 2

Fig. 3

When worn as shown in Fig. 1, the slide adjusts itself into the exact position where the suspenders naturally cross, and maintains this position, making the brace fit the form exactly and comfortably, and giving to the dress an easy and luxurious feeling, which will win for the improvement a wide popularity.

The invention was patented March 29, 1870, by Thos. W Bartholomew, and the article is manufactured by the Waterbury Suspender Company, Waterbury, Conn., to whom orders may be addressed.

JUDGE of thine improvement, not by what thou speakest or writest, but by the firmness of thy mind and the government of thy passions and affections.—*Fuller.*

Scientific American.

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NEW YORK, SATURDAY, JANUARY 6, 1872.

Contents:

(Illustrated articles are marked with an asterisk.)

WE are printing every week 40,500 copies of the SCIENTIFIC AMERICAN, and subscriptions are pouring in as they never have before. We expect to reach a circulation of 50,000 before the 1st of next April, and, from present indications, we shall not be disappointed. Send for illuminated poster and calender for 1872, catalogue of our publications, blanks for names, or specimen copies, to Munn & Co., 37 Park Row, New York. For terms and inducements for clubs, see prospectus on last page.

SIX MONTHS OF ENGINEERING PROGRESS.

While the last six months have been more distinguished for advances in mechanical than in civil engineering, and while little has been done in either department which can be placed in the category of great improvements, the time has not been unfruitful. Good, solid, healthy progress has been made.

In civil engineering, the great works which were begun have advanced with unprecedented rapidity. Of these, the most prominent in this country are the removal of the Hell Gate obstruction at Hallett's Point, East River, the New York and Brooklyn Suspension Bridge, and the Hoosac Tunnel. Each of these works has been pushed ahead during the last six months with a vigor that evidences the continued enlargement of mechanical and engineering resources.

The Brooklyn Pier of the East River Bridge now stands 72 feet above mean high tide. The caisson on the New York side has been sunk to the bottom of the river by the weight of masonry upon it, and work in the inside has been commenced.

In regard to the tunneling at Hell Gate, although we are not in possession of exact figures on which to base estimates, we hazard the prediction that it will be found, at the termination of the work, that the cost of blasting and removing will be less than that of any similar quantity of the same material in any preceding work. This will be owing to the use of improved mining appliances, which greatly facilitate this kind of work. For the same reason, the completion of the Hoosac Tunnel will be reached much sooner than would have been the case but for recent additions to our means of drilling and blasting rocks.

The inauguration of the Mont Cenis Tunnel, which took place Sept. 19th, marks the termination of one of the greatest works of modern times.

During the period under review, many large railroad enterprises have been projected, and a large amount of iron has been put down.

In marine engineering, the compound engine system has been largely extended, and it is probable that this system will become almost universal with sea-going steamers.

Among inventions which deserve to rank far above the average, the cutting of hard substances by the use of sand projected against the surfaces to be cut, or falling thereon by the action of gravity alone, is perhaps the most noteworthy. There have been, however, important advances made in other branches of industry. Wood working machinery, in particular, has received many and important additions.

New applications of electricity to regulating large and actuating small machines have been made. Devices for increasing safety in the use of steam have been a numerous progeny, some of them being excellent inventions.

The inventive talent of the country has been concentrated on the problem of canal boat propulsion, through the offer of a large prize by the New York State Legislature. Numerous inventions have been made, and the subject has been discussed in all its bearings. What will result, the future must determine; but we trust all this labor will not come to nought.

The increased use of artificial stone, for various purposes, is a feature of the time. Concrete building is slowly winning public favor, and, we trust, will continue its advances, as in it we see the solution of the problem of cheap building.

The great fire in Chicago has aroused the attention of constructors and inventors to the necessity of increased protection from fire, and doubtless, important improvements will result.

In short, the past year has been one of activity, and decided though unostentatious progress, which gives good ground for the prophecy that the one to follow will not be barren.

PROPOSED ATLANTIC AND GREAT WESTERN CANAL.

For a long time, the question of a direct water communication between the Mississippi Valley and the Atlantic, on some route where the northern annual frosts would not obstruct a winter passage, has been discussed and rediscussed. The general Government has authorized extensive surveys, and nearly every route that seemed practicable has been explored. The extended growth of the agricultural interest in the West, and the pressure upon every outlet of its annually increasing productions, urges the consideration of this question at the present time more than at any former period. The present connection of the great chain of lakes with the seaboard, by the Erie Canal and Hudson River, has been notoriously deficient. A large amount of traffic has been diverted through the Welland Canal and St. Lawrence River, and a valuable trade established that would have been kept wholly within our own borders, had the Erie Canal been enlarged in time and sufficiently to furnish facilities for the transportation of the vast productions of the Western States.

It has long been seen that a highly practical route for a canal, connected with certain navigable rivers, exists in Georgia. The annual report of the Superintendent of Public Works, for the State of Georgia for 1871, does full justice to this route, over which constant water communication at all seasons, from St. Louis to Rome, Georgia, can be obtained by the construction of a canal, thirty miles in length, across the neck of land which, in the vicinity of Guntersville and Gadsden, separates the Tennessee and Coosa Rivers. From Rome, the proposed canal is to be continued *viâ* the Etowah river through a broad level valley, and along Rocky Creek to the nearest point of contact between this creek and Long Branch, thence along the ridge, between the Etowah and the Chatahoochee rivers to the latter, in the vicinity of Warsaw and Duluth, thence by an aqueduct across the Chatahoochee, and through the valley of the Ocmulgee river *viâ* either Atlanta or the Yellow River to Macon, whence there is always steam navigation to Savannah and Brunswick, making about 148 miles more of canal, the entire cost of the work being estimated at $10,000,000. The advantages of the proposed canal are thus summed up in the report:

"The distance from St. Louis to New York, by way of the lakes and Erie Canal, is 1,932 miles. From St. Louis, by the Atlantic & Great Western Canal to Savannah or Brunswick, 1,088, a saving of 844 miles. From St. Louis to the Gulf of Mexico, by the Mississippi, is 1,370 miles, actually 282 miles further than to the Atlantic Ocean by the Georgia route. By this route, a barge, loading at St. Louis or any other point on the Mississippi or its tributaries, can discharge her cargo on board a vessel at Savannah or Brunswick, without, in the meantime, breaking bulk, thereby saving the cost of transhipment, storage, and wharfage, incident to other routes. No marine insurance will be necessary; and being unobstructed by ice in winter, and with abundant water in summer, it will at all times afford a sure and certain transit to the sea. And being, for most of the distance, a river route, it will afford the cheapest transportation known to the commercial world. A tun of freight from St. Louis to New York now costs $11.76, sent by way of the lakes. To Norfolk, by the James River and Kanawha Canal, it will cost $6.61. From St. Louis to Savannah or Brunswick, $4.56, a saving of $7.20 upon present charges, reducing the freight upon wheat to 14 cents a bushel, and its cost to New York to 22 cents."

It will be seen that this proposition makes a bold bid for the trade of the Great West, and it is, we believe, perfectly feasible. It has been pronounced practicable by able and experienced engineers, and the route would, doubtless, have already been opened, had not the production of cotton so fully absorbed the attention of southern capital. Had the Erie Canal, twenty years ago, been enlarged to permit the passage of boats of 600 tuns burden, as it ought to have been, the interest of this State and its great metropolis would not have been endangered by the opening of competing avenues of trade, either North or South. Such an inevitable result was to have been foreseen and provided for in time. It is not, however, yet too late to retain the legitimate share of traffic that ought naturally to flow through this State to the port of New York. The resources of the West are so large that it will ultimately task every commercial thoroughfare to relieve it of its surplus products. It is to be hoped that the legislature of New York will not content itself by the offer of its $100,000 prize for a system of canal boat propulsion. Such a system, if obtained and adopted, would not increase the carrying capacity of the canal nearly to the extent demanded by the exigencies of the case. The canal should be enlarged throughout, so as to float 600 tun barges. The effect of such enlargement would be an immediate and enormous accession to the commerce of the State.

ARTIFICIAL STONE.

The importance of this subject justifies our frequent recurrence to it. The reader will find, on another page, the commencement of an able paper by Dr. Ott, recently read before the American Institute, which discusses the relative merits of various kinds of stones now looked upon as the best yet made by artificial means. Without indorsing all the views therein expressed, we call the attention, of those interested in the progress of this industry, to the facts, therein collected from many sources, which are of great value to all who desire to become perfectly familiar with what has been done and is now doing in this field.

Few are aware how much has been written upon this subject, or what an amount of study it has received. The following is an imperfect list of authorities which may be consulted by those who can gain access to them:

Guyton Morveau. *Recueil de divers mémoirs sur les pouzzolanes naturelles and artificielles.* Paris, 1805.

Fleuret. *L'art de composer des pierres factices, etc.* Paris, 1807.

John Smeaton. Directions for preparing, making and using puzzolano mortar. London, 1812.

Vicat. *Recherches experimentales sur les chaux de constructions, les bétons et les chaux ordinaires.* Paris, 1818.

John. *Ueber Kalk und Mörtel.* Berlin, 1819.

Rancourt de Charleville. *Les mortiers.* St. Petersburg, 1822.

Freussart. *Mémoire sur les mortiers hydrauliques, et sur les mortieres ordinaires.* Paris, 1829.

Ch. Bérigny. *Mémoire sur un procédé d'injection.* Paris, 1832.

Vicat. *Resumé sur les mortiers hydrauliques.* Paris, 1840.

Pasley. Observations on limes, calcareous cements, mortars, stuccos and concrete, and on puzzolana, natural and artificial; together with rules deduced from numerous experiments for making an artificial cement, equal in efficiency to the best natural cements of England. London, 1847. Second edition.

Henschel. *Gesammelte Erfahrungen über die Verarbeitung und Anwendung des Ciments, aus der Cementfabrik von Ernst Koch in Hessen-Cassel.* Cassel, 1851.

Joseph Bonin. *Traveaux d'achèvement de la Digue de Cherbourg, de 1830-1853.* Paris, 1857.

G. Feichtinger. *Ueber die chemischen Eigenschaften mehrerer bayerischer hydraulischer Kalke im Verhältnisse zu Portland Cement.* Munich, 1858.

John von Mikálik. *Practische Anleitung zum Bèton Bau.* Vienna, 1859.

W. A. Becker. *Der feuerfeste Treppenbau von natürlichen und künstlichen Steiner* (with 16 plates). Berlin. Second edition, 1861.

J. Manger. *Der Stettiner Portland Cement in Versuchen und Erfahrung in dargestellt und beleuchtet.* Berlin, 1862. (?)

Practical treatise on Limes, Hydraulic Cements and Mortars, by Q. A. Gilmore, A. M., U. S. Corps of Engineers. New York; D. Van Nostrand, 1863.

Von Gerstenberg. *Die Cemente.* Weimar, 1865.

W. A. Becker. *Practische Anleitung zur Anwendung der Cemente zu baulichen, gewerblichen, landwirthschaftlichen und Kunstgegenständen* (with 31 colored plates). Berlin, 1860-1868.

Victor Petit. *Habitations champêtres. Recueil de maisons, villas, chálets, pavillons.* Paris.

G. Hagan. *See Ufer und Hafenbau.*

W. Michäelis. *Die Hydraulischen Mörtel, insbesondere der Portland Cement in chemisch-technischer Beziehung.* Leipzig, 1869.

A Practical Treatise on the Manufacture of Portland Cement, by Henry Reid, C. E., to which is added a translation of M. A. Lippowitz' Work, describing a New Method, adopted in Germany, of Manufacturing that Cement. Philadelphia, Henry Carey Baird, 1869.

E. Böhmer and F. Neumann. *Kalk, Gips und Cement. Handbuch für Anlage und Betrieb von Kalkwerken, Gipsmühlen und Cementfabriken.* (With Atlas). 1870.

J. Mikálik. *Die hydraulischen Kalke und Cemente; ihre Verwendung.* (With five plates). Pesth, 1870.

The signs of the times point significantly to artificial stone as the building material of the future. In this category, we include bricks, which, when made of suitable material and properly burned, will probably resist the action of disintegrating influences as long as any natural stone obtainable.

Brick making, which has generally been done in the rudest fashion, has received considerable attention of late, and important improvements have resulted, especially in the construction of kilns by which a much better average stock is produced, and a large percentage of fuel saved. Bricks will, therefore, long compete with the very best natural and artificial stone as a building material, some having already stood the test of time for thousands of years.

In conclusion, we may say that with anything so universally in request as good building material, the slightest advance becomes of immense importance; and the study which is now being expended upon such improvements can scarcely fail to largely benefit the entire civilized world.

ALTHOUGH, almost ever since agriculture has been practiced, soot has been known to be a valuable manure, in the nineteenth century there are hundreds of farmers who cannot be persuaded to believe it. It is really as valuable as guano. Take a hogshead of water, and dissolve in it twelve quarts of soot, and you will have a splendid liquid manure for plants. Apply it to the roots, of course, and then watch the result.—*Journal of the Farm.*

GRANITE AND ASPHALTE ROADWAYS.

So much has been said about the superiority of asphalte over granite as a road making material, that those who have not the opportunity to form opinions from actual observation will be glad to obtain some reliable statistics, relating to the actual duration of granite roads under service, as a basis of comparison.

In Paris, where asphalt was first extensively used for street paving, the climate is such as to favor its use. It has not the slipperiness of surface that has been an objection in foggy rainy London, nor the winter ice accumulations of colder latitudes. Yet the London pavements afford an average test, of its adaptability to general use in cities, better, perhaps, than is found in the Parisian roads. The report of Mr. William Haywood, Engineer and Surveyor of the Commissioners of Sewers of the city of London, made to the Streets Committee of that body, furnished most important information upon this subject. The facts therein given at length are of the utmost value to this branch of engineering. The asphalts which have been, or are about to be, laid down in the carriage ways of the city of London are, the Val de Travers Compressed Asphalt, the Val de Travers Liquid Asphalt, the Limmer Liquid Asphalt, Barnett's Liquid Iron Asphalt, McDonnell's Patent Adamantean Concrete Paving; and to these may be added granite sets with asphalt joints.

The term "liquid" asphalt is used to indicate those asphalts which are brought to a semi-liquid state by heat, before being laid. French writers have named these, "mastic" asphalts.

For the methods of constructing asphalt roads in Paris, the reader is referred to an illustrated article on page 107, Vol. XXII. (February 12, 1870) of the SCIENTIFIC AMERICAN, in which full details are given.

The Limmer asphalt is brought from Limmer, near Hanover, and from Vorvohle, near Alfeld, Brunswick. The method of constructing roads with it is thus described by Mr. Haywood: "A concrete foundation is first formed, and the asphalt, which, in the Hanoverian mine, differs in quality from that in the Brunswick mine (the one being harder than the other), is used in certain proportions by the judgment of those directing the work; it is broken up and mixed with clean grit or sand of different sizes, according to the place in which the pavement is to be laid; a small quantity of bitumen is then added to the materials, which are placed in cauldrons on the spot, and made liquid by heat, and the compound is run over the surface and smoothed with irons to the proper slopes and curvatures. It is run in two thicknesses, the lower stratum being made with grit of a larger size than that of the upper. The total thickness of the asphalt, when finished, is from 1½ to 2 inches, according to the traffic in the street."

This pavement is laid in London only in Lombard street. Concrete foundations are also generally used for the Val de Travers asphalt in London.

There are various kinds of pavements, that have been tried or are to be tried, into which asphalt enters as one of the materials; those not yet tried are mentioned in Mr. Haywood's report, but we shall not refer to them further in the present article.

A granite pavement, with joints filled with a composition of pitch and oil, has been experimented with in Duke street, since 1868. In that street 350 yards of pavement were formed of granite, the size of the st nes being about 6 inches by 3 inches, and 6 inches deep; they were laid one inch apart from each other, the joints were filled up with small clean pebbles, and a composition of pitch and oil in a heated state was then run into them. Immediately adjacent to this was laid a granite pavement, constructed in the usual manner in vogue in London, the joints being filled with stone lime grout. The results are so far favorable to the pavement with pitch joints

The granite pavements are, in certain places, subjected to as severe traffic as can be found in the world, and as a consequence the very hardest stone is sought for in their construction. That usually employed is brought from Aberdeen, Scotland, and it is with this class of granite the comparisons are made. In our review of Mr. Haywood's report, we shall omit detailed comparisons of cost, since these would be no guide to American road builders. The comparison of relative durability is one which is universally applicable, and is what we wish to bring before our readers.

In these comparisons, the durability of the asphalt roads is assumed to be that period for which the contractors guarantee them to last. This period is, with one exception, seventeen years, in the streets referred to in the report. A pavement, called liquid iron asphalt, is guaranteed for eighteen years. The following is a summary of the durability of Aberdeen granite pavements (blocks 3 inches by 9 inches), the estimated duration being computed from extended data and records of dates of laying and relaying the streets named: Cheapside, 15 years; Poultry, 8 years; Old Broad street, 20 years; Moorgate street, 15 years; Lombard street, 20 years.

Two of these streets, Cheapside and Poultry, are those which are subjected to the most constant and heavy traffic in London.

The comparison is also limited to granite and Val de Travers asphalt, which, in Paris, is considered more expensive than granite. In London, there is little difference in cost, on streets where a great amount of traffic prevails.

In an extended statement of the advantages of asphalt roads, as compared with granite, Mr. Haywood gives a great many details and references, of which we shall make only a brief summary.

The asphalt roads are far less trying to vehicles and passengers than granite roads. The asphalt is far less noisy than granite, but not so much so as wooden roads. It is not so noiseless after being used some time as when first laid. The asphalt makes a road which dries very much more quickly after rain than the granite. In ordinary dry weather, it is less slippery than granite; at other times horses fall upon it, but not more frequently than they do on granite roads. In frosty weather, without snow, which makes the granite pavement slippery, the asphalt does not become so. When slight rains fall, followed by hard frost, the asphalt becomes very slippery, and at such times is more dangerous than granite; but this defect is at once remedied by slightly strewing the surface with sand. A worn, dirty granite pavement would, however, be more dangerous, under such circumstances, than the asphalt. The secretary of the London Omnibus Company, the Inspector of Pavements, the Superintendent of Street Cleansing, and the Police, are of the opinion that no more horses fall, on an average, on asphalt than on the granite roads.

On the whole, the comparison seems favorable to the asphalt roads, not only in point of cost, but in comfort. This conclusion will doubtless prove true of roads made of similar material in this country, provided such a material can be found to compete in cost with the stone now used for paving. It is further questionable whether the superior comfort and cleanliness of asphalt would not compensate for increased cost. We noticed in our issue of Sept. 2, 1871, an American asphalt which seems to us to have properties for roadmaking even superior to the Val de Travers or the Limmer asphalts, and we look to see extensive trials of its merits.

MR. JUSTICE GROVE, F.R.S.

Our English advices inform us that the distinguished philosopher, William Robert Grove, who has long been one of the most eminent men of the legal profession, has been raised to the Bench of the Court of Common Pleas.

Mr. Justice Grove is the son of a Welsh gentleman of property, and was born in Glamorganshire, in 1811. He was educated at Brasenose College, Oxford, and took his M. A. degree in 1833. He studied law in London for two years, and was called to the bar of Lincoln's Inn in 1835. Being compelled by ill health to surrender the more active duties of his profession, he, fortunately for science, devoted his brilliant intellect to the investigation of physical phenomena, especially those of electricity. One of the first productions of his researches was his invention, in 1839, of the voltaic battery which has given him a worldwide fame. Subsequently, in 1840, he received the chair of experimental philosophy at the London Institution, and continued to occupy it for seven years; and it was in the fulfilment of his duties as a lecturer that his courageous originality and penetrating diagnosis were shown in the assertion of the correlation and mutual convertibility of the various species of force. This announcement, one of the most brilliant lights over the field of nature which has ever illuminated the path of the investigator, and one of the greatest discoveries which has been made since Newton promulgated the laws of gravitation, is now universally accepted as indisputable truth; and Mr. Grove's experiments have substantiated the fact that no force whatever can be evolved except at the expense of some other force. The new doctrine gave the word at which many other scientists commenced their labors, and proofs of the truth and importance of the Doctrine of the Correlation of Forces are coming before us daily. Mr. Grove further developed his views in another lecture, published in 1846. Among his many valuable and important discoveries are the gas voltaic battery, the striæ in the electrical discharge, the electricity of flame, the voltaic etching of daguerreotypes, the electro-chymical polarity of gases, new combinations of aplanatic object glasses of telescopes, and the molecular impressions by heat and electricity.

Although Mr. Grove's weak health formerly prevented him from following the arduous career of a popular advocate, as a lawyer he has achieved a high reputation for learning and forensic ability, and he has just received a fitting recognition of his talents by his elevation to the judicial bench. To a philosopher of Mr. Grove's renown, public honors and wealth are of little importance, and indeed, his acceptance of the judicial ermine will cause him to forego a lucrative practice, and take the moderate income of $25,000 a year. But the ease and dignity of the new position will enable the eminent recipient to prosecute further his investigations, and we have no reason to doubt that the world of knowledge and science will be greatly benefitted thereby.

THE FIRST LOCOMOTIVES IN AMERICA.

There has been on our table for some weeks a book which we were reluctant to notice in the usual brief space we can generally allot to new publications. We have read this book*, which makes no pretensions to high literary style, with an interest and enjoyment that we are sure it will give to every intelligent mind.

The history of locomotives is perhaps more instructive than that of any other department of steam engineering. But in its beginnings, it has a peculiar attraction to young and old. The ludicrous predictions, the unbelief of the world, the daring of the earlier inventors, their mistakes and struggles, the genius displayed by them, the marvelous results that have followed their labors, form a chapter, in the annals of civilization, unequaled in grandeur and importance.

The author of the work under review states that, "being familiar with railroads from their first construction, he has, at much labor and expense, collected all the important facts in relation to their construction and to the development of the locomotive machine in this country. These facts have been obtained from the living witnesses who were the actors in those early events, and are presented in their own language."

The book opens with a dedication to Mr. Peter Cooper, in which the first paragraph is as follows:

"It is my belief that your early and most successful experiments upon the Baltimore and Ohio Railroad in 1829-30 proved that the locomotive could be used upon the short-curved railroads in this country. The practicability of this was doubted at the time mentioned even by the most eminent engineers in Europe. I cannot therefore refrain from bestowing upon you the praise of having given the first impulse to the adoption of the locomotive in the United States, a fact which justly entitles you to the honor of being regarded as the 'Father of the Locomotive System in America.'"

We venture to say that Mr. Cooper has become far more widely known through his public benefactions, since the period referred to, than by his connection with the introduction of locomotive engineering in America and his other inventions. The facts are however that he has been a rather prolific inventor, and has done as much for the general welfare in the quiet walks of industry as he has through his generous gifts of money for educational purposes.

The experiment referred to is described in the following extracts from a letter to the author by Mr. Ross Winans, who was present on the occasion:

"On Saturday, the 28th of August last, 1830, the first railroad car propelled by steam proceeded the whole distance from Baltimore to Ellicott's Mills, and tested a most important principle—that curvatures of 400 feet radius offer no material impediment to the use of steam power on railroads, when the wheels are constructed with a cone on the principle ascertained, by Mr. Knight, chief engineer of the Baltimore and Ohio Railroad Company, to be applicable to such curvatures. The engineers in England have been so decidedly of opinion that locomotive steam engines could not be used on curved rails, that it was much doubted whether the many curvatures on the Baltimore and Ohio Railroad would not exclude the use of steam power. We congratulate our fellow citizens on the conclusive proof, which removes for ever all doubt on this subject, and establishes the fact that steam power may be used on our road with as much facility and effect as that of horses, at a very reduced expense.

"The engine" (Cooper's locomotive engine) "started from Pratt street depot, taking the lead of a train of carriages. The power of the engine is a little, if any, over that of one horse, and it can therefore only be regarded as a working model. Immediately in front of and connected with it, was a passenger carriage containing (including the engine attendants) twenty-four persons. The aggregate weight of carriages, persons, fuel, and water, as nearly as could be ascertained, was estimated to be from four to four and a half tuns. Notwithstanding the great disproportion of the moving power to the load, the following highly gratifying results were obtained; the time was accurately noted by disinterested gentlemen of the first respectability:

"The entire passage of thirteen miles was made in sixty-one minutes, including the four minutes lost in taking in water at the middle depot. If this be deducted, it will give precisely fifty-seven minutes in traveling the distance."

Other names connected with the early history of locomotives are John B. Jervis, Horatio Allen, B. H. Latrobe, David Matthew, Stevens, Dickson, and others familiar to the engineering world, and, many of them, of wider fame as public men.

From evidence that seems conclusive, Mr. Brown states the first locomotive that ever ran upon an American railway was the "Stourbridge Lion," purchased by Horatio Allen for the Delaware and Hudson Canal and Railroad Company. Its first trial on the railroad took place at Honesdale, August 8, 1829. The engine was found too heavy for the track, and was consequently taken off.

The Hon. John Torrey, a resident of Honesdale who witnessed the trial, says:

"The failure was a great disappointment, not only to the directors and stockholders of the company, but also to the community, who were interested in the prosperity of the county.

"While thus standing by the side of the railroad, it was an object of great dread to timid children who were obliged to pass by it; and many, now residing in Honesdale, remember the care they were accustomed to take, when children, to avoid passing near the fierce looking 'lion.' In November, 1829, it was housed in with rough boards, as it thus stood beside the railroad, though some of the boards on the sides were soon displaced, to give opportunity for the curious to examine it more readily. It remained where thus housed some fourteen or fifteen years, until so many of its parts were detached or broken, that it was entirely disabled and considered worthless as a locomotive: when the boiler was removed to Carbondale, and used with a stationary engine in one of the company's shops, and the wheels, axles, and loose parts were sold for old iron. Some of the loose parts are still kept as mementos of the first locomotive run upon a railroad in America. The boiler is now [March 28, 1870] in use in Carbondale."

"Its plan of construction was much less simple than that of those now in use. From the great number of its rods and joints, some who were observers of its experimental trial on the road describe it as looking like a mammoth grasshopper, having three or four times the usual number of legs. Its driving wheels were of oak wood, banded with a heavy wrought iron tire, and the front was ornamented with a large, fierce looking face of a lion, in bold relief; and it bore the name of 'Stourbridge Lion.'

"This locomotive and two others, purchased by or made

*The History of the First Locomotives in America. From Original Documents and the Testimony of Living Witnesses. By William H. Brown, one of the Pioneer Locomotive Engineers in this Country.

for the company in England, arrived in New York in May, 1829. August came before the railroad was so far completed that the formal opening could be attempted."

The first American locomotive, the experiments with which we have already referred to, was built by Mr. Peter Cooper. With characteristic modesty, this venerable inventor writes, under date of May 18, 1869:

"The engine was a very small and insignificant affair. It was made at a time when I had become the owner of all the land now belonging to the Canton Company, the value of which, I believe, depended almost entirely upon the success of the Baltimore and Ohio Railroad.

"At that time an opinion had become prevalent that the road was ruined for steam locomotives, by reason of the short curves found necessary to get around the various points of rocks found in their course. Under these discouraging circumstances, many of the principal stockholders were about abandoning the work, and were only prevented from forfeiting the stock by my persuading them that a locomotive could be so made as to pass successfully around the short curves then found in the road, which only extended thirteen miles, to Ellicott's Mills.

"When I had completed the engine, I invited the directors to witness an experiment. Some thirty-six persons entered one of the passenger cars, and four rode on the locomotive, which carried its own fuel and water; and made the first passage, of thirteen miles, over an average ascending grade of eighteen feet to the mile, in one hour and twelve minutes. We made the return trip in fifty-seven minutes."

At the risk of making our extracts too profuse, we give the following description of Mr. Cooper's locomotive, from a lecture by Mr. B. H. Latrobe, before the Maryland Institute in 1868:

"The boiler of Mr. Cooper's engine was not as large as the kitchen boiler attached to many a range in modern mansions; it was of about the same diameter, but not much more than half as high. It stood upright in the car, and was filled above the furnace, which occupied the lower section, with vertical tubes. The cylinder was but three and a half inches in diameter, and speed was gotten up by gearing. No natural draft could have been sufficient to keep up steam in so small a boiler; and Mr. Cooper used, therefore, a blowing apparatus, driven by a drum attached to one of the car wheels, over which passed a cord that in its turn worked a pulley on the shaft of the blower. Among the first buildings erected at Mount Clare was a large car house, in which railroad tracks were laid at right angles with the road track, communicating with the latter by a turntable, a lilliputian affair indeed compared with the revolving platforms, its successors, now in use.

"In this car shop, Mr. Cooper had his engine, and here steam was first raised; and it seems as though it were within the last week that the speaker saw Mr. George Brown, the treasurer of the company, one of our most estimable citizens, his father, Mr. Alexander Brown, Mr. Philip E. Thomas, and one or two more, watch Mr. Cooper, as with his own hands he opened the throttle, admitted the steam into the cylinder, and saw the crank-substitute operate successfully, with a clacking noise, while the machine moved slowly forward with some of the bystanders who had stepped upon it. And this was the first locomotive for railroad purposes ever built in America; and this was the first transportation of persons by steam that had ever taken place on this side of the Atlantic, on an American built locomotive."

It is thus seen how large a debt the country owes to one of the most estimable of its citizens; a debt larger than is generally known and understood by the public; for, be it known, that other industries have been largely advanced by his inventions and suggestions. Like Franklin's, Mr. Cooper's name will descend to posterity clothed with honor, and in the future years, as in the present, will be uttered with pride by every true American.

We should gladly extend our rambles through this pleasant and instructive book; but our limits forbid. We have shown the reader some of its attractions, of which copious extracts from autograph letters are the chief, as they bring the reader into close contact with the individuality of a class of men which he rarely finds in other works.

The book is plainly but neatly bound, and is sure to meet with an extensive sale.

The author will supply the work on addressing him, care American Publishing Co., 31 Beekman Street, New York.

MR. GROVE ON PATENT LAW.

In a recent editorial, we placed our advocacy of the system of granting patents upon the broad ground of public rather than individual benefit. We held that patents are privileges granted, not rights inherent. Like other civil rights or privileges, patents are granted as a matter of policy. They are an inducement for inventors to make public rather than conceal their improvements; and thus the public gets the benefit of what it would otherwise never possess, or would in most cases only obtain after long delay. We now find these views so ably sustained, by the opinions of Mr. William R. Grove, Q.C., F.R.S., in his evidence before the House of Commons Committee on the subject of patents, that we reproduce below a portion of his statement.

It is well known on both sides of the Atlantic that Mr. Grove occupies a high rank as a scientist, and is perhaps as able a patent lawyer as can be found in England. Our extract is taken from the short hand report furnished to the *Engineer*.

Most of the honorable members of the Committee would perhaps agree with him that the notion of Government rewards is quite out of the question. To make political interest for inventors would be simply to have that man rewarded who was the most ingenious beggar. To his mind, it is not worthy of argument. He was perfectly prepared to justify what he said if any of the Committtee thought that any practical plan could be devised; but he thought it would lead to a perfectly impracticable result, that instead of having to attend their own business, they should have them running about the corridors of the House of Commons trying to obtain rewards for their inventions. He had considered that subject a good deal, and heard it a good deal discussed. Then what is next best? They might suggest a number of things, but they would come ultimately to this, whether they could not effect their purpose by something like letters patent; that is to say, by making the invention reward itself. Of course that was a very unequal and irregular reward, like most other human rewards; but he did not put letters patent on the ground of rewarding the inventor. He did not think that it was the business of the Government to be charitable or to give medals as tutors at school do; it is not a ground on which the Government could act, and, if Government were to act in all things on that principle it would lead to an, impossibility, to a theoretical Laputa. The real reason for rewarding the inventor is *pour encourager les autres*, to induce inventors to make their inventions and to work them or, so to speak, to force them on the public. The benefit, and the benefit alone which he thought should be looked for, from letters patent is the benefit to the public. He refused to consider it a matter of right. He considered it a matter of expediency. He did not in the least recognize a right in it. The merit of the great scientific man whose discovery leads to a thousand valuable inventions is immensely greater than that of the man who takes a single valuable commercial step; but though they gave the former some titular honors, they would pay the physician for saving the life of a child far more dearly than they would pay a man for discovering the law of gravitation. It is idle to talk of apportioning reward to abstract merit; the future must decide that; they must look to the practical question of immediate benefit to the State. He submitted that the sole ground on which letters patent can be held to be justifiable or permissible is that they are beneficial to the public. If they are, and so far as they are, keep them. If they are not, abolish them. [The distinguished witness has been since raised to the judicial bench. ED.]

SCIENTIFIC INTELLIGENCE.

BURNING METALS AS FUEL.

We can hardly expect to make use of the heat of burning metals as a substitute for wood, coal, or other fuel, but there may be occasions, where a sudden and short heat is required, in which metals would prove available. Some experiments, made by Ditte, upon the heat of combustion of a few of the commonest metals are therefore of sufficient interest to be recorded in a technical journal. Without going into the details of the processes by which he arrived at his results the results themselves are all that we require. The author has compiled the following table:

	For one grain.	For one equivalent.
Magnesium	6,130·5 units of heat.	73,568 units.
Zinc	1,357·6 " "	44,248 "
Indium	1,044·6 " "	37,502 "
Cadmium	271·1 " "	15,231 "

Two of these metals have been actually tried for both light and heat, namely, magnesium and zinc.

NEW USE OF THE HYDRATE OF CHLORAL.

Since the production of hydrate of chloral in considerable quantity, we occasionally hear of its incidental use in chemical manufacture. There are important compounds of acetic acid (not popularly known, but of considerable value, especially in medicine) which can be derived from the new hypnotic, chloral; for example, trichloracetic acid. A mixture of hydrate of chloral with three times its weight of fuming nitric acid is allowed to stand in the direct sunlight for three or four days until red fumes no longer appear. It is then distilled with thermometer, and, as soon as the temperature remains constant at 195° C., the product is saved, and proves to be pure trichloracetic acid. This interesting compound solidifies at 44° C. and fuses again at 52° C. Three hundred grammes of the pure acid were obtained from forty-eight grammes of the hydrate of chloral. Dichloracetic acid, a liquid resembling acetic acid, is one of the best agents for burning off warts and similar excrescences that we possess. Within a few years, numerous compounds of acetic acid have been invented, for which some use ought to be suggested; among them is the trichloracetic acid described above.

MODIFICATION OF LECLANCHE'S BATTERY.

M. Bouman, of Holland, has proposed some modifications of Leclanche's celebrated galvanic battery, that are said by our exchanges to be of considerable value. In a flat bottomed glass jar, a plate of gas carbon and a rod of amalgamated zinc are placed upright, a short distance apart. The intervening space and the surrounding parts of the vessel are then two thirds filled with the usual mixture of coarsely pulverized coke and black oxide of manganese. In order to prevent the zinc pole from coming in contact with the black mass, it is protected by a cover—a sort of muff—of woolen cloth. As soon as the coarse powder is in place, water is poured in until it rises a trifle above the surface; and a few crystals of sal ammoniac are laid in, which can be renewed as often as they disappear, as well as the water removed by evaporation. Leclanche produced the connection with the carbon plate by means of a covering of sheet lead, but as this was liable to oxidation, complete contact was often destroyed. Bouman remedies this evil by cutting a slit in the gas carbon pole, and inserting a platinum wire, on the end of which are clamps for connection with the outer circuit. Thus modified, the elements were found to run without interruption for a year, sufficiently strongly to drive an electric clock, and to sustain an alarm clock for two years. For the renewal of the battery, it is only necessary to wash out the coke and manganese with weak muriatic acid, and to replace such portions as have been consumed. Under the new arrangement, this is said to be the work of a few minutes The chief modifications appear to be the omission of the sheet lead, and the covering of wool or felt for the zinc plate.

DISINFECTING BY HEAT.

We learn from English exchanges that the corporation of Dublin have constructed a hot air chamber, in which clothes and bedding are disinfected for the public at a moderate charge. The walls and ceiling, of the compartment in which the clothes are heated, are built of brick, and its floor is composed of perforated iron plate. The heat is supplied from the exterior surface of a coil of pipe, eighty feet in length, which acts as part of the furnace flue. The products of combustion escape into the atmosphere without passing into the close chamber, and no emanations from the infected clothes can pass into the open air; this disinfecting apparatus cannot, therefore, taint the atmosphere of the locality Clothes can be disinfected in a common oven, the theory being that contagious germs are destroyed at a heat considerably lower than that at which the goods would be injured.

NEW TEST FOR STARCH.

The old and familiar test for starch is the blue color which free iodine produces when brought in contact with it; but this is not the only reagent by means of which we can detect the presence of starch in combination with similar bodies. Bromine is nearly as good as iodine, and tannic acid is said, in some instances, to be better. A solution, of 3·5 grammes tannin in 300 C.C. distilled water, will answer for making the test. A drop of this tannin solution will cause a precipitate in extremely dilute solutions of starch; the precipitate dissolves when warmed and reappears when the solution cools; and where the starch paste is old, the reaction is said to be more sensitive than that of iodine.

A SUBSTITUTE FOR THE SPECTROSCOPE.

E. Lommel has devised three very simple instruments called the *erythophytoscope*, the *erythroscope*, and the *melanoscope*, which can be advantageously used, instead of the spectroscope, for the detection of substances by their colors and colored flames. Two colored plates of cobalt blue and dark yellow oxide of iron glass are laid upon each other, and, by inserting them in black pasteboard, with a slit for the nose, something like a pair of spectacles is made of them. The combined glasses are only transparent for the ultra red, for yellow green, for blue green and blue rays; and they cut off all other colors. Substances, known to possess these colors or to impart them to the flame of a spirit lamp or Bunsen burner, can be detected by viewing them through such spectacles. The *erythroscope* consists of a cobalt glass and ruby glass, which only admits the ultra red, beyond Fraunhofer's line B, to pass. The third combination, called the *melanoscope*, consists of a dark red and clear violet glass which only allows the middle red tints to pass. Any one who possesses the facility of alternately using the right and left eye, could employ two combinations at once and thus cover nearly the whole length of the spectrum. For the use of students in laboratories, we should think that the simple arrangement described above could be frequently employed to advantage for the detection and separation of a large class of bodies which give characteristic colors to flames; and, by practice, the learner would soon be able to assign the true position to each color nearly as well as if he used the scale usually attached to the spectroscope.

DETERMINATION OF SULPHUR AND PHOSPHORUS IN IRON.

The presence of the least trace of phosphorus and sulphur in iron will destroy it for many purposes, and a correct and easy way of detecting these substances is therefore of importance. K. Meineke dissolves the finely pulverized iron in chloride of copper, separates the reduced copper by treatment with an excess of chloride of copper and common salt, filters through a layer of asbestos, brings the insoluble portions adhering to the asbestos into a beaker glass, and oxidizes by strong nitric acid and chlorate of potash; then he evaporates with hydrochloric acid and determines the sulphur by baryta, as sulphate, and the phosphorus by molybdic acid in the usual way. The novelty of this method is in the substitution of chloride of copper for the chloride of iron employed by other chemists, and its advantages are said to be in the greater facility with which the various liquids and solutions can be filtered. It also yields more accurate results than the former methods.

ECONOMICAL USE OF THE PHOSPHORUS OF IRON ORES.

A Bohemian engineer proposes to economize the waste phosphorus of iron ores by converting it into soluble salts He accomplishes this result by acting on the stamped ores by sulphurous acid, thus rendering the phosphorus soluble, according to the principle recently described in our journal. The ore is then thoroughly leached by water, the excess of sulphurous acid expelled by heat, and quicklime added until the whole of the phosphorus is precipitated. The precipitate can be used at once for agricultural purposes or can be worked up into salts of phosphorus. Where sulphur ores are used, they can be roasted and the sulphurous acid thus evolved advantageously economized to convert the phosphorus into the soluble modification. The iron ore, freed of its phosphorus, is now in condition to be worked for pure metal. The process can only be available where labor is cheap and good iron scarce, and where the yield of phosphoric acid would pay for the cost of its separation. The use of sulphurous acid for the purpose of reclaiming phosphorus ought to receive more attention from our metallurgists and chemists.

RELATIVE VALUE OF GALVANIC BATTERIES.

Count Moncel comes to the following conclusions, after examining the various forms of batteries in use: Of all the galvanic elements used in industry and the arts, those with bichromate of potassa yield the greatest electromotive force, are the most economical, and give off no irritating vapors; but are, on the other hand, not very constant, and become strongly polarized. He commends the following batteries, but gives no description of them: The Delaurier element, the Chutaux element, and the Grenet element.

ELECTROTYPES OF GELATIN PICTURES.

To prepare gelatin relief pictures for the galvanoplastic deposition of copper, the film is glued to a glass plate by copal varnish, and immersed for an hour in a concentrated solution of tannic acid, in order to render it less sensitive to the action of water. It is then suspended in a silver bath, until the whole surface is moistened. The picture is then laid down horizontally in the sunlight, and a copper wire moved over its surface. The silver separates as brilliant metal on the wire and on the parts of the picture touched by it. It then becomes a conductor, and only requires a weak current to deposit copper upon its surface. In this way, a gelatin picture can be easily converted into an electrotype.

APPLICATIONS FOR EXTENSION OF PATENTS.

MACHINE FOR TRIMMING BOOKS.—Mary H. Semple, Lowell, Mass., administratrix of A. C. Semple, deceased, has petitioned for an extension of the above patent. Day of hearing, February 28, 1872.

GRAIN SEPARATOR AND CLEANER.—Simeon Howes, Silver Creek, and Gardner E. Throop, Syracuse, N. Y., have petitioned for an extension of the above patent. Day of hearing, February 28, 1872.

HUB OF CARRIAGE WHEEL.—James M. Whitney, Providence, R. I., has petitioned for an extension of the above patent. Day of hearing, March 13, 1872.

PHOTOLITHOGRAPHY.—James A. Cutting and L. H. Bradford, Boston, Mass., have petitioned for an extension of the above patent. Day of hearing, February 28, 1872.

WIRE STAPLE.—Byron Boardman, Norwich, Conn., has petitioned for an extension of the above patent. Day of hearing, March 13, 1872.

HOT AIR FURNACE.—John Child, Elyria, Ohio, has petitioned for an extension of the above patent. Day of hearing, March 6, 1872.

LIGHTNING CONDUCTOR.—Caroline A. White, Racine, Wis., administratrix of Oren White, deceased, has petitioned for an extension of the above patent. Day of hearing, March 13, 1872.

Value of Extended Patents.

Did patentees realize the fact that their inventions are likely to be more productive of profit during the seven years of extension than the first full term for which their patents were granted, we think more would avail themselves of the extension privilege. Patents granted prior to 1861 may be extended for seven years, for the benefit of the inventor, or of his heirs in case of the decease of the former, by due application to the Patent Office, ninety days before the termination of the patent. The extended time inures to the benefit of the inventor, the assignees under the first term having no rights under the extension, except by special agreement. The Government fee for an extension is $100, and it is necessary that good professional service be obtained to conduct the business before the Patent Office. Full information as to extensions may be had by addressing

MUNN & CO., 37 Park Row,

Inventions Patented in England by Americans.

From November 28 to December 4, 1871, inclusive.

[Compiled from the Commissioners of Patents' Journal.]

ALE TIN.—J. T. Butler, New Orleans, La.
EXCAVATOR.—J. Shelley, Mahanoy, M. C. Bullock, Pottsville, Pa.
HAT LOOMS.—J. Van D. Reed (of New York city), London, England.
LAMPS, ETC.—J. W. Bartlett, New York city.
PUDDLING FURNACE, ETC.—J. Mackintire (of New York city), London, Eng.
STAIR ROD FASTENING, ETC.—H. C. Marston, F. W. Brooks, New York city.
STONE SAWING MACHINERY.—H. Young, Stamford, Conn, and J. L. Young, New York city.

Foreign Patents.

The population of Great Britain is 31,000,000; of France, 37,000,000; Belgium, 5,000,000; Austria, 36,000,000; Prussia, 40,000,000; and Russia, 70,000,000. Patents may be secured by American citizens in all of these countries. Now is the time, while business is dull at home, to take advantage of these immense foreign fields. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address MUNN & Co., 37 Park Row, New York. Circulars with full information on foreign patents, furnished free.

Notes & Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.]

1.—MOLDS FOR IRON CASTINGS.—Can these be made of plaster of Paris, and yield good castings?—J. H. P.

2.—TINNING CAST IRON.—Can any one inform me by what process I can tin cast iron?—J. R. W.

3.—LIQUEFACTION OF SULPHUR.—Will some of your readers tell me whether sulphur can be liquefied or not, and how?—F. C. A.

4.—CYLINDER LUBRICATOR.—What is the best lubricator or the cylinder of an engine?—A. S.

5.—BLUE THISTLE.—Can any of your readers tell me how to effectually kill out a very obnoxious weed, popularly called "blue thistle," which grows luxuriantly upon our poorest pasture land?—J. H. M.

6.—PAPER MAKING MATERIAL.—Can information be given of a simple process for testing the various paper making substances that come under the eyes of observing persons? and how can I make a sample of paper in the laboratory?—J. H. M.

7.—WHITEWASH.—Can any of your readers give me a good recipe for whitewash for rough wood work that is exposed to the weather, which will not come off when wet?—A. M.

8.—LETTERING ON STEEL.—How can I stamp letters or figures, on polished tempered steel, in black, such as we see on saws, (the makers name, etc.)?—C. T.

9.—WASTE OF PIG IRON IN CASTING.—Can any one tell me what would be the percentage of loss on iron, in pigs, passing through fire for purpose of making castings? The experience of any large foundry will be sufficient.—E. M.

10.—STAINING CANES.—Will some one oblige a number of amateur cane makers with a receipt for staining canes a good chocolate color, also for giving a matted appearance? The kind of wood used is principally white thorn, which is almost as hard and white as ivory.—W. H.

11.—LIGHTING BY GAS.—Is there any rule by which gas fittings may be proportioned in number in lighting churches, public halls, etc.? The burners consuming six foot of gas each per hour, how many will be required to light a given space?—G. E. E.

12.—TUBING FOR SIPHON.—I wish to bring hard water from a well by means of a siphon, distance 700 feet, fall 20 feet; what size and kind of tubing should I use? Will iron pipe fill up? Would bathing in, or watering stock with, water drawn through lead pipe from a cistern, be injurious?—P. B.

13.—CONSUMPTION OF FUEL IN MELTING IRON.—Will some of your readers state their experience as to the amount of coal that will be consumed in melting three thousand pounds of iron (mixed Scotch pig and scrap, one part of first, and five parts of second) in a small furnace; and how the coal and iron should be distributed to obtain best results?—H. A. W.

14.—TRANSFERRING POWER.—I have a small machine shop, and wish to put up a circular saw as cheaply as possible. I can get the speed required direct from the line shaft, and I want my saw mandrel to set at right angles with it. Can I run it with a quarter twist belt? The drum on the line shaft is three feet eight inches in diameter, and the saw pulley is five inches in diameter. The distance between the *face* of the two pulleys is three feet.—E. L.

15.—IMPURITIES IN COAL GAS.—Will some one please explain the following points? (1.) What is the easiest and simplest way of detecting, in coal gas such as is used for illuminating our buildings, the impurity known as a compound of sulphur and carbon? (2.) Where this impurity exists, is it deleterious to health, and injurious to furniture, paintings, gildings, etc.?—J. T. P.

16.—UTILIZING HUSKS.—Will any one give me, in few words, the best and most recent method of utilizing corn husks? In the West, they can be supplied in large quantity, but for the want of a remunerative market are now lost. And will any one inform me if there is any manufactory in the United States where the husk of the maize is used in making felt, paper, etc., successfully; and whether there is any simple form in which it could be introduced into our humane institutions, poor houses, etc? The value of such industry in public institutions, as a means of preserving health and order, deserves attention.—L. S. P.

17.—NEATS' FOOT OIL.—Will some one of your correspondents inform me how best to clarify neats' foot oil?—M. B. E.

18.—BOILERS IN THE UNITED STATES.—Can any readers of the SCIENTIFIC AMERICAN inform us how many steam boilers are in use in each of the New England and Middle States, also in the principal cities in each State?—V. & N.

19.—SAND IN DRIVE WELL PIPES.—Will some of your readers give me a remedy for sand drawing up the pipes, in drive wells, and thereby causing the valves to leak?—W. J.

20.—FUSION OF SAND.—Can common sand be melted and molded into blocks, say 16 inches square, without being mixed with other materials? If so, would such blocks be strong and hard to break, or would they be brittle? What degree of heat would be required to melt sand?—W. S. G.

21.—WATERWHEEL.—I have an overshot wheel, eight feet in diameter, which propels a drag saw for sawing wood, and a lathe. The wheel is getting old, and must be renewed or replaced by another kind. Will a small turbine, say 16 inches diameter (12 feet fall) with same quantity of water, give as satisfactory results as an 8 feet overshot, for moving a drag saw?—J. H. P.

22.—HEATING SMALL IRON ARTICLES.—Can any of your readers tell me the best mode of rapidly heating, to a red heat, small iron work, to be stamped or worked on drop presses, etc., without much scale? W. S. H.

23.—PREPARATION OF COTTON SEED OIL.—How can we prepare cotton seed oil in such a way as to make a quickly drying oil, to use for painting purposes, instead of boiled linseed oil?—S. & B.

24.—PROPORTIONS OF CUT OFF.—My engine works full stroke. I wish to cut off at three-fourths. I have a common slide valve; and have had a new valve made, with ⅛ inch more lap than the old one, which I think will give the proper cut off. What I wish to know is, will I have to alter anything else, either eccentric rod or eccentric?—A. H. G.

25.—PRINTING ON WOOD AND METAL.—Is there any way by which one can print, with type, on wood or on some common metal, so as to withstand entirely, or to a certain degree, the inclemencies of the weather, sun, rain, heat, and cold? The printing should be done in some kind of ink; and instead of on wood, it may be done on some kind of paper, parchment or other material that will withstand moisture, and can be nailed on the wood. But of course the direct application to the wood, if practicable, would be best.—G. H. P.

26.—MECHANICAL MOVEMENT.—I wish to procure a mechanical movement by which, two wheels being given, one acting upon the other and the motor wheel revolving at a uniform rate of speed, the speed of the wheel acted upon may be increased or diminished at pleasure. To be of any value the increase or decrease should be positive, and under the certain and complete control of the operator.—D. L.

27.—FRICTION MATCHES.—Doubtless the lucifer match was regarded as a great improvement upon the tinder box, and upon the friction of two sticks upon each other; but in these days of lightning expresses and lightning telegraphs, the lucifer match is a slow coach entirely. It requires about ten seconds to pick a match out of the box, scratch it, and ignite a candle or lamp. There are, in the United States, say 30,000,000 inhabitants or 6,000,000 families, and every family averages ten matches per day. A simple calculation will show that the people of the United States spend more than nineteen years every year in scratching lucifer matches. Cannot this valuable time, or a part of it, be saved? An almost indispensable requisite of the chemist's laboratory is the hydrogen lamp, which consists of a suitable vessel for generating hydrogen gas, having a stopcock and tube, at the end of which is a bit of platinum sponge; and almost in contact with the latter is the wick of a miniature alcohol lamp. This lamp is ignited by simply turning the stopcock, and apparently without loss of time. The hydrogen lamp is very simple in its operation, and the expense attending its use must be very trifling. If some enterprising inventor would perfect, cheapen, and introduce to the public the hydrogen lamp, or some other device equally effectual, to take the place of the friction match, he would not only secure for himself a fortune, but be instrumental in saving to the world a great deal of time, and preventing many destructive conflagrations, and deaths of children from eating matches, to say nothing of the burnt fingers, the loss of temper, and the profane swearing.—J. H. P.

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.

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.

CARBON PLATES FOR BATTERY.—Let A. N. take coke from the gas works, pulverize, mold to the required shape with flour and a little molasses, and bake it in an oven.—J. A. L., of Ohio.

HYGROMETER.—T. M., Jr., can pour alcohol or ether, instead of water, on the wet bulb of his hygrometer when the air is of a known humidity, and find the difference; then he can compute the humidity at lower temperatures.—J. A. L., of Ohio.

J. A. L., of Ohio, asks: Is Ampère's theory generally accepted, namely: If a compass is placed above or below a wire through which a strong current of electricity is passing, the needle tends to place itself at right angles to the wire? Ans. Yes.

T. J. P., of Ill.—We refer you for answers to your queries to the elaborate discussions of steam boiler explosions, already published by us.

W. T., of Mich.—A cylinder, to give a spherical surface to pilules of semi-plastic material, should revolve slowly and not be overcharged with the pilules. With these points properly attended to, we judge your apparatus will succeed.

SCREW CUTTING.—Let R. F. C. take the number of threads to be cut for a numerator, and the threads of the back screw for a denominator; thus, two threads on the back screw and four threads to be cut will give 4 divided by 2, equals 2 divided by 1. This *is* the proportion; so if 80 threads are required on the screw to be cut, the back screw must have 40 threads.—J. A. L., of Ohio.

REVOLUTION OF BODIES.—If R. O. H. goes around a tree, of course he goes around anything that may be on the tree. The varying position of the squirrel, in the case mentioned, does not affect the question at all, as the squirrel is always within the circle described by the man around the tree.—H. G. F., of Va.

BINIODIDE OF MERCURY IN SOLUTION.—If H. G. I. will dissolve the potassium iodide and the corrosive sublimate separately in small portions of the water or other menstruum, he will find, on mixing the solutions, that the resulting biniodide readily dissolves.—H. G. F., of Va.

SALT AND ICE.—We put salt in our pumps in cold weather, because water holding salt in solution does not freeze as readily as pure water. But where salt and ice (or snow) are mixed, the consequent liquefaction renders a large amount of heat latent, thereby effecting a very considerable reduction of temperature. A mixture of ice and salt in equal proportions will remain at a temperature of 4° Fahr. for several hours, and is, therefore, an excellent agent for refrigerating creams, jellies, etc. —H. G. F., of Va.

BEES IN WINTER.—Bees should, if possible, be wintered in the cellar or some other warm and dark room. A strong swarm, well supplied with honey, in a hive with good upward ventilation, with a small opening through the bottom board, would probably winter safely, even though covered with snow. A hive of bees out of doors requires for the winter, says Langstroth, twenty-five pounds of honey. In 1869, my twenty-seven hives (stored in cellar) consumed, between December 1st and March 18th, 15¼ pounds. Greatest loss, 21 pounds; the least, 9 pounds.—J. H. P.

J. H. V., of Kan.—Not knowing the cause of your boilers foaming, we cannot suggest the remedy. It is probable the fault is either in the construction of the boiler or in the quality of the water. If the former, the only remedy is to get a boiler properly made; if the latter, thorough purification of the water, by chemical means or by the use of a surface condenser, is necessary.

G. W. B., of Mich.—A wheel is in "standing balance" when, not being revolved, a perpendicular plane drawn through its axis of revolution will divide it into two portions having this relation, namely, that when the weight of each particle is multiplied by its horizontal distance from the vertical plane, the sum of all the products on each side of the plane shall be equal. If you should perform this operation with the wheel you propose, you will find the sums equal, and hence the wheel will be in standing balance, but not necessarily in "running balance," as the action of centrifugal force might change the relative distances of the particles.

CUTTING BEVELED JOINTS.—G. S. N., in reply to C. S., gives a rule for finding the miter cut of hoppers, etc., but not the bevel joint. Let C. H. S. bevel the edges of his stuff at any angle required; then, with the same bevel, strike a line across the face of the board, say from the top edge. Now, with the perpendicular hight of hopper, from the same edge draw a line parallel with the edge, cutting the line just formed; from the point of crossing, square across to the opposite side of the stuff; then a line drawn across the board, connecting the ends of the lines thus made, will give the true joint in every case where the hopper is square, or the sides at right angles.—G. D. Y., of N. J.

HYGROMETER.—To T. M., Jr., No. 19, December 16, 1871. Throw your hygrometer away: it is an ingeniously constructed one, but impracticable to American love of simplicity. Take two strips of soft poplar, cross grained, an inch and a quarter wide and four inches long, rubbed evenly down as thin as stout drawing paper. Secure an end of one to a suitable metallic frame, the edges of the wood being free and confined in polished metallic grooves, the opposite end to be attached securely to a strip of thin metal which reaches back to the place of beginning, at which place the other strip of wood takes the metal strip, and in its own grooves lies snugly, parallel with the first. Now, from the free end of the last wood, another shorter strip of metal acts as a connecting rod to a toothed sector; this engages a pinion on an arbor, which, passing through a disk, secures the pointer of the index. Graduate the circular scale from 1 to 100, having 50 at the top and a space between 1 and 100 at the bottom. Whenever the weather indicates that the dew point is reached, 80° on your dial will be about right, the pointer of course moving towards 50 as the moisture lessens, and "dry" being opposite to dew point. This instrument will never fail.—R. H. A.

NEW BOOKS AND PUBLICATIONS.

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

This new and elegant work presents, in convenient form, notices of the leading subjects and events, pertaining to science, that have occupied public attention during the past year. The progress of the more important public works is duly chronicled, with illustrative engravings. The leading discoveries, facts, and improvements, in chemistry, mechanics, engineering, natural history, and the various arts and sciences, are recorded and illustrated. Sketches of prominent scientific men, with illustrations, are given, and among the portraits are those of Faraday, Murchison, Darwin, Agassiz, Huxley, and Herschel. The Mont Cenis tunnel, the Hell Gate works, the Brooklyn suspension bridge, the Hoosac tunnel, the St. Louis bridge, the United States Patent Office, and other works are illustrated. A large amount of useful information, tables, descriptions of improvements, with engravings, are likewise presented. The book is one of much interest and value, and should have a place in every library.

Recent American and Foreign Patents.

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

WINDOW AWNING.—Charles C. Moore, New York city.—There is nothing new about the construction of the frame of the window. A strip of cloth, or other suitable material to form a shade, is made of the proper length and width to fit into the frame. The upper edge of the shade is attached to a roller in the ordinary manner. The roller may be a spring roller, or any other kind of a shade roller that may be desired. Triangular pieces of cloth, or of the other material of which the shade is made, may extend nearly to the upper end of the shade or only half the length. The triangular pieces may be made separate and sewed to the edges of the piece, or they may be all formed in one piece of the requisite width and cut to reduce them to the desired form. A bar is placed in a hem formed upon the lower ends of the parts. The bar is hinged or jointed at the seam or meeting of the pieces, so that it may be folded together to adapt the shade to be rolled upon and unrolled from the roller with the same facility as an ordinary shade. To adjust the shade for use as an awning, it is passed out of the window, above the upper sash, when the triangular pieces extend nearly to the upper end of the shade proper, and below the upper sash, when the same pieces extend only half the length of the shade proper. The end parts of the bar are then opened out at right angles with the middle part of said bar, and their ends are placed and rest upon the lower part of the window frame, thus forming an awning. The awning is secured in place by cords attached to the lower end of the shade, or to the middle part of the hinged or jointed bar, or at any other point or points equidistant from the joints of said bar, and are secured to hooks, catches, or other fastenings attached to the lower part of the frame. The cords may be the ordinary cords for raising and lowering the shade. If desired or necessary, the edges of the triangular pieces may have eyelets formed in them, to enable them to be conveniently secured to the sides of the casing or frame.

SEEDER.—Thomas L. Pierce and George Pierce, New Providence (Union Post Office), Iowa.—This invention consists in placing oval shaped buttons on cutaway ends of the conducting spouts to admit of scattering the seed to a greater or less extent, according to the nature of the seed to be deposited.

FENCE.—Russ B. Meeker, Sandford's Corners, N.Y.—The posts have bases which are broad transversely to the line of the fence, and which enter the ground slightly at their outer extremities, so as to hold them firmly from tipping by the action of strong winds, or by any pressure that animals may bring to bear against them. The rails are interlocked with these posts in such a way that a wedging action is secured with the rails themselves and with the rails and posts, making a firm yet easily created structure, which may readily be taken apart, and replaced whenever desired. In short, it is a portable fence, obviating the need of post holes, and not disturbed by the action of frost.

KNIFE CLEANER.—William S. Beebe, Joseph T. Baynes, and Abraham A. King, West Troy, N. Y.—This invention consists of a roller cleaner for knives, forks, spoon handles, and the like, in which one elastic faced roller turns and the other is stationary when the article is pushed in between them, and when it is drawn out, the roller, which was previously stationary, turns and the other is stationary, so that the labor of polishing is divided between the two movements, and can be accomplished with less pressure of the rollers than when the polishing is done on both sides at once; or, if the same pressure is maintained, the work will be done better. The invention also consists of a combination of a trough, containing brick dust or the like, with the lower roller so arranged that the dust will be automatically supplied to the roller.

WASHING MACHINE.—Oscar L. Dorr, of South Walpole, Mass.—The frame consists of two end uprights or posts which are, at their lower ends, connected by a longitudinal beam. In the upper part of the frame are the bearings of a multiple roller which is composed of a series of rods arranged in a circle around the axis. The ends of the rods are fitted into sockets provided for their reception in metallic head plates. These head or end plates are mounted upon a central axle, and further connected by screw rods. The rods are so fitted into the head plates that every other rod is free to revolve on its own axis, the remainder being rigidly secured. The axle is continued beyond the head plates and has its bearings in the uprights of the frame. Its ends are connected with springs which tend to draw it down, and with it the entire roller. Three plain rollers are hung in the frame under the multiple roller. The springs crowd the latter down upon the plain rollers. The fabrics to be washed are placed between the rollers, and rotary motion is then imparted to the latter by means of a crank handle, so that the rods and rollers will be successively brought into contact with the fabric, and by the springs carried forcibly against the same. The connection of the springs with the bearings of the axle is peculiar. These bearings are made in form of cylindrical blocks with an annular recess, cut into their lower ends. The spring enters this recess, thus embracing the pendent plug, and is fastened by a nail or pin driven through the block and one of the convolutions of the spring. The lower end of each spring is secured to the base by a screw or pin. Slotted or forked cleats are secured to the side of the tub to which this machine is to be applied, the base piece of the frame fitting into these cleats, and being thereby securely held in place.

EARTH SCRAPER.—George W. Bayley, of Stuyvesant, N. Y.—We shall be unable, in the absence of diagrams, to give our readers an idea of the details of this novel combination. It is, however, a marked improvement in scrapers used for grading roads, lawns, etc., and though quite peculiar not complicated and costly. Its use will lighten the labor of both horses and men in the performance of this class of work.

BRICK MACHINE.—John Treadway, of Haverstraw, N. Y.—This invention consists in certain improvements on a brick machine for which letters patent were already issued to the same inventor, and consists in the mechanism employed for varying the action of the presser and operating the follower, and in a joint box for the presser guide.

CHURN.—John Cochran, Jr., of Auburn, Mo.—This invention relates to improvement in that class of churns in which two dashers are so arranged on separate shafts as to be rotated in opposite directions by suitable connection with bevel gears. It consists in so combining clutch devices with the shafts or rods of the dashers and the operating gears that said dashers may be readily set parallel to each other, so as to be revolved together, to facilitate gathering of the butter, or at right angles, or to be revolved in opposite directions, as heretofore.

SPRING PERCHES FOR BIRD CAGES.—Edward Aldom, of New York city.—This invention consists in a spring perch attached to the side of a cage and extending into the cage. To the perch is attached, a wire coil spring, the spring itself being soldered or otherwise fastened to a metallic plate. On the outer or opposite side of this plate are hooks soldered or riveted thereto, and also fingers, which project outward. The hooks clasp the surrounding band wire of the cage, while between the fingers one of the vertical wires of the cage is received. When the plate is thus attached, the two fingers may be bent together so that the vertical wire will be firmly clasped and the perch well supported in position. The perch thus supported by the coil spring resembles the bough or twig of a tree or bush in its elasticity, and gives the bird that graceful movement so much admired by the observers in birds of song when they are free to select their own perches in the open air. The device has, moreover, the merit of being exceedingly neat in its appearance.

WAGON BRAKE.—John A. Gerhart, of Easton, Pa.—This is an improvement in wagon brakes wherein a lever is arranged horizontally beneath the wagon body in such a manner as to operate the brake bar through a connection established therewith by means of rods; and the invention consists in a particular arrangement, whereby a brake is provided, combining, it is claimed, in a pre-eminent degree, economy in manufacture, simplicity of construction, and ease and efficiency of operation. A great advantage of leverage is obtained, so that the brake may be readily applied with any desired force to the wheels.

TINMAN'S TONGS.—Samuel T. Dickinson, Jr., of Belvidere, N. J., assignor to himself and Ezra De Witt, of same place.—This tongs is formed of two jaws hinged together like a butt hinge, with a pintle, each jaw having a handle rigidly attached to the jaws, the jaws and the handles being connected to operate like the ordinary tongs. These jaws are chambered out on their inner sides, forming a hollow space. A gage bar extends through the space. There is a slot in the top jaw and a lug on the gage bar, which projects through the slot. An index pointer is used, by which the gage is set to correspond with lines indicating inches on one of the jaws. The side edges of this jaw are grooved. The ends of the gage bar are turned up on to these edges with set screws therein. The ends of the set screws slide in the groove when the gage is moved, and, when the gage is placed in the desired position, the screws are turned up and confine it there. Guide arms are attached to the guide bar, standing at right angles therewith. These arms pass through slots in the back jaw and project therefrom when the jaws are closed. When the tongs are open and applied to the edge of the metal sheet, the edge of the metal will strike these arms and thereby be prevented from passing beyond the gage. When the jaws are closed, the edge of the sheet is forced by the jaws down to the gage, when the angle in the sheet may be made at the edge of the tongs. These tongs may be made o any size, so that with a single pair an edge may be turned on sheet meta from half an inch to twelve inches, and the work may be done by one man, whereas in turning edges in putting on tin roofing in the ordinary way, or by the tinners' tongs now in use, three or four men are required. The advantage of having an adjustable gage arranged and operating as described must be apparent to all who are at all acquainted with tinmen's tongs.

FASTENING FOR MAIL BAGS.—Thomas McGrane, of New York city.—A label is formed by bending a strap together at its middle to form a loop to receive a ring, and sewing its parts together along their side edges and ends, with a narrow strip of leather between the edges to form a pocket to receive the direction, which should be printed upon stiff paper to enable it to be conveniently inserted and removed. The middle part of one of the sides is cut away to allow the direction to be seen. The label has a small flap formed in its side near its looped end to form a place through which the direction card may be inserted and withdrawn. The flap is made of such a length that it may be tucked beneath the part that is not cut away to confine the direction card in its pocket. The flap may have a small tag attached to it by two eyelets, for convenience in inserting and removing it. In the back of the label, directly opposite the eyelets in the flap, are inserted two other eyelets, so that, when the bag is to be sent a long distance by puncturing holes in the end of the direction card with the point of a pencil or other convenient instrument, a cord may be passed through and tied and a seal attached. The label may be attached to any mail bag, letter bag, or other package. For mail bags it is preferred to attach it to a strap in the loop formed by turning back the end of the strap to receive the buckle. Through the same loop is passed a strap, which is designed to be attached to the mail bag to serve as a handle for handling the bag. The strap is passed around the mouth of the bag and buckled. The free end of the strap is then passed through the label link or ring which serves as a keeper; and is then passed over a staple secured to the strap, and its end passed through a keeper. The bag may then be secured by a padlock passed through the staple, or by a seal passed through the staple and gummed to the strap. In the latter case the strap may be provided with a small leather key, to be passed through the staple after the seal has been attached to protect the said seal and keep it from being accidentally injured.

RIDING SADDLE.—Francis M. Simpson, of Pittsville, Mo.—This invention provides a saddle having springs so arranged as to better secure the comfort of equestrians than those of an analogous character heretofore in use. The invention consists in the peculiar arrangement of the springs and bars composing the seat of the saddle. The saddletree is slotted longitudinally to allow the air to have free access to the horse's back. Two curved springs pass over the saddletree transversely. The ends of the springs rest upon the plate, attached to the lower parts of the sides of the saddletree, to which they are secured by screws or rivets which pass through longitudinal slots in the ends of the springs and into the plates, so that the springs may have an up and down movement, and at the same time may be firmly secured. To the rear spring, near its ends, are securely riveted the ends of a bent bar or bow, to which are securely riveted the rear ends of side bars and a central bar. These bars are securely riveted to the springs. The forward end of the central bar projects, and is bent or inclined upward along the pommel of the saddle, and is slotted longitudinally, to receive the screw or rivet by which it is secured to a plate attached to the pommel, so that the bar, while held securely in place, may yet be free to move up and down with the springs. The springs, more especially the rear one, form a fulcrum for the longitudinal bars, so that the weight of the rider, applied to the rear part of said bars and the cantle bow, will increase the elasticity or spring of the seat. Thus a very pleasurable effect is claimed to be secured, independently of the direct vertical movement of the seat.

BUNG ATTACHMENT TO BARRELS.—Anton Wieners, of Williamsburg, N. Y.—The barrel bung, made of rubber, wood, or other suitable material, is perforated axially, and only applied when the barrel is to be fitted for drawing and after the removal of the solid bung. A tube is driven through the central aperture of the bung. A pipe is screwed into the upper end of the tube and carries a cup or disk. A bell, made of glass or other material, is placed in the cup. When beer is to be drawn, the solid bung is removed and the bung attachment put in its place, with the tube and pipe properly applied. Water is poured into the cup to about the middle of its hight, and the bell put into the same, so that the water will seal the air chamber under the bell. Experiments have satisfied the inventor that the comparatively small column of air contained within the bell is sufficient to furnish the necessary amount of pressure for relieving the vacuum produced by the withdrawal of beer. The sealed bell prevents more air from entering the barrel; still, it can be raised to admit air should this be deemed necessary.

MEDICAL COMPOUND OR FEVER AND AGUE CURE.—Louis Bodenheimer, of Paducah, Ky.—This is a combination of a vegetable acid salt and a free vegetable acid to be taken in a cup of curdled milk an hour before breakfast or from one to two hours before chill time. The administration of the remedy is claimed to pass the necessary bile from the stomach, giving increased action to the liver and kidneys, so that the patient will immediately recover. The inventor says he has not known more than a second dose to be required to perfect a cure.

STEAM BOILER.—Francis R. Hulbert, Grand Rapids, Mich.—The object of this invention is to so construct a steam boiler, comprising a proper combination of tubes, tube sheets, and fire and heat passages, as to effect a saving in fuel; to so secure the tubes in the tube sheets, as to provide an easy means of their insertion and removal for repair; and also, from the manner of construction of the double enclosing shell, to provide for the effectual bracing of every part of the enclosed tubes.

STONE CUTTING MACHINE.—Jacob Diadinger and Christian Henri, New Orleans, La.—This invention relates to a stone cutting machine, in which is employed a gang of horizontal saws, placed in a reciprocating frame, and used in connection with means for feeding the frame downward, and with means for raising and lowering the frame.

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FOR THE WEEK ENDING DECEMBER 26, 1871.

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122,096.—MUSICAL NOTATION.—F. W. Acee, Columbus, Ga.
122,097.—FIRE PLUG, ETC.—A. F. Allen, Providence, R. I.
122,098.—PERFORATING MACHINE.F.Anderson,Peekskill,N.Y.
122,099.—PAPER BAG MACHINE.—J.Arkell, Canajoharie, N.Y.
122,100.—PREPARING SALT.—F. Baker, Boston, Mass.
122,101.—PREPARING SALT.—F. Baker, Boston, Mass.
122,102.—MAKING SHOT.—W. W. Brigg, Home, Tenn.
122,103.—EARTH CLOSET.—H. C. Bull, New Orleans, La.
122,104.—STOCK CAR, ETC.—J. B. Calkins, Pacific, Mo.
122,105.—DRAUGHT REGULATOR.—F. E. Chatard, Jr., Baltimore, Md.
122,106.—BOX OPENER.—R. H. Chinn, Washington, D. C., G. Hall, J. J. Fitch, Morgantown, Va.
122,107.—TREADLE.—H. A. Clark, Boston, Mass.
122,108.—WRENCH.—A. G. Coes, Worcester, Mass.
122,109.—HAY RAKE.—J. Comley, York, Pa.
122,110.—MARINE PAINT.J.J.Currier,L.Cook,Gloucester,Mass.
122,111.—UPHOLSTERY SPRING.—J. F. Duffy, Chicago, Ill.
122,112.—BOOT HEEL.—C. H. Eggleston, Marshall, Mich.
122,113.—SEWING MACHINE.—J. Fanning, E. Nugent, Brooklyn, N. Y.
122,114.—HORSE CHECK.—S. French, Boston, Mass.
122,115.—RECTIFYING.—J. G. Guenther, Buffalo, N. Y.
122,116.—SAW COLLAR. F.A.Huntington, San Francisco, Cal.
122,117.—SHINGLE MACHINE.—F. A. Huntington, San Francisco, Cal.
122,118.—BLOWER.—W. G. Hyndman, Cincinnati, Ohio.
122,119.—CALF WEANER.—T. A. R. Keech, Bladensburg,Md.
122,120.—STOCK CAR.—T. E. Knauss, Zaleski, Ohio.
122,121.—HAND PLANTER.—J. H. Latimer, Crystal Lake, Ill.
122,122.—TOY GUN.—A. L. Lenhart, New Brunswick, N. J.
122,123.—EARTH CLOSET. J.M.Loewenstein,New Orleans,La.
122,124.—LOCK.—F. P. Marsden, Galena, Ill.
122,125.—GATE.—M. Martin, Rockford, Ill.
122,126—STOVE LEG.—J. T. Milligan, Du Quoin, Ill.
122,127.—SNAP HOOK.—L. Morse, Attleborough, Mass.
122,128.—PITCHING BARRELS.—D. Myers, Baltimore, Md.
122,129.—FEED MILL.—J. W. Myers, Lyons City, Iowa.
122,130.—REMOVING GREASE.—J. Perkins, Peabody, G. L. Newcomb, Salem, Mass.
122,131.—TIN LINED PIPE.—C. M. Platt, Waterbury, Conn.
122,132.—SOLDERING.—D. Porteous, Baltimore, Md.
122,133.—BARREL.—H. G. Porter, Grand Rapids, Mich.
122,134.—DRAWING TABLE.—J. L. Ross, Boston, F. C. Hanson, Charlestown, Mass.
122,135.—FASTENER. G.C.Setchell,C.L.Taylor,Norwich,Conn.
122,136.—DICING LEATHER.—A. Shedlock, New York city.
122,137.—PLAITING CLOTH.—W. M. Storm, New York city.
122,138.—MUSICAL CAGE.—A. Suppernio, Milburn, Ohio.
122,139.—WRENCH.—G. C. Taft, Worcester, Mass.
122,140—SAFETY CLASP.—D. C. Tuck, Farmington, Me.
122,141.—ELASTIC WASHER.—J. P. Verree, Phila., Pa.
122,142.—TREATING RAWHIDE.B.F.Wright,Winchester,Mass.
122,143.—FRUIT JAR.—H. U. Allen, North Bennington, Vt.
122,144.—VISE.—N. H. Baldwin, Laconia, N. H.
122,145.—PARALLEL MOVEMENT.—A. G. Barrett,Barrett,Kan.
122,146.—THILL COUPLING.—L. D. Belnap, Jonesville, Mich.
122,147.—COAL HOD, ETC.—R. Bogle, Milton, Pa.
122,148.—GRAIN SEPARATOR.—J. Boozer, Potter's Mills, Pa.
122,149.—WELL SPRING BIT.—J. H. Boyd,West Monterey,Pa.
122,150.—WASHER.—T. M. Brintnall, Medina, Ohio, W. E. Powers, Cortland, N. Y.
122,151.—WINDLASS.—E. Buell, Clinton, Conn.
122,152.—CORSET BUSK.—M. E. Bulkley, Providence, R. I.
122,153.—HAIR SWITCH.—B. F. Burgess, Jr., Boston, Mass.
122,154.—BLIND STOP.—P. A. Burgess, Butler, Mo.
122,155.—PLOW CLEANER.—G. W. Burr, East Line, N. Y.
122,156.—COOKING STOVE.—W. Clark, Shelburne, Vt.
122,157.—TAN VAT.—J. W. Coburn, East Walpole, Mass.
122,158.—PICTURE FRAME. G.E.& W.C.Collins,Bucksport,Me.
122,159.—OILER.—J. Crook, Ludlow, Vt.
122,160.—HEATING STOVE.—M. A. Cushing, Aurora, Ill.
122,161.—SAW MILL.—M. W. Danks, Fulton, N. Y.
122,162.—PLOW.—W. H. H. Doty, Sonora, Ohio.
122,163.—HARNESS.—W. Fawcett, New York city.
122,164.—CLOTHES WRINGER.—J. Fox, Farmersville, Iowa.
122,165.—HEAD REST.—J. C. Giffing, New York city.
122,166.—BUTTER TUB.—J. Gilberds, Jamestown, N. Y.
122,167.—BILLIARD REGISTER.—L. Godefroy, Pulaski, Tenn.
122,168.—HAT RACK.—N. Hayden, Chicago, Ill.
122,169.—PEN AND PENCIL CASE.—W.S.Hicks,New York city.
122,170.—PRINTING ENAMEL.—S. J. Hoggson, New Haven, Ct.
122,171.—METALLIC LATHING.—I. V. Holmes, New York city.
122,172.—HOMINY MILL.—T. Hudnut, Terre Haute, Ind.
122,173.—PEAT.—E.J.Hulbert, A.N. N., Aubin, Portland,Conn.
122,174.—LIQUID METER.—D. W. Huntington, W. A. Hempstead, South Coventry, Conn.
122,175.—CAR COUPLING.—F. A. Illingworth,Waltham, Mass.
122,176.—HARVESTER.—J. Johnson, Mott Haven, N. Y.
122,177.—CLOSING CASKS, ETC.—A. Koegler, Newark, N. J.
122,178.—SUPPORTING DRAWERS.C.F.Langford,Brookl'n,N.Y.
122,179.—BUREAU.—J. E. Lawrence, J. S. Young, Phila., Pa.
122,180.—HEMMER.—S. B. Lawrence, Scarsdale, N. Y.
122,181.—PEAT FUEL.—T. H. Leavitt, Boston, Mass.
122,182.—FIRE ARM.—T. Lee, Westport, Conn.
122,183.—HAIR CURL, ETC.—J. Mayer, Philadelphia, Pa.
122,184.—KNEADING MACHINE. E.McAllister,Rochester,N.Y.
122,185.—AXLE BOX, ETC.—M. McNalley, Houston, Texas.
122,186.—BRUSH.—J. Michales, Jr., R. J. Combs, Bergen, N.J.
122,187.—GUN BARREL.—R. R. Moore, Cortland, N. Y.
122,188.—RELEASING DEVICE.—E. B. Myers, York, Pa.
122,189.—CAR COUPLING.—F. Nalley, Battle Ground, Ind.
122,190.—TWEER.—S. Parsons, St. Francisville, Mo.
122,191.—CORN PLANTER.—J. Pies, Sparland, Ill.
122,192.—JEWELRY.—R. J. Pond, New York city.
122,193.—TOY PISTOL.—H. M. Quackenbush, Herkimer, N. Y.
122,194.—EVAPORATOR.—P. Robinson, Harrisburg, Ill.
122,195.—LIQUID MEASURE.—J. Schmidt, Vienna, Austria.
122,196.—SOUNDING BOARD.—J. H. Schucht, London, Eng.
122,197.—PRESS.—T.D.Simpson,W.S. Lamkin, Marshall,Tex.
122,198.—CUT OFF.—George W. Smith, New Haven, Conn.
122,199.—CLOTHES PIN.—L.and C.H.Sprague,Henderson,N.Y.
122,200.—HOUSE BELL.—A. L. Swan, Cherry Valley, N. Y.
122,201.—HARVESTER.—J. B. Thomson, Lynchburg, Tenn.
122,202.—RAILWAY SIGNAL.—C. D. Tisdale, Boston, Mass.
122,203.—SHOE FASTENING.—S. P. R. Triscott, G. A. Wheeler, Worcester, Mass.
122,204.—HEATER.—W. E. Walsh, Jersey City, N. J.
122,205.—BLOCK WASHER.—A. D. Westbrook, Astoria, N. Y.
122,206.—SPADE BAYONET.—W.S.Wetmore,London,England.
122,207.—CAR LOADER.—J. Williams, Bell's Depot, Tenn.
122,208.—PASSENGER CAR.—J. T. Worley, Cleveland, O.
122,209.—TRAP.—A. B. Ashman, A. H. Newell, Cincinnati,O.
122,210.—THRESHOLD.—E. Baker, Meriden, N. H.
122,211.—FILLER BOX.—G. Barry, Chicago, Ill.
122,212.—ENVELOPE.—S. D. Bates, Boston, Mass.
122,213.—THILL COUPLING.—E. Batwell, Ypsilanti, Mich.
122,214.—BRICK MACHINE.—F. Beaujeu, Orleans, La.
122,215.—HEAD BLOCK.—N. F. Beckwith, Omro, Wis.
122,216.—BRONZING MACHINE.—E. F. Benton, Buffalo, N. Y.
122,217.—LAMP.—E. Boesch, San Francisco, Cal.
122,218.—BILLIARD CUE, ETC.—C. A. Bogert, Bay City, Mich.
122,219.—JOURNAL BOX.—R. Brewer, Pontiac, Ill.
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REISSUES.

4,680.—CLOTHES WRINGER.—R. B. Hugunin, Cleveland, O.—Patent No. 53,001, dated March 6, 1866.
4,681.—THILL COUPLING.—D. A. Johnson, Boston, Mass.—Patent No. 113,329, dated April 11, 1871.
4,682.—PUMP ROD.—H. H. Locke, Pleasantville, Pa.—Patent No. 103,682, dated May 31, 1870.
4,683.—VENTILATING ROOMS.—A. S. Lyman, New York city.—Patent No. 14,510, dated March 25, 1856; extended seven years.
4,684.—COPPER ALLOY.—W. Magee, Jamaica, N. Y.—Patent No. 119,091, dated September 19, 1871.
4,685.—EXPANDING PULLEY.—T. H. Savery, Wilmington, Del.—Patent No. 78,363, dated June 9, 1868.
4,686.—GUN BARREL.—J. H. Burton, Leeds, Eng.—Patent No. 27,839, dated March 20, 1860; antedated September 29, 1859.

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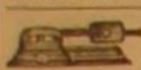

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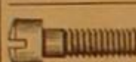

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