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IMPROVED HIGH PRESSURE ALARM.

Our engravings illustrate a very ingenious high pressure alarm, a patent on which was obtained through the Scientific American Patent Agency, January 30, 1872, by Herbert S. Jewell and Ferdinand Steele, of Brooklyn, N. Y.

A, Fig. 2, is the valve—cone pointed—and enlarged above so as to form a hollow chamber, into which lead can be run to weight it; or it may be cast solid and of a given weight, as shown in Fig. 3. Surrounding the valve seat is the plate, B, shown in detail in Fig. 5, the lower side being presented to view to show two ports, C, Fig. 5, through which, when the valve is raised only a little way from the seat, enough steam passes to prevent the valve from rising any further till gradual pressure has accumulated in the boiler. It is obvious that the valve may be weighted and the size of the ports adjusted, so as to allow this action to take place at a given pressure, say 30 lbs. Suppose this, with a margin of 3 lbs., to be the limit of pressure which the engineer is allowed to carry in the boiler. As soon as 30 lbs. is reached, the steam escapes through the ports, C, Fig. 5, passing up through the annular spaces, D, Fig. 6, to the whistle, to warn the attendant that the pressure approaches its limit.

The flow through ports, C, is controlled by screw valves.

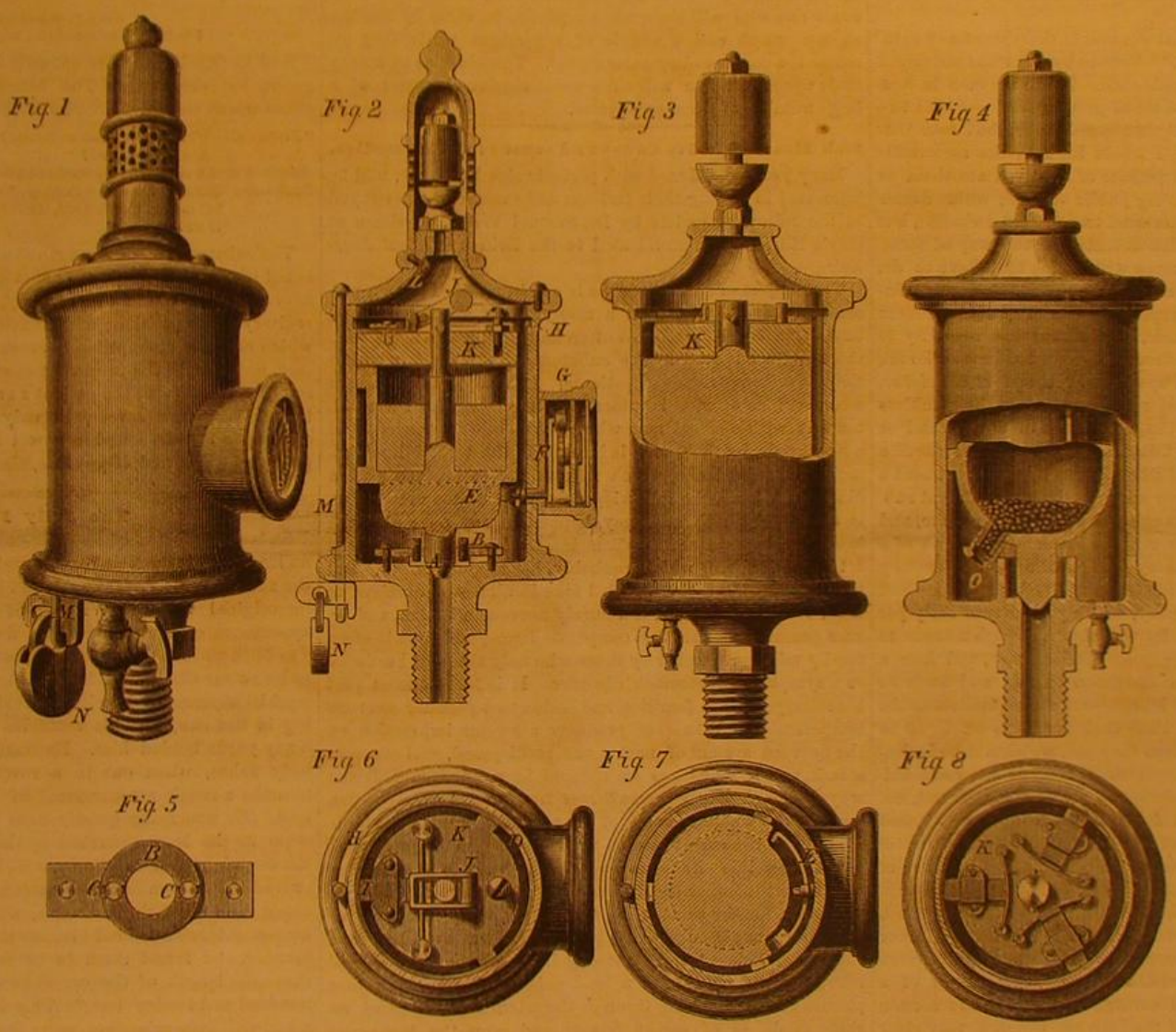
Should the engineer allow the margin of 3 lbs more pressure to accumulate, the instrument performs another function. Referring to Fig. 7, the reader will perceive a bent weighted lever, E, the end of which, opposite the counterpoise, rests under the shoulder of the valve weight, as shown in dotted outline at E, Fig. 2. As the valve weight rises, the counterpoise of the lever, E, descends, thus oscillating the lever on its pivot. To the pivot of the lever, E, is attached the arm, F, Fig. 2. The arm, F, carries a pawl, G, which actuates a toothed wheel, to the axis of which is attached a pointer, as shown in Fig. 1. The pointer is thus moved along the dial a distance of one tooth on the wheel for every time the attendant comes up to or exceeds his margin of pressure. It thus becomes a tell-tale which he cannot escape. As the wheel, by continued turning, finally presents an uncut space upon which the pawl cannot act, an attempt to work it around to its original position, by allowing the pressure to rise a sufficient number of times, only accumulates evidence.

Thirdly, if he exceeds the margin 3 lbs., and runs the pressure up to 35 lbs., the valve will be so much raised as to lock itself in that position. The device by which this is accomplished is shown in Figs. 2 and 6. On the inner side of the outer shell is turned a groove, H. Into this groove the slide, I, Fig. 6, enters, as soon as the valve has been raised high enough, the slide being actuated by the weighted lever, J, Fig. 6, or by springs, as shown in Figs. 3 and 8. These slides suspend an auxiliary weight or disk, K, Figs. 2, 3, 6, and 8, which, from that time, will not act again until the instrument has been opened and the parts readjusted. The careless attendant now finds that he cannot carry within five pounds of the pressure he was allowed to use without continually sounding the alarm and calling attention to his fault, to the commission of which any suitable penalty may be attached; either a fine or his discharge being probably severe enough to keep him on the alert. The cap of the whistle being locked on the inside by the screw, L, Fig. 2, and the cap of the valve being securely locked by the rod, M, and lock, N, he has no recourse but to report himself and to submit to the consequences of his neglect.

It is obvious that this principle may be extended by enlarging the valve, so as to combine the alarm and safety valve in one instrument if desired.

Another form of alarm is shown in Fig. 4. Here the valve is weighted with shot held in a chamber by a disk, O, of fusible metal. The valve rising slightly first gives an alarm, which if neglected, the pressure and consequently the temperature exceeding the proper margin, melts the fusible disk. The shot now escape from the chamber by their own gravity, and the valve is so much lightened that the alarm will thereafter sound at a pressure much below that the engineer is permitted and desired to maintain. Thus hedged in, he is obliged to be careful or lose his position.

The instrument is compact and capable of receiving a highly ornamental finish. For further particulars address H. S. Jewell 2 Fulton street, Brooklyn, N. Y.



Iron Steamers for the Mississippi.

Chapman & Thorp, of St. Louis, lumber dealers, have contracted in Dubuque, Iowa, for a boat of the following dimensions: Hull, 145 feet; beam, 26 feet; depth, 4½ feet. The entire hull is to be of iron, including deck and guards. The hull will be divided into eight water tight compartments. There will be tanks in it, by which it will be practicable to sink the boat to the draft required in five minutes, or in about the same time to raise her to her original draft of water.

The contract requires that she shall draw but eighteen inches water when completed, with water and twenty-four hours' fuel on board. Mr. Hopkins, a practical builder from the Clyde, Scotland, will superintend the construction.

The power is to be equal to 20 × 30 inch cylinders, to propel Dowler & Birdseye's shoal water propeller which is the invention of Captain John Dowler, an Illinois river steamboatman. That this wheel and style of boat are excellent for towing rafts is evident from the fact that Chapman & Thorp gave a thorough trial of it last year in the Humbug, a poorly constructed craft, yet she performed the tasks that were set before her in an unusually satisfactory manner. The one under contract is to be able to tow up stream 2,500 tuns weight at a speed of 4½ to 5 miles per hour. She will have a full "texas" with business office, and rooms for the employees of the company. She is to be completed by May 1st of this year.

Robbery with the aid of Chloroform.

Dr. Stephen Rogers, of New York, in a report on "Can Chloroform be used to Facilitate Robbery?" records some facts which prove it to be of no use to robbers. 1st. As to its use to promote the greater security from the disturbance of the sleeper, even were that practicable, the very time that would be consumed in the gradual and cautious administration of the vapor—the only possible theoretical manner of accomplishing it—would so increase the danger of detection that few thieves would think of employing it. 2d. During the course of the administration of the chloroform, whatever manner may be adopted, the patient or subject, as a rule, becomes excited, often very violent and turbulent, with an irrepressible propensity to sing or shout, which is often so loud as to alarm the inmates of the whole house. He is in a state of wild chloroformic intoxication. The exceptions to this rule are so few that no prudent thief would think of running the risk of not meeting one of those exceptions. 3d. Supposing the two preceding obstacles overcome, and the victim thoroughly quieted into a narcotic sleep, a third and very frequent complication arises; he begins to vomit, and, while he does not generally make much noise about it, still he may; and he always requires attentions lest fatal strangulation occur. The knowledge, among the criminal classes, that the abandonment of their victim, with a towel still over his face, to the liabilities of vomiting and strangulation, would often add the crime of murder to that of robbery, would have great effect in deterring them from the further employment of it.

THE *Journal of Applied Chemistry* recommends the use of a small quantity of carbolic acid in paste for laying paper-hangings and in white wash, and states that it will repel cockroaches and all other insects. It will also neutralize the disagreeable odor consequent upon the decomposition of the paste, which in newly prepared walls is sometimes very oppressive. The cheapest and best form of carbolic acid is crystal, which dissolves in water at an excess of temperature.

CRYSTALLIZATION.—Professor Schultze has recently exhibited, to the German Chemical Society, Berlin, beautifully formed crystals of sugar, borax, and other substances. He states that by the use of a gelatinizing substance as a solvent, the formation of perfect crystals is much promoted. Solutions of gelatin and kindred substances were the vehicles he employed.

THOMAS FITZGERALD, of Rhinecliff, N. Y., on the Hudson, is 108 years old, and his wife is 100. Both are in good health.

MINING SPECULATION---SOMETHING AS APPLICABLE TO NEW YORK AS TO LONDON.

Says the *Mining Magazine and Review* (London): Among the "comic" paragraphs, that go the round of the press in the dull season the following has had a wide circulation during the past month:

"An American gentleman who claims Oregon as his abiding place, is making an honest living by getting up companies of men, one hundred in number, whom, in consideration of one hundred dollars paid by each, he promises to pilot to a mountain of solid gold. After wandering round in the mountains with his dupes for a few weeks, he suddenly disappears, to start a new enterprise of the same character."

Which is a parable. We need not go to Oregon. There are a good many gentlemen of the kind in America, and not a few in England. Even in the City of London, under the very nose of the Lord Mayor, and within a few yards of the detective quarters in Old Jewry, the "Messrs. Robin" flourish. Companies of men, not by any means limited to one hundred in number, are being continually piloted to mountains of gold, or iron, or silver, which is the same thing, since by a process of modern invention, far transcending in skill the labors of the old alchemists, even visionary mountains of non-existing metal of any kind get transformed into gold "where merchants most do congregate." The nineteenth century alchemists, abandon their dupes after a few weeks; and having set up iron as their discovery one day, on that day six months find that silver or lead will answer their purpose just as well, the net result being that all is gold which comes to their purse; but it comes out, not of the mountain, but of the banking accounts of the befooled public.

It has been said by a great wit that if there were no "flats" there would be no "sharps." We are by no means convinced of the exact truth of this aphorism. There are men in London who have mastered the art of proving that two and two make not, as is commonly supposed, four, but four and-twenty—men who hold their heads high in the mercantile world; who associate with persons of title, and use them as decoy ducks for the lord-loving public outside; whose names are never seen in connection with transparent swindles, but who nevertheless do not stick at trifles in the way of statements respecting the concerns with which they have to do. It is such men who do the mischief to the reputation of mining as an investment for surplus capital. The mere brokers who advertise large dividends, upon shares that are fifty to eighty per cent below par, deceive nobody but those who are anxious to be deceived. *Populus vult decipi et decipiatur.* These small men prey upon small men—upon the gamblers who stake their money on the one chance in a thousand or so; upon the chandler in Camden Town, who has saved a hundred pounds, and would like to draw by its investment a hundred and fifty pounds per annum; the self confident suburban pedagogue, who is caught, like a moth, by glare, and would fain obtain sixty per cent for his money, instead of a steady six; the simple country parson, who fancies that by putting three hundred pounds into the Ayrshire Castle Gold and Platinum Mining Company, which pays fifty or sixty per cent in the advertisements, he will obtain enough returns to send his hopeful son to Rugby or Marlborough, and hire a finishing governess for his daughter. These and such as these—men whom we have known—are not capitalists in the true sense of the word. That their interests ought to be looked after more closely than they are, we should be inclined to allow; but a more important portion of the community, the legitimate holders of capital, are on the look out, not for cent per cent., but for a fair return for their money, and are perfectly well aware of the fact that, as the Duke of Wellington said on a memorable occasion, the promise of high interest means the probability of bad security.

In eleven months of 1871, five and a half times as much capital, speaking in round numbers, has been required from our market for mining purposes alone, as in the twelve months of 1870. Since the railway mania of a quarter of a century ago, there has been nothing like this in one section of business. The causes of the increase are not very clear and are at the best complicated. The chief cause was that the public at large, and especially the commercial classes, came all at once to perceive that nothing in the whole range of trade offers both a more reliable investment and a larger interest than sound mining property. How many of the schemes named in 1871 come under this category it is impossible definitely to say; and the present state of the Law of libel—which renders it as much an offence in such cases to tell the truth as to malign unjustly—prevents us from indicating with much particularity the projects which it requires no knowledge of mining to perceive were intended to feather the nests with promoters at the expense of investors.

These cuckoos of the share market have unquestionably had a very good time this year. When a sound company comes before before the world, there are sure to be two or three "shady" concerns in its train which pick up the capital of those who have failed to obtain allotments in the more reputable undertaking; and it may be laid down as a general rule that the more tempting the promises of a mining company's prospectus, (whether at home or abroad, but rather abroad than at home), the more completely should the facts be investigated before a penny of capital is entrusted to the promoters.

Some of the prospectuses issued this year have been curiosities of transparent cunning. So plainly is the net spread in the sight of the birds that one can hardly conceive the possibility of the existence of beings who could be thus deluded. Yet these very companies have obtained, if not the whole, at least a very large proportion of the capital they required—capital to all intents and purposes thrown away as completely as if it were pitched into the mid Pacific. It would really appear that investors have of late begun to believe in the return of the golden age, when every man interests himself, not in his own concerns, but in promoting the wordly prosperity of others—or that the possessors of princely properties underground have imbibed Communistic principles, and have resolved to set a good example by sacrificing a large portion of their wealth in order to raise those are poorer to their level of riches. They offer properties which they represent to be worth hundreds of thousands of pounds sterling for about a year and a half's purchase. It would be tedious to go through the number of examples which we might cite of this astounding generosity; but let us take one instance, in order to show what open-handed and noble spirited men we have amongst us, whose wealth is a burden to them, and who desire to share it with the million. We have forgotten the name or locality of the company which offers reserves of ore estimated at a value of £600,000, and a minimum net profit of £216,000 per annum, for some portion of a capital of £250,000. As we have said, we know nothing of this undertaking or its promoters; we cite it as an example of a noble generosity seldom to be met with in this world. They do not seek fame, these good and generous men. They are content to remain unhonored and unknown. More than Peabody or Coutts, their benefactions are always anonymous. There are those, however, who take a harsher view of such proceedings, and liken the generous promoters to the tavern sharpers who produce bags of Hanoverian medals as gold, and pocketbooks full of Bank of Elegance instead of Bank of England notes, who have received all this wealth as a legacy, and wish to share it with every one who will show his confidence in them by lending them a watch and a couple of sovereigns while they go round the corner to buy some cigars. The exercise of a very little common sense will show the delusive character of a large number of these companies.

Sick Headache---Its Cause and some of the Remedies.

Many persons, afflicted with periodic sick headache, will be interested in finding their feelings and experiences portrayed in the following article by Dr. Samuel Wilks, physician at Guy's Hospital, communicated to the British *Medical Journal:*

The subject of sick headache is one in which I take a personal interest, having been a martyr to it all my life, and having, in consequence, too often had to compare notes with those who have been like sufferers with myself, whether they have been friends or patients. It is important to posses a correct idea of what is intended by the name, for I have often met with medical men who have no other knowledge of a sick headache than what is implied in the term bilious attack, or the headache which follows the eating too good a dinner. A headache following a debauch or too much wine is common enough, and may happen to any one; also the headache, in peculiar idiosyncracies, from eating some special article of diet, and which, probably, has a gouty origin. But the true sick headache, which I take is almost equivalent to hemicrania or migraine, is a purely nervous affection, and occurs generally in the most temperate livers, and thus is often totally misapprehended by those who only think of headache as a symptom of stomach disorder. It is for the most part hereditary, runs in families, and is due to a peculiar nervous temperament. Whatever produces a strong impression on the nervous system of such a one predisposed, will cause an attack, and it may thus be induced in a hundred different ways. Consequently the sufferers from this complaint often make it the whole busines of life to avoid moving a single step out of the even tenor of their way, so as to prevent as far as possible its occurrence. The visit to the theatre, the concert room, or the dinner party, is always followed by headache, for the excitement, the altered temperature or vitiated air, are all equal to its production; but even less than these is sufficient, for any strong impression on the special nerves will produce it, as a loud noise, an hour's visit to a picture gallery, looking through the microscope, odors of various kinds, as of spring flowers, and even the testing of some substances; also exposure of the body to the sun or a strong wind; moreover, various moral causes and worry are sure to be followed by the familiar headache.

The true cause, then, of sick headache, lies deep in the patient's idiosyncracy, and is developed by a hundred different causes. The advice, then, to sufferers is to give as much tone as they can to their nerves by adopting all those methods which experience has shown to be good, and then avoid, as far as is practicable, all those causes which are known to excite an attack. I need scarcely describe a sick headache—how one rises in the morning more dead than alive, perfectly unable to swallow the smallest particle of food, and often, perhaps, actually sick; how the head throbs, and the pain is increased by the slightest movement; how speaking or doing is a burden beyond bearing; how one prays to be left alone in the utmost quiet, so that he may, if possible, sleep. To other persons the sufferer looks extremely ill, very pale, dark around the eyes, and with contracted pupil. To himself his head feels hot, and the application of cold is very refreshing. The clamminess in the mouth, the nausea, and general disturbance, are secondary, and have no connection with any improper meal, and thus are in no way relieved by the too frequent and ignorantly administered purgative. This is not needed, and has no good result. The only remedies which are of any avail are those which act on the nervous system, such as hot tea and coffee; or, after the stomach is quieter, and the more urgent symptoms have passed off, a little wine or ammonia. If the headache take more the form of hemicrania, then remedies are occasionally useful, as the local application of the bisulphide of carbon, or galvanism, and internally the bromide of potassium. This is the only drug which I have really seen to be serviceable. Whilst the nausea exists and the worst symptoms prevail, even this remedy is of no avail. So little can we prejudge the value of medicines, that I have even been willing to administer any remedy which can be proposed; and thus not long ago I myself swallowed with great faith a specific powder sent me by a friend from Vancouver's Island; but, alas! it must be catalogued with all other remedies for sick headache—it was useless. As regards tea and coffee, which often relieve, it is possible that these and other stimulants, taken in excess, render the nervous system more susceptible to the attacks; and I believe I am right in saying that it was Mr. Martyn, of Brompton, who informed me of more than one person who had entirely lost his headache from leaving these off.

The various influences spoken of, acting through the different parts of the nervous system, impress immediately the sympathetic, and so alter the current of blood through the head; thus, while the face is pale, the larger vessels are throbbing, the head is hot, and the remedies which instinct suggests are cold and pressure to the part. In fact, of all the means which have been used to cure this trouble, the only one on which we can rely to procure relief is the wet bandage tied tightly round the head. The method must be instinctive, for it is universal, and has been from all time. As our Shakespeare is often quoted to illustrate the morbid states of the body as well as the passions of the mind, he may be again conjured up to testify to the ancient practice of which I have been speaking. For example, in the scene between Hubert and Arthur, in *King John*, the latter, when petitioning for the preservation of his eyes, says:

"When your head did but ache
I knit my handkerchief about your brows."

And in *Othello* we have not only the remedy for headache given, but the cause. The former was the handkerchief about which the chief interest of the play centered.

"Desdemona—Why do you speak so faintly?
Are you not well?
Othello—I have a pain upon my forehead here.
Desdemona—Faith, that's with watching; 'twill away again.
Let me but bind it hard, within this hour
It will be well."

The substance of this communication is, that sick headache is not to be cured by gastro hepatic remedies. It is purely nervous affection, and due entirely, in my experience, to hereditary predisposition; and is excited by causes innumerable which act on a susceptible nervous system. There is, therefore, no cure, in the proper sense of the term, for this would imply a change in the patient's nature; and for the attacks themselves, when severe, the only relief which can be reckoned upon is to be found in a wet bandage round the head, profound quiet, and, if possible, sleep.

The Jelly Fish.

So large a portion of its bulk consists of water that one of no less than thirty-four pounds weight, being left to dry in the sun for some days, was found to have lost 99 per cent of its original weight. Writing of the not very attractive appearance of these huge jelly fish, Agassiz observes that "to form an idea of his true appearance, one must meet him as he swims along at midday, rather lazily withal, his huge semi-transparent disk, with its flexible lobed margin, glittering in the sun, and his tentacles floating to a distance of many yards behind him. Encountering one of these huge jelly fishes, when out in a rowing boat, we attempted to make a rough measurement of his dimensions upon the spot. He was lying quietly near the surface, and did not seem in the least disturbed by the proceeding, but allowed the oar, eight feet in length, to be laid across the disk, which proved to be seven feet in diameter. Backing the boat slowly along the line of the tentacles, which were floating at their utmost extension behind him, we measured these in the same manner, and found them to be rather more than fourteen times the length of the oar, thus covering a space of some hundred and twelve feet." This huge mass is produced by a hydroid measuring not more than half an inch in length when full grown.

Salt and Iron Hail.

Professor Kengott, of Zurich, Switzerland, states that a hail storm, lasting five minutes, occurred last year, the stones from which were found to possess a salty taste. Some of them weighed twelve grains. They were found to consist essentially of true salt, such as occurs in Northern Africa on the surface of the plains, mainly in hexahedric crystals or their fragments, of a white color, with partly sharp and partly rounded grains and edges. None of the crystals were entirely perfect, but appeared as if they had been roughly developed on some surface. They had probably been taken up and brought over the Mediterranean from some part of Africa, just as sand is occasionally transported thence to the European continent and the Canaries by means of hurricanes. A still more remarkable phenomenon has been recently recorded by Professor Eversman, of Kasan—namely, the occurrence of hailstones, each containing a small crystal of sulphuret of iron. These crystals were probably weathered from some rocks in large quantity, and were then taken up from the surface of the ground by a storm, and, when carried into the hail-forming clouds, served as a nucleus for the formation of hailstones.

To CLEAR a well of carbonic acid gas, it is suggested to lower a red hot iron to the water, so as to produce a little steam. The vapor instantly absorbs the gas. Should any of our readers try this plan, we hope they will report the result to the SCIENTIFIC AMERICAN.

A New Photographic Process.

An entirely novel method of photographic printing has just been discovered by M. Merget, Professor of Physics at the Faculté des Sciences of Lyons. The principal points discovered by M. Merget may be thus summarised:

1. The vaporization of mercury is a continuous phenomenon, that is to say, the metal emits vapor at all times, even at a very low temperature, and when in a solidified form.

2. Mercury vapor may be condensed upon certain substances, such as carbon, platinum, etc., without these latter being chemically affected.

3. Mercury vapor will pass with exceeding facility through porous bodies, such as wood, porcelain, etc.

4. The salts of all precious metals when in solution are very sensitive to the action of mercury vapor, which has the effect of rapidly reducing them.

The most sensitive to mercury of the precious metal salts are nitrate of silver and the soluble chlorides of gold, palladium, and iridium, and paper prepared with any of these forms at once a most delicate test for the volatile metal; but the solutions must contain some hygrometric body to prevent complete desiccation, so that the surface coated with them will always remain in a moist condition. To demonstrate how exceedingly sensitive this test paper is to mercury, we may state that a section of wood, exposed to mercury vapors and afterwards pressed in contact with a sheet of sensitive paper, prints off upon the surface all the rings and markings it possesses, the mercury being deposited in the pores of the wood in a more or less condensed form.

In the event of nitrate of silver being used for preparing the paper, it is necessary, obviously, to exclude the light, as otherwise a reducing action will be already set up by solar means alone; but with the salts of palladium or platinum no such action need be feared. According to the kind of metallic salt employed, so the tint of the impression varies; but in most cases an intense black may be obtained where the action has proceeded far enough.

Having described M. Merget's discoveries thus far, it is easy to guess how that gentleman employs them in the carrying out of a photographic process. An ordinary glass negative, possessing an image which has been formed by the deposition of silver particles, is prepared in a suitable manner to protect it from injury by contact with the mercury (such, for instance, as coating it in some way with platinum or carbon particles), and the picture is then exposed to the action of mercury vapor. The vapor condenses, in a more or less concentrated form, upon the image—in the same way, pretty well, as it becomes deposited upon, and develops the latent image in the daguerreotype process—and subsequently the plate thus treated is brought into contact with the sensitive paper. The consequence is that the minute particles of mercury deposited all over the image exercise a reducing action upon the salts on the surface of the paper, and a print of the original photograph results, possessing the same gradation of tint as the original. Indeed, when nitrate of silver is employed for sensitizing the paper, the photograph secured is in every respect similar to that produced by light in the ordinary silver printing process, and the picture is forthwith toned and fixed in the same way, in fact, as one of these; in the one case, however, the reduction of the silver salts has been brought about by mercury vapor, while in the other light alone has been the reducing agent. Impressions obtained by means of platinum and palladium salts need simply to be washed in water in order that they may be permanently fixed. These latter, in truth, are so indestructible and inalterable that they cannot be destroyed except by a chemical agent which would at the same time radically injure the paper or other basis upon which they rest.

This process of photography is not yet in such an advanced state as to be of any practical importance; but, nevertheless, it is certainly one of the most ingenious and interesting discoveries made of late in this branch of science. The great advantage it possesses is that of printing without the aid of light, and yet producing prints with detail and half tone dependent upon delicate chemical reaction—such rare gradation being secured as our present light printed pictures (silver and carbon prints) alone possess. A mechanical printing process could, of course, easily be worked out from these *data*, if considered desirable; and, indeed, it is by no means improbable that that this will be the most successful way of applying the discoveries in a practical form. But even in the event of no practical use at all being made of the process—for this is indeed questionable—the research, regarded from a purely scientific point of view, is deserving of the highest eulogium.—*H. Baden Pritchard, in Nature.*

Sea Water to Make Bread.

At the Paris Academy, says *Good Health*, the propriety of using sea water to make bread has been under discussion. M. Moison stated that, in the neighborhood of Cancale, yeast alone is made with fresh water, and that pure sea water is exclusively employed in kneading the paste; the bread thus made has not more than the necessary amount of saline matter. On the contrary, when sea water has been added to soup, instead of salt, a food has been obtained which should be rejected. The author asks if he must not see, in the comparison of these two results, proof of a particular transformation undergone in the salts of sea water during the process of baking. He also calls the attention of the Academy to the good hygienic effects which he attributes to the use of bread salted with sea water.

This discussion is interesting in reference to making bread on long voyages. Why should we not have hot rolls every morning? Moreover, it may be that the therapeutic effects of the constituents of sea water may be obtained in this way.

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections in the months of November and December, 1871:

During these two months 1,490 visits of inspection were made, and 2,965 boilers examined—2,656 externally, and 1096 internally—while 240 were tested by hydraulic pressure. The number of defects in all discovered were 1,566, of which 332 were regarded as dangerous. These defects were as follows:

Furnaces out of shape, 71—17 dangerous; fractures, 99—62 dangerous; burned plates, 95—43 dangerous; blistered plates, 204—28 dangerous; sediment and deposit, 282—22 dangerous; incrustation and scale, 235—23 dangerous; external corrosion, 90—24 dangerous; internal corrosion, 45—7 dangerous; internal grooving, 38—5 dangerous; water gages defective, 93—10 dangerous; blow out defective, 26—9 dangerous; safety valves overloaded and out of order, 49—14 dangerous; pressure gages defective, 230—14 dangerous; boilers without gages, 8; cases of deficiency of water, 15—2 dangerous; cases of broken braces and stays, 52—29 dangerous; boilers condemned as unsafe to use, 34. Among the defects enumerated, fractures are quite numerous, and we call attention to it from the fact that several cases have been found where the difficulty originated in poor workmanship in the construction of the boiler; for instance, a case was found where a seam was cracked in line of the rivets for three feet, and on close examination it was ascertained that the defect had its origin with the "drifting tool." Several similar cases have been met with, and although presenting fractures of less extent, are, perhaps, none the less dangerous from the fact that a weak point in the boiler is provided, which, upon severe strain being brought, is liable to be increased suddenly with serious results. Plates often become burned and weakened in places impossible to discover, except the boiler is cold and subjected to both internal and external examination. A case of this kind has recently come under our notice. The brick work setting of the boiler had become broken down on the side against the brick wall of the building. The fire had gone up beyond the water line, and badly burned and weakened the sheets exposed. The boiler was set with the front in the chimney, and the defect was so far forward that the fire escaped through the break into the chimney. No idea or apprehension of danger was suspected, until a cold examination revealed the defect and prevented disaster. We find more or less ignorance prevailing relative to the importance of a good safety valve. And in the fitting up of a boiler, or nest of boilers, the ignorance of the boiler maker and fitter is often glaringly apparent. There seems to be no calculation made relative to the fitness of appliances for the work required of them. Of course this is not true of those who, by long experience and careful observation, have ascertained just what the wants of a boiler are, but more particularly of irresponsible concerns that have no conception of the immense strain brought to bear on boilers at work, nor of the importance of having all the appliances adapted to the size of boiler, pressure of steam carried, and amount of work required.

In a large mill using six boilers there was but one safety valve, and the escape pipe from this valve was only 2 inches in diameter. We do not think the firm making and fitting these boilers up in this way evinced a proper understanding of the principles of boiler fitting. The boilers condemned were not all beyond repair, though many were entirely worn out. Those capable of being renovated have been put in good condition, and will doubtless last for some time yet. There were 24 boiler explosions during the months of November and December, doing serious damage and killing 19 and wounding 38.

The Oyster Trade.

The oyster trade of New York is one using large amounts of capital, employing nearly one hundred and fifty sailing vessels, with crews averaging in the aggregate seven hundred seamen, and handling millions of bushels of oysters per annum. There are now moored at the wharves in New York city nearly sixty barges, or "lay boats" as they are called, costing from $3,000 to $5,000 each, substantially built, having compartments capable of containing thousands of bushels of oysters in the shell, and which pay to the city nearly $27,000 a year as wharfage.

The oyster season commences, says the New York *Journal of Commerce*, about the first of October, when the boats owned by the dealers are sent to the beds for cargoes, and lasts until the middle of March or first of April. The oyster fleet is composed principally of schooners, ranging from 35 tuns to 250 tuns, and receives the proceeds of the dredgings of the beds at York River, Prince's Bay, Keyport, City Island, Cow Bay, Rockaway, Oyster Bay, Glen Cove, Blue Point, Norwalk, Stamford, and Greenwich. When the oysters are received here they are discharged directly on the wharf to dealers; and after the dealers are supplied, the balance is stored in the compartments of the lay boats. From the lay boats the oysters are shipped to other cities at the North and West. For shipment, they are packed in barrels in the shell, or opened and packed in tubs with ice, and forwarded by rail to Boston, Providence, Portland, Chicago, Omaha, San Francisco and other cities. Very few oysters are canned in New York. That trade seems to be substantially monopolized by Baltimore. Besides the oyster shipping interests in this city is the important retail trade. The well fitted and at times luxurious offices on the lay boats are the meeting rooms of the proprietors of the hotels, restaurants, retail oyster saloons, and cheap oyster stands. At certain hours in the day, representatives of each of these branches of the trade may meet in the office, and the rapidity with which a cargo of oysters—extras, box, cullens—is disposed of astonishes a novice. One man wants only the largest oysters in the lot. Another wants to know if the dealer hasn't got a lot of small oysters for cheap stews. Another wants tiptop box oysters, and another asks when the next cargo of York rivers or Rockaways is expected.

Most of the dealers own the beds from which they receive the oysters, but are compelled to have partners to superintend the catching and loading, because most of the beds, in fact all except those bordering on Long Island, are out of the State. The laws of the other States—Connecticut, New Jersey, Delaware, and Virginia—do not permit non-residents to own beds or catch oysters within their domains. So the New York dealers—at least some of them—form copartnerships with residents near the fishing grounds, supply them with money, let them buy beds and plant the oysters, take them in as part owners of the vessel in the carrying trade, and then divide the profits with them.

The New York trade is controlled in a great measure by the weather. If the nights are clear and cold, the sidewalks dry, and the stars out, the consumers throng the retail saloons, and the result is an assemblage of all sorts of vehicles in the morning at the lay boat stations for new supplies. If the country roads are in prime order, and the fast horses of the well-to-do farmers or bloods can make good time to the village, carrying the girls on supper excursions, the demand for new supplies by rail is increased. But when the barometer falls to 29 inches, the stars go out of sight, the roads are muddy, and the sidewalks damp, the demand falls off. Singularly, however, the prices do not fluctuate. The retail prices never change. The wholesale change to so trifling an extent that the consumer never receives the benefit; if any one profits by a fall, it is the retailer.

The oyster trade is one requiring peculiar and delicate perception. What consumer, as he gazes on the silent, quiet, brown shell of what he expects will soon form a portion of his corporal household, could even guess the nativity of the unfortunate bivalve? Yet the expert who catches it in his left hand, taps it over the eye with the butt end of the knife to make it insensible, and shatters its stony lips to take its life, knows as soon as he takes it from the pile where it came from, how old it is, whether it is a Delaware, Prince's Bay, City Islander, or has grown under the dashing waves of Rockaway. He knows, too, whether it will open good. The wholesale dealers at this port have over three millions of dollars invested in the oyster trade, and receive on an estimated average two million five hundred thousand bushels of oysters per annum. Every vessel arriving at this port with a cargo of oysters pays its regular wharfage, discharges either on the wharf or into the lay boat, which also pays wharfage, and then returns for another load. During the warm season, the oysters are sent by rail in refrigerator cars, a recent railway improvement.

The oyster trade has its dangers as well as other lines of business. Only three years ago hundreds of dealers, especially the smaller ones, owning beds were ruined by the devastation of their crops by the oysterman's dread, the drum fish. Enormous schools of this singular inhabitant of the deep visited the oyster beds at Keyport, Prince's Bay and the shores of Long Island, where they devoured hundreds of thousands of bushels of oysters in three days. The drum fish (*pogonias chromis*) is remarkable for making a peculiar drumming or grunting sound under the water. It gathers the oysters from the beds, and grinds the shells to fine fragments in its jaws, sucking out the body and leaving nought but ruin in its path. New York, with its large and ever increasing population, demands a supply of oysters and needs them furnished at the lowest possible cost.

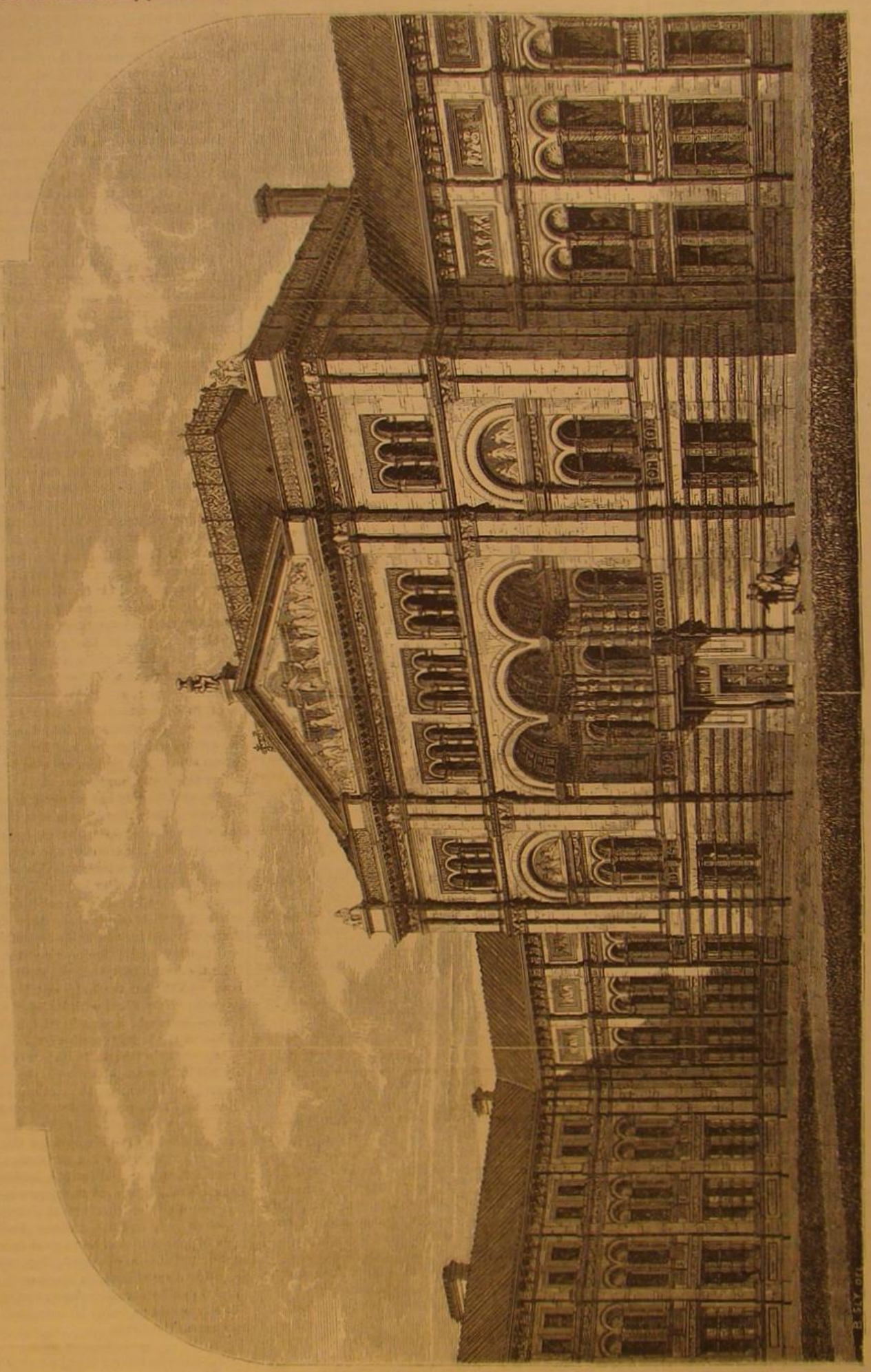
Any obstacle thrown in the way of this trade will probably fall in increase of the price on poor consumers. It is a general opinion among the dealers that the action contemplated by the Commissioner of Docks is just such an obstacle. The Department of Docks proposes to clear the slips now occupied by the lay boats of this trade, and devote the space so acquired to other purposes. The result of this, it is contended, will be to drive the business to New Jersey and Long Island. The dealers express no desire to remain here. They say that the wharfage at Jersey city is cheaper, the water deeper, and the railway facilities for transporting their freight will soon be as good as on this side. The slips now occupied here could not, they say, be made to pay from any other class of boats an amount of wharfage equal to the $27,000 paid by the oystermen; and the cost of the oysters in this city would probably be increased by removing the business across the rivers.

PHOSPHORESCENCE PRODUCED BY FRICTIONAL ELECTRICITY.—M. Alvergniat states that if a little bromide or chloride of silicium is introduced into a glass tube, and the tube is then exhausted and sealed, friction with a piece of silk, or even with the fingers, produces a beautiful phosphorescence, which is rose colored if the chloride is contained in the tube, and a yellowish green with the bromide. The induction spark produces no light within these tubes unless the vacuum is very perfect, but in that case the phosphorescence disappears.

ADULTERATION OF BONE DUST.—Ground bones are now, it appears, occasionally adulterated with the turnings and raspings of vegetable ivory, otherwise known as the ivory nut (*phytelephas macrocarpa*). This fraud may be detected by heating the bone dust to redness. Spurious samples will leave a much smaller amount of ash or fixed mineral matter than the genuine kind, and will be found especially deficient in phosphate of lime.

LECTURE THEATER BUILDINGS AT SOUTH KENSINGTON.

Our illustration this week represents the façade of the new Lecture Theater and Refreshment Rooms, which form the north side of the internal quadrangle of the Museum at South Kensington, London, England. The materials employed are mainly red brick with dressings, and enrichments of terra cotta. This is a government institution, maintained for the encouragement of science and art. The first establishment of this department was about twenty years since, the encouragement of art having been chiefly furthered, previous to that time, by the Royal Academy, National Gallery, and the Schools of Design. It began as a school of art, the increase of pupils and the growth of the collection necessitating the erection of the present building.



SOUTH KENSINGTON MUSEUM, LONDON ENGLAND.

The chief feature of the design is a deeply recessed arcade on the principal floor, the arches being supported on columns of terra cotta, modeled by the late Godfrey Sykes. The soffits of the arches are filled with white majolica. Figures holding shields of the same material are also introduced in the spandrels on either side of the circular panels in the arched recesses, and in the square panels above the door. The three circular panels just alluded to, are filled with glass mosaics, by Messrs. Salviati, Rust & Simpson. The figures, which represent History, Poetry, and Alchemy, are executed in colored tesseræ upon a gold background.

The door, which forms the central feature of the lower story, is in six panels, with figures of Newton, Davy, Bramante, Michel Angelo, Watt, and Titian. It may be remembered that this bronze door attracted a great deal of notice in the Paris Exhibition. It has since been richly gilt. The brick work of the ground floor is banded with four courses of molded bricks, the intermediate portions being rubbed and gaged. The arch heads of the large openings to the right and left of the central building are filled with lunettes in mosaic work. These mosaics were executed in the South Kensington Museum by the female students, the materials being supplied by Messrs. Minton, Hollins & Co. The rectangular panels in the upper portions of the wings, and the large picture which occupies the tympanum of the pediment, were carried out in the same way. The upper story of the theater building consists of a series of triple arches placed in square headed recesses, the spandrels above the arches being filled with a diaper of red terra cotta. The subject of the design in the pediment is the Exhibition of 1851. Four allegorical figures, representing the four quarters of the globe, receive from Queen Victoria wreaths and rewards, while natives of the different countries bring their manufactures and produce to the Exhibition. In the background is the building. The figures are executed in buff tissue, the Exhibition being black, and the groundwork of the whole, gold. On the pedestals at the corners of the building will be colossal groups in terra cotta, designed by Mr. Bale, a student of the Lambeth School of Art. One of these figures is already on the ground. The summit of the roof is surrounded by a perforated screen of cast iron.

Meat Extracts and Beef Tea.

Dr. P. Müller has given, in the *Moniteur Scientifique*, an account of his researches on this subject, and his conclusions are as follows: Meat extracts are neither directly nor indirectly food, for they do not contain albuminoid matter, neither do the nitrogenous principles which they contain arrest dis-assimilation; that is, they do not prevent the waste of the organic matter which composes the body. In small doses, these extracts are useful, by the stimulant action of the potassa salts, which promote digestion and circulation; in strong doses—too large at once—these substances may have a very injurious effect. When given to convalescents from serious diseases, especially if the system is exhausted by prolonged abstinence, the potassa salts, present in these extracts in large quantities, will act more injuriously, because the system has lost a great deal of chloride of sodium; instead, then, of promoting digestion, these substances will interfere with it; (1) by the direct action of the salts of potash on the blood globules, whereby the absorption of the oxygen by these globules is greatly decreased; (2) by the predominance of such salts, in the serum of the blood, which only physically dissolve carbonic acid and do not allow the normal quantity of that gas to be exhaled, and thus impede the access of oxygen. Medical men should bear in mind that, if given alone, these extracts, and likewise beef tea, are no nutriment, and only tend to keep the convalescent weak, being thus ill-fed, or rather, not fed at all. These conclusions are substantially those entertained by Liebig and many other investigators in the same field.

Robinson's Self-acting Mules for Spinning.

This invention consists of an enlargement on the scroll or wheel of the back jack band of the Sharp and Roberts and other like spinning mules, so arranged that just previous to the end of the inward or winding-on movement of the carriage, the back jack band—which is the one that regulates the movement of the carriage when it is drawn out by the front jack band—will be wound upon the enlargement so as to considerably increase the tension of the front jack or drawing out band, for giving the carriage a quicker movement—as the back jack band is delivered from the enlargement at the beginning and during a small portion of the outward movement—than the ordinary movement, and faster than threads are delivered from the rollers, for taking out the kinks which get in the yarns when slackened up by the rising of the fallers to let said yarns run up to the points of the spindles, ready for twisting, as the carriage runs out again.

The improvement differs from the arrangement of the enlargement on the scroll which works the front jack band or drawing out band, in that, while it pulls out the kinks, it does not put drag in the yarn; that is, it does not draw out the yarns or threads any finer than they are drawn without it, as the other arrangement does, for the slacking off of the drawing out band compensates for the accelerated motion of the carriage in the first part of its movement, so that, notwithstanding such accelerated movement, the carriage does not move any further during the whole stretch than it would if the enlargement was not used; whereas, in the other arrangement—that is, where the enlargement is on the drawing out scroll and the accelerated motion is caused by the running of the cord on to the enlargement at the beginning of the outward movement—the gain of the carriage on the delivery of the rollers is kept up throughout the stretch, and thus more stretch or drag is put in the yarn than is desirable.

Mr. Feargus O'Connor Robinson, of Fall River Mass., is the inventor of this improvement.

A MONSTER ENGINE.—One of the largest stationary engines in the world was recently put into operation a few days ago at the Lehigh Zinc Works, at Friedensville, Lehigh county, Pa. It is of three thousand horse power; it weighs 650 tons, and is capable of pumping, if necessary, from 15,000 to 17,000 gallons of water per minute, and this from a depth of 300 feet. The heaviest pieces are sections of beams weighing 24 tuns each. The cylinder is 110½ inches in diameter, and the stroke 10 feet long. Two wrought iron shafts weigh 16 tuns each, and the crank pins one tun each. The piston rod is 14 inches in diameter. The crosshead weighs eight tuns. The connecting rods weigh 11 tuns each, their length is 41 feet 2½ inches, and their diameter 9 inches in the neck, and fifteen inches in the middle.

THE boiling point of bisulphide of carbon is 118½° Fahr.

COLORING SEEDS FOR SOWING.

Horticulturists and farmers are fully acquainted with the importance of securing the equal distribution of seeds, whether sown in drills or broadcast. If the seed be unequally distributed, the result is too small a crop upon the parts of the land that have less than their share, while the portions that are overcrowded with plants will also yield too little, unless the defect is remedied by thinning out, which process is always more or less detrimental to the growth of the plants that are left.

In sowing seeds that, on account of their size and color, are undistinguishable from the soil, there is, in the ordinary way, no guide for the operator, who cannot see whether his work is done uniformly or not. But an inventor down South has just taken a patent through the Scientific American Patent Agency, for so coloring the seed as to enable the sower to see where it falls, thus supplying this needed guide.

The seeds are prepared for sowing by first moistening them, and then rolling them in flour or other suitable material until they are coated. This does not injure them, as the coating absorbs the water, and speedily dries in the sun, if the seeds are not immediately required for sowing.

When the seed is deposited, the coating, by the absorption and retention of moisture, hastens and renders more certain the germination.

The seeds being thus rendered visible, as shown in the accompanying engraving, the sower, whether scattering them by hand or planting them by a machine, may correct such faults in the work as are made apparent. The coating will also act as a fertilizer, the value of which will depend upon its character.

Patented January 16, 1872, through the Scientific American Patent Agency, by J. C. H. Claussen, of Charleston, S. C., whom address for rights or other information.



COLORING SEED FOR SOWING.

Gather Woods Dirt.

When going to work in the fields near the wood lot, take along a shovel and carry home at noon and at night a load of forest loam, or else set apart a day and devote it entirely to the purpose of collecting. Woods dirt is one of the best mulches that can be used; it is one of the absorbments for the stable, and as a loam and fertilizer for soil it cannot be excelled. It is good upon all kinds of soil, and as cheap as the air.

Leaves and loam form an excellent material for house banking and for covering vegetables buried in the fields or garden. Nature has designed the fallen leaves as a shield to the tree roots against the frost; a thin coating being almost impervious to that element, they are, therefore, exactly fitted for the use above mentioned. No better manure can be used upon the garden, as it will make the soil light and airy, and at the same time give it the primitive qualities of fertility.—*Ohio Farmer.*

Painting.

A correspondent in the *Journal of the Farm* gives the following hints on painting buildings: The advantage of a good coat of paint on the woodwork of buildings and wooden implements is too obvious to need any special notice. The only thing necessary to speak of is, which is the best method of performing the work to give the greatest durability? Buildings are painted for a double purpose; in the first place for ornament, and in the second place to afford greater durability to the wood. Painting is an object of great importance to the farmer, for without it houses and implements will not last more than half as long as when kept well painted. The ornamental part of painting depends on the coloring material employed and the skill shown in the proper adaptation of mixing the ingredients. But the utility of the work depends altogether on the oil. The closing of the pores or the saturating of the surface of the wood to exclude air and moisture is the great object to be obtained.

Oil without the admixture of paint thoroughly worked into the wood will be the best protection against atmospheric influence, but the first cost will be much greater than when mixed with paint. Painters direct too much attention to the rapidity of execution, which is incompatible with filling the wood with oil without extra ingredients for drying, such as benzine, turpentine, japan, varnish, litharge, etc., which have a tendency to decompose the oil with which the paint is mixed, and which is the only principle of durable adhesion in paint. The small amount of oil which is left in the paint is formed into a gloss which is only superficial and is soon worn off by rain.

To be convinced that turpentine injures the durability of paint, we need only observe the effect it produces on oil spots on floors, clothing, etc. But for inside work not exposed to weather, a due portion of turpentine with oil is much better for mixing paint than oil alone, which turns the paint yellow in the absence of air and light. All the preparation that oil needs to make good paint is boiling to free it from impurities, and for outside work, barns, fences etc., nothing but the purest oil should be used, as it is always the cheapest in the end; for in painting, everything depends much on having the work well done. All the articles should be good, and the operation skilfully performed. In conclusion, let farmers not in any wise neglect to paint their buildings, yard, fences, etc. Moderately cold weather is the best time lay on the paint, and great haste in the application is inadmissible. The oil must have time allowed for absorption, so that the paint and oil will become glazed and indurated before the second coat is applied. Some painters talk of giving two coats of paint in a day. It may be done, but depend upon it, durability is far paramount to dispatch, and the farmer who does his painting in a hurry and in hot, dry weather, commits a great mistake; for the preparation dries with such rapidity by the heat in the boards that the oil is absorbed and the pores of the wood are only closed on the surface by the paint. Clear cold weather, pure linseed oil without any turpentine or other drying materials, and long intervals between the applications of the several coats of paint, are the best plan that can be adopted.

PATENT CROCHETED CAPS, FOR INFANTS.

Mrs. L. E. Love, of New York city, obtained, through the Scientific American Patent Agency, Nov. 28, 1871, a patent upon crocheted silk caps for infants as a new article of manufacture. Our engravings represent the appearance of these articles, which may be made in various other styles and patterns, the material employed, and the method of manufacturing it admitting of variety, with extreme delicacy and beauty of finish.



The caps are admirably adapted to the use for which they are intended, and are much cheaper than those of real lace and quite as beautiful; while the softness of the texture renders them far preferable. They will neither chafe the delicate skin of infants nor be injured in folding. Lace is a harsh material and is apt to abrade the skin and produce irritation about the neck. These caps, may be made very warm and comfortable for winter cover, or light and airy for summer.



The article is doubtless destined to take its place in the regular trade in this line of goods, and will, we think, upon inspection, verify all we have stated in regard to it. Patents have also been secured, through this office, in England and France. For further information address Samuel Love, agent, 313 Sixth avenue, New York.

Evans' Improvement in Overshoes.

This invention consists of a cloth top and india rubber bottom overshoe, having a yoke of elastic india rubber lined cloth inserted in place of a portion of the instep at the upper part removed, for stretching to allow the shoe to be put on, and contracting again to keep it snug and tight, the object being to dispense with the elastic gores heretofore used, which are objectionable, as it is only a small portion of the upper part of the shoe top that is required to stretch to put on the shoe, while the gores extend to the bottom and take much more of the elastic cloth than is needed; and they are not so easy on the foot, for the latter is subject to the contracting power of two pieces of the elastic cloth; whereas in this invention but one is used, and the same length of cloth is stretched as when the gores are used, for the yokes may be extended as far along the top as necessary.

The yoke of elastic cloth is made wide—say an inch or thereabout, at the center of the instep, as may be necessary to allow of putting it on sufficiently easy, but varying according to the hight of the shoe; and it extends along the top at each side toward the heel one third of the way, more or less, gradually tapering up to the top of the shoe, where it is secured in any way preferred. This yoke is preferable to the gores, in that it is exactly in that part of the shoe that is required to stretch when putting it on or taking it off, or by the action of the feet in walking. The shoe is therefore more symmetrical and natural than when the gores are used, and the stretching is at the sides.

The improvement is the invention of Mr. John Evans, of New Brunswick, N. J.

Transparencies for the Lantern.

Mr. E. Anderson gives the following as the most simple plan of preparing photographic views, etc., for exhibition on the screen. The negatives should be very intense, and, of course, reduced to a size proportionate to the lantern. Let the glass be very flat and free from scratches and bubbles; for these, when magnified, produce an unsightly appearance on the screen. Varnish them with a very thin, transparent varnish. Next take ordinary portrait collodion, and add to it one third of its volume of a mixture of equal parts of alcohol and ether, shake well, and filter. Coat very thin, spotless glass with this, and sensitize in the usual way. When smoothly coated, wash thoroughly under the tap, and flow twice with common ale well filtered. When perfectly dry, put in contact with the negative in a printing frame. Expose one minute or more to strong gas light, or from five to twenty seconds to diffused light. Next flow on and off the plate an ounce of the following solution:—Pyrogallic acid 12 grains, citric acid, 8 grains, water 6 ounces. When the plate is uniformly covered, add a few drops of a forty-grain solution of nitrate of silver in water. When sufficiently developed, wash, fix, wash again, and set aside to dry. Pictures thus produced may be painted with the ordinary transparent oil colors.

Phosphorus Bronze.

Some recent experiments, made for a committee of the French Academy, upon the properties and merits of the application of the new alloys containing phosphorus, have resulted very favorably. One of these experiments was the bursting trial of a six pounder cannon of phosphorous bronze cast at the royal foundry at Liége; the result showing that under the charges the regulation piece had burst, while the new gun could still be fired with perfect safety. The bronze employed was made by adding phosphorous copper to metal coming from old guns. From the great hardness, toughness, and stability of the new compounds, as evinced by these as well as other trials, it is safe to conclude that their future applications will be very numerous. As an example of the application of the bronze in machinery, it is stated that a pair of pinions of universal rollers had been used for ten months, and were finally destroyed by the wearing away of the teeth, none of them having been broken or split. It has also been successfully applied for the collars of hydraulic presses, eccentric rings for locomotives, pistons and bolts for steam cylinders, etc.

IRON AND WIRE RAILING.—J. B. Wickersham, formerly of this city, but more recently of Philadelphia, has again established himself in the manufacture of iron and wire railing, at 1,003 Ridge avenue, in the latter city. He was among the first to make light ornamental iron and wire railing in this country, and for many years carried on the business prosperously in this city. The railings around the reservoirs in our Central Park, and at Prospect Hill and Ridgewood water works, were made under Mr. Wickersham's patent. We wish him prosperity in his old field of labor.

THERE have been 72 patents granted for post hole augers, the first dating back to 1835, and the last, October, 1871.

Correspondence.

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

Diamonds.

To the Editor of the Scientific American:

The late immense discoveries in Africa of large precious gems are startling and wonderful, creating no small amount of interest in the craving minds of many; and although I have from time to time seen, in your ever interesting and instructive paper as well as in some other publications, brief accounts of or merely allusions to size, value and number of precious stones, I have not as yet ever seen any reference as to the manner or mode of knowing at sight how to discriminate between a common pebble and a gem in the rough state. No doubt, if the information now respectfully sought after can be given, it will be of very great interest to thousands who weekly enjoy the perusal of your science-imparting paper.

1. What (if any) are the particular geological locality and peculiarities indicating the presence of the diamond?

2. Are there any superficial indications of soil, etc., and does the diamond generally accompany precious metals or their ores?

3. Is the diamond found only in isolated localities, and more frequently in tropical regions?

4. Do precious stones, the diamond in particular, always conform, in their natural rough state, to any special shape or configuration; or are they of irregular shape like ordinary river pebbles, with granular incrustations or sandy coatings?

5. Are the skill and experience, of a lapidary only, capable of knowing and determining at sight what a diamond or other precious gem is?

6. Are diamonds so hard as not to admit of any ordinary abrasion or scratch of a steel file, or will any ordinary percussion or blow produce fracture? I have heard many persons assert that the blow of an ordinary hammer would make no impression on or deface the diamond.

7. Are precious stones in the rough shaped and dressed in the United States, or are the finished gems produced only in foreign countries?

8. Do diamonds in primitive form have impurities or fractures?

9. Does a genuine diamond emit rays in darkness, and are the facets of the finished gem due to the taste and skill of the lapidary, or are the facets peculiarities of the gem requiring special cutting?

10. What is the real estimated value per carat of a diamond of the first water, and does the size increase the value per carat?

I have never seen in print, nor have I ever been able to find any full and satisfactory explanation to the foregoing questions, although Dana's works, Feuchtwanger and others have been consulted carefully.

Sunnyside, D. C. QUERIST.

Answers: 1. Diamonds have been found in alluvial deposits, in brown hematite, and in conglomerates; but in almost all instances the rocks have been of the metamorphic group, containing gold. 2. There are no surface indications; in Brazil, diamonds are found in conjunction with itacolumite or flexible stone (already described in these columns), while in Golconda, the most famous mines in the world, the stones are in boggy earth so soft that the workers pound it with their feet to find the diamonds. 3. India, Borneo, and Brazil have till lately furnished most of the diamonds now in use, but some have been found in Georgia and North Carolina. 4. Diamonds have been found of all possible shapes, but their surfaces are always characterized by peculiar crystallization, and, 5, it is by this that they are distinguished from pebbles or pieces of quartz, by diggers. 6. No steel file will cut a diamond, but fragments have been reduced to powder in a steel mortar. 7. Diamond cutting is carried on chiefly by the Jews of Amsterdam, although it is done to a considerable extent in London, Paris and Vienna. 8. The faults of diamonds are fractures and impure color, the latter taking all shades of blue, red, yellow, and brown. The celebrated blue diamond of the late Mr. Hope attracted much attention in the Exhibition in London, 1851. Black diamonds are common in Brazil; they are nearly pure carbon, and are now extensively used in the construction of rock drills. 9. It has been stated that diamonds, after exposure to the rays, especially the blue rays of the spectrum, of the sun continue to emit light after removal into a dark room; but this report needs confirmation. The heat of fire or of the sun increases the refractive power of the stone. The manner of cutting is determined by the shape and proportions of the stone, the usual forms being the brilliant, the rose, and the table. It is in judging on this point that the skill and knowledge of the lapidary is chiefly exhibited. 10. The value varies from $15 to $75 multiplied into the square of the number of carats in the stone. Thus a diamond of 10 carats, of the highest purity, would be worth 10 × 10 × 75 — $7,500. A 61 carat stone sold in 1858 for $165,000.—ED.

Test of Water Wheels at Lowell.

To the Editor of the Scientific American:

Some time since, seeing a notice of Mr. Burnham's in your paper, giving results of a test of one of his wheels, stating how much benefit the public generally is deriving from the tests of water wheels at Lowell, Mass., and giving the wheels so tested their true record and position: it occurred to us that fuller details of a test might interest your readers, for we also are of the opinion that more light is needed upon turbine wheels.

On January 10th, 1872, one of our wheels, an ordinary cast iron wheel and case, was tested with the friction brake employed in these tests. This brake is made in sections, very ingeniously arranged, to allow a current of water to circulate all around the bearing surfaces, thus keeping them cool, and not interfering with their lubrication.

The circumference of the circle, which would be described by the revolution of the point where the load was attached to the brake, was 15 feet. The wheel made 433 revolutions in five minutes, or 86·6 revolutions in one minute with 220 pounds load;

$$\frac{86{\cdot}6 \times 15 \times 220}{33000} = 8{\cdot}66$$

actual horse power developed by the wheel. To obtain as great accuracy as possible in this test, it was thought best to correct the observed depth on the weir for the velocity of the water approaching the weir. This is not always done, even though the water may approach the weir with greater velocity than it did in this test. Mr. J. B. Francis, the author of this mode of correction, says that it is only necessary where great accuracy is required. In this test, this correction reduced the percentage of the wheel seven tenths of one per cent from what it would have been had such correction not been made.

Mr. Francis' formula for the flow of water over weirs is the one used in this test, as well as in all the Lowell tests. This formula and the one for correction, for velocity of water approaching the weir, were both verified by Mr. Francis in his experiments at the lower locks in Lowell, Mass., in 1852, and both must be equally correct.

The depth on the weir by observation was 1·02 feet; velocity of water approaching the weir, ·64769 feet per second; head due to this velocity, ·00652175 feet; then by Mr. Francis' formula, we have

$$[(1{\cdot}02 + {\cdot}00652175)^{\frac{3}{2}} - {\cdot}00652175^{\frac{3}{2}}]^{\frac{2}{3}} = 1{\cdot}02619$$

the depth on weir by correction.

The length on weir was 4·5 feet; the number of end contractions, two.

$$4{\cdot}5 - {\cdot}2 \times 1{\cdot}02619 = 4{\cdot}2948$$

length of weir corrected for end contractions; then

$$3{\cdot}33 \times 4{\cdot}2948 \times 1{\cdot}02619^{\frac{3}{2}} = 14{\cdot}86708$$

cubic feet of water per second.

The head of water was 6·11 feet, each cubic foot of water at temperature of 33° F., weighing 62 377 lbs.; then

$$\frac{14{\cdot}86708 \times 62{\cdot}377 \times 6{\cdot}11}{550} = 10{\cdot}3021688$$

theoretical horse power of water flowing through wheel.

Actual power of wheel

$$\frac{8{\cdot}66}{10{\cdot}30213} = {\cdot}8406$$

actual percentage or ratio of useful effect to power expended.

We submit herewith a tabular statement of percentages of useful effect, the results of all the tests yet made with different wheels at Lowell by this brake:

No. of Wheel.	FULL GATE.							THREE FOURTHS.						
	1	2	3	4	5	6	Average.	1	2	3	4	5	6	Average.
Bladon	·7214	·7830	·8496				·7847	·6000	·6500	·7000				·6500
Houston	·7660	·7996	·8320	·8000	·7720	·7320	·7836	·6000	·6500	·7000				·6500
Swain	·7729	·8100	·8570	·8320	·7996	·7660	·8062	·6000	·6500	·7000				·6500
Burnham	·7709	·7920	·8100	·7996	·7720	·7214	·7776	·6000	·6500	·7000				·6500
Stetson	·7516	·7720	·7996	·7720	·7430		·7676	·6000	·6500	·7000				·6500
Leffel	·7270	·7430	·7720	·7430			·7462	·6000	·6500	·7000				·6500
Bodine	·7214	·7320	·7430				·7321	·6000	·6500	·7000				·6500
Bryson	·6927	·7000	·7214				·7047	·6000	·6500	·7000				·6500
Luther	·7234	·7000	·7270				·7168	·6000	·6500	·7000				·6500
Barber	·7023	·7146	·7320				·7163	·6000	·6500	·7000				·6500
Libby	·6927	·6940	·7146	·7000	·6720		·6946	·6000	·6500	·7000				·6500
Wheeler	·7023	·7146	·7320	·7146	·6940	·6720	·7049	·6000	·6500	·7000				·6500
Cook	·7111	·7246	·7430	·7320	·7146	·6940	·7199	·6000	·6500	·7000				·6500
Thompson	·7111	·7246	·7430	·7320	·7146	·6940	·7199	·6000	·6500	·7000				·6500
Trulliger	·7000	·7111	·7320	·7246	·7111	·6940	·7121	·6000	·6500	·7000				·6500
Cox	·6927	·7000	·7214	·7111	·7000	·6927	·7030	·6000	·6500	·7000				·6500
Stillwell & Bierce	·6800	·6927	·7111	·7000	·6927	·6800	·6927	·6000	·6500	·7000				·6500
Davis	·6656	·6800	·6927	·6800	·6656	·6500	·6723	·6000	·6500	·7000				·6500
Easton	·6656	·6800	·6927	·6800	·6656	·6500	·6723	·6000	·6500	·7000				·6500
Tyler	·6656	·6800	·6927	·6800	·6656	·6500	·6723	·6000	·6500	·7000				·6500
Whitney	·6513	·6656	·6800	·6656	·6500	·6346	·6579	·6000	·6500	·7000				·6500
Wesby	·6513	·6656	·6800	·6656	·6500	·6346	·6579	·6000	·6500	·7000				·6500
Wyckoff	·6346	·6500	·6656	·6500	·6346	·6190	·6423	·6000	·6500	·7000				·6500
Fiddleberger	·6190	·6346	·6500	·6346	·6190	·6033	·6267	·6000	·6500	·7000				·6500
Keller	·6190	·6346	·6500	·6346	·6190	·6033	·6267	·6000	·6500	·7000				·6500
Upham	·6033	·6190	·6346	·6190	·6033	·5876	·6111	·6000	·6500	·7000				·6500

Mount Holly, N. J. T. H. RISDON & Co.

Something about Opals.

To the Editor of the Scientific American:

The opal, a well known mineral and precious stone, is a silicate containing water, much softer than quartz. It can be easily dissolved in a hot solution of potash, while quartz is not so dissolved. As many are aware, such stones often, after a time, become dull, losing the water contained in them, and in this state are valueless. A friend of mine, a few months ago, purchased several such worthless stones from a jeweler in this city, for a mere nothing, with a view of restoring them. He placed them in a damp cellar, and in a month or two they were perfectly restored, and are as brilliant and beautiful as when the jeweler bought them.

Let any who have such stones try this experiment, and they will find their opals restored. G. J. R.

Hoboken, N. J.

A FINE tube is half filled with bromine and hermetically sealed; on heating, the bromine becomes opaque, so that the tube appears to be filled with a dark red resin.

Our Rotten and Inefficient Navy--A Cheap and Tried Plan for Vessels of War.

To the Editor of the Scientific American:

As the fostering of erroneous opinions, or other causes, has not only cost the government untold millions of money in the construction of seagoing vessels of war, but has left us without an efficient navy with which to protect our commerce or assert our rights among nations on the high seas; and as the public journals from Maine to Georgia are now complaining most bitterly of the past administration of our navy department, it may be of utility to the country at large, and the scientific and practical mechanic in particular, to offer a few remarks upon plate armor for ships, and the practicability of diffusing the impact of percussive force; in other words, upon a means of resisting or deflecting shots and shells of all sizes and shapes, and at the same time constructing ships so that they may possess the essential elements of buoyancy and dispatch, as well as cheapness.

Without referring to familiar instances, it is well known that excessively hard or soft fibrous substances, when impacted and of sufficient thickness, will successfully resist the penetration of projectiles. Iron is one of the former substances, and cotton, oakum, wool, and silk are among the latter, the former operating by opposing direct resistance, and the latter gradually checking the force of the projectile and enlarging the base of resistance. Therefore it would seem, theoretically, that a combination of both these powers of resistance would at the same time unite impenetrability and lightness.

Plates of vulcanized india rubber, as at present manufactured in the United States, possess all the conditions required to enter into this combination, and accordingly the results of experiments with this substance when laid under the iron plates of gunboats in the West, during the late war, has fully demonstrated the theory to be correct. But a series, of plates of iron and elastic cushions alternately arranged, appears from the results of experiments more effectual than a single layer of each composed in the aggregate of the same thickness of materials: as the force of the blow is thereby diffused from the point of impact over a larger surface of the inner plates (in the proportion of 80 to 200 per cent at direct firing, and as the angle becomes obtuse the per centage has been known to quadruple), and, therefore, opposes a greater proportionate resistance to penetration.

These results correspond with the theory before advanced, and were anticipated from the well known action of india rubber when combined with fibrous substances. The iron plates resist the sudden percussive force of the ball, and the india rubber plates oppose a gradual but powerful resistance from a greater extent of surface. Many useless and erroneous objections have been made to the use of india rubber for this purpose, without reflecting that when we wish to cut or punch a bar or plate of iron, we naturally lay it upon and in close contact with the most unyielding and solid support that we can devise, in order to obtain the greatest effect from the percussive force applied to the chisel or punch. Surely, we may reasonably infer, from this familiar example, that iron plates should be never laid upon a solid support if we wish them to resist the penetration of a cannon ball.

It is true that, in punching a hole through an iron plate, we place it immediately over a cavity or hole, which is to receive the plug of iron which is cut out and driven through the plate; but we must bear in mind that in order to do this, the support must be unyielding and the edges of the hole in the die made hard and sharp, so as to have the effect of powerful shears, when the die, in combination with the sharp square edges of the punch, cuts out the plug which the punch follows through the hole. Sheet iron workers also frequently use blocks of wood, endwise, and lead upon which to punch holes through their iron; but we all know that these two substances are comparatively inelastic, and that for this purpose the most unyielding support is the most effective for this or similar purposes.

Of the action of india rubber itself, which is not so effective as when combined with the fibrous substances, the feat of a juggler, when catching a heavy cannon ball falling from a great hight, is an apt illustration. In attempting to check its descent, he does not place himself perfectly erect, or in a rigid attitude, but he gradually yields to the momentum of the descending body; and thus he is enabled to check, without injury, the impetus of the weight that would otherwise crush every bone in his body.

Aside from the familiar examples above cited, the superiority of elastic backing for defensive armor was fully and indisputably demonstrated in the late war, as before stated, on board the United States gunboats *Essex*, *Lafayette*, and *Choctaw*. These three vessels were in the hottest of battles, fought at close quarters; some of them were under the enemy's fire for more than five hours at a time, and were hit by cannon balls 276 times in the aggregate, as appears from published official reports. Notwithstanding the fact that the iron plate armor did not exceed two inches in thickness, and in some parts was only three fourths of an inch thick, on these three vessels, all that portion of them that had elastic backing was not in a single instance penetrated, while certain parts of the same vessels (protected with iron of like thickness placed on unyielding oak backing, but without the elastic backing) were penetrated at various times and by different sized shots and shells. These statements are authenticated by the affidavits of commissioned officers, who not only served on board these three vessels during the war, but were present during their reconstruction, and saw how each square foot of each vessel was protected. The *Essex* was originally a common ferry boat at St. Louis. Her cost to the Government was less than one hundred thousand

dollars; and at the time she destroyed the ram *Arkansas*, August 6, 1862, she drew only 6½ feet of water. The *Lafayette* and the *Choctaw* were originally common steamboats on the Mississippi river.

From the above facts, it is apparent that it is not essentially necessary to expend untold millions of money in order to produce a good and efficient navy; neither is it essential so build ne v vessels. But it is essential to do away with old fogyism and fossil-like plans, expedients, and devices, and adhere to scientific principles and mechanical laws, as well as to past experience.

To awaken the attention of officials and Congress to a sense of the humiliating condition we are in, owing to our inefficient navy, we have only to refer to the last annual report of Hon. G. M. Robinson, Secretary of the Navy, and the records of the past. That our foreign relations are such as to demand of every honest citizen a faithful response to the *imperative necessity*, is apparent to every intelligent person in the country. J. . J.L

[For the Scientific American.]

A REMEDY FOR SMALL POX, BY ONE WHO HAS TRIED IT.

The following was written several months ago, but was not forwarded, as the press has been teeming with small pox "cures" which are generally so evidently worthless that I hesitated putting my little communication among the prescriptions; feeling almost sure it would meet with no more attention than is accorded to the many, placed daily before the prudently incredulous reader.

But I find it impossible to resist the conviction on my part that to withhold any longer from the public my knowledge of a remedy—or mode of treatment—for variola and its modifications, would be criminal, as well as weak, in view of my confidenee as to a successful result.

Some years ago, I had a case of varioloid, in my family, contracted from actual contagion, but not from strictly immediate contact with variola. The patient, my daughter, a child nine years old, carried a muff to church, the day after her mother had loaned it for a short time to a young lady friend in the cars. This lady had just recovered, apparently entirely, from small pox contracted from her brother, who had returned home from the army, convalescent but during the period of active desquamation, after a recent and almost fatal attack of small pox.

Precisely ten days after my daughter carried the muff. on the eve of the tenth day, she was quite ill from a complication of symptoms. The next morning I noticed a number of spots on her skin, alarmingly suggestive of variola. Not having had any experience of such a case, I consulted a friend, a physician, who at once pronounced her disorder varioloid. He thought, too, that it would prove a severe case, as the symptoms, namely, fever, back ache, headache, nausea, and the general appearance of the eruption, warranted such a diagnosis.

I took the case pretty much into my own hands, as I had at once resolved to pursue a line of treatment entirely different from that usually employed in such cases. Some time in the year 1861, I read in a number of the SCIENTIFIC AMERICAN (of that year), that a new remedy, discovered by a French chemist, namely, *sodæ sulphice*, was attracting great attention in certain quarters from its success in the treatment of ulceration, etc., and more particularly by its having cured entirely several well attested cases of hydrophobia. Its many valuable properties were fully discussed, verified, and freely endorsed by the French College of Surgeons; and were in substance what is now given in ample detail in the "United States Dispensatory," 1871, thirteenth editorial article—"Sodæ sulphis."

After some delay, I obtained a bottle of this medicine, and made use of it according to the notice of its properties, as occasion gave opportunity and always with satisfactory results.

To resume the subject of my case of varioloid. I administered to my patient 15 grains of the *sodæ sulphice*, dissolved in milk well sweetened, every three hours. I also had her entire body oiled effectually with crude petroleum, applied with the bare hand.

The next morning the eruption was absolutely killed and dry; and the disease broken up, to the wonder and, I need scarcely add, the great relief of all interested. As no pustules had had time to form, not the least trace of the eruption remained; and in a few days my child was as well as ever.

When the "seventeen year locust" abounded in this region, it was found that the sting of the male locust was so poisonous as to produce serious and, in some cases noted, even fatal effects. A servant girl in my family trod upon a locust, and the sting had to be withdrawn with tweezers. The girl screamed with agony, and said it was "worse than forty bee stings." I gave her about 15 grains of the *sodæ sulphice*, and kept the wound wet with a cloth dipped frequently in a mixture of equal parts of spirits ammonia, alcohol, and strong water solution of the *sodæ sulphice*. Although her foot had swollen amazingly before I had time to prepare my remedies, yet it stopped swelling at once after the first dose and application. A sharp pain went through the foot occasionally, but in a few hours the swelling and pain were entirely gone.

When my interest was first excited by the article referred to, concerning the *sodæ sulphice*, I urged a prominent druggist to send for it. He consented, stating, as far as I remember, that I should have to wait some time for it, as he should have to order it through a London house. I received it in due time, labelled as above.

I have, since that first supply was exhausted, made use of the American preparation, the sulphite of soda; but I prefer the foreign (French) article, as the American contains a larger percentage of sulphuric acid, and is, in fact, a hyposulphate. However, this now officinal preparation is equally efficacious.

I used the *sodæ sulphice* with perfect success, in cases of ulceration and as a wash for scrofulous discharges of the eyes and glands, at the same time administering it internally, in doses varying from 10 to 30 grains, three times a day.

I would strongly urge the use of the crude petroleum in connection with the *sodæ sulphis*, for variola and all its modified forms; and in the treatment of measles, scarlatina, or any eruptive disease, whatever its nature may be. The beneficial effect of oiling the skin is well known.

The "crude oil" I use is that sold here in Pittsburgh under the name of "Kiers Petroleum." Several varieties of crude petroleum can be got, on inquiry, that are so clear and pure as to be available for many purposes without refining. Of this article there is, fortunately, no scarcity.

As the latest edition of the "United States Dispensatory" may not be within reach of all interested, I subjoin, from my copy (1871) a portion of what is said of the remedy—*sodæ sulphice*—under the description of the article, pp. 826, 827.

"Sulphite of soda, (*sodæ sulphis*). This salt was first adopted as officinal in the present edition of the 'United States Pharmacopœia.'

"Medicinal uses. Sulphite of soda has been used in cases of yeasty vomiting with remarkable success. The matter vomited in these cases has a yeasty appearance on the surface, and is generally found to contain—when examined by the microscope—two microscopic fungi called *sarcina ventriculi* and *toruli cerevisiæ*. The diseases, in which these medicines (the sulphites) have been recommended, are purulent infection, of whatever origin; malignant pustules; hospital gangrene; erysipelas and other exanthematous fevers; malarial and miasmatic fevers; and in fine, all diseases which may be supposed to depend on absorbed poisons not acting on the tissues, but by a species of fermentation. . . . . .

"Also, in controlling suppurative ulcers, and all suppurative affections of the mucous membranes, as of the throat; the bronchial tubes, through inhalation by the atomizer; the urinary passages; and the alimentary canal; and in any case where there is reason to think that the local affection is sustained by zymotic influence or invisible organisms, (parasitic, vegetable or animal); and in any disease in which purulent infection of the blood may be produced by the same cause. They almost act as specifics in such cases.

"At certain stages of cancer they operate in the same way, by obviating the effects of putrid fermentations."

Dr. Farnsworth says, in an article on the influence of drugs upon *larvæ* and insect life in standing water: "A solution of soda sulphite destroyed the inhabitants of the water in one glass, in two hours," etc. By comparing the effects of the different drugs, the Dr. shows that the soda sulphite takes rank with the highest in efficiency.

Thus we have evidence that the soda sulphite is an agent (just beginning to be appreciated) that can be relied on in exterminating noxious parasitic life; also animalcules, that produce or follow upon various diseases; as a remedy for ulcers and sores, for nausea, and vomiting; for eruptive diseases; for poisonous stings and bites; and at the same time possessing no injurious properties whatever, when made use of, internally or externally, in reasonable proportions and quantity.

THE ELECTRO-MAGNETIC TELEGRAPH.--HONOR TO WHOM HONOR IS DUE.

At a recent meeting of the Regents of the Smithsonian Institute, correspondence was presented in relation to the proposal of the National Monumental Society to erect a monument at Washington to symbolize, in statuary of colossal proportions, the history of the electro-magnetic telegraph. Among others, a letter was read from Mr. F. O. J. Smith, who was one of Morse's earliest and strongest aids in the introduction of the telegraph, and who is very familiar with its original history. Speaking of the Monumental Society, he says:

"I feel constrained to say, if that highly laudable association resolves 'to erect at the national capital of the United States a memorial monument' to symbolize in statuary of colossal proportions the 'history of the electro-magnetic telegraph' before that history has been authentically written, it is my conviction that the statue most worthy to stand upon the pedestal of such monument would be that of the man of true science who explored the laws of nature ahead of all other men, and was 'the first to wrest electro-magnetism from nature's embrace and make it a missionary to the cause of human progress;' and that man is Professor Joseph Henry, of the Smithsonian Institution.

"Professor Morse and his early coadjutors would more appropriately occupy, in groups of high relief, the sides of that pedestal, symbolizing by their established merits and coöperative works the grandeur of the researches and resulting discoveries of their leader and chief, who was the first to announce and to demonstrate to a despairing world, by actual mechanical agencies, the practicability of an electro-magnetic telegraph through any distances.

"All telegraphic inventors, from Steinheil, of Germany, down through Cooke, and Wheatstone, and Bain, of England, and Morse and House, of our own country, are but disciples to the science of Henry; and the world is indebted to the latter alone, and to our country, for the first and earliest revival of incentives to mechanical genius directed to telegraphic results of both the electric and magnetic orders, subsequently to the announcement of Barlow's experiments, which were accepted by the scientific world as demonstrating the utter impracticability of such telegraphs.

"But Henry pushed on and melted away his toiling hours in more than four thousand experiments, piercing the mysteries of the subtile forces of galvanic electricity and electro-magnetism, and at length won the victory beyond disputation. And to Joseph Henry our country and beyond it the 'rest of mankind' owe, first, last and forever, the highest and foremost distinction in their monumental symbols of telegraphic history.

"To place the statue of any man above that of Professor Henry in symbolizing the history of the electro-magnetic telegraph, would be to reverse the order of nature as much as if the apex of a monumental shaft were inverted to rest on its pedestal. It would be, in fact, more symbolical of the misdirected judgment of its promoters, than of enduring honor to their subject. It would be to perpetuate, in granite and bronze, a blunder of history. * * * * * *

"Dr. Barlow reached, in 1825, the same mechanical point that Professor Morse reached in 1837, and failed of success for the want of Professor Henry's discovery, for *then* it had not been made known. And, in 1837, Professor Morse must have failed without Henry's discovery, of which he was ignorant, although it had been made known to all men of science several years previously.

"Then Barlow and Morse are inventors of exactly equal merit *in the electro-magnetic history*, although the former was in advance of the latter many years.

"Barlow used the Moll magnet and Morse used the Moll magnet, and neither could succeed.

"Barlow used the quantity battery and Morse used the quantity battery, and neither could succeed.

"Neither knew how to propel the galvanic current *to* a distance, and neither knew how to generate the needful magnetic forces *at* a distance; and hence each failed to construct a practical electro-magnetic telegraph that could be worked at a distance from the operator beyond from 'fifteen to forty feet.'

"Who invented the needful agencies to breathe the breath of life into the mechanism of each—of Barlow and of Morse, and of all other forms of mechanism for an electro-magnetic telegraph?

"Undeniably, Professor Joseph Henry is that man; and 'to him,' I repeat, 'our country, and beyond it the rest of mankind, owe, first, last, and forever, the highest and foremost distinction in their monumental symbols of telegraphic history.'

"In vain will ephemeral pretensions contest this honor. Time, the great unfailing touchstone of exact truth, will correct the errors of partisan and sordid sycophancy; and history, sublimated by true knowledge, will write the name of Henry at the head of the column of well earned, immortal fame in this department of human progress.

"To such a monument I would cheerfully subscribe in the ratio of my means, but to none other that shall precede it, though flattering may be the encomium of having been an early coadjutor of Professor Morse.

"I will thank you to make these sentiments known to the finance committee of the Monumental Association, with my highest considerations of respect for their patriotic motives.

"I remain, with great respect, your obedient servant.

"FRANCIS O. J. SMITH."

PATENT OFFICE DECISION.

In the matter of the interference between the application of Thomas Hanvey and the patent No. 102,346, granted to Henderson Willard, April 26, 1870, for improvement in barrels. Appeal from Examiners-in-chief.

Leggett, Commissioner:

The invention in controversy is a barrel or cask made, in the manner usually adopted for making cheese boxes, of thin strips of wood bent around a mandrel and the ends fastened with nails driven through and clinched. The barrel is made of two plies, one within the other, and so arranged as to break joints. The inner ply is a little shorter than the outer, thereby making a shoulder upon which the head rests.

The evidence shows that Hanvey conceived the idea in 1866, and that he produced some small specimens for exhibition; but there is no evidence to show that he has ever made a barrel for use as such up to the time of filing his application, October 31, 1870.

Willard shows that he began making barrels involving the invention in December, 1869; has continued the same, and applied for a patent April 1, 1870. There is no doubt but the parties are both independent inventors of the device in question. Hanvey first conceived the idea; Willard first reduced it to practice, and threw it upon the market, the first to come to the office, and had his patent six months before Hanvey applied. Yet Hanvey, being the first to conceive, is entitled to priority, provided he used "due diligence" in reducing his idea to practice, and in making application for his patent. Did he use such diligence?

Hanvey states himself that he made the invention complete in 1866, and that in that year or the next he made a barrel; but, notwithstanding the fact that he is a barrel maker, he has never made one since. He tries to account for this neglect of his invention by proving that he was sick during two years of the time. The proof, however, shows that he was not so sick as to be confined to his house or to keep him entirely from business. From his own statement, his invention required no more study and no more experimenting. His model was already made, and I can see no reason for delaying application for a patent, except a want of appreciation of the value of the invention. He evidently regarded it as impracticable or of very little value, and therefore gave it no attention. Willard had invented the same thing, obtained his patent, and put the barrels manufactured under his patent upon the market before Hanvey awoke to the knowledge that his invention was of any value. He slept too long. The man who invents a device and hides his invention under a bushel until another has invented, patented, and developed the same thing is not regarded with favor in this Office or before the courts.

The decision of the board of examiners-in-chief is affirmed, and priority decided in favor of Willard.

SULPHUROUS acid boils at $17\frac{6}{10}$ degrees Fahr.

Cotton Seed Hulling Machine.

Thousands of planters in the South are in the habit of throwing away large quantities of cotton seed, of which they cannot dispose and for which they have themselves at present no use except as manure; yet they buy corn from the West to feed their mules and cattle. These will be interested to learn that a machine has been invented which can, it is claimed, be sold at so reasonable a price as to pay for itself in a very short time; it cracks the seed and separates the meats, which can be used for oil or for feeding purposes. The hulls, when rotted, make a splendid manure.

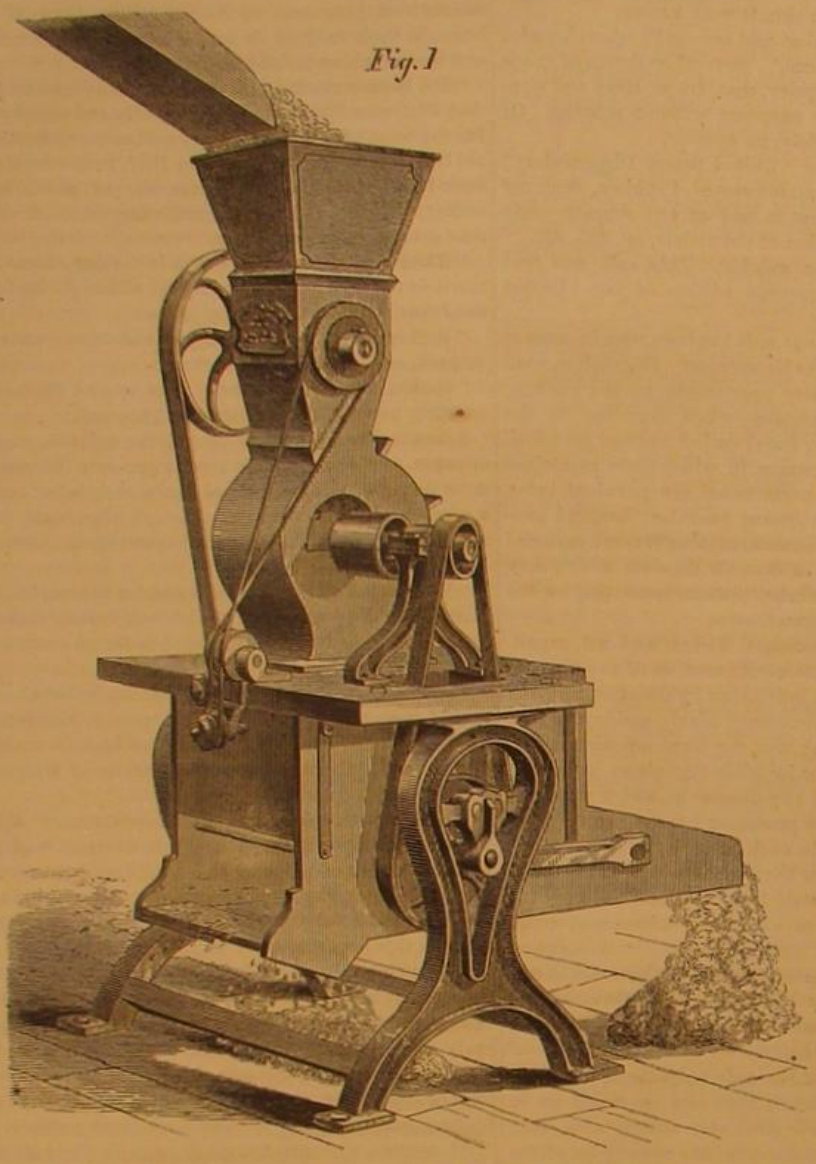


Fig. 1

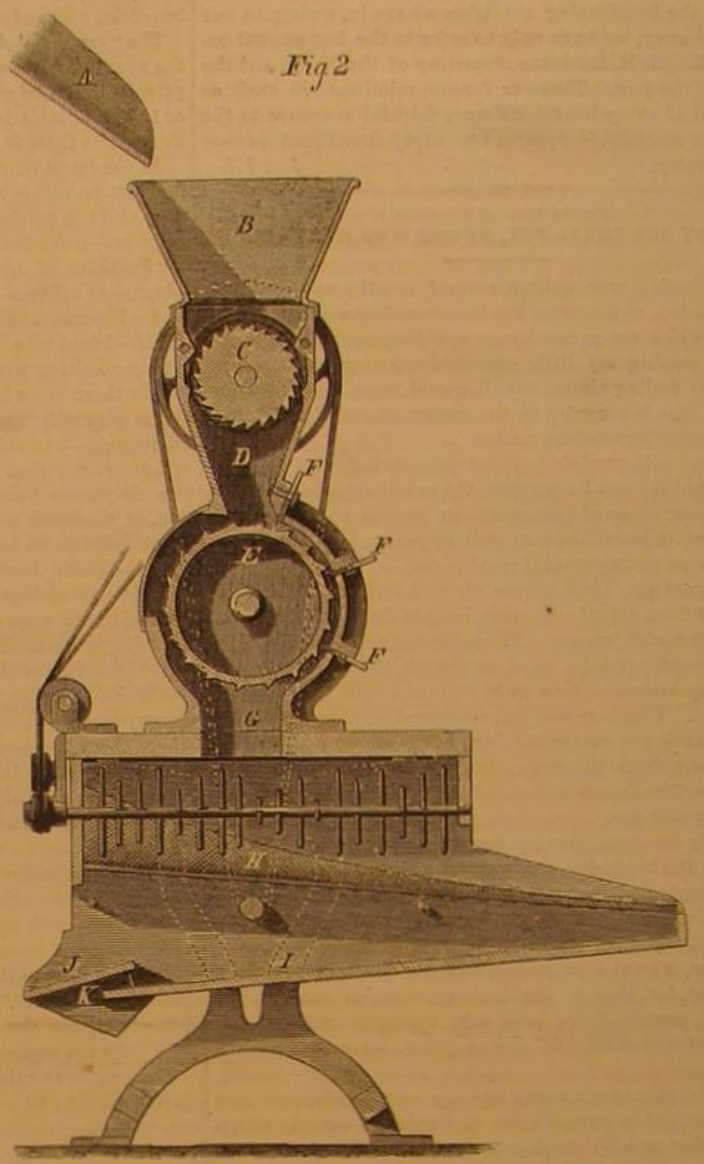


Fig 2

KAHNWEILER'S COTTON SEED HULLING MACHINE.

Our engravings illustrate this new huller. It has its origin from a very successful machine adapted for oil mills, and patented by the same inventor in 1869, and which has been used over three years in some of the largest oil works.

Mr. Kahnweiler designed, in this machine, to simplify the construction of the original machine, so that it might be managed by almost any laborer, and at the same time greatly lessen the cost. There is a great demand among planters for a machine of this kind, to prepare seed for feeding purposes; also to fit it for sending to distant oil mills, to which it might not pay to ship the unhulled seed.

A new improvement also, a screening apparatus, is attached to this machine, forming a complete hulling mill on a small scale. It separates the meats from the hulls effectually without the use of a fan, and is therefore less complicated, and requires less power to run it. The same separator is adapted to use in all the cotton seed oil mills, as the work is done in a small space, and the separator can be built at much less expense than ordinary revolving screens, while it is claimed that it does more perfect work.

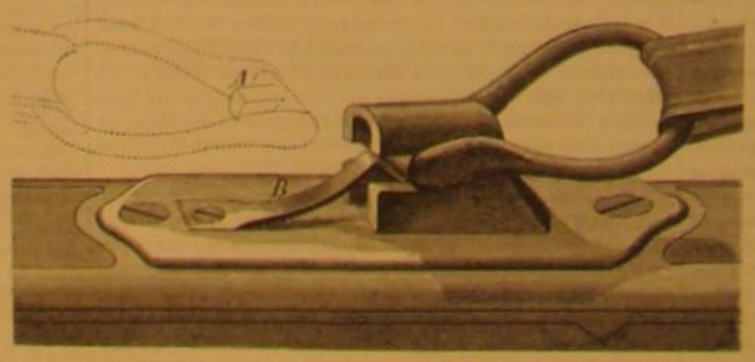
The operation and parts of the machine will be understood by reference to Fig. 2, in which A represents the chute which conveys the seed to the hopper. B is the hopper, C is a toothed or rather a ribbed cylinder, which feeds down the seed, but arrests the passage of stones, sticks, or other substances likely to injure the machine. These foreign matters wedge between the cylinder and the hopper, and cause the belt, which drives the ribbed cylinder, to slip until the obstruction shall have been removed. D is the chute through which the seed passes from the feed cylinder, C, to the hulling wheel, E. This wheel is made of three notched and ribbed sections, which act in conjunction with the knives, F, in the concave shell of the hulling wheel, to crack the hulls of the seed. The sections of the hulling wheel are so arranged that the cutting notches or ribs are staggered, thus rendering the action of the huller more uniform and steady. The knives are adjustable, so as to secure their proper action upon the seed. G is a chute between the hulling cylinder and the screen, H. This last is made of wire netting and bent into the form of a portion of the surface of a cylinder. The seed, when it reaches this screen, is acted upon by a revolving agitator or rubber, formed of a shaft with radiating arms, as shown, which completes the separation of the hulls from the kernels. The latter pass through the screen, while the coarser hulls and fibers are carried along and discharged from the lip of the screen. The hulled seed is then received into the box screen, I, which being shaken by suitable mechanism, separates the still remaining lighter portions of the hulls that pass the wire screen, carrying these portions out over the apron, J, while the cleaned and hulled seed passes out through the chute, K.

The machine is compact, and may be run with one horse power. The invention is secured by several patents, obtained through the Scientific American Patent Agency, the last of which bears date January 9, 1872. For further information address David Kahnweiler, 241 East Fifty-seventh street, New York.

SIMONS' SAFETY HOLD-BACK FOR CARRIAGES.

The nature and object of this improvement secures, at a trifling cost, a neat, convenient, and safe hold-back for all vehicles drawn by a single horse. It is constructed in such a manner that when tugs unhitch, or the singletree breaks, it will let the horse go free It is stated, from a reliable source, that more persons are killed every year by runaways than are killed on railroads and steamboats, and a large portion of these accidents are occasioned by the tugs unhitching, and the horses getting frightened and running away.

This invention appears to afford security against accidents of this kind, and is, in our opinion, an excellent substitute for



the clumsy and inconvenient practice of wrapping the hold-back strap two or three times around the thill, and through an iron or a leather loop, so that the horse cannot become detached from the thills until the harness breaks.

These hold-backs are attached to the upper side of the thills, and the quarter straps of the harness pass through the rings of the hold backs instead of around the thills. The moment the tugs unhitch, or the singletree breaks, and the horse attempts to run away, he turns the ring over, it unlocks and springs out (as shown in the dotted lines of the engraving) thus letting the horse go free.

The projection, A, shown in the dotted outlines, presses upon the spring, B, when the ring is reversed, forcing the latter down so that the ring slips out from the slot in which it plays previous to its release.

Patented April 4, 1871, by N. W. Simons, Williamsport Ohio, whom address for further information.

Good Practical Advice.

Thomas Hawksley, Esq., was elected in January last, to the presidency of the Institution of Civil Engineers, London and on taking the chair, delivered a very interesting and able address, in which the existing condition of science, practical and theoretical, was reviewed in glowing terms. His address closes with the following sound and sensible advice for young men.

1st. Of all things, don't attempt too much. 2nd. Keep up and augment your knowledge of mathematics and the applied sciences, especially of those sciences which are most needed in that walk of the profession which you have selected for your own path; but again, I say, do not attempt too high a flight, for if you do you will never become a practical man. 3rd. Do not let your French grow rusty, and acquire German if your leisure and aptitude are sufficient for the purpose, because your future avocations may be in countries in which these languages are either habitually spoken or are in considerable use. 4th. Acquire in the office, and by the study of esteemed works, a knowledge of form and design. 5th. But bearing in mind that you will never become a practical engineer on theory alone, take every opportunity which presents itself of becoming apt in surveying and levelling, and in the methods employed in the settingout of works; learn the uses and applications of tools; make yourselves able to distinguish a good material from a bad material, good workmanship from bad workmanship, sound ground from treacherous gound, good puddle from bad puddle, good mortar from bad mortar, and a good workman from a bad workman. This knowledge is not to be obtained in a school, a college, or an office, and cannot be learnt from books. 6th. Make yourselves acquainted with every description of plant, and all the appliances and contrivances which an experienced contractor employs for the purpose of rendering a paper design into a substantial construction. 7th Keep brief treatises on geology and chemistry always at hand, for some acquaintance with these sciences cognate to engineering is, in the present day, almost essential. 8th. Practise as much as possible the art of mental computation, for this will give you the means of almost intuitively arriving at determinations on questions of cost, and of at once seizing on the best of several alternative plans or methods. 9th. Be not afraid of soiling your hands or dirtying your boots, but be in every other respect—in thought, feeling, and conduct—a gentleman.

OVER the western half of the Atlantic ocean there are three times as many storms as there are over the eastern side.

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SUBSTITUTING OTHER VAPORS FOR STEAM.---VAPOR OF LIQUEFIED CARBONIC ACID.

Most volatile liquids resemble water in this respect: That when heating them many degrees above their boiling point, the tension or pressure exerted upon the vessel containing them increases in an enormous ratio for a comparatively slight rise of temperature. The table below illustrates this in regard to water and liquid carbonic acid; but it should not be overlooked that these pressures are only obtained as long as there is liquid present; when the last drop is evaporated, and dry steam or pure carbonic acid gas is obtained, the law for the expansion of gases by heat is applicable; the expansion being then uniform for equal degrees of rise in temperature, and by no means subject to the enormous increase experienced as long as unevaporized liquid is present.

If, then, we can get no advantage in using liquids requiring a small amount of latent heat for their evaporation, as shown on page 119, we may, by using liquids of very low boiling point, take advantage of the slight difference in higher temperatures, able to produce evaporation and condensation. If we would apply this principle in the use of steam, we stumble at once on the high temperatures required; if we heat water, for instance, in a closed vessel, from 212° to 248° Fah., we increase the pressure one atmosphere, that is, for 248—212 or 36° Fah. increase in heat, we increase the pressure only 15 pounds per square inch, scarcely half a pound for every degree of heat, while if we add the same quantity of heat to water previously heated to 473° and bring it to 509°, the expansive force of the steam will be raised from 35 to 50 atmospheres; this is 15 atmospheres or 15×15 pounds per square inch. The increase is now 15 pounds or one atmosphere for every degree of heat added. Two vessels of water thus, in which such a difference of temperature was maintained, could, when connected by proper arrangements, be made to exert this difference of pressure on both sides of a piston, and thus drive machinery, with a steam pressure of 15 atmospheres and even more, if a difference of more than 15° in heat was only maintained.

As said above, the very high temperature required is the objection to the use of this principle in the case of water and steam; but when going down to the bottom of the list of condensable gases, or to the top of the list of volatile liquids, and selecting one of the most volatile, say liquefied carbonic acid, which boils at 148° below zero, Fah., we have a liquid which, at the common temperature of say 60° Fah., will exert a pressure of 51 atmospheres, and at the freezing point or 32° a pressure of 38 atmospheres, giving thus a difference of 12 atmospheres or 180 pounds per square inch for only a cooling of 28°, which in the case supposed may be effected by means of ice. We have thus here a prime motor driven by the use of two reservoirs, the temperature of one of which is kept up at some 60°, simply by the heat of the surrounding air, while the other is cooled by ice and kept at some 32°; in this way, a power may be kept up equivalent to that produced by a high pressure boiler carrying 180 pounds of steam. The curiosity of this arrangement is the fact that in place of storing up coal for the production of heat, we store up ice for the production of cold. One great objection would, however, be that one pound of ice will only subtract, by its melting, 142 units of heat, while one pound of coal will, by its combustion, produce some 14,000 units of heat. We should thus require about 100 pounds of ice as equivalent for only one pound of coal; if we add to this the difficulty of keeping ice and the ease of keeping coal, and above all, if we consider the enormous strength of the vessels required, and also of the cylinders and connecting tubes, all able to stand about 1,000 pounds per square inch, making the apparatus heavy and dangerous: also if we consider the obstacles which such thick plates offer to the transmission of slight differences of temperatures, it is evident that such strong surface condensers cannot act properly; add to all this the expense of the liquefied carbonic acid, the ease of its escape when confined under the required high pressure, its corrosive action on the metals, the objection that such an engine would have to work with a back pressure on its piston of some 700 or 800 pounds per square inch, while the comparatively slight excess of 80 or 100 pounds would be the motive power, etc., and it is clear that the plan is utterly impracticable.

But the old saying of Cicero "that there is no theory so absurd that there are no philosophers to defend it" may be applied to inventors; and it may be said that no contrivance is so objectionable but there are inventors who attempt to bring it in practice. It is the same with this carbonic acid power. A few years ago a pamphlet appeared under the title: "Power without fuel; an investigation of the means by which it may be obtained from natural sources." In this publication, the author attempts to prove the practicability of the plan explained.

On the title page of the pamphlet referred to, we find the following remarkable note: "The right is reserved to patent in the United States any of the plans herein described. None of them will, however, be patented in any European country; they will be free to all who may there choose to employ them." This is simply a bait to European inventors, in order to save our inventor here trouble and expense; giving him, in case the idea should perhaps turn out to be practical, the advantage of the American monopoly, which surely would be worth something if—successful.

To recondense the gas by pressure is of course out of the question, as it would be equivalent to a water wheel pumping up the water which drives it.

We close with the following table of the remarkable effects of heat on water and liquid carbonic acid:

TABLE SHOWING THE COMPARATIVE TEMPERATURES OF STEAM AND CARBONIC ACID, PRODUCING THE SAME PRESSURE.

Pressure in Atmosphere.	Temperature required for this purpose.	
	Of water.	Of liquefied carbonic acid.
100	577	120°
90	566	109°
80	554	98°
70	541	87°
65	534	81°
60	526	75°
55	518	67°
50	509	59°
45	500	52°
42	491	45°
39	482	33°
34	464	23°
29	446	13°
24	428	3°
22	420	—4°
20	410	—8°
18	401	—13°
16	392	—22°
14	380	—27°
12	368	—32°
10	356	—43°
8	338	—53°
6	320	—62°
5	302	—70°
4	288	—78°
3	275	—90°
2½	262	—102°
2	248	—114°
1½	232	—128°
1	212	—148°

Authorities agree as to the steam pressures corresponding with the different temperatures, as contained in this table; in regard to the pressure of the liquefied carbonic acid gas, those for temperatures above 32° Fah. have been taken according to Pelouse, and for the low temperatures, from 32° to —148°, according to the determinations of Faraday.

SULPHITE OF SODA AS A REMEDY FOR SMALL POX.

We publish in another column a very interesting letter upon this subject, the writer of which desires his name to be suppressed, as he does not wish to detract from the force of his statements by creating an impression that he is puffing a nostrum from personal motives. Though personally unknown to us, we have formed a high opinion of the candor of this writer, both from the communication itself and the private letter that accompanied it.

The statements made are in the highest degree remarkable. Small pox has so long been considered an incurable disease, not to be arrested by any human means when once its virus has entered the circulation of those unprotected by vaccination or previous attacks of the same complaint, that the announcement of even a single successful cure will arrest public attention at once.

The remedy named, sulphite of soda, has been growing in favor for some time as an antidote for blood poisons, which act seemingly like ferments; and we have ourselves witnessed apparently happy effects produced by its use in complaints supposed to arise from such poisons. Its value in this class of diseases has been so far demonstrated that it has been made an officinal remedy.

If we are to credit the statements of our correspondent, a most astonishing effect upon the small pox poison was produced by something, which, if it was not the *sodæ sulphis*, ought to be most earnestly sought. We are not aware that any spontaneous resolution of this terrible disease ever has taken place, of a character that could be mistaken for the cure ascribed to the action of the drug under consideration. The drug produces in proper doses no effects to be feared, and can therefore be made the subject of experiment without danger to patients. Its merits, therefore, as a small pox remedy ought to be at once thoroughly tested, and if it should be found that the cure alluded to was probably an effect of the crude petroleum employed to anoint the body, or the result of a cause unknown, the fact that a cure is alleged should stimulate investigation into the real cause. It is, we believe, very rare that an unfavorable prognosis, based upon the acuteness of pain in the head and back in attacks of small pox, fails to be verified. In the particular case described, these bad symptoms were strongly marked, yet the patient, the next day after the character of the complaint was deemed established by the eruption, was convalescent, and in a few days recovered without the formation of a single pustule.

There is, of course, the possibility that there was a mistake in diagnosis, and that the disease was not really small pox, yet this seems rather improbable. The hope that a cure, for such a scourge as small pox, may be discovered prompts us to call particular attention to the letter of our correspondent; and we most sincerely wish that the supposed efficacy of this simple remedy may be demonstrated to be a verity.

COMPULSORY SAFETY GAGES.---THE STEAMBOAT OWNERS' PROTEST.

A meeting of steamboat owners, held in Philadelphia on Friday, February 2d, resulted in a decided expression of opinion adverse to the action of Congress in rendering it compulsory for them to use certain so-called safety appliances *per se;* but they maintain with much reason that, as they are compelled to assume a responsibility, they should be the judges of the best means to fulfil such obligations.

It is objected that the appliances in question are not safety appliances in fact, but only so in name, and that the act enforcing their use was passed in the interest of private individuals who hold by patent the monopoly of certain inventions. Mr. Copeland, of New York, a well known and able engineer, pronounces the "safety gages" prescribed in the act as actually perilous to human life, so much so that several steamboat companies have resolved to carry no more passengers till the regulation is abrogated.

The principle of this kind of legislation is wrong, and when adopted always acts in an oppressive manner. It is right that steamboat proprietors should be held responsible for the lives and safety of their passengers; but it is not right that they should be forced to use devices which they and experienced engineers regard as worse than useless. Their responsibility, if they are strictly held to it, will prompt them to select, under the best advice, all that can insure them from incurring damage from accidents to passengers. To arbitrarily select these things for them is to deal a death blow to that healthy competition which is vital to progress. So far from securing safety, such action actually defeats its avowed intent, and increases risk. The action of the companies, as stated above, is wise. Responsibility without free volition is always revolting to reasonable minds; no wonder the steamboat owners reject it. Let the law be either amended or repealed.

THE EFFECT OF SOUND IN BUILDINGS, AS INFLUENCED BY VENTILATION.

We noticed in a recent issue the publication of a work upon this subject.* We now take occasion to review the theory, and its claims to become accepted as science.

It is scarcely necessary to dwell upon the importance of constructing public buildings with reference to the effect of sound. There are so many in which it is difficult both to speak and to hear distinctly, that those who speak and those who listen may find examples without number to enforce the lesson. Any real contribution to our knowledge of the subject, that will enable architects even partially to correct the faults of present construction, would be eagerly embraced by them and find universal application hereafter. Mr. Saeltzer claims to have made such a contribution and to have discovered that, however correct the proportions and form of an auditorium may be with reference to acoustic effect, the result will be failure, unless the ventilation be made to correspond with certain principles, so called, which he lays down in his work.

The following propositions have long been accepted as part of the science of sound, namely: that sound is propagated by fluid, solid, or gaseous media, in waves or pulsations, which extend in all directions from the source of the sound—the sonorous body; that, in general, whatever may be the source of the sound and the number or kind of media that convey it, air forms the best medium by which it reaches the auditory apparatus; that the intensity of sound depends upon the density of the medium in which the sound is generated, and not at all upon the densities of the media which convey it; that the velocity of sound in air is independent of the density of the air; that the velocity of sound in air, at 0° C. or 32° F., is 1,090 feet per second, and that this velocity will be increased two feet per second for every centigrade degree the temperature is raised.

It is further known that the greater the elasticity of a medium is, the greater the velocity of sound through it, and the greater its density the less will be the velocity of sound traversing it, according to the following law. See Tyndall on "Sound," page 45:

"The velocity is directly proportional to the square root of the elasticity, and inversely proportional to the density of the medium." It follows that in media which, like air, obey Mariotte's law, namely: that their elasticity shall increase in exact proportion to their density, sound will, as above stated

* A Treatise on Acoustics in Connection with Ventilation, by Alexander Saeltzer. New York: D. Van Nostrand, 23 Murray street.

in regard to air, always pass with equal velocities, no matter what their densities may be. This holds good for all gases.

Now, as the density of a medium may be affected by the presence of matters foreign to it, floating in it or intimately mingled with it, while its elasticity may remain unaffected, it follows that the rapidity with which sound is conveyed will be influenced by the presence or absence of such foreign matters. Tyndall, in his first lecture on "Sound" speaks of thunder peals as not penetrating the air to a distance commensurate with their intensity, on account of the non-homogeneous character of the atmosphere attending such storms. In the same lecture he shows how, in the presence of hydrogen which, equally elastic, is less dense than air, the velocity of sound will be much greater than in pure air; and how this velocity is reduced by the presence of carbonic acid, which is denser than air though possessing the same elasticity.

We have here sufficient reason for the assertion that, when the air in an auditorium becomes vitiated by the breathing of many occupants, the increased density affects the velocity of the sound, and the non-homogeneous character of the medium must interfere more or less with the extent to which sound will reach; all this without any new discovery or the enunciation of any new law. Inasmuch as sound is thus impeded, it will be less and less interfered with if the air is kept pure by perfect ventilation. But what is the new discovery?

If we understand the author, who does not make himself very clear in his enunciation of it, it is that carbonic acid is poison to sound as it is poison to life. In other words that sound has some peculiarity that renders air, independent of considerations of density and elasticity, a fitter medium for its transmission than air mingled with watery vapor and carbonic acid. The language used to express this supposed discovery will strike those familiar with acoustics as somewhat peculiar, not to say ludicrous. We will quote some of these propositions:

"The density of the air in those rooms is generally in an unhealthy state, heterogeneous (?) to the nature of sound, and even to health itself." * * * Speaking of the echo in St. Paul's Cathedral, London, the author says: "Now, if we rest upon the assumption that a pure air, genial to sound, guides the path of sound, this mystery is solved at once. Bad air, it is true, becomes much more dense, but the substances of this air are poison to the vitality of the sound, as well as to health, mind, lungs, and voice, and this proves that sound can only carry out its function when well supplied with healthy and congenial air. If you notice the changes of sound in crowded houses, and follow its diminishing state of existence, you will first find its nature often in tolerably good humor, then it becomes delirious, and is placed in a most uncomfortable position, not knowing which way to turn; poison on all sides, ever anxious to do its duty, full of its natural vitality, it becomes disheartened, leaves its first battle field, the pit, next the first gallery, then the second, third etc., and at last, exhausted, looks up as high as possible to gain rest in the strata of warmer and more flexible air, air more congenial to its nature, which is always found at the highest point."

"The theory advanced will also abolish sound boards over pulpits; how is it possible that a sound board, even eight or ten feet square or circular, should cause the sound to descend to the lower strata of air full of poison? never will its nature consent to such unreasonable demands; no, it will, like a bird leaving its open cage to seek its liberty, pass the outlines of the sounding board to rise to a higher sphere, in the very reverse direction to that desired. Forget not that sound is of a nobler character than generally supposed; its requirements are a distinguished treatment, and it will resist every infringement upon its dignity, and hence, not only through science, but even art, is an approach to hearing possible."

"The heat will rise to those parts (the ceiling) and invite the sound to follow, and it does follow with force, and its general diffusion throughout the church is lost."

In another place, the author speaks of sound rays following "the most flexible air," and becoming "isolated and distinct in their field of operation." In still other places, he dwells upon what he calls the "vitality" of sound, as though it were a living entity that could be poisoned by a foul gas.

But enough of quotation. What we have quoted, as well as what we have said, shows that the author thinks, as Josh Billings quaintly says, he has discovered a new truth when he has only stumbled over an old one. That sound is somewhat less audible in ill than in well ventilated rooms has long been known, and the causes have also been known. The fancied cause, assigned by Mr. Saeltzer, is scarcely worth writing a book about, a book that can only influence the opinions of the ill informed, and this by its false teachings.

THE DIFFERENCE BETWEEN BENZOLE AND BENZINE

So much confusion prevails, in consequence of the indiscriminate use of the words benzole and benzine, that it may be proper to state what these substances really are, and in what particulars they differ, and in what they are alike.

In the year 1825, Faraday discovered a peculiar liquid in the holders which at that time were used for conveying illuminating gas to private houses in London. He gave to it the name of bicarburet of hydrogen, and published a pretty full account of its properties. Nearly ten years afterwards, the Berlin chemist Mitscherlich produced the same substance from benzoic acid, and in allusion to its origin he proposed the name benzine. Liebig reprinted Mitscherlich's article in his "Annals," and in a foot note remarks that, as the termination *ine* is too suggestive of strychnine, quinine, etc., bodies with which it has no analogies, it would be better to change the word into benzole, and this he accordingly did. It was thus that the word benzole was first introduced into our language. The French writers adhered to Mitscherlich's original name, and in their dictionaries we find the word benzine, while the English have adopted Liebig's proposition, and speak of benzole. We should have been spared much confusion if Faraday's original name had been retained by all parties.

It will thus be seen that, at the outset, benzole and benzine meant identically the same thing, but after the discovery of petroleum it was observed by chemists that the native rock oil was quite a different substance from the coal tar product of the gas house. The various hydrocarbons which can be distilled from petroleum have a different chemical composition, and vary in specific gravity and properties from the coal tar products. Benzole has a fixed molecular composition; it is a true chemical compound, as much so as alcohol or water; its properties have been fully studied and described, so that on this point no doubts need prevail. On the other hand, the volatile substances which come over during the fractional distillation of petroleum are of a mixed and indefinite character, and it is difficult for chemists to agree upon a definite specific gravity, boiling point, etc. By degrees it has become customary in the United States to call the liquid which has the specific gravity of 62° to 65° Baumé (=0·73) benzine; the lighter hydrocarbons are called naphtha, rhigoline, and chymogene; the latter is condensed by pumps and is used for an ice machine. This class of liquids differ considerably from the true benzole of coal tar; the latter has a specific gravity of 0·85, and freezes at 37° Fah. The light oils of petroleum have never been frozen, and their specific gravity is very low; any product of the distillation of petroleum having so great a specific gravity as 0·85 (that of benzole) would be too thick to burn in a lamp and could only be used for lubricating purposes. The solvent properties of benzole and benzine are analogous, though by no means identical; benzole rapidly dissolves asphaltum while benzine scarcely attacks it; benzole is a better solvent of resins; benzole is far superior to benzine in carbureting air or gas for illuminating purposes. The most marked difference between the two exists in the fact that benzole can be converted by nitric acid into nitro-benzole, and by further treatment into aniline; whereas benzine from petroleum is not thus acted upon, and cannot be employed in the manufacture of aniline colors. Benzine can be readily ignited at a distance, while benzole must have the flame brought a little nearer; although it is volatile at all temperatures, and gives rise to explosive compounds. Benzole costs from six to eight times as much as benzine, according to the state of the market. Nearly all of the benzole of the world is sent to Germany to be there manufactured into aniline, from which are subsequently made the favorite aniline colors. It will thus appear that although benzine and benzole started into *life* meaning one and the same thing, they have, in the course of time, come to be two widely different substances. Benzole is made from coal tar, benzoic acid, and numerous other bodies, and can be converted into aniline. Benzine comes from petroleum, is very light, cannot be frozen, and cannot be converted into aniline. We find from our foreign exchanges that the English, French, and German writers are beginning to recognize this distinction, and it will be better for all parties to agree upon what boiling point, specific gravity, and chemical formula they will adopt for benzine. Benzole contains about 92·5 per cent carbon and 7·5 per cent hydrogen; benzine is approximately composed of 84 per cent carbon and 16 per cent hydrogen. In America, therefore, benzole and benzine mean different bodies of different origin, and having different uses.

THE ART OF THINKING.

Is thinking an art to be acquired? Are not all men endowed with the power of thought? Is there anything more necessary than for one to close his eyes and let his mind have free course in order to think? To answer these questions, it is necessary to define what is meant by thought. If day-dreaming, that act of mind in which thought roves at random, purposeless and without effort, is thought, then even the idiot thinks in his poor fashion. Then are no rules applicable to this sort of thinking. But much indulgence in this kind of dreamy thinking weakens the mind and begets a mental laziness that is fatal to progress. It benumbs all but the purely animal faculties and instincts. It is, therefore, to be deprecated in the strongest terms. It has proved and will yet prove the ruin of many a promising youth.

The kind of thought worthy the name, which strengthens instead of weakening the mind, is what we mean when we speak of thinking as an art. This kind of thought is the pleasant labor rather than the luxurious ease of the mind. It is only perfect when under complete subjection to will.

The first great thing in learning to *think* is to bring thought under subjection to will. There has been a great deal said about the importance of gaining mastery over our animal passions, propensities, and emotions. Many an earnest prayer for help to conquer these fleshly lusts has been breathed. The fact is, however, that with minds trained to perfect subservience, the passions can have but little sway. It is unrestrained imagination that kindles the fires of passion. Cool blood generally goes with cool heads.

Too much stress cannot be laid upon the fundamental importance of perfect command over thought. How many a student finds a lack of this power the chief hindrance to progress! How many a page must be re-read, how many a lesson conned over and over to compensate for lapses of thought! In the possession or absence of this power over mind, lies the chief difference between mental strength and mental weakness. Some men think as a child plays with a hammer, striking little blows here, there, anywhere, at any object within reach. The action of a strong mind may be compared to the stonebreaker's sledge hammer, dealing stubborn blows successively upon one spot till the hard rock cracks and yields.

When this command over thought has been acquired through the long exercise of resolute will, the power to arrange ideas and to think systematically will come with it, and no thinking amounts to much unless it is systematic. This, then, may be considered as the second important acquirement in the art of thinking.

The power to classify and arrange ideas in proper order is one that comes more or less slowly to even the best of minds. In proportion as this faculty is strengthened, desultory and wasted effort diminish. When the mind acts, it acts to some purpose, and can begin where it left off without going over the whole ground again to take up the threads of its ratiocinations.

Concentration and system are thus seen to be the chief elements in the art of thinking. To cultivate the first, constant watchfulness to detect the least wandering and the immediate exertion of the will to call back and hold the mind upon the subject under consideration should be vigilantly exercised. To secure the latter, the practice of analyzing and considering the different parts of a subject, first separately and then in their relations to each other, is a discipline to which every young mind should be subjected, and which, we are sorry to say, is very much neglected in the methods of instruction practiced in this country.

JAPANESE NATIVE STEEL.

Mr. G. D. Hamill, superintendant of the Imperial arsenal at Tientsin, China, originally of New York State and now on a visit to this country, called upon us the other day, bringing with him a specimen of what is stated to be native steel found in Japan, several large deposits of which are reported to exist. He states that swords and other articles of cutlery are forged directly from this metal, and that it has been recognized as native steel by every Japanese to whom he has shown it, a circumstance which increases his confidence in the truth of the reports concerning it. The specimen is highly crystalline, resembling somewhat the pig bloom obtained in the Ellershausen process of iron manufacture. If it be true that large and accessible deposits of this material exist in Japan, that country has in its possession an element of wealth the value of which can hardly be estimated.

Though not connected with this subject, we may remark that Mr. Hamill speaks discouragingly of the prospect of future progress in China. This peculiar people is hard to arouse from the influence of the superstitions and prejudices that obstruct civilization; while Japan, inhabited by the same race, and with a religion almost identical in its main features to that of China, is shaking off the sleep of ages, and advancing with marvellous rapidity.

Mr. Hamill speaks of the annual freshet in the region of Tientsin as unusually severe this season. It has flooded the arsenal at that place, and work is suspended. On his return, this gentleman proposes to investigate the subject of the native steel deposits in Japan, and to communicate to us such facts as he may be able to obtain.

SCIENTIFIC AND PRACTICAL INFORMATION.

DESTRUCTION OF SCIENTIFIC COLLECTIONS BY THE CHICAGO FIRE.

Dr. J. W. Foster and Mr. William Stimpson, respectively the President and Secretary of the Chicago Academy, have circulated a report of the losses sustained by their valuable institution in the late conflagration. Among these are some collections of national importance, such as that made by the Audubon club, the entomological collection of Mr. B. D. Walsh, the illustrations of the natural history of Alaska, the Smithsonian *crustacea*, and many others of more or less importance. With characteristic energy and courage, the trustees have announced the intended reconstruction of the buildings, and the recommencement of the publication of the Transactions of the Academy.

The large general collection, illustrating American natural history, was one of the most extensive and complete in this country, and great efforts will be necessary to replace the specimens. Assistance from the museums of Europe, many of which have duplicates, may be relied on; and similar institutions in the United States would do well to help, with all their power, the noble collection of the Chicago Academy, now struggling to regain her position and renown among the *almæ matres* of science in America.

BOILER DEPOSITS.

M. P. Champion publishes the result of his investigation into the causes of a boiler accident, in a sugar manufactory, which was originated by a deposit of carbonate of lime on the interior of the boilers. The utter impenetrability of the carbonate of lime to water caused the burning of the boiler plates. These boilers were fed with water both from an artesian well of great depth and from the condenser of the engines. The water of condensation was free from the carbonate, but the well water showed on boiling a considerable deposit of it. On inspection, fatty matter was discovered in the feed tank; and with a view of investigating its effects, M. Champion prepared a concentrated solution of bicarbonate of lime, and added to it one drop of oil. On boiling, the carbonate was precipitated, and it combined with the fatty matter; and, when dried, it was absolutely impenetrable to water, the oil doubtless giving it this resisting power. This is a new light on the subject of boiler incrustation, and deserves the attention of our engineers. Judging from the

scores of letters we receive weekly, the subject of boiler explosions continues to engross the attention of a large number of experts, and a statement so consistent with the ascertained facts as that of M. Champion deserves thorough investigation.

PURIFYING WATER FROM CARBONATE OF LIME.

As a corollary to the above, we may append a description of a process for ridding water for boiler purposes of its most dangerous ingredient. One mode in use is to precipitate the lime salt before pumping the water into the boiler, either by boiling or by the addition of lime. By the latter process, sixty-six per cent of the carbonate of lime can be removed; but the proportion used must be only sufficient to effect the precipitation. Oxalate of ammonia can be employed to test the thoroughness of the process. The Northern Railway of France cleanses water for its locomotives in this way, subsequently filtering it through sponge.

ORIGIN OF FIRES.

Mr. Alexander A. Cröll, a well known London gas engineer, suggests that rust on iron pipes may, under some circumstances, absorb oxygen so rapidly as to become red hot, or till a temperature, dangerous to dry timber in their proximity, is attained. Galvanizing the pipes would prevent this, if it be found, on investigation, to be a possible occurrence.

THE HÔTEL DIEU, PARIS.

One of the most ornamental of the public buildings, so lavishly ordered by the late Imperial Government in France, has just been condemned as unfit for its purpose. It was a new erection for the chief hospital in Paris, and its total cost was enormous; but the Society of Hospital Physicians and Surgeons has unanimously resolved that, in its construction, it does not fulfil the conditions required by a hospital in the present state of scientific and hygienic knowledge. Two members of the society proposed the reduction of the 800 beds to 400, and using them for the reception of patients suffering with skin diseases, thus utilizing the building, but vitiating the scheme of a general hospital. This proposition has been negatived, and some alterations to the costly structure must be made, casting an additional burden on the citizens of Paris.

FURNACE FOR BURNING PETROLEUM.

Of the many attempts to construct a furnace to consume crude petroleum as fuel economically, one recently introduced in Paris deserves especial mention. The appliance for distributing the oil consists of a pipe with branches, and of a grooved grate along which the oil flows after dropping from these tubes. A wrought iron cistern contains the supply of petroleum, and is connected to the distributor by an india rubber tube. The grate is placed vertically; the air, passing between its bars, supplies the oxygen for the combustion of the petroleum vaporized by the heat of the fire. The petroleum is supplied to the grate a little in excess of the requirements of the furnace, and the surplus drops into a receiver, and is volatilized by the heat of the furnace and the vapor consumed. The flame is described by the inventor, M. Wiesnegg, as being of great intensity, a temperature impossible from coal alone being attained. This fact recommends it for use in the laboratory, as a great heat can be obtained without the use of a blast.

ANTIDOTE TO CARBOLIC ACID.

The use of carbolic acid as a disinfectant, now so common everywhere, is fraught with danger, as it is a virulent poison; and if it be accidentally taken internally, an effective antidote will be necessary. Dr. Husemann, of Göttingen, suggests, for counteracting its effects on the stomach, a new preparation which he calls *calcaria saccharata* (saccharate of lime), prepared by dissolving 16 parts refined sugar in 40 parts water, and adding 5 parts slaked lime. Digest the mixture for three days, stir occasionally, filter and evaporate to dryness.

THE NEW COINAGE IN GERMANY.

The *Borsen Zeitung* of Berlin gives details of a bill, to be introduced into the German parliament during the present session, for the regulation of the coinage of the empire, a measure the necessity of which is obvious to any one who has ever been perplexed with the multifarious currencies of the many German states. According to this sketch, the new bill establishes the mark of 100 pennies as the unit of account, and the following will be the small coins: 1. A ten penny piece, 1,035 of which will contain a pound of fine silver, and 227·7 of which will weigh a pound. 2. A five penny piece, with half the value in silver and half in copper. 3. A two penny piece in copper. 4. A one penny piece in copper. Higher silver coins: 5. A quarter mark piece, value 25 pennies. 6. A half mark piece, value 50 pennies. 7. A mark piece. 8. A three mark piece, corresponding to the present thaler. As the gold money established by the last bill was to consist of 20 and 10 mark pieces, the whole new coinage system, if this bill is carried out, will consist of ten coins—the gold pieces corresponding to the English sovereign and half sovereign, but worth respectively 5 pence and 2½ pence less; the higher silver coins (quarter mark, half mark, mark, and three mark) corresponding to the three penny piece, sixpence, shilling, and what would be a three shilling piece, if there were such a coin, but all of fractionally less value, corresponding to the less value of the gold coins; and the smaller silver and copper pieces (ten, five, two, and one pennies) corresponding to the penny and half penny, and what would be the fifth and tenth of the English penny, but all of fractionally greater value—the German ten penny piece being the 200th part of 19s. 7d., whereas the said penny is only the 240th part of 20s. The new German coinage will thus, in small matters as well as great, approximate in a perplexing fashion to the English system without obtaining any of the advantages of identity.

Burns' Improvement in the Manufacture of Candy.

Mr. William J. Burns, of Georgetown, Kentucky, has patented an invention which has for its object to furnish a candy, pure and simple in composition, beautiful and inviting in appearance.

In making this candy, ten pounds of brown sugar and one ounce of cream of tartar, with sufficient water to make a syrup, are used. This solution is boiled and well skimmed and then boiled to a bale. At this stage, one half of a gallon of molasses is added, little by little to prevent boiling over, and boiled down to a bale. At this point, two pounds of butter are added clarified as follows: Boil the butter and skim off all impurities that may rise to the top; strain it to free it from all particles of undissolved salt; let it stand and cool from five to ten minutes. The candy, as soon as the butter is added, is boiled to a crack and poured upon marble to cool. When cold enough to work, about one fourth of it is cut off for striping in the ordinary way. The balance is then pulled white on the hook, the stripe put upon its top, and both are pulled out upon marble, cut in the middle and doubled with the white next the stripe; then pulled out again and cut and doubled until it is striped as desired. In this way the white will be upon both sides and the stripes will all be on the inside. It is then laid, from half an inch to an inch in thickness, upon a large pan, well greased, and cut or broken when cold with a small hammer.

Burnett's Kalliston cures *chapped hands* and all unpleasant conditions of the skin.

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.

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Notes & Queries.

1.—SAFETY BOILER.—Which is the most secure from explosion, an upright or an horizontal steam boiler?—J. T. W.

2.—GOLD BRONZE.—Will some one give me a recipe for making a bright gold bronze liquid?—G. F. McI.

3.—JAPANNING.—Will some one tell me what composition is used by japanners for locks and other small gray iron ware?—J. J. D.

4.—TEMPERING STEEL.—What is the best way of tempering steel bits? The common processes do not make them hard enough.—H. G.

5.—J. M. K., wants to know where he can procure a machine for sawing stumps off even with the ground.

6.—MATHEMATICAL PROBLEM.—Will some one tell me how to raise a number to a power of a fraction; for instance, how can I raise to the power of 3-8?—T. M. N.

7.—GIVING UNFINISHED YELLOW BRASS CASTINGS A COPPER COLOR.—Will some one give me a recipe for giving yellow brass castings a copper color?—E. R.

8.—FIREPROOF FABRICS.—Which is the best known process for rendering women's clothing fireproof?—H. S.

9.—FIREPROOF WOOD.—Is there anything known that will render wood to a certain extent non-combustible?—H. S.

10.—METAL FOR WIRE.—What metal, or combination of metals, will produce the strongest, softest, and cheapest wire?—N. F. E.

11.—WELDING STEEL AND CAST IRON.—Is there any preparation in use by which steel can be welded to cast iron, so that when welded, they will stand hard knocks?—T. T. D.

12.—BREWING.—Can some one furnish me with a good recipe for the manufacture of a light ale for table or invalids use? And also with the process of brewing, etc.?—J. A. Jr.

13.—HYDROGEN LAMP.—Will C. C. W., of Ill., or some other reader of the SCIENTIFIC AMERICAN, give such information in regard to the hydrogen lamp as will enable me to obtain or construct and use one as a substitute for friction matches?—L. G. G.

14.—FELT ROOFS.—We have here several roofs made of felt paper, covered with tar; and in winter time the frost cracks them so that when the snow melts or rain falls on them, they leak like a riddle. Is there any paint or other substance which will fill up the cracks and keep them from leaking?—O. S.

15.—DISSOLVING MICA.—Can any of your readers tell me of anything that will dissolve mica and hold it in solution? I wish to know of something to mix with paper pulp, that will render the paper or pasteboard entirely impervious to water.—W. R. H.

16.—SAND IN TUBE OF PUMP.—Will reaming out the bottom end of the wooden tubing of a pump, so that the hole in the tube will taper, prevent the sand that may be in the bottom of the well from rising?—C. M. R.

17.—FREAK OF BROKEN IRON.—I have a small iron pulley about 12 inches in diameter and two inch face; in running it, I broke out a section of the rim, and then found that the piece which I broke out was too large to go in where it came out. Can any of your readers tell me why it was too large?—C. M. R.

18.—SPLITTING OF HORSES HOOFS.—Can any of your many blacksmith readers inform me how to keep the hoofs of horses from splitting or breaking? The shoes will not keep fast more than two or three weeks.—E. E. S.

19.—CUTTING SEALS.—I want to engrave a seal, for sealing express packages, with name and place of business. Will some of your readers please inform me how I can mark the letters so as to be right on the impression; and what process engravers use for transferring copies of photographs to plates before engraving them?—J. B.

20.—CEMENT FOR STOPPING CRACKS IN IRON.—Having just taken charge of a stationary steam engine that has had the steam passage, leading to the cylinder, cracked by frost, I would ask your numerous correspondents for a recipe for a cement to apply internally in the crack to stop the leakage of steam. A patch of iron has been put on the outside without stopping.—H. P. S.

21.—FREAK OF PRESSURE GAGE.—Whilst building a fire under our boiler, on the coldest morning of the season, I discovered Kirkup's steam gage showing 100 pounds. There had been no fire for forty hours previous, consequently there was no steam whatever. I would like to hear from some of your correspondents, a philosophical reason. A boy standing near suggested that Pluto's dominion had frozen to the bottom, and the contraction outside, and the expansion inside, had produced the effect. Who can give a better solution?—Mc.

22.—WIND POWER FOR RAISING WATER.—I wish to avail myself of a boiling spring, located 600 feet from, and 25 feet below my dwelling house, and to discharge the water into a tank 27 feet above level of ground at the house. I want about 300 gallons of water per day. Can I use any thing cheaper, more effective and requiring less attention than a wind mill of the improved kind? I have no fall, and cannot use a ram. Will some of your readers please answer?—G. W. D.

23.—ELECTRIC LIGHT.—Will some one inform me how to construct an electric light, stating the proportion of the several parts, the kind of charcoal to be used, the battery power required, etc?—S. F. C.

24.—COATING CAST IRON WITH PORCELAIN, ETC.—Is there any kind of cement or varnish, which can be applied to cast iron, which will harden and be smooth and stay hard under water? Something of the porcelain nature, which would impart to cast iron the same sort of surface that varnish does to wood, is wanted. It should not have to be baked in order to harden it.—F. W.

Declined.

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

BOILER EXPLOSIONS.—C. T.

EXTRACTION OF GOLD BY ZINC.—R. d'H.

MENTAL PHENOMENA.—R. O. D.

METEORS.—T. R. D.

PSYCHIC FORCE.—J. B.

SAW CLAMPS.—C. M. S.

SUSPENSION BRIDGE.—J. B.

TRADES UNIONS AND APPRENTICES.—W. C. D.

TROUBLE.—R. G.

ANSWERS TO CORRESPONDENTS.—M.—J. G. H.—O. R.—S.—J. W. T.—J. A. P.—C. M. B.

NOTES AND QUERIES.—M. H. B.—D. L. B.—G. J. B.—M. H B.—J. A. P.—I.

Examples for the Ladies.

Jennie A. Van Cott, Glenwood, N. Y., exchanged in 1858 a —— for $50 Wheeler & Wilson Machine, which was used constantly five years making coats and vests; since then it has annually been changed from city to country for family sewing, and is now in good repair, doing the stitching in a first-class dress-making establishment. It did $400 worth of stitching in eight months of last year.

Mrs. Amelia Coutant, Brooklyn, N. Y., has had her Wheeler & Wilson Machine since June, 1869; has, besides other sewing, made 836 pairs of pantaloons, making as high as seven pairs a day, besides doing her own housework. She was self-taught, and has broken but two needles of the original dozen.

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.

A. B. L., of N. Y.—Answer to first query.—Suppose the wheels of a railway truck to be perfectly round, their surfaces perfectly smooth, running upon a rail that is perfectly smooth, and, when not loaded, perfectly straight, supported only at the ends, this rail, when the truck with its load reaches the center, will be deflected, so that the last half of its length will present a curved up grade, which the truck must mount. In ascending this grade, the action of the truck against the rail will equal the reaction or upward pressure of the rail against the wheels of the truck. Now to raise a given body through a given distance requires an initial force, the quantity of which will increase as the square of the velocity with which the body is raised. The force which raises the truck is the reaction upon the rail; therefore this reaction must increase, according to the law above stated, with the velocity of ascent. Any irregularity in the shape of the wheels or in the surface of the rails generates a reaction which obeys the same law; except that short depressions are jumped at high speeds, and the steady reaction of ascent is changed into impact at the end of the jumps, which will be as the distance the load has fallen during the jump, and the square of the velocity of its motion. Answer to second query. Ice and salt, when put together, mutually dissolve and become liquid, in doing which the solution, as it forms, draws heat from other bodies. By taking heat from cream they freeze it, and by taking heat from other bodies the two melt and dissolve, whether in pipes or freezer.

LIGHT ENGINES FOR SAW MILLS.—NEMO (No. 16, January 20), in speaking of the application of light engines to saw mills, thinks that a ten horse power in theory should saw half as much as a twenty, and finding that it will not do so, asks how to employ an engine of that size on a saw of 50 or 56 inches with the best results. From a series of experiments, made in this State, to ascertain how far a light power could be utilized in driving circular saws of that size and larger, the point seemed to be clearly proven that they must be driven by the necessary power to produce favorable results, and that any attempt to reduce this power only resulted in choking down the saw and in reducing the useful effect below a point of any value. These failures, however, have resulted in experiments in applying these threshing powers to muley saw mills in this State. They are spoken of as attaining the point your correspondent asks for in making as much lumber per day to the hand as is made by mills with power sufficient to drive a 50 or 56 inch saw; and I see that they are here coming into very general use, or, in other words, I believe them to be a success.—INDIANA.

S. N., of N. Y., writes: I have a fall of water (say four feet) and wish to use it for power. If I raise a pipe in the form of a siphon, with the long leg extending over the fall, shall I have more power if I apply the water through the siphon than if I took it directly from the fall?—Answer: No.

R. K., of O.—A back pressure of one pound per square inch upon the piston of an engine having a cylinder 10 inches in diameter, 30 inches stroke, and making 80 revolutions per minute, will require, to overcome it during ten hours, a work of 75,398,400 foot pounds, equal to 3·8 horse power for the same time.

R. L., of N. Y.—We know of no work that treats of coloring fur skins.

T. F. A. W., of ——.—Portland cement is itself a hydraulic cement. Any good hydraulic cement may be substituted for it. We do not know the cement to which you refer.

F. B., of N. Y.—The smaller the pipe leading from your pump to your boiler, the greater will be the power consumed in friction while forcing a given quantity through it. The velocity of flow in forcing the given quantity in a given time will be greater with the small pipe than with the large one, and to produce increased velocity requires a greater consumption of power.

W. D. B., of Pa.—Can the same amount of power be obtained out of the same amount of pressure of steam if the length of stroke be twice or thrice as long, the speed not being taken into consideration, but merely the power? For instance, let there be a boiler whose hourly supply of steam at 40 pounds equals *a*, which supplies a *b* horse power engine with a stroke of *c*. Now by lengthening the stroke to 2 or 3 *c*, can a *b* or *b plus* horse power be secured with *a* steam, high pressure and crank motion having nothing to do with the question? Answer: The power is in the steam, not in the engine, which is only a means of applying this power to work. Theoretically, the power developed should be in proportion to the quantity of steam used.

WATERPROOFING CANVAS.—W. T. B., of D. C.—The alum processes, given on page 105 of the current volume, will no doubt serve your purpose.

ASBESTOS.—To J. R., of Ill.—Answer to query 1: Yes. 2: No. 3: Yes. 4: To a very great degree, but not wholly. 5: If you claim asbestos for a peculiar purpose, you must have the real article in your model.

CHARGING MAGNET.—To W. E. D.—Jacobi's method is to place the poles of the magnet to be charged against the poles of another making the opposite poles meet. Then place a piece of soft iron at right angles to the magnets, and draw it from the poles to the bend of the magnet to be charged. Do this many times on both sides. If the magnets are of good steel, this produces a maximum power.

CLEANING CASTINGS.—If L. B., query 9, February 3, 1872, will provide his tumblers, for cleaning castings, with hollow shafts, say four inches in diameter, closed at one end and well perforated inside the tumbler, and attach a suction fan to the open end, and a discharge pipe leading out to the open air, it will answer his purpose of getting rid of the dust. One fan will serve for a number of tumblers.—J. L., of Ind.

FACE WORMS.—If H. E. A. will use a crash towel and chafe well each side of his nose whenever he washes his face, he will find that the grubs will soon disappear; at least it was so in my case. Both my nose and forehead were constantly marked, but for the last ten years I seldom have a mark on my face from that cause.—H. W., of Ill.

SAW SETTING.—If C. M. B., query 7, January 27, 1872, will file toward the point of the saw, holding the handle of the file a little lower than level for soft wood, and low enough to make back of teeth square across for hard wood; and after setting and filing, with a fine single cut file, lay the saw flat on a straight board and joint sides I think he will be satisfied with the result.—J. T. D., of Ill.

POUNDING OF PISTON.—To W. M. T., query 12, February 3, 1872. The trouble with your engine is probably that the valve is not set right to clear the cylinder of steam in time for the return stroke. An engine, say of 24 inch stroke, should have about one eighth of an inch lead on steam side, and commence to exhaust when the piston gets within two or three inches of the end of the stroke; then, if everything else is right, your engine will make 200 revolutions per minute without pounding. C. G., query 17, same date, will see by the above whether he is right or not.—A. A. H., of Pa.

GRINDING STEEL TOOLS.—To E. C. J., query 3, February 3, 1872. You can grind edge tools on an emery wheel without material injury to the temper of the *tool*, by holding your fingers close to the edge you are grinding. Do not remove your fingers until you have completed your grinding.—J. E. G., of Mo

QUESTION IN MECHANICS.—Query 16, page 90, Vol. XXVI., February 3. If H. W. U. will arrange a rope and pulley in such a manner as to raise a weight of fifty pounds as the opposing force of his fluted rollers, he will find that it takes no more power to force the last block through than it did the first, friction not being considered.—J. E. G., of Mo.

SPEED OF CIRCULAR SAW.—To D. S. B., query 11, February 3, 1872. You can run your 52 inch saw 600 revolutions per minute to od good work and more of it than by running it faster. I have had thirty two years practice with saw mills, and that is the speed I use for 52 inch saws.—J. E. G., of Mo.

FACING OIL STONES.—I have used oil stones for eighteen or twenty years without facing. I drop oil on the end nearest me, then push my bits, etc., out over the far end (not off) taking up the oil just as I need it. Thus I can keep my stone straight or a little rounding, always whetting on the highest part; and so I waste neither time, labor, nor stone by facing.—C. H. W., of Pa.

SPEED OF CIRCULAR SAW.—In your issue of 3d inst., D. S. B. inquires: "How many revolutions per minute a 52 inch circular saw should make to cut from 5,000 to 8,000 feet of lumber in ten hours working time? And also, how high a speed it would be safe to run such a saw?" It will do the 8,000 feet easily enough by running 500. It will be safe to run it 1,500.—N. B., of Pa.

POLISHING WOODEN ARTICLES.—Let C. M. (page 90, Vol. XXVI., No. 15, Notes and Queries) who has failed to get the polish he wishes on wooden articles in the lathe, take two parts of rather thick shellac varnish (made by cutting the gum in alcohol) and one part of raw or boiled linseed oil: put them together in a bottle and shake thoroughly before using. Apply with a woolen cloth to articles to be polished. He will, after practice, get as good a polish as he could desire.—G. M. H., of N. Y.

WILD TEA.—I have been informed by a friend that J. B. W. with his wild tea is a humbug. He writes to the editors around the country, stating that he is over sixty years old, and has been cured of cancer by the application of wild tea, both by drinking the tea and putting it on the cancer; and he asks the editor to publish it for the benefit of mankind (thus getting advertised for nothing). The editor most generally publishes the statement, and the readers that have a cancer make inquiries in regard to wild tea: but no one ever heard of the plant. At last the sufferer writes to J. B. W., of Pa., in regard to finding the tea, and receives a reply "that he can furnish the tea" at the modest price of three dollars per ounce. The sufferer sends for some of the tea and receives, in return for his money, dried pulley leaves. The tea does the sufferer no good and J. B. W. goes on his way rejoicing.—E. E. D., of N. Y.

WILD TEA.—J. W. McA. is informed that the *Ceanothus Americanus*, a small spreading shrub common to all parts of the original thirteen States of the Union, is generally known as wild or New Jersey tea, and is said to have been used during the revolution of 1776 as a substitute for tea. It is of the order *Rhamnaceæ*, and described in nearly all botanies. I have found it in Darby, page 270, and in Gray's "Manual," page 115. If J. W. McA. will apply to any botanist in his neighborhood for the *Ceanothus*, he will be likely to get what he wants.—J. H. A.

PROPORTIONS OF ENGINE.—Page 49, Vol. XXVI.—The trouble with J. R. L.'s engine is that his steam pipe is too small. It will be seen that the area is only about one half the area of the steam port, while the piston speed is nearly 400 feet per minute. With 80 pounds pressure upon the boiler, I doubt if J. R. L. realizes more than 45 or 50 pounds upon the piston, owing to the wire drawing of the steam through the governor. He must put in a 3 or 3½ inch pipe with a governor of the same size; a large governor with a smaller pipe will not answer as well. The proposition of the builders to put on a heavier fly wheel sounds very like a perpetual motion theory, as of course it will effect nothing but to equalize motion. It is quite likely, also, that the distributing valve in this engine is badly proportioned; for a builder, who would use a 2½ inch steam pipe with a 12 inch piston traveling 400 feet per minute, cannot be very wise upon the subject of the steam engine. A good governor will always throttle the steam considerably, and J. R. L.'s difficulty is therefore but another evidence of the value of the automatic cut off.—F. H. C., of N. Y.

SLIDE VALVE QUESTIONS.—As C. G. does not give the travel of the valve, his questions may not be so easily answered; but I am confident he could not have set his eccentric nearer right for common practice than he did, as the drag of the valve when the pressure of steam is upon it will cause it to open the ports about on the center. There is nothing gained by giving much lead to a valve where there is much lap, as the early closure of the exhaust will generally cause all the cushioning that is required. The exhaust does not open any too soon to allow the spent steam to escape in time to clear the cylinder properly. If he will examine his valves and ports, he will find the exhaust is closed considerably before the steam is admitted, and that the common slide valve is a very imperfect thing when much lap is added, as it deranges the exhaust.—A. L., of Mass.

POUNDING OF PISTON.—To W. M. T.—You have not given the style of engine you have the trouble with; but if it is a common slide valve engine and does not prime, or in other words, work water over into the cylinder, the trouble is evidently in the engine alone. You do wrong to draw the keys or loosen any part of the engine. The keys should be loose enough not to heat or bind; then if the piston does not strike the cylinder head, the pounding is probably caused by the steam not being admitted in proper time. If it pounds after the crank has passed the center, the steam is not admitted soon enough, and you should set your eccentric forward; if the pounding occurs before the crank reaches the center, set your eccentric back; and if that does not remedy it on that side of the center, the only conclusion I can come to is that the exhaust closes so early as to cause excessive cushioning, and the only remedy is to cut away, from the exhaust side of the valve faces, enough to relieve it; but I would not advise you to make such an alteration in the valve until you are thoroughly acquainted with its principles, as you will find it an ugly customer. Otherwise, buy a good treatise on the engine and slide valve, and study it. I would like to learn the results of your experiments when convenient.—A. L., of Mass.

SLIDE VALVE QUESTIONS.—No. 17, Page 90, Vol. XXVI.—The slide valve about which C. G. inquires has still too much lead. 1 should say one thirty-second of an inch was ample. If I am not much mistaken, the ideas of live engineers on the question of lead have been considerably modified of late years. The exhaust lead referred to as being one eighth of an inch is all right; only it should probably be double or treble that amount, the exact quantity depending upon the proportions of the valve and the speed of the piston. The exhaust ought in all cases to be liberated soon enough to preclude the possibility of back pressure on the return stroke. But exhaust lead may be carried to excess. The proportioning of slide valve presents so many complicated considerations that it is impossible to give definite instructions in any particular case without a full knowledge of all the data.—F. H. C., of N. Y.

Recent American and Foreign Patents.

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

SALVE.—Theodore Kuhn, of Greenville, N. J.—This invention relates to a new salve for the cure of boils and eruptions of a non-poisonous character, by combining a certain quantity of beeswax with good brandy. While it is entirely harmless, it is claimed to be invigorating to the system.

SAWING MACHINE.—Henry P. Ohm, of Baltimore, Md.—This invention relates to an improvement in portable sawing machines, intended especially for working up lumber, and performing other light work, but also equally applicable for cross-cutting logs, etc., and the invention consists mainly in an apparatus for feeding the lumber to the saw and in the manner in which the driving power is applied to the latter.

MACHINE FOR PRESSING COTTON, HAY, OR ANALOGOUS ARTICLES.—John S. Schofield, of Macon, Ga —This invention consists in a new and ingenious method of constructing a sectional press so as to obtain free access to the bale after being pressed; and also in a new way of giving ample space for the insertion of the bale by arranging a carriage so that it can be moved to one side and carry with it the press screw, nut, and levers.

PAPER FEEDING MACHINE.—Dundas Dick, of New York city, assignor to Victor E. Mauger, of same place.—This invention relates to new apparatus for "pointing" sheets fed to a cutting machine; and consists in the arrangement of spring plates through which the points work, the sheet to be cut being placed upon the points and held thereon while the table is being moved forward. At the end of this forward motion the spring plates are raised by means of sliding wedges, so that the sheet is freed from the points and taken ahead by the feed rollers of the machine. By this invention great exactness of feed to the cutters is obtained, which is an item of extreme importance in the cutting of playing cards and also in the cutting of all sheets that have been pointed or marked before cutting, and even in the marking of sheets. When on cutting machines no reliable pointing apparatus is provided, the sheets are easily fed so as to be cut out of line, and the cards consequently spoiled. In the manufacture of playing cards considerable loss is experienced from this cause, which will be prevented by the application of this invention.

CHUCKS FOR SCREW CUTTING LATHE.—Eugene C. Plimpton and Samuel Taylor, of Bridgeport, Conn.—This invention relates to a class of chucks ordinarily used for cutting screws, but which may be used for other purposes; and consists in the mode of operating the chuck, and of making the dogs of the chuck adjustable, so that a larger or smaller piece of metal may be admitted and worked. The inventors do not confine themselves to the precise form or arrangement of any of the parts, as they may be varied without departing from their invention. The claims cover a combination with a dog, a plate, and adjusting screw, and also a sliding fastener, plates, and adjusting screws, in combination with a band and lever.

SASH HOLDER.—Robert B. Ball, of West Meriden, Conn.—This invention has for its object improvement in sash locks of the class in which a gravity bolt is employed, the same being provided with a thumb piece, projecting through a slot in its case, whereby it may be raised. The invention consists in a peculiar construction and arrangement of parts, whereby there is no exposure or projection of the thumb piece of the bolt through the slot of the case. A plate is provided within the case to form, in connection with a lug, a guide for the bolt, and also constitute a floor for the slot, or made to cover and conceal the wood beneath. A sash lock is thus formed whose functional parts are not only concealed within the case to the usual extent, but the thumb piece of whose bolt is flush with the face of the case, so that no impediment can exist to sliding the upper sash past the lower. The lock is likewise claimed to be more simple in construction, and hence cheaper in manufacture than others, since the guide and stop devices are cast in one piece with the main parts of the case. It is, furthermore, ornamental in appearance.

GRAIN SEPARATING ATTACHMENT TO THRASHING MACHINE.—Zephaniah Miller, Canal Fulton, Ohio.—This invention consists of a tailing screen, conveyer, and elevator, combined with the sieves and with the straw carrier, by which the pods and tailings are separated from the stems and other large refuse matter that is carried over and conveyed back to the bottom of the returning part of the straw and chaff carrier, to be returned to the thrashing cylinder for being more completely thrashed. It also consists of a conveyer levator, and another conveyer arranged to receive and convey the dirty seed which drops down through a slot in the said box back upon the sieve again to be subjected to a second operation.

BOOT BLACKING MACHINE.—Nathan Eisenmann, New York city.—This invention has for its object to improve the construction of a boot blacking machine for which letters patent were issued November 28, 1871. The bristles that form the brushes are so arranged as to cover and operate upon the entire surface of the boot or shoe, whether the said brushes be expanded or contracted. By the present construction of the machine, the brushes, by the combined action of the suspension cranks and operating bars, receive the necessary movements to cause them to operate properly upon the boot or shoe to be blacked or polished.

COMB.—Orange Johnson, Grand Lodge, Mich.—The object of this invention is to so construct a comb that broken teeth may be removed and renewed. It consists in making the plate of the comb with a rib, and with screws for securing the teeth. The teeth may be made of wood, metal, or ivory, or of any other suitable material. When a tooth breaks, the screws may be loosened and a new tooth put in its place. This comb is adapted for most of the purposes for which combs are used, being made of any size or proportions. In combination with independent teeth and set screws, a sheet metal plate is doubled upon a block, and ribbed on the inner side, to hold the teeth.

CAR LOADING MACHINE.—Samuel J. Bingham, Garlandsville, Miss.—The object of this invention is to provide ready and convenient means for loading railroad cars with wood and coal or freight. It consists in a suitably constructed frame and a lifting platform, so constructed and arranged that the wood, coal, or freight is made to slide from the platform on to the tender or car of a railroad train. The machine is situated near the railroad track, so that the contents of the platform may be dumped directly into the tender, or on to a car, as may be desired. The platform may be made of any desired size, so as to contain sufficient coal or wood to supply the tender. The platform being loaded, when it is used for transferring fuel to the tender, all that is necessary is to bring the tender into the proper position and dump the contents of the loaded platform into it. With this machine, it is claimed that much hard labor and time are saved.

ELASTIC LANYARD.—John E. Jones, of Waretown, N. J.—This invention relates to a new arrangement of parts used on an elastic lanyard, and is for the purpose principally of reducing the length of the adjusting screw, and thereby adding to its strength and effectiveness. The invention consists in a new combination of parts, whereby the stated object is attained, and whereby also the rubber cushions are brought close together and the transverse plates reduced in length. Two rubber or metallic cushions impart the necessary spring to the lanyard. They are held between plates and their several sections separated by other plates. Rods constitute the lower strap of the lanyard. Their lower ends are formed into or connected by an eye which is secured to the side of the vessel. Their upper parts pass respectively through the cushions and are riveted or otherwise secured to the upper plate. Rods also constitute the upper strap of the extension part of the lanyard. They are at their upper ends formed into or connected by an eye to which the lanyard proper is secured. Their lower ends are riveted or otherwise secured to a plate, which is below the cushions, fitted upon the rods to slide loose thereon. A screw is swiveled in a plate which slides on the rods below and is fitted through the lower plates which has a female screw thread for its reception, the upper end of the screw bearing against the lower plate of the cushions, or swiveled therein. When the screw is turned to the right, it serves to stretch or to slacken the lanyard. By this practical arrangement the screw is brought entirely against one end of the cushion, and does not, as heretofore, pass between the same. It is, therefore, shorter, and, in consequence, stronger, besides permitting the two cushions to be brought close together, so as to occupy less room and reduce the length of the plates.

SAWING MACHINE.—William Weaver, of Greenwich, N. Y.—This invention has for its object to furnish an improved machine so constructed that it may be readily adjusted for use as a scroll saw, a circular saw, a planer, or a boring machine, and be convenient and effective in either capacity. When either the circular saw, the planer, or the boring tool is to be used, the other two of said parts are to be detached, so as to obtain as much space as possible for the work, avoid carrying unnecessary weight, and avoid the danger of injuring the workman with the tools not being used.

OPERA CHAIR.—Anthony Abel, of New York city.—The seat, arms, and back of this chair are supported by vertical frames which rest upon the floor. A pivot plate is attached to each side of the bottom of the seat, by means of which the seat is pivoted to the vertical frames, so that the seat may be turned up to a vertical position out of the way. The frames are provided with lug bearings, one being at the front, upon which the bottom of the pivot plate bears. The other lug is on the back portion of the frame, against which the upper side of the pivot plate strikes, as the seat is turned down. The seat is thus supported at the rear as well as near the front, so that no strain is brought upon the seat pivots. A rod is pivoted to the side of the seat and also to the arms. The arms are jointed to the frames. With the rod the arms may be raised when the seat is raised, but the inventor does not confine himself to the use of the rod, as the arm can be raised by a separate movement of the hand. By this construction and arrangement of parts, these chairs are readily taken apart for transportation or storing away.

LOOM.—Alwill Urbahn, of Paterson, N. J.—This invention relates to a new arrangement of the working mechanism of a positive motion loom for weaving goods of less width than the length of shuttle.—The object of the invention is to produce more reliable and effective action than heretofore, and also to provide for an easy adjustment of all parts, and a most absolute control of the shuttle. The loom differs but little from ordinary power looms in its general principle of operation. But the manner of carrying the various movements and actions differs considerably. The invention embraces peculiar features upon which no less than eight claims have been allowed.

HOE SOCKET ATTACHMENT.—John S. Craig, Guilford, Kansas.—The invention consists in constructing a tubular hoe socket of wrought metal, with a shoulder near the end, and a prolongation therefrom which is extended through the tool and then staved up on the front side of the blade. This seems to be a very decided and useful improvement in tools for farmers' and gardeners' use.

BOOT CRIMPING MACHINE.—Rufus H. Dorn, of Port Henry, N. Y.—An endless chain runs over pulleys, the chain carrying one or more metallic formers, attached in such a manner that they do not obstruct the movement of the chain over the pulleys, while they are attached firmly thereto. Two jaws are securely attached to the top of the bench. They stand edgewise and a short distance apart. Attached to the insides of each of the jaws is a perforated steel plate, but between the jaws and these steel plates, strips or pieces of rubber or other elastic material are placed. The position of the plates is regulated by bolts and set screws. The leather to be crimped is placed upon the forming end of the two jaws, and hanging therefrom to or near the top of the bench. A plate is at the base of the former. An elbow corresponds nearly or quite in shape with the two forming ends of the jaws. A crank or a pulley on the end of the driving shaft revolves the chain around the carrying pulleys by hand or other motive power. As the chain revolves the formers are carried round with it, and when the former strikes the leather it carries it through between the steel plates of the jaws, stretching and crimping it as it is held by the friction between the plates. The slots of the plates increase the friction on the leather, but the elasticity afforded by the rubber strips prevents tearing. At the base of the jaws there is a groove which admits the plate of the former. The chain revolves with the former or formers with very little friction when not crimping the leather. One or more "uppers" of a boot may be crimped at each revolution of the chain.

GIG SADDLE TREE.—Samuel E. Tompkins, of Sing Sing, N. Y.—The first part of this invention consists of a construction of the frame whereby it is adapted for making a saddle with short jockeys, and, at the same time, preserving bearings of the requisite length and breadth, which is accomplished by shortening the flanges, though making the main portion as long as heretofore or longer, and as wide as the flanges, with the exception of the notches or recesses at the ends of said flanges, to allow of sewing the jockeys as far as needed. The second part of the invention consists of projections on the tarret nuts to fit in the notches in the frame to prevent the nuts from turning around in the tree when screwing the terrets in or out. The third part consists of ribs on the outer edges of the flanges to have sufficient thickness along the edges to insure the security of a perfect form in the casting, while the said flanges are made thin enough between the said ribs and the bearings of the frame to allow of punching the nail or rivet holes readily in case they fail of being formed properly by the casting of the plates. The fourth part consists of a shoulder on the front upright on the crown of the plate for supporting the saddle for said saddle to rest on while the continuation of said support extends up in the hole through the saddle for the bolt, which secure it to the tree to hold it against lateral movement, as well as to support said tree a certain distance above the plate, the tree being fastened on either by a screw bolt and socket nut—the latter being at the top—or by a bolt with the cone nut at the bottom fitted into a countersunk hole in the plate for allowing the nut to sink to the surface so as not to injure the animal's back. The fifth part consists of a detachable crupper loop having a flattened shank or portion, by which it is connected to the tree by one of the bolts used for attaching the check rein hook and the saddle, and by a square or other angular projection rising up from the top of the tree, and having a screw threaded portion and a nut screwing down upon said shank, which has a square or other angular hole for said projection, also a hole for the aforesaid bolt; and the loop is so bent upward at its connection with said shank as to make room for the rear end of the "middle leather" to be placed under it, while the shank is firmly clamped to the tree. The sixth part of the invention consists of a cone shaped projection raised on the upper side of the shank of the check rein hook around the countersunk bolt hole for compensating for the lack of strength caused by countersinking the hole on the underside to allow the bolt head or nut to sink in said hole, so as not to come in contact with the animal's back and injure it, as would be the case if it projected below said shank.

PLANTER AND CULTIVATOR.—Edward B. McClellan and John F. McClellan, Alexandria, Ala.—The standards which hold the plows are in this machine detachable on the frame, and the plows are also detachable on the standards for shifting both the standards and the plows to use different kinds as may be required by the nature of the work in hand. When it is to be used as a cotton bedding machine, one double turning plow is attached to the middle beam in the rear, a right hand turning plow to the right hand beam, and a left hand turning plow to the left hand beam. This arrangement is employed for turning the earth from the middle each way to form a bed wherein the cotton is to be planted, which bed will be completed by two passages of the machine, each passage finishing one bed and forming one half of the next. A front sloping hopper, having a hole and slide, rotary arms, having holes and tube, when combined in a seeder, constitute the claim.

HAND PLANTER.—Young F. Wright, of Hannahatchee, Ga.—This invention has for its object to furnish a simple, convenient, and reliable hand machine for dropping seeds and distributing fine fertilizers. It consists in the combination, with a boot piece and seed reservoir, pivoted at the heel thereof, of the valves and a spring, arranged to contain the seed or fertilizer, prevent its packing, and to drop it uniformly.

TELLURIAN.—George Shotter McKenzie, New York city, assignor to William J. Gordon, Cleveland, Ohio.—A wheel and pin, an intermediate wheel hung to a frame, and a loose and spokeless wheel combined with a forked frame and driving wheel, are the features of this simple yet evidently well designed piece of apparatus for the illustration of all the important changes, movements, and phenomena produced by the motion of the earth and moon.

CAR TRUCK.—Lemuel I. Fleming, Mobile, Ala.—This invention has for its object to improve the construction of railroad car trucks in such a way as to make them stronger and better than the trucks constructed in the ordinary manner, to prevent the possibility of the brake bars falling upon the track, and at the same time to allow the truck frame to have a free vibration. The invention is ingenious and practical, while, we judge, it may be cheaply appl ed

Practical Hints to Inventors.

MUNN & CO., Publishers of the SCIENTIFIC AMERICAN have devoted the past twenty-five years to the procuring of Letters Patent in this and foreign countries. More than 50,000 inventors have availed themselves of their services in procuring patents, and many millions of dollars have accrued to the patentees, whose specifications and claims they have prepared. No discrimination against foreigners; subjects of all countries obtain patents on the same terms as citizens.

How Can I Obtain a Patent?

is the closing inquiry in nearly every letter, describing some invention which comes to this office. A positive answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them: they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

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This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows and correct:

Construct a neat model, not over a foot in any dimension—smaller if possible—and send by express, prepaid, addressed to MUNN & Co., 37 Park Row New York, together with a description of its operation and merits. On receipt thereof, they will examine the invention carefully, and advise you as to its patentability, free of charge. Or, if you have not time, or the means at hand, to construct a model, make as good a pen and ink sketch of the improvement as possible, and send by mail. An answer as to the prospect of a patent will be received, usually, by return of mail. It is sometimes best to have a search made at the Patent Office; such a measure often saves the cost of an application or a patent.

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To Make an Application for a Patent.

The applicant for a patent should furnish a model of his invention, if susceptible of one, although sometimes it may be dispensed with; or, if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should be securely packed, the inventor's name marked on them, and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by a draft, or postal order, on New York, payable to the order of MUNN & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents.

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MUNN & Co. will be happy to see inventors in person, at their office, or to advise them by letter. In all cases, they may expect an honest opinion. For such consultations, opinion, and advice, no charge is made. Write plain; do not use pencil, nor pale ink; be brief.

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In all matters pertaining to patents, such as conducting interferences procuring extensions, drawing assignments, examinations into the validity of patents, etc., special care and attention is given. For information, and for pamphlets of instruction and advice,

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DESIGNS PATENTED.

5,510.—HAND STAMP.—W. H. Golding, Chelsea, Mass.
5,511 to 5,513.—OIL CLOTHS.—H. Kagy, Philadelphia, Pa.
5,514.—TYPE.—J. Lindsay, Brooklyn, N. Y.
5,515 to 5,517.—FLOOR OIL CLOTHS.—C. T. Meyer, Lyons Farms, Elizabeth, N. J.
5,518.—CARPET.—E. Pyne, Morrisania, N. Y.
5,519 to 5,527.—CARPETS.—R. R. Campbell, Lowell, Mass.
5,528.—PULL FOR DOORS, ETC.—H. Herit, New York city.
5,529 to 5,538.—CARPETS.—H. Horan, Newark, N. J.
5,539 & 5,540.—IRON PEDESTAL.—M. D. Jones, Boston, Mass.
5,541.—SHOE.—G. E. Lesthe, Reading, Mass.
5,542.—CARPET.—J. Wade, Palmer, Mass.

TRADE-MARKS.

653.—BREAD.—J. F. Kohler, New York city.
654.—WATERPROOF GARMENT.—H. Kuhlman, Boston, Mass.
655.—WOOLEN CLOTH.—Middlesex Company, Lowell, Mass.
656 & 657.—WHISKY.—T. E. Moore, Shawhan, Ky.

APPLICATIONS FOR EXTENSIONS.

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

20,196.—STEAM ENGINE.—D. Barnes. April 17, 1872.
21,698.—SHINGLE MACHINE.—J. R. Hall, June 5, 1872.
20,245.—GUIDE FOR SEWING MACHINES.—L. W. Serrell. April 24, 1872.
20,243.—GUARD FOR HARVESTERS.—L. Miller. April 24, 1872.
20,175.—SEWING MACHINE.—E. H. Smith. April 17, 1872.
20,267.—THICK WOVEN FABRICS.—J. Gujer. May 1, 1872.

EXTENSIONS GRANTED.

19,258.—FLASK FOR CASTING WHEELS.—F. Nishwitz.
19,252.—PLATE FRAME FOR PHOTOGRAPHIC CAMERA.—W. & W. H. Lewis.
19,318.—LAP JOINT.—H. Underwood.
19,321.—PLOW.—G. Watt.
19,328.—CANE GUN.—J. F. Thomas.

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 insures 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

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Inventions Patented in England by Americans.

From January 19 to January 25, 1872, inclusive.
[Compiled from the Commissioners of Patents' Journal.]

AXLES AND WHEELS.—E. Doty, G. W. Millimore, Janesville, Miss.; R. Mickel, Chicago, Ill.; I. Mickel, New Lisbon, N. Y.
CLUTCH FOR BRAKES, ETC.—F. G. Bates, Springfield, Mass.; R. Baker, Middletown, P. Ferguson, New Haven, Conn.
COPYING PRESS.—A. Le Clercq, New York city.
DIAPHRAGM MOTOR, ETC.—W. E. Prall, Washington, D. C.
ELEVATOR, ETC.—T. Silver, New York city.
FIRE ARM LOCK.—W. F. Parker, Meriden, Conn.
LUBRICATOR.—W. A. Clark, New Haven, Conn.
POWER FOR TRACTION ENGINES, ETC.—W. W. Hanscom, San Francisco, Cal.
SEAL LOCK.—American Seal Lock Company, New York city.
SHUTTLE BOX, ETC.—J. Brierly, Worcester, and J. Brierly, Millbery, Mass.
WOOD PAVEMENT, ETC.—B. B. Hotchkiss, 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.

NEW BOOKS AND PUBLICATIONS.

We are in receipt of the REPORT OF THE CHIEF SIGNAL OFFICER OF THE WAR DEPARTMENT for the year ending June 30, 1871. It is an interesting and important document.

AMERICAN LOCOMOTIVE ENGINEERING AND RAILWAY MECHANISM. With a Practical Treatise on the Material, Draughting, Construction, and Management of the Locomotive Engine and Railway Cars. Illustrated with Large and Detailed Engravings, Diagrams, etc. By G. Weissenborn, Mechanical Engineer. Published by the American Industrial Publishing Company, 267 Pearl Street, New York.

This is a work to be sold to subscribers only. The large plates are folio size, while the printed text is of large quarto size. The plates are beautifully executed, and the typography is good. We wish we could say as much as to the treatment of the subject in the text. From what we can judge of the first number, the work will prove more a compendium of facts extracted from various sources than an exhaustive treatise upon locomotive engineering, pure and simple. We are not wholly sure that the facts do not contain some misstatements—cite the following, which, appearing on page 5, will certainly astonish some chemists. The statement is this: "Up to within the past few years, these two bodies (hydrogen and oxygen) have been considered as gases; but a series of remarkable experiments which were conducted in France, and repeated in the laboratory of Dr. Doremus, of New York city, seem to prove the astounding fact that the base of hydrogen is *a metal.*" This statement will be truly astounding to those who are acquainted with the history of hydrogen, and who are not aware that the gentleman mentioned has thrown any great light upon its real character, or confirmed authoritatively the researches of lesser lights in Europe. However, the work is beautiful in execution, and calculated to interest locomotive builders and engineers.

FIRST LESSONS IN PHYSICS, for Use in the Upper Grades of our Common Schools. By C. L. Hotze, Teacher of Physics in the Central High School, Cleveland, Ohio. St. Louis: Hendricks & Chittenden.

A book of this character, placed in the hands of pupils in the higher grades of common schools, would undoubtedly do much good. The plan is a good one, strictly in accordance with the method of object teaching, and consists in the description of simple experiments illustrative of elementary principles and facts in physical science, with remarks upon them calculated to elicit thought, and lead to the inference of other facts and principles. Extreme care should, however, be used to avoid errors in a book of this kind, as early misconceptions are so hard to eradicate. Glancing through the pages of this work, we see some typographical errors, as well as some errors of a graver sort. On page 32, the term adhesion is repeatedly used to denote that species of attraction known to physicists as cohesion. On page 60, in speaking of the equilibrium of a lever, the term power is used to denote a purely static effect. On page 113, we are told, a locomotive or steamboat could never have been thought of without circular motion. These are errors which we light upon hap-hazard, and which, on that account, are more evidence that the book has been too hastily prepared.

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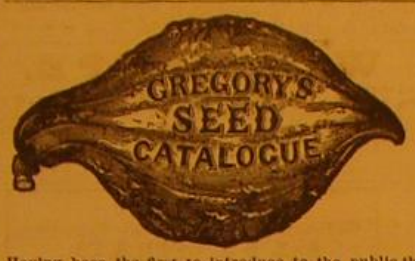
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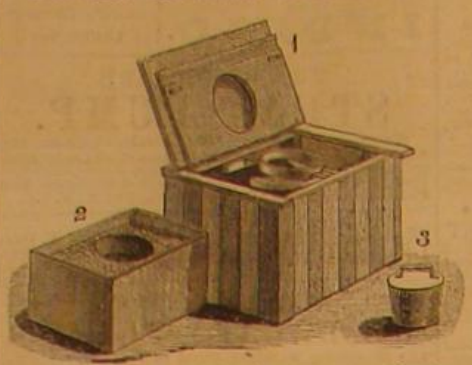
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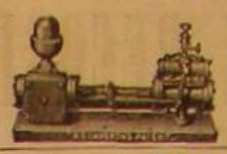
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SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXVI.—No. 10. [NEW SERIES.] NEW YORK, MARCH 2, 1872. $3 per Annum. [IN ADVANCE.]

THE GATLING SYSTEM OF FIREARMS.

Probably the most destructive field weapons, ever yet devised by man, are those illustrated in the accompanying engravings. In saying this, we are perfectly aware that we make a very strong statement. No class of invention has absorbed more thought and study than that of military engineering. "How to kill" most effectively has been a problem, to the solution of which the finest mechanical genius, aided by all the discoveries of science, has been applied for ages. It is indeed sad to reflect upon the apparent necessity for improvements in the means by which wholesale slaughter is to be perpetrated; but one consolation may be drawn from the consideration that the more destructive weapons can be made the less is the probability that nations will seek to settle their controversies by the stern arbitrament of blood, and the sooner will come the happy era when a better and wiser method for the adjustment of differences will be adopted.

A peculiar merit of Mr. Gatling's invention is the facility with which it may be adapted to the exigencies of field warfare in various parts of the world. The engravings illustrate several such applications, the largest exhibiting the way in which it may be used on the backs of camels, in India or other oriental regions where the absence of good roads and the peculiar features of the country render these animals most serviceable both for attack and defence.

We think it safe to say that one of these guns, mounted upon the back of a camel, as shown in our engraving, or carried by an elephant, would be, in some situations, an efficient substitute for a regiment of men armed and equipped in the best modern style of infantry practice. Figs. 2, 3, and 4 represent respectively the battery gun mounted on a horse with ammunition, etc., the gun as it appears mounted on a tripod ready for service, and, lastly, the gun with its tripod folded and carried on the shoulders of two men, while others carry the supply of ammunition.



THE GATLING BATTERY GUN.—Fig. 1.

For a description of this gun, we avail ourselves of an excellent and exhaustive essay upon the subject, which we find in the "Science Record," for 1872*, from which we shall make such extracts as suit our present purposes.

HISTORY OF THE GUN.

The inventor of this wonderful arm is Dr. Richard J. Gatling, at the time of its discovery a resident of the city of Indianapolis, in the State of Indiana, but now of Hartford, Conn. He first conceived the idea of a machine gun in 1861, and is justly entitled to the proud distinction of being the originator of the first successful weapon of the kind ever invented. His first "battery" or gun was completed in that city in the early part of the year 1862, and his first American patent bears date November 4th of the same year. The gun was fired repeatedly during that year in Indianapolis, in the presence of hundreds and thousands of persons, over two hundred times a minute, and its performance was regarded by military men as so satisfactory that the Governor of that State, Hon. N. P. Morton—now United States Senator—appointed a committee of gentlemen of high standing and military experience to examine and report upon its merits. The committee performed the task assigned them, and on the 14th of July, 1862, made a highly favorable report to the Governor, from which we quote the following brief extract:

"The lock is certainly ingenious and simple in its construction, and fully protected from injury from any cause. The barrels are so arranged as to fire independently of each other, so that an injury to one does not affect the others. There are no complicated parts, and the common soldier can keep it in order as readily as he can his musket. It is so substantial as to endure without injury the same usage as an ordinary field piece. The discharge can be made with all desirable accuracy as rapidly as one hundred and fifty times per minute, and may be continued for hours without danger, as we think, from overheating. Two men are sufficient to work the gun, and two horses can carry it over the field with the rapidity of cavalry."

This report and his own personal observation so impressed Governor Morton that, in a letter to P. H. Watson, Esq., Assistant Secretary of War, he recommended the weapon to the United States War Department as a "valuable and useful arm."

MANUFACTURE OF GUNS IN CINCINNATI.

In the meantime Dr. Gatling had twelve of his guns manufactured in an establishment in the city of Cincinnati, Ohio, and fired them there repeatedly in the presence of army officers and the citizens generally. Among those in that city who witnessed the performances of the gun was Major-General H. G. Wright, then in command of the United States forces in that district, who also was so favorably impressed with it that, under date of March 11, 1863, he wrote to Brigadier-General J. W. Ripley, Chief of Ordnance of the United States army, indorsing it as "possessing much merit," particularly "as a device for obtaining a heavy fire of small arms with very few men; it seems to me admirably adapted to transport steamers plying upon the Western rivers, where infantry squads are needed for security against guerilla and other predatory bands.

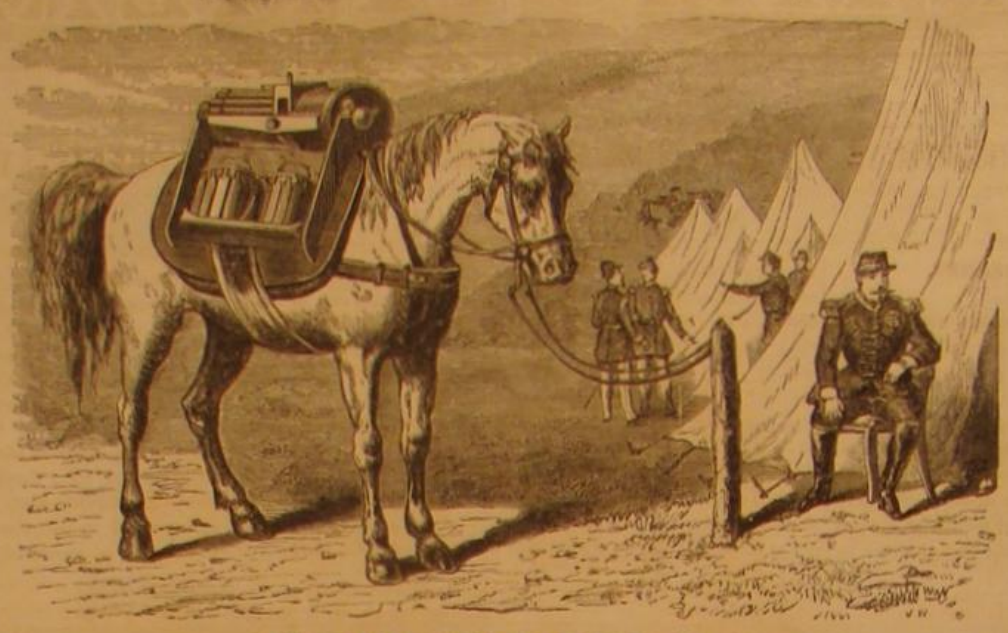
TRIALS BY THE U. S. GOVERNMENT.

Thus brought to the notice of the authorities in Washington, Rear Admiral Dahlgren, Chief of the Bureau of Ordnance, ordered a trial of the gun, which took place in the Washington navy yard. The official report made to him on this occasion, bearing date May 20, 1863, concluded thus:

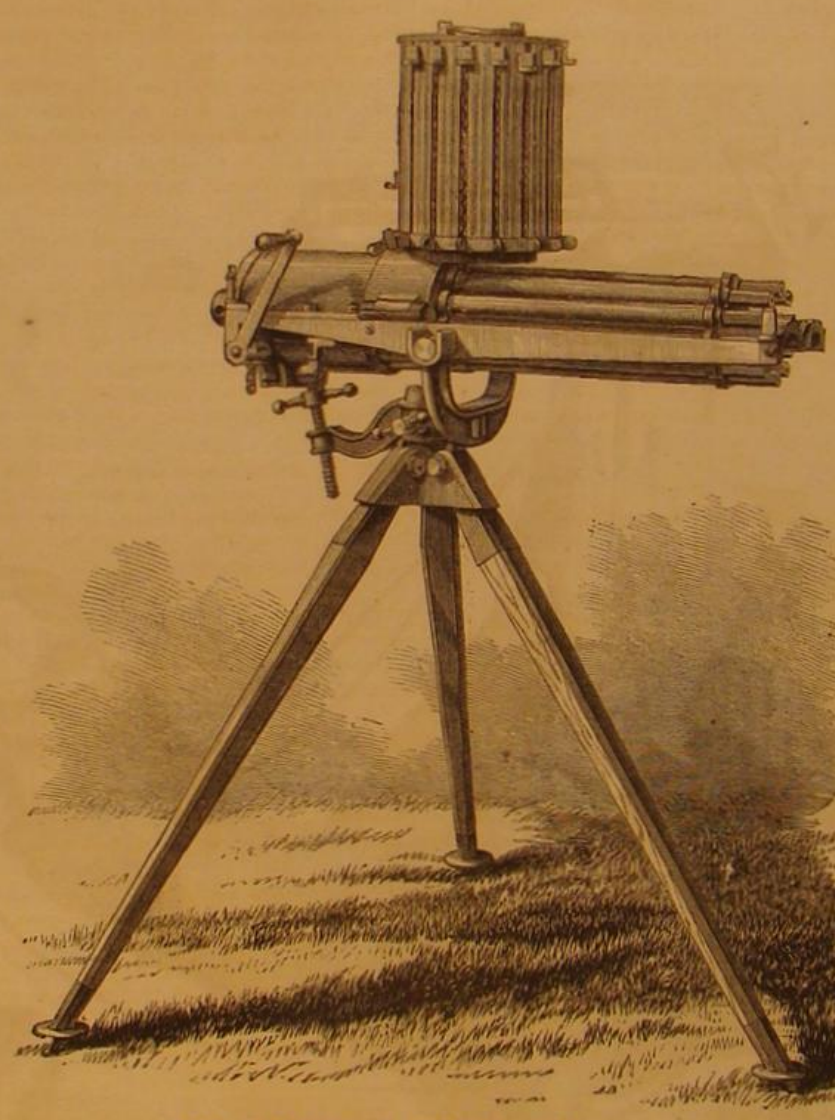
"The gun or battery has stood the limited test given it admirably; has proved itself to be a very effective arm at short range; is well constructed, and calculated to stand the usage to which it would necessarily be subjected. It is suggested that an improvement in the manner of rifling the barrels would be advantageous."

In accordance with the suggestion of this report, Dr. Gatling had a new set of barrels, with a change in the rifling, made and put in the gun; and it was on the 17th of July, 1863, again fired at the Washington navy yard, in the presence of a number of officers. The official report of this trial states that "the penetration of the Gatling battery was equal to that of the Springfield musket;" that the gun in its "mechanical construction is very simple, the workmanship well executed, and we are of the opinion that it is not liable to get out of working order."

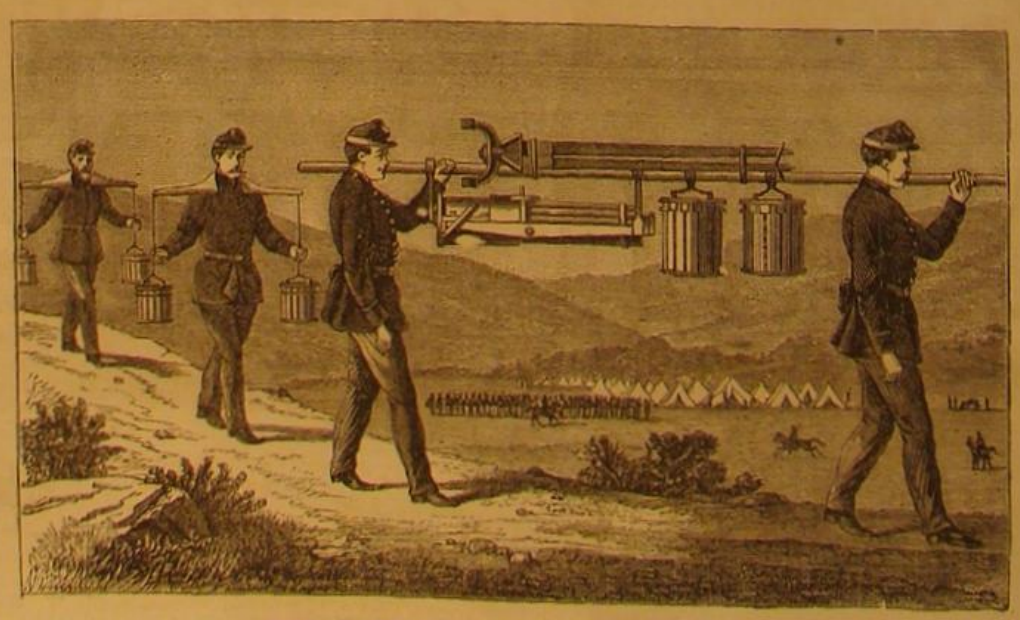
These trials were so satisfactory to Admiral Dahlgren that he gave permission to commanders of fleets and squadrons to order what guns they might think proper for the service; but few guns were then furnished, however, owing to Dr Gatling's inability to make them in quantities, and want of time to see naval officers and impress upon them their value and true character. But some of them did get into service before the close of the American war, and were used effectively in repelling rebel attacks upon the Union forces under command of General Butler, near Richmond, Va.



THE GATLING BATTERY GUN.—Fig. 2.



THE GATLING BATTERY GUN.—Fig. 3.



THE GATLING BATTERY GUN.—Fig. 4.

VARIOUS OTHER TRIALS AND REPORTS.

Trials in France, in 1867, proved the superiority of the gun over the famous mitrailleuse, but the Emperor claiming the latter as his own, refused to recognize the merits of the American arm so far as to supersede the mitrailleuse by it.

The gun was thoroughly tried by the United States Ordnance Bureau, in 1865, favorably reported upon, and adopted.

In Vienna, in July, 1868, the Military Committee of the Austrian Government gave the gun a trial, which produced a very favorable impression. In this trial the gun fired 246 shots per minute, hitting 216 times, while infantry, firing 721 shots per minute, hit only 196 times.

At Shoeburyness, England, in September, 1870, the gun was tried in comparison with the celebrated nine pounder India bronze muzzle-loading gun, the twelve pounder Armstrong breech-loader field gun, the Montigny mitrailleuse, the Martini-Henry breech-loading rifle, and the breech-loading Snider rifle; the three last at short distances, up to 1,200 yards. Probably no arm was ever put to a severer test than that the Gatling gun endured on this occasion, yet the committee, embracing the highest military experts of the kingdom, made a most favorable report upon it, recommending its adoption. A subsequent exhaustive trial at Woolwich resulted in its adoption by the British Government.

Its merits, thus demonstrated by actual experiment, have secured its adoption by Russia, Turkey, Hungary, and Egypt, in addition to the United States and England.

MAIN FEATURES AND SUPERIORITY OF THE GATLING GUN.

The main features and superiority of the Gatling gun may be summed up thus:

1. Its rapidity and continuity of fire.

2. Its simplicity—there is nothing complex about the gun.

3. Each barrel in the gun is provided with its own independent lock or firing mechanism.

4. These locks are made interchangeable, and are strong and durable; but should they get out of order, the gun is so constructed that any one or all of them can be, in a few moments, taken out and others inserted in their places, and so the gun can be kept in perfect working order at all times on the field of battle. It will not be denied that this is a feature of the greatest value, s the lock mechanism is the most essential part of a machine gun, and is the only part liable to get out of order from use.

5. All the locks revolve simultaneously with the barrels, carrier, and inner breech, when the gun is in operation. The locks also have a reciprocating motion when the gun is revolved. The gun cannot be fired when either the barrels or locks are at rest.

6. The gun is made of single barrels, open at muzzle and breech, with space between them for the free circulation of air and radiation of heat, thus preventing to a great extent that heating and fouling of the barrels which, otherwise, the rapidity and continuity of its fire would cause.

7. The isolation of the barrels makes their expansion and contraction equal and uniform, and thus they suffer no distortion from these causes, as they would if massed together.

8. The barrels are open from end

*Science Record for 1872. A Compendium of Scientific Progress and Discovery during the Past Year. New York. Munn & Co.: Office of the Scientific American, 37 Park Row.

to end, and can easily be kept clean by the use of a swab or wiper.

9. The cartridges are loaded directly into the rear ends of the barrels; thus all leakage of gas at the breech is prevented.

10. The gun fires a shot at a time in rapid succession, and thus, by dividing the time used in rapid firing into equal parts between the discharges, and preventing an accumulation of recoil, it admits of larger charges, heavier balls, and consequently greater range.

11. This peculiarity of no recoil is of special value in the defenses of bridges, fords, mountain passes, etc., which are frequently attempted during darkness, fog, or storm, as also in the smoke of battle, when the movement of the enemy cannot be accurately observed.

12. Firing a shot at a time also allows a lateral motion of the gun to be kept up during the time of firing, which result is attained in the Broadwell carriage upon which it is mounted, or by the Kinne attachment to the carriage manufactured at Colt's armory, Hartford, Conn., by which the gun is traversed automatically.

13. No resighting and relaying are necessary between the discharges. When the gun is once sighted, its carriage does not move but at the will of the operator, and the gun can be moved laterally when firing is going on, as heretofore remarked, so as to sweep the sector of a circle of twelve or more degrees without moving the trail or changing the wheels of the carriage.

14. The continuous firing, a shot at a time, avoids all deflections of the balls.

15. As musketry fire, the small Gatling can be trained with far more accuracy and delicacy than small arms from the shoulders, and has no nerves to be disturbed in the din, confusion, and carnage of the battle field, nor will the smoke of battle prevent its precision.

16. It requires fewer horses and men to serve it. The weight of the small Gatling is only three hundredweight, of the medium, five hundredweight, and of the largest sized, six hundredweight. Two men serve the first, and from five to seven men the last two. A still smaller sized gun, weighing only one hundred and twenty-five pounds, has recently been constructed at Colt's armory under the supervision of Dr. Gatling, a full description of which is given hereafter.

17. Its great economy, not only in men and horses, but in ammunition.

18. The great safety in the transportation of this ammunition. The cartridge cases or shells for the larger Gatling guns are constructed of sheet metal which is $\frac{15}{100}$ of an inch thick; the heads are made solid, and solder is used in their bases. These shells can be reloaded and fired from fifty to one hundred times. They are also waterproof, strong enough to stand all usage incident to the service, and are safer in transportation, are of less weight, and occupy less space, thus requiring fewer men and horses, for their transportation and service, than artillery ammunition. By carrying loading machines, with extra balls and powder, and detailing men to reload the shells after they have been fired on the field of battle, a supply of ammunition can always be kept up in time of action.

19. The operation of loading is greatly simplified. There is no need of sponging, capping, priming, adjusting of fuses, cocking, etc. All that is required is to supply the hopper with the cartridges and to turn the crank, when a continuous stream of balls can be discharged.

20. The flanges of the cartridges have square faces in front, which enable the shells to be easily extracted from the chambers of the barrels, after they have been fired, by the improved extractors with which the locks are now made.

21. The great range of the large gun, equal for all practical purposes to that of the field gun, and greater, in accuracy and precision, given to it from the use of the elongated leaden bullet, which has great specific gravity and small air resistance.

22. The projectiles of the large gun may be either solid shot, shell, or canister, like those of field artillery.

23. The balls of the Gatling gun ricochet for a greater distance than the shells or missiles of the field piece.

24. The feeding drums and feed cases of the gun can all be used with any gun of the same calibre.

25. The working parts of the guns are encased in the breech covering so as to be entirely protected from dust and bad weather.

26. The largest sized gun, with a range of from two thousand to three thousand yards, can be taken apart, packed on mules, carried across mountains, and on its arrival at its destination can be reassembled in a few minutes.

DESCRIPTION OF THE GATLING GUN.

The gun consists of a series of barrels in combination with a grooved carrier and lock cylinder. All these several parts are rigidly secured upon a main shaft. There are as many grooves in the carrier and as many holes in the lock cylinder as there are barrels. Each barrel is furnished with one lock, so that a gun with ten barrels has ten locks. The locks work in the slots formed in the lock cylinder, parallel to the axes of the barrels. The lock cylinder, which contains the locks, is surrounded by a casing which is fastened to a frame, to which trunnions are attached. There is a partition in the casing, through which there is an opening, and into which the main shaft, which carries the lock cylinder, carrier, and barrels, is journaled. The main shaft is also, at its front end, journaled in the front part of the frame.

In front of the partition, in the casing, is placed a cam provided with screw surfaces. This cam is rigidly fastened to the casing, and is used to impart a reciprocating motion to the locks when the gun is revolved. There is also, in the front part of the casing, a cocking ring, which surrounds the lock cylinder, is attached to the casing, and has on its rear surface an inclined plane with an abrupt shoulder. This ring and its projection are used for cocking and firing the gun. This ring, the spiral cam, and the locks make up the loading and firing mechanism.

On the rear end of the main shaft, in the rear of the partition in the casing, is located a gear wheel, which works to a pinion on the crank shaft. The rear of the casing is closed by the cascable plate. There is hinged to the frame in front of the breech casing a curved plate, covering partially the grooved carrier, in which is formed an opening through which the cartridges are fed to the gun from feed drums. The frame which supports the gun is mounted upon the carriage used for the transportation of the gun.

The operation of the gun is very simple. One of the feed drums filled with cartridges is placed upon the gun, as shown in the engraving; a man then turns the crank, which, by the agency of the gearing, revolves the main shaft, carrying with it the lock cylinder, carrier, barrels, and locks. As the gun is revolved, the cartridges, one by one, drop into the grooves of the carrier from the feed cases, and instantly the lock, by its impingement on the spiral cam surfaces, moves forward, pushes the cartridge into the chamber, and, when the butt end of the lock gets on the highest projection of the cam, the charge is fired, through the agency of the cocking device which at this point liberates the lock, spring, and hammer and explodes the cartridge. As soon as the charge is fired, the lock, as the gun is revolved, is drawn back by the agency of the screw surface in the cam acting on a lug of the lock, bringing with it the shell of the cartridge after it has been fired, which is dropped on the ground. Thus, it will be seen, when the gun is revolved, the locks in rapid succession move forward to load and fire, and return to extract the cartridge shells. In other words, the whole operation of loading, closing the breech, discharging, and expelling the empty cartridge shells is conducted while the barrels are kept in continuous revolving movement. It must be borne in mind that while the locks revolve with the barrels, they have also, in their line of travel, a spiral reciprocating movement; that is, each lock revolves once and moves forward and back, at each revolution of the gun.

The feed drum has been lately applied to the gun by Mr. L. W. Broadwell. It takes the place of the feed cases previously used. The feed drum is a cylinder, containing four hundred cartridges, and by its use, four hundred shots can be fired, one man only being required to work the gun—that is, to attend to the feed and turn the crank—and all of these shots can be fired in one minute. The ammunition is carried in the drums, and as soon as one is emptied, it is removed and replaced by a full one, the change only requiring a few seconds.

The carriages for the gun which are represented in the plates are manufactured in Europe of wrought and cast iron; those made at Colt's armory, Hartford, Conn., are constructed of wood, and there is attached to them an automatic traversing apparatus, which, by the act of turning the crank, causes the gun to traverse through a maximum angle of six degrees. This angle can be diminished at will, or the apparatus can be thrown out of gear in an instant, and the gun be fired in one direction.

The use of these guns in connection with camels was, we believe, suggested by Col. H. H. Maxwell, R. A., Superintendent of the Cossipore Gun Foundery, whose experience in East India warfare led him to believe the adaptation would prove of the greatest benefit. From this has resulted the camel gun illustrated herewith.

It is needless for us to dwell upon the importance of this gun. All future warfare will be modified by it to an extent difficult to foretell. Mr. Gatling has placed his name on historic record with the greatest military inventors of this or any previous age, and has achieved a success which his genius and persistent effort well merit.

Mr. Gatling's present address is at Colt's Foundery, Hartford, Conn., where the guns are manufactured.

Steam on the New York Canals.

Last year the Legislature of the State of New York offered a reward of one hundred thousand dollars for the best plan for canal boat navigation by power. But as yet no person has produced the right sort of a plan, and the reward is still open for competitors.

The State Auditor, in a recent report, says:

The Legislature of 1871 passed an act entitled "An act to foster and develop the internal commerce of the State, by inviting and rewarding the practical and profitable introduction, upon the canals, of steam, caloric, electricity, or any motor other than animal power, for the propulsion of boats," and appropriated for that object the sum of $100,000, to be paid to the owners of the successful plans, not exceeding three in number, which might be submitted for trial, and tested and approved by the commissioners appointed under the act. The act further provides that the commissioners shall demand and require:

First—The inventions and devices to be tested and tried at the proper cost and charges of the parties offering the same for trial.

Second—That the boat shall, in addition to the weight of the machinery, and fuel reasonably necessary for the propulsion of said boat, be enabled to transport, and shall actually transport on the Erie canal, on a test or trial exhibition, under the rules and regulations now governing the boats navigating the canals, at least two hundred tuns of cargo.

Third—That the rate of speed, made by said boat, shall not be less than an average of three miles per hour, without injury to the canals or their structures.

Fourth—That the boat can be readily and easily stopped or backed by the use and power of its own machinery.

Fifth—That the simplicity, economy, and durability of the invention or device must be elements of its worth and usefulness.

Sixth—That the invention, device, or improvement can be readily adapted to the present boats; and, lastly, that the commissioners shall be fully satisfied that the invention or device will lessen the cost of canal transportation, and increase the capacity of the canals. A means of propulsion or towage, other than by a direct application of power upon the boat, which does not interfere in any manner with the present method of towage on the canals, and complying in all other respects with the provisions of the act, may be entitled to the benefits thereof; but this shall not be construed to apply to the system known as the Belgian system, or to any mode of propulsion by steam engines or otherwise, upon either bank of the canals.

Previous to the passage of this act, steam had repeatedly been introduced, by way of experiment, on the Erie and Oswego canals, resulting in a speed of three miles per hour with cargoes of two hundred tuns, but it was only accomplished at such a cost as to preclude its profitable employment.

The reward offered by the State has induced a renewal of experiments, and it is to be hoped that it will result in some invention or device by which some motor other than animal power may be found practicable in the propulsion of boats upon the canals. As yet, the reward has not secured that object. It is believed, however, that it has caused an agitation upon the subject, which will, sooner or later, result in success.

While it would be very desirable to apply steam as a motor to the form of boats now in use, it is deemed by many to be impracticable with the canals at their present dimensions. The paddle wheel and the screw, since the introduction of steam as a motive power, have been the only methods successfully employed in the propulsion of vessels. It is claimed that, with a good propeller wheel working under the most favorable circumstances, as in the open sea, the loss of power amounts to from forty-five to fifty-five per cent; but employed in the canals, the loss rises to seventy and even eighty per cent. If this be true, engines out of all proportion to the work to be accomplished would have to be employed, and hence unprofitable when brought into competition with animal towage.

The employment of tugs might, to a certain extent, be attended with success, but the loss of power adds correspondingly to the cost, which may in a measure be compensated by an increased speed. This method of towage has at different periods been introduced, and the fact of its early abandonment leads to the conviction that it is unprofitable.

It has been suggested that a railroad might be constructed on each side of the canal, and the boats drawn by locomotives. This plan has many advocates, but it is urged against it that the great outlay required to introduce this method renders its adoption impracticable.

The Honorable W. H McAlpine, late engineer and surveyor of this State, in a recent letter from Europe, where he is at present sojourning, mentions a method employed in Europe, and known as the Belgian system, which he had witnessed and believes to be just what is needed on our canals.

This system to which Mr. McAlpine alludes was exhibited on the Erie canal, between Albany and West Troy, previous to the close of the navigable season of 1871. Its operation was witnessed by the State officers and distinguished citizens from different parts of the State.

The system apparatus employed may briefly be described as follows: A wire cable is laid on the bottom of the canal, passing through intervening locks, and fastened at the two extreme ends; and a steam tug or tow boat provided with an engine to which is attached a clip drum, or grooved driving wheel, with suitable guiding and tightening pulleys. The boats to be towed are made fast to the tug, and the process of towing is performed by lifting the cable from the bottom of the canal by means of a grapple, and placing it over the clip drum and under the tightening or press pulleys. The clip drum is then put in motion (turned) by the machinery in the tug, causing the cable to pass over it and fall back again into the canal at the stern of the tug. Thus the tug is drawn along the cable with the same facility as a locomotive is drawn on the rails, though there is no slipping as in the case of the locomotive. All the power of the engine is directly employed in the propulsion of the tug.

It is claimed by the advocates of the system that its general introduction would be attended with complete success in diminishing the time of trips, the cost of transportation, and increasing the capacity of the canals.

This plan of towage appears to have been excluded from competing for the reward offered by the State. No good reason is seen for the exclusion of this or any other apparently practicable system from the benefits of the act. The policy of the act is the encouragement of inventors and others to perfect and test their several plans, and enable the State to select from all that which shall promise the best results. Any plan which will practically combine economy with greater speed than is now attained, and employing the boats at present in use, will not only prevent the diversion of trade, but largely increase the business and revenues of the canals.

To secure such results, the State should offer every encouragement and essential aid, and should exclude no system from her bounty which promises the successful and speedy introduction of steam on her public works. The reduction of time, in making a trip to and from tide water and the lakes, is a matter of the greatest importance, and should receive the most careful attention of the Legislature.

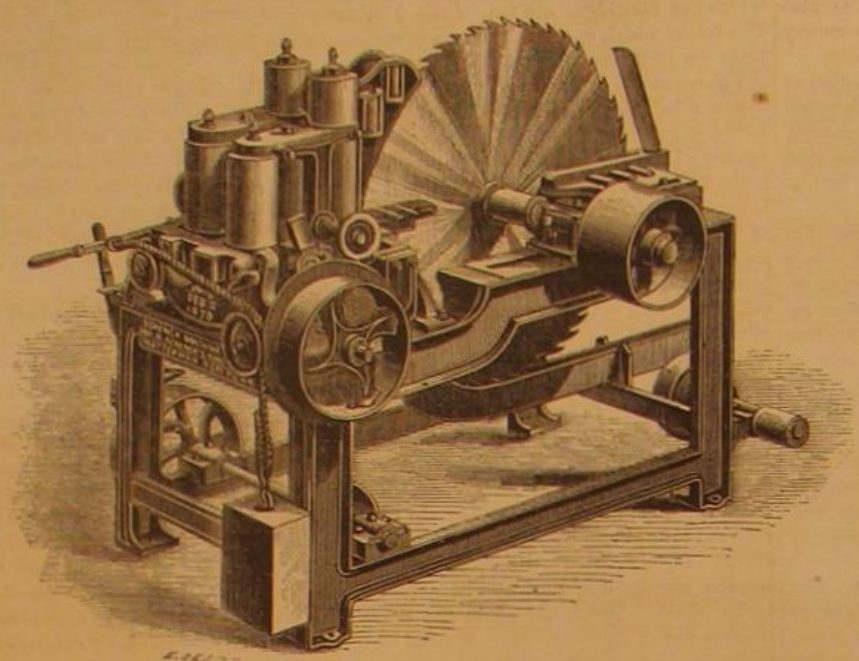
Improved Circular Re-Sawing Machine and Siding Saw.

Our engraving is a representation of a re sawing machine, to which was awarded the first medal and diploma at the Exhibition of the American Institute for 1870. The award was made with discrimination and justice, as the machine is undoubtedly one of the best of its kind.

A prominent feature of the saw is that the feed rolls may be set inclined to the saw, so as to saw siding. This adjustment is made simultaneously for all the feed rolls by inclining the table to which they and their gearing are journaled, a set screw holding the table when set, and a simple adjustment compensating for what would otherwise be the increased tension of one of the belts when the table occupies this position.

The feed rolls have an adjustable speed motion through the use of a system of cone pulleys intermediate between the first pulley, from which motion is carried to the feed, and the last, which imparts motion to the gears of the rolls. They are also self-centering, so as to guide the stuff for uniform thickness through all inequalities on each side of the saw; or they may be made not self centering, and may be held in a fixed position by the adjustment of a single screw.

The machine is constructed in a very substantial and workmanlike manner. It was patented February 2, 1870, and is manufactured by John B Schenck's Sons, the manufacturers of the celebrated Schenck's planers, at Matteawan, N. Y. The salesrooms are at 118 Liberty street, New York, where the machine may be seen and the firm addressed.



SCHENCK'S CIRCULAR RE-SAWING MACHINE.

Museum of Natural History.

The Museum of Natural History in Central Park, New York, is rapidly becoming an attractive and important institution. It is open to the public free, and is daily visited by thousands.

Since its first opening and reception last year, many valuable acquisitions have been received; the more valuable being the collection of Prince Maximilian of Germany, which contains a vast number of fine specimens, accumulated by the labors of a lifetime. Beside this collection and the remarkable Verreaux cabinets, a fine specimen of ichthyosaurus has been added. This fossil is imbedded in a slab from the lias formation of Europe, and is one of the most perfect ever found; the plates of its enormous eye-balls are peculiarly distinct. Over 14,000 specimens of birds, besides several hundreds not mounted, are in course of rapid preparation for public inspection and study. A case recently received from Paris contains many finely mounted birds and mammals. Another valuable acquisition is a fossil elk from the bogs of Ireland. This is a perfect skeleton, the antlers being of enormous size. Two very fine specimens of quartz in crystals have lately been presented to the museum. One consists of a block about two feet in diameter, completely studded with prisms from half an inch to two inches in diameter, each prism being perfectly six-sided. A department of building stones has lately been introduced, the design of which is to afford builders and all interested an opportunity to examine at a glance the various building stones of this country and of the world. Other additions are constantly received. A list of the mammals has just been completed and put in the hands of the printer, and a full catalogue will be ultimately prepared.

Premiums to Locomotive Engineers.

The first duty of railway managers is to secure skilled and reliable employees in every department, and to do this they must pay them well. It may not in every case be possible to give the workmen in the different departments a direct portion of the savings made, due to extra care and skill, as is done in many manufactories and workshops; but it is possible to reward them for these requisites in some manner. When the Philadelphia, Wilmington and Baltimore Railway was operated under the "contract system," pecuniary inducements were held out to all the men to make them careful and skillful, they receiving a percentage of the savings made over a given standard of expense. The system worked favorably to the contractors and the men, the company getting a proportionate benefit from it by the men being better educated to better habits of care, greater skill, and a feeling of responsibility for success in their different spheres of labor. There can be no question that this system, by fostering competitive excellence, was conducive to greater safety in operation, and eventual economy in everything. We learn that the Leavenworth, Lawrence and Galveston railway managers have adopted this system with the most favorable results, by awarding annual premiums to the best performances of engineers for the services following:

1st. For general efficiency and care of engine.
2d. For lowest cost of repairs per mile run.
3d. For best performance per ton of coal and pint of oil.
4th. For least cattle killed in proportion to miles run.

The premium is to be given either in lots or lands of the company—to be located by those receiving them, on certificates to be used as cash for that purpose. Premiums have just been awarded of $150, $100 and $75, under the first head; of $100 and $75 under the second; of $100 and $75 under the third; and $100 and $75 under the fourth; the total amount being $500. In his circular to the Master Mechanic announcing the policy, Superintendent Chanute says:

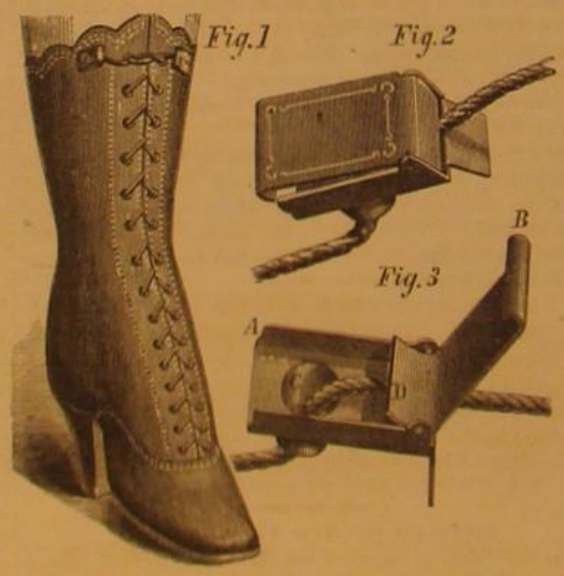
"I have long entertained the opinion that more was exacted from locomotive engineers, in proportion to their pay, than from any other class of operatives on railways. Their post is one of dangers, and on their skill, judgement and fidelity, the safety of the public largely depends. As a class, they thoroughly appreciate the importance of the trusts that are confided to them, and not only do they uncomplainingly endure hardships, exposure and necessary overwork, but they have furnished many examples of self devotion, as noble as any in history. The past year, all our employees have worked well and faithfully to advance the company's interests. Not a passenger has been killed or injured on our trains, and it is the desire of the management to recognize the zeal with which the service of all has been rendered."—*Railway Times.*

TRISCOTT AND WHEELER'S SHOE FASTENINGS.

This neat and seemingly very convenient device, for fastening the ends of shoe or boot laces, is claimed to hold them very firmly, and, at the same time, to be tasteful and comely in appearance, obviating both the trouble in tying the ordinary knot, and preventing the annoyance caused by the knots becoming untied.

Fig. 1 represents a shoe with laces fastened as when worn. Figs. 2 and 3 represent the fastenings in different positions.

The device consists of two parts, A and B, which are hinged



together. The part, A, is fastened to the material of the shoe by means of the eyelet, C, and a tongue, which last is passed through the material of the shoe and bent down to hold the part, A, from turning on the eyelet. The lateral edges of A are turned up, as shown, so that the part B, shuts down to meet them, like a cover. The forward end of B is turned down at D to press upon and clamp the lace when this part is closed into the position shown in Fig. 1. The opposite end is bent so as to form a spring clasp, which engages the notched ends of the turned up edges of A.

In fastening the lace, the part, B, is turned up as shown in Fig. 3. The lace is then passed through under the pivot joint which unites the two parts, and is then passed through the eyelet, C. B being then pressed down and clasped, the shoe is permanently fastened in such a way that contact with the dress of the wearer cannot loosen it.

The fastening has the further advantage that, one end of the lace being thus secured, the other may be drawn up as tightly as required, a great convenience with some kinds of laces that slip easily.

Patented through the Scientific American Patent Agency, December 26, 1871. For further information address S. P. Triscott, 50 Thomas street, Worcester, Mass., to whom the patent has been assigned.

MR. J. H. COLT, of Oregon Territory, informs us that there is snow twenty feet deep on the Blue Mountains.

Robertson's Telegraphic Insulators and Brackets.

This invention consists in the use of tubular slotted insulators provided with projecting lugs at the ends, and fitted into a bracket so as to be entirely held therein, the lugs entering recesses provided in the sides of the bracket. The insulator is made of glass or other non-conducting material. At its ends are projecting lugs or ears. The bracket, made of wood or other material, is as thick as the insulator is long between the lugs. It has one or more apertures through it for the insulators to be held in, one aperture for every insulator. To every such aperture in the bracket leads a slit, from front or back. The insulator is fitted through the bracket with its lugs in the slit, and when through is turned so as to bring a slot in line with the slit for the admission of the wire. When that has been applied, the insulator is once more turned to bring the slot out of line with the slit, so as to have the wire entirely inclosed. Staples may be driven over the ears into the countersunk parts or sockets of the bracket to prevent the insulator from turning spontaneously. The wire may be further fastened by a short wire drawn through a hole in the bracket, and twisted about the main wire.

Tubular insulators heretofore used were not slotted, and the wire could therefore only be introduced by being parted and then again united.

In actual work, the advantages and simplicity of this invention are that, the bracket being nailed or otherwise fastened to the post, the wire can be repaired, renewed, or removed without trouble, the slit in the bracket allowing the wire to drop into the insulator hole at once when the slit is in line.

The insulator can at any time be put on, without disturbing the wire, by means of the slot in it, and then pushed into the hole in the bracket, all that is necessary being to keep the lugs opposite the slit in the bracket, and then pushing it in till the lugs clear the bracket; then, by turning the insulator slightly round and putting the small staples over the lugs, (which latter can be done with perfect ease,) the insulator is secured in its place, and the wire effectually prevented from getting out.

To retain the telegraph wire in its place, all that is necessary is to pass a wire through the small hole under the insulator, and fasten it by twisting it to the main wire at each side, and the main wire is effectually retained; the whole process being exceedingly simple and effective.

There is, it is claimed, no risk of the insulator being broken or disconnected, or of the wire becoming disconnected; and any unskilled workman could do all that is necessary in repairing and fixing the line.

Mr. John Robertson, of Carbondale, Pa., is the inventor.

Noyes' Vacuum Tanks for Tanning Leather.

The object of this invention is to so construct tanks for tanning leather by the vacuum process, and for other purposes, that they will be sufficiently strong when made of wood, and tight enough to preserve the vacuum. It consists in one or more layers of pitch or cement of any suitable kind applied when in a fluid state, so that not only every crack and crevice in the walls and sides of the tank will be filled therewith, but so that the air shall be totally excluded from the tank.

These vacuum tanks have hitherto been made of iron, but it has been found that the tannic acid combines readily with and oxidizes the iron and colors the liquor, consequently coloring the leather, and making it to a certain degree unsalable. These tanks of wood overcome this difficulty, but the vacuum cannot be preserved in a wooden tank except by the use of pitch or cement applied according to this invention, or without one or more continuous and perfect partitions thereof surrounding the chamber on either side.

When the wooden partitions, boxes, or layers are placed, and the exhaust induction pipes are attached, the pitch or cement, in a fluid or semi-fluid state, is poured into the spaces, so as to entirely surround the chamber with one or more partitions, layers, or coats thereof. This hardens directly, excludes the air, and preserves the vacuum, while it preserves the wood from decay.

The inventor does not limit or confine himself to the precise form or arrangement described, as they may be varied in many ways without departing from the invention. Neither does he confine himself to vacuum tanks for tanning hides or leather, but designs to apply the invention to tanks for bleaching or extracting tannin from bark by the vacuum process, and for other purposes.

Mr. D. F. Noyes, of Lewiston, Me., is the inventor.

Gratitude all Around.

We desire to thank all our good friends who have supplied us, with early numbers of this volume, for the alacrity with which they responded to our call. Hundreds of new subscribers have thus been furnished from the commencement of the year, by the courtesy of those who supplied the numbers, and the publishers are saved the necessity of reprinting.

THERE is a trinity in the communication of heat. It is conducted, circulated, and radiated. It passes through solids by conduction, through liquids by connection or circulation and from hot bodies generally by radiation.

PATTON'S IMPROVED MEAT CHOPPER.

The principal peculiarity in this meat chopper is the movement by which the knife is made to strike in a different position at each stroke. This movement is ingenious yet simple, and only operates when the knife is raised to its highest position.

The knife is caused to reciprocate by a pitman connecting the fly wheel with a collar, A, placed just below the ratchet wheel at the top of the shaft which carries the knife, this shaft turning freely in the collar when not otherwise held.

The pitman extends upward from the collar, A, its upper end carrying a pawl pivoted to the pitman at B, and caused to act positively and surely by the rubber spring, C. D is a spring pawl which works into teeth cut in the perimeter of the ratchet wheel, and holds it from turning except as it is actuated by the pawl pivoted at B.



The oscillation of the lower part of the pitman past the middle vertical axis running through the pivot, A, causes the upper part to oscillate in the opposite direction, and thus operates the pawl, causing the knife to make its stroke in different positions successively.

Patented December 19, 1871. For further information address Joseph R. Piper, Harrisburgh, Pa.

Machine Forged Horse Shoe Nails.

A correspondent of the *Commercial Bulletin* has paid a visit to S. S. Putnam & Co.'s nail works, at Dorchester, Mass., which he describes as follows:

Here was a busy scene, and the utmost life and activity prevailed in every department. Between 180 and 200 hands are employed on all the different kinds of work, and more than 1,000 tuns of horse shoe nails are annually made in this factory, from the best Norway and Swedish iron, which are sold all throughout the country. The business was established in 1835. The nail factory is 260x60 feet, of both stone and brick, and the machine shop is 100x50 feet. Two steam engines, one 200 horse and the other 20 horse power, propel the machinery, three Harrison boilers are kept in constant use, and the continual clang of 100 nail machines is sufficient to almost deafen the inexperienced visitor. The monthly pay roll reaches between $8,000 and $10,000. The men work "by the pound," and earn from $2 to $5 per day.

Horse nails, from time immemorial, have been made by hand, forged out on the anvil by blacksmiths. In many parts of Europe, whole villages are devoted to this branch of business. The bundle of iron rods is secured by the head of the family, who takes it to his home; and, with the assistance of his wife and children, it is made into horse nails, and the product returned to the capitalist, generally at a depreciation of 25 per cent for waste. For many years these nails found a ready market in this country, under various brands or marks, like "G" or "A" horse nails, as they could be imported at a less cost than our own blacksmiths could make them. Of late years, however, much attention and capital has been devoted to their manufacture by machinery, and Yankee ingenuity has devised various methods to produce a nail equally as good as those made by hand.

Machines have been made, from time to time, to cut the nail from sheets or plates of iron, either hot or cold, but it has been found impossible to produce a nail so compact, firm, tough and strong, as can be made by hammering out on the anvil, whereby the grain of the iron is compacted, refined, and made more ductile and tenacious; although many nails of the former description have come into general use. Some few years since, Mr. S. S. Putnam, of Neponset, conceived the idea of forging horse nails by machinery from the red hot rod, and devoted much time and money to perfecting a machine which would make a nail equal, if not superior, to those made by hand. This invention has proved a success; prejudice and difficulties have been overcome, and nails made by this machine are now in general use all over the country.

Fight between a Cobra and a Mongoose.

The snake was a large cobra, 4 ft. 10½ inches in length, the most formidable cobra I have seen. He was turned into an enclosed outer room, or verandah, about 20 ft. by 12 ft, and at once coiled himself up, with head erect, about ten or twelve inches from the ground, and began to hiss loudly. The mongoose was a small one of its kind, very tame and quiet, but exceedingly active.

When the mongoose was put into the rectangle, it seemed scarcely to notice the cobra; but the latter, on the contrary, appeared at once to recognize its enemy. It became excited, and no longer seemed to pay any attention to the bystanders, but kept constantly looking at the mongoose. The mongoose began to go round and round the enclosure, occasionally venturing up to the cobra, apparently quite unconcerned.

Some eggs being laid on the ground, it rolled them near the cobra, and began to suck them. Occasionally it left the eggs, and went up to the cobra, within an inch of its neck, as the latter reared up; but when the cobra struck out, the mongoose was away with extraordinary activity.

At length, the mongoose began to bite the cobra's tail, and it looked as if the fight would commence in earnest. Neither, however, seemed anxious for close quarters, so the enclosure was narrowed.

The mongoose then began to give the cobra some very severe bites; but the cobra, after some fencing, forced the mongoose into a corner, and struck it with full strength on the upper part of the hind leg. We were sorry for the mongoose, as but for the enclosure it would have escaped. It was clear that, on open ground, the cobra could not have bitten it at all; while it was the policy of the mongoose to exhaust the cobra before making a close attack. The bite of the cobra evidently caused the mongoose great pain, for it repeatedly stretched out its leg, and shook it, as if painful, for some minutes. The cobra seemed exhausted by its efforts.

The natives said that the mongoose went to the jungle to eat some leaves to cure itself. We did not wish to prevent it, and we expected it would die, as it was severely bitten.

In the evening, some hours after the fight, it returned, apparently quite well, and is now as well as ever. It follows either that the bite of a cobra is not fatal to a mongoose, or that a mongoose manages somehow to cure itself. I am not disposed to put aside altogether what so many intelligent natives positively assert.

This fight shows, at any rate, how these active little animals manage to kill poisonous snakes. On open ground a snake cannot strike them, whereas they can bite the body and tail of a snake, and wear it out before coming to close quarters. This mongoose did not seem to fear the cobra at all; whereas the cobra was evidently in great fear from the moment it saw the mongoose.—*R. Reid, in Nature.*

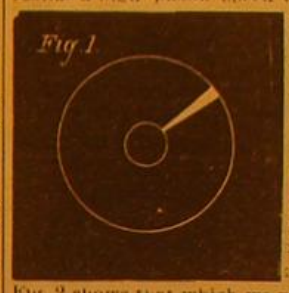
ROTARY ENGINES.

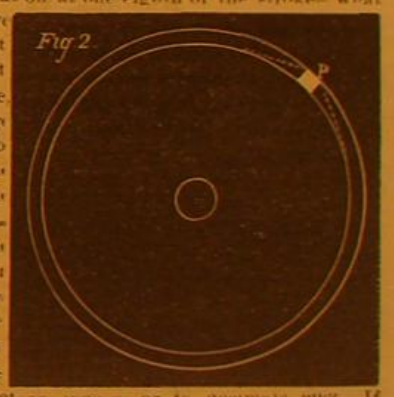
Rotative engines are those in which the energy of the steam produces the continuous rotation of a shaft through the medium of a crank and reciprocating piston. Rotary engines are those in which the continuous rotation of a shaft is caused by the action of steam on a piston or its equivalent continuously rotating within an annulus or steam tight casing. Reaction and impact engines—an example of the latter is furnished by Schiele's steam fan—are also sometimes classed as rotary engines. The rotary engine is a very old invention. One was designed, for example, by James Watt. The records of the Patent Office show that at least 200 separate schemes, for producing motion by the direct action of steam on a piston, have been patented at one time or another. We have no intention of describing any one of these engines, but we may refer such of our readers as are interested in the subject, to a very able and exhaustive review of the best of such inventions, which recently appeared in the shape of a series of papers in a French technical publication, "*La Propagation Indnstrielle.*" The object we have at present in view is simply to explain the principles which should guide inventors who direct their attention to the production of efficient rotary engines, and to point out the true nature of the advantages which would attend the use of such machines if perfectly successful.

There are very few treatises on the steam engine in existence which do not contain an allusion to rotary engines, but the writers, one and all, take particular pains to warn inventors that nothing would be gained by the substitution of rotary for reciprocating rotative engines. This statement is perfectly true in one sense, but it is not wholly true. There is, practically, no loss of power as a consequence of reciprocation alone in the normal steam engine; and it is quite certain that no economical advantages would, within well defined limits, attend the use of rotary engines. But it can easily be demonstrated, on the other hand, that advantages could be derived from the use of a good rotary engine which would well repay the trouble, expense, and skill required to make it. The great point in favor of the rotary engine is that it will permit large measures of expansion to be used to the utmost possible advantage, simply because it places at our disposal a piston speed without any parallel in existing engines. This will become more apparent as we proceed. Strangely enough, it is a point which has hitherto been overlooked by all inventors.

To enter on a long exposition of the defects which exist in all the usual designs for rotary engines would only prove tedious; we therefore propose to explain here the principal features of a theoretically perfect engine, and to point out the difficulties which present themselves when we attempt to reduce this theory to practice. It remains to be seen whether the admirable workmanship of the present day will enable these difficulties to be overcome.

The principal feature in all rotary engines hitherto proposed consists of a piston or its equivalent rotating in a case, the piston being of a length equal or nearly equal to the radius of the circle which it describes in its revolution. The edges of this piston must be packed in some way to keep them tight. There are three edges to be packed; the fourth is made up by the shaft. But a moment's reflection is required to show that the nearer any portion of the packing is to the center the less rapid will be its wear. The consequence is that the packing nearest the edge suffers more than that nearest the shaft, and leakage very quickly ensues. Again, the piston area in such engines is very considerable. The center of effort is not far from the shaft, and any attempt to realize a high piston speed would entail a rapidity of rotation which is inimical to the successful action of the abutment valve or its equivalent. A theoretically perfect rotary engine must have a very small piston, and the center of effort must be located as far as possible from the shaft. The two accompanying diagrams will make our meaning clear. Fig. 1 shows the old form of rotary engine; Fig. 2 shows that which we propose as being in theory infinitely superior. Let us suppose that the diameter of the outer ring in Fig. 2 is 10 feet, the diameter of the inner ring 9 feet 4 inches. The piston, P, will then be 4 inches deep, and let us further suppose that it is 2 feet wide, with semicircular ends. The area of such a piston will be in round numbers 86 square inches. Let us suppose that steam of 100 lb. pressure is cut off at one eighth of the stroke—what a stroke means we shall explain presently—and that, deducting back pressure, the effective average pressure is 30 lb. Then we have for the whole pressure on the piston 86 × 30 = 2,580 lb. Now, the circumference of a circle 9 feet 8 inches diameter—that described by the center of effort of the piston—measures 29 feet or inches, or in decimals 29·3. If our engine makes sixty revolutions per minute, we shall have a piston speed of not less than 1,758 feet per minute, and





$$\frac{1758 \times 2580}{33000} = 137 \text{ H. P.}$$

Thus we have an engine occupying a little more space than the fly wheel alone of an ordinary 10 horse engine, which may nevertheless give out 140 indicated horse power with ease. Into questions connected with the arrangements required for packing such an engine and keeping the joints tight, we shall not now enter. We are dealing at present with principles, not with details. We shall, instead, proceed to examine a most important feature, namely, the means to be adopted in providing an abutment for the steam. In very many rotary engines of the old type, a simple flat-sided sliding valve is used as an abutment, and the consequence is a great loss of useful effort. Move this valve as quickly as we will, it is simply impossible to get it out of the way of the advancing piston and into position again behind the piston without leaving a very considerable space between the two. Even if we suppose the sliding abutment to have the same velocity as the piston, we find that it cannot, in such an engine as we have described, be completely closed until the piston has moved 4 inches away from it. This 4 inches represents clearance, and all clearance is waste in a rotary engine, because, unlike the reciprocating engine, there is in all rotary engines hitherto designed no compression. It is obvious that the abutment should not be withdrawn till the last moment, and that it should be replaced as quickly as possible. Suppose that the withdrawal and replacement are effected while the piston—including its own length—has moved over 2 feet; then as the piston is moving at the rate of, in round numbers, 30 feet per second, only the fifteenth part of a second will elapse while it is running over two feet; and it follows that a heavy mass of metal must be jerked out, brought to a dead stop, suffered to pause while the thickness of the piston is passing, and jerked in again through a distance of about 5 inches in the fifteenth part of one second, and this operation is to be repeated every second. We have no hesitation in saying that this is practically impossible.

But it is not impossible to contrive a form of abutment which shall be either a sliding valve or its equivalent, and

yet comply with the required conditions: and it is to scheming such an abutment that inventors of rotary engines should direct attention. We may throw out the hint that, by prolonging the piston backwards and forwards, and sloping it off as shown by the dotted lines in Fig. 2, much of the clearance may be saved, and a modification of the form of the valve or abutment may also be adopted to produce like results; but in a succeeding article we shall consider this point more at length. The ordinary remedy is to provide two abutment valves, one remaining closed during half a revolution, while the other is opening and closing again; but a moment's reflection will show that this plan is only applicable to engines working absolutely without expansion, and would entail enormous waste in engines in which steam was cut off much before the end of the stroke, a stroke being represented by the travel of the piston from abutment to abutment.—*Engineer.*

Process of Germination.

An eminent writer upon the subject, in speaking of the action of the sun in this great work of germination, remarks:

"Upon the chemical influence of the sun's rays depends the germination of seeds as well as the growth of the plants. We bury the seed in the ground and shut it out from the influence of light, but we do not place it beyond the reach of the sun's actinic influence, for that penetrates like heat to the little earthy couch where the embryo plant lies hid, and arouses it into life. Light, or the luminiferous rays of the sun, so important to the well being of the plant, is actually inimical to the excitation of vitality in the seed. How singular is this fact! A series of carefully conducted experiments has proved that seeds will not germinate in light, although supplied with heat and moisture, when the actinic rays are cut off. Deprived of the luminous rays with the actinic in full force, they spring into life with great rapidity. Seeds sown upon the surface of the earth will scarcely germinate, as soil cultivators very well know, and, on the other hand, seeds buried so deep that the actinic rays cannot reach them will certainly perish. The planting of seeds, so as to secure the proper distance below the surface, is a most important point in husbandry, as it has much to do with the early starting of the plant and the success of the crops."

Correspondence.

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

The Wonderful Curiosity---The Flexible Marble of Wheeling, Va.

To the Editor of the Scientific American:

My attention has been called to a "Wonderful Curiosity" in your issue of the 17th inst., and I deem it not improper to give you some facts which may not have been in your possession at the time you penned your comments on the *Intelligencer's* article. I am the owner of the curiosity, and know what I say when I assure you that it is a common slab, of the dimensions named, from the Portland quarries, Vermont. It was purchased at one of the marble cutting establishments of this city, like hundreds of similar specimens of the same mineral, from the same quarry, which are kept constantly on hand by all our marble cutters. It was originally sawn for tombstone purposes, and its flexibility was not discovered until after its removal from the *débris* of the burnt college edifice at Moundsville. In proof that it is marble, and not itacolumite as you have supposed, I hand you herewith, from the Pittsburgh *Dispatch*, February 8th, an analysis of the specimen, made by Professor George Hay, Q S, Professor of Chemistry in the Western University of Pennsylvania. With the value of his opinion, you are no doubt entirely familiar. J. A. HOLLIDAY.

Wheeling, West Va., Feb. 20, 1872.

ANALYTICAL LABORATORY, 25 Diamond Square,
ALLEGHENY, Pa., February 7, 1872.

J. HOLLIDAY, Esq—Dear Sir: I have, at your request, carefully analyzed a portion of the flexible marble slab, now in your possession and on view at 22 Fifth avenue, Pittsburgh. Its constitution is as follows:

Carbonate of Lime	97·50
Magnesia, a trace	
Silica	2·05
Water	·45
Total	100·00

The above composition and its crystalline character together proclaim it to be a true marble, and, at the same time, a pretty pure specimen of that mineral. The indubitable flexibility of the slab is its most remarkable feature. Dana states that "some of the West Stockbridge marble is flexible in thin pieces when first taken out." The slab in the possession of Mr. Holliday is about two inches thick, and is nearly as flexible as an equal thickness of vulcanized india rubber. I shall not attempt to explain the flexibility of this extraordinary slab. It may be due to a species of ball and socket movement among the minute crystals which compose the mineral, or it may be due to molecular motion alone; I cannot tell. Certain it is, however, that the slab consists of marble, nowise different in chemical constitution from ordinary marble, and possesses an unusual degree of flexibility for marble which has been so long out of the quarry. Those who are interested in what is curious or strange in Nature should go and see this remarkable slab. I am, &c.,

GEORGE HAY, Q. S.,
Professor of Chemistry in the Western University of Pennsylvania.

The Models at the Patent Office.

To the Editor of the Scientific American:

In your issue of February 10th, you ask: "What shall be done with the models at the Patent Office?" No one but an inventor can appreciate the advantage of a fair opportunity to examine models of other inventions in his line.

To be obliged to depend upon drawings alone would add to his labor an hundred fold. As it is, he can find and examine everything of interest to him. He does not expect or wish to go over the whole collection, any more than he would wish to examine every book in a library of reference; but, being directed by courteous assistants, he can spend hours or days in the pursuit of the knowledge he desires, and save himself months of thought and labor on some invention which has perhaps long been patented unknown to him. In answer to your question, I say: Preserve them; erect new buildings as often as necessary. Invention and discovery are the life of America. Let nothing be done to impede them or make them more difficult. B.

Models at the Patent Office.

To the Editor of the Scientific American:

I am heartily glad to see you come out squarely against the costly farce of requiring to be deposited models of every invention for which a patent is asked. To see that it is a farce, an inventor has but to go and examine his own specimens after only a few years. He will find them beautifully misrepresenting his invention, as I have done, broken, parts reversed, inverted, transposed and lost. They may have been useful, and even necessary, in the early days and at the origin of the patent system in this country. Those days are past. Good drawings are easily and cheaply obtained, and if, with good and profuse illustration in drawing, the examiner is incompetent to fully and completely comprehend a machine, his place should be filled with one better qualified. Drawings do not allow parts of machines illustrated to be lost, misplaced, transposed, or substituted. Drawings do not have to be unscrewed, unbolted, taken to pieces, chipped, filed, or oiled, to make them do their work of illustration. With drawings, the different movements do not have to be examined in rotation, but may be seen, compared, and comprehended at a glance. So also with the construction of internal parts. They are more portable, occupy incomparably less space, can be arranged in more systematic and convenient order, are more accessible, less liable to injury, and cost the inventor, in most cases, much less.

In short, I believe there can be no one sound argument used in favor of models, unless it be the (inexcusable) incapacity of examiners. INVENTOR, No. 2.

A New Building Material---Bricks of Slag.

To the Editor of the Scientific American:

To call bricks a new building material is perhaps hardly correct, when every child knows that brickmaking dates as far back as the Israelites in Egypt. But bricks, like everything else, have undergone various changes in form, material, and manufacture. Whether these changes have had a tendency to improve the Egyptian brick is a question not so readily answered. The bricks manufactured by the Egyptians were intended to last for ages, and in this respect they have certainly answered their purpose. With our modern brickmakers, it is different. The inferiority in modern bricks consists principally in the bricks being made of cheap material and badly or insufficiently burnt, and the consequence is that they will not withstand the wet or the hard frosts. This principle of manufacturing an article which is to last for a limited time only is far from being conducive either to safety, durability or comfort. It is precisely with the view of meeting these all-important considerations that the material now introduced to the public has been invented and patented.

Mr. J. J. Bodmer, of London, has discovered a new method of making bricks from a material hitherto treated as refuse only, and the removal of which had to be effected at considerable expense. This material is simply blast furnace slag.

A careful analysis of the slag of a blast furnace showed a great similarity with the well known puzzolana, and this fact suggested to the discoverer the idea of manufacturing a cement by incorporating the slag with a certain proportion of lime. The very first experiment succeeded, as far as the quality of the cement was concerned. It set somewhat more slowly than Portland cement, but it attained a similar degree of hardness, especially under water. The blast furnace slag, however, had proved to be so hard that it was quite evident the manufacture of the new cement could never pay unless an improved method could be adopted to deal with the slag. In watching the slag as it flows in a half liquid or viscous condition from the furnace, the idea occurred to the inventor: "Why should the slag be allowed to form lumps and get hard? Why not subdivide it in its viscous, plastic condition?" The difficulty of reducing the hard slag was thus solved. A pair of plain rollers were put under the spout of the furnace instead of the large tub, which was formerly used to receive the slag. Sufficient speed was given to the rollers to receive and take through the whole off flow issuing from the furnace; and by giving the rollers differential velocity, the slag fell from them in the shape of thin scales or flakes. These were found to crush as easily as sugar, and by grinding such slag, together with the proper proportion of lime, the cement was obtained at a mere nominal cost. This cement, in a proportion of 2 parts to 6 parts of sand, makes the finest bricks imaginable. At iron works, slag is again used in lieu of sand; it is rolled coarser and then mixed with the cement like sand, and the bricks obtained are as hard as flint and of a most pleasing color, being that of grey sandstone. The color can, however, be varied *ad libitum*, from a light to a very dark shade. Nor is the material adapted for the manufacture of bricks only, but may be used for blocks or ornaments of every description, as the cement itself may be used in the same manner as the Portland cement. For the purpose of manufacturing blocks and ornaments, a somewhat different *modus operandi* must be observed. If the attention of the owners of some of the large iron founderies of New York or Pennsylvania could be drawn to the subject of brick manufacture from slag, they would find that this hitherto useless material can be turned to profitable account, producing a brick which would prove both cheaper and harder than any other made. A conspicuous feature of these bricks is that they resist the action of the weather, and do not crumble away like most of the clay bricks, a defect from which even the brown stone is not exempt.

The idea of using slag as a building material is not altogether an original one. When the slag is allowed to form large masses, the inside of such blocks cools very gradually and thereby attains the hardness of rock. Such blocks are used, in iron manufacturing districts in England, for foundations, sea walls, &c.

A special feature, too, is the machinery used in the process of brickmaking. The cement and the sand or coarse slag are shovelled into their respective receivers or hoppers, and at the other end of the apparatus, the finished bricks rise to the table, from which they are wheeled away and piled up to set and harden in the open air. The manufacture of bricks from blast furnace slag is covered by letters patent taken through the Scientific American Patent Agency.

Messrs. Bodmer & Co., of Hammersmith, London, are now manufacturing these bricks, and would like to correspond with parties in the United States with a view of introducing the manufacture here. Should any of the American iron manufacturers be present at the great annual meeting of the Iron and Steel Institute in London, in March, 1872, they will have every opportunity to see the process in actual operation.

[The above communication is from a valued correspondent in London, describing a novelty in brick which was patented in this country, and which was briefly referred to in these columns at the time the patent was issued.—ED.

The Davenport Tricks Again.

To the Editor of the Scientific American:

Now that Messrs. Vander Weyde and Patton are about explaining the operations of the Davenport brothers, I hope they will make their explanations as brief, exhaustive, and comprehensive as possible, for the benefit of science. I was once one of a committee of three, chosen to investigate these performances. We proceeded in the following manner: First, we placed eight inverted glass tumblers upon the platform; upon these we set the legs of two light benches, and upon the benches we set up their cabinet, made of thin black walnut boards. We then with strong hemp cords made first two turns around one wrist of one of the brothers, and tied him with a strong square knot; and then tied the other in the same manner. We then pinioned their hands and arms firmly behind their backs, then ran the ends of the rope through holes in the seat, and drew their feet back and secured them firmly to the seat, winding the ropes around their legs and knees, and fastening with a strong square knot, leaving no slack rope anywhere. We also tied their heads back to the cabinet. We then made them open their hands, and placed in each a good teaspoonful of wheaten flour, taking great care that not a particle be dropped inside the cabinet; then, closing their hands, we sewed the ropes and knots through and through with strong linen thread. When thus secured, we placed a speaking trumpet, three or four bells, a violin and guitar in the cabinet, and closed the doors, hooking the two outside doors, the middle door being bolted inside instantly after closing. Immediately the instruments began to be played upon, all together; a hand and half of a naked arm were thrust out through a hole near the top of the middle door, swinging a bell for several seconds, and throwing it upon the floor. Then another hand and arm thrust out the speaking trumpet. This time I seized the hand near the wrist and did my best to hold on to it by pulling downward, but with a power greater than my own, it drew back into the cabinet with a loud grating noise as it rubbed on the edge of the board under the weight of my grasp. The hand was warm, but it left no marks of skin or blood upon the sharp edges of the opening. Immediately after, a head and neck rose through another opening in the top of the cabinet and was plainly visible for several seconds to all the audience. After these things had been going on some time, the doors were thrown open, and we made an examination of things within, but we could discover no change in the tieing of the brothers, the flour still being in their hands as we left it, and no marks of it upon anything in the cabinet. We then proceeded to close the doors a second time; one other of the committee closed the door at the right. While I was fastening the door at the left of the cabinet, a hand struck me with great force upon the left shoulder; I instantly turned to see who did it, and the hand appeared to vanish over the shoulder of one of the brothers. The hand was seen and the force of the blow plainly heard all over the hall; we threw open the doors, but no change could be found in the condition of our ropes or prisoners. We then closed the doors again, and, inside of four minutes, they were thrown open and the brothers stepped out, still holding the flour in their hands undisturbed, the ropes lying upon the floor of the cabinet, but their marks deep in the wrists of our "no longer prisoners."

These things were performed in the presence of at least 250 witnesses in New Haven, Conn. Now, Dr. Vander Weyde says he has performed certain tricks repeatedly and "done everything the Davenports did," etc. If he will come to New Haven and perform everything the Davenports did, under like conditions, and give us a satisfactory scientific explanation of the *methodus operandi*, as he calls it, I stand ready to hire a hall and pay all expenses, and pay him well for his trouble, for the benefit of science.

New Haven, Conn. GEO. T. CALDWELL.

Borax in Nevada.

To the Editor of the Scientific American:

Some years ago Professor Silliman traveled through this section of country, and made an analysis of the many different minerals found in Nevada, and also made a report of the same.

William Troop, of California, got hold of some of his reports, and learned by them that the Professor had discovered a saline marsh, near the Carson river, of some 2,000 acres, which contained traces of borax. He at once prospected, but met with little success, and the marsh lay unclaimed and unnoticed until last May, when Mr. Troop and others located according to law. Since that time I have become interested in the affair, and put up small works and manufactured five tuns of borax and placed the same upon the market. The article is merchantable, and has a ready sale; and the demand is increasing.

Our crude material has an incrustation upon the surface, and is called borate of soda. From what little knowledge of chemistry I have, I believe it contains boracic acid, soda, salt, magnesia, and ammonia, but may be mistaken as to the last named.

In looking through the SCIENTIFIC AMERICAN for 1869, on page 202, I find some interesting information entitled "Ammonia and its uses in the arts." That article states that the most recent supply is from the boracic acid works in Italy, and that they had until recently lost a million of pounds of salts of ammonia during a year.

I have been paid double the price of the SCIENTIFIC AMERICAN, almost monthly for the last five years, by reading the many communications on different subjects; and I am desirous of knowing the best method for manufacturing borax from borate of soda; the best method of separating an excess of soda from the borax in concentrating; how to separate magnesia from borax, and also the best method of manufacturing ammonia.

If some of your readers will give me a description of the works at the Tuscan lagoon in Italy, and the manner of working, and the kind of material worked there, they would confer a great favor upon me and many others.

I am informed that these are the greatest borax works in the world.

J. V. LEWIS.

Nevada, Jan. 17, 1872.

Technical and Classical Education.

To the Editor of the Scientific American:

In looking over the SCIENTIFIC AMERICAN for the past year, I notice a prevailing tendency towards technical education. I am glad that this is so; but while we consider the value of a technical education, classical studies should not be neglected. To be successful in any calling, a man must have a well balanced mind; and a mind certainly cannot be well balanced which has continually run in one channel. It may be good in certain points, but problems are continually coming up, in the course of a man's life, which require other faculties of the mind than those which a technical education is likely to develope. To educate the other faculties of the mind will not require a very deep insight into classical learning; but a little cannot injure any one in his scientific attainments, and will undoubtedly add to his general culture.

The above is not intended to decry technical education in the least. But at this time it has so many able advocates that we may be in danger of running into extremes on this subject, and to neglect classical education entirely.

PRINCETON, N. J. M.

Shaving with Pumice Stone.

To the Editor of the Scientific American:

I see by your No. 4 that nothing useful is so small as to escape your vigilant attention. I allude to instructions for easy shaving. This leads me to say that shaving with an expensive tool like a razor is all nonsense. The proper way to keep down the human stubble is to get two pieces of of pumice stone, cubes of one and a half inches. Keep them clean by rubbing their faces together; then rub them over your own face, that is all; no soap, no brush, no razor costing originally $1·50, and giving the seller a regular annual income of at least fifty cents in sharpening, no Emerson's patent strap required, no looking glass, no hot water. In traveling you have only to sit still and move the cube around; the shaking of the car, carriage, horse, donkey, or boat will do the work clean.

The moral effect of pumice stone can be imagined when you think of the statistics on suicides by razors, the vituperations of irascible men with hard beards when their razors do not cut smoothly, or when they shave with bad water, bad soap, or by a bad light.

Many other considerations for giving up the razor might be named, if time and space would permit; but I must content myself on giving you this hint on domestic and, I may say also, political economy.

* * *

Watch Cleaning.

A correspondent says: "To clean a watch, even if it be of the lowest grade, the barrel or mainspring box should always be taken apart, the arbor and spring taken out and cleaned, fresh oil being applied before the cover is replaced. That there is nothing better than naphtha for cleaning purposes, is the opinion of most watchmakers. If the watch has a fusee, that also should undergo the same treatment as the mainspring box. The pivots also form an important part of the mechanism of a watch; and, to be examined as they always should be, necessitate the act of taking the watch apart. Such attention, no honest practitioners will overlook."

THE population of London, by last year's census, is 3,883,092.

[For the Scientific American.]

MIDDLE PARK, COLORADO.

Colorado is the apex of the United States; within her borders is the culminating point of the Rocky Mountains. Here are those huge vertebræ of the continental back bone, whose cloud-piercing, cloud-compelling summits collect the snow and distil the water to form those mighty rivers—the Platte, the Arkansas and the Colorado—which, flowing to the two oceans, begin their journey in the eternal snows of the dividing range. Beyond the boundary of Colorado the mountains become less abrupt, lose one third of their altitude, and, stooping as it were, form a passage for the iron pathway of the nations.

The main range in Colorado is flexed and doubled upon itself like a huge anaconda; within one of these immense folds lies Middle Park.

It is a region but little known outside of Colorado. There are several reasons, mostly negative, that will account for the meagerness of our knowledge of this gem of American mountain scenery. The principal reason is that the precious metals have never been found here in paying quantities. How little would be known to-day of the greater portion of our western Territories, but for the presence within their borders of gold and silver, those powerful lodestones of humanity!

Middle Park lies on the western or Pacific side of the great continental divide, and is about sixty miles long from north to south by twenty-five miles in breadth, with an area about equal to that of Rhode Island.

An immense wall of granite, porphyry and queissoid rocks bounds the Park on every side, rising from 3,000 to 7,000 feet above the surface: Long's Peak, with its 14,000 feet of altitude, forming the north-east corner stone. The altitude of the park proper is from 6,000 to 8,000 feet above the sea. Middle Park is drained by Grand river and its tributaries; the Grand rises near the base of Long's Peak, and, flowing diagonally through the park, passes out at the south-west corner.

This river is one of the principal branches of the Colorado, and its waters, after flowing through the three hundred mile cañon of that stream, finally reach the Pacific by way of the Gulf of California.

The surface of Middle Park is, for the most part, rough and hilly, the hills frequently becoming mountainlike in their proportions.

Some of the streams are bordered by broad, level savannas, covered with a dense growth of sage brush. This tough, aromatic plant grows here from one and a half to two feet high, and is very abundant in most of the Territories west of the Rocky Mountains; but no true sage brush has ever been found east of the main range. The spherical cactus or, more scientifically, *cactus mammilacis* grows in the more arid portions of the park. There is but little timber in the park proper, and that is generally confined to the summits of the higher hills; the foot hills of the mountains, however, are covered with forests of pine. Grass is abundant and so nutritious that cattle and horses require no other food, summer or winter. The climate in summer is pleasant and exhilarating, though there is more or less frost every month in the year.

In nearly the lowest part of the park, your correspondent noted a temperature of 22° Fahr. at 6 A. M. August 28, and for a week the temperature at this hour averaged as low as the freezing point.

One thing to be said in favor of this climate, however, is that frost has not the same blighting effect upon vegetation in this rare, dry atmosphere that it would have in the damp, dense atmosphere of the States. It is a well attested fact, improbable as it may seem, that flowers and even strawberries will mature, in the open air, in this elevated region where there is frost every week in the year. The annual snow fall is from 12 to 15 feet, commencing in September and ending in May.

The fauna of Middle Park include deer, coyotes, trout, mountain hares, beavers and Indians; the latter are rather scarce in summer, but infest the park in considerable numbers during the winter. Trout are the principal fish found in the lakes and streams. Beavers are abundant, and their dams may be found on most of the smaller streams. On one stream there are fifty or more beaver dams within a mile, a regular beaver city.

Near the head of Grand river, just within the foot hills of the mountains, lies Grand lake, a beautiful sheet of water, of small area and great depth; though not more than two miles long, a sounding line of five hundred feet failed to reach bottom. It is set as a mirror in a framework of mountains, which rise abruptly from the water's edge. The altitude of the lake, as determined by the temperature of boiling water, is 7,551 feet above the sea.

Grand river forms at once its inlet and outlet. Up through the cañon, where the river comes tumbling down, are several smaller lakes; and higher still is Estes Park, a wee bit of a park on the verge of timber line, wearing its mantle of green grass and beautiful Alpine flowers 11,000 feet above the sea and in close proximity to the eternal drifts.

The hills along all of the larger streams are terraced. There are generally three terraces, very distinct and regular, rising steplike to a hight of two hundred or three hundred feet.

The geology of the park is unique, and forms one of its most interesting features. All the formations known in America, from the azoic to the later tertiary, are represented here. It is a well established principle of geological science that, generally speaking, the highest mountains are the youngest, and *vice versâ*. Thus the Adirondacks of New York are the oldest and the Rocky Mountains are the youngest mountains in the United States; while the Green Mountains and the Appalachians occupy intermediate positions in point of time.

At the close of the cretaceous age only a few isolated ridges of azoic rocks appeared above the waste of waters of the great interior sea, and the elevation of the Rocky Mountains was just beginning. But early in the tertiary age communication with the exterior ocean was cut off, never to be resumed; and fresh or brackish water lakes took the place of the previous interior sea. Middle Park probably formed the bed of such a lake.

The great thickness of tertiary rocks over the Rocky Mountain region proves that this lacustrine condition continued for a long time. The stratified rocks of Middle Peak form an immense quaquaversal; this is the natural result of the elevation of the mountains after the deposition of the strata.

Tertiary rocks are found high up on the flanks of the mountains, above timber line and 12,000 feet or more above the sea; this shows conclusively that the Rocky Mountains received most of their present altitude after the beginning of the tertiary age.

The tertiary beds are composed of soft, light colored sandstones and marls, alternating with conglomerates and some laminated, argillaceous beds.

The absence of limestone and marine fossils from this formation is evidence that the water in which the beds were deposited was fresh or nearly so.

Fossil wood is abundant in the rocks of this age; fossil palm trees are recognized by their characteristic endogenous structure, but most of the trees were exogens. In the argillaceous beds mentioned above are many impressions of fossil leaves. A species of magnolia has been identified.

The presence of the remains of these tropical plants in this semi-arctic region is some indication of the great climatic changes that have taken place over the surface of the globe, within quite recent time, geologically speaking.

In the valley of the Blue river, the cretaceous beds have an immense development, and they follow this stream nearly to its source, running high up on the mountains, where the beds have been broken and faulted on a grand scale. Marls and shales are the predominating rocks. In the shale I found *boculites* (cephalopod molluscs) and *inoceramus* (a species of *conchifer*), fossils characteristic of this age.

The carboniferous beds of Middle Park contain the only true carboniferous coal in Colorado.

During the closing epochs of the tertiary age, there was a stormy time, strongly marked in the rocks of this era; fire and water united to leave an indelible impress upon the land.

In Middle Park, there were extensive eruptions and overflows of igneous rocks—basalt and lava—forming a number of well defined *mesas*, whose frowning battlements form an interesting feature in the topography of the park. The most remarkable of these eruptions occurs fifteen miles below Grand lake. Grand river cañons here (making a verb of the noun). The cañon is an enormous gorge cut through a high ridge of basaltic rocks. The ridge is from 800 to 1,200 feet high, and seems to be an intrusive bed, for it is conformable to the sedimentary beds above and below.

The underlying cretaceous shales were converted into slate by the metamorphic action of the fiery mass.

The hot sulphur springs still bear witness to this geological storm. They are situated near the center of the park on the west bank of Grand river, and form the chief attraction of the park at present.

The water issues, from the ground, strongly impregnated with sulphuretted hydrogen, and flows into a capacious basin, of its own handiwork, which forms an excellent tub.

The volume of water is about twenty-five inches, an inch being the amount of water that will flow through an orifice one inch square under six inches head. The temperature of the water is 112° Fahr., which indicates that it comes from a considerable depth, and an analysis of it would probably afford some clue to the mineralogical character of the rocks for a long distance below the surface.

The monumental rocks in the valley of Troublesome Creek are interesting examples of the erosive action of water and frost. During the lapse of ages, the original sandstone beds have been worn down and cut out by the degrading elements, leaving these strange, weird monuments to be the wonder of the world.

Near the mouth of Troublesome Creek is a rectangular hill, about 200 feet high, composed of light colored marl and sandstone; the sides are nearly perpendicular and have been so fashioned by the elements that the whole resembles a huge castle. The resemblance is quite complete; towers, abutments, massive gateways, all are here. When seen by moonlight or in the early morn, the effect is enchanting.

The quantity of agates, jasper, chalcedony and silicified wood in Middle Park is sufficient to supply the world. Agate and chalcedony are found in the volcanic rocks, and were formed by the deposition of silica in the vesicles of the lava; the subsequent disintegration of the lava leaves the minerals free. There are thousands of acres in these agate patches. Much of the agate contains that dendritic formation of the oxides of manganese and iron, supposed by some persons to be petrified moss, which gives it the name of moss agate.

The Park is much visited by Coloradoans during the summer, but the permanent white population is small, including only a few hunters and trappers who spend the winters in the vicinity of the springs and Grand Lake. The Indians still claim the Park, and are jealous of all attempts of the pale faces to make permanent settlements.

W. O. C.

Improved Gas Burner.

Having ourselves experimented with one of these gas burners, we are in a position to speak from knowledge of its merits. We regard it as one of the best, if not the best ever employed for burning gas. Professor Henry Wurtz, editor of the *American Gas Light Journal*, states that "on the evening of June 13, 1870, in the photometric room of the Metropolitan Gas Light Co., at their 42d street station, in company with Mr. Dietrich, the engineer of said company, he made comparative tests of burners of Mr. Cremin's pattern in comparison with an ordinary three feet fish tail. The general result was that, the pressure being one inch, and the consumption of gas being 3½ feet per hour, the ordinary burner indicated an illuminating power equal to seven candles, while the Champion Gas Burner of Mr. Cremin went up as high as 11·5 candles; thus indicating, according to the experiment, a clear gain, by the employment of his peculiar principle, of over sixty-four per cent of the light from the same materials."

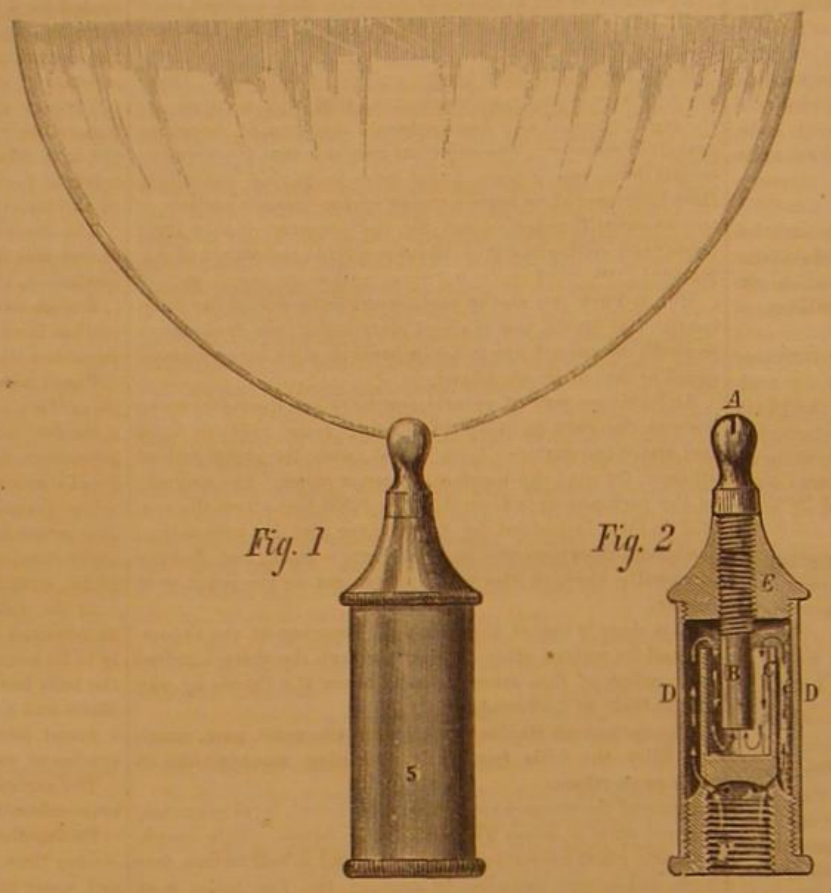
This testimony, from one of the most reliable authorities on gas lighting in this country, is sufficient to establish the reputation of this burner, which is, we are told, being rapidly adopted by such as are cognizant of its economy and value.

Our engravings give a view of the flame of a five feet burner, full size, and drawn, as it actually appeared, by our artist, and also a section showing the construction of the burner.

The general principle is the heating of the gas before it is delivered to the air for burning, whereby the gas is expanded, and a higher illuminating power secured with a given flow as measured by the meter.

In the engraving, Fig. 2, A is the burner proper, from which descends a tube, B, into a tube or cup, C. This cup is closed by a diaphragm passing across it just above the screw thread, at F, by which it is attached to the delivery pipe. Small holes perforated in the part, F, allow the gas to flow out into the annular space between the cup and the outer shell, D, and its flow, indicated by arrows, is thence upward within the outer shell, down into the cup, and up to the burner proper through the tube, B. The tube, B, conducts heat downward into the shell, and thus the gas is heated and expanded before reaching the point of combustion at A.

The invention was patented January 11, 1870, by Joseph W. Cremin, whom, for territorial rights or other purposes, address at 213 East 51st street, New York.



CREMIN'S GAS BURNER.

Cloth Measuring Machine.

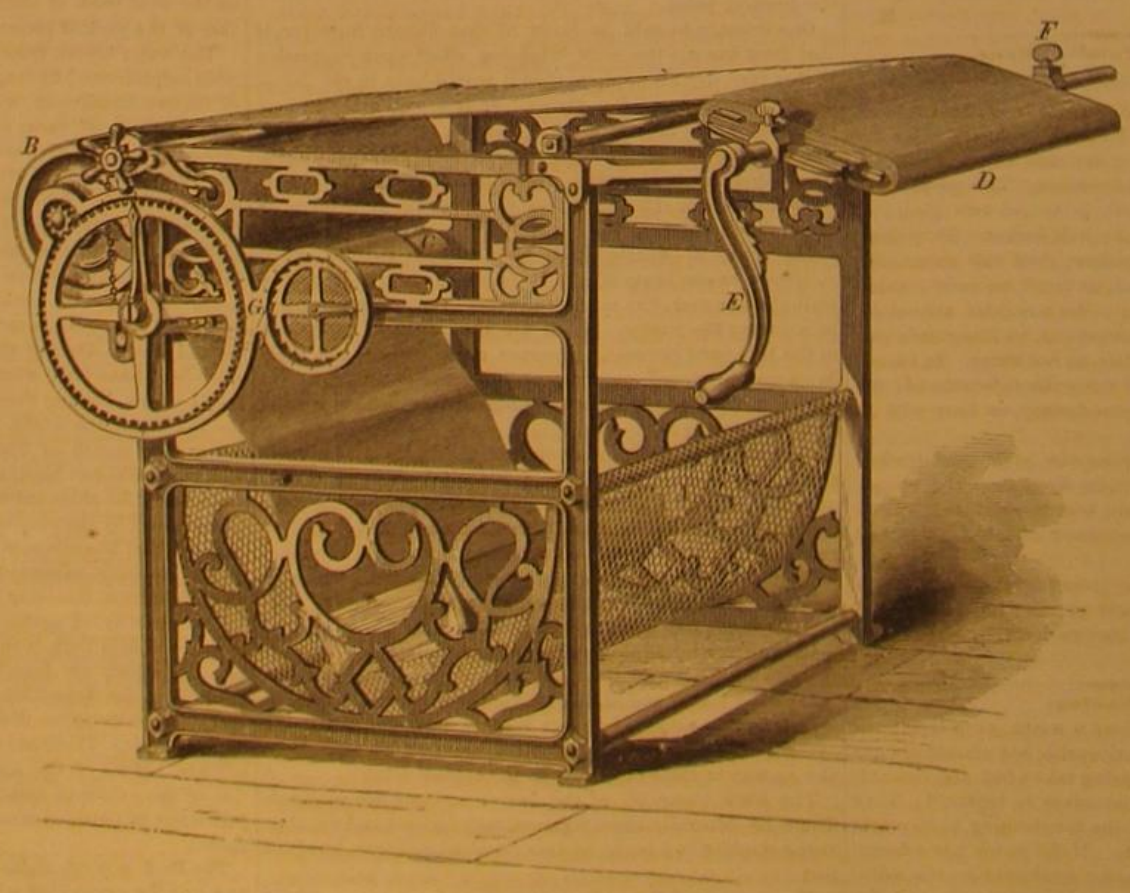
The measuring of cloth by the ordinary method is a tedious and laborious operation. The machine herewith illustrated is designed to replace manual labor and to render cloth measuring very much more rapid than has heretofore been the case. The invention is extremely simple, insures accuracy, and indicates correctly the quantity, while it may be operated readily by a boy.

The construction is as follows:

A is a hollow receptacle for the unmeasured goods; B is a measuring roller covered with cloth; C is a tension roller directly under the measuring roller. The cloth is passed between these two rollers and around the measuring roller, and then connected with the reel board, D, which is turned by the crank, E. The goods on the reel board, D, are quickly disengaged from the same by turning the screws, F, half round. The dials, G, indicate the exact measurement.

The machine will, it is claimed, unroll, measure, re-roll and correctly count every yard and fractional part of a yard with rapidity and exactness, fifty-two yards having been passed through the machine in one minute and a half, to do which, in the ordinary way, would require the work of six or eight men.

Patented June 25, 1871, by Isaac Miller, whom address for further information as to rights or machines, Hamilton, Ontario



MILLER'S CLOTH MEASURING MACHINE

The Science of War.

Captain Layman, Instructor in Tactics at the German Military School at Cassel, in a series of lectures before the students of that Institute, attributes the victories of the German armies to the efforts which their commanders ure to secure the offensive in war, and to keep the initiative of movements constantly in their own hands. This view is sustained by the results of the late Franco-Prussian war. The moral force of attack

Microscopic Observation of Hydrofluoric Acid on Glass.

When the acid was first dropped upon the glass, no action was evident, the appearance presented being simply that of a drop of water on glass. In a very short time, however, the drop became a little duller, but this almost immediately cleared away, and several small particles, seemingly of glass, were seen floating in the drop. These seemed to be undergoing a process of fusion, the appearance being similar to that seen when a small portion of metal is thrown into some of the same substance in a state of fusion—it is tossed about for some time and then finally disappears. This was what evidently appeared to me to be going on here, the hydrofluoric acid having apparently a solvent action on the glass. What strengthened this opinion was the presence of magnificent colors, changing every moment as these small portions of glass were liberated from the larger piece and were undergoing the process of solution, thus leading one to suppose they consisted of small glass prisms, the colors being more perfect than those obtained by water prisms simply. Some of these particles were completely surrounded by a halo of color, as if they had been thrown into a variegated solution. The principal color evident in such cases was a deep green but dark blue was also seen at rare intervals. The foregoing observations were repeated several times, and always with the same results, with the exception that the small particles of glass floating in the drop of acid exploded now and then, causing a great commotion in the liquid and throwing up little jets of finely divided acid, behaving as if the small glass particles were hollow spheres. I may also mention that when these explosions occurred, bright flashes of light were visible, resembling closely the appearance of rainbows seen in waterfalls.—*Microscopical Journal.*

Japan.

We are indebted to an esteemed correspondent for a copy of the Japan *Herald*, of December 9, 1871, printed at Yokohama, one of the treaty ports and a large commercial center. We find a number of curious items relating to Japanese affairs, of some of which we will give the substance:

The Government has taken possession of some extensive tea houses at Yedo, and converted them into a grand hotel for the accommodation of the princes of the empire, that once great and powerful class known as Damios. The hotel charges are as follows: First class guests per *diem*, lodging and three meals, 11 nomies, or 18¾ cents.

Six hundred houses were recently burned at Yedo, all of which had been erected on the district swept by the great conflagration of 1870. The latter burned over a district of five square miles.

Extensive gas works for the supply of Yokohama are now in process of erection. The company is of native formation, capital $150,000. The apparatus is supplied by Laidlaw & Son, Glasgow, Scotland.

The nursery gardens in the vicinity of Yedo are gay with blooming chrysanthemums which are cultivated with assiduous care. The Japanese, not content with potting and sticking them, support the large blooms in many instances by circular pieces of thin wood or cardboard, and, placing them under paper lighted conservatories, artistically dispose the plants in such a way as to represent men, women, and scenes in real life—effigies in various striking attitudes being completely covered with the growing blooms and foliage of these plants. Every year an illustrated sheet is issued by the Yedo nurserymen, showing the designs that have been adopted, there being a different one for each garden.

The Japanese Government, with the object of pushing on the civilization of the country and bringing it to as high a pitch in as brief a time as possible, are continuously engaging foreigners from abroad to enter their service. Without mentioning the American citizens who will presently arrive to fill various capacities, twenty-three French military instructors for the imperial army are engaged, and ten English instructors for the Japanese navy. Further, twelve beer brewers from Bavaria have been ordered, and a number of shoemakers (country unknown) will shortly arrive to teach the craft and mystery of boot making.

Building Blocks.

This invention relates to a new manner of forming brick for practical building purposes; and has for its object to facilitate their transportation and handling, and to increase the strength of walls erected from the same. The invention consists principally in forming blocks from a number of bricks, within molds or boxes, in such a fashion that they (the blocks) will form sections of walls with interlocking joints. For certain purposes—as, for example, in the formation of pillars, etc.—the blocks may be made without interlocking projections. Another advantage of thus forming the blocks preparatory to building is that ornamental bricks may be baked on the blocks by subjecting the same to heat.

This will permit the application of all—even the most artistic—kinds of ornaments to the faces of brick structures. Blocks thus formed, with or without ornaments, can, in building, be placed so as to project one beyond the face of another, thus relieving the tiresome monotony of the modern plain brick building fronts.

The inventor of this improvement is Mr. Andrew Derrom, of Paterson, N. J.

DISPATCHES from Teheran state that the famine in Persia is unabated. Many persons are dying daily.

Scientific American.

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PUBLICATION OF THE PATENTS.

Our readers will remember that the publication of the diagrams and abstracts of the patents, in the annual Patent Office reports, was discontinued by Congress some three years ago, much to the dissatisfaction and inconvenience of a large portion of the public. But there was good reason for the discontinuance. The printing entailed an immense cost upon the government, while large quantities of the books, given over as they were to members of Congress for free distribution, were thrown away and wasted, or gathered into the cellars of wrapping paper dealers.

After the discontinuance of the reports, the Commissioner of Patents began the weekly publication of the patent claims in a special pamphlet, which has proved of much value, and is in a measure a substitute for the annual reports. This weekly pamphlet has lately been styled the *Official Gazette*, and it is furnished to regular subscribers at $5 a year. To make the *Gazette* still more complete, the Commissioner of Patents now proposes to publish in it, weekly, the drawings, with abstracts, of all patents issued. For the information of members of Congress and to illustrate the proposed method of publication, the Commissioner has caused to be issued one number of the *Gazette* with abstracts of the specifications, claims, and drawings of the patents for one week, the drawings being photo-lithographed on a reduced scale. This number is now before us, and it is altogether the most concise, economical, practicable and valuable form of patent publication that has yet been produced at Washington. It reflects the highest credit upon the Commissioner of Patents, and we trust that Congress will promptly grant the necessary authority and means for its continued and regular issue.

The present number of the *Gazette* presents the abstracts, claims and drawings of 205 new patents, and they occupy 26 pages. All the drawings are perfectly clear, and yet so compact is the printing that a single volume of 1,600 pages would suffice to contain the drawings and abridgments of all the patents for an entire year, or about thirteen thousand in number. The last complete Patent Office report, that of 1868, consisted of four volumes, comprising over 3,500 pages, and in it were illustrated not quite thirteen thousand patents. To be sure, the pages were a little smaller than those of the *Gazette;* but the economy of space, of paper, and consequently of expense, is considerably in favor of Commissioner Leggett's present plan of printing.

We earnestly hope that Congress will authorize the proposed publication. Nothing contributes more directly to the growth and prosperity of our varied industries than the general circulation of intelligent descriptions and drawings of the latest improvements. All our artisans are interested in them; they stimulate thought, they encourage industrial progress.

Having thus signified our approval of the Commissioner's project, for we regard it as a step in the right direction, we will now suggest, to him and to Congress, some reasons for advancing a little further. Instead of giving only abstracts of the specifications, we ask the Government to *print the specifications in full.*

The Commissioner shows us, in his specimen, how readily the drawings may be reduced and printed, and how compactly the abstracts may be presented. We ask him now to compact the publication a little more, and print the specifications and drawings in full every week, thus placing them conveniently before the public.

The chief defect of our present patent system consists in its lack of provision for the full publication of existing patents *in a condensed, cheap and popular form, so that everybody may possess them.* This once accomplished, patents may be granted to every applicant, and the present cumbersome and defective system of Patent Office examinations, with all its delays, expenses, injustices, and unnecessary prosecutions, may be discarded. Instead of a small corps of official examiners, we should then have twenty thousand examiners, every applicant for a patent being his own examiner.

In no country in the world is there so much patent litigation, or so much time and money wasted in procuring, defending, and wrangling about patents as in the United States. The value and validity of a patent rests upon the clearness of its statements and its priority over other patents. But when these other patents are unknown or difficult of access by the people, as are our patents, quarrels and confusion are the natural result.

It may be laid down as an axiom in regard to patents that, where the full specifications and drawings are easily accessible to the public, there will be little or no patent litigation.

In England, the drawings and specifications of all patents are printed in full and are, to a considerable extent, accessible to the public. The practical result is that England is almost exempt from patent litigation, although patents are granted to almost every person who chooses to file an application.

The evidence recently presented to Parliament shows that in all England the average number of patent cases in which proceedings are commenced before the courts is *only eighteen cases per annum!*

To say nothing of our courts, there is more trouble and litigation over patent cases before our Patent Office in one month, than there is in all the courts of England in an entire year! It is true that five times as many patents are granted here; but the excess of American litigation is out of all proportion to the augmentation of patents. We apply the term litigation to all contested patent cases.

The remedy is simple. 1. *Print the patents in full, at the cheapest rates, so that everybody may possess them.* 2. Grant patents to every applicant who presents proper papers. 3. Dispense with models, official examinations, rejections, appeals to Boards of Examiners, appeals to the Commissioner, appeals to the District courts, and all the other cumbersome machinery of the Patent Office which now burdens the inventor with expense and annoyance.

CONGRESS AND PATENT EXTENSION CASES.

As will be gathered from the letter of our special correspondent at Washington, published in another column, there is at the present time an unusual number of applications before the Committees on Patents in Congress for extensions of patents. The success of a few of the applicants, and the apparent facility with which those presented are reported upon by the Committees and passed by Congress, is giving encouragement to those disappointed in their efforts to obtain extensions before the Patent Office, and so increases the demands upon Congress for special legislation as to threaten to become a serious evil.

It has always been our opinion that Congress ought not to meddle with these cases, an opinion to which we have given the most clear and emphatic expression in these columns. We have never seen cause to change our views upon this subject, and we now repeat that the only proper action on the part of the National Legislature in regard to such applications is to authorize the Commissioner to take cognizance of and act upon applications which for valid reasons have not been presented during the time fixed by our patent laws. An application that the Commissioner has refused should never receive the sanction of the Committee on Patents, nor the time of Congress be used in discussing such claims. In the first place, that body has not the requisite knowledge, or time to obtain knowledge, on which to act intelligently. Second, the presentation of such applications is like those of claims, a great opportunity to the lobby, who will either enforce inventors to entrust these camp vultures with the prosecution of applications, or strive to defeat any favorable action. It is well known that the merit of a claim is seldom what passes it. We were once, when pressing the merits of a claim upon the mind of a distinguished member of the third house, interrupted by the bluff assurance that "bless your innocence, the merits make no manner of difference. Claims don't go through on their merits; but they do go through, and if you can spend money enough yours will go through, and not without." We would not spend money enough in this way, so our claim still stands unsatisfied.

It will not be long, if this sort of patent extension legislation continues, before it will become a matter of lobbying altogether, and it is not much better than that now. Occasionally the maladroitness of some blunderer gives the public a peep into the mysteries of lobbying. Some of our readers—not the oldest by any means—will recollect how one of these "too smart" manipulators, who pressed an application for the third extension of one of the most valuable patents ever granted, invited the lawgivers with their wives to a feast, and how beside each gentleman's plate was placed a handsome revolver mounted in the richest style, enveloped in a handsome case, and how beside each lady's plate was a box of the finest kids, and how, the fact being published abroad by the watch dogs of the press, the storm of protest thus evoked, through the lobby man's overdoing, made that gentleman's anticipated cake turn out the most underdone kind of dough. This thing was not done in a corner; that is probably the reason why it failed so signally in its desired effect, but it indicates the existence of the probabilities referred to. Skillful lobbyists understand more thoroughly the value of corners, both literal and figurative, than did the bungler who afforded the public an insight into the way things may be accomplished by demonstrating how not to do them.

The kind of action which we consider legitimate, namely the authorization of the Commissioner to act on applications after the legal time has expired, may be exercised with justice and equity, and it gives less rise to jobbery; but the reasons for such exceptions should be good, and if, as in some cases, the fault rests with the party, who has omitted, through simple carelessness, to apply, within the period limited by law, to the Patent Office tribunal for his extension then we contend the applicant has no right to the attention of Congress to remedy his own heedlessness. The passing of an act to extend a patent, after the application has been refused by the Commissioner on grounds deemed valid and derived from thorough investigation, seems an insult to the intelligence of that officer, and is a kind of special legislation which must inevitably lead to corruption and foster monopolies. We see no reason why Congress should not as soon give a patent to a man who has been refused a grant on an original application as to extend a patent to one who has not only enjoyed all the privileges pertaining to his original patent, but has in the opinion of the Commissioner, who has the opportunity to know, reaped an adequate, or more than an adequate, reward for his invention and the labor and expense of introducing it to the public. But this is not the worst of patent legislation; after an extension of seven years by the Patent Office, making the monopoly enjoyed by the patentee 21 years—the limit allowed under the patent law—the patentee, or more usually the manufacturer monopolist in the name of the patentee, goes to Congress and asks a further extension for the poor inventor! Not because he has not been amply rewarded, but because he has made so much out of the invention as to enable him to afford the large expense necessary to enforce his claim. Those persistent applicants are the ones most likely to succeed before Congress, and it is against legislation in such cases that we most specially protest. Instead of encouraging and fostering inventions and manufactures, such legislation discourages the poorer inventors and brings into disrepute our patent system.

DRYING SUBSTANCES BY STEAM.

There are three physical states in which water may exist above the temperature of 32° Fahr.: first, as liquid: second, as saturated steam; third, as superheated steam. When the word "steam" is used alone, saturated steam is what is meant. Saturated steam always contains, as we have shown in previous articles, a specific number of units of heat in each unit of weight, no matter of what temperature or pressure. Steam generated where heat is applied only to the water from which the steam is made is always saturated, because no heat can pass into the water without converting a portion into steam. When we speak, then, of saturated steam, or simply *steam*, it is to be understood that such steam as contains the normal amount of water specific to steam generated from water under ordinary atmospheric pressure is meant. The weight of saturated steam corresponding to a given number of heat units is always the same for any pressure or temperature at which steam can be generated. This, of course, follows from the law previously stated, and therefore requires further no remark.

Superheated steam, on the contrary, is produced by applying heat to the steam while it is isolated from water, either by a *septum* of saturated steam, or by walls of metal or other suitable material. Superheated steam may contain more or less heat in proportion to its weight. It differs, therefore, from saturated steam in that its quantity of heat is not specific to its weight. These distinctions are important to the clear understanding of what is to follow.

Substances may be dried either by saturated steam or by superheated steam, and either the one or the other may be employed in one of two different ways, the principles of which differ.

First, the steam or superheated steam may be used in a confined state, as in racks of pipe, steam cylinders, etc. In this way, the heat is transmitted by the steam through the material, that surrounds it to the substance to be dried, the moisture in which, being thus transformed into vapor, passes off into the surrounding atmosphere. To successfully dry substances in this way, two points must be observed, namely, the water which accumulates in the heater must be constantly removed, and the air, which absorbs the vapor from the drying material, must be changed so often as not to become saturated. Free circulation of air in drying rooms heated by enclosed steam is therefore an absolute essential to success, and it should be secured even if necessary to use fans for the purpose. Cold dry air will dry substances faster than hot air saturated with watery vapor.

There are many substances, such as cotton or woolen yarn, white lead, sand, etc., that, having a great attraction for water, will not dry rapidly when confined steam at 212° Fahr. is employed. At this temperature, there is slow evaporation from the surface. The water converted into steam is condensed and held by action of capillary attraction at the surface. The water is thus slowly forced from the interior outward, and so on until the substance is at last sufficiently dried When drying is performed solely by heat externally applied, it will proceed almost as well at 90° as at 210°, provided a good circulation of air is maintained. The air cannot take up the water faster than the capillary attraction will convey it from within to the surface, and as up to a temperature of 212° this action is in no way aided by the expansive force of steam generated at higher temperatures in the interior, a

great deal of heat may be wasted by carrying a temperature, higher than necessary to maintain surface evaporation, yet too low to produce evaporation from the interior.

When a higher temperature, say that corresponding to 45 lbs. pressure or 292° Fahr. is maintained, a very different action takes place. The water in the substance to be dried is then converted into steam of sufficient tension to not only overcome adhesive attraction, but to expand and force its way out and to float away as steam does from the exhaust of a steam engine. This accounts for the fact stated by a recent correspondent, published in answers to queries, to wit.: that in drying woolen yarn, he finds it necessary to carry forty-five pounds pressure of steam in his drying cylinder. As soon as the temperature corresponding to this pressure is reached, the yarn dries rapidly, while at all lower temperatures the drying is a tedious process.

So much for drying by steam inclosed in pipes. The direct admission of saturated steam into the interstices between solid bodies, which are not only to be dried but heated, has been found in practice to answer admirably in some cases. In this method of using steam, it is received in closed retorts containing the substance to be dried and heated. The steam immediately heats the material, and in doing so becomes condensed. The water of condensation is drawn off, as it forms. The solid bodies attain the temperature of the steam with great rapidity. As soon as this is the case, the following conditions exist in the retort: The bodies are hot and their surfaces are dripping wet with the water of condensation. Now, if they have a temperature sufficiently high, and are sufficiently large, the heat they contain will evaporate all the water upon their surfaces, and still leave the bodies at a temperature of 212° Fahr. or higher, whenever the flow of steam from the boiler is cut off, and the retort is opened or allowed to exhaust into a second retort containg another charge of cold material. This method has been employed with great success for heating broken stone for paving purposes, gravel for roofing, etc. The reader will find full description of a patented invention of this kind on page 305, last volume of the SCIENTIFIC AMERICAN.

Water may be extracted from solutions by the direct injection of superheated steam. Every pound of superheated steam will convert such an amount of water at 212° into saturated steam as corresponds to the excess of heat in the superheated steam over that of one pound of saturated steam. In doing this, it becomes reduced to saturated steam and passes off as such without condensation, carrying with it 967 units of latent heat. Therefore this method of drying or concentrating solutions must be exceedingly wasteful unless the heat in the saturated steam can be subsequently used. It may, however, be employed advantageously in some processes where it is an object to maintain a constant temperature, and in which economy is of secondary importance.

AMERICAN HOMESTEADS.

There is a peculiar charm about old houses, which is seldom felt in America. In Europe, one finds everywhere quaint old buildings, in which generation after generation have been born and reared, and have married and died. Every nook and corner of the building is clustered over with memories and associations. The change of such a mansion from the possession of one family into that of another is regarded as a humiliation, and mourned as disaster. This feeling is not without a salutary moral effect. It cultivates a family pride, a feeling of honor in the family name, which, handed down from father to son, is sought to be maintained through successive generations. It begets a sentiment of unity, among those who bear the same name and are connected by ties of blood, which strengthens these ties, and tends more or less to make each regardful of the interests of all.

But here in America there are, as a rule, no old houses. The son tears down what the father built, or passes it into other hands with little or no regret or compunction. He builds again that which his sons shall raze or sell, regarding merely his own convenience, and careless who shall dwell in the spot he inhabits after he has quitted it forever. Almost all our building is for the present. We erect with a view to tearing down, not for permanence, and hence it is that our architecture has an unsatisfactory air of instability, of cheapness, and temporary expediency, which offends cultivated taste, and goes far to justify the assertion that American architecture as an art is scarcely to be met with in our homes.

It is true there are some fine and costly residences, scattered about through the country and grouped in our large cities, but throughout the land, cheap frame buildings, with scarcely an appearance of design, offend the eye by uncouth forms, shapeless sculpture, and glaring white or dingy mud colored exteriors. Though we do not dwell in tents, like some of the Tartar tribes, we are essentially nomadic in our habits and tastes. Boys escape as soon as possible from unattractive homes, to chance their luck in cities, or hew out fortunes on frontiers. Young men clear off farms in the far west, sell them at the first apparently good offer and try it over again. Land, with us, is not a thing to be kept if possible, but to be speculated in. Cultivation of soil is too often only the temporary improvement preparatory to sale.

Thus increases and flourishes that restless, wandering spirit which characterizes the true Yankee born American. Considerations of love for the spot, on which one has been born and bred, are feeble when placed against hopes of profit. All this may, perhaps, find some compensation in the enterprising spirit it engenders; but it does not make our rural homes picturesque piles half hidden by honeysuckle, ivy, and woodbine, like the garden embowered farm houses and cottages of England.

Much has been written with a view to improve our architectural taste as a nation, but we are yet too young to progress rapidly in this respect. The greater portion of our land is too cheap. We have too much elbow room, and we are too fond of change. We do not wish to spend much money on what we may, in a few years at furthest, cease to occupy. So we go on the cheap principle in building, and content ourselves with mere bodily comfort, sacrificing æsthetic considerations to utility. It is vain, therefore, to expect any great general improvement in architecture until we shall have advanced beyond adolescence as a nation. When the great West shall have absorbed all it will hold of the world's population, and people look to die where they are born, homesteads will be beautified, and a sense of what is meant by the word home will be so impressed, upon the minds and hearts of youths, that to adorn the place of nativity will seem almost a duty.

THE STUPIDITY OF IGNORANCE.

Some three years ago, the Commissioners of the Central Park, New York, at the instance of some of our leading scientific men, undertook to establish a palæozoic museum, where the pupils of the public schools and those interested in the study of natural history might find specimens of the earliest animal creations, now extinct, and acquire useful knowledge of their forms and habits. For this purpose Mr. B. Waterhouse Hawkins, one of the most learned and talented of professional men, was empowered to construct the restorations, and upon them he labored as assiduously as means were provided for nearly two years, when a political change took place, by which a new set of Commissioners came into power. These men were under the control of an Irish politician, the head of the notorious gang known as the Ring, by whom the city treasury was plundered of so many millions.

One of the first acts of these blundering and ignorant Commissioners was to annul the contract made with Mr. Hawkins, and arrest his work. He recently stated that all he had done during twenty-one months to restore the skeletons of the extinct animals of America (of the Hadrosaurus, and the other gigantic animal, which was thirty-nine feet long), was destroyed by order of Mr. Henry Hilton, late vice president of the Commission, on the 3d of May last, with sledge hammer, carted away and buried. The preparatory sketches of other animals, including a mammoth and a mastodon, and the molds and sketch models were also destroyed. Mr. Hilton did this, said Mr. Hawkins, out of ignorance, just as he had a coat of white paint put on the skeleton of a whale which Mr. Peter Cooper had presented to the Museum, and just as he had a bronze statue painted white. Mr. Hilton told the celebrated naturalist, who had come from England to undertake the work, that he should not bother himself with "dead animals," that there was plenty to do among the living. This illustrates the policy of having such ignorant men as Hilton at the head of one of the most important departments of the city government. A new and more intelligent set of Commissioners having recently come into power, the skeletons were dug up again, but they were found broken in thousands of pieces. Professor Henry, of the Smithsonian Institute, when he heard of this piece of barbarism, would not believe it. "Why," he exclaimed, "I would have paid them a good price for the work." Mr. Hilton, however, preferred to destroy the work of the naturalist, which has cost the city at least $12,000.

THE POSITIVE MOTION LOOM GRAND MEDAL OF HONOR.

This exceptional prize of the American Institute, awarded only to inventions of such great importance as to promise a revolution in the industries to which they are applied, was, as our readers are aware, awarded to Mr. James Lyall for his Positive Motion Loom, on its first exhibition at the annual fair held by the Institute. After some delay, the medal has been struck, and is now in the possession of Mr. Lyall. It is of gold, large and handsome; and is mounted in a beautiful case. It is a just recognition of a masterpiece of ingenuity. The loom was shown again at the last year's exhibition with very marked improvements, which, according to unanimous opinion, have greatly increased its utility. All the predictions made by us in our description of this invention, page 17, Vol. XXI, have been fully verified, and although the proprietors have had to contend with a disastrous fire, they are meeting with the most gratifying success in the introduction of their looms. The invention has been applied with remarkable advantage in the weaving of corsets and the manufacture of wire cloth, as well as oil cloth foundation, druggets, etc., and several new and large manufactories have been put into operation, employing the positive motion loom in the industries named. The inventor, Mr, James Lyall, is one of those men whose characteristic modesty and other good qualities secure the heartiest goodwill from all who know him, and a choice party of these friendly well wishers honored the occasion of the presentation of the medal, on the evening of February 22, at his residence in this city.

GLYCERIN CEMENT.—A cement, said to be capable of use where resistance to the action of both water and heat is required, is composed by mixing ordinary glycerin with dry litharge, so as to constitute a tough paste. For uniting the joints of steam pipes and other similar applications, this preparation is said to be very satisfactory.

MR. J. F. MCCURDY writes to us to suggest that grindstones are often burst by the strain on the center caused by the shaft, and that centrifugal force is not the sole cause of such accidents.

SCIENTIFIC AND PRACTICAL INFORMATION.

GUN COTTON.

In our number of September 3, 1871, we described the apparent dangers and difficulties of the manufacture of gun cotton; and we are now in possession of a report of a commission of enquiry, appointed by the British Secretary of State for War, which gives some information which will interest many of our readers. The committee decided that compressed gun cotton is not uncertain or perilous in use; and, as an explosive, it is effective, certain, safe, and portable. The paper pulp gun cotton of Mr. Abel's invention is capable, says the report, of being more thoroughly purified than the ordinary cotton in cords or skeins, and moreover is, from being prepared in a wet state, uninflammable up to the time of its leaving the press. The drying is alone the dangerous part of its manufacture.

SULPHURETTED ALCOHOL.

Professor Gamgee informs as of a new concentrated disinfectant, obtained by impregnating alcohol with sulphurous acid, of which gas it is capable of containing no less than three hundred times its own volume. The portability and convenience of such a fluid will be obvious to every one; its general use as a disinfectant will be probably somewhat qualified by the nauseous smell. But for the destruction of insects and as a substitute for fumigation with burning sulphur, it has the recommendation of apparent efficiency.

SUBSTITUTES FOR GUNPOWDER.

The exigencies of the people and authorities during the protracted siege of Paris called out many improvements and substitutes for articles in common use. M. Deplazanet, of Grenelle (a suburb of Paris, within the besiegers' lines), produced a powder in which chlorate of potash was used instead of saltpeter (nitrate of potash). This preparation answered well for torpedoes and mining purposes, but it proved to be so destructive to metal as to be unfit for use in small arms and artillery. It was composed of 2 parts chlorate of potash, 1 part of prussiate of potash, and 1 part of powdered sugar. These ingredients are known to be very dangerous when combined, and it is not to be wondered at that the factory of M. Deplazanet was destroyed by an explosion, which catastrophe put an end to the manufacture.

ELECTRICAL EXPLODERS.

Mr. Clemens Herschel, of Boston, Mass., writes to call public attention to the dangerous implement called an electrical exploder, used for igniting blasting charges, etc., by electricity. It is said to be so sensitive that dusting near it with a feather duster produces sufficient electricity to discharge it, and the use of a rubber comb may occasion a similar accident. He suggests that such contrivances, useful enough in their proper places, should be so constructed that the spark of a battery would be needed to discharge them. There is reason in the suggestion, as a battery is always used for the purpose.

STACKING LUMBER.

The news of a distressing accident in which some little children were crushed by falling lumber, in Newcastle on Tyne, England, warrants us in calling attention to the dangers of our lumber yards and the insecure manner in which high piles of timber and boards are stacked. In many of our cities, it is common to see stacks of great weight piled together without due regard to safety, giving the next high wind an opportunity of toppling them to the ground. Children are apt to seek lumber yards to play, and we would warn our lumber merchants to guard against such an accident as has recently occurred in England.

New Invention.

The Girard *Cosmopolite* says that, at a certain station on the Philadelphia and Erie Railroad, the company has a new night telegraph operator, who, if inclined to slumber, is too ingeniously wide awake to be caught napping at his post. Recently he was seized with drowsiness which he could not shake off. As it was his duty to report all passing, he dared not yield, and yet could not resist. That mother of invention, necessity, at length suggested an alarm signal, which he proceeded to put in operation by suspending a scuttle full of coal, by means of a cord which was passed through the keyhole of his office door and fastened across the track at the requisite elevation. Mr. Operator then resigned himself to rosy dreams, which were finally interrupted by a passing train, the engine of which snapped the cord, causing the coal scuttle to come down with a rattle-te-bang that would have aroused even a sleeping Erie policeman. Another young operator, some thirty miles up the road, let a train slip by him the same night, and applied to the inventor of the coal scuttle alarm to know, when the train passed his station. No answer was vouchsafed, the inventor remarking "Why don't the darned fool get the right to use my patent?"

THE *Lens* is the title of a new quarterly magazine, of microscopy and its allied natural sciences, published by the State Microscopical Society of Illinois, at Chicago: S. A. Briggs, editor. The first number is before us. It is illustrated with a variety of diagrams of monads, and contains a large amount of useful matter, rather technological in character, but of value to the trained microscopist. The *Lens* promises to be a valuable addition to the scientific periodical literature of our country. We trust that it will be well sustained.

HUMILITY is the lesson of science. It is by measuring ourselves against the unsolved mysteries of science that we learn our feebleness.

[Special Correspondence of the Scientific American.]

EXTENSION CASES BEFORE CONGRESS.

WASHINGTON, D. C. February 20, 1872.

Under the new Patent Act, passed July 8, 1870, power is vested in the Commissioner to extend any patent granted prior to March 2, 1861, for the term of seven years from the expiration of the original term, but no patent granted since the above date can be extended. The Commissioner, however, has no power to renew a patent after it has once expired, neither is provision made for an appeal from his decision in extension cases. Hence, disappointed applicants in these cases have occasionally carried them before Congress under the form of petitions for relief, and as that body has shown a disposition to give them a favorable consideration, the number of applicants has of late increased. The present Congress has received many applications of this class, of which the following is a list, the first one mentioned being one of the most important and meritorious, as will appear from the following brief statement:

The case is that of A. Smith and H. Skinner, of Yonkers, N. Y., for an extension of their patent of November 4, 1856, for a carpet weaving loom. The object of the invention is to produce by machinery an Axminster or tufted carpet, a fabric of which the distinctive features in the manufacture, namely, the insertion and binding of the tufts, had heretofore depended on hand skill, a weaver working only two yards a day. With this loom, the devices of which are necessarily very complex yet very admirable as specimens of mechanical action and effect, the manufacturer can produce from seventeen to twenty yards per day. Owing to losses by fire, and the delays incident to the perfecting of some parts of the mechanism, it was not until the fall of 1868 that the inventors put their carpet on the market. The article was so well received that the company erected a large factory, and in 1870 had thirty looms in operation. A. T. Stewart & Co. early became dealers in this important article of American manufacture. The application for extension was refused by Commissioner Fisher, on the ground that the English patent issued to the inventors before the American patent had expired, in accordance with section 25, of the Patent Law of 1870, which provides that domestic patents, issued upon inventions previously patented abroad, shall expire with the foreign patents. As this decision of Commissioner Fisher has not been sustained in subsequent cases of this nature, there will be no hesitation on the part of Congress in granting the petition of Messrs. Smith & Skinner; and it should be stated in this connection that Mr. Fisher considered that the facts and considerations of the case favored the granting of an extension, while at the same time, his understanding of the section of the new law, above referred to, imposed on him the unpleasant duty of refusing the application of the patentees.

No opposition to the above extension has been filed.

The application of A. B. Wilson, now before Congress, is exciting special interest, as very large moneyed interests are involved, and the opposition is necessarily strong, and is rendered more determined from the fact that the patentee has already received the benefit on one extension term, which has proved immensely lucrative. The patent was for an improved sewing machine, was issued November 12, 1850, and was extended in 1864 for the authorized time of seven years, which expires November 12, 1871. Its value is apparent when it is considered that it covers all the four motion feed mechanisms in use. The invention included other devices, but the feed motion was its valuable feature, and consisted of a box vibrating upon the machine table, the other side of the box having serrations like a shoemaker's rasp. The cloth was laid upon these projections, and being pressed on them by a spring was carried forward by the teeth at each movement of the bar. This was called the rough surface two motion feed, and as no points penetrated the cloth, as was the case in the continuous feed of Batchelder, patented in 1849, it could be turned so as to sew seams of any desired curvature. In 1852, this feed was improved by giving to the bar a motion forward, to carry the cloth to the needle, a motion downward to release the cloth, a motion backward and a motion upward to take a fresh hold. This is what is known as the four motion feed, and is seen in most sewing machines. This application is opposed.

Petition of W. E. Ward for extension of his patent for a nut making machine, issued October 7, 1856, and reissued January 1, 1867. The patentee's application to the office for an extension was refused by Commissioner Fisher for the same reason that decided his action in the case of Smith & Skinner above referred to, namely, that the letters patent obtained by applicant in England, in 1856, had already expired. The English patent was dated May 8, 1856, and therefore, expired five months in advance of the American patent. "If the extension now asked for be granted," says the Commissioner, in his decision, "it will be a continuation in this country of the monopoly for an invention, the foreign patent for which has expired." Previous to this invention a punch and die were used for both cutting off the blank and for compressing it, and another punch for forming the hole, and the blank or nut was swaged while yet on the punch by which it was pierced. In Ward's machine the blank, after having been cut from the bar by one punch and the central hole made in it by another, is transferred automatically to and placed upon an intermittingly revolving mandrel equal in diameter to the hole in the blank, and while in the mandrel is swaged upon the sides and edges by hammers operating automatically. The examiner, in his report, states that the invention was only in part novel, the punches and dies and their arrangement relative to one another being substantially shown in a French patent of 1826.

George W. Morse. Two patents for improvements in fire arms, both dated October 28, 1856, expired October 28, 1870. The applicant filed his petition in the office for an extension, in accordance with the rules, but the application was refused by Mr. Duncan, the Acting Commissioner, on the ground that the testimony given in the case to show that the inventor, though residing in the South during the late civil war, neither aided nor abetted the rebellion, was insufficient. Mr. Duncan, in his decision, says: "We should have a declaration, not of beliefs, but of actual facts. With these before us, a reliable judgment might be formed as to whether applicant carried himself free from all contamination with the rebellion, and whether circumstances were such as to justify him in absenting himself from that portion of the country where alone he would have been in position to urge his improvements upon the Government at the time when, if the inventions were of real value and importance, he might reasonably expect to secure their trial and introduction." The bill before Congress for the relief of Mr. Morse asks that the Commissioner be authorized to reconsider his case, in view of additional testimony to prove his loyalty. The bill has already passed the House, though not without some discussion. These inventions pertain to breech loading arms and metallic cartridges.

Ira Buckman, Jr. Patent for a walking stick gun, dated August 4, 1857, exp'red August 4, 1871. The inventor did not apply to the office for an extension, and now asks that the Commissioner be authorized to hear his application in the same manner as if it had been duly filed ninety days before the expiration of the patent.

William Sellers and Coleman Sellers. Patent for improved coupling, dated May 5, 1857, expired May 5, 1871.

The petition of the patentee is similar to that of Buckman just given. The device consists of two conical sleeves within one external sleeve, so arranged as to compress the ends of the coupled shafts separately, whether of the same or different diameters; also in the mode of bolting the conical sleeves, the bolts serving as keys to prevent the cones from turning.

Edward Hall and Joseph L. Hall, for improvements in fire proof safes, dated August 21, 1849. Extended by the Commissioner for the term of seven years from August 21, 1863. The surviving patentee, Mr. Edward Hall, petitions for a second extension, on the ground that, without neglect or fault on his part, he has failed to obtain a reasonable remuneration. By the terms of the Patent Law, the Commissioner is not authorized to grant a second extension in any case. The invention consists of a concrete safe, the interior and exterior covering being joined by bolts imbedded in hydraulic cement.

Frederick P. Dimpfel, for a steam boiler, dated July 16,1850, Extended by the Commissioner; the term expired July 16, 1871. This is an application to authorize the Commissioner to grant a second extension, after a due examination on the merits of the case. The invention relates to the construction of the water tubes and a means of forcing the circulation.

Horace L. Emery. Improvements in endless railway horse power, dated February 22, 1852, expired February 22, 1866. The case is similar to that of Buckman, mentioned above.

William Trapp. Machine for making casks, barrels, etc., dated October 1, 1845, extended by the Commissioner, the term of which extension terminated October 1, 1866. The petitioner asks for a direct extension from Congress.

C. P. S. Wardwell, for a circular sawing machine, dated March 10, 1857, and expired March 10, 1871. Petition to go before the Commissioner. The invention consists in an arrangement of two or more saws, in a swinging frame so that either may be brought into working position.

William Pierpont, for a straw and grain separator, dated May 7, 1850. Extended by the Commissioner. Petitions for second extension from May 7, 1871. The device is an elongated apron or pierced platform hung upon and worked by cranks in connection with the other parts of the threshing machine.

Alfred W. Gray. Improvement in links of endless horse powers, dated September 9, 1856, and expired September 9, 1870. Petitions to go before the Commissioner. The links are made of corrugated sheet metal, so that the corrugations shall serve both as hinges for connecting the links and as cogs for the gearing.

Thomas W. Harvey (deceased). A machine for threading screws, dated May 30, 1846, and extended by the Commissioner in 1860. The applicant, Mr. H. A. Harvey, petitions for a direct extension from Congress.

Edward P. Torrey and William B. Tilton. Improvement in torsional rod door springs. The application to the Commissioner of Patents was refused because Tilton had not joined as a party seeking the extension, it being alleged at the time that Tilton was believed to be dead. The Commissioner, in his decision, also strongly intimated that the patent sought to be extended ought not to have been granted originally, in view of the proofs adduced. Both inventors now come forward and pray that Congress grant the extension so refused by the Commissioner.

The following persons have also petitioned Congress for relief, namely: Chester C. Tolman, Stephen Hull, John B. Emerson, L. W. Pond, P. L. Wardwell, D. J. Powers, Calesta E. Cox, William Sellers, John C. Bickford, William C. Jardine, Elizabeth A. Jackson, William A. Graham, Samuel A. Knox, A. S. Macomber, John W. Nears, Fred. N. Norcross, and Levi Bissell.

The Private Acts and Resolutions of Congress in relief of patentees or their heirs are few in number, only twenty-four from 1860 to 1870, and nearly one half of these cases were passed in 1870. The great proportion of these cases arose out of the neglect of the parties to file their applications in the Patent Office within the prescribed time, namely, ninety days before the expiration of the patent, and the Acts simply authorize the Commissioner to consider the applications as if filed in accordance with the law. In some instances, not only months but years have passed between the expiration of the patent and the action of Congress, the invention in the meantime becoming public property. In such cases the public is protected by a proviso to the effect that all persons who shall have made use of the invention, during the interval referred to, shall be relieved from all liability for said use.

We find only two cases in which Congress has granted an extension independently of the Patent Office. The first occurred in 1867, on an application from the widow of Henry A. Wells for the extension of her husband's inventions in the manufacture of hat bodies. The patents were two, both dated April 25, 1846, and had been extended by the Commissioner in 1860. Several reissues had been granted from time to time, and the two most important of these were extended by Congress without condition.

The second case is that of John Batchelder's patent for sewing machine, dated May 8, 1849, and extended by the Commissioner in 1863. By Act of July 14, 1870, Congress granted an unconditional extension, to take effect from the expiration of the first extension, namely, May 8, 1870, adding the usual clause for protection of all persons who had purchased the machine after the expiration of the first extension term.

In 1866, a patent to Theodore Hyatt, for a vault cover, was directly extended by Congress, and in 1867 a patent to Thomas D. Burrall for a corn sheller, but in both these instances the applications were submitted to the Commissioner, he being directed to extend the patents, on payment of the usual fees, "if in his judgment, upon full hearing, the same should be granted." This proviso must be considered as, on the whole, formal and complimentary, as the acts pronounce the patents "hereby extended."

In some of the extension cases now before Congress, much interest is excited, as not only the interests of the public are affected, but extensive business arrangements have been completed by manufacturers, under the expectation that the patents were about to become, or remain, public property.

Another case of importance is that of Rollin White, of Massachusetts, for a rehearing, before the Commissioner, of his rejected application for an extension of his three patents, dated April 3, 1855, for improvements in repeating fire arms. The leading claim in these patents is for "extending the chambers of the rotating cylinder right through the rear for the purpose of enabling the chamber to be charged at the rear, either by hand or by a self acting charger. As early as 1866, Mr. White filed an application in the Office for an extension, which was refused by Commissioner Foote at the expiration of the term of the patent in 1869. It appears that the invention was not of any practical value until the invention of Smith and Wesson's metallic cartridge, and the patentee assigned his right, for a valuable consideration, to that firm. The validity of the patent was, about that time, contested in the courts by the manufacturing company of Allen & Co.; and in 1863, the case reached the Supreme Court, where four of the judges were in favor of confirming it, and four were against it. On the refusal of Mr. Foote to grant an extension, Mr. White immediately petitioned Congress for a rehearing before the Commissioner; and the bill of relief was passed by both Houses, without debate, on the last day of the session. On January 11, 1870, the bill was vetoed by President Grant, for reasons embodied in an accompanying communication from General A. B. Dyer, Chief of Ordnance, and approved by the Secretary of War. General Dyer says: "It is believed that the Government suffered inconvenience and embarrassment enough during the war, in consequence of the inability of manufacturers to use this patent, and that its further extension would operate prejudicially to the interest of the Government by compelling it to pay, to parties already well paid, a large royalty for altering its revolvers to use metallic cartridges." In the Senate, the bill was passed over the veto by a vote of 11 to 13. In the House, it caused one of the most lively debates of the session, Mr. Butler and Mr. Farnsworth engaging in a spirited tilt growing out of a charge of the latter that Mr. Butler had accepted a fee of $2,000 to advocate the interests of the patentee. The bill failed by an overwhelming majority—yeas, 12, nays, 168.

A New Dodge in Advertising.

One of the most ingenious means of advertising we have met with is the following: A thin buff envelope, printed and directed as though it covered a telegraphic despatch, contains a slip which looks like a printed telegraphic dispatch. We read thereon that a certain tea company has the celebrated —— tea, pure and delicious, for sale in pound packages, etc., etc. Of course, being pleased at the trick, it is preserved and shown to one's friends, and so one circular is seen by many, as intended by the advertiser, who laugh over it, and pronounce it a clever trick, as was also anticipated. The genius who devised this dodge can go up to the head of the class.

ERRATUM.—In a small part of our edition of last week, the address of Mr. N. W. Simons, inventor of the patent safety hold back for carriages, is printed Williamsport, Ohio. It should be Williamsfield, Ohio.

DR. KANE, the arctic explorer, recorded the fact that snow at a temperature of 40 degrees below zero, F., loses much of its anti-frictional quality. He found it nearly as difficult to draw sleds upon such snow as upon sand.

Practical Hints to Inventors.

MUNN & CO., Publishers of the SCIENTIFIC AMERICAN have devoted the past twenty-five years to the procuring of Letters Patent in this and foreign countries. More than 50,000 inventors have availed themselves of their services in procuring patents, and many millions of dollars have accrued to the patentees, whose specifications and claims they have prepared. No discrimination against foreigners; subjects of all countries obtain patents on the same terms as citizens.

How Can I Obtain a Patent?

s the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them: they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

How Can I Best Secure My Invention?

This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows and correct:

Construct a neat model, not over a foot in any dimension—smaller if possible—and send by express, prepaid, addressed to MUNN & Co., 37 Park Row New York, together with a description of its operation and merits. On receipt thereof, they will examine the invention carefully, and advise you as to its patentability, free of charge. Or, if you have not time, or the means at hand, to construct a model, make as good a pen and ink sketch of the improvement as possible, and send by mail. An answer as to the prospect of a patent will be received, usually, by return of mail. It is sometimes best to have a search made at the Patent Office; such a measure often saves the cost of an application or a patent.

Preliminary Examination.

In order to have such search, make out a written description of the invention, in your own words, and a pencil, or pen and ink, sketch. Send these with the fee of $5, by mail, addressed to MUNN & Co., 37 Park Row, and in due time you will receive an acknowledgment thereof, followed by a written report in regard to the patentability of your improvement. This special search is made with great care, among the models and patents at Washington, to ascertain whether the improvement presented is patentable.

Caveats.

Persons desiring to file a caveat can have the papers prepared in the shortest time, by sending a sketch and description of the invention. The Government fee for a caveat is $10. A pamphlet of advice regarding applications for patents and caveats is furnished gratis, on application by mail. Address MUNN & Co., 37 Park Row, New York.

To Make an Application for a Patent.

The applicant for a patent should furnish a model of his invention, if susceptible of one, although sometimes it may be dispensed with; or, if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should be securely packed, the inventor's name marked on them, and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by a draft, or postal order, on New York, payable to the order of MUNN & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents.

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A patentee may, at his option, have in his reissue a separate patent for each distinct part of the invention comprehended in his original application by paying the required fee in each case, and complying with the other requirements of the law, as in original applications. Address MUNN & Co. 37 Park Row, for full particulars.

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Mrs. Elizabeth A. Monaghan, of Brooklyn, N. Y., has used her Wheeler & Wilson Machine since 1861. During the war she stitched forty blouses a day of eight hours, averaging about $16 a week: since then she has stitched from thirty to thirty-six linen coats a day. Last year, in three months, she stitched 1774 linen coats, earning $166.46, besides doing her own housework and tending her baby. She would use no other Machine.

Jennie A. Van Cott, Glenwood, N. Y., exchanged in 1858 a —— for a $90 Wheeler & Wilson Machine, which was used constantly five years making coats and vests; since then it has annually been changed from city to country for family sewing, and is now in good repair, doing the stitching in a first-class dress-making establishment. It did $400 worth of stitching in eight months of last year.

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Grist Mills, New Patents. Edward Harrison, New Haven, Conn

Taft's Portable Hot Air Vapor and Shower Bathing Apparatus Address Portable Bath Co., Sag Harbor, N.Y. Send for Circular.

For Steam Fire Engines, address R. J. Gould, Newark, N. J.

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Hydraulic Jacks and Presses, New or Second Hand, Bought and sold, send for circular to E. Lyon, 470 Grand Street, New York.

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.—CASTOR BEAN POMACE.—What is its value as a fertilizer, what should it be mixed with, and how much should be used per acre?—H. S.

2.—TRUEING GRINDSTONES.—Will some of your correspondents inform me how grindstones can be kept true by the means of a gas pipe?—A. J. P. S.

3.—COPAL VARNISH.—I would like to have a recipe for making a first quality copal or coach varnish.—L. G.

4.—SOLDERING STEAM PIPES.—Will some one please inform me of the best means of stopping cracks or leaks in steam or water pipes? Is there any way of soldering them?—E. W. K.

5.—ELECTROMAGNET.—What is the best way to make an electromagnet? Should the wire on the spools be in contact with the iron, or should it be insulated?—F. L. T.

6.—TEMPERING SPRINGS.—What is the best method of tempering cast steel springs, such as trap springs, gun main springs, etc.?—W. H. R.

7.—WELDING CAST STEEL.—Can any of your correspondents inform me of any method of welding steel castings, such as pitmans?—W. H. L.

8.—CEMENT FOR BRASS AND RUBBER.—Will any of your correspondents inform me of an insoluble cement which will hold together finished brass and rubber, or cork?—J. L.

9.—HEATING WITH STEAM.—Will some one tell me the proper size of a boiler which will heat, with steam, a house two stories high with twelve rooms, containing say 50,000 cubic feet? The boiler is to be placed in the basement.—E. D. M.

10.—PERMANENT PENCIL MARKS.—Is there a kind of paper or cloth so prepared that, when pressed on a sheet of paper which is written on with a common lead pencil, it will cause the pencil marks to become permanent and ineffaceable.—A. F. S.

11.—DISLODGING SOOT.—There is wanted very much, out here in Iowa where we burn so much soft coal, some preparation which burned in the stove or in the flue or pipe, or vaporized therein, will cause the coal soot to become dislodged from pipe and flue, and fall down?—A. F. S.

12.—CLEANING GUTTA PERCHA.—Can any one tell me how to keep the gutta percha covering, on the telegraph magnet, nice and shining?—O.

13.—PAPER FRICTION PULLEYS.—I would like to learn, through the SCIENTIFIC AMERICAN, how paper friction pulleys are made, and whether they are better than wood or leather to drive iron pulleys?—L. I. O.

14.—GALVANISM IN WINE MANUFACTURE.—Will "Amateur," of Paris, France, tell me definitely the mode of application in this process? Are the silver plates to be in contact in the juice, and if not, how far apart? The right dimensions of the plates and battery will also be valued by me.—J. S.

15.—Mr. W. H. Dabney, of Teneriffe, U. S. Consul for the Canary Islands, writes to ask whether any of our readers can give him information about a machine for separating the fibers of agave, sisal and New Holland hemps, as well as those of analagous plants; and also by whom such a machine is manufactured.

16.—BROWNING GUN BARRELS.—Will some correspondent give me a little information on this point? I use the following prescription for browning iron, gun barrels, etc.: Tincture of muriate of iron, 1 ounce nitric ether, 1 ounce, sulphate of copper, 4 scruples, rain water, 1 pint. Now what I wish to know is, how long ought the barrel to remain after the application of the liquid. How can I best stop the action of the acid? And what is the best mode of finishing the article thus treated? I have seen work, finished with this preparation, with a fine glossy appearance; how is it produced?—W. H. R.

17.—SHRINKING OF WOOLENS.—Can any one give us through the columns of your interesting paper, the philosophy of the shrinking of woolens by successive washing? I know finely made and substantial woolen shirts become too small to wear, long before they were worn out. Perhaps it was the fault of the washwoman, perhaps not. Is there a way of washing them that will not shrink them?—F. X. M.

18.—STEADYING THE MOTION OF GANG SAWS.—I have a large gang mill in Pennsylvania, with forty saws hung in one gate, driven by a large steam engine. I have had a great deal of trouble in trying to get the gate to run steadily, and have not yet succeeded. It is a very heavy gate, weighing nearly 5,500 pounds, and is hung upon the wrist. Now, can I find a point

on which to put a counter balance, to round up the motion to make it run as steadily as if it were not a crank motion? I am going to make a thorough test, by putting on counter balance to overcome the weight of the gate. What is your theory as to putting on balance opposite to the wrist, or must a fly wheel be put on of sufficient weight that the momentum will carry it past the dead centers so as to steady the motion and resistance of the cut of the saws?—E. F. J.

19.—THE SEA WAVES.—Can any one oblige me by answering the following questions? What is the average hight of the waves of the ocean, in a heavy sea, and also in an ordinary sea? What is the distance from the center of one wave to the other? What is the difference in the hight of the ends of an ordinary ocean steamer when the stern is in the trough of the sea and the bow on top of the wave in a heavy sea, and also the same in an ordinary sea?—J. G. H.

20.—PLUMBERS' SOLDER.—Will some one please tell me how much time is necessary to thoroughly eat all the impure metals out of plumbers' solder, and the quantity of water to put to the sulphuric acid? My object is to get the metal to retain its heat while in a semi-melted state (while wiping with the cloth) as quickly and at the least expense possible. Such metals as zinc, iron, and bismuth give it a tendency to crystallize and to be porous and white instead of having a bright solid metallic shine when the joint is wiped. We plumbers have always used sulphur with a little rain thrown into the pot while the metal is at a dull red heat, but that not only burns the zinc out, but also the tin, lead, and pot together.—W. S.

21.—PURITY OF WATER.—In the SCIENTIFIC AMERICAN for Feb. 17th is reprinted an article by Professor Chas. F. Chandler on the "Effect of Animal Excreta in Water." As the majority of our population residing out of large cities is dependent on wells for its water supply, this is a matter of the greatest importance to thousands who, nevertheless, are not aware of its importance. The points of the above article were included in a lecture, delivered by Professor Chandler about a year since, before the American Institute. At that time, he stated that there had not then been discovered any chemical test for discovering the presence of sewage contamination in water, nor was it apparent to the senses, except by its influence on health. Has any method since been discovered for its easy detection? In villages and country towns especially, privies, cesspools and drains are unavoidably located unpleasantly near the wells, and this is used as a strong argument by those interested in the sale of earth closets. Comparatively few use earth closets at all, and of this number still less apply the system so thoroughly, to all sources of contamination, as to secure the advantages claimed therefor. Can Professor Chandler, or any one, point out a feasible method of securing immunity (as society is at present constituted) from sewage poison? What amount of filtration through the different soils is necessary to secure perfectly pure water? Or in other words, as a privy or cesspool and a well must often exist within the limited enclosure of a village lot, what would be the nearest approach that would be admissible, while securing freedom from contamination?—J. Q.

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.

INDICATOR OF METALS.—W. H. L. is informed that there is no known substance that will attract gold, silver, or lead.

J. L. J., of R. I.—A. L. D., of Canada.—For the mechanical books you mention, Bourne's "Catechism of the Steam Engine," and Dussauce on "Perfumery," address H. C. Baird, Philadelphia.

CEMENT FOR ALABASTER.—In answer to query No. 7, page 90, Vol. XXVI., I would say that I have had success in cementing different kinds of stone together, and also stone to wood. I use plaster of Paris tempered with glue, mixed up in small quantities as needed. It takes some time to set.—E. B. M.

COPPER DIP FOR IRON CASTINGS.—Query 2, February 10, 1872. Dissolve two pounds sulphate of copper in three gallons of water, and add two fluid ounces sulphuric acid.—K., of Conn.

RUBBER BOOTS.—J. R. M. can patch his rubber boots as follows: Rub the patch and boot thoroughly with sharp sand paper. Smear both with liquid rubber five times, every time letting them dry. Do this once more, and, before they dry, apply the patch, with pressure, if possible, and the boot is mended. If liquid rubber is not obtainable, dissolve small pieces of rubber, not vulcanized, in warm spirits of turpentine to the consistence of molasses in summer.—L. S., of N. Y.

WATERPROOFING BOOTS.—In answer to query 2, page 42 of current volume, I will say: Let C. B. take one pint neatsfoot oil, one pound old rubber boots, and one ounce rosin. Melt slowly, take out the fragments of the cloth of the old boots, and apply warm, say at 100° Fah. The boots will be water and snow proof.—C. E. G.

TENSILE STRENGTH OF SWEDISH IRON.—O. W. is in error in quoting our statement, as to the above, as from 120,000 pounds to 160,000 pounds. Our figures (see page 107) are from 70,000 pounds to 112,000. Knut Styffe bears us out in this statement. On pp. 124 and 125 of the English edition of his work, he gives the breaking weight of puddled steel and puddled iron from Surahammer as ranging from 72,737 pounds to 111,987 pounds, and the average of all the results in this table is about 85,000.

HYDRAULIC CEMENT.—J. A. T., on page 106, can take lime which contains from twenty to thirty per cent of clay or finely divided silica and make it into mortar with water. Should he wish to make watertight joints for a slate cistern, or aquarium, or for filling up metallic joints, let him take equal parts of red and white lead and work them to a thick paste with boiled linseed oil. This hardens slowly.—R. T., of Ill.

VOLUME OF HYDROGEN.—W. W., page 90, current volume, will find 22,429 97-107 cubic inches in one ounce of hydrogen, being ·0214 of a grain to one cubic inch.—R. T., of Ill.

SLIDE VALVE QUESTIONS.—Query 17, page 90, current vol. I more than agree with C. G. concerning the engine he has been repairing. I think there must have been some heavy rotary motion, either in the shape of fly wheel or mill stone, to carry the engine over the centers. I claim that any amount of lead that forces back against the crank before it gets to the center is a resistance; all the lead that is required is to overcome the *inertia* of the reciprocating parts, and this is partially accomplished by the lap of the valve cutting off the exhaust. I think that one thirty-second of an inch would be lead enough on the feed side, and about one sixteenth on the exhaust side. The more exhaust lead and lap of the valve there is, the less feed lead is required.—E. W. K.

POUNDING OF PISTON.—Query 12, page 90, current volume. To W. M. T. I think the pounding in your engine arises from the connection of the piston rod and the cross head; if this is the case, there will be some difference in sound; for, as the engine starts on the front stroke, it forces the piston rod into the beveled socket in the cross head; whereas when it commences its return stroke, it withdraws from the socket against the key. A very little play in this joint will make a good deal of noise.—E. W. K.

D. S., of Pa.—The insurance companies have good reason to charge higher rates for woolen mills heated by steam pipes, in which buildings woolen waste, wood, and other rubbish about the mill are allowed to come in contact with the pipes. Woolen waste often takes fire spontaneously when oily, and so will wood shavings. The danger of this is much increased by artificial heat, even though the latter is not intense enough to ignite these substances directly.

W. C. A., of Mass.—The reason that low steam will not dry yarn as readily as high steam is that the yarn holds its moisture by adhesive attraction with such force as to require greater heat than the ordinary boiling point to expel it. The conditions for the evaporation of water under any circumstances are very different from those of heating a gas or mixture of gases. The force of the vapor of water at 212° is just that of the atmospheric pressure, and thus only surface evaporation from moist yarn could take place at this temperature. With higher temperatures, the water is converted into steam exceeding in expansive force the pressure of the air, and is thus expelled with greater or less rapidity.

LIGHT ENGINES FOR SAW MILLS.—In the SCIENTIFIC AMERICAN of January 20, query 16, inquiry is made how can an engine of light power be made to run a saw and cut lumber in proportion to the power used. This is a subject which should be better understood than it is by many. There is no reason why a ten horse power should not be made to cut one half as much as a twenty, or a five horse power to cut one fourth as much. The common mistake made when engines of limited power are used is to run the saw with too high a motion. If a twenty horse engine can revolve a forty inch saw successfully at 300, a ten horse power should revolve the same saw at 150 revolutions in the same time, and a six horse power should revolve the same saw at 90. The difference in the power of the engines must be made in the revolutions of the saw, and not in the feed. Or, in other words, the cut of the saw for each revolution should be the same with the ten as with the twenty horse power engine. A fifty inch saw, run by the same power as a forty inch, should revolve one fourth slower, but should be made to cut one fourth more to each revolution. Perhaps some will ask why the ten horse power may not run the saw with same number of revolutions as the twenty, making the difference in feed. But in this case it would have the same friction to overcome as the twenty, and consequently but a small part of its effective power would remain. One of the first things to do in applying a small power engine to run a saw mill is to enlarge the saw pulley. With an eight or ten horse power portable engine of the usual order, the saw pulley should be made nearly or quite the size of the saw. If the saw is forty inches diameter, the pulley should be made nearly the same.—S. W., of Ga.

G. L., of Vt.—In the long run you will find it better to carry the water to drive your proposed factory through a canal sixty rods than to attempt to transmit the power through that distance by compressed air and the aid of an engine. The expense of pipe and engine will nearly or quite construct the canal, unless very adverse circumstances in cutting the latter exist; and a canal will cost little or nothing for repairs.

POUNDING OF PISTON.—Query 12, February 3, 1872. To W. M. T. Your engine may be out of line, so that tightening any of the bearings may be only temporary relief. Engines that have run some years, working full capacity, frequently pound when passing centers from the shaft wearing flat in the crank bearing on the side next the crank pin, as this portion of the shaft takes the heaviest strain on either center. There is no remedy except to true up the shaft in a lathe, and refill the box. Watch the main bearing carefully, when the engine is running with a heavy load on, and see if the lost motion is not in the main box.—C. T. S.

E. S. E., of N. J.—I contend that it is impossible for a player of ball, in throwing or pitching the ball, by any particular "twist" or "screw" of the wrist, or by any possible device, to cause the ball to describe a curve in the air, that is, to turn to the right or left in the track of a curve after leaving his hand. Of course the parabolic curve which it makes in its fall to the earth is not referred to. I maintain that any regular body, such as a sphere or cube, hurled by the hand cannot be, unless blown by wind, made to go in any line except one in a straight vertical plane, and that the famous slow and deceptive pitchers in base ball have never yet succeeded in making a ball deflect to the right or left, in the form of a curve. The boomerang I suppose is irregular in form, and its motion, like all deviations of a flying body, is produced really by a compound force. Please settle this point, as there is a wide diversity of opinion about it among men who set themselves up as authorities.—E. S. E. Answer: You are right in every particular.

D. W. H., of Mo.—The friction of the earth upon the ordinary plow is greater upon the mold board than upon the land side and bottom together. Therefore, one half of the power used in drawing a plow is not wasted by friction on the land side and bottom.

R. G., of Nova Scotia.—We advise you to use steam pipes for your lumber drying room.

FACING OIL STONES.—The most convenient way to face oil stone that I have yet tried is to use No. 3 sand paper. I have used it for about six years, and have always found it effectual; and it is generally so convenient that it can be done at short intervals, and the stone at all times kept in a good condition. I lay the sand paper upon a smooth and true surface, and in rubbing I confine myself to one half of the sheet until it is nearly rubbed down, to leave a sharp surface to finish up with. One sheet of sand paper has always answered for me, and it can be done in from ten to twenty minutes.—H. W., of Ill.

Recent American and Foreign Patents.

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

CAR COUPLING.—John A. J. Chapman, Kansas city, Mo.—When two cars are uncoupled a dart headed link is held by one or the other, the free end of said link being held by springs in such a position as to freely enter the jaws of the opposite draw head. The spring, adjusted in strength and position for the purpose, presses against the inclosed dart head beneath it, and thus sustains the outer or free end of the link. The invention consists in a arrangement, of the springs described, with the pivot jaws and a combination with a car coupling, of bars, a compression spring, ratchet, and pinion, by which the proper movements and the desired attachment are made.

UPRIGHT PIANO FRAME.—Justin Whitney, Boston, Mass.—The frame stands upright, and forms the back, which supports the strings of the instrument, the strings being drawn across it over the bridge and sounding board. The sides and bottom of the frame are made in double angle form, and the trusses are of iron in the form of double Ts in cross section. The top is of irregular form, the front portion being the bridge over which the strings pass. Like some other parts of pianos—the legs, for instance, for square or horizontal pianos—these frames are made for the "trade" and sold as an article of commerce, the form or size of the frames being varied to suit different piano manufacturers.

PROPELLING BOATS.—Charles Dancker, Hoboken, N. J.—In the stern portion of a canal boat is hung a transverse crank shaft, to which oscillating motion is imparted by means of steam or other power. The cranks of the shaft are connected to the front ends of rods that extend backward through the stern of the boat, where they are packed water tight. The motions of the rock shaft serve to move the rods back and forth. To the outer end of each rod, behind the stern of the vessel, is pivoted a metallic or wooden blade, of suitable width and length the pivot pin being rigidly attached to the rod. To said pin is also secured a metal or wooden plate, which has its ends guided in grooves or tracks provided in backwardly projecting frames of the boat. The said frames also hold transverse pins or friction rollers, upon which the propeller blades rest. As the rods move outwardly they push the blades back, and cause them to gradually drop from a horizontal into a vertical position by bringing its pivot gradually nearer to the supporting pin. The blade crowds the more against the water the more it is brought into a vertical position, the covering plate to which it is attached preventing the water from escaping over the top. In moving forward, the rod draws the blade gradually into a horizontal position, and prevents it from hindering an advance of the boat. The rudder is hung in cross pieces that connect with the projecting frame. One or more rods, blades and plates may be applied to one boat. The space inclosed by the frames may be closed on top if desired. A modification of the invention is one in which the blade is drawn into a pocket formed in the stern of the boat, the projecting frames being dispensed with. In this case two rudders are preferably used near the sides of the boat.

CLOTH PLAITING MACHINE.—Joseph A. Sawyer, Worcester, Mass.—This very ingenious invention relates to a new machine for plaiting fabrics to be used in the manufacture of shirt bosoms, and for other purposes. The invention consists in the use of several appliances for imparting and regulating the necessary motion and guiding the fabric. Seven distinct claims have been allowed on this invention which shirt manufacturers would do well to examine, as we regard it as one of much importance to this line of business.

WASHING MACHINE.—Henry S. See, Evansburg, Pa.—The clothes to be washed are placed upon the bed, and a reciprocating motion is given to a rubbing frame, which carries a rubber over the clothes. The rubbing frame acts as a lever, the rubber being the fulcrum. A reciprocating frame, in combination with spindles, rollers, standards, springs and pins, is employed in combination also with a board pivoted to side pieces and arranged with the bed.

WALL GUARDS FOR FURNITURE.—James L. Brander, Boston, Mass.—The object of this invention is to provide a cheap, safe, and convenient means for preventing the defacement of the walls of parlors and other apartments by the backs of sofas, lounges, or other similar articles of furniture. It consists in a guard, of crescent shape, screwed to the floor so that the front or concave side shall receive the leg of the sofa, lounge, or other article, and so that the guard shall act as a stop to prevent the back of the article from touching the wall of the room.

WASHING MACHINE.—Martin Way and Frank Way, of Springfield, Ohio.—This invention relates to a new washing machine of extremely simple construction. A frame supports the wash tub, which has a cover, the cover having a hinged lid over a central aperture. Vertical posts are attached to and under the cover, extending not quite to the bottom. A crank shaft, swiveled in the lid, carries a forked frame. By operating the crank, the frame rubs the clothes against the posts and thereby cleanses them from dirt.

TIME LOCK FOR BURGLAR PROOF SAFES.—John Burge, of Circleville, Ohio.—This lock is placed upon the inside doors of vaults or safes, and moved and operated by clock work, so that no key hole or other aperture through the door is necessary. A mechanism composed of a revolving cam wheel and actuating plate and springs is employed, by means of which a continuous motion in one direction locks and unlocks the door. The inventor does not confine himself to any peculiar clockwork or mechanism for this purpose, but designs to use any motive power within the safe or vault by which the purpose may be effected. Neither does he limit or confine himself to the precise form or arrangement of any of the parts described, as they may be varied in many ways without departing from the invention.

BEER FORCING APPARATUS.—William H. Otto and Peter Korper, of Tremont, Pa.—This invention has for its object to furnish an improved apparatus for forcing beer out of the keg. It consists in the construction and combination of an apparatus by which, on opening a stop cock and the faucet of the beer keg, the beer will be forced out violently from the keg. The beer keg may be placed at any desired distance from the operating parts of the apparatus, which may be placed beneath the bar, or in any other convenient place.

BIN FOR STORING AND DRYING GRAIN.—Jarvis Royal, of White Rock, Ill.—This invention is an improvement in the construction of bins, boxes, ships, boats, etc., in which grain or other substances are placed for storage or transportation, so that the substances placed in them—whether grain, fruits, flesh or fish, salt or sugar—may be dried and thus preserved from injury from dampness; and it consists in lining the inside of the bins with porous bricks or tiles. The bricks or tiles may be secured in place by a slight frame work, or in any other convenient manner. In case plain brick or tile are used to line the bin when made close, thin laths should be placed along the sides and bottom of the bin for the bricks or tiles to rest against, so as to form channels or openings for the ingress of the air. In some cases—as, for instance, in grain boats and ships—it may be advisable to line the lower part of the bin with thicker and heavier brick or tile than is necessary for the sides or upper parts. By this construction the porous bricks or tiles will, it is claimed, absorb the water from the grain or other substance, which, coming in contact with the air in the chamber or corrugations, is evaporated. This process of absorption and evaporation continues until all the grain in the bin is sufficiently dried. The claim is based upon the interposition of these laths so as to form the open spaces between the bricks or tiles and the outer walls of the bin.

CARRIAGE WHEELS.—Charles H. Appel, of Allentown, Pa.—This invention pertains to an improvement in the devices for securing the spokes of carriage wheels in the sockets of their wooden hubs; the invention consists of a detachable metallic ring or collar, provided with dovetailed lugs, in combination with the spokes and wooden hub.

FISHING APPARATUS.—Orange M. Fuller, of Catasauqua, Pa.—This invention consists of a float from which the line is suspended by a trip lever and spring in such a manner that when a fish takes hold of the hook and pulls on the line, the spring will be tripped by the lever and the fish will be hooked; also a weighted arm, held in a horizontal position by the spring, will be let fall to raise a flag as a signal that a fish is taken, and the hook will be pulled in by the spring, so as to fasten the fish, the said float being connected by a long line to a reel in the hands of the operator, to be pulled in by him to secure the fish.

ORE AND STONE CRUSHER.—Robert Learmonth, of Buffalo, N. Y.—A method of adjusting the stationary jaw, by means of detachable links formed of different lengths, constitutes this invention. In other respects the construction does not differ from other stone crushers in use.

VISE.—John Peace, of Camden, N. J.—The vise is placed on horizontal and vertical swivels, so it can be turned in suitable direction to hold the work in convenient position. The invention consists in a new general arrangement of parts, and also in a new application of the proper jaws. A flanged and flat sided screw, provided on opposite sides with jaws, when combined with and swiveled to a nut, constitute the claim on which a patent has been obtained.

CASTERS FOR FURNITURE.—William Ireland Blackman, of Columbus, Miss.—This invention relates to an improvement in casters for furniture. It consists in the mode of confining the ball and securing the caster to the leg. A shell in which the ball is confined, having a shank, a fastening ring, a thimble, and a holding pin are the several parts of the device. The shell and shank are made in two pieces, forming a globular opening for the ball and a tapering shank for the leg. The main bearing of the ball is at the center of the globular opening above; but, to reduce the frictional surface of the shell, there is a small rib with which the center of the ball comes in contact. About one fourth of the diameter of the ball projects below the shell. The bottom of the thimble rests upon a shoulder and a collar of the thimble rests upon the top of the fastening ring, while the ring itself rests upon the shoulder. The fastening ring is secured to the end of the leg. The ends (one or both) of the holding pin project from the shank over the edge of the thimble, which prevents the caster dropping from the leg when the piece of furniture is raised. In some cases the entire shell and shank will be let into the leg, in which case a larger ring will be used.

STONE LIFTER AND STUMP EXTRACTOR.—Josiah Knoop, Casstown, O.—The invention consists in several improvements, upon the portable stone lifters and stump extractors heretofore known to the public, by which the inventor has produced a durable and convenient machine, peculiarly well adapted to its purpose. It seems to provide pretty effectively for all the accidents to which such machines are liable, and to economize the power required in producing the desired effect.

CULTIVATING PLOW.—Cealy Billups, Norfolk, Va.—The invention consists in constructing two wing mold boards so that they can be reversed on the cultivator plow and thus made to represent two different sizes and widths. The same wings will thus serve for all stages in the growth of the plant and never require to be left off the plow.

FENCE.—Alfred M. Aplin, Chetopah, Kan.—The invention consists in forming a fence of tubular clay posts placed close together in the ground and held in line by top caps at suitable intervals. This fence dispenses entirely with rails, is almost imperishable, and yet may be made at the small cost of about 30 cents a panel.

ANIMAL TRAP.—Lawrence Lewis, of Tuskegee, Ala.—This invention has for its object to furnish an improved trap for catching rats, mice, and other animals. The animal, in trying to reach the bait, steps upon a platform, which withdraws a catch from the door of a box and allows the door to be revolved, through a quarter of a revolution, into a vertical position, when its upper edge is caught and held by another catch. The slam of the door frightens the animal, which, seeking to escape, rushes through the passage way leading into a rear compartment, raising another door in his passage, which movement operates a lever, releases the first door, and allows it to be revolved into a horizontal position, again setting the trap.

HAY LOADER.—Thomas Giffin, of Perrysville, Ohio.—This invention has for its object to furnish an improved machine for loading hay spread upon the ground directly upon the wagon. It consists in the construction and arrangement of bearings and castings arranged upon an axle and the frame work of the machine, with a combination of rake teeth and guides with a frame work and a carrier.

HARVESTER.—Ernst Henry Ruwe, of Walcott, Iowa.—A revolving rake or scraper, having mechanism to carry it over a double track is employed in this invention. The platform is projected beyond the divider and is turned upon a curve corresponding to the orbit described by the passing scraper. By this construction not only is an auxiliary divider furnished which will press the standing grain out of the way of the revolving rake, but an extension which effectually prevents, by its acclivity, the straw from working over the edge of the platform. A rod placed longitudinally across the platform and directly in the rear of the cutter bar, holds up the butts of the straw and prevents the scraper from passing over them. A cross bar, with its fingers and a double rail, causes the endless chains to move uniformly and without wabbling.

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DESIGNS PATENTED.

5,543.—CUTLERY BOLSTER.—M. Chapman, Greenfield, Mass.
5,544.—CHAIN LINK.—V. Draper, North Attleborough, Mass.
5,545.—CHAIN BAR.—V. Draper, North Attleborough, Mass.
5,546.—OIL CLOTH.—J. Hutchison, Newark, N. J.
5,547.—PARLOR STOVE.—J. Martino and J. Currie, Philadelphia, Pa.
5,548.—BORDER.—J. Moore, Brooklyn, N. Y.
5,549 to 5,552.—CARPETS.—W. McCallum, Yonkers, N. Y.
5,553.—SODA FOUNTAIN.—G. F. Meacham, Newton, Mass.
5,554 and 5,555.—CARPETS.—D. Paton, New York city.
5,556.—CROQUET IMPLEMENT.—J. W. Pettengill, Rockford, Ill.

TRADE MARKS REGISTERED.

658.—GIN.—Adams & Taylor, Boston, Mass.
659.—WHISKEY.—Adams & Taylor, Boston, Mass.
660 and 661.—KNITTING COTTONS.—J. Attwell, Jr., New York city.
662.—WELTING CORD.—J. Atwell, Jr., New York city.
663.—CALICO PRINTS.—Coffin & Altemus, Philadelphia, Pa.
664.—REFRIGERATORS AND WATER COOLERS.—A. M. Lesley, New York city.
665.—CONCENTRATED AMMONIATE.—Navassa Phosphate Co., New York city.
666.—CUTLERY.—G. Wostenholm & Son, Sheffield, England.

APPLICATIONS FOR EXTENSIONS.

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

20,227.—HARVESTER.—J. S. Troxel. April 24, 1872.
28,512.—CAR WHEEL.—S. P. Smith. May 1, 1872.
20,249.—HULLING CLOVER, ETC.—J. C. Birdsell. May 1, 1872.
20,506.—AFFIXING STAMPS TO LETTERS.—G. K. Snow. May 1, 1872.

EXTENSIONS GRANTED.

19,384.—BANK CHECK CANCELER.—William M. Simpson.
19,377.—HARVESTER.—F. Nishwitz.
19,377.—HARVESTER.—F. Nishwitz.
19,483.—HARVESTER.—J. S. *Butterfield.*
19,347.—RUBBER MAT.—E. F. Chaffee.
19,346.—PROPELLING BOAT.—H. Camp.
19,398.—HYDRAULIC VALVE.—C. and G. M. Woodward.
19,370.—KNITTING MACHINE.—J. K. and E. E. Kilbourn.
19,349.—SHINGLE MACHINE.—G. Craine.

SCHEDULE OF PATENT FEES:

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Inventions Patented in England by Americans.

From January 26 to February 8, 1872, inclusive.
[Compiled from the Commissioners of Patents' Journal.]

ALARUM FOR GRIST MILL.—T. Glasspool, Minneapolis, Minn.
BURNING HYDROCARBONS.—J. K. Caldwell, Philadelphia, Pa.
CARPETS, ETC.—W. Webster, Morrisania, N. Y., and C. M. Messrole, New York city.
COMBINING MINERALS AND VEGETABLES.—A. Hitchcock, New York city.
DETECTING LEAKAGE, ETC.—A. G. Myers, New York city.
ENGINE OPERATED BY EXPLOSION.—J. S. Foster, Salem, Mass.
FIRE ARM.—A. Burgess, Owego, N. Y.
FLUTING MACHINE, ETC.—T. M. Tucker, Newark, N. J.
GLOVES, ETC.—J. Harrison, Chicago, Ill.
IRON AND STEEL.—C. M. Nes, York, Pa.
KILN.—A. R. Morgan, New York city.
LAMP BURNER.—A. G. Myers, New York city.
METAL KNITTED FABRICS, ETC.—W. Edge, Newark, N. J.
NAIL MACHINE.—J. Lawrence, Philadelphia, Pa.
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PACKING PAVEMENT, ETC.—B. B. Hotchkiss, New York city.
PAVEMENT.—B. B. Hotchkiss, New York city.
PEGGING MACHINE.—L. R. Blake, Fort Wayne, Ind.
PREPARING HOPS, ETC.—D. A. Clarke, Baltimore, Md.
SEWING LEATHER, ETC.—G. V. Sheffield, Providence, and G. K. Mello Woonsocket, R. I.

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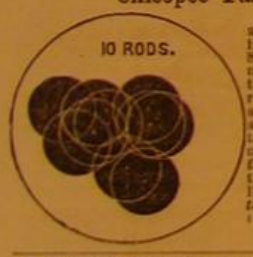
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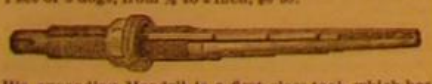


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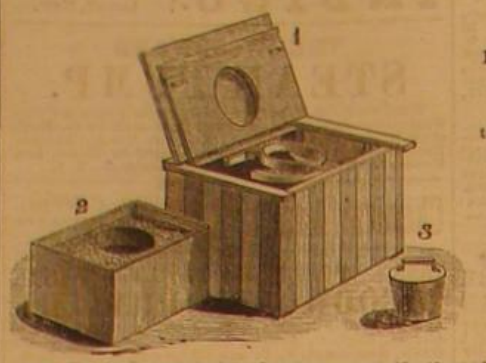
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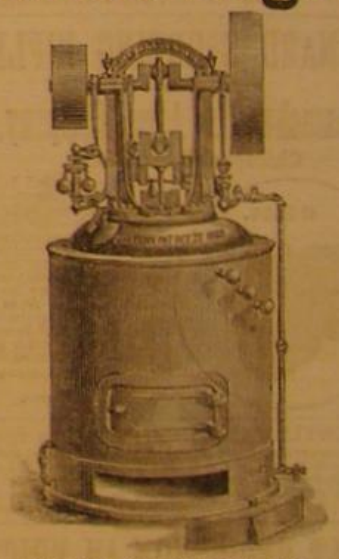
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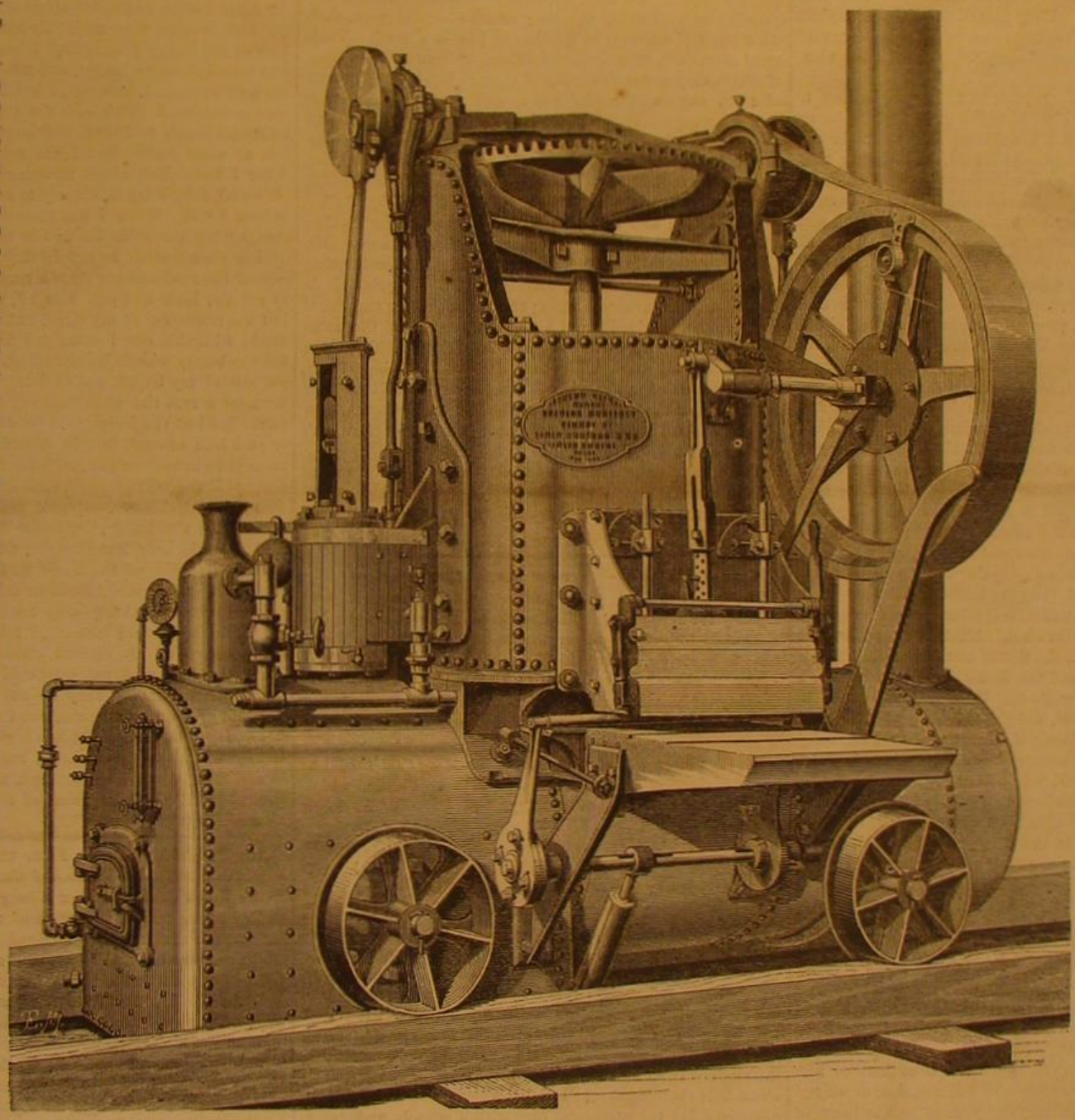
A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE. MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXVI.—No. 11. [NEW SERIES.] NEW YORK, MARCH 9, 1872. $3 per Annum. [IN ADVANCE.]

Improved Portable Steam Brick Machine.

This machine was illustrated and described on page 321, Vol. XXI., of the SCIENTIFIC AMERICAN, in which article its claims to superiority were fully set forth. The illustration referred to was from the original model of the machine, whereas the engraving we herewith present is from a photograph of a full sized machine, put in operation last season at Columbus, Ohio, and used for making the brick for the Ohio State Central Lunatic Asylum, one of the largest, if not the largest, structure of the kind in the United States, requiring over twenty-five millions of brick in the walls. It will be observed that the engraving exhibits some important improvements in its construction.

The general construction of the machine is as follows: The clay mill is placed on top of the boiler. It is composed of an outer and inner wall of boiler iron, between which water circulates for feeding the boiler, as well as for tempering the clay. A cock in the pipe under the cog wheel, which extends across and over the top of the clay, regulates the supply of water required to further wet the clay in the process of tempering it, while a steam pump on the back side of the machine supplies the water to this annular space in the clay mill, and also feeds from it the boiler. The form of the clay mill gives the requisite framing and strength for the attachment of engines and combination of the working devices. The steam cylinders are attached on opposite sides of the clay mill. These cylinders were, in the original model and machine, attached to the boiler, the expansion of which by heat tended to disturb the allignment of the working parts. The present position of the cylinders obviates this difficulty, and is a marked improvement on the original design. Improvements in the guides for the crossheads have also been made, by which no dust or grit can get to them, as the opening shown in front of the crossheads is closed by a door. The size of the boiler has been increased, the fire box greatly enlarged, while the whole boiler is built of heavier iron.



WINN'S IMPROVED PORTABLE STEAM BRICK MACHINE

As shown in the engraving, the machine is a boiler, engine, and brick machine combined, the whole placed upon wheels, so that it can be moved upon a track on the yard from one "pit" to the next. The boiler is 25 horse power, the cylinders are each 8¼ inch bore, and the pistons have a stroke of 14 inches, and make from 40 to 60 strokes per minute.

The operation of tempering the clay, molding, and delivering the brick in molds upon the table, in front of the machine, is entirely automatic.

Reference to the engraving will show that the pinion on the longitudinal shaft (driven by the engines) drives the large bevel wheel upon the mixing shaft with its knives rotating among radial bars on the inner side of the clay mill; the clay is forced, by means of strong scroll wipers on the bottom of the shaft, into the press box in front of the clay mill, in which the follower is worked up and down by the crank on the shaft of the large pulley driven by a belt from the small pulley on the engine shaft.

The mold, when full, is forced out from under the follower at the proper moment, by the roller in the ends of the arms extending up from the counterpoised rock shaft, which is actuated by the lever, receiving intermittent motion from the trip wheel on one of the arms of the large pulley. The lever, trip, wheel, and arms, carrying the mold roller, are all adjustable, and the pressure can be instantly increased or diminished and varied from one to six inches, by means of the pin at the end of the connecting rod of the follower. The whole construction of the machine is substantial and very simple, and the slow motion of the engines and moving parts makes it very durable.

The patentee claims, simply, to make a first class common building brick upon the same principle, but superior to the best hand made brick, and at a much less cost. After a large experience, he does not consider the principle, upon which "dry clay" brick and "stiff clay" brick are made, as good as the method of the hand makers, which he, to all intents and purposes, carries out in this machine, namely, thoroughly tempering the clay and using sand upon the molds. The use of water and a thorough mixing of the clay to the consistency suitable for molding it into form, in his opinion, is the proper preparation for the chemical reaction which takes place in burning, and is necessary to make the brick homogeneous, even in texture, and free from grain, that they may be easily cut with the trowel to any desired shape, and obtain in the process of burning that porosity necessary to prevent the action of extreme heat and cold from expanding, bulging, or contracting the walls, or crumbling the brick.

To practical men, it is unnecessary to explain that sand, in the manufacture of brick, is a chemical necessity, but aside from this and its mechanical convenience in molding, it gives to the brick, after being burned, a sufficiently rough and granular surface to retain the mortar, the lime in which, under pressure of the weight of the wall, fills up the cells or interstices, and naturally and chemically adheres to the sanded surfaces.

The machine has been in use four seasons, and, according to numerous testimonials from practical brick makers now using it, makes 40,000 brick per day.

The proprietors also build the machine separate and unattached to a boiler or engine, which may receive power from a pulley on a line of shafting driven by a stationary engine or from other convenient source.

The machines are manufactured for the proprietors by John Cooper & Co., Mount Vernon, Ohio. For further information, or for machines, address Wright & Winn, Lock Haven, Pa.

Traction Engine.

Mr. John Greenslade, of Steeple-near-Maldon, England, has invented and patented, through the Scientific American Patent Agency, improvements designed for rendering traction engines, especially those used on common roads, well suited for descending or ascending steep inclines. This is sought to be accomplished by mounting the boiler, together with the engine, so that it may be maintained in a horizontal position, and thus keep the water always at the same level, whatever may be the inclination of the framing, whereby the priming of the engine is prevented, as well as injury to the fire box and tubes from excessive heat, such as is the case when the boiler is fixed to the framing in the usual manner.

The inventor connects the boiler and working parts of the engine so that they may all move together, and provides the boiler to which the said working parts are attached with pivots, trunnions, or an axis or axes, placed at or near the center or otherwise, so that one end of the boiler may counterbalance the other. The engine and boiler oscillate in bearings on the framework, which is provided with driving and steering wheels as usual.

The position of the boiler can be regulated by means of a screw or screws mounted to the foot plate and working in nuts carried on the rear end of the boiler, or the boiler may be adjusted in any other equivalent manner by means of which its rear end can be raised or depressed, as required, according as it is ascending or descending an incline. The front end of the boiler is also suitably supported for the purpose of avoiding undue strain on the oscillating bearings or framing when the engine is in motion. The cylinder may be mounted in any convenient position, and motion is transmitted therefrom to the driving wheels by means of chain or other gearing, through the medium of a pulley mounted on one or both of the boiler trunnions, pivots, or axle, which is prolonged to form an axis for the pulley; or any other equivalent arrangement may be adopted. By the above means, the working of the engine is not in any way affected by the variable positions of the boiler. The pulley for transmitting motion to the driving wheels being mounted at the center of oscillation of the boiler, the distance between the main shaft and driving pulley, as well as the strain, is at all times the same. The carriage and boiler can be carried on springs or not, as desired. It is claimed that these engines will be found very serviceable for the work performed by portable engines. One or more windlasses can

be attached under the framework, and can be driven by suitable gearing from the intermediate wheel, rendering them more suitable for agricultural or other like purposes.

STOVE MANUFACTORIES IN TROY.

One of the most interesting of a series of articles, describing the manufacturing industries of New York State, now in course of publication by the New York *Times*, is devoted to an account of the stove and other iron productions of Troy and its vicinity.

There are in Troy fifteen stove foundries, whose annual consumption of pig iron is about 20,000 tuns, and of coal, 10,000 tuns. They make 150,000 stoves a year, and give employment to over 1,000 moulders, about 250 mounters and fitters, 300 laborers in different departments of the business, and about 200 skilled pattern makers. This pattern making is quite an important branch of the stove business, a vast number of patterns being made and shipped to other towns in all parts of the country. The pattern is half the battle in casting stove plates, and has to be as true as possible, and to allow for expansion and contraction in the casting taken from it.

The extent and rapid growth of this trade may be judged from the statement that Troy now manufactures and sells annually 150,000 stoves, and there is, of course, no necessity for fetching any more down from Vermont, whence, thirty years ago, a cargo of stoves arrived in Troy for shipment west, over the Erie canal. They came down the Champlain canal from Vermont, and the young supercargo in charge of them is now a partner in one of the principal stove foundries in the city.

The stove business of Troy, prior to 1845, was limited to four establishments, the oldest of which dates back so far as 1812. A Mr. Arnold was the founder of it. He made his first essay in casting stove plates in 1814, and during that year the molders he employed were deserters from the British army, which had recently been defeated at Plattsburgh. Mr. Arnold conducted a limited business for some years, and then turned his foundery over to Mr. Stratton, a gentleman who, in after years, became foreman at the West Point foundery, and in 1840, he surrendered his interest in the foundery to James Wager, at present the senior partner in the firm of Wager and Fales, and generally regarded as the oldest stove manufacturer in the United States—not in point of years, but from the time he has been engaged in the business. From 1840 to 1854, he encountered many trials and pecuniary embarrassments; but he fought his way through them all, enlarged his foundery, quadrupled his business, and he secured a fortune before he left his own foundery in 1855, in spite of the competition created by the erection of half a dozen new foundries between 1845 and 1850. During those years, he developed marked and valuable improvements in cooking and heating stoves, bestowing great pains on the production of a smoother and better quality of castings. His stoves soon became popular and thousands were shipped to California and Oregon; a steady sale for them was found in Australia, and Canada became an extensive buyer in the Troy stove market. Alas! no longer so; the heavy duty on stoves from the States now closes that market to Troy New England and the South also began to draw a large supply from Troy; while the West began to make itself felt in the Troy market, and the shiploads of emigrants, arriving every week at Castle Garden, pointed significantly to that vast section of the country as a future mine of wealth to the stove foundries. Of late years Mr. Wager has had a fine business in the manufacture of stoves in association with Mr. Fales, under the style of Wager, Fales & Co.

Another great pioneer in the Troy stove business, but as an inventor rather than as a manufacturer, was Philo Penfield Stewart, born in Sherman, Fairfield County, Conn., in 1793. In his boyhood Mr. Stewart exhibited a strong fancy for perfect mechanical workmanship, and was constantly contriving and making miniature machinery. For this reason, I suppose, his parents compelled him to serve a seven years' apprenticeship to a saddler and harness maker, and were astounded to find out, at the expiration of his sentence, that the repository of strap oil did not agree with the lad's tastes. Of course it didn't. The boy's mind was bent on machinery, not on stitching bridles. We next hear of him working as a missionary among the Indians, and at thirty-five years of age, as founding the village and college of Oberlin in Ohio. About this time, poverty compelled him to practice economy, and after some study of cooking cooking stoves he succeeded in constructing one which only consumed three small sticks at a time. It was a stove with a fire box hanging in the oven, and was patented by him in 1838 Gradually Mr. Stewart turned his entire attention to the invention of new stoves; and when he died in 1863 the names of Stewart's stoves made a formidable list in the catalogue of stoves manufactured by Fuller, Warren & Co., who held all his numerous patents. The dumping grate cooking stove was the result of his greatest efforts, and its capabilities are statistically set forth in the following extract from one of the journals of the day:

There were 265 loaves of bread baked, each loaf weighing 1¼ pounds, aggregating 332 pounds, or 50 pounds more than the equivalent of a barrel of flour; 72½ pounds of beef perfectly roasted; one bushel of potatoes baked and boiled; 2 barrels of water heated to boiling temperature, all accomplished with 24½ pounds of coal, at 3½ in the afternoon.

This is cooking by wholesale. If the master saddler and harness maker, to whom Stewart was bound, lived long enough to read the above extract, his ideas concerning the ability of the apprentice whom he thought so stupid must certainly have been considerably modified. Well, greater men than Mr. Stewart have been pronounced fools by their schoolmasters. Bacon was imprisoned for years on account of his scientific researches. DeCamp and others were confined as lunatics. Mr. Stewart may then be said to have succeeded "excellently well," considering the adverse influences which entrammelled his early career.

A man who cannot suit himself with a stove in walking along River street Troy, must be one of those creatures—too often to be met—impossible to please. He could pick and choose between base burners, self feeders, gas consumers, patent bakers, hot closets, reservoirs, and a hundred other sorts; and if he happened to be a free handed, liberal minded kind of fellow, he would, in all probability horrify his economical Western wife by taking home one of each pattern.

The leading firm in the Troy stove business is that of Fuller, Warren & Co., in which Geo. A. Wells and Walter P. Warren are also active partners. Their foundery is on the Albany and Troy line, immediately adjacent to the celebrated Rensselear iron works, on the outskirts of the city, is known as the Clinton stove works, and is on a most extensive scale. It is a large brick structure, covering between five and six acres of ground, and furnishes employment to 400 men. The molding rooms are the finest I have seen. They are four in number, two being 150 feet square, and the others a little smaller. Four cupolas, with an aggregate capacity of seventy tuns a days, supply the molten metal for the castings. About forty tuns in the day is the average quantity run. During the busy months of the year, their labor pay roll amounts to $6,000 and $7,000 a week. Their great stoves are, of course, the different "Stewart" patterns, of which they make about 10,000 a year; but they also manufacture any number of furnaces and ranges. They have special arrangements with Mr. James A. Lawson, which give them the exclusive privilege of making the Lawson furnaces, including the "Diamond" and "Ruby" furnaces. Mr. Lawson took out his patent in 1864. Since then $300,000 worth of his furnaces have been made and sold by Fuller, Warren & Co.; and this year they fully anticipate making $250,000 worth of them. They are surface burners. Mr. Lawson, while fully appreciating the merits of base burning as applied to parlor stoves, maintains that the principle is not suitable for furnace heaters; and that a greater amount of heat can be obtained from a surface burner of the same power. These furnaces weigh from 450 to 2,800 pounds, and find a ready market, like the "Stewart" cooking stoves, from Bangor to San Francisco. Aye! even the delicate toes and fingers of the vailed ladies of the harems of Constantinople are warmed on a chilly afternoon by one of Lawson's furnaces.

These few figures and facts are all that are needed to point out the thriving condition of the city of Troy, and to call attention to the talents of her manufacturers whose wares are known in all parts of the world.

Colorado---Narrow Gage Railway.

The Colorado road, which has been constructed with great rapidity for seventy-five miles south of Denver, is intended ultimately to be built along the base of the Rocky Mountains to Sante Fe, thence to Albuquerque, thence to El Paso on the Mexican border, thence to Chihuahua and finally to the City of Mexico—a total distance of about 1,750 miles. When completed, it will be one of the most important lines of railway on the Continent.

Mr. Bowles says that the cost of building this road has been but $13,000 a mile, while the Kansas Pacific, which traverses a like region of country, cost $32,000. As to its working, he says:

The road and its trains, in the first place, look like a railway plaything in contrast with the broader and heavier tracks and larger cars of the accustomed lines; delicate and dainty, they seem almost too faint and feeble for the hard, quick work to which they are called, and especially unequal to the great contest which they have invited. Yet so far, surely they are performing their task with ease, with comfort, with celerity and success. The track bed of the narrow gage is 6 feet wide, as against 9; the distance between the rails 3 feet, as against 4 feet 8½ inches; the ties are 6 to 6½ feet, as against 8; the rails 30 pounds to the yard, as against 56; the engines 12 to 16 tons, as against 25 to 30 tons, putting about half the weight on the drive wheels that the large locomotives do; the passenger cars with 8 wheels, and carrying 32 passengers, weigh 6 tuns, as against 18 tuns, 8 wheels and 50 passengers; and the freight cars, thus far introduced, weigh 2 tuns, run on 4 wheels and carry 4 to 5 tuns of freight as against cars weighing 9 tuns on 8 wheels, and capable of 10 tuns load. Where four passengers sit in the ordinary car two three are seated in the narrow ones, two on one side and one on the other of the passage way, the car being divided in the middle by a door, and the seats for two and one respectively, being reversed in the two sections, so as to balance the carriage. The cars at first introduced are 7 feet wide, and 10½ feet high from rail to top. They prove a trifle more compact than is necessary, and not quite generous enough in accommodations for passengers; but this evil is being remedied in new cars now constructing; while sleeping cars and day drawing room cars can be made for the narrow gage roads, which will accommodate still more persons in proportion to their size and weight, than the ordinary cars of this character now do.

Starch.

According to the views of Mr. Alexander Macrae, of Liverpool, there is now a good opportunity for American starch manufacturers to enter the British market. He says:—"Starch crystals, whether made from wheat or potatoes, have been selling during the last ten years at an average price of $4.80 gold per 112 pounds, packed in flour barrels lined with blue paper. To-day the value is $7.20. The cause of this advance is due, in one instance, to the great falling off in the supply of Dutch farina or potato flour, and in the second instance, to the upset of agricultural development on the Continent, caused by the late Franco-German war. These deficiencies cannot be recuperated for some time to come, not only because material difficulties have to be overcome, but because the exigencies of other trades arising from that war have more sterling claims over men and money.

This, then, would seem the proper time for the American manufacturers to introduce their starch and farina into this market, and to found for themselves a reputation which will not suffer when Continental manufacturers again attempt to compete.

We can take in Great Britain alone at least 100,000 tuns per annum, and it is this disposition, to deal to so large an extent in wholesale packages, that commends itself to manufacturers who are now harassed by limited sales, and the labor and expense of small packages."

How a Man Feels when Freezing.

During the recent cold weather, Dr. McMillan, a young dentist, while traveling from North Middletown, Ohio, to the adjoining town of Paris, was overcome by the intense cold, and came near being frozen to death. He narrates his experience, in the *Cincinnati Enquirer*, as follows:

"After having proceeded about three miles on my journey, my feet became very cold. By stamping my feet upon the floor of the buggy I imagined I was perfectly warm, as my feet troubled me no longer, and the cold sensations through my body ceased. I, however, felt dull and sleepy, like a man who is drunk. I didn't care for anything. At this point, I believe, I began to freeze, and ought to have known it, but felt so comfortable that I did not examine my situation. After I had driven about three miles further my hat was blown off, but, being in a hurry to reach Paris, I did not stop to hunt for it. When I had proceeded perhaps a mile further, letting the reins lie in the bottom of the buggy and paying no attention to my driving, my horse shied off the side of the road and ran upon a rock pile. I then attempted to get the lines and pull him off, when I discovered I had lost the entire use of my right, and could barely use the left hand; with this one I attempted to pull him off the rocks, but the buggy wheels being locked, I could not do it. I then got out of my buggy, and in doing so struck the bridge of my nose across the wheel and cut it severely. I then went to the head of the horse, took hold of the bit and attempted to pull him around, but he would not move. I then commenced to unharness him, with the expectation of pulling the buggy off the rocks myself, feeling all the time very sleepy. When I had almost completed the task of unhitching the horse from the buggy, the desire for sleep became so great that I could bear it no longer, and I laid down upon the rocks by the side of the horse and went to sleep. I must have lain there some fifteen or thirty minutes, when I was aroused by a colored boy who found me. Upon his asking me where he should take me, I told him to Paris, still not being aware of my critical condition. Upon arriving in Paris, my feet were put into cold water, which entirely, I think, cured them, as they do not hurt me. My left hand does not give me much pain, and I think will be all right in a few days; but my right hand was badly frozen, nothing seemed to do it any good, and I am afraid I shall lose three, if not four, of my fingers. Last night, when I arrived in Paris, I could give no account of myself, but this morning I remember every incident."

AIR CUSHION FOR THE FEET IN RAILWAY TRAVEL.—A writer to the *Medical Times and Gazette* refers to the fatigue of the limbs produced after a long railway journey as due mainly to the trembling motion of the floor under the feet, and states that, having suffered considerably from this abuse, he was induced to try the experiment of using the well known air cushion as a footstool. This answered so well that he has never travelled without using one in this way, and has found the effect to be a remarkable improvement.

If the air spring is good for the feet it must also be good for the whole body. Perhaps some ingenious person can devise a car seat, elastic throughout that will afford real comfort to the traveller.

IMPROVED CRUCIBLE.—A crucible for melting metal has been invented, which consists in providing the ordinary crucible of plumbago or other substance with a flue or passage from the bottom to the top, for allowing the heat to act, upon the center of the mass of metal contained in the crucible, more directly than it otherwise can. This passage is surrounded by a shell or tube of the same material of which the crucible is made. The inventor also grooves or indents or constructs the sides of the crucible, both inside and out, so as to form projections to interlock with the paste, clay, or other substance with which the crucible is coated, to cause the coatings to be retained much longer than they now are, thereby preserving the crucible much longer, and reducing the cost of melting steel or other metals.

MONSTER OF THE DEEP.—At Norwich, Conn., at a recent descent made by one of Mr. Fuller's divers in Shetucket, he fell, unexpectedly, into a fissure between the rocks at the bottom, nearly twenty feet deep. Here he was assailed by a large animal, half serpent and half fish, which snapped viciously at the eye plates of his helmet, and though repeatedly struck with an iron bar, was with difficulty driven away.

INVENTIONS AND PATENTS CONNECTED WITH BUILDING.

This was the subject of a paper read at a meeting of the Inventors' Institute, London, on Jan. 4, by Mr. B. Fletcher.

Mr. Fletcher said: "I shall first take the entire building, and thence work to details. Probably I proceed in this form as it is the usual course pursued in designing buildings, bearing in mind, too, the injunction by the poet:

'Consider what you undertake,
And analyse it well;
And ever work from whole to part,—
Grand principle of master art,—
That makes that work to tell.'

Well, in what does the house of to-day differ from the house built one hundred years ago? I must be understood to mean the usual houses which are being built all over the kingdom, and not as alluding to an exceptional house here or there.

It is wise to imitate the prudent tradesmen who just now are 'stock taking;' and I am afraid, if we take stock, and look upon the houses of to day and those built some one hundred years ago, like that I live in, we must not say merely that our predecessors built much stronger and better houses than we do, but also that the inventions and patents (grand as they are) have been so little utilized by builders that even in conveniences the old houses will almost equal the modern. It is strange that this should be so, if one considers the almost appalling number of inventions and patents that yearly are granted. Take, for instance, this country, and the average number per annum during the last ten years; a little over 3,000 applications were made, and of these more than 2,000 were granted. The number applied for last year was 3,500, and of these, according to the average, two thirds would be granted. Now see how slow Old England is. In the United States, for the year ending the 30th of September, 1871, 19,429 applications for patents were filed in the Patent Office (including reissues and designs), and as many as 12,950 patents were issued. Yet again, startling as this is, we find that this number was not so great as that of the preceding year. I notice the fees received during the year by the United States Patent Office amounted to 671,583*l.*

I cannot say what proportion of patents relates to buildings; but one sees from time to time in our professional papers a long list of such patents, so that, no doubt, the thought must arise in the mind of the public: Why, then, are not these inventions and patents more used?

I will explain. A man, if he can invent something which will enable him to produce cotton ½d. per pound cheaper, or some machine which shall be a perfect substitute for hand labor in some department where the demand is unlimited, may out of such single invention amass a great fortune. The one condition of such success is that the article manufactured shall be in great demand, and that his invention saves money in its production, or that he produces a better article at the old price, or that by his invention useless materials may be made available (for example, much iron is now used, by the application of the hot blast, that formerly was thrown away: I do not say to the improvement of the iron, but that formerly it could not be used at all). Now, you will notice in all cases the basis of large profit is from extended demand for the article. It is, therefore, evident that an inventor who turns his attention to patents, in connection with manufactures, has the prospect, if he succeeds, of larger profits than he who devotes himself exclusively to patents connected with buildings. This may account in some measure for the relative small proportion of inventions relating to building.

Having, then, shown that the inventive genius is somewhat allured from building patents by the temptation of larger gains, a few words will be well to indicate the difficulties that beset those who, having devoted their time to this class of patents, succeed in producing a valuable and useful one. The architect who is building a house probably goes to see the invention, likes it—thinks he will try it— hesitates—finally, probably, decides against its employment, from fear that it may not be successful. Yet, I think, little blame can attach to him; if the invention succeeds, the merit is the inventor's; if it fails all the blame falls on him for selecting such a "fandangle, stupid thing;" such will be the language his client may use to him. He, therefore, has no inducement to recommend a novelty, as it cannot benefit him in his practice, and by so doing he may lose a client. Is it, then, to be wondered at that we are so conservative in our decisions?

Cui bono, you may ask, all this explanation if there is no remedy? Well, I have a remedy. It is the formation of a commission, with unpaid members, who should inquire into patents or inventions when (and not till then) the results are being manufactured for sale, and should test them, and should also invite the opinion of all who use them; and these commissioners from time to time should report the result of their investigations. I would base their operations very much on the mode of proceeding adopted by the commissioners of the *Lancet;* and I think my hearers will agree with me, that these commissioners have done much good. I feel sure that the commissioners I propose would be of great service, if the gentlemen were carefully selected.

I have said that houses now are built very much as they were years ago. Go into any ordinary house in any of the suburbs of London, and what difference will you find? Why, the house is as nearly as possible a counterpart of any old house, except that it is not so strongly built. Shutters are gone, and perhaps instead of the sash bars (which, by the bye, some architects are putting in their new works), a large square of plate glass. In fact, the house when ready for letting usually has not one of the modern appliances.

This being so, let us consider what a house should be.

It should first have a good damp course, to prevent damp arising. Every room should have an air flue to let the foul air escape, and those rooms where gas is burnt should also be provided with an external ventilator. The pipes from closets should be carried up in an inside recess, to prevent frost, and should be accessible by merely opening the wooden covering. The bells should also be so carried up. There should be a hydraulic lift where the house is large. Water, hot and cold, should be on the bedroom floors, and in the lavatories attached to the water closets. Where cupboards are put, they should be fitted with regard to the use they will be put to. For instance, in bedrooms they may be made like wardrobes. To see what is being done out of this country, look at the Americans. Take one of their houses: not a servant (or help, as I should perhaps call them) wanted up stairs, every room always ready, except the dusting; the bed a spring mattress, no making required; a tap to regulate the temperature of the room; washstand, with hot and cold water laid thereto, and waste therefrom; so that, positively, while we are quite helpless without our domestic servants, they can do everything upstairs without servants. Surely the picture I have drawn shows how much we have to do before we can call the Englishman's castle really a home fit for this century. Well may I quote those lines:

'So hard
The growth of what is excellent; so hard
T'attain perfection in this nether world.'".

As to concrete building, this formed an important portion of the paper, and Mr. Fletcher took great pains in showing its advantages and disadvantages, as compared with the ordinary building materials. He stated the former to be cheapness, strength, and durability, rapidity of construction, and economy of space; the latter, its liability to failure from the use of improper materials, or from the want of knowledge and proper care, and the limits which the material and method impose on architectural design and decoration. He objected to the imitations he had seen of stone fronts by concrete, with core of that material to form moldings, and facing it with Portland cement. Such a method, he considered, would soon bring concrete building into disrepute. There is little doubt that concrete building, so far from being necessarily a "sham," may be made an admirable and useful material, capable of perfectly legitimate treatment with good results. The different kinds of apparatus used in the erection of concrete buildings were treated of. Amongst the peculiar features of concrete buildings was mentioned that with regard to steps; four of Portland stone pounded to one of cement were stated as the proportion. The cost of these steps is about half that of Portland stone. Seven to one is the usual proportion for general building, but four to one is used for coring out for mouldings, and two to one where the projection is very great. An advantage in regard to sanitary arrangement was mentioned, namely, that it will take any number of flues for any purposes anywhere; so solid is the material, that flues may come within three inches of the outer face. All fitting into vertical grooves must be avoided, as the swelling of the cement prevents the lifting of the apparatus.

Many examples of locks and their fastenings, door springs and rollers, water bars, casement fastenings, revolving shutters, electric bells and domestic telegraphs, cottage ovens, stoves, lifts and hoists, dust shoot boxes, pipes, paints and enamels, etc., were exhibited and explained. An ingenious letter box was also introduced, and he concluded his remarks with this observation:

"I think, however, there is a grand future for architecture, but it must be by striving to combine in buildings all the scientific inventions of the day, to do so continuously and with judgment; and herein new forms will be created by the use of new materials, if only the desire be present not to be slavishly bound by precedent, but earnestly to strive to make the requirements of science express themselves in our works. Whilst, therefore, I contend no architect should have or invent any patent, or have any interest in any, for the reason that he may be tempted to use it when some better thing may have been discovered (and this merely from the natural love we all have for the children of our brain), he should be ever willing to experiment with all the inventions of others, and thus give them aid. I have learnt much while pursuing my investigations, and if I but lead others to investigate for themselves, I am confident they will also learn much."

Carr's Disintegrating Machinery.

At a recent meeting of the Institution of Mechanical Engineers, held at Birmingham on the 25th of January, the first paper read was a "Description of the Disintegrating Flour Mill, and Machine for Pulverizing Minerals, etc., without grinding, crushing, or stamping," by Mr. Thomas Carr, of Bristol. In this process of disintegration, the particles of the material operated upon are shattered in mid air by a succession of blows delivered with extreme rapidity in opposite directions, and are thus pulverized by the force of the blows alone, without being subjected to the compression or friction which accompanies the ordinary processes of grinding, crushing, or stamping the material between two surfaces. The disintegrator consists of a pair of disks rotating in contrary directions upon two shafts situated in the same line; the opposing faces of the disks are studded with a series of short projecting bars or beaters, arranged in successive concentric rings or cages; and the rings of beaters fixed in one disk, intervene alternately between those fixed in the other disk, and revolve in the opposite direction. The material to be pulverised is supplied through an opening in the center of one of the disks, and receives from the innermost rings of beaters a centrifugal motion propelling it towards the circumference of the disks; in its course through the machine, it encounters successively the several rings of beaters revolving alternately in opposite directions at a high speed, and the particles are thus dashed violently by each beater against the beaters in the next outer ring running in the contrary direction, whereby the material is effectually broken up and reduced to powder. In this mode of action, by the free blows of the beaters upon the material, the friction and compression between the machine and the material, which are involved in all grinding, crushing, or stamping processes, are avoided, as the material is not acted upon between a pair of surfaces; and the whole force of the blows given by the revolving beaters is usefully expended in pulverizing the material. Disintegrating flour mills upon this construction have now been a year in regular work with complete success, a single machine of 7 feet diameter being found to do the work of twenty-seven pairs of millstones, and produce the same percentage of flour from the wheat, with a remarkable saving in cost of production; the quality of flour, moreover, is decidedly superior, owing to the absence of the compression that accompanies grinding by millstones; and in consequence of the bran being scaled off in larger flakes than in grinding, it is more perfectly separated from the flour in the subsequent dressing process. Smaller sizes of the disintegrating machine have been several years in use for pulverizing various mineral substances, such as artificial manures, calamine and blende ores, auriferous quartz, and rock asphalte; also for breaking up cattle food, such as oil cake, etc., and for mixing in sugar factories different shades of moist sugar, and for mixing the materials for making mortar; and the machines have proved very successful for these purposes. Models were exhibited of the machine, with specimens of a variety of materials pulverized by it, and the samples of the flour produced by the disintegrating flour mill.

American Solar Eclipse Observations.

It appears from a recent official report of Professor Pierce of the Coast Survey, that the first total eclipse of the sun, visible in this country since the formation of the Government, was that of June, 1806. This was accurately observed at several points, and a valuable painting was made of it. We were not favored with another until that of November 30, 1834, which was observed by R. T. Paine, Esq., of Boston, at Beaufort, S. C. A third eclipse did not visit our country until 1860; hence, at that time this wonderful phenomenon was, for most American astronomers, a matter of hearsay. The path of the eclipse of July 18, 1860, was from Washington Territory to the northern shore of Labrador, and thence across the ocean to Spain. This eclipse was observed by expeditions organized under the Superintendent of the Coast Survey, and the results are published in the report for that year. It was also observed by the astronomers of several Governments abroad, and was the first total eclipse which was photographed. In 1868, British, French, and German expeditions were fitted out for the observation of a total eclipse in India. On this occasion brilliant discoveries were made in regard to the spectrum of certain rose colored prominences seen about the sun at such times, and these discoveries have been increasing in interest ever since. In 1869, another total eclipse was visible in the United States. It was observed by parties organized by the Coast Survey and other Government bureaus. The results were of high importance. Photographs of the entire corona were taken for the first time. The first observations were made upon the spectrum of the corona. The radial polarization of the corona was first observed with care, and the former knowledge of the subject was advanced in every direction. The results of these two eclipses were of such importance in regard to one of the chief scientific problems of our time, the constitution of the sun, as to excite the profoundest interest throughout the world.

THE ECLIPSE OF DECEMBER, 1870.

It was felt by everybody even casually interested in science that the eclipse of the year 1870 afforded an opportunity for removing the last obscurity from the subject of the corona, such as ought not to be let slip; the more so as no other eclipse was expected to be observed by a Government expedition from this country during this century.

In accordance with these views, Congress authorized the fitting out of an American expedition, similar to those to be sent out by Germany, France, Great Britain, Italy, and Spain, to study the phenomena of this eclipse.

It was decided to dispatch two parties—one to be stationed in the vicinity of Jerez, in Spain; the other, in the Island of Sicily, in the neighborhood of Catania. A large number of spectroscopic observations were made by both of these parties during the eclipse, with results establishing the correctness of the previous observations, especially the fact of the radial polarization of the corona.

BRICK DUST CEMENT.—In the Spanish dominions ordinary brick dust, made from hard burned, finely pulverized bricks, and mixed with common lime and sand, is universally and successfully employed as a substitute for hydraulic cement. It is a regular article of commerce, sold in barrels by all dealers in such articles, at the same price as cement. The proportions used in general practice are one of brick dust and one of lime to two of sand, mixed together dry and tempered with water in the usual way.

EVERY railroad station in England has a stairway or platform, or some other means of crossing the track, and such persons as disregard the prescribed way and step upon the track are immediately seized and fined twenty five dollars. In this way, the companies are saved many suits for direct and constructive damages.

The Great Canal Reward.

Last year, it will be remembered that, the State of New York offered a reward of one hundred thousand dollars for the invention of any form for the application of motive power to the canal boats by which they could be economically propelled, as cheaply as by horses. The law was published in full in the SCIENTIFIC AMERICAN in May, 1871.

The Canal Commissioners have recently published a report, in which they say that they have received over 700 communications from all parts of the world in reference to power on canals; many models have been sent, some being the productions of women; some are valuable, but many are the results of inexperience, or are visionary. The Commission does not advise any change in the law, of the kind desired by such persons as think its objects cannot be secured as it now stands and is construed by the Attorney General. On the contrary, the Commission is of the opinion that compliance with all the present requisitions of the law should be insisted upon before the money should be awarded. All the time allowed by the law will be given to the competitors; but the Commission will adhere to the determination expressed at its first meeting, that boats in actual service, and not drawings or models, will be considered as competing for the money offered by the State.

The reward still holds good, and any person who desires further information upon the subject may address Henry A. Petrie, Secretary of the Canal Commission, Albany, N. Y.

THE COMBA SCURA BRIDGE---MONT CENIS RAILWAY.

We are indebted to *Engineering* for a view of one of the numerous bridges which convey the Mont Cenis Railway across the ravines and streams that interrupt its course. The Comba Scura bridge spans a singularly picturesque ravine in a spur of the Piedmontese Alps, and it crosses at a hight of 395 feet above the bottom of the valley.

The following are the principal dimensions of the structure:

Clear span between abutments	185 feet 2 inches.
Width	14 " 9 "
Depth of girders	18 " 0¼ "

It was constructed to carry and sustain a test load of 4·5 tuns per lineal yard, with a deflection of $\frac{3}{4}\frac{1}{2}$ inch at a calculated strain on the iron of about 4 tuns per square inch. The weight of iron in the bridge is 201 tuns.

The Comba Scura bridge, as well as that of the Serre-de-la-Voûte, situated about 6½ miles further up the valley, was contracted for by Messrs. Kreeft, Howard & Co., of London and Turin, and both were constructed, from designs prepared by the Italian Government engineers, by Messrs. Fleet & Newey, Crown Boiler Works, West Bromwich, London, England.

MINING IN COLORADO.

A correspondent of the New York *Evening Post*, writing from Central City, Colorado, gives the following interesting ticulars:

ORE RAISED FROM THE VEINS.

From the veins of Gilpin county alone nearly 600 tuns of ore are raised daily, or a total of 180,000 tuns annually. Nearly 500 lodes have been assayed or mapped in a circle of three miles in diameter; fully a thousand lodes have been recorded, and more or less work performed upon each. From fifteen to twenty miles of reputable lodes are known to exist, upon which there is not less than eight miles of shafting, the deepest shaft going eight hundred feet into the bowels of the earth. There is not less than twenty miles of drifting on these veins, following the ore deposit in the crevices. The assays of the territorial assayer amount to thousands, from samples of those leads. Averaging three hundred of these assays, samples of mill ore alone, taken as they were set down in the official register one year ago, would show this species of ore to be worth nearly $40 per tun. Averaging over two hundred assays of select ore, as they were made during the same time, the result shows a value of $130 per tun for such stuff. Then turning to the tailings, the refuse of ore put through the stamps, we find the average to be over $20 per tun, notwithstanding from ten to twenty per cent of the precious metals have passed away down the stream. Taking samples of this lost material in the streams coursing down to the plains, over $30 to the tun is found to be the average. Notwithstanding this extraordinary waste, the average shipment of bullion from this county trenches on $2,600,000 yearly, a production of $500 per year for each man, woman and child in this county.

MILLING GOLD ORES.

There are 83 stamp mills in this county, 185 engines in place, 4,367 horse power, and 1,597 stamps, of which there are over 800 in use, requiring 1,703 horse power. There are 39 engines used at the shafts of mines for raising ore from the veins and keeping them free of water; 12,000,000 pounds of freight, general merchandise, consumed in the county, and nearly 3,000,000 pounds of flour, all brought there to sustain the mining industry of the region, the product of which is mainly derived from milling the ores regardless of the waste alluded to. These mills are various in size, containing as high as fifty stamps and down to five, mostly driven by steam. The ore, broken into small fragments, is fed into a battery in which the stamps are raised and allowed to fall, crushing the ore fine enough to flow through a screen placed in front. Mercury is fed in this battery, and the pulverized ore, mixed with sufficient water, is then made to flow over wide plates of copper fastened upon wooden platforms, and the copper amalgamated with quicksilver. The gold, or part of it, adheres, forming an amalgam with the mercury, which is afterward scraped off, squeezed hard, and the lump retorted in a closed retort of iron for the purpose of vaporizing the mercury and getting the gold almost pure. The banks of Central buy these retorts and ship them to the East for minting. Each stamp is calculated to do from one half to three quarters of a tun in twenty-four hours, requiring about one horse power to each stamp head. Most of the ore is reduced in leased mills abandoned by companies, but there are several names famous for good results in custom work. These mill men charge their customers between three and four dollars per tun for doing this work and returning the retort of gold. The tailings are partially caught in the best mills on blankets, and reworked at a profit; the bulk, however, passes outside, a portion stopping to be shovelled into a pile, the balance going on to the stream. The waste is nearly or quite equal to the gross yield in bullion.

SMELTING FOR GOLD.

The most profitable branch of vein mining and reduction was undertaken by Professor Hill in 1867, in connection with some Boston and Providence capitalists. This is a close corporation, managed with rare ability in the executive as well as the metallurgical department. Large profits are made, but kept very jealously from the public eye. As you reach Black Hawk, the sulphurous vapors of these works arrest your attention. From the roadside, you see from twenty to thirty piles of ore, each vieing with the other in sending stifling vapors of sulphur into the atmosphere. These piles are first started on a layer of wood and are run up in a pyramid form some five or six feet, with a diameter at base from sixteen to twenty feet, and then fired, the sulphur affording the only fuel, after the exhaustion of the wood, to keep the fire going from four to six weeks. This ore has passed through the sampling works and been paid for, the amount lying thus in piles at one time amounting to, perhaps, $80,000. After roasting sufficiently to drive off sulphur and oxidize a portion of the iron, these piles are cooled and the ore carried to the smelting furnaces, where, under a heavy heat, more sulphur is driven off, and the silica or *gangue* matter is made to unite with the oxide of iron to form a slag. At the end of the smelting, some eight or ten tuns are thus reduced to one called "matte," containing from $1,500 to $2,000 in the precious metals, and from forty to sixty per cent of copper. This product is then shipped in bags to Swansea, England, for separation into the several metals contained. The establishment contains three smelting furnaces and three



THE COMBA SCURA BRIDGE—MONT CENIS RAILWAY

calcining furnaces, capable of reducing from twenty to twenty-five tuns of ore per day. The tailings, which are concentrated along the streams, and are also sold to this establishment, of which there are now on hand possibly 1,500 to 2,000 tuns, average from $35 to $40 per tun. These works are, doubtless, the most profitable of the kind known in the world. The field of Colorado has been open to them without competition since their start, and right shrewdly has the monopoly been maintained. As an evidence of success in treating the gold ores of Colorado it is pre-eminent, and in this respect a great step in the progress of mining industry.

New Method for Platinum Black.

I prefer taking platin-chloride of potassium, and were it not that rubidium and cesium are too expensive, these would be even better, for their atomic weights are higher than that of the potassium, and consequently the particles of platinum are more widely separated. After the platin-chloride is completely reduced, the mass is treated with water to wash out the chlorides of the alkalies thoroughly, and the residue dried at a temperature not exceeding 220° Fahr., when it is ready for use. The operation can be readily conducted in a capsule of porcelain or platinum. The platin-chloride is introduced and covered with a circular piece of mica, a little smaller than the wide diameter of the capsule, with a hole in the center, through which the tube conducting the gas is introduced. The capsule is then heated by any convenient arrangement by which a temperature not exceeding 400° or 500° Fahr. can be maintained with a little management; a small Bunsen burner with a rosette can be used. If the temperature be too high, the platinum black will not be as good as that made at a lower temperature. Washing the platinum black, after the chloride is taken out, with a solution of caustic potash or soda and subsequently washing with distilled water may improve the product.—*American Chemist.*

Butter in Sacks.

The dairymen of Washington Territory, for want of tubs and jars, have adopted a method of putting up and keeping butter which presents some features that are worthy the attention of those having butter packed for family use or for retail trade. The packing is thus described by the *Illustrated Journal of Agriculture:*

"All butter is packed in muslin sacks, made in such form that the package, when complete, is a cylinder three or four inches in diameter and from half a foot to a foot in length. The butter goes from the churn, as soon as worked over, into the cylindrical bags, made of fine bleached muslin. The packages are then put into large casks, containing strong brine with a slight admixture of saltpeter, and, by means of weights, kept always below the surface. The cloth integument always protects the butter from any impurities that chance to come in contact with the package; and being always buried in brine it is protected it from the action of the air; and it has been ascertained by trial, that butter put up in this way will keep sweet longer than in any other way.

"Besides, it is found easier and cheaper for the manufacturer than to pack either in jars or firkins. And for the retailer there is no telling the advantage on the score of safety and convenience. These rolls of butter can lie upon his counter as safe from injury, from dust or other contact, as bars of lead; can be rolled up for his customer in a sheet of paper with as much propriety as a bundle of matches. If the consumer, when he gets home, discovers specks of dust upon the outside of the sack, he can throw it into a pail of pure cold water and take it out clean and white. As he uses the butter from day to day, with a sharp knife he cuts it off from the end of the roll in slices of thickness suited to his want, and peels off the cloth from the end of the slice, leaving it in tidy form to place upon the table.

HISTORY OF GAS LIGHT IN BRIEF.—In 1792, in England, Wm. Murdoch lighted his own dwelling with gas; in 1803, a machine shop, and in 1805, a cotton factory were similarly lighted. He began to lecture upon the subject, but not until 1810 could a company get a charter for its manufacture. In 1813, Westminster bridge was lighted, and in 1815, Guildhall. Still there was great opposition even from scientific men, and there were also great difficulties from want of machinery to make and use the gas. Gun barrels screwed together were used to convey it from place to place. Finally, however, every obstacle was surmounted, and now there is not a city of any size in the civilized world which is not lighted by gas.

COOKING FOOD BELOW 212° F.—From a series of experiments, it appears that food (meat as well as vegetables) boiled at 200° is more nutritious and of better flavor than when boiled at or above 212°. The author illustrates this point by what takes place in mountain localities (every 100 meters' rise above the sea level makes a difference of 0·6° less in the boiling point of water); as, for instance, at Potosi (Bolivia), at 4,061 meters above sea level, with an average barometer reading of 454 m.m., the water boils at 187°; at Mexico, 2,277 meters above sea level, 568 m.m. barometer, water boils at 198°; at Briançon (France), 1,321 meters above sea level, 643 m.m. barometer, at 184°; and he further cites the action of the so-called Norwegian cooking apparatus.—*Dr. Jeanel.*

THE great pyramid, which is seven hundred feet square and five hundred high, and weighs 12,760,000,000 tuns, required, according to Herodotus, the labor of 100,000 men for twenty years to build it; but Dr. Lardner affirmed that 480 tuns of coal with an engine and hoisting machine would have raised every stone to its position.

Correspondence.

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

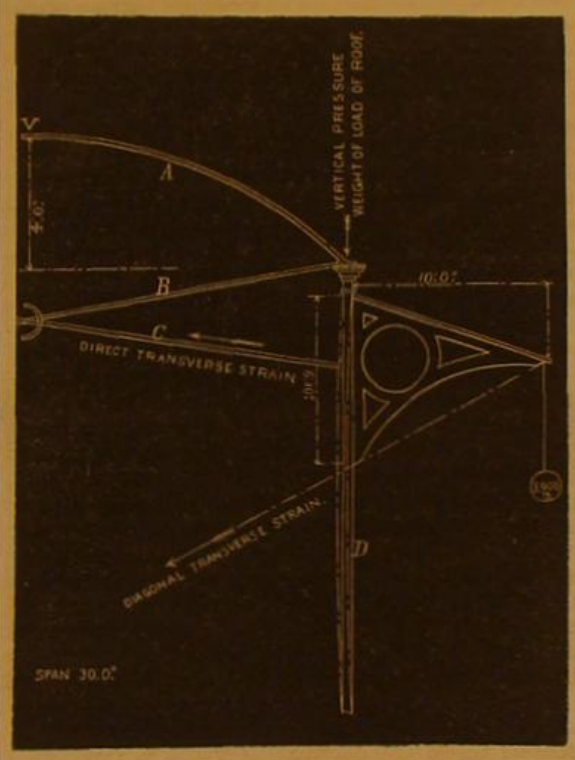
Fall of the Roof of the Depot, Saratoga Springs.

To the Editor of the Scientific American:

My attention has been directed to your issue of February 17th, in which you gave an account of the destruction, in December last, of the new passenger depot at Saratoga Springs.

The roof was arched, of thirty feet span, and made of corrugated iron, with wrought iron tie rods five eighths inch in diameter, and was supported by round columns four inches diameter, fifteen feet distant from centers. On the inside of each column, about five feet distant down from its top, was attached one end of a wrought iron tie rod, supporting the roof; and, on the opposite side, was a bracket, extending out ten feet, whose bottom exerted a diagonal transverse strain in the same direction as the tie rod. These brackets supported a roof, forming a shed over the gangway beyond the arched roof, making, with the thirty feet span of roof, an entire width of fifty feet. I was induced, after reading the article, to go into a calculation of the strains on the weakest part of this mantrap, namely, the columns and tie rods.

From the dimensions given, I take the diagram to be drawn on a scale of one sixteenth of an inch to the foot, and have made my calculations accordingly. The weight of snow and ice upon the roof, in accordance with the leading authorities, is considered at 40 lbs. per superficial foot as a maximum load in our climate. On the day of the falling of this structure, your article says, there had been a light fall of snow, and the ground was frozen. I question if the weight on the roof, at the time, exceeded 20 lbs. per foot, as snow is ordinarily light. What causes it to become heavy is a subsequent fall of rain, then freezing, and snow again. Forty pounds per foot is considered a maximum load under the most unfavorable circumstances.



The column was four inches in diameter, and, say, one inch in thickness, and about eighteen feet long, considering the diagram to be made on the scale of one sixteenth inch to the foot. Its proportion of vertical pressure would be the weight coming upon half the roof of thirty feet by fifteen feet distance from center to center of columns. Taking the weight of roof alone, exclusive of any contingent weight, at 12 lbs. per foot, we have 52 lbs. per foot for the weight of roof and load upon it.

15×15 feet—225 feet×52 lbs.—11,700 lbs. Weight of girder between columns, 15 feet, say, at 40 lbs. per square foot, —600 lbs. Total, 12,300 lbs., being a vertical load of 6·15 net tuns on columns.

The strain upon the tie rods, which was exerted transversely on the columns, about five feet down from the top, and tending to both break them across and pull them inward, was as follows: Let S—span in feet—30 feet; V—versed sine, say 4 feet; U—uniform load per foot span—780 lbs.; H—horizontal thrust or strain on tie. Then

$$H=\frac{US^2}{8V}=21{,}937 \text{ lbs., about 11 net tuns,}$$

which was an entirely uncalled for transverse strain on the column, and what caused the accident.

The weight on each bracket was: 10 feet out by 15 feet long—150 feet×52 lbs.—7,800 lbs.; one half weight on end of bracket—3,900 lbs, exerted at $\frac{1}{2}^0$—5,570 lbs., or 2¾ net tuns diagonal transverse strain on the column, acting in the same direction as that produced by the tie of the arch just above it.

The following is a summary of the strains on the column:

Vertical pressure, weight of roof, 6·15 net tuns; unnecessary transverse strain of tie to break the column across, 11 net tuns; diagonal transverse strain at the bottom of the bracket, in the same direction as that exerted by the tie, 2¾ net tuns.

Taking these spindle columns, whose dimensions are about suitable for a summer house or verandah, at a safe weight of one fifth the breaking weight, when subject to a vertical load and then only when the ends are at planes with their axes, we have the safe weight at $8\frac{8}{10}$ tuns. Nothing less than one fifth the breaking weight will do, as at one fourth the breaking weight it was found, by experiment, that incipient crushing took place. This safe weight allows nothing for a lateral blow caused by merchandise falling, in transmission, against the column. For a column where transverse strain is to be exerted, calculation should be made in accordance with the formula for strength of beams, as well as that for the columns.

In regard to the tie rods, they were not nearly up to the standard required for safety; a five eighths inch round rod is equal to about three tenths square inch of cross section. The working strain should not exceed the limit of its elasticity, which is about eight tuns per square inch. The Board of Trade of Great Britain permits, as a maximum working strain, but five gross tuns per square inch of cross section. In this case, the tie rods should have been at least one and a half inches in diameter to resist the thrust of the arch; and the columns seven inches in diameter, and one inch thick, providing the tie rod was not attached to it.

I would ask why it is that more stringent laws should not be enacted, whereby some restraint can be placed upon the construction of such insecure structures, equally so with the laws governing the construction and use of steam boilers? Here is a structure, every part of which, with the exception of the corrugated roofing, is largely deficient, imperiling the lives of hundreds of people under the trap daily.

PETER H. JACKSON,
Inspector of Iron Construction, Department of Buildings.
New York city, March 1, 1872.

Fall of the Roof of the Depot, Saratoga Springs.

To the Editor of the Scientific American:

In reading your number of February 17, in regard to the fall of the Saratoga depot, built of iron with corrugated roof, I was reminded of a paragraph in Achille Cazin's work on "Heat."

From the diagram in your paper, and the description of the case, it occurs to me that the columns, being vertical, were drawn inward by the contraction of the iron roof, aided by the iron cross bars. It seems that the weather was very cold, and there was snow on the roof. Now suppose that when the roof and iron bars were fitted to the vertical columns, the weather was warm, and the iron expanded to its greatest extent; the contraction by change of temperature to intense cold would be, in a distance of one hundred yards, 2½ inches. If the roof and rods of the depot were thus contracted, the vertical columns, having nothing to counteract this inward pressure and having the weight of an iron roof with snow upon them, canted, say two inches from the perpendicular. It occurs to me that these facts may account for the catastrophe at Saratoga.

"The laws of the dilatation of metals," says M. Achille Cazin, "deserve the more careful study seeing that iron especially is now so generally used for building purposes. A serious question might be raised, whether its universal employment is not in some degree censurable, and whether, in fact, our houses and public buildings are not exposed to accidents owing to simple change of temperature—so of iron bridges, so of metal roofs, gutters, etc. A chain of one hundred yards will vary 2½ inches in the course of the year," etc. (Page 145.)

Again, on page 143, Cazin says:

"A very curious application of the force of contraction of solids has been made by the architect Molard, on the building of the *Conservatoire des Arts et Métiers*, in Paris. The walls of a vaulted gallery had been pushed outwards by the weight of the superincumbent masonry, and it was feared the whole would fall. Molard arranged iron bars in a parallel direction, passing through the walls and carrying at both ends a screw thread fitted with screws. He heated the bars throughout their whole length, and having immediately screwed them up tight, allowed them to cool. The contraction of the iron, which proceeded slowly as it cooled, drew the walls nearer together without endangering them; and this was repeated at several trials, until the walls were re-established in a vertical position."

Suppose they had been so at first, would they not have caved in? R. B. M.

Utica, N. Y.

Tubal Cain.

To the Editor of the Scientific American:

In your issue No. 5, current volume, is a very interesting article, "The Antiquity of the Iron Manufacture." I venture to call your attention to an error therein in history.

Tubal Cain is spoken of as the half brother of Noah. In the fourth chapter of Genesis, it is shown that Tubal Cain was the seventh from Adam, through Cain; while Noah was the tenth from Adam, through Seth.

Pickereltown, Ohio. J. H. GREEN.

[Lamech is mentioned, in the chapter quoted by our correspondent, as the father of Tubal Cain, and he is also stated, in the fifth chapter of the same book, to be the father of Noah. There is no reason for our believing that there were two Lamechs. Probably the confusion arises from an inaccuracy in the translation.—EDS.

The Flexible Marble.

To the Editor of the Scientific American:

In your paper of the 17th, I noticed an article on the flexible stone in possession of Mr. Holliday of this city, and having examined the wonder, allow me to say that it is not itacolumite, which is a sandstone and belongs to the talcose series, but a very pure carbonate of lime, the crystals of which exhibit the usual variety of forms that, according to

Dana, American marble should. The analysis gave but traces of impurities.

Under the microscope the exterior of the crystals was opaque, while the center was translucent and hard. I judged that there was partial calcination, either of the outside of each crystal or of the group of crystals, and perhaps that might account for the flexibility. Or, perhaps a part of the lime, rendered soluble by the calcining, was dissolved out while lying a year exposed to water almost constantly.

One thing is certain, that while the slab retains almost precisely the appearance of a piece of marble that has not endured such exposure, it is easily penetrated by a penknife blade to the depth of nearly half an inch. Considering the inutility of the thing, and the somewhat exaggerated accounts of its flexibility, I think ink enough has been shed over it.

E. E. WORTHEN.

Wheeling, W. Va.

[Professor James Orton, of Vassar College, states that a specimen of flexible marble was once in the cabinet of Williams College, about 6 feet by 8 inches wide. It is quite flexible for marble. It was soon broken by rough handling. He does not think a knife would penetrate it, as in this case. He conjectures that the Wheeling specimen owes its flexibility to a disintegrating process which has proceeded just far enough to allow some freedom of motion among the crystalline particles.—EDS.

[Reported for the Scientific American.]

SOCIETY OF ARTS OF THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

MEETING HELD AT THE INSTITUTE IN BOSTON, FEB. 8, 1872.

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

Mr. Edmund H. Hewins read a communication, well illustrated by photographs projected upon a screen by the calcium light, on European and American bridges, and compared the cost and methods of building bridges in the two countries.

It is now generally acknowledged that the "truss" is the form which admits of the greatest economy in the use of material; and yet there are some engineers who cling tenaciously to the old plate or box girder. A few years since an engineer of wide reputation and large experience condemned a truss bridge, giving as a reason that the peculiar construction would cause the iron to crystallize from the trotting of horses over it. The bridge was consequently built as a plate girder, and the cost was more than fifty per cent greater than it would have been for a truss bridge.

The days of tubulars, girders, etc., have substantially passed away; there will be no more Britannia or Victoria bridges; they stand as vast monuments of indomitable will and energy. All honor is due to Stephenson for building the bridge over the Menai Straits; considering the then limited knowledge of the use of iron in bridge building, it is a monument worthy to make his name famous for ages to come.

Brunel has done even more; the Saltash is a conception more gigantic, and as much a flight of genius—a work which will remain when the other is destroyed by time.

Truss and lattice bridges now predominate, the latter being but a form of the first.

THE BRIDGES OF EUROPE

are secured together by almost innumerable rivets; the various parts being usually composed of plate and angle iron riveted into box and other forms best calculated to resist the storms to which they may be subjected. The building of parts in this manner requires much care and is very expensive. The rivet holes deduct a considerable amount from the strength without reducing the weight.

A strut or tie composed of several pieces riveted together has not an effective strength proportioned to its section, for it is impossible to bring the different pieces to an equal strain at the same time. The engineer has here to make an allowance which is a very variable quantity. The ties and struts are rigidly connected with the chords.

Whenever a load comes upon a bridge, there must be some deflection; this causes a distortion of the form of each panel, and as the ties and struts are rigidly connected to the upper and lower members, a powerful leverage to bend them is the result, and there is at the same time an increased strain upon the rivets.

In the crossing of a railway train or other partial load, the counters, necessarily, not being in readiness to receive their proper strains at the proper moment, allow an undulation which materially increases the bending strains upon the ties and struts. This occurs every time a train or locomotive crosses the bridge.

The trusses used in American and European bridges are very similar; the essential difference being in details of construction, which in the European bridge are very expensive, as so much hand labor and fitting is required. A large amount of material is used which is mere dead weight, being of no use in sustaining the load or itself. The action of such a bridge is necessarily unsatisfactory from the fact that certain portions receive strains in practice which are not legitimate, and consequently must tend to shorten its life.

The following data were collected in Europe by Mr. David Buck. The viaduct of Fribourg, on the Orleans Railroad in France, is composed of eight spans of 160 feet each, and has a hight of 250 feet above mean low water of the Sarine. The piers have a masonry foundation 89 feet high, with a metallic superstructure of 142 feet. The total length of the viaduct is 1299·88 feet, and cost, above the masonry, $366,000 in gold, or $282 per lineal foot. The figures for three other viaducts on the Orleans railroad are as follows:

THE VIADUCT OF THE ROUBLE.

6 spans of 164 feet each, total length	984 ft.
Hight above masonry, average	138·76 ft.
Cost per lineal foot	$167.00

THE VIADUCT OF BELLOU.

3 spans, average length 140 feet, total	420 ft.
Hight above masonry	137·76 ft.
Cost per lineal foot	$123.00

THE VIADUCT OF NEUVILLE.

2 spans of 161·13 feet each, total length	322·26 ft.
Hight above masonry	136·18 ft.
Cost per lineal foot	$112.00
1 span	77·08 ft.
Cost per lineal foot	$108.00

THE AMERICAN TRUSS BRIDGE,

instead of being bound together in one solid mass, is composed of various members, each independent of its neighbor, so far as its own work is concerned, each having a specific and defined duty to perform, and proportioned accordingly. By no change of temperature, or variety of load in amount or position, can any but legitimate strains be imposed upon any part. The joints are made with pin connections so that a deflection can bring no twisting or bending strain upon any of the parts—and though the form of each panel be very much distorted by an approximation to the breaking load, no excess over the proper strain can be brought to bear on the bridge. Each part is known to receive its proper strain at the proper time, as they are made adjustable in all directions, and by this means the vibration and undulation are reduced to a minimum. American bridges have astonished the world that such light structures should have so little deflection and undulation.

American bridges are cheap to build. Most of the work is done by machinery instead of hand labor, and but little skilled labor is required.

Work done by machinery does not cost one half as much per pound as work done by hand. Considerable expense is also saved in handling and erection.

It is sometimes necessary to erect bridges over streams which are liable to rise suddenly and sweep away the temporary works. In such a case, the loss would be incalculable in time and money, if the bridge should be carried away.

Our bridges—built as they are in parts which are seldom too heavy for two or three men to handle—can be erected in a very short time.

A 200 feet span could be swung clear of the staging in three or four days, while the plate girder, lattice, or European truss would require as many weeks. The average cost of railroad bridges in America is about one half as much in currency as European bridges cost in gold.

ANCIENT BRIDGES.

Professor Watson made a few remarks concerning ancient bridges.

The Sublicius Bridge across the Tiber at Rome was the first of which we have drawings and descriptions. It was built B. C. 616, and was of wood. It was replaced by a stone bridge and this subsequently by a marble bridge.

The Senator's bridge, now called Ponte Rotto, was built by Scipio in the year 127 B. C., and reconstructed by Gregory XIII in 1575.

The bridge of Trajan across the Danube, built in 104 A. D., had piers of stone with a wooden superstructure.

The bridge over the Elbe at Dresden has eighteen arches of sixty-three feet span. It was built in the year 1200 and restored in 1731.

Michael Angelo built the Rialto at Venice in 1578. The order of "*Frères Pontifes*" was instituted in 1189, for the purpose of building bridges in Italy and France. This order existed for about five centuries.

"MINERAL WOOL."

Professor Pickering exhibited two novelties he had received from Dr. Wm. Wahl, of Philadelphia. The first is a white fibrous substance, resembling asbestos, which is made by forcing high pressure steam through melted slag.

This mineral wool, as it is called, is a good non conductor of heat and is, of course, incombustible. It seems well adapted for steam packing and a variety of uses. The second novelty was a plate of glass on which an engraving has been made by the sand blast. A photograph was first taken on the glass, which was then covered with a film of gelatin and bichromate of potash, and exposed to the light. The light renders the film insoluble; and after washing off the portion unacted on by the light, the plate is ready to be subjected to the sand blast; the remaining insoluble portion of the film protects the parts of the glass which it is not desirable to cut.

He then made a few remarks about the various methods of photographic engraving.

With the earlier processes, it is necessary that the printing be done on a lithographic press and that the object be entirely in black and white.

The New York Lithographing and Engraving Company have succeeded in printing the photographs on a common printing press. To do this, it is necessary that the dark portions of the photographs should be raised above the white. This object is secured by means of the film of gelatin and bichromate of potash, as above described.

Specimens of Woodburytypes, Albertypes, heliotypes and autotypes were exhibited, and their peculiarities and different applications pointed out.

Mr. Markoe showed an improved achromatic stereoscope, made by Mr. Beck, of London. It admits of the use of opaque or transparent objects, and can be readily adjusted to suit the focal distances of both eyes, in case they should differ.

W. O. C.

Changing Clothing---Pneumonia.

Pneumonia has prevailed in this city during the past month, to unusual extent and many of our well known business men have fallen a prey to the disease. Our physicians say that they have never before known the disease so difficult to treat successfully. The following from *Hall's Journal of Health* for March is timely and worthy of consideration by all.

In the latitudes of New England and New York, going westward, the month of March is the most disagreeable of the whole year, with its changing temperature, its slosh and mud, its cold, raw, piercing, damp winds; and although not as cold as January and February, it is more prolific of dangerous diseases, greatly promoted by the hurry of the people for lighter clothing; but it would be a great deal better to wear the entire winter suits through March, and even to the middle of April; and even then, until the first week in May, to make no change in the outer clothing, nor any in the inner garments, except to a less heavy woolen next the skin; for it is only for the three hours embracing one o'clock in the afternoon that winter clothing is at all oppressive; while the very warmth of noonday makes the raw dampness of the morning and late afternoons specially felt.

All changes to a lighter or cooler garment should be made at dressing in the morning; and if in any case the change leaves the body chilly, or if soon after it is made the weather changes to be much cooler, by all means promptly, without half an hour's delay, resume the full winter dress. The old, the young, the invalid, in short all persons of feeble constitutions of small vitality, should be especially careful to heed these suggestions; inattention to which gives rise to the very frequent announcements in the morning papers, in the early spring: "Died suddenly, yesterday,———, of pneumonia,"—often, the very friend whom we had met in the street, or at church, within a week, apparently as well and as hearty as ever before.

Softening Frozen Ground for Excavating.

This invention has for its object to reduce the expense of digging the ground during the winter season for building or other purposes; and consists in the application of steam to frozen ground for the purpose stated. At present, with frozen ground, the digging in winter is very expensive and difficult, and consequently the preparation for a commencement of building during the cold season is not generally undertaken on account of the greater expense. The hands are, therefore, mostly idle in winter. All this will be, it is claimed, avoided and a flourishing trade continued throughout the year by the introduction of an inexpensive system of softening the frozen ground.

The inventor, Mr. Andrew Derrom, of Paterson, N. J., claims to have ascertained that a small jet of steam applied underground will take the frost out of a disproportionately large extent of earth. He practically utilizes the discovery by applying steam, under pressure from a boiler or steam generator, which is conveyed under the earth in a suitable pipe. As it is forced out of the pipe, it interpenetrates the particles of earth, is condensed, parts with its latent heat, and is asserted to thaw an astonishing space of ground in proportion to the quantity of steam employed.

Postal Telegraphy.

In England, all the telegraph lines are now owned by the government, and short messages may be sent to any part of the kingdom for twenty-five cents. The government issues what are called postal telegraph cards, bearing a twenty-five cent postal stamp. On this card you write your telegraph message, and drop it in the lamp post letter box. The letter carrier delivers it to the telegraph department, and the message is promptly forwarded to its destination. The English Government has been petitioned to purchase all the submarine telegraph cables leading from England.

A Queer Case.

Dr. H. Vogel, writing from Germany to the Philadelphia *Photographer*, relates a queer case. A photographer made pictures of two brothers, who refused to take or pay for them on the ground that they were not likenesses. The artist complained, but the judge was of the same opinion as the brothers, and decided that the pictures were not likenesses. Mr. Photographer then went home with his rejected pictures and placed them in his show window, with the label, "The murderers of Mrs. X." The brothers then waited on the artist and alleged that it was a libel to expose their pictures with such a title, and, on his refusal to remove the placard, they entered suit. It remains to be seen how the judge will decide in this new phase of the affair.

PEARLS.—Mr. R. Garner lately read a paper before the Linnean Society, London, in which he referred to the theory, now generally adopted, that the production of pearls in oysters and other mollusks is caused by the irritation produced by the attacks of the minute parasite known as *Distoma*, and believed that, by artificial means, this parasite might be greatly increased. British pearls are obtained mostly from species of *Unio*, *Anodon*, and *Mytilis*, but it is probable that all mollusks, whether bivalve or univalve, with a nacreous lining to the shell, might be made to produce pearls.

MR. JOSEPH B. SYKES, of West Hartford, Mo., writes to inform us that large and severe sores on his legs have been cured by the use of a remedy prepared according to the following prescription: To 1 pint sweet milk, a heaped teaspoonful pulverized alum is adding while stirring, the milk being at a temperature high enough to curdle it. The whey is poured off, and the curd is applied to the sore. The sores arose from accidental bruises and abrasions, and had been troubling our correspondent for many years.

THE LOWELL WATER WHEEL TESTS.

Some of the water wheel manufacturers, whose wheels have been tested at Lowell, have expressed dissatisfaction at the table of results, furnished by Mr. Risdon, published in our issue of February 24. In the hope of satisfying all parties we append herewith a tabulated statement, furnished by Mr. Emerson, which he asserts to be correct. In the report from which this table is taken, the writer states that the Risdon wheel was bound slightly in the upper bearing, at Lowell, causing a loss of perhaps one per cent, while it ran perfectly free at Mount Holly, where it gave 84·60 as the highest result. It will be seen, by referring to the table previously published, that the latter was included under the Lowell tests; but it seems the result was obtained at another time and in another place.

NAME.	Size.	REMARKS.	Ft. Head.	PERCENTAGE OF PART GATE. ¼	⅜	½	⅝	¾	WHOLE GATE. H.Power	Per cent.
Swain	42 in.	In quarter turn	14.25	.....	.....	.....	.....	.....	63.00	82.2
"	36 "	" " "	15.10	.....	.....	.....	.....	.....	46.30	77.56
"	36	Wood flume	15.10	13.10	43.20	67.00	71.90		45.40	74.60
"	30	" "	15.41	.....	47.30	59.20	59.20	72.80	36.40	76.17
"	24	Quarter turn	16.66	.....	54.17	.....	72.30	.....	24.26	77.69
"	24	Wood flume	15.89	.....	55.40	.....	67.60	72.90	18.67	72.60
Leffel	40	Iron case, extra finish, expressly for test	.....	.....	.....	.....	.....	.....	42.00	79.70
Common finish.	30¼	Wood flume	15.40	.....	59.10	64.80	66.40	67.50	31.82	74.30
Bodine Jonval.	33	Iron case	14.70	.....	.....	.....	.....	.....	34.60	75.90
Bryson turret.	42	Wood flume	14.00	.....	.....	.....	.....	.....	.....	75.14
" "	30	Iron case	14.51	.....	.....	.....	.....	.....	26.00	74.10
Tice	30	Wood flume	.....	.....	.....	.....	.....	.....	.....	.....
Houston	30	" "	8.50	.....	.....	.....	.....	.....	11.25	82.30
"	35	" "	15.50	.....	.....	.....	.....	.....	41.28	79.94
Second	35	Iron case. Ice in flume and on weir	14.15	.....	.....	.....	.....	.....	37.36	77.50
"	30	" " " " "	15.80	.....	.....	.....	.....	.....	26.81	78.80
Third	30	Wood flume	15.00	.....	45.50	48.60	60.90	65.00	29.45	81.20
"	30	With four guides stopped with blocks of wood	.....	.....	.....	.....	.....	.....	22.72	76.00
"	30	With seven, or one half, the openings stopped, discharging a little more than half water	.....	.....	.....	.....	.....	.....	5.76	70.30
Trullinger	30	Brass buckets, bound in curb and burst	15.69	.....	.....	.....	.....	.....	19.31	50.64
Second	30	Iron buckets. No reliable part gate	15.80	.....	.....	.....	.....	.....	27.78	70.37
Kindleberger	25		15.30	.....	.....	.....	.....	.....	25.22	62.46
Stetson	30	Open flume—1870	15.79	.....	.....	.....	71.60	.....	25.72	78.46
"	30	In decked flume—1871	15.69	.....	56.84	.....	72.83	.....	26.13	79.26
Second	30	Deeper, greater discharge	16.17	.....	.....	.....	.....	.....	29.32	74.10
Same	30	Suspended by the neck	16.07	.....	55.76	.....	70.36	.....	27.17	75.70
Another	30	Like the above, with one bucket less	16.00	.....	55.41	.....	71.79	.....	29.61	77.40
Same	30	Suspended by the neck	14.76	.....	.....	.....	.....	.....	26.81	79.08
Upham	36	Wood flume. Bound in curb and crumbled to pieces	15.99	.....	.....	.....	.....	.....	18.32	52.08
Second	36	" " Same curb bound badly	15.59	.....	.....	.....	.....	.....	22.06	58.82
"	36	Scroll	15.85	.....	.....	.....	.....	.....	26.53	72.84
Third	36	Wood flume. Bound in curb	15.64	.....	.....	.....	.....	.....	17.11	53.78
Fourth	36	" " Less No. of buckets than the above	16.52	.....	.....	.....	.....	.....	18.96	60.03
Fifth	36	Scroll. Scroll 1¼ in. in depth less than the above	16.38	.....	.....	.....	.....	.....	20.65	64.09
Sixth	36	Less buckets. The 4 wheels made with plates at top	16.38	.....	.....	.....	.....	.....	20.05	64.09
Seventh	36	1st scroll wheel made with arms, openings between, tested in reduced scroll	16.31	.....	.....	.....	.....	.....	22.38	67.42
Luther	30	Scroll wheel	16.10	.....	.....	.....	.....	.....	18.91	70.51
"	16	Discharged so little water that it would not carry brake	.....	.....	.....	.....	.....	.....	.....	.....
Wheeler	36		15.65	.....	.....	.....	66.90	.....	27.73	74.50
Second	36		16.10	.....	61.56	.....	70.62	.....	29.63	74.46
Third	36		15.61	.....	.....	.....	.....	.....	25.56	67.61
Whitney	30		15.28	.....	.....	.....	.....	.....	23.48	67.13
Second	30	Greater discharge	5.71	.....	.....	.....	.....	.....	23.59	.....
Third	30	Three less buckets. Results better than with more	15.66	.....	.....	.....	.....	.....	27.07	.....
"	18	Sliding gates	15.15	.....	.....	.....	.....	.....	11.70	.....
Wynkoop	42		15.12	.....	.....	.....	.....	.....	36.22	55.99
"	42	Cut hole in draft tube. Large quantity of water escaped unmeasured	10.90	.....	.....	.....	.....	.....	21.88	62.60
Davis	36	See his patent curb. Wheel burst after running a few minutes	16.30	.....	.....	.....	.....	.....	30.97	66.90
Second	36	Curb tried for part gate tests, but nothing seemed gained by the arrangement	15.17	.....	.....	.....	.....	.....	36.42	68.56
Third	36	Like the Warren	15.48	.....	.....	.....	.....	.....	33.30	63.46
Tyler	42	In use six years	15.20	.....	.....	.....	.....	.....	34.90	55.56
"	30	New, none sold	15.70	.....	38.11	.....	59.08	.....	27.13	73.83
Second	30	Old style, wrought iron buckets	15.69	.....	.....	.....	.....	.....	25.91	67.04
Third	30	Old style, cast whole, cast iron buckets	15.53	.....	.....	.....	.....	.....	25.66	67.01
Burnham	24		15.40	.....	48.16	.....	64.63	71.95	19.71	77.09
"	36⅛	Tested with rigid shaft	15.27	.....	45.60	54.60	.....	71.00	42.18	78.60
"	36⅛	Clutch couplings used	15.57	.....	.....	.....	.....	.....	43.27	78.50
"	36¼	Rigid couplings. Buckets and shaft filed	15.42	.....	.....	.....	.....	.....	43.27	79.10
Buzby	36		14.97	15.93	43.08	.....	58.51	63.25	24.40	66.13
Cook	30	Buckets changeable	15.70	.....	56.78	.....	67.92	.....	27.53	73.11
Second	30	Double buckets	14.71	.....	66.10	.....	74.90	78.20	28.14	72.40
Bastion	30	Intended to be like Houston's	16.25	.....	26.51	.....	48.30	.....	18.04	66.75
Second	30	Wicket gate	16.10	.....	.....	.....	31.40	.....	27.64	69.70
Third	30	" "	16.06	.....	9.35	.....	34.60	.....	24.67	70.10
Risdon	30	With diffuser on. Diffuser was a flaring tube underneath	15.79	.....	.....	.....	.....	.....	27.53	77.09
"	30	Diffuser off	15.98	.....	37.41	.....	66.59	.....	27.42	77.14
"	36		15.92	.....	41.17	53.08	69.02	.....	36.57	78.71
Eclipse	24	Experimental to determine effect of changes	.....	.....	.....	.....	.....	.....	.....	.....
Barber	30	Combination—two wheels—test of upper wheel alone	15.97	.....	.....	.....	.....	.....	24. 8	66.56
"	30	Test of the two combined	15.03	.....	.....	.....	.....	.....	26.30	68.43
Teller	30	Double wheel	14.78	.....	.....	.....	.....	.....	27.27	64.50
"	24	"	16.11	.....	.....	.....	.....	.....	20.64	53.80
Libby	30	An inverted Houston's	15.36	.....	11.50	.....	41.42	48.88	25.78	75.81
Second	30		15.94	.....	.....	.....	.....	.....	21.05	64.80
Third	30		15.42	.....	.....	.....	.....	.....	27.13	77.80
Gardiner Cox.	30	Double—Spiral and Jonval	14.87	.....	45.90	.....	64.30	69.50	20.11	70.00
Thompson	30	Somewhat like Houston's	15.87	.....	53.90	.....	68.90	69.10	24.50	72.00

City Disinfection.

The excreta of man and animals contain all the mineral matters formerly contained in their food. It is, therefore, obvious and most natural, yet more, an absolute necessity, to return these excreta to the soil. Fresh feces contain an average of twenty-five per cent of solid matter and seventy-five per cent of water. The mineral matters consist of one third of phosphoric acid. Dried feces are, of course, much richer on account of having lost the water. A city of one hundred thousand inhabitants would yield per year 1,300 tuns dried feces, containing 112,000 lbs. of phosphoric acid.

Professor Liebig says: "The coming generation will consider those men as the greatest benefactors of mankind who devote all their efforts to utilize and save the night soil of the cities." Poudrette works have been established in the United States, Germany, France, and England, but none have ever yet united the sanitary with the agricultural interests. Some trials have been made to employ iron salts for disinfecting the night soil, but such a poudrette is almost valueless. Other trials were made with lime, which only caused the loss of the ammonia, and had no disinfecting value whatever. Dr. Julius E. Dotch, of Washington, D. C., has patented a method for such disinfection, which appears to be of value. It consists in the application of a prepared earth, containing clay, sulphuric acid, and nitric acid, which is spread in thin layers over the fresh feces.

By this means, not only is the formation of fungoid growth effectually prevented, but also all the ammonia is taken up on account of the sulphuric acid; and the sulphuretted hydrogen developed from the feces will be entirely destroyed by the nitric acid present in the patent earth.

A Lecture on Rattlesnakes.

Two miles out on our road back, we found Straddlebug sitting like a statue, gazing at something in the road just ahead of him. "Come here, General Bradley," he called, "I want to introduce you to one of the inhabitants of this delightful country," at the same time pointing to a monster rattlesnake coiled in the trail. "I have been plaguing him," continued old Straddle, "and he is a game fellow. See," he added, holding out his sabre toward the reptile. Quickly the snake raised his chest and sprang his full length, falling within two feet of the legs of old Straddle's horse. "Look out there, or he'll bite you," cried General Bradley. "Not a bit of it," replied Straddle. "The fact is, General, I have been studying this specimen of the natural productions of this country for more than an hour; and I have found out, first, that he will not bite unless coiled; second, that he can only jump the length of himself when coiled." He then made the snake coil up again and strike two or three times. "He ain't much of a traveller, either," said old Straddle, whipping the reptile when stretched out and making it run as fast as it could. "He coils tail first," continued the experimenter, making him coil, "and like an honest fellow, gives fair warning before he strikes, which is more than some of our own kind do, General; besides, I don't believe he'd strike in the dark at all. You will readily observe," continued old Straddle, growing facetious, "the difference between the nature of the snake and the dog; a dog shakes his tail to show you he is pleased; the snake shakes his tail to show you he is mad. Look at that eye, sir; I have looked a mutineer in the eye and disarmed him; but I would not like to look at that fellow steadily in the face for the space of five seconds." The snake was coiled, his body resting on his tail, and his head raised to the hight of a foot, and his neck proudly curved. His eyes shone like two little diamonds, and his yellow skin glistened in the sun. The spots on his back seemed ever changing from dark brown to a bright red copper color. "Come," said old Straddle, "I'll bet there's not a man in the crowd can shoot him in the head." (It is said to be almost impossible to shoot the head off a rattlesnake. The hunters declare that their sensitiveness is so great that they can feel the wind of a coming bullet, and dodge it. Be this as it may, I have seen men who could hit a bull's eye or drive a nail at one hundred yards that could not shoot a snake in the head.) Several revolvers were levelled and discharged at him, but the snake remained unharmed. A soldier then dismounted, and taking a carbine, at the fourth shot nearly severed the body of the reptile. "Foul!" cried out Straddle; "you hit him in the body; but take off the rattles, the game is yours." The man did as he was bid, and there were eleven rattles and a button.—*Letter from the Plains to the Philadelphia Press.*

MANUFACTURE OF THE SULPHATES OF SODA AND POTASH, AND CHLORINE.—Henry Deacon, of Warrington, Eng., has recently patented in this country a process of manufacturing sulphate of soda and sulphate of potash and chlorine, by causing heated sulphurous or sulphuric acids, mixed with air or oxygen and with or without vapor of water, to pass in succeeding alternations over, through, or in contact with certain chemical substances called catalytic, and over, through or in contact with the alkaline chlorides, common salt, or chloride of potassium, which alkaline chlorides are kept separate from the said catalytic substances or may be easily separated therefrom by mechanical means.

Velocity of Meteoric Stones.

In Professor Nordenskjold's account of the aerolitic shower which took place near Hessle, in Sweden, on the 1st of January, 1869, he mentions as a remarkable fact that stones weighing two pounds, which struck the ice of the Larsta-Viken, failed to penetrate, making holes only three or four inches deep in the ice and rebounding.

The small velocity retained by these stones, at the time of striking the earth is, doubtless, owing to the resistance of the air, and, consequently, is not an indication of the velocity which they had upon entering the atmosphere.—*Nature.*

The interest of the above, says the *American Gas Light Journal*, lies in the fact that many meteorites have been proved to pass into the atmosphere with a swiftness more than ten thousand times greater than that of the swiftest cannon ball. The flame that attends their passage is believed to be due to heat produced by their compression of the air in front, as in the "fire syringe." The writer has before suggested that, if a cannon ball could be projected with this velocity, it would burn up instantly as a streak of intensely brilliant flame. The probability is that the impulse necessary, however, to impart such a velocity to a cannon ball would grind it to powder in overcoming its inertia. We have also before thrown out the idea that aerolites which reach the earth are such as have had their velocity so reduced by friction that they become cooled below the vaporizing point before reaching the earth. The comparatively low velocities above recorded are thus easily understood. Much must depend on the angle at which they first strike the atmosphere. Some think that, in meteoric showers, they merely flame through the outer edge of the atmosphere, and shoot on in their appointed paths, like messengers from the outer universe who merely call to take a look at the earth in passing; but it may be, on the other hand, that these "falling stars" are altogether consumed or dissipated, reaching us only as impalpable dust.

Copper Gas Pipes.

The *Journal de l'Eclairage* notices an accident which once more proves the danger of using copper gas pipes. On the 21st of April last, a workman having, with a triangular file, cut almost through half the diameter of a gas pipe of red copper of ⅝ in. interior diameter, which supplied the Liége station, was removing the tool when an explosion similar to the report of a rifle ensued, and the workman was much burnt.

A similar incident happened the other day, with less intensity, however; and the workman, who was not injured, did not report the circumstance. Some gas pipes having been taken down, they were found covered with a blackish coating, and they showed evident signs of corrosion from ammoniacal condensation.

The black matter was analyzed, and was found to consist of an acetate of copper, which exploded between 203 and 248 degrees, producing water, copper, carbon, carbonic acid, and traces of carbonic oxide.

Coating Cast Iron with other Metals.

We are constantly receiving queries requesting information in regard to tinning, zincing, and coppering small iron articles. While we have often answered these by details of processes that we have found to answer, and which our readers have contributed to our column of answers, it is evident that there are various practical difficulties which arise to defeat success in many cases. If our correspondents who have had the requisite experience can give directions how to escape these stumbling blocks, the information will be gladly received by many readers.

SWEETENED FUEL.—During a recent passage of the steamer *Morro Castle* from the West Indies to New York, a fearful storm was encountered, which lasted four days. The coal fuel became short and, it appearing evident to Captain Curtis that if the engine stopped the vessel would be lost, he ordered the firemen to make use of sugar in the fires. Chairs and other furniture were also broken up and burned. Mixed with coal and wood, the sugar proved to be a good heating material, and by its use the ship was saved. Ten thousand dollars worth of crude sugar was consumed.

AN American engineer, now engaged in the construction of the Arequipa and Puno railway in Peru, a railway which twists about among the Andes, gives the following items: This road is to be 220 miles long, its highest grade line will be 14,600 above the sea; its terminus at Puno is on the shore of Lake Titica. The gage is 4 feet 8½ inches. The steepest grades are 211 feet to the mile, curves 16 degrees. From Arequipa to the Pacific coast, 100 miles, a railway is now in operation.

MR. G. D. HAMILL writes to say that, in our article on Japanese native steel on page 136, current volume, speaking of him as having the position of superintendent of the Imperial arsenal at Tientsin, we were in error. Mr. Hamill is the foreman of the machine shop department of the arsenal.

THE iron plates intended to protect the turrets of the great war ship *Devastation*, which is being built at Portsmouth, Eng., each weigh twenty-four tuns and measure twenty feet in length, nine feet in breadth, and eight inches in thickness.

A DOUBLE line of telegraph is at present being constructed across the Andes. Thirty miles of this line, which will pass over the snow covered cordilleras, will be constructed of two copper sheathed cables. It is expected that the line will be completed early this spring.

Combined Scissors, Button Hole Cutter, and Tracer.

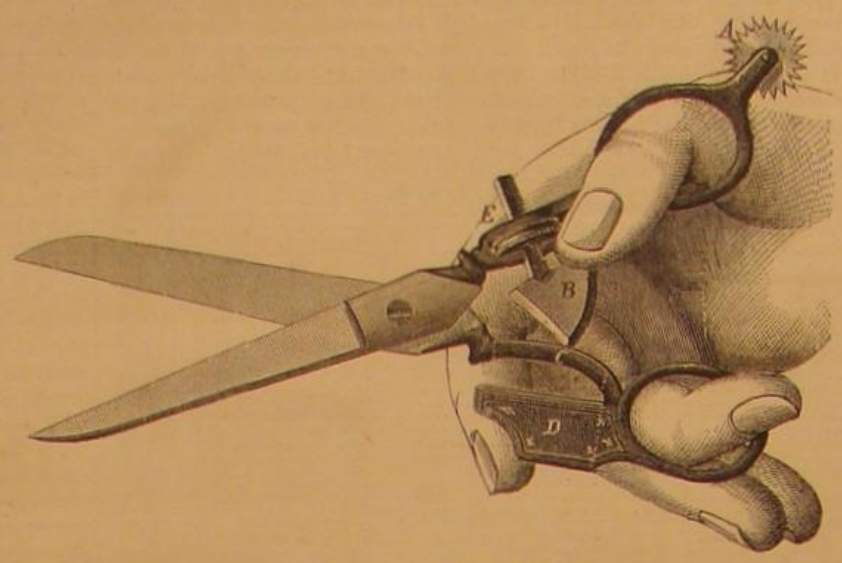
Our engraving illustrates a very simple, and, we think, useful combination of tools to form a single implement, which adds much to the convenience of the ordinary scissors, while it but very slightly increases their cost.

It is, as our heading implies, a combined scissors, button hole cutter, and tracer for patterns, the operation of which will be readily understood, from the engraving, by our lady readers.

The tracer, A, is a toothed marking wheel pivoted to the thumb piece of the scissors. The button hole cutter is a pointed blade, B, which is fastened to the upper branch of the scissors, and which plays through a slot in the lower branch, at C, and passes into a slot in a metallic sheath, D. The edge, of the cloth in which it is desired to cut the button holes, is supported by this sheath, and the size of the holes is regulated by the thumb nut, E, which, turning in a slot in the upper branch and working on a thread cut upon the shank of the buttonhole cutter, raises it or lowers it, so that it passes more or less into the sheath as the branches of the scissors are brought together.

The button holes are thus cut with great facility and accuracy.

Patented by E. A. Franklin, through the Scientific American Patent Agency, February 27, 1872. Address the patentee, as above, or B. R. Franklin (till the 15th of March), at the Merchants' Hotel, Courtlandt street, New York. The latter wishes to negotiate with manufacturers for making the article, or will dispose of rights.



COMBINED SCISSORS, BUTTON HOLE CUTTER, AND TRACER.

A Model Railway Foundery.

The Aurora *Beacon* says that the new foundery of the Chicago, Burlington & Quincy Railway Company, in Aurora, Ill., is 180 by 190 feet. One wing is reserved exclusively for casting car wheels. The cupola which supplies the molten iron for this purpose is of the capacity of seventeen tuns, and the full force is enabled to turn out sixty car wheels per day. This floor is supplied with four monster cranes, which pick up the wheels from the flasks while still at a red heat, and, passing them along from one to the other, convey them to the annealing room. Here are twelve immense pits, of great depth and walled with brick, into which the wheels are lowered one by one to undergo the annealing process. Nearly the entire eastern floor is appropriated to general casting purposes, supplied with another cupola, of the same dimensions and mammoth cranes for handling the ponderous castings produced. Another wing contains the carpenter shop for the repair of patterns, flasks, etc., and the cleaning room, which is furnished with two immense "tumblers" to facilitate that operation. The engine room, in charge of Mr. Keyes, is a model of order and neatness. The machinery of this room was put up under the direct supervision of C. F. Jauriet, Esq., Superintendent of Machinery of the road, and Mr. Prindle, Master Mechanic, a sufficient guarantee that the nearest possible approach to perfection has been attained. All the iron and coal is elevated to the furnaces by steam, instead of the old system of tramways; and one of the celebrated Root blowers furnishes the blast for the cupolas. So perfect is the working of every portion of the machinery that with the eyes averted one will fail to detect the slightest noise, or to dream that a powerful engine, massive wheels, and numerous pulleys are in full operation within a few feet of him.

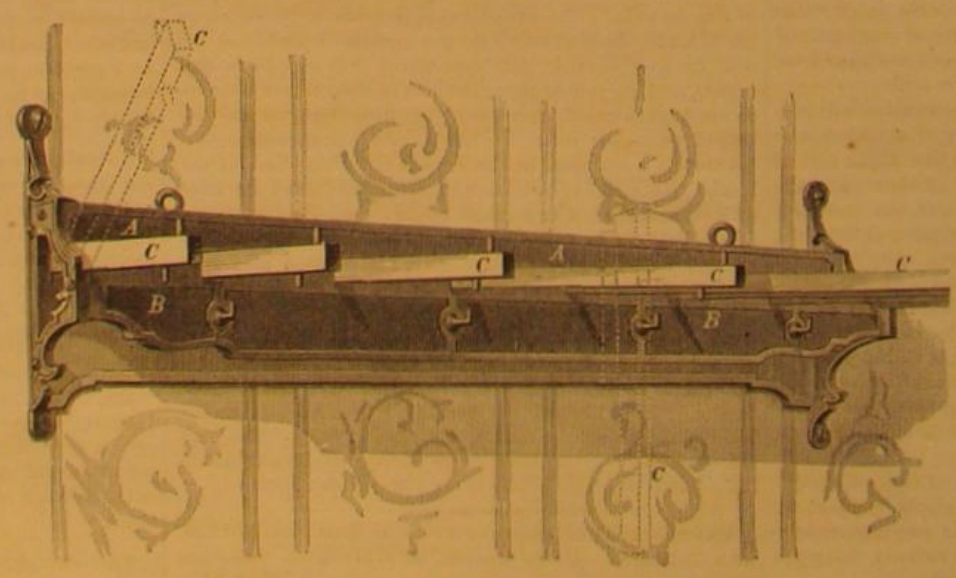
Improved Clothes Rack.

The clothes rack shown in the accompanying engraving is a very neat and handy device, cheap, and easily applied to use. It occupies no floor space, and when not in use can be arranged to occupy but very little space on the wall to which it is attached.

A wall piece is constructed of a back rail, A, and a front one, B. The back rail, A, has a projecting flange, under which the rear ends of the clothes bars, C, bear while they rest in notches cut in the front rail, as shown. The clothes bars have each a short dowel pin extending upward from the rear end, which engages with a hole bored partly through the projecting flange of the rail, A. This prevents their swinging laterally. At the front end of each clothes bar there are two pins placed at a suitable distance from each other, on opposite sides of the bar. The bars, when not in use, may be taken out and, by the two pins described, may be suspended vertically from the wall piece.

The rack, as a whole, may be suspended in any suitable manner from the wall.

Patented, December 19, 1871, by J. & D. Miller, of Marietta, Ohio. For further particulars, address them as above.



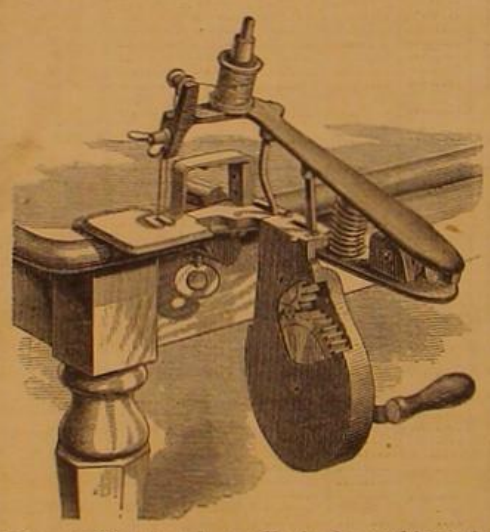
MILLER'S IMPROVED CLOTHES RACK.

Expert Testimony.

There was a fresh example of the worthlessness of expert testimony during a recent trial for forgery at Taunton. A couple of experts disposed of the prisoner at the bar very summarily. When Mr. Henry D. Hyde, of Boston, his counsel, handed the smartest expert four old envelopes and asked him if he could tell whose handwriting was on them, the witness, after taking time to examine them, said that "the superscriptions on the envelopes were all in the same handwriting, and all written by the man who forged the check." Mr. Hyde at once took the stand, and taking the envelopes, said, "This one was written by the clerk of the Boston Water Power Company, this one by a friend of mine in New York, the third is my own hand writing, and the fourth is the prisoner's," substantiating his statement by producing the letters received in some of the envelopes.—*Springfield Republican.*

THE BECKWITH IMPROVED SEWING MACHINE.

Our readers will remember our illustration of a ten dollar sewing machine, published on page 70, current volume. They will also recollect that the needle, in the machine referred to, was carried by a bar, the downward motion of which was produced by the hand through the agency of a wire and thumb-ring, while the upward movement was made by a coiled spring. This arrangement, while it answered the purpose very well, had two defects; first, that it required some practice to acquire the motion of the wrist, necessary to impel the machine properly and make it do uniform work, and secondly, that the speed was limited to the speed at which it is possible to move the wrist with regularity and without fatigue.



Both these defects are removed by the improvement here with illustrated, which consists in the attachment of a strong toothed wheel impelled by a winch, which wheel meshes into an equally substantial pinion, the pinion being also a crank wheel connected to the needle arm by a short pitman. This gearing is protected by a shield, so that neither the cloth nor the dress of the operator can get caught in it. A spring is used merely to balance the weight of the bar and render the power necessary to be applied to the winch more uniform. The speed of the needle is by this means more than doubled, with an expenditure of less labor than before, the exertion required to move the fore arm in the former machine being the principal source of the expenditure of power. A much slower motion of the wrist—while the fore arm is comparatively motionless—now produces more than double the useful effect, and greatly increases the utility of the machine.

No change has been made in the feed, or in the stitch (loop stitch) and the cost of the machine is not increased by the improvement. We have never seen a sewing machine that will work with so little expenditure of power as this. It is self feeding, the stitch may be made long or short, it will hem and tuck, and it sews with facility through a number of thicknesses of muslin.

For further particulars, address W. S. Barlow, President Beckwith Sewing Machine Co., 26 West Broadway, New York.

Power of the Waves.

The tremendous force of the sea was exemplified on a recent passage of the steamship *Helvetia*, from London to New York. At midnight a mountainous wave struck the ship from the starboard side. The captain at the time was standing on the bridge giving orders. The wave caught him with full force, and would have washed him into the sea had he not grasped a funnel stay. After the wave had passed, the captain found himself dangling in mid air, twenty feet from the deck. He held on until rescued. The storm continued with relentless fury for six days, when another monstrous wave was shipped. It carried away two life boats, made a complete wreck of the larboard side of the bridge, destroyed all the ventilators on deck, and tore a hole eight feet in length by two feet in breadth in the smoke stack. Through the aperture thus made, an avalanche of water was precipitated into the engine room. The fires were all extinguished, and for two hours the vessel lay helplessly battling with the waves. After almost superhuman efforts, the rent in the funnel was patched up, the fires were again kindled, and the engines resumed operations.

Durable Sensitive Paper in Photography.

Sensitized albumen paper may be preserved good and white for many days, if placed between heavy paper—that used for copperplate printing—provided the paper is first saturated with a solution (1 to 5) of carbonate of soda, and dried.

Another method, highly spoken of and long practiced by Dr. Vogel, is to wash the paper after sensitizing. This paper requires ammonia fuming when used.

The same author states that paper sensitized in a bath composed of 12 parts of water, 1 part of nitrate of silver, and 1 part of citric acid, keeps perfectly white for six weeks, will print as rapidly as ordinary silvered paper, and requires no fuming.

In the last volume of the SCIENTIFIC AMERICAN, we published a formula for citric acid paper, as presented to the Berlin Photographic Society, consisting of 6 ounces of water and 1 ounce each of nitrate of silver and citric acid. One of our correspondents who tried the formula stated that it gave him red pictures, and that discouraged him from its further use.

Traveling Stones.

Many of our readers have doubtless heard of the famous traveling stone of Australia. Similar curiosities have recently been found in Nevada, which are described as almost perfectly round, the majority of them as large as a walnut, and of an irony nature. When distributed about upon the floor, table, or other level surface, within two or three feet of each other, they immediately began traveling toward a common center, and there huddled up in a bunch like a lot of eggs in a nest. A single stone, removed to the distance of three and a half feet, upon being released, at once started off, with wonderful and somewhat comical celerity, to join its fellows; taken away four or five feet, it remained motionless. They are found in a region that is comparatively level, and is nothing but bare rock. Scattered over this barren region are little basins, from a foot to a rod in diameter, and it is in the bottom of these that the rolling stones are found. They are from the size of a pea to five or six inches in diameter. The cause of these stones rolling together is doubtless to be found in the material of which they are composed, which appears to be loadstone or magnetic iron ore. "Rolling stones gather no moss."

GREAT BRITAIN uses 30,000,000 tuns of coal per annum for power, and thereby adds an equivalent of 133,000,000 of working men to her population without having to feed or clothe them or care for their families.

Scientific American.

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SCIENCE IN THE COURTS.

As science has advanced, it has become an important aid in the discovery of crime. The experts, so called, whose examinations, investigations, and opinions are made a part of evidence in important legal cases, are called by the prosecution and defence and make their statements, upon the value of which as evidence the jury must decide. Now it most generally happens that the judge, who is a master of civil and criminal law, knows comparatively little of Nature's laws. The counsel, *pro* and *con*, are generally as unscientific as the judge, and the jury, as a rule, know even less of science than of law. To prevent their making mistakes on law points, it is the duty of the court to instruct the jury as to the law and the rules of evidence; and it is the duty of the jury to accept his instructions as correct in every particular, and, applying the rules of evidence to the testimony before them, to give a verdict in accordance with these rules upon the issues of facts involved in the case.

Experts, so called, are introduced for the purpose of instructing the jury upon matters upon which neither the court nor jury are supposed to be informed. If the experts, so called, differ in opinions and statements, the jury must judge of the weight to be given to each opinion and testimony, and the evidence of experts, like that of other witnesses, must be taken for what it seems to be worth.

This is, we believe, the rule as concerns such evidence in modern courts of law. It certainly works in a very peculiar manner, and, as applied, does, in our opinion, as often defeat as it helps the administration of justice. Besides, its effect is to throw odium upon science and those who are really scientific, as neither judge, counsel, nor jury are qualified to decide from the evidence given—unless very gross ignorance is exhibited—whether the witnesses are really qualified to testify as to the points upon which they presume to pronounce authoritatively.

To establish the qualifications of the witness as an expert, he is generally asked his age, profession, and experience in the matters upon which he is required to testify. If he swears he has been twenty years a professor of chemistry in some public institution, has practiced medicine a certain length of time, or has been an engineer in some industrial establishment for a stated period, he is thenceforward to the jury, an expert chemist, physician, or engineer, as the case may be; and if he is possessed of the *otium cum dignitate*, coupled with a free use of formulated expressions having the sound of profundity and learning to a juryman's ear, he may swear to any absurdity he likes, and the average arbiter of the jury box will gulp it all down as gospel. To be a professor in an institution of learning, ought to, but does not, always indicate professional acquirements. We all, probably, know some physicians of many years' standing, whom we would not invite to "throw physic to the dogs," if the dogs were *our* dogs. We have many of us met professed engineers who have hardly the qualifications requisite for a boiler tender. It is not what a man ought to know, but what he does know that renders him competent to give an authoritative opinion.

We have plenty of examples of the different, and even conflicting, evidence of this class of witnesses. The testimony taken before the coroners' juries in the celebrated *Westfield* case, is one. Truly, the average juryman must have had a good time in trying to reconcile the legion of theories and opinions ventilated in that memorable investigation.

In Albany, quite recently, one set of physicians swore that in death from abortion, certain *post mortem* appearances must inevitably appear. Another set of medical witnesses swore to just the opposite.

In Philadelphia we have had recently the spectacle of a professed chemist and toxicologist making an examination of the body of a man supposed to be poisoned, and carrying his investigations far enough to convince himself of the presence of antimony, and forgetting there was a jury and a public to be convinced as well, appearing on the witness stand without a particle of proof that he found it, except his bare assertion. The prisoner in this case was acquitted, on the evidence of other experts called for the defence.

In Albany, some twenty years since, a man was hung, for poisoning his wife by aconite, on the evidence of a professed chemist, who swore he obtained aconite by a process that never detected it before and never detected it since, and this, notwithstanding that other chemists swore that the process described would, so far from detecting, absolutely prevent the detection of aconite, were it present.

In a recent trademark suit, relating to the manufacture of mustard, Dr. Ogden Doremus, of this city, swore that mustard seeds contained over eleven per cent of starch. To prove it, he used a solution of iodine upon mustard placed on filtering paper, which paper gave, when tested, the characteristic reaction of iodine with starch when no mustard was present. The error in the experiment was pointed out by Professors Seely and Chandler. Dr. Doremus was aided by Dr. Austin Flint, who tried to confirm by the use of a microscope, what Dr. Doremus tried to prove by the iodine test. Dr. Flint swore that he could see the granules of starch by the use of a high power. Professors Seely and Chandler could not see any such granules, but they did see what they thought might have been fragments of the exterior envelopes of the seeds. Dr. Doremus has, in a letter since published, affirmed the presence of starch in mustard seed (he says nothing of the percentage), and attempted to prove it by a test which would give the same results with cellulose as with starch.

Now, in view of such facts as these, is it any wonder that the public is beginning to mistrust the value of this kind of evidence? Such a mistrust is based upon good grounds enough. As now presented to juries, the testimony of the both competent and incompetent witnesses, only serves to muddle their intellects, and to complicate rather than make plain the facts.

If it be necessary to give juries authoritative instruction on points of law, how can it be less necessary that they should be similarly instructed in matters involving scientific knowledge. To bring before them A, who swears to one thing, and swears to the truth, and then bring B, the charlatan, who looks and talks twice as wisely as A, and denies under oath all that A has asserted, is not to instruct but to mystify them. When Counseller X tells the jury in his address that something is law which is not law, the Court quietly corrects the assertion in his charge, and the correction has the weight of authority. The jury believe the judge and discredit Counsellor X. But when Charlatan B tells them something is science that is not science, the true, yet modest A's assertions are no more authoritative to decide the question than B's. The jury must decide, or rather make a guess, as to what is right or wrong; and the average juryman is rather more likely to guess wrong than right in matters of science.

Now there is a plain, simple, and practical remedy for this state of things. In all cases where there are points of law to be decided, there is an arbiter on the bench to perform that office. There should be an equally authoritative tribunal to decide on scientific points, a separate jury of experts, if may be, constituting, for the time, a scientific court, whose charge to the jury should be as authoritative as that of the judge. Would it not be refreshing to hear such a witness as the one mentioned above, who swore to finding aconite, disposed of in the following fashion "It is my duty, gentlemen of the jury, as foreman of the scientific jury in this case, to instruct you that aconite cannot be detected by the process described in the testimony of the witness. However much he may be convinced that he did so, it is contrary to known laws of chemistry to suppose that he so obtained it. You are, therefore, to dismiss from your minds the possibility of such a result, in your deliberations upon this case." Or perhaps this:

"The process sworn to by A will obtain arsenic from the stomach of a person poisoned by that substance. The process sworn to by B will not obtain it. A says that by his process he found no arsenic. B says he found it in a process by which he could not have found it. It remains for you to judge whether, if by an accurate method arsenic could not be found, the testimony of one who swears he found it by an impossible process proves its presence."

Let such a course be pursued, and we soon should have somewhat less of *pseudo* science on the witness stand, and true scientific testimony would become of real value.

BEET SUGAR IN THE UNITED STATES.

As our readers are aware, we have done our utmost to promote the establishment of this industry, and we may therefore, with all the more reason, rejoice at the encouraging statements of the Commissioner of Agriculture in regard to it, published in his monthly report for January. He regards the future of the industry as now mainly dependent upon the comparative profit of beet sugar and cane sugar manufacturing.

The introduction of this business into this country met with many obstacles, notwithstanding the remission of duties on importations of machinery intended for beet sugar making. Perhaps no branch of chemical manufacturing needs to be conducted with greater nicety; and as in the outset we had to depend upon foreign skill—much of it hardly fit to be called skill—there were many failures, and success has come slowly.

The pioneer experiment at Chatsworth, Ill., failed disastrously; yet at Freeport, in the same State, the lessons of that failure are being turned to such good account that success is confidently anticipated. At Black Hawk, Wis., a coöperative beet sugar manufactory is pushed with great vigor, and gives large promise of good results But the most decided success has been met with in California, where two companies are in full operation, the California Beet Sugar Co. at Alvarado having produced over a million pounds of sugar in the second year of its operation. Success is also reported from the Sacramento Valley Beet Sugar Co. A third company is delayed from the difficulty of obtaining seed.

The percentage of sugar obtained from Silesian Beets raised in California is quite extraordinary. The superintendent of the Sacramento Valley Beet Sugar Co., Mr. S. Ehrenstein, states that an average shows a yield of from 13 to 14 per cent, and exceptional instances occur in which 18 per cent is obtained, a much larger yield than ever was obtained in Europe.

It seems from these facts that *the* sugar producing region of the West is to be California, that land of wonderful resources and unprecedented development. Though the beginnings are comparatively small, there is little doubt that they will prove the foundation of a gigantic interest. The struggles of the pioneers in this field have been severe, but those who have held out will be ultimately rewarded.

DRYING SUBSTANCES BY HOT AIR.

Drying by hot air differs very materially from drying either by confined, saturated, or superheated steam, which convey their heat to metal racks, cylinders, or pipes, the latter radiating their heat and thus reaching by it the material to be desiccated. It also differs in principle from that of drying by superheated steam forced into interstices between solid bodies or injected into solutions. The latter, as we have shown in a previous article, acts by its superfluous heat over that of normal, saturated steam, converting more moisture into steam, and itself passing off as saturated steam.

When hot air is injected into a solution, it parts with its heat slowly; decreasing in volume and taking up a portion of watery vapor, it passes off as warm, saturated air, or air loaded with moisture. The use of air in this way would be practically uneconomical, the application of the heated gas would be very imperfect, and could not compare in convenience even to the injection of superheated steam, to say nothing of that most admirable of modern contrivances for evaporating liquids, the steam jacketed pan.

But hot air blown through the interstices, between bodies wetted upon their surfaces, will dry them very rapidly. The general principles of such drying are as follows:

Air always contains a quantity of watery vapor, which quantity varies with the temperature, the formula expressing this variation being that, with every increase of 27° above 32° Fahr., the capacity of air is doubled.

Thus air at 32° holds suspended one 160th part of its weight of water as vapor; at 59° it holds one 80th part; at 86° it holds one 40th part; and at 113° one 20th part; and so on, the temperatures increasing in an arithmetical series, the common difference of which is 27°, and the quantities of vapor suspended increasing in a geometrical series, the first term of which, taking air at 59°, is one 160th of the weight of the air, and the common ratio of which is 2.

Now the specific heat of air under atmospheric pressure, or any constant pressure, does not practically vary between the limits of —22° and 392° Fahr., as proved by Régnault in his elaborate investigations on this subject. That is, the amount of heat necessary to raise the temperature of one pound of air one degree of the Fahrenheit scale, is the same for all temperatures between these limits, and this law holds good for all non-condensible gases, or gases that cannot be liquefied, by cold or pressure or both combined.

It takes $\frac{2375}{10000}$ of a heat unit to raise a pound of air one degree. To raise one pound of air, from say 59° to 113°, would take 12·825 heat units. At 59°, one pound of air holds one 80th of a pound of water. At 113°, it holds one 20th, hence, by the increment of 12·825 heat units, it has been able to absorb one 20th its weight minus one 80th, — three 80ths. Now if we add to it 25·650 more heat units, we shall raise its temperature 54° more, heating it to 167°, whereupon it will suspend one fifth part of its weight of watery vapor,—an increase of three 20ths of its weight, or just four times as much effect as was produced by a rise of temperature, of an equal number of degrees, from 59° to 113°.

In drying by air, then, it is economy to admit the air at as high temperatures as the substance to be dried will sustain without damage; and as fast as the air has taken up its specific load of moisture, to change it.

It is further evident that the temperature of the air should as far as possible be kept from falling during its passage; since if it does this, a portion of the moisture it first seized upon will be deposited before it escapes, and a portion of the due effect will be lost. It should also be allowed to remain in contact with the substance to be dried till it arrives at the point of saturation, for if ejected before this, a portion of the due effect will also be lost.

We have seen that 51·3 heat units absorbed by one pound of air at 59° raises the air to 167°, and imparts to it the power of absorbing fifteen 80ths of a pound more water than it first possessed. To convert fifteen 80ths of a pound of water at 59° into saturated steam, and thus remove it, requires 209·8 heat units, or more than four times as many as required for the removal of the same amount by heated air

When, therefore, mere surface drying is all that is sought, there is a clear showing in favor of heated air on the score of economy when only theoretical principles are considered. But practically there are many sources of loss in the use of air for drying that cannot well be avoided even by the best applications of the principles we have endeavored to elucidate; so that a practical comparison, of the economy of this system with that of steam drying, would give very different figures. There is no doubt, however, that for mere surface drying, the greatest economy would be secured by hot air properly applied.

THE AMALGAMATION OF ORES OF THE PRECIOUS METALS.

It has frequently been our duty to call attention to the great loss arising from the imperfect methods, now in use, of extracting gold and silver from their ores; and the waste has been so extensive, amounting probably to thirty-five per cent of the whole of the gold and silver mined since the first discovery of these metals in California, and the inefficient processes are still so much used, that this important subject is always demanding our attention, as well as that of miners and other persons immediately interested. Much, indeed, remains to be written and done with regard to the extraction of these metals before a system, worthy of the present age of metallurgical chemistry, will be generally practiced. These considerations give interest to a new utensil and process which not only have the merits of apparent simplicity and adaptability to their purpose, but are recommended to the mining world by a practical man having experience and knowledge in this field, whose communications on this and cognate subjects are known to all readers of the Scientific American, namely, Mr. Percival Stockman, of 322 Grand street, Williamsburgh, N. Y.

The metal mercury still retains its preëminence as a means of obtaining gold and silver by amalgamation; and although the use of zinc is well known, it is chiefly employed in combination with or subsequently to the quicksilver treatment. Mr. Stockman employs mercury, using specially selected chemicals to expedite the amalgamation, and treats the metalliferous earth in an iron caldron, similar to those used for evaporating cane juice in sugar manufacture, This vessel is intended to be set in brickwork, and to be heated by a fire beneath it. The caldron has a socket, cast on the bottom inside, to receive the end of a perpendicular spindle or shaft. Attached to this shaft near the lower end, so as to agitate the contents of the caldron, are three or more fans similar to those of a propeller. Power for driving the shaft is applied by gearing on its upper part. The object of these fans is to keep the pulverized metallic ore in constant motion. The ore is placed in the caldron with sufficient water to make it of a muddy consistency, and the mixture is boiled for fifteen minutes; and then, the ore being diffused in the water by the heat and by the agitation of the fans, mercury is introduced. This metal is immediately, by the same means that divided the earthy particles of the ore, dispersed into millions of minute globules, and the heat gives these greater facility for attacking the gold concealed in the earth.

Mr. Stockman states that, in the case of ore containing pure metal, the amalgamation by the above described process can be completed in one hour without the use of chemicals. But the valuable metals are frequently found in combination with the sulphurets of antimony, arsenic, and mercury, and with the pyrites of iron, copper, and argentiferous galena; and it is especially with regard to these more obstinate combinations that a new and thoroughly effective process is desirable. Mr. Stockman treats these, in his newly devised apparatus, by the addition of chemical preparations, chiefly chloride of sodium, nitrate of potassa, lime, bisulphuret of carbon, and any of the fixed or volatile oils. The latter is especially needed when orpiment (the sesquisulphuret of arsenic) is present in combination with the pyrites; and with a view to rid such ores of the arsenic, the introduction of muriatic acid in connection with sulphuretted hydrogen is recommended. As in the case of the pure ore, the mixture is allowed to boil for fifteen minutes; the quicksilver is then introduced, and the mass is again boiled for two hours longer. At the expiration of this time, a stream of cold water is introduced to precipitate the amalgam; and the whole mixture is allowed to pass, from an outlet in the bottom of the caldron, to a sluice containing a separator in which the amalgam is gathered. This amalgam is then ready for separation of the gold or silver by evaporation of the mercury in a retort. As it is well known that hardly any two ores are chemically similar, it is obviously impossible to give fixed proportions of the ingredients above mentioned; these quantities must be determined by the character and percentages of foreign matters found in combination with the metals.

To the imperfection of the extracting processes now in use must be attributed the disappointment and failures of of many of those who go to seek their fortunes in gold and silver mines. Such searchers frequently base their calculations upon assays, perhaps scientifically made, of small specimens of the ores; and they have then been surprised to find that the ore did not yield, by the old methods, so much as the assay by ten, twenty, or fifty cent. This difference discourages the miner, and perhaps induces him to abandon his operation; whereas the fact is simply that the process of the assayer was more efficient than that of the miner.

The importance of this subject cannot be overrated, and any information that will add to the knowledge already possessed by our readers, many of whom are extensively engaged in the interesting and valuable industries of gold and silver mining, will always be received with pleasure by us, and communicated willingly to the public.

THE KNOWLEDGE OF SPECIFIC HEAT APPLIED TO THE DETERMINATION OF VERY HIGH TEMPERATURES.

Among the most important investigations, for finding methods to determine temperatures so high that no practical thermometer can give a uniform and reliable result, are those founded on our present knowledge of the specific heat of bodies. When, for instance, we know the specific heat of a body which can resist the effects of very high temperatures, say platinum, and we take a mass of this metal of known weight, place it in a blast furnace, and when the mass has acquired the temperature of the furnace, we transfer it quickly to a vessel surrounded with a known weight of water, we have only to observe the rise of temperature of this water, by means of an ordinary thermometer, to find how many units of heat were transferred from the furnace to the water by the intervention of the platinum; and from this it is easy to determine the degree of heat to which the latter was exposed. Pouillet was the first to examine the specific heat of platinum, and he found that it differs for different temperatures, which is, in fact, the case with most substances, even with water; and the saying that a unit of heat is the heat required to raise the temperature of one pound of water one degree is only approximately correct; in order to express ourselves with proper scientific accuracy we must say: The unit of heat is the amount of heat required to raise the temperature of water from 32° to 33° Fah. Régnault found that the specific heat of water increases, in consequence of its expansion, with the rise of temperature, and that if accepted at 1,000 for 32° Fah., it becomes 1,003 when the water becomes heated to 200°, or near its boilingpoint.

The specific heat of platinum is approximately equal to that of gold and mercury (see page 372, Vol. XXV.); but in order to use the metal for the purpose of measuring heat, a correct determination is required, and this was elaborated by Pouillet by means of air thermometers of peculiar construction. We here give:

POUILLET'S TABLE FOR THE MEAN SPECIFIC HEAT OF PLATINUM.

From	32°	" 212°	0·03350
"	32°	" 572°	0·03434
"	32°	" 933°	0·03516
"	32°	" 1,292°	0·03602
"	32°	" 1,832°	0·03728
"	32°	" 2,192°	0·03813
"	32°	to 2,732°	0·03938

The table shows that the specific heat of platinum, when taken at the common temperature, is nearly one thirtieth of that of water, while at some 2,700° it is about one twenty-fifth.

In order to make this more clear, we will state it in other words: At the common temperature, 30 pounds of platinum, losing one degree of heat, will produce one unit, and thus raise the temperature of one pound of water from 32° to 33°; while at the temperature of the blast furnace, say 2,700°, only 25 pounds of platinum, losing one degree of heat, will produce the same results.

We must, in passing, draw attention to a fact of much importance in regard to the theory of steam economy. The above table shows that the same quantity of heat will not raise the temperature of a mass of platinum equally for all parts of the thermometric scale; and for water, there is a still greater difference. So one unit of heat, being accepted as sufficient to raise the temperature of one pound of water of 32° one degree, will not suffice to do this to boiling water. If such water is heated in a closed vessel from 212° to 213°, it will require 1·013 units.

It is thus seen that in the case of water, it requires one seventy-seventh part more heat to raise the temperature of water from 212° to 213° than from 32° to 33°, and that, in the case of platinum, it requires only one ten thousandth part more heat to raise the temperature from 212° to 213° than from 32° to 33°, while, for the very high temperatures, it takes about one hundredth part more heat for one degree of thermometric ascension.

Applying the knowledge attained to the determination of the temperature of a blast furnace, we have only to observe by the thermometer the moderate amount of heat diffused in a large mass of water by means of a comparatively small mass of platinum, possessing a great amount of sensible heat or very high temperature at the moment that it is taken from the furnace. It is evident that precautions must be carefully taken against loss of heat by radiation, and against any other exterior disturbing influences, and the determination is then very easy, as we will illustrate by an example.

Suppose we have heated a mass of one pound of platinum in a blast furnace, and left it a sufficient time to be heated to the temperature of the flame. Outside we have say ten pounds of water, kept at 32°, surrounded by non conducting material, and enclosed between the double walls of a vessel, in the interior empty space of which the platinum is placed immediately after its withdrawal from the furnace. It is cooled without touching the water, and precautions are taken not to lose heat by evaporation of the water or radiation. Suppose now that, under the circumstances accepted, we find that, after a sufficient time has elapsed, the temperature of the ten pounds of water has increased from 32° to 43¼°, or 11¼°; this is, for ten pounds of water, equivalent to 115 units of heat, which, reduced to degrees in one pound of platinum of which the mean specific heat between 32° and 2,732° is equal to 0·03938 (see table), gives 115 divided by the latter number, or 2,920 for the degree of heat to which the platinum was exposed; so that the temperature of the blast furnace must have been 2,920° Fah. If the result of the calculation had given us a much lower temperature, say some 1,800, it would be necessary to renew the calculation with another coefficient of specific heat; in this case it would be 0·03728, which corresponds nearer to the specific heat of the temperature of about 1,800°, and would thus give a more nearly correct result.

This method gives at the same time the means of corroborating the specific heat of platinum in another way. If, namely, we make two experiments, in the same furnace and at the same temperature, with unequal quantities of platinum, we may obtain two equations of two unknown quantities, namely, one quantity the specific heat of the platinum, the other the temperature of the furnace. From these two equations, we may easily extract, first the specific heat in question, and secondly the desired temperature of the blast furnace. In this way, a few fragments of any substance able to withstand the heat of the furnace may be employed to determine its temperature. We reserve the further elucidation of this method to a future article.

SCIENTIFIC AND PRACTICAL INFORMATION.

VACCINE MATTER.

The terrible visitation of small pox, which has largely increased the death average in many of our cities, has created an unusual demand for vaccine lymph; and, moreover, it has drawn especial attention to the sources whence the virus is derived, and the need of obtaining it of the greatest possible purity. A Boston physician has recently found the applications for vaccine matter so numerous that he has devoted much time and attention to its propagation by vaccinating heifer calves. The animals chosen are between the ages of three and six months, and are selected with particular regard to their sound and healthy condition. As the disease affects the calf but for the short period of fourteen days, and as the pustules are ready for the lymph to be taken on the sixth or seventh day only, a considerable number, no less than three hundred, of calves are yearly required to supply the customers of this one collector.

The animal is thrown, and a portion of its abdomen is shaved clean; the virus is then inserted in small incisions about one inch apart. Vesicles are thus originated, and on the sixth or seventh day, the lymph can be removed by squeezing the spots with pliers. The exudation is carefully collected on ivory points. Hundreds of points can be prepared from one animal in this way. The crusts which afterwards form on the pustules are removed and fixed on gutta percha mounts, many surgeons preferring to communicate the vaccination by their use. In many localities, the vaccine disease has lost its vigor, and the operation is seldom followed by appearances of the cow pox; but the necessity of the latter as a prophylactic has called attention to the deficiency, and a supply fresh from the cow is valuable to ensure the taking of the vaccination.

A SUBSTITUTE FOR A RUDDER.

The screw steamer *India* of the Anchor line, plying between Glasgow and New York, put into Halifax, N. S., on February 23d. She had been twenty-seven days out from Glasgow, having lost her rudder on February 8th. Thirteen days afterwards, she fell in with the American fishing schooner *Joseph H. Chandler*, and lashed her to her stern, the schooner steering the strange vessel compounded of two craft dissimilar from each other in every respect.

EXPERIMENTAL SCIENCE AT CORNELL UNIVERSITY.

Professor Burt G. Wilder, referring to his request, published on page 49, current volume, encloses us some further suggestions for the guidance of such of our readers as may be able to forward him specimens:

"It sometimes occurs that the heads of rare and valuable animals come into the possession of individuals or associations, when only the skulls are to be preserved on account of the great expense of an alcoholic collection of brains. In such cases, for the sake of the brains, I shall be glad to open the skulls, by either vertical or horizontal section, as may be preferred, properly prepare them by maceration, etc., and return to the owners, free of expense."

The Professor desires also to mention that 500 copies of a circular nearly like this were distributed during the past month, and kindly copied by many scientific and agricultural papers; already specimens and letters of inquiry and information are arriving from all parts of the country and from all classes of people. In fact, the museums contain but a very small proportion of the valuable scientific material of a country; every village has its malformations, which are there regarded as mere curiosities and gladly put into the hands of scientific men when asked for; every hunter, butcher, and farmer has it in his power to furnish most interesting specimens every year, and according to Professor Burt's experience, is glad to do so, when assured of their scientific value.

Coleman, Rahm & Co., of Pittsburgh, Pa., have put into use Stearn's smoke burner improvement, in connection with some of their iron furnaces, and find that it heats the iron quicker, with a less quantity of coal, and prevents the smoke nuisance. The estimated total saving in time and fuel, by the use of the invention, is thirty-three per cent. There are about one thousand furnaces in operation at Pittsburgh. If the smoke nuisance could be abated, and money saved in the doing of it, Pittsburgh would become famous.

Recent letters from Professor Agassiz report the safe arrival of his exploring ship at Pernambuco, Brazil. His explorations of the sea bottom are continued with undiminished zeal. He has made many discoveries of fossil and live animals, sponges, etc., the mere nomenclature whereof is enough to break the uninitiated jaw.

PSYCHIC FORCE.---SPIRIT FACES.

One of the marvels of spirit jugglery, or "psychic force" as the learned Dr. Crookes denominates it, is the production of images of human forms, hands, arms, faces, etc., which are seen by the observers to float around in the air. In some cases, the faces have been recognized as those of departed friends by sitters in spiritual circles. Quite a thriving business is done in this city by professors of the art; but some queer revelations have lately been made. One Gordon carried on a spirit establishment and was doing a profitable business, at 50 cents a head, until his partner, the business manager, in a quarrel peached on him, and revealed to the public how the thing was done. Professor Gordon, it appears, dressed in the paraphernalia of a high priest, appears before his audience, turns down the lights, and then by means of strings and hands manipulates a series of large lithographic colored pictures of faces, causing the pictures to rise from behind an altar, float and sway in the air. These pictures represent females, children and men, and in the dim twilight are from time to time pronounced, by this or that person in the audience, to be the spirit faces of their departed friends. Only a small stock of pictures is required to produce these supernatural effects.

A higher priced professor of this mystic art is one Slade, who until recently has confined his spirits to the more commonplace dodges of spirit-writing on slates, rapping, table lifting, accordeon playing, knife throwing, etc. His circles are more select, generally only two admitted at a time to the performance; tickets $3 each. Lately he has added on the the spirit face business and raised the price to $5. An intelligent friend of ours, who visited the show, pronounces the faces to be those of genuine spirits, and regards the whole performance as most astonishing. He came away completely converted to the doctrine of the bodily presence and power of the spirits. *Per contra*, the New York *Sun* recently published an *exposé* of Slade's manipulations, as derived from a member of his own household. The faces are produced behind a black curtain, and make their appearance before a small opening in the same. Slade employs a stock of masks and pictures, which he works by means of threads, making them rise and appear before the opening, the gas being turned down so as to give a dim, sepulchral effect. How it is, that any intelligent person can be brought to attribute these tricks to spiritual agency, passes comprehension.

The following letter, evidently from a believer, gives perhaps as good an explanation of the matter as any that has been made public:

THE SPIRIT FACES.—THEIR APPEARANCES EXPLAINED.

To the Editor of the Scientific American:

One who has tested many phases of spirit communion, and who has been through varied experiences herself, feels that she can give an explanation of the so-called spirit faces, produced by means of paper pictures by Gordon, Slade, and other mediums. Through the science of mesmerism, the spirits of our departed friends can, as I believe, act upon the optic nerves of those in the body. The psychic force, emanating from the medium, forms an atmosphere which acts upon the brain of the sitter, and a real portrait may be thus transfigured in the mind of the sitter and made to resemble the form of the departed one.

In my own experience, I have been attracted to look at ordinary pictures hanging upon the wall, and my eyes have been somehow affected by the mesmeric influence, until the pictures have been transformed so as to appear to me like the forms of departed friends. This I call the science of magnetic painting.

I believe that Mesmer is now acting upon the earth.

The mysteries of science are yet unfathomed.

Electricity, mesmerism and magnetism are combined in this new science, and will carry humanity onward and upward in its search after truth. H. E. B.

March, 1872.

AMERICAN DISTRICT TELEGRAPH COMPANY.---A NEW ENTERPRISE.

A novel enterprise has been inaugurated in this city, which we are confident will not only be a great public convenience but prove remunerative to the company organized to conduct it.

It is proposed by this company to place, in private dwellings, stores and offices, a telegraphic signalling instrument, by which communication may be established with one or other of a number of district offices located in New York and adjacent cities, and which will summon a messenger or policeman, as may be required, the district offices being so located that the call may be responded to in three minutes' time. Thus a person, awaking and becoming conscious of the presence of thieves in the building, may quietly touch a key at the head of his bed and summon assistance. Or, in case of sickness, he may have a messenger at the door in an equally short space of time, no matter at what hour of the day or night; or, if messengers are required for business purposes, they may be summoned in like manner, this being in our opinion the most useful feature of this plan, which, if well carried out, will prove a great convenience to the business public.

The apparatus, placed in dwellings, offices, etc., requires no attention, the battery and other fixtures, besides the signalling apparatus, being under the sole care of the company's employees at the district offices. The service is rendered for a small sum, payable monthly by each subscriber. The general offices of this company are at 62 Broadway, New York, and 185 Montague street, Brooklyn. Sub-offices are to be established throughout New York and Brooklyn.

A New Gun Cotton.

Some experiments for showing an improved quality of gun cotton, as made by Mr. Punshon, took place within the last few days at Wormwood Scrubbs. Mr. Punshon claims to be able to produce a gun cotton of any required explosive quality, so as to suit any purpose for which it may be wanted, and at the same time insure perfect uniformity of manufacture. He also states that by his treatment the difficulty of stowage is got rid of, and that his gun cotton may be stored dry without any liability to decomposition and consequent spontaneous explosion. He accomplishes his objects by covering the particles of gun cotton with sugar, with chlorate of potash or other salts, so as to separate the particles of cotton, and by varying the proportions and quantities of these materials to suit the special explosive quality required. These experiments, however, were simply to test the quality, of the cotton as prepared for rifle shooting, compared with gunpowder. The cartridges contained fifty grains of cotton, and were tried against gunpowder cartridges containing fifty, seventy, and eighty-four grains. The first trial was against a target composed of fourteen pine boards, of one inch thick, clamped together, and at twenty-five yards' distance. In this case, the bullets in each instance passed through all the boards, and splashed against the iron target behind; but at longer distances, up to two hundred yards, the gun cotton still penetrated, while the gunpowder cartridges containing seventy, and ultimately eighty-four grains, had to be used to effect the same amount of penetration. At five hundred yards, the shooting from the shoulder with the gun cotton cartridges was regular and good.

Fidgety Nurses.

It is almost better for a sick person to be without an nurse at all than to have in the room a fussy fidgety one, who gives the poor invalid the feeling of living in the midst of the whirlwind. That it proceeds from the nervousness and anxiety of affection is no comfort, and indeed is often only an aggravation, for the fresh worry that the poor nurse is sure to throw herself into is a check upon the expression of uneasiness or additional illness which is often a relief. Real affection, united with common sense, will produce the steady, calm demeanor which is such a rest and comfort to those who have to struggle with the nervousness and irritability incidental to severe illness. Want of presence of mind says the *California Farmer*, in a sick room is productive of more evils than distress to the invalid. The fussy easily agitated nurse will be quite overwhelmed by the sight of a fainting fit, or the bursting afresh of a vein after bleeding; she will forget the simplest remedies, or be too nervous and too faint to apply them properly; she is always in danger of mistaking medicines, and sometimes give a lotion internally, and carefully rubs on a tonic or a soothing draught. It is no exaggeration to say that far more suffering, and even loss of life, has been caused by want of composure and presence of mind in a sick room, than by negligence.

A CHURCH ON WHEELS.—A London vicar proposes an itinerating church, to reach the neglected masses. A large furniture van, with a belfry and seats and other fittings, holding thirty or forty persons, is to pass from street to street, gathering a congregation and holding worship in one place, outrunners preceding it to invite attendance, and then pass on to repeat the same in another locality; and so from hour to hour, filled and emptied, teaching a great number who will not come even to chapels or to Bible rooms.

IT is a very curious fact that many people—capitalists especially—have an impression that invention and mechanical design are somehow outside of the range of the reasoning faculties, that they are a sort of inspiration or *afflatus* which comes over a man in an inexplicable way, and that probably the less common sense or wisdom a person may have, regarding other matters, the better must he be as an inventor. Many who have entertained such impressions have had bitter reason to mourn that they based their faith on so insecure a foundation. The successful application of an invention requires, in fact, an exercise of the reasoning faculties quite as much as, or perhaps more than, a lawyer's argument in court; and the conclusion of the inventor should be as carefully sustained by evidence as is the lawyer's case.—*Railway Gazette.*

OBJECTIONS are urged by some that science has not improved the condition of the multitude, and that its benefits are limited to the body only. But surely this is not so. The more the intellect is developed, the more is man indisposed to make sensuality his aim. Whatever lightens human toil, sets free a portion of the intellect to bask in the light of its native element, and relieve some weak part of humanity from the stress of temptation. It is impossible to obtain a high standing in science without moral training.

RED RIVER RAFT.—The immense raft which has so long obstructed the Red River appears to move up stream instead of down, the motion being at the rate of about two miles in a year. The explanation of this retrograde movement is that the logs of the lower end of the raft are continually broken away and carried off by the flood and freshets, while the other end is constantly receiving additions. Thus the raft, always falling away at one end and growing at the other, gradually moves up the river, and it is calculated that it has moved since its forming about four hundred miles. In 1833, when the raft was 124 miles long, the work of removing it was commenced by the Government, but after working at it for twenty-two years, the attempt was abandoned as impracticable, and was confined to opening some of the lateral channels so as to facilitate navigation.

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.—DYEING FURS.—How can I dye furs a permanent black?—K.

2.—MARBLEIZING SLATE.—Will some one tell me what materials are used for this process, and how they are prepared and applied?—P. P. G. G.

3.—COINS.—Can any one tell me how to detect the dates on old and worn coins?—L. B.

4.—TANNING RABBIT SKINS, ETC.—Can any one tell me a cheap and simple way of tanning the skins of rabbits, musk rats, etc?—L. H. S.

5.—PRESERVING NATURAL FLOWERS.—How can pressed and dried flowers be made to preserve their colors?—H. P.

6.—LICORICE.—I wish to have information on the cultivation of licorice, and as to how the seed may be procured.—P. F. D.

7.—HARDENING MILLSTONE PICKS.—Can any one inform me of a process for hardening steel picks for French burr stones, or state where I could get such information?—L. P.

8.—HEAVY GUN.—What is the weight of the heaviest gun ever cast in the United States? What is its caliber; and what is the weight of its solid shot?—J. E. H.

9.—SAW DUST FOR DEAFENING WALLS.—Will some of your correspondents please inform me how to render saw dust non-combustible, to fit it for use in deafening dwellings, etc., also to make it proof against mice and other vermin?—L. M.

10.—DESTRUCTION OF GALVANIZED IRON.—Please inform me if there is a magnetic or electrical influence operating continually in galvanized iron, tending to destroy it?—D.

11.—HYDROGEN.—How can I obtain nascent hydrogen, or where can I see full descriptions of the different ways of producing it?—J. G.

12.—EXTRACTING INK MARKS.—How can I remove ink marks from green paper without destroying the original color?—J. J. M.

13.—WATER FOR AQUARIA.—Can any of your readers tell me how to keep the water in my aquarium pure and clear without changing it? It can be done.—C. D.

14.—TRUEING GRINDSTONES.—Is there any reliable method of hacking or keeping grindstones true without stopping them?—A. J. P. S.

15.—PREVENTION OF FREEZING.—What can I put into cider or vinegar to prevent its freezing? I want something not injurious in use, and other than alcohol.—J. R. D.

16.—TRANSFER VARNISH.—What is the proper composition to use for transferring illustrations from paper to copper and steel? It is only required to transfer an outline or general impression.—D. B. K.

17.—TRANSFERRING TO GLASS, ETC.—Can prints from steel or wood engravings be transferred from paper to glass, wood, or other material? And how is it done?—K. W.

18.—ELECTRO-CHEMICAL TELEGRAPH PAPER.—How can the marks on electro-chemical telegraph paper, moistened with a solution of iodide of potassium, be rendered permanent? Can any chemical be added to the solution to effect this?—G. B. M.

19.—TEST FOR NITRIC ACID.—What is the simplest and best test for nitric acid in any solution? Is litmus paper reliable when the quantity of acid present is very minute?—P. C. H.

20.—ANTS AND MOLES.—Can any of the readers of the SCIENTIFIC AMERICAN inform me how to destroy ants about the house, and moles in the garden? Thousands would like a practical answer to both enquiries.—T. M. G.

21.—BLOWING OUT BOILER.—At what pressure would it be safe to blow out a 24 horse boiler, carrying 60 pounds steam?—D. & N.

22.—WATER FEED TO BOILERS.—Would it not be advantageous to pump into a boiler just so much water as is evaporated in the production of the steam we are using? If we should pass air into our boiler with the water, what would be the result? Would it be beneficial or injurious?—D. & N.

23.—BLACK WALNUT DOORS.—When these have had the grain filled and received a coat of shellac and another of oil, on exposure to the sun they become light colored. Is there anything that can be put on to make them darker, or at least to prevent them from becoming lighter? I oil them every few months, but the shellac seems to keep the oil from striking in.—F. C.

24.—TEST FOR LEAD IN WATER.—Is there any way in which I can test rain water for lead? It goes through a lead pipe that has not been disturbed for more than 40 years. Suppose I boil down a couple of gallons to a gill or less, can I not apply some test to it?—F. C.

25.—CLEANSING HAIR BRUSH.—How can a hair brush be cleaned without injuring the stiffness of the bristles?—F. C.

26.—TEMPERING SPRINGS.—Will some reader of the SCIENTIFIC AMERICAN inform me how to secure in a carriage spring, after it has been mended, the desired temper? I would also like to know an approved plan for obtaining the right temper in the main spring of a gun lock.—J. H. S.

27.—FRUIT JELLIES.—Will any of your readers inform me how fruit jellies are made? They are extensively sold in the grocery trade. I should like to know of what fruit they consist, as they evidently are not made of the varieties after which they are named. Perhaps the currant is an exception to this.—M.

28.—CEMENTING GROUND EMERY TO WOOD.—Will some of your many readers inform me how to apply ground emery to wood for the purpose of grinding wood under water? How long will it last? Would it be durable or not, if run at about 200 revolutions per minute, under a pressure of 300 pounds of wood.—J. J. T.

29.—MOUNTING CHROMOS.—I wish to know the mode of mounting chromos. How are the chromos put on the canvass and stretched on the frames so that, when they are dry, they will be as tight as a drum head? I have tried putting them on wet, and, when they are dry, they are loose. Will some of your readers give me the whole process?—J. W. B.

30.—CLEANSING BOILER.—Immediately after blowing out a boiler at a pressure of from 50 to 60 pounds, would it be prudent to rinse out with water passed through a heater, say heated to 40 degrees or luke warm? If not right, what would be the consequence?—D. & N.

31.—PACKING RINGS.—Would you consider it right to place ordinary brass packing rings (such as used in locomotives) in the cylinder of a stationery, so as to allow them to turn, and not make them fast to the inside ring or fast to each other by feather, steady pin, or otherwise? This would allow them to work around, independently of each other and the said inside ring. If so, what would prevent the openings in the brass rings working around opposite each other, thereby allowing the steam to blow through?—D. & N.

Examples for the Ladies.

Mrs. Elizabeth A. Monaghan, of Brooklyn, N.Y., has used her Wheeler & Wilson Machine since 1861. During the war she stitched forty blouses a day of eight hours, averaging about $16 a week; since then she has stitched from thirty to thirty-six linen coats a day. Last year, in three months, she stitched 1274 linen coats, earning $186.46, besides doing her own housework and tending her baby. She would use no other Machine.

Mrs. C——, of New York, has used a Wheeler & Wilson Machine since 1857, never averaging less than $700 a year, and for the last five years $1,000. She used the same needle during 1870, and earned with it over $1,000.

The Sweet, Fixed Oil of the Cocoanut is represented in *Burnett's Cocoaine.*

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.

Boiler and Pipe Covering manufactured by the Chalmers Spence Non-Conductor Co. In use in the principal mills and factories. Claims—Economy, Safety, and Durability. Offices and Manufactories, foot E. 9th street, New York, and 1208 N. 2d street, St. Louis, Mo.

Pattern Molding Letters (metallic), to letter or number castings. All sizes. H. W. Knight, Seneca Falls, N. Y.

Wanted—To invest $5,000, or less, in business—manufacturing preferred. Would join a practical man in starting. Business experience and capacity—references. D. Nelwin, Boston, Mass.

J. H. Preston, Jefferson City, Mo., wants to know where whangs or thongs are made.

To Sash, Door, and Blind Manufacturers in the Southern States: A man, who thoroughly understands the above business, wants a position as superintendent, or as foreman. Good reference can be given. Address N. White, Meadville, Pa.

The Tools that sell—Patent Star Bevels and Star Try Squares. Acknowledged by all to be the best Tools in the market. G. W. Hallett & Co., West Meriden, Conn.

Valve Refitting Machinery, sold by C. F. Hall & Son, sole manufacturers of the only original Patent Machines. Office, 21 Murray Street, New York.

Contractors for the removal of buildings, entire, are requested to communicate with I. H. McHenry, Pikesville, Md.

Cutlers' Grindstones, machine made—J.E.Mitchell,Phila., Pa.

Wickersly Grindstones, very cheap—J. E. Mitchell,Phila., Pa.

For Cheap Process to anneal small hard Castings in ten minutes, send 50 cents to J. C. Spencer, Phelps, N. Y. Will file easily.

Cast Steel Reaper and Mower Guards are made by the Pittsburgh Steel Casting Co., strong as bar steel, and cheaper than wrought iron guards. See advertisement.

Sixty per cent allowed canvassers for Carpentry Made Easy, a valuable work for scientific men and mechanics. Howard Challen, Publisher, 531 Minor Street, Philadelphia, Pa.

Manufacturers and Mill Supplies of all kinds. Greene,Tweed & Co., 18 Park Place, New York.

The "Railroad Gazette" of March 2 contains a full page engraving of a Car Wheel Borer. Also much information of value to Engineers and Mechanics. Single copies, 10c. Address 79 Broadway New York.

The "Safety" Hold Back for Carriages prevents runaway accidents. See Sci. Am. Feb. 24, 1872. Undivided Interest, or State and County Rights, for sale. Address N. W. Simons, Williamsfield, Ohio.

Lord's improved Screen or Separator—also Watchman's Time Detector. For particulars, address Geo. W. Lord, 232 Arch St., Phila., Pa.

Scale in Steam Boilers. We will remove and prevent Scale in any Steam Boiler, or make no charge. Geo. W. Lord, 232 Arch Street, Philadelphia, Pa.

Walrus Leather for Polishing Steel, Brass, and Plated Ware. Greene, Tweed & Co., 18 Park Place, New York.

An Engineer, experienced in designing and constructing Engines, Boilers, and general Machinery, desires a permanent position as superintendent or head draftsman. Is practical machinist, and familiar with Indicator. Refers to leading concerns. Address, M. E., P. O. Box 5,052, New York.

Send samples of your Boiler Scale to Richard H. Buel, Consulting Mechanical Engineer, 7 Warren St., New York, who will find a method of removal or prevention, at moderate charges.

Gage Lathes and Wood Lathes. Wm.Scott,Binghamton,N.Y.

Null Lathes and Law Arbors. Wm. Scott, Binghamton, N.Y.

The Exeter Machine Works, Exeter, N. H., manufacturers of Sectional Boilers and Steam Engines, will soon open, in Boston, Mass., a centrally located sales room, in connection with their works; and are willing to take the agency of a few first class Machines and Tools not already introduced in that city.

For Diamond Turning Tools, for Emery Wheels and Grindstones, address Sullivan Machine Co., Claremont, N. Hamp.

Grindstones for manufacturing purposes a specialty—made by Worthington & Sons, North Amherst, Ohio. Send for price list.

Standard Twist Drills, every size, in lots from one drill to 10,000, at ⅓ manufacturer's price. Sample and circular mailed for 25c. Hamilton E. Towle, 176 Broadway, New York.

For Best Galvanized Iron Cornice Machines in the United States, for both straight and circular work, address Calvin Carr & Co., 26 Merwin St., Cleveland, Ohio.

Dickinson's Patent Shaped Diamond Carbon Points and Adjustable Holder for dressing emery wheels, grindstones, etc. See Scientific American, July 25 and Nov. 23, 1869. 64 Nassau st., New York.

Railway Turn Tables—Greenleaf's Patent. Drawings sent on application. Greenleaf Machine Works, Indianapolis, Ind.

Peck's Patent Drop Press. For circulars address the sole manufacturers, Milo, Peck & Co., New Haven, Ct.

All kinds of Presses and Dies. Bliss & Williams, successors to Mays & Bliss, 118 to 122 Plymouth St., Brooklyn. Send for Catalogue.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W.D.Andrews & Bro.,414 Water st.,N.Y.

Presses, Dies, and Tinners' Tools. Conor & Mays, late Mays & Bliss, 4 to 8 Water st., opposite Fulton Ferry, Brooklyn, N.Y.

Over 1,000 Tanners, Paper-makers, Contractors, &c., use the Pumps of Heald, Sisco & Co. See advertisement.

To Ascertain where there will be a demand for new Machinery, mechanics, or manufacturers' supplies, see Manufacturing News of United States in Boston Commercial Bulletin. Terms $4.00 a year.

Hydraulic Jacks and Presses, New or Second Hand, Bought and sold, send for circular to E. Lyon, 470 Grand Street, New York.

For Hand Fire Engines,address Rumsey &Co.,Seneca Falls,N.Y.

Over 800 different style Pumps for Tanners, Paper Makers, Fire Purposes, etc. Send for Catalogue. Rumsey & Co., Seneca, Falls, N.Y

Grist Mills,New Patents. Edward Harrison, New Haven,Conn

Taft's Portable Hot Air Vapor and Shower Bathing Apparatus Address Portable Bath Co., Sag Harbor, N.Y. Send for Circular.

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

For Steam Fire Engines, address R. J. Gould, Newark, N. J.

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

Belting as is Belting—Best Philadelphia Oak Tanned. C. W. Arny, 301 and 303 Cherry Street, Philadelphia, Pa.

Patent Interlocking Grate Bars—Used and approved in 5000 furnaces, in the principal manufactories in the United States. Superior to all others in durability, and economy of fuel. No economist can afford to do without them. Address Salamander Grate Bar Co., 32 Broadway, N.Y.

Asbestos and Silicate of Soda in large and small quantities. E. D. & W. A. French, 3rd & Vine Sts., Camden, N. J.

In the Wakefield Earth Closet are combined Health, Cleanliness and Comfort. Send to 36 Dey St., New York, for descriptive pamphlet.

Enameled and Tinned Hollow-Ware and job work of all kinds. Warranted to give satisfaction, by A. G. Patton, Troy, N.Y.

For Circular of the largest variety of Wood Planing and Mitre Dovetailing Machinery, send to A. Davis, Lowell, Mass.

Rubber Valves—Finest quality, cut at once for delivery; or moulded to order. Address, Gutta Percha & Rubber Mf'g Co., 9 & 11 Park Place, New York.

Williamson's Road Steamer and Steam Plow, with Thomson's Tires. Address D. D. Williamson, 32 Broadway, N. Y., or Box 1809.

Boynton's Lightning Saws. The genuine $500 challenge. Will cut five times as fast as an ax. A 6 foot cross cut and buck saw, $6. E. M. Boynton, 80 Beekman Street, New York, Sole Proprietor.

Blake's Belt Studs. The best fastening for Leather or Rubber Belts. 40,000 Manufacturers use them. Greene, Tweed & Co., 18 Park Place, New York.

Hoisting Engines. Simplest, cheapest, and best. Send to John A. Lighthall, Beekman & Co., Office 5 Bowling Green, New York.

L. & J. W. Feuchtwanger, 55 Cedar St., New York, Manufacturers of Silicates, Soda and Potash, Soluble Glass, Importers of Chemicals and Drugs for Manufacturers' use.

New & Improved Bolt Forging Machines, J.R.Abbe,Prov.,R.I.

The N. Y. Manuf'g Co., 21 Courtland St., N.Y., buy, sell, and manufacture Patented articles. Illustrated Catalogue, 48 pages, free.

Patent Rotary Engine; for all purposes, two to one hundred horse power; equal to any, for less price. Send for particulars and price list to John A. Lighthall, Beekman & Co., corner Imlay and Verona Streets, Brooklyn, N. Y.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4.00 a year. Advertisements 17c. a line.

Best and Cheapest—The Jones Scale Works,Binghamton,N.Y.

New Pat. Quick and easy way of Graining. First class imitations of Oak, Walnut, Rosewood, &c. Send stamp for circular. J. J Callow, Cleveland, Ohio.

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.

T. N. L., of Va.—The mineral you send is ferruginous quartz—quartz containing iron.

BLACKING.—B. B. can find the information he seeks on page 170 of Vol. XXIV. of the SCIENTIFIC AMERICAN.

F. F. H., of N. Y., has omitted something in his letter, so that it is unintelligible.

S. L. A. M., of Ga.—We know of nothing that will remove the outer portion of the moss without destroying the texture of the rest.

CEMENT FOR CAST IRON.—Answer to query 6, February 17, 1872. If C. C. will take six parts of pulverized clay and one part of iron filings, make into a paste with boiling linseed oil, and apply hot, he will thus render his cracked vessels watertight.—J. J. M., of Pa.

CEMENT FOR CAST IRON.—C. C., query 6, February 17, can make this by mixing equal parts of salt and sifted ashes, and moistening them with water. Drive the cement into the crack with a mallet, and dry slowly over a fire.—M. L. B., of N. Y.

O. S., No. 14, February 24, 1872, will find a remedy for leaky roofs, whether of felt or other material, in the application of internal heat to the eaves, trough, and conductor, as may be seen upon my roof, No. 41 Whitesboro street, Utica, N. Y. Call and see how it works.—R. B. M.

W. E., of N. Y., is troubled with weak knees and exudation of the sinovial fluid, so that for their support he requires elastic bands.

L. P., of Mass., sends us a fragment of charred hair or wool, which has been used as steam packing, with the inquiry whether there is danger of fire from steam heating apparatus, in contact with combustibles. We reply that with high steam we think there is. With low steam we think there is not, unless substances liable to spontaneous combustion are laid against the pipes or heating racks.

L. H. P., of Chicago.—We do not think the accident of fire, occurring under circumstances as you describe them, was caused by the steam pipes. Our opinions upon this subject generally have already been fully expressed in recent issues, and we do not wish to reopen the discussion at present.

CEMENT FOR CAST IRON.—In answer to query 6, February 17, take one part fire clay and one part iron filings, mixed to the right consistency with muriatic acid diluted with a little water. The longer it stands before being used the better.—M. H. K., of N. J.

ENGINE POWER FOR CIRCULAR SAWS.—To NEMO, query 16, January 20: A ten horse engine driving a circular saw, cutting with the grain of the wood, will be equal to a fifteen horse engine cutting against the grain. If he will try it, the result will both satisfy and surprise him.—E. B. T., of Va.

CEMENT FOR CAST IRON.—To C. C., query 6, February 17. If the crack be in the bottom of the pot, drill a hole at each extreme end of the crack, to stop further cracking, plug rivet the holes with copper, and, with fine iron filings saturated with urine, calk the crack. I have tried this method on oil pots on board whale ships, with success.—C. F of Mass.

SAND IN DRIVE WELL.—In answer to query 24, February 17, let W. L. take a three quarter inch pipe and run it down inside his pipe to the sand; put on a force pump, and force water down. The sand will come out at the top of his pipe. Pump till the water is clear.—L. C. M., of Mass.

BORING CONICAL CYLINDER.—On page 122, of Vol. XXVI., No. 8, February 17, I. F. W. asks how he can bore out a cylinder forty inches long and twelve inches in diameter, diminishing one eighth of an inch in that length, with a boring bar ten feet long. If he will throw his bar three sixteenths of an inch out of center next to the face plate, he can accomplish what he desires, provided his boring bar has a feed screw on it, and he bores from the small end of the cylinder.—G. C.

G. D. B., of Pa., says: Enclosed you will find a specimen of something which I dipped out of a creek. It comes out in considerable quantities, and covers the whole bottom of the creek for fifteen or twenty rods from the place where it first shows, which is under a mill dam. A man that worked in the mill over twenty years ago says they used to get it on their clothes, and it could not be washed out. We have lately put in steam, and it gets into the boiler and bothers us some. Would you please tell me what it is?—G. D. B.—Answer: It is hydrous oxide of iron mixed with earthy matter. Is used somewhat for polishing purposes.

TEMPERING SPRINGS.—Judging from the character of answers to queries in your columns, as to the best method of tempering springs, and from other observations, I conclude that a great many mechanics think it necessary to repeat the process of drawing two or three times in order to get just the right temper. This is an erroneous idea. Once drawing to the proper color, after hardening in water, is sufficient, and any repetition is a waste of time and fuel; as, if the degree of heat applied does not exceed that required to obtain the right color in the first instance, the temper of the spring will remain the same after any number of subsequent heatings.—G. L. B., of Me.

F. C. S., of R. I.—Sulphur, like other remedies, should only be used as the choice of a lesser evil over a greater one. As an application for dandruff, which is the result of a diseased state of the skin, we have no doubt of its occasional efficacy. Like other remedies, it sometimes effects a cure, and when used in the proper manner, no injurious effects upon the hair need be feared. When sulphur is combined with metals, as lead for instance (with which it is often used as a hair restorer) the metal may by absorption produce ill effects upon the general health.

COMPOUND GEARS FOR SCREW CUTTING.—Permit me to say a few words in defence of the rule given by C. F., of N. J. I have made made my mind thoroughly familiar with its use, having composed indexes for different lathes, some of them containing over one hundred common and useful threads; and therefore I feel that on this subject I can speak with authority. This rule supplies a want long felt in machine shops, a rule which would at once and to a certainty tell whether a lathe would cut a certain thread. Let any one thoroughly master that rule, and he will be convinced of its merits. J. P. M. C., in condemning it, showed that he neither understood it nor gave it a practical trial. His objection of its taking so much time to work by is not a good one. I want only from one to three minutes, according to the fraction of thread. Now a word about the rule, which I have used for years, and which is the common rule all over the country, but which, though it is good so far as it goes, is often of no value whatever in the cutting of fractional threads, owing to the number of threads which can be cut by its use being extremely limited; while by the rule of C. F. there is almost no end to the number. Let J. P. M. C. work a few years in shops where jobbing of all kinds is done, where fractional threads are a common thing, and my word for it he will find, as I have done, that the rule he gives is as far behind the requirements of the age, as the engine lathe of to-day is in advance of the hand tool of our fathers. He will then, instead of assuming superiority, indulge a humble and contrite spirit, and with others send thanks to C. F. and the SCIENTIFIC AMERICAN.—C. D., of Conn.

J. G., of N. J.—The nascent state of hydrogen or other gas is the state (by some thought an allotropic state) which the gas has at the moment of its liberation, either by electrolysis or ordinary chemical action, in which state gases act much more powerfully in combining than when once liberated and isolated. You will see therefore that this state exists in hydrogen at the moment of its liberation from combination, and that no particular process can be given for its production. A convenient way to illustrate the increased power of hydrogen at the instant of its liberation is to allow the gas, as produced from the decomposition of water by electrolysis, to pass into platinum sponge. The sponge absorbs it, and when placed in sulphate of silver, precipitates metallic silver, which ordinary free hydrogen will not do.

FRICTION GEAR FOR SCREW CUTTING.—To E. C. J., query 2, February, 1872. You cannot cut screws by friction gear, with sufficient accuracy for any purpose, except wooden screws. These should be finished with the first cut.—J. E. G., of Mo.

POUNDING OF PISTON.—I have noticed in "Notes and Queries" considerable discussion of the piston pounding question, and various theories have been advanced. I have often removed the trouble by setting up the springs in my piston packing, thereby preventing the shaking back and forth at every change of the direction of motion.—E. L., of N. Y.

Declined.

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

ADVERTISING.—L. K. F.
BOON TO THE TRAVELLING PUBLIC.—H.
BUILDERS' HARDWARE.—A. T. S.
CLAPBOARDING.—E. S. W.
MODELS AT THE PATENT OFFICE.—A.
NATIONAL DEBT.—J. R. F.
ORIGIN OF DISEASE.—A. B.
PATENT SYSTEM.—A. S. L.
ROTARY ENGINE.—G. R. W.
SUN SPOTS.—J. B.
WEATHERBOARDING.—J. L. G.
WILD TEA.—G. Z.
ANSWERS.—S. T.—O. A. B.—H. J. C.—D. H. N.—M. M.—W. E.—J. K. B.—D. O. T.
NOTES AND QUERIES.—G. A.—F. H. F.—F. H. A.—E. F. G.—J. M.—C. M.—G. W. M.—A. K.—R. M.—L. D. M.—D. B. H.

Inventions Patented in England by Americans.

From January 31 to February 7, 1872, inclusive.
[Compiled from the Commissioners of Patents' Journal.]

SEWING MACHINE.—Howe Machine Company, Bridgeport, Conn.
SHUTTLE MECHANISM.—E. P. Terrell, D. B. Allen, J. Enoch, West Liberty, O.
SMELTING FURNACE.—S. W. Harris, Hudson, N. Y.
WEIGHING MACHINE.—A. H. Emery, New York city.

Recent American and Foreign Patents.

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

CULTIVATOR.—John R. Minter, Unionville, S. C.—This invention consists a combination of various devices, and the use of a cultivator tooth or shovel plow, the shank of which is slotted so that it may be moved up and down. It may be removed entirely when it is desired that the scrapers should straddle the row of cotton, corn, or other crop. For the first time going over the field with the cultivator, the row would generally be straddled, and consequently the shovel or tooth would be taken off; but for cutting and stirring up the entire soil surface between the rows, it would be put on. In the cultivation of cotton, it has been found extremely difficult to find a substitute for the hoe. The ordinary plows and cultivators are too inflexible and rigid to suit the purpose. With this adjustable implement, it is believed that the cultivation of the cotton plant will be greatly facilitated, and that it may be employed to good advantage in the cultivation of corn and other crops.

SHOE FASTENER.—Alexander Klinger, California, Mo.—This invention aims at providing for shoes and gaiters a hook attachment to receive the latchet or lacing string, which is so applied to the shoe or gaiter and secured to a metal plate as to avoid certain objections to other hook attachments, and attain advantages highly desirable in the manufacture of shoes. The device retains itself in place without aid of any other means, and the leather is punctured in but one place (which is done by a flat or cutting blade). The cheapness of such attachment, the absence of all liability to injure the shoe to which it is applied, and its capability of retaining itself in place, are claimed to recommend it above all others heretofore used or known.

CORN HUSKER.—Peter B. Snell, Manheim, N. Y.—A bench is supported upon legs of such a length as to raise it to a convenient hight. The side edges of the middle part of the bench are concaved to allow the operator to sit astride of it conveniently. To the upper side of the middle part of the bench is secured a metallic plate or casting, having two parallel upwardly projecting flanges, formed upon its upper part. The upper edges of the flanges are concaved between their centers and ends, to receive the ear to be husked. A lever is pivoted to and between the flanges, and passes down through a slot in the middle part of the casting and bench. Through the lower end of the lever is passed a pin, the ends of which project sufficiently to receive the foot or feet of the operator. To the upper end of the lever, a little above the casting, is attached a knife or cutter, having serrated or slotted edges. The cutter is attached to the end of the lever so that its edges may project upon the opposite sides of the lever, and so as to pass down alternately between the flanges as the lever is vibrated. In using the machine, the operator or operators sit astride of the bench at the end of the casting, and place their feet upon the pin of the lever. An ear of corn is then placed across the concaved upper edges of the flanges of the casting, in such a position that the knife, as it descends, may sever the butt of the ear, allowing it to drop from the husks. Another ear is then placed upon the flanges at the other side of the lever, which is husked in the same manner, and so an ear is husked at each movement of the lever.

DOUGH MIXER.—Reuben Kent, Portland, Me.—The object of this invention is to provide means for mixing dough in the manufacture of bread, crackers, etc. A cylinder, made in two parts, is employed, the parts being connected by a hinge and catch, and provided with a cover, a shaft, knives, stop pin, drawer and stand, all constructed, arranged, and operating for the purpose named.

COMPOUND BUILDING BLOCKS.—The object of this invention is to produce a very inexpensive building material which will rank with the very best in the country, both as regards durability and appearance, but will be much less costly and more durable than material which is only valued for its appearance. The invention consists in forming brick building blocks with stone, metal, or imitation stone faces, so that, when put upon buildings, they will constitute perfect and uniform blocks of greater strength and durability and with the desired appearance on the face. The building block is composed of a number of bricks, which are cemented or otherwise united together; and a stone, metal, or imitation stone face, if applied as a plate by cement or by mechanical fastenings, is secured to the block of bricks, and the entire block can then be conveniently transported to a suitable place, and put up as part of a building front. Such blocks can be formed in boxes or molds, wherein they can be put up by unskilled hands. When the ornamental face is made of composition, imitation stone, cement, plaster, or other matter, the mold should be formed to shape the compound in the desired manner. By this arrangement, it is claimed that cheap building fronts, richly ornamented or plain, can be made to order. Mr. Andrew Derrom, of Paterson, N. J., is the inventor.

MACHINE FOR PUNCHING METALS.—Gaspar Zender, Caledonia, Minn.—An annular die ring is provided, carrying dies of various shapes and sizes. A punch is provided for each die in case the latter vary in size or shape, and is readily detached when a different punch is required. When this is done, the die ring is turned on the bed, so as to bring the required die directly beneath the punch. When the die ring is thus placed, it may be held in position in any suitable manner. By this arrangement, holes of various sizes and shapes may be punched with a single machine without removing the dies. The advantages of this arrangement will be readily understood by all who are acquainted with the subject.

ELEVATOR.—Paul Giffhorn, Akron, Ohio.—This invention relates to a new endless ice elevator, for conveying ice from barges or sleds to sheds or ice houses; and consists of an endless double chain, provided with braced projections, and arranged on an inclined frame, which has a chute or guide at suitable elevation. A combination, with drums and double chains, having lugged and braced hooks of an inclined channel, formed of side bars and bottom, constructed and applied in a suitable frame, is the claim on which a patent has been allowed.

HOOKS AND EYES.—Miranda R. S. Davis, Kansas City, assignor of one fourth of her right to James P. Howe, Macon, Mo.—This invention relates to an improvement in hooks and eyes for fastening dresses or clothing, and for all purposes to which hooks and eyes are applicable; and it consists in the mode of fastening the hooks and eyes to the cloth or other material. The hooks and eyes are formed with two pointed shanks, which allows them to be inserted in the cloth the same as pins; and, when inserted, they are fastened either by bending the shanks over and down on to the cloth, bending over the eye or hook. No needle and thread are required. The improved hooks and eyes may be inserted and fastened almost as easy as common pins can be inserted, and, it is claimed, in the most substantial and perfect manner.

AMALGAMATOR.—George C. Langtry and George Emmett, Gold Hill, Nev.—This invention has for its object to produce an improved machine for pulverizing slime or mud containing gold and silver ores obtained in the preparatory dressing, tailing or the refuse part of stamped ore thrown behind the tail of the buddle or washing apparatus, or gold and silver bearing sand, and also to separate and amalgamate the precious metals therein contained.

COMBINED BUREAU, BEDSTEAD, BOOK CASE, ETC.—Herman Rocke, of New York city.—This invention relates to a new combination piece of furniture, which embodies within a reduced compass nearly all the requisites of a sleeping and dressing apartment and of a study, since it contains a bedstead, mosquito-net frame, wash stand, toilet case, mirror, table, drawers, wardrobe, spittoon, boot jack, writing case, writing table, and book case.

BALE BAND STRETCHER.—Logan J. Anderson, of Water Valley, Miss.—This invention relates to baling cotton, hay, and all other merchantable commodities which are usually transported and sold in bales; and consists in a lever, clamp, or stretcher so constructed that the ends of the bands are griped and drawn together, and the band is tightly drawn around the bale, for fastening or tying.

WRINGING MACHINE.—Martin Way and Frank Way, of Springfield, Ohio.—In this invention the power of the wringer can be held under constant and varying control, in accordance with the requirements of every single article passing between the rollers. A combination of a bench, wringer frame, tub, wringer rollers, rods, cross bar, lever, point, and treadle is employed to secure the desirable end.

BEE HIVE.—David Latchaw, of Barkeyville, Pa.—This hive comprises features which are not novel; such, for instance, as an arrangement of comb frames designed to form a suitable enclosure for bees without the use of the usual cover or case; also, removable comb frames, with top bars, beveled on the under side, and with central cross bars; also, sectional "supers," or surplus honey boxes; also, inclined bottom board; but the invention consists in a peculiar construction of the feed box, which is a combination with the comb frames provided with bevel top bars, of the feed boxing, having notched end bars and honey receptacles, and a trough, the same being adapted to fit into said frames.

LAMP BASKET.—Patrick J. Clark, of West Meriden, Conn.—This invention consists of a combination of one or more springs with the metal baskets or cups of brackets for suspending lamp holders arranged to spring upon the annular bead or rib near the center of the lamps and hold them from being accidentally thrown out.

BAG HOLDER.—George W. Dungan and Warren Wasson, of Genoa, Nev.—This invention has for its object to furnish an improved device for holding bags, sacks, etc., while being filled with grain or other substances. It consists in the construction and combination of a movable bottom, flexible straps, levers, stops, perforated straps, hooks, and knobs or buttons, with a suitable frame work.

SULKY PLOW.—William B. Cummins, of Leon, Iowa.—This invention has for its object to furnish an improved sulky attachment for plows, which shall be simple in construction and easily operated to raise the plow from the ground for convenience in turning and passing from place to place, and to again drop the plow into working position.

STUMP EXTRACTOR.—Warren Beckwith, of Geneva, Wis.—The object of this invention is to furnish a machine for pulling stumps and raising rocks and other heavy bodies from the ground. It consists in the construction, arrangement, and combination of a frame, timbers, standards, windlass, pulley, and hoisting chains or ropes arranged to act with a standard shaft and block in combination with the standards.

CHURN.—David A. Willbanks, of Harmony Grove, Ga.—This invention is a combination, with a belt, connecting two pulleys, of a looped rod and pin to prevent the belt from becoming tangled when removed from the dasher rod, which is vertical, and rotates the dasher in a churn having the general form of a frustrum of a cone.

HARVESTER.—George W. Holmes, of Council Bluffs, Iowa.—This invention has for its object to furnish an improved device designed especially for facilitating the operation of the cutter bars of reapers and mowers. It consists in a pitman provided with springs and nuts, and also a bar and a two armed lever combined in a harvester with the cutter bar and the rock shaft that drives it in combination with a sliding and supporting frame.

PRESS.—William Randle, of Hadensville Station, Ky.—This invention relates to an improvement in presses, which consists in a novel arrangement of perforated bars, ratchet bars, pawls, and levers with a beam carrying the follower to actuate the latter by lever power.

BRICK MACHINE.—Henry Jones, of Fort Madison, Iowa.—This is an improvement in brick machines, which employs a combination, with a mold wheel, of a chain of mold closers, pressers, and curved bars with inclined planes, also a combination with the mold wheel and pressers of a curved bar, and an endless carrier, also mold closers hinged together in an endless chain by the flanges and pins, the latter being provided with rollers and combined with a support and wheel, also the mold closers have pins arranged for gearing with a toothed rim, and finally bars, housings, and supporting screws arranged in a peculiar manner, the whole being embraced in five claims, allowed on the patent.

LAMP.—Joseph M. Parker, of La Grange, Mo.—This invention consists of a lamp, the body of which is in the form of a frustrum of a cone, with an inverted frustrum of a cone at the top, and the opening at the top being very large, for allowing a free escape in case of an explosion, it being intended that the burner and wick tube, which are held in said opening by a hollow plug of elastic substance, shall be forced out vertically and relieve the lamp so that it will not be broken. The conical shaped body is used because of being more favorable for the expansion and contraction without fracturing than other form; and the concave bottom is used because water, which it is proposed to use as a safeguard against explosion, freezing in such a formed bottom, will not burst it, as the said form allows the expansion without straining the walls. The inventor claims that a lamp constructed on this plan will, in the first place, be scarcely liable to explode at all; and, in the second place, if an explosion does take place, the burner and flame will be forced away from the lamp in the most harmless direction, and the lamp will not be broken. He uses water in the lamp nearly up to the lower end of the tube; as any burning fluid, however volatile it may be under other circumstances, gives off but a very meager portion of carburet of hydrogen, even at a high degree of heat, when resting on a column of water, whereby the danger of explosion is very much lessened.

EXPANSION PIVOTS FOR WHEELS OF SEWING AND OTHER MACHINES.—Emanuel Motz, of Woodward, Pa.—This invention has for its object to provide against the wear of pivots or arbors in machinery, or of the wheels running thereon; and consists in making the same expansible by means of longitudinally adjustable ratchet keys placed around the pivot and within a split ring. The invention is claimed to be particularly useful for sewing machines and similar devices, as it counteracts the wearing of bearings and eyes of wheels, and consequent noise, rattle, and increase of friction.

PEDAL ATTACHMENT FOR PIANOS.—Nathaniel A. Stimson, of Herkimer, N. Y.—This invention has for its object to furnish an improved attachment for pianos, to enable a performer upon a violin, flute, or other instrument to play with his feet a piano accompaniment for himself. It consists in the construction and combination of pedals or foot levers, rods, cross bars, pins and levers with each other, and with a frame to adapt them for attachment to a piano, and to constitute a pedal action of the kind set forth.

COMBINED KNIFE AND FORK CLEANER, KNIFE SHARPENER, AND CAN OPENER.—Frederick W. Echternach and Milton J. Welch, of Philadelphia, Pa.—This invention is a combined knife and fork cleaner, knife sharpener, and can opener, consisting of a base, hard grit cakes, and a lever, pin cutter, and notched plate, all combined to form one implement.

SPARK ARRESTER.—Herman F. Reiner, of Blairsville, Pa.—This invention consists in a wire screen in the form of a frustrum of a cone, which is inverted and attached to the mouth of the smoke stack by its base, so as to extend downward therefrom to within a short distance of the base of an inverted funnel used for deflecting the sparks against the top of the stack, arranged suitably therefor, and receiving them from the sides of the screen after the force with which they are carried up is arrested; and below this funnel, which has a hole at the bottom, is an inverted conical cup, into which the sparks are received, to be again delivered to the blast and forced up to the top of the stack, as before, to be extinguished and broken, so as to be carried off through the screen with the smoke, this operation being repeated until the sparks are fine enough for being so carried off and the fire extinguished. The apparatus is specially designed for application to straight or cylindrical smoke stacks, which are much more preferable than those with flaring tops.

HORSESHOE.—Thomas Kinghorn and Robert Kinghorn, of Morgan, Ohio.—This invention consists of a horseshoe with joints about half way between the heel and toe, and india rubber springs arranged to force the heels outward when attached to expand feet contracted at the heel. The two sides of the horseshoe are jointed so as to approach to or recede from each other at the heel, and provided with projections having cavities adapted for holding a spring on each side, in such a manner that their being contracted by moving the heels toward each other when the shoe is attached to the foot, will constantly tend to spread the foot at the heel by their action thereon. Projections are so placed on the inner side of the bar forming the shoe as not to rise so high or extend so low as to interfere in any way with the wearing of the shoe. A sponge holder is used, consisting of a piece of leather formed mainly in outline like the inner lining of the shoe, but a little larger, with a depression for the frog, and provided with metal clips, having an upper prong and a lower one which engage the inner edge of the shoe above and below, and hold the said leather piece in position. The leather is sprung, to contract it when being introduced and the clips are engaged with the shoe, one of the clips being near each heel and the other at the toe.

Practical Hints to Inventors.

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How Can I Obtain a Patent?

is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them: they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

How Can I Best Secure My Invention?

This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows and correct:

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Preliminary Examination.

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To Make an Application for a Patent.

The applicant for a patent should furnish a model of his invention, if susceptible of one, although sometimes it may be dispensed with; or, if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should be securely packed, the inventor's name marked on them, and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by a draft, or postal order, on New York, payable to the order of MUNN & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents.

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DESIGNS PATENTED.

5,557 and 5,558.—COOKING STOVE.—C. H. Buck, W. S. Wright, St Louis, Mo.
5,559.—SIDE FRAME FOR CHAIRS.—J. H. Travis, Charlestown, E. H. Mahoney, Boston, Mass.
5,560.—FIREMAN'S HAT.—C. D. P. Watters, New York city.
5,561 and 5,562.—CENTER PIECES FOR CEILINGS.—J. W. Reeves, Philadelphia, Pa.

TRADE MARKS REGISTERED.

667.—SOAP.—J. P. Babcock & Co., Stonington, Conn.
668.—TALLOW PACKING.—I. U. Coles & Co., New York city.
669 and 670.—SOAPS.—C. Davis, Cambridgeport, Mass.
671.—LIQUOR PACKAGE.—R. George, New York city.
672.—WATERPROOF MATERIAL.—A. A. Hawley, Methuen, Mass.
673.—NECK TIE, ETC.—Hurlbut & Shantz, Philadelphia, Pa.
674 to 676.—SPICE.—Stickney & Poor, Boston, Mass.
677.—COFFEE.—Stickney & Poor, Boston, Mass.
678.—SODA WATER APPARATUS.—J. W. Tufts, Medford, Mass.
679.—LEWING MACHINE.—Wilson Sewing Machine Co., Cleveland, O.
680.—SHOE BLACKING.—C. H. Young & Co., Boston, Mass.

APPLICATIONS FOR EXTENSIONS.

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

20,254.—DAY AND NIGHT RAILROAD CAR.—J. B. Creighton. May 1, 1872.
20,277.—PAPER PULP MACHINE.—J. Jordan, Jr., T. Eustice. May 1, 1872.
20,364.—CLOTHES PIN.—D. Pierce. May 8, 1872.
20,385.—POWER AND HAND DRILL.—H. Woodman. May 8, 1872.
20,394.—HARVESTER.—W. H. Seymour and H. Pease. May 8, 1872.

EXTENSIONS GRANTED.

19,490.—COTTON BALE TIE.—F. Cook.
19,412.—CULTIVATOR.—F. Dennis.
19,420.—HORSE RAKE.—W. Horning.
19,465.—CARPET BEATING MACHINE.—J. Harris, Jr., D. Holmes.
19,417.—COTTON GIN.—B. D. Gullett.

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HOW TO TREAT THE SICK WITHOUT MEDICINE. By James C. Jackson, M.D., Physician-in-Chief of "Our Home on the Hill Side." And TRAINING OF CHILDREN, by the same Author. Austin Jackson & Co., Dansville, Livingston Co., N. Y. Oakley Mason & Co., 21 Murray Street, New York.

These are works devoted to an exposition of what is styled by the author the psycho-hygienic treatment of the various diseases which afflict mankind, with a view not only to their cure but their prevention. Designed for popular reading, they are necessarily not exhaustive, but, in expounding the rules of temperance, cleanliness, and right living in every respect, they are calculated to do much good, and will repay perusal, even by those who could comprehend more profound treatises.

PLAIN TALK ABOUT INSANITY. Its Causes, Forms, Symptoms, and the Treament of Mental Diseases. With Remarks on Hospitals and Asylums, and the Medico-Legal Aspect of Insanity. By T. W. Fisher, M.D., late of the Boston Hospital for the Insane. Boston: Alexander Moore.

We have not yet had time to read this work, but from a glance at the various topics, and their manner of treatment, we are convinced it is a valuable work, which will repay the thorough perusal we intend to give it as opportunity offers. It is adapted for popular reading, is chaste and elevated in style, and is evidently the work of a skillful practitioner and close observer

ANIMAL AND VEGETABLE PARASITES OF THE HUMAN SKIN AND HAIR. By Joy Jeffries, A.M., M.D., Fellow of the Massachusetts Medical Society, etc, etc. Boston: Alexander Moore.

This is an important, though not altogether attractive subject. It is ably and popularly discussed in this work, and many skin diseases are directly traced either to animal or vegetable parasites.

LOGICAL PRAXIS. Comprising a Summary of the Principles of Logical Science, and Copious Exercises for Practical Application. By Henry S. Day, Author of Elements of Logic, Rhetoric, Rhetorical Praxis, Æsthetics, etc. New Haven: Charles C. Chatfield & Co.

The title fully sets forth the object and scope of this work, which is in method excellent, and well calculated to discipline the reasoning faculties.

HOLY LAND. With Glimpses of Europe and Egypt. A Year's Tour. By S. D. Phelps, D. D., Author of "Poems for the Heart and Home." Twenty-five Engravings. New Haven, Conn.: Charles C. Chatfield & Co., 400 Chapel Street.

Those fond of interesting Journals of travel will find, in this book, an agreeable narrative of a tour through a region more replete with historical and sacred associations than any other on earth. The book is medium sized octavo, printed on tinted paper, and neatly bound.

THE ATLANTIC MONTHLY.

The number for March is an exceptionally good one, containing a great variety of very interesting matter. Hawthorne's Story of Septimius Felton, third part, and Holmes' number three of the "Poet at the Breakfast Table," are worth, in themselves, the price of the magazine; but, in addition to these, there are contributions from De Mille, Nora Perry, J. T. Palmer, John G. Whittier, Longfellow, Bret Harte, Parton, and others well known to American literature.

FOREIGN PATENTS--A HINT TO PATENTEES.

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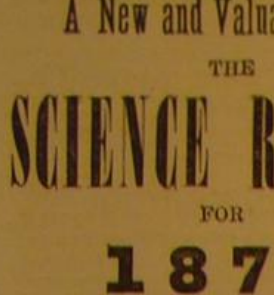
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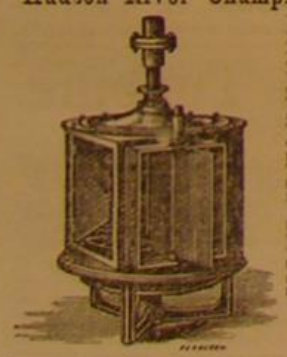
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SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE. MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXVI.—No. 12. [NEW SERIES.] NEW YORK, MARCH 16, 1872. $3 per Annum. [IN ADVANCE.]

Colt's Armory Testing Machine.

This machine has just been completed at Colt's armory, Hartford, Conn. It was designed by Mr. Charles B. Richards, the engineer of the Company, who is already well known to engineers as the inventor of the steam indicator which bears his name. The idea, of using an ordinary platform scale to measure the strain upon a specimen, is claimed to be original by Mr. Richards, and all of the details of the apparatus have been worked out by him.

The Company was led to build the machine, first for its own convenience and necessities; and, secondly, on account of the apparent need of an accurate testing machine in inquiries into causes of boiler explosions, strength of materials for bridges and other metal constructions, and in general for measuring the strengths of American iron and steel and other materials.

We give herewith an engraving which, with a detailed description of the machine, will sufficiently explain its principles and mode of action.

A is the platform of a fifty tun scale, of which B is the weigh beam, with its sliding weight, C. Upon the platforms, a cast iron frame, D, about ten feet high, is placed to receive the fixtures for holding the upper end of a specimen intended to receive a tensile strain. The platform is five feet long by three feet wide, and has an oblong opening in its center, through which two long screws rise about two feet above the platform. One of these screws, E, is shown in the engraving, the other is hidden by the frame, D. The screws carry a strong crosshead, F, which can be raised or lowered by two nuts, one of which can be seen in the engraving. The screws and crosshead are not connected with the platform until the specimen is placed, and the specimen makes the connection.

The crosshead receives the fixtures for applying strains of all kinds to specimens of every shape. The lower ends of the screws, E, are attached to the short arms of a massive forked lever (not shown in the engraving), which is beneath the floor, and has its fulcra supported by the bed plate which forms the foundation of the scale. The long arm of this lever is coupled to the differential system of levers, G and H, the coupling being nearly in line with the fulcrum of the lever, G. The connections, between the lever, G, and the screws, E, which carry the crosshead, are so arranged that, by depressing the free end of G, the crosshead is pulled downwards, and by raising the fulcrum of G, the same result is produced.

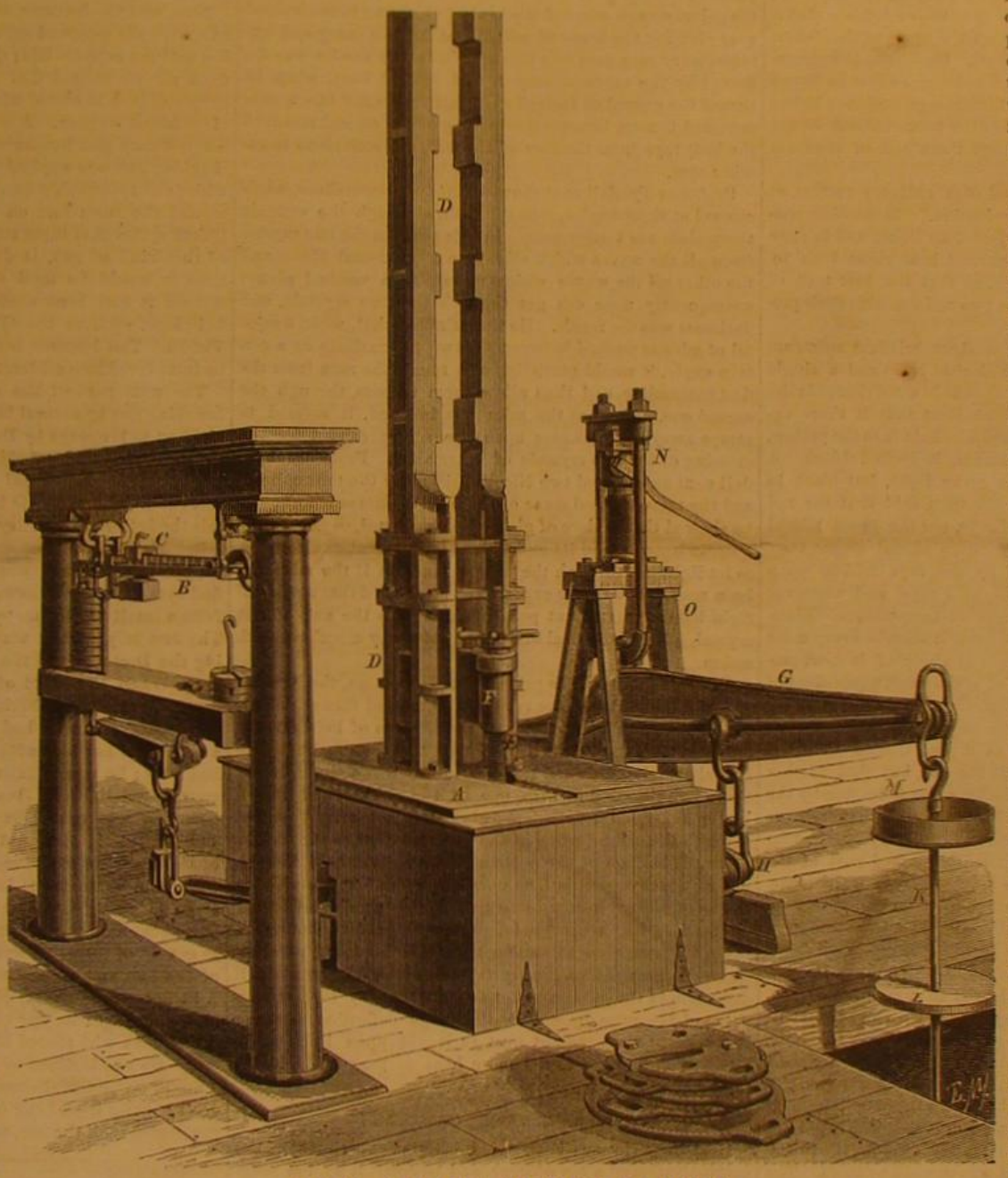
The weight to produce a strain on the specimen is applied at the free end of G, and a rod, K, is there suspended, to which plates and pans, L and M, are attached to receive weights of various values.

To raise the fulcrum of the lever, G, a small hydraulic jack, N, is used, to which the fulcrum is suspended. The jack is fixed upon a cast iron frame, O, erected upon the scale foundation.

If the foregoing description is understood, it is evident that if one end of a specimen, a rod of iron, for instance, be attached to the frame, D, above the crosshead, F, and the other end be attached to the crosshead, the rod may be stretched by bearing down the end of the straining lever, G, for the crosshead will thereby be pulled downwards. The arms of the levers are so proportioned that one pound applied at K will exert a strain of 120 pounds on the specimen, so a strain of 100,000 pounds will be exerted by the application of 800 pounds at K, and this strain will be measured by balancing the weigh beam.

The specimen is supported on the platform, A, and any weight which pulls it down will be indicated on the weigh beam with great accuracy. This result cannot be obtained by using straining levers alone, because the motion which takes place in the specimen requires a very great angular motion in the straining levers, which introduces several errors into calculations based upon the weight applied to the straining levers to produce the strain. Now in this machine it does not matter whether we know the weight applied at K, or not, the strain will nevertheless be always accurately measured by balancing the weigh beam.

As the sources of error mentioned above are common to testing machines in general use, we think this will prove to be more accurate than any that has been used.



COLT'S ARMORY TESTING MACHINE.

The crosshead, under the action of the straining weight, can be moved more than one inch without requiring readjustment. Any metallic specimen can, therefore, be stretched beyond its limit of elasticity in this machine.

For transverse strains, the frame, D, is removed, and the specimen is supported at each end upon the platform, beneath the crosshead, and the straining weight is applied by a knife edge fastened to the under side of the crosshead. To crush a specimen, it is supported on the platform, and subjected to the pressure of the crosshead, under which it will stand. Torsional strains can be applied to shafts by using the necessary fixtures for the platform and crosshead. [See advertisement on back page.]

THE Banking Committee of Congress has reported a bill requiring the officers of national banks to stamp all altered or counterfeit bills which pass their counters under any circumstances whatever. The bill is a good one and should be passed; it is one of the surest safeguards against the circulation of spurious notes.

IN the bitter cold of the arctic regions, 40° to 66° below zero, Fah., iron breaks like glass—so says Dr. Kane.

Railway Power Brakes.

Within the last two or three years, the inventive fraternity have brought forward many new devices for controlling railway trains, independent of hand brakes, and some few of these have achieved quite a success. The Boston and Providence Railway has now in experimental use no less than three different kinds of power brakes, one train each being fitted and operated by each of these devices. Included in this number is the Westinghouse atmospheric brake, which we have heretofore described somewhat at length, giving some account of its successful trial on the Providence road, and of its adoption on quite a number of important roads in different parts of the country, after full and repeated trials and proof of its efficiency. The good character of this device seems to be settled in this country, and the inventor is now in Europe introducing the device there.

Next on trial is the Steinard steam brake, which was first introduced on the Flushing and North Side Railway, and has been in successful operation there on its passenger equipment for some months. In the last volume of the *Railway Times*, we gave some account of the details of this device, which, we understand, is working very favorably on the Providence road.

The last of the three is the electric brake, which, though less known, is said to have proved quite successful on one of the interior roads, and so far worked favorably on the Providence. One of the noted features of the management of the Providence road, for many years, has been its liberality in the trial of all new devices in railway machinery; and to this liberality the public is indebted for many important improvements, without which they would have never been publicly recognized. We are glad that this liberal system of experiments is still continued, and we hope that Mr. Superintendent Folsom will, after this competitive brake trial has been fully carried out, give the public the results of his experience. There is hardly anything more important in railway machinery than efficient means for controlling the movement of trains from the foot board of the engine. The power should be certain and ample, and graduated in intensity to suit the emergency that may arise from possible collision, from unexpected obstructions on the track, and for stopping promptly but easily at stations. In the economy of railway operation, the engineer of the locomotive exercises a most important influence. If he is an intelligent person, he will understand that, in starting, if he throws the throttle valve open with a jerk, he takes a good many dollars, possibly hundreds of dollars, out of the wearing value of the rolling stock; and the hand brakemen, often of the most ignorant and unreflective class, can do the same injury by applying the brake so hard as to skid or slide the wheels, thus grinding out of a true circle, and making the wheels instruments of discomfort and possible danger, to say nothing of the needless expense. In making the engineer responsible for the *movement* of the train by enlarging his duties, as must be done by the use of power brakes, he will be likely to take a more decided interest in the ease of the movement of the train, whether in starting or stopping; he will take some pride in becoming an expert, if not an artist, in these matters, and if he is the man for the place, can save the company a good many hundreds and even thousands of dollars annually in the wear of rolling stock and rails. We are fully committed to the adoption and use of power brakes, for a great many good and sufficient reasons, and when there are so many good devices of steam, air, and electricity brought forward to meet this want, the railway managers ought to put themselves to some trouble to decide which is the best; and they can only do so by fol-

lowing the lead of the managers of the Providence road, and giving all these devices a a intelligent trial.—*American Railway Times.*

INTERESTING LECTURE BY PROFESSOR TYNDALL---THE IDENTITY OF LIGHT AND RADIANT HEAT.

Dr. John Tyndall, F. R. S., recently lectured at the Royal Institution, London, on "The Identity of Light and Radiant Heat." There was a very large attendance, the theatre of the Institution being full to overflowing, so that many of those present could find standing room only. Sir Henry Holland, Bart., M. D., F. R. S., President, occupied the chair.

Professor Tyndall said that it was long a question in the scientific world whether light and heat were the same thing, or whether there was something very different between them. Melloni, in some of his experiments, found that light would not produce heat with his thermopile; but he forgot that the human eye is a very delicate instrument, capable of being excited by an amount of light which, when resolved into heat, would give so little increase in temperature that no thermometer in the world would detect it. Principal Forbes, of St. Andrew's, found that radiant heat, like light, could be polarised; and other philosophers have done much to establish the absolute identity of light and radiant heat. Mr. Faraday showed that the magnetization of a ray of light had its strict parallel in the magnetization of a ray of radiant heat; and he did this with delicate instruments—so delicate that it needed the utmost care and caution on the part of the observer in the laboratory to see the effects. Since then instrumental means had been increased, and so much so that he hoped that evening to be able to show, to the large audience before him, many effects which had hitherto been confined to the observation of those who discovered them and of students who followed in their footsteps.

Heat was sometimes associated with ordinary matter, so that it passed through it by "conduction." In another condition, heat flies through space just like light, and is then called radiant heat. Light and radiant heat come both together to the earth from the sun, so that the first task of the investigator is to separate the two and examine their properties.

Professor Tyndall here threw a short brilliant spectrum upon the screen, by means of the electric lamp and a single bisulphide of carbon prism. He then held a red riband in the red part of the spectrum, and pointed out that it there appeared of a brilliant red color; when he held it to the yellow, green, blue, or violet of the spectrum, it looked black. A green riband looked green in the green light, but black in all other parts of the spectrum. He then said that the red riband was not heated by the red rays, nor the green riband by the green rays; but when they were placed where they looked black, they were warmed by the rays falling upon them, because they absorbed the said rays, and wherever there is absorption there is increase of temperature. Black absorbs all rays, and it is black because it absorbs every color of the spectrum. Only where light is absorbed is heat produced by it, and the heat produced is the exact equivalent of the light absorbed. If a black riband could speak, it could say in what part of the spectrum it felt warmest; and it would say that it grew warmer as it was carried from the blue end of the spectrum towards the red, but that further on still, beyond the red, where nothing was to be seen by the eye, it felt warmest of all. It felt warmest when there were no rays competent to excite vision at all. Every eye in that theatre was receiving, from the non-illuminated part of the screen beyond the red end of the spectrum, rays which, measured by the force they were capable of exerting, were a thousand times more powerful than the rays from the part of the spectrum which was seen by the eye.

The lecturer added that he wished to prove this. He substituted a small round hole for the slit in front of the lamp, thereby producing a narrower spectrum with curved ends. He then placed a piece of red glass in front of the hole, whereby all the visible rays of the spectrum but the extreme red were cut off, and a small round circle of red light was seen upon the screen. He then brought a thermopile so near to the red circle of light that, although it manifestly did not touch or encroach upon the red rays, yet it caught the invisible heat rays beyond the red and was warmed by them. The consequence was that the needle of a large galvanometer connected with the pile swung round in the sight of all the observers, thereby proving the presence of heat. He then cut off all the visible rays from the lamp by means of a glass trough filled with a solution of iodine in bisulphide of carbon, yet the needle swung round as before when the thermopile was placed in the track of the invisible waves. These experiments, he said, proved that radiant heat was refracted by a prism just like light.

He also explained the nature of the thermopile, telling how it was built up of little bars of antimony and bismuth soldered together at alternate ends, and how, when one end of the pile was made warmer than the other, in even an excessively slight degree, an electrical current was set up, the effects of which could be measured by a galvanometer. The thermo-electric pile is the most delicate instrument known for indicating slight changes of temperature.

Professor Tyndall next proved that radiant heat was reflected from plane surfaces like light. Parallel rays from the electric lamp were thrown, upon the surface of a plane mirror placed at an angle of forty-five degrees, so as to reflect the light upwards towards the roof of the theatre. A lens above the mirror brought the rays to a focus, which could be plainly seen because of the illuminated dust in the air. The opaque solution of iodine in bisulphide of carbon was then placed in front of the lamp, so as to cut off all the light; but, when the thermopile was then placed where the brilliant visible focus had been, it was proved that dark radiant heat from the lamp still came to a focus there, as the needle of the galvanometer was powerfully deflected.

Above the lens used in the last experiment, he so placed a prism as to totally reflect the upward beam of light or heat, making it take once more a horizontal direction. When the light was cut off by the interposition of the opaque solution as before, heat rays were still reflected by the prism, as proved by the thermo-electrometer. This radiant heat is reflected like light by a right angled prism.

The lecturer next proved that radiant heat is reflected like light by curved mirrors, and can be brought to a focus like light by lenses. In each case, after showing the experiment with light, he cut off the visible rays by means of the iodine solution, and then by means of the thermopile showed that a radiant heat focus occupied the place where the light focus had previously been.

In the next experiment, he proved that crystals of Iceland spar which split a beam of light into ordinary and extraordinary rays will do the same with rays of radiant heat. A little circle of light was thrown upon the screen, and this, by the interposition of a piece of Iceland spar, was transformed into two little circles of light a few inches apart. When the thermopile was placed before either of these circles, and while all light was cut off by the trough of iodine and bisulphide of carbon placed in front of the lamp, the needle of the galvanometer was deflected as before, owing to the Iceland spar dividing the beam of radial heat into ordinary and extraordinary rays, just like light. While the needle was deflected by the extraordinary ray of radiant heat, when he turned the crystal of Iceland spar halfway round the needle returned to zero, because the turning of the crystal removed the heat rays from the face of the pile, and sent them to another spot.

Professor Tyndall next showed that two tourmalines, when crossed at right angles, stop all light, although the crystals themselves are transparent. In this position the one crystal stops all the waves which vibrate in a horizontal plane, and the other all the waves which vibrate in a vertical plane; consequently none can get through the two crystals, and darkness was the result. He then showed that, when a crystal of mica is pushed between the two tourmalines at a certain angle, it would partially twist round the rays from the first tourmaline, and thus allow them to pass through the second one. Thus, as the mica was inserted, it seemed to scrape away the darkness upon the screen caused by the crossing of the two crystals of tourmaline. Professor Tyndall next substituted two Nicol's prisms for the tourmalines, and the mica enabled some of the light to pass as before; and he showed that a piece of glass when squeezed, so as to throw a strain upon it, had its molecular arrangement so altered as to let light get through the prisms, much as if the mica had been used. In another experiment he showed that a piece of right handed quartz, cut perpendicularly to the axis of the crystal, gave a beautiful display of colors by circular polarisation.

While the two Nicol's prisms were in position, the lecturer placed a lens to bring the rays to a focus, and then cut off all the light by the interposition of the solution of iodine in bisulphide of carbon. Then he placed the thermopile where it could receive the dark rays, and there was a slight deflection; he proceeded to turn one of the prisms, and then a larger deflection resulted, showing that more heat passed through the crystal when in one position than when in another. This fact of the polarisation of radiant heat, he said, destroys many speculations once prevalent. It shows that waves of radiant heat vibrate transversely; polarisation has no meaning with respect to longitudinal vibrations, but where there are transverse vibrations there is a power of polarisation. He then placed the crystals where they gave a small deflection of the galvanometer needle; then by the interposition of the mica he obtained a large deflection, showing that it acted upon radiant heat as it did upon light. The pressed glass also allowed more heat to pass through the crystals.

MAGNETIZATION OF HEAT.

Next he performed Faraday's celebrated experiment of the magnetization of a ray of light, and followed it by the magnetization of a ray of radiant heat—one of the most delicate and complicated experiments ever shown to a public audience. First he took a parallel beam of light and heat from the electric lamp, then quenched the light by the bisulphide solution. The dark rays thus obtained were then passed through a Nicol's prism, and afterwards through a piece of Faraday's heavy glass, placed between the poles of an electro-magnet; next they were passed through a second prism and were finally received upon one face of the thermopile, which they warmed. Rays of radiant heat from a tube of warm water were then allowed to fall upon the other face of the pile, and the heating power was regulated by a square disk, which could be placed so as to cut off more or less of the rays at will. Thus the two faces of the pile were brought to the same temperature, and then there was no deflection of the galvanometer needle. Under these conditions, when the electromagnet was excited by the passage of an electric current, so that the piece of heavy glass was placed in a powerful magnetic field, at once there was a deflection of the needle showing that some influence had been exerted on the radiant heat by the magnetism. This experiment was all the more complicated because a very small and sensitive galvanometer had to be used. Professor Tyndall, therefore, had to illuminate the little dial of the galvanometer with one of his electric lamps, and to throw an enlarged image of the dial upon the screen by means of a lens and a plane mirror placed at an angle of forty-five degrees; thus the movements of the needle were made visible to everybody present.

The lecturer then said, in conclusion, that the thing called radiant heat was part and parcel of the radiations from luminous bodies. At the other end of the spectrum, beyond the violet rays, there were some feeble rays of radiant heat; but in the short range of the visible spectrum lay all that wealth of color which is the chief source of beauty in nature and in art. If they asked him how came the light to be thus composed, and how it is that external nature so sifts this light as to give to the flowers of the field and the leaves of the forest trees their wealth of beauty, and how it comes to pass that we have a sense of the beautiful which has grown up in the midst of these agencies, and how it is that man derives perfection and elevation of mind from the contemplation of this beauty, he would answer that the cause must be left for philosophers to discover. He thought, nevertheless, that they would be able to give but an approximate solution, and that the real root of the matter would forever lie beyond them.—*William H. Harrison, in the British Journal of Photography.*

Laughing Gas.

Dr. Colton recently lectured in Brooklyn, giving some practical illustrations of the peculiar effects of nitrous oxide or laughing gas, which is composed of a mixture of two parts of nitrogen and one part of oxygen.

Now, said the lecturer, the air we breathe is composed of oxygen, hydrogen, and carbon. Any gas that will extinguish fire will not support life; therefore, if oxygen were removed from air we should die. This Dr. Colton illustrated by a couple of jars, in one of which was pure air, and in the other air without oxygen. A number of experiments followed. An ordinary gas burner was lighted, then gradually some laughing gas was applied to the common gas, producing a white and remarkably powerful light, making the gas lights around the room and on the stage appear quite dim. Dr. Colton stated that three miles of piping, for the conveyance of this kind of gas, is down in New York, and in a short time it would be used opposite the Fifth Avenue Hotel. Abroad it had been used some time to light large public buildings, such as the Grand Opera Houses at Paris and Vienna. The lecturer believed that, after a while, it would be introduced into all large cities.

The next part of the exhibition was the inhalation of laughing gas by several ladies and gentlemen who were invited on to the stage by Dr. Colton. Just sufficient was given to exhilarate. Since 1844, Dr. Colton had given the gas to 55,923 persons for dental operations, and none of them had felt the worse for it. He inhaled a small quantity daily, and felt the better for it. They had removed nineteen teeth from a Brooklyn lady that morning, and she never felt the slightest pain; indeed, she was astonished, when she awoke, to find that her teeth were out. Dr. Colton then gave the gas from a small bag to two or three ladies and ten gentlemen. The first lady danced with ease and even elegance, clutching the Doctor round the waist and making him dance with her. When the effect of the gas was off, she stood in the center of the stage, looking at the audience, and wondering, apparently, what she had been doing. She ran to the couch and covered her face with her muff. Then a tall gentleman had a try; he was talkative, and said, "You know how it is yourself—delightful! beautiful! delicious!" His speech, however, was cut short by a pitch forward towards the audience, and, had it not been for the ropes placed in front of the stage, he would assuredly have fallen over. A small dark man came next; he was pugilistic, and cleared the stage in no time. Then there was a dancer, who threw his legs about as if they did not belong to him, and had a desire to get rid of them; he was most amusing under the influence of the gas, and the audience were convulsed with laughter. A little boy was put to sleep for a minute, and laid out flat upon the stage; he was quite insensible. After this came a young man who snored like a pig while he was taking the gas. He was inclined to make a speech, commencing thus: "Happy—wonderful—worth seven miles of travel—happy don't express it—a little more—would go fifty miles." Other gentlemen took the gas, and the effect was similar.

Native Coke.

Messrs. Litman and McDowell, editors of the *Genius of Liberty*, Uniontown, Pa., send us a curious looking mineral with hair upon it, termed among the miners "coal with hair on." They ask us for further information. It is a beautiful specimen of *native coke* or fixed carbon. The "hair" or filiform structure is sometimes seen in artificial coke. It originated in the action of heat on bituminous coal. The long line of outcropping old red sandstone, brought up by the rising of Chestnut Ridge, and stretching from Indiana county, Pa., to Marion county, Va., crossing Fayette county diagonally, is proof of igneous action. Very likely a trap dyke exists in the vicinity of the coal bed. Native coke also occurs near Richmond, Va.

AN esteemed correspondent, M., of Princeton, N. J., sends us a letter in which he states that, some years ago, he picked up a number of the SCIENTIFIC AMERICAN in the office of a rolling mill. His attention was caught by an article entitled "How to make a toy steam engine," and in company with a schoolmate, he began to construct one, and ultimately succeeding, his course in life was determined. From this circumstance, he attaches particular importance to practical scientific instruction, and rightly considers its general dissemination to be the chief element in our modern progress.

THE NEW YORK FIRE ALARM TELEGRAPH.

A visitor to the central office in Mercer street is surprised at the amount of delicate and costly machinery which is crowded into the small room devoted to the use of the telegraph. Three sides of the apartment are completely filled with the apparatus—some of it so intricate that it must be kept covered with glass, to exclude the least dust or grit, which would at once interfere with its movements. At the end of the room facing the entrance may be seen the wires, which center here from all parts of the city to the number of nearly two hundred, each with its little brass key with which it is thrown "into circuit." To the right of this frame of wires stands a large "annunciator," similar to that used in hotels; this is surmounted by a Morse magnet and a small gong. Below and in front of the annunciator is a printing machine, and on each side of this a "dial machine" and pointer, similar to those used in the station houses. On the opposite side of the room a very beautiful piece of mechanism stands on a table, covered with glass and always ready for use. At the first glance, one would say it was a rather complicated musical box or a small barrel organ; for it has six drums with the stops and steel combs, and its operation is somewhat similar. To this instrument is entrusted the work of conveying an alarm to every engine house from the Battery to Harlem, which it does with "neatness and dispatch."

To illustrate, let us suppose that an alarm is struck on the gong. The number rung is 256; instantly the annunciator uncovers this number, and the printing machine writes it down three times and the gong repeats it twice. The wires are thrown at once into "circuit" by an operator, while another places a brass button bearing the same number on the spindle of the machine in the glass case, touches a spring, and off starts the automaton operator, striking 2—5—6 on every fire-gong in the city, making a pause of five seconds, and then repeating the 2—5—6, and yet again repeating the numbers after a similar pause. While this is going on, the same operator throws the wires to the bell towers into circuit, and the alarm is thrice sent to them; and, in less time than it takes to read the description, the bells are heard, and if the fire is near the office, the engines rattle by.

The next step is to make a record of what apparatus is at the fire, which is done by pulling out, from their receptacles in a neat frame, cards bearing the numbers of the engines and trucks which respond to a first alarm. This is scarcely done before 3—3—3 is rung on the gong. This is a private signal, sent from some box by a fireman, policeman, or perhaps one of the commissioners who has not heard the alarm distinctly, and wants to know where the fire is. The number of the box whence the alarm came (2—5—6) is at once sent to the box designated by the annunciator, where it is rung on a little bell. Occasionally this inquiry comes from half a dozen boxes.

By this time, the bells in the office have ceased their tinkling, the automaton has given its alarm, the record of engines out is made, and the operators sit down to compare notes as to what buildings are in the neighborhood of the box giving the alarm, and the probabilities of a large fire. But any apprehensions are allayed very soon by the signal 2—2—2——6, announcing that engine No. 6 has returned from the scene of the fire, proving that it was either a trivial affair or a false alarm. No. 6 is returned to its place in the register, showing that the district is no longer unprotected. The other engines announce their return in a similar way. In a few minutes after the last one has returned, a report of the property burned, the cause of the fire and the probable loss is received from the police station in the district, all of which is registered.

At some time during the night, or perhaps two or three times, the roll is called, to ascertain if the tower men are at their posts and awake. This is done by throwing all the tower wires into circuit, and giving the private signal, which is responded to by the watchers striking the numbers of their respective towers on the gong in the office. As an instance of how acute the sense of hearing becomes by constant training, it may be mentioned that an operator can almost certainly tell by the manner in which the numbers are struck whether the reply comes from the proper tower, or another watcher is answering. For instance, if tower No. 6 answers for itself, and then attempts to answer for No. 9, the difference in the manipulation for the longer signal will be detected by the operator at headquarters. In this case, or should no reply be received, a messenger is despatched to find out why the tower is without its occupant.

Of course, where instant action is required, it is necessary that the circuits be complete, the batteries all in working order, and the machinery without fault. To secure this, the aid of music is very ingeniously obtained. A number of magnetic coils are attached to the hammers of a harmonicon, and they, with the plates of the instrument, form the opposite poles. To prove that everything is in proper order this harmonicon is thrown into connection with the other machinery, and if everything is right a complete octave from C to C is performed. Should anything be out of order one or more notes will be dropped, and the missing tone indicates where to look for the trouble.

Like all other telegraph lines, accidents will happen to the wires occasionally, and here another very ingenious contrivance is brought into use. Should there be any break in the line running up Third avenue, for instance, instead of sending a man to examine the wire from the central office to Harlem and back again, the circuit is made complete, a little instrument attached, and a current sent through the line, which travels until it meets the break, where, of course, it stops; and this point is indicated so exactly that the operator can tell almost the particular block in which the repairers must look for the trouble.—*New York Evening Post.*

THE YALE EXPLORING EXPEDITION OF 1871.

FOSSIL SEA-SERPENTS—A CURIOUS SWIMMING BIRD—REMARKABLE REMAINS—THE GREAT WATER FALLS OF THE SHOSHONE.

At a recent meeting of the Connecticut Academy, in the library of the Sheffield Scientific School in New Haven, Professor Marsh gave a sketch of the Yale exploring expedition of 1871. The New Haven *Palladium* gives the following summary of his remarks:

"The object of the expedition was to ascertain the character of the three great basins of the West; that of the plains west of Fort Lawrence in Kansas, that of the Bridge basin, just west of the main range of the Rocky Mountains and north of the Winter Mountains, and of the basaltic region still farther west, through which flows the Snake river, and, farther to the north, the Columbia. The party was in the Kansas basin in July, and worked there five weeks. The region is a parched, barren country, covered with buffalo grass, no trees, with but few streams, and what there were were very low at that season of the year. The heat was intense, ranging from one hundred to one hundred and twenty degrees Fahrenheit. The method of work was to start about sunrise and continue the examination of the country until about 10 o'clock, and then keep perfectly quiet during the heat of the day. Many of the party were unable to endure the heat; the guide, an old army scout, was completely used up, and the Professor confessed that he never suffered so much in all his life. There was constant danger of sunstroke, and at every step each man crept under his horse for a moment's shelter. The results of their work were most satisfactory. Several tuns of valuable fossils were gathered. They were mostly remains of great reptiles, corresponding to the popular idea of the sea serpent. One they exhumed measured ninety feet in length. They found also fossils of huge winged reptiles, one of which must have measured at least twenty-four feet across the wings. The largest found in Europe of equal perfection measures only three or four feet. The most curious of all their discoveries here was a fossil bird, five feet long, which is like nothing ever seen before. It appears to be a swimming bird, but has features widely different from anything known. They also made some discoveries about the extent of this great lake basin, and fixed its northern boundary.

The next region was the Bridge basin in Wyoming. Here they found another vast bed of fossil remains, that the Professor estimates at a mile in depth. It is like the eastern basin in its deposits, but the animal remains are totally distinct. The eastern has nothing but tropical animals. The only reptile found there is a turtle, and there are no fishes, but a large number of ruminants. In the western basin, on the contrary, are nothing but reptiles. It seems to have been an immense lagoon swarming with reptile life. They found five species of crocodiles, six of serpents, and many lizards. They discovered also mammals of the tapir family. In every tenth layer of the deposit may be expected a different series of animals. The deposits in which they are found are mostly sand. The scenery is very peculiar, as it is the region of cañons. The rivers have cut it through in deep gorges, subdividing this deposit, and the tops of the intervening masses have been washed down, leaving a region of conical hills with deep valleys between. He should say they found in that basin at least fifty species of animals entirely new to science. It was a much more interesting country, as regards its life, than the plains, for there was plenty of game. The scenery of the Winter Mountains is very fine, the peaks being very high, reaching fourteen thousand feet, and the lowest pass is eleven thousand feet above the sea. From this region the party went to Salt Lake, where they made some observations on the past level of the lake. The Professor concluded that at one time it must have had an outlet toward the Columbia river, through the mountains that form the northern rim of the Salt Lake. Going northward, the country changes, becoming a great basaltic plateau extending hundreds of miles. Here they visited the great Shoshone Falls of the Snake river. They are higher than Niagara, one fall being two hundred and ten feet, and the gorge is much deeper and grander. There are two falls, and a stretch of fearful rapids. A curious feature of the scene is that the traveller perceives no indication of a river till he is close upon the ravine. The country is a land of desolation. The only vegetation is the sage brush, growing about four feet high, and making travel difficult. The remains found in this country were discovered in the strata of fine clay at the base of the cañons, and were all of fishes.

From this country they proceeded north to the Blue Mountains, a range but little known, and which they had no time to explore, as it was already the middle of November. From this range they struck the head waters of the John Day river and followed it to the Columbia. The upper part of the John Day valley abounded in fossil remains of horses. They were found of all sizes and all kinds, some three-toed, some like those now living. This northern country is the grandest volcanic region of modern times. The clay strata show the effects of volcanic action, being tilted up in all directions, while in the Bridger and eastern valleys they are horizontal. They followed down the Columbia river, and at last crossed the Cascade Mountains into the Pacific slope. The scenery on the Columbia river, he thought to be the finest of the kind in the world. On reaching San Francisco, the party broke up, most of them coming home by rail, the rest, with Professor Marsh, taking the Panama route. In Central America, a large number of antiquities were collected, including a full series of pottery and some of the famous golden idols. In the explorations in the west, also, many valuable curiosities relating to the Indians were gathered for the new museum of archæology. Professor Marsh was listened to with the greatest interest, and left the impression that the expedition was one of the greatest importance and advantage to science."

PRINTING THE PATENT DRAWINGS.

We are indebted to the Hon. L. Meyer, M.C., of Pennsylvania, for a report of a recent discussion in the House of Representatives on the bill, to provide funds for the publication weekly of the drawings of patents, recently alluded to in our paper.

The project of the Commissioner, which is to publish an abstract with the drawings of all the patents, in the *Official Gazette* at $5 a year, meets with general favor and has passed the House. It now goes to the Senate for concurrence. In the course of the discussion Mr. L. Meyer, among many other reasons for advocating the publications of the drawings, said;

"By placing every particular relating to our patented inventions before the people at the earliest possible moment, many a man will desist from mental labors which he may find have been anticipated, and turn his genius into other channels; while on the other hand, by a close study which only this information and especially these illustrations will permit, many scientific and valuable improvements will be given to mankind. The project, I think, must commend itself as a most judicious one. Certainly it will have the approval of the people, and I hope there will be no dissenting voice upon its passage.

"The publication of discoveries generates in others the desire and the ability to add to the inventive arts. These inventions should be placed before the country in the cheapest manner, but, at the same time, in such form that not only justice shall be done to the genius of our inventors, but credit and honor secured to the country."

The Hon. Mr. Hoar, of Massachusetts, said:

"There are inventors all over this country who are engaged either in perfecting old machines or inventing new ones, and to whom a lifetime of laborious industry of mind and body may be saved by a prompt and perfect diffusion of this work.

"These gazettes, if deposited in the public libraries of the country, will be in a place where inventors will know where to find them, and they will keep themselves posted in regard to particular inventions, and they can send to the Patent Office for particular sheets which contain the lithographs and drawings and the printed statements of the inventions in which they are especially interested.

"Now, sir, this is a matter of immense importance to the people of a district like mine. It is of importance not only to the people of that district, but also through them to the people of the whole country. To show how important is this matter of inventions, even to the agricultural districts where not many mechanics live, I have only to relate one fact to the House. Ten miles from where I live, within the limits of my district, was born a man who by a single invention doubled the value of every acre of land producing cotton throughout the entire South. Twelve miles in another direction lived the inventor of the sewing machine, which has had an almost equal effect upon the industries of the country. Ten miles in another direction was born the man who practically introduced chloroform to the knowledge of mankind, which for the entire world has lightened the pains of death, removed the pangs of labor, and made surgery a blessing instead of an agony to the patient.

"Now, sir, each one of those three men—and I might introduce several other instances of almost as much importance—was a benefactor to the entire civilized world. Each of those men would undoubtedly have found an arrangement of this kind of immense benefit to him in his study of inventions."

SIMPLE DISINFECTANTS.—As a simple method of employing carbolic acid, C. Homburgh, of Berlin, proposes to saturate sheets of coarse millboard with the disinfectant in question. The sheets may be hung up in the rooms requiring purification, or a small piece may be torn off when a small quantity only of carbolic acid is wanted. Sheets of millboard, having an area of about seven square feet, and containing about one fifth of a pound of carbolic acid, are sold in Berlin for a shilling a piece. Dr. Hager gives the composition of a disinfecting paste for use as a washing powder. It consists of 100 parts of white clay, 1,000 parts of distilled water, and thirty-five parts of ordinary nitric acid. The mass thus obtained is allowed to stand for a few days, being stirred frequently. The supernatant fluid is then to be poured off, and the clayey mass thoroughly washed with distilled water. Five parts of permanganate of potash are now to be added, and the composition, when dried, is made up into tablets and wrapped in paper saturated with paraffin.

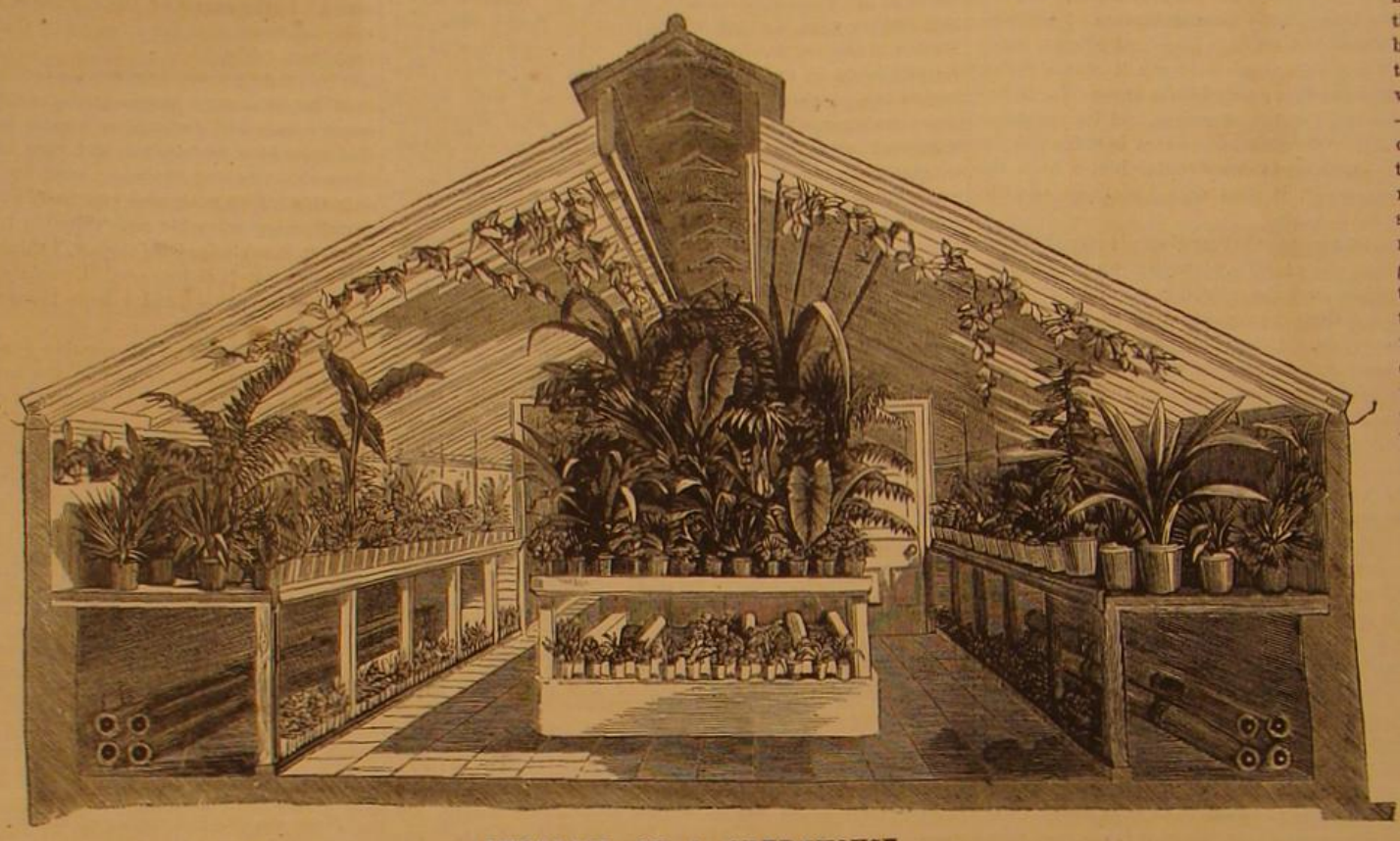
WHEN DOCTORS DISAGREE, ETC.—The temperature of the sun, according to Secchi's calculations, is at least 10,000,000° C; and, according to Mr. Spœrer's, 27,000° C.; while Pouillet placed it between 1461° and 1761° C. Mr. Vicaire, in a note to the French Academy of Sciences, objects to Secchi's use of Newton's law of radiation, because applicable only in case of low temperature, and accepting that of Dulong and Petit, arrives at the more probable conclusion that the temperature does not exceed 3000° C. (5400° F.). He observes that the greatest heat of the oxyhydrogen blowpipe is 2500°C. (4500° F.), and the highest furnace heat is not above 2000° C. (3600° Fah.

INTERIOR OF A GREENHOUSE.

The annexed engraving represents a fine greenhouse lately constructed for William Bull, Chelsea, England, and is considered one of the most admirably constructed and conveniently arranged houses for plant growing of the present day.

The range is about 47 feet long by 20 feet wide, 4½ feet high at the sides, and about 11 feet from the paths to the apex of the roof. It is divided into two compartments, one being fitted for stove plants and the other as a greenhouse. Each division has a large center stage, and side stages with slate tops and wood supports. Under the middle stage, at each end, is formed a bed, in which are planted climbers, to be trained along the roof on light wooden trellis work. In the stove division there is also a hot water tank for evaporation.

The paths are tiled and bordered with cement curbs, on which upright supports of the stages are fixed. Ventilation is effected by means of iron boxes with sliding covers, built in the outer walls near the path level, and by an arrangement at the apex of the roof. This, as shown in the engraving, follows the form of the roof, and extends over the opening made therein sufficiently to prevent any chance of the rain falling or drifting into the side of the house. The ventilator is raised and regulated by a system of levers and quadrants, which being easily used gives greatly for maintaining the desired temperature in the house. In addition, the coal compartment has upright sashes in both sides; they are hinged at the top, and may be all opened when necessary.—*The Horticulturist.*



INTERIOR OF A GREENHOUSE.

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections in the month of January, 1871:

During the month there were 932 visits of inspection made, and 1,794 boilers examined—1,751 externally, and 491 internally—while 113 were tested by hydraulic pressure. The number of defects in all discovered were 1,291, of which 311 were regarded as dangerous. These defects were as follows:

Furnace plates overheated and contorted, 72—28 dangerous; fractures, 145—86 dangerous; burned plates, the strength being greatly reduced, 99—51 dangerous; blistered plates, arising from a want of homogeneity in the iron, 119—25 dangerous; sediment and deposit, 207—23 dangerous. These dangerous cases arose from the accumulated sediment preventing the water from coming in contact with the iron. The sheets were consequently overheated and buckled, and greatly weakened, unsafely so for the pressure carried. Incrustation and scale, 144—15 dangerous; external corrosion, 73—17 dangerous; internal corrosion, 30—5 dangerous. In these dangerous cases of external and internal corrosion, the boilers in places were worn so thin that smart blows of the inspector's hammer entirely penetrated the shell. We are aware that many old boilers are worked in a fearful condition. While the pump is sufficient to supply a little more water than leaks out through cracks and corroded spots, they are considered all right. Hence many steam users regard inspection of boilers as entirely unnecessary. They hold that a boiler will tell its own story, and give them due warning far better than an inspector. The boiler does frequently tell its own story, and it is one the steam user does not readily forget. As well might he neglect his house furnaces or stoves, and expect to escape accident and harm, as to allow a boiler known to be dangerously weakened to go unrepaired. Internal grooving, 9—1 dangerous; water gages defective, 44—17 dangerous; blow out defective, 9—1 dangerous; safety valves overloaded or out of order, 26—15 dangerous; pressure gages defective, 139—29 dangerous; boilers without gages, 4; cases of deficiency of water, 13—8 dangerous; braces and stays broken, 51—26 dangerous; boilers condemned, 13. There were 11 serious explosions during the month, by which 13 persons were killed and 18 wounded.

Fig Culture in California.

W. H. Haynie, at a recent meeting of the Sacramento Farmers' Club, gave his idea of the cultivation of the fig in California, in these words: The white Smyrna fig could be grown and cured as well here as in Smyrna or any of the countries on the Mediterranean. They cannot be imported at less than about twenty-eight cents a pound in bulk, and there are millions of dollars' worth sent to the United States annually. We should and could supply the market. Fig trees ten years old would give on an average one hundred and fifty to two hundred pounds of dried figs a year, and two hundred trees could be grown on an acre—making for the acre 30,000 pounds—which at ten cents a pound would give $3,000. On the same subject, J. R. Johnson said he had been raising figs and marketing them a number of years; he had twenty good trees over ten years old; they averaged him ten dollars a year per tree. Fig trees must not be crowded; they do better standing large distances apart, with the limbs trimmed horizontally, cutting the top of the tree off. They would run in this way like a grape vine, and one tree could be made to cover a quarter of an acre. The Italians dry their figs on dry sand. This giving a uniform heat, and they don't require turning, the sand becoming heated.

JONES' IMPROVED PROJECTILE FOR FIREARMS.

We illustrate, in the accompanying engraving, an improved projectile, patented through the Scientific American Patent Agency, Feb. 20, 1872, by Mr. Samuel E. Jones, of Santa Fé, New Mexico. The improvement is in that class of projectiles with which a sabot is employed.

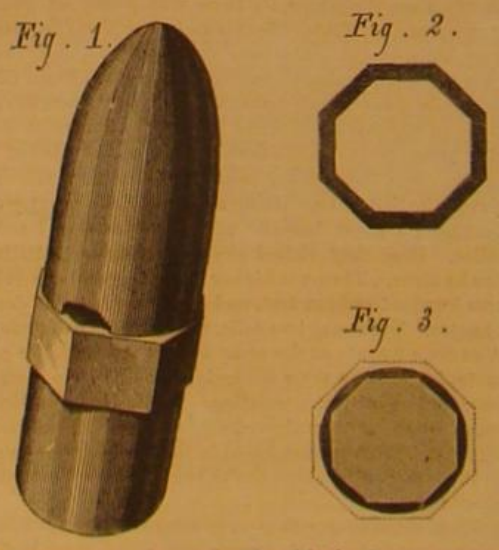


Fig. 1 represents the projectile with the improvement attached; Fig. 2 shows the form of the ring or band, which is a part of the invention; and Fig. 3 is a section of the projectile through the ring, showing the way in which the ring is applied, the patent covering an elastic prismatic ring, arranged in a prismatic groove of the projectile, this groove being made to correspond to the bore of the gun in which the projectile is to be used.

The prismatic groove is cut in the present instance so as to form an octagonal section, the perimeter of which is lower than the cylindrical surface of the projectile, indicated by the dotted outline in Fig. 3. The ring, shown in Fig. 2, may be of leather, rubber, or other elastic material, which, when slipped over the cylindrical part of the projectile, contracts upon the prismatic bottom of the groove, taking the same form exteriorly and interiorly, as shown in Fig. 1.

In this manner, the ring stands out on all sides of the projectile, so as to form a shoulder, practically enlarging the surface of the ball on which the powder gas acts.

It is claimed that in this way a light ball may be projected from a gun having a larger bore with greater velocity than from one which the ball accurately fits, owing to the difference in weight, friction, and surface of impact.

For further information address S. E. Jones, Santa Fé, New Mexico, or G. W. Coffin, North Springfield, Mo.

New Method of Copying.

A novel method of rapidly and economically copying manuscripts and designs, whether produced by hand or photography, has been invented and patented in England by M. Eugenio de Zuccator. An ordinary letter copying press is used for printing from the design, which is formed upon a varnished metal plate. This plate, which is of iron, is either coated with a shellac varnish, and the writing or design to be copied then traced thereon with a metal point—or it may be coated with gelatin and bichromate, and the design produced by means of photography with a transparent positive. In any case the lines are formed of bare metal upon a surface of varnish. To the bed of the copying press is connected one wire of an electric battery, and to the upper plate of the instrument the other, so that when the press is screwed down, and the top and bottom plates come into contact, an electric current passes

The varnished metal plate, upon which a memorandum has been scratched or otherwise produced, is covered with a few sheets of copying paper wetted with an acid solution of prussiate of potash, and then screwed into the press. As before stated, the characters or design upon the varnished plate are formed of bare metal, and in these parts, of course, an electric current is set up; this action permits of the union of the iron with the potash, and the consequence is that prussiate of iron, or Prussian blue, is formed in lines corresponding to those upon the varnished plate. Copies thus produced in blue ink may be printed at the rate of one hundred per hour.

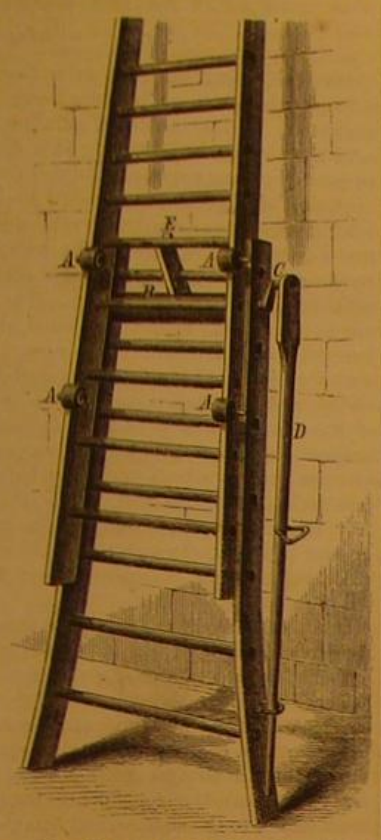
Value of Salt.

This substance is remarkable as constituting the only mineral eaten by man. Not only does it afford an indispensable and wholesome condiment for our tables, but it forms an essential constituent of the blood, and supplies to the human system the loss sustained by saline secretions. Its antiseptic properties are invaluable; but although it preserves, it ultimately changes and deteriorates the quality of the food to which it is applied, rendering the same innutritious and indigestible; for salt, notwitstanding its being a strong stimulant to the animal fiber, is not convertible into nutriment. This is the cause while sailors who subsist long upon salted provisions are subject to the sea scurvy. Its medicinal qualities are also remarkable. While all other saline preparations tend to cool, this but heats the body and engenders thirst. Some years ago, a medical man wrote a *brochure* in which he condemned the use of salt, attributing to it all the diseases to which flesh is heir. The poor fellow eventually committed suicide. Only lately, a book has appeared in which the writer, who is a physician, recommends salt as a sure antidote to the contagion of small pox. Doctors will of course disagree; but as *variola* is acknowledged to arise from a diseased or poisoned condition of the blood, the due use of salt may possibly form a safe and effective specific. Salt is not only an agreeable condiment, but also an indispensable requisite. When moderately used, it acts as a gentle stimulant to the stomach, and gives piquancy and relish to our food. In Africa, the high caste children suck rock salt as if it were sugar, although the poorer classes of natives cannot so indulge their palates. Hence the expression, in vogue among them, "He eats salt with his victuals," signifying that the person alluded to is an opulent man. In those countries where mineral salt is not procurable, and where the inhabitants are far removed from the sea, a kind of saline powder is prepared from certain vegetable products to serve in its stead. Indeed, so highly is salt valued in some places—such as Prester John's country—that from its very scarcity it is employed as a substitute for money.

THERE is a kind of granite, found in Finland, from which glass is made directly. Its composition is as follows: silica, seventy-four per cent; felspar, twelve; oxide of iron, three; lime, one; alkalies, with traces of magnesia, nine.

MILLENER'S EXTENSION LADDER.

The object sought in the construction of this improvement is to provide a ladder that can be used by firemen instead of two ladders hooked together. It is, so to speak, one ladder, although made in two sections, and is, it is claimed, fully as strong as an ordinary ladder of equal length. As it is capable of being made both light and strong, it will, it is claimed, be equally adapted to farmers' and mechanics' use.



In the engraving, A represents friction rollers attached to the stationary part by bolt irons. B is a roller placed between the two pairs of friction rollers, the movable part of the ladder working up or down between them, and the sides of this part being in contact with all the rollers and sliding between the side pieces of the stationary part.

The roller, B, is turned by the crank, C, either directly or by means of a rod or pitman, D, by the use of which the roller may be turned and the ladder extended by a person standing upon the ground, so that a person standing on the movable part may be raised or lowered, to the hight required, by those below. A self-acting brace, E, holds the parts extended in any required position.

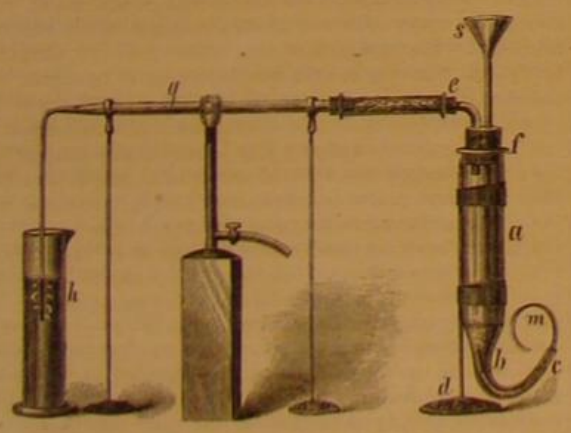
The friction roller bolts are fastened through the sides of the stationary part by screw nuts, so that there may be more or less friction on the movable part.

The invention was patented, through the Scientific American Patent Agency, Feb. 20, 1872, by Mr. Louis N. Millener, of Adams Basin, N. Y.

MAGNESIUM IN MARSH'S TEST FOR ARSENIC.

BY JOHN C. DRAPER, PROFESSOR OF CHEMISTRY, UNIVERSITY MEDICAL COLLEGE, NEW YORK.

The difficulty experienced in obtaining zinc free from arsenic, for Marsh's test, has led to the suggestion of the use of magnesium for this purpose. The latter metal is rarely to be found in any other form than that of strips or ribbons, which expose so large a surface to the action of the acidulated water as to render the evolution of hydrogen too rapid for the proper conduction of the operation. To meet this difficulty, I have contrived an apparatus in which the evolution of the gas is completely under control, and which also shows that the strip or bandlike form of the metal is well adapted to the purposes of this test.



The instrument in question consists of a stout tube, *a*, about one inch in diameter, open at both ends and six inches long, drawn down at *b c* to a caliber which will permit the free passage of an ordinary magnesium ribbon, *m*. The tube is attached by rubber bands to a paper file, *d*, with a stout iron foot or base which serves the purpose of a support admirably. At *f*, the supply tube, *s*, for the introduction of acid and other liquids, and the escape tube, *e*, pass air tight through a cork. The evolved gas is dried in a chloride of calcium tube at *e*, whence it passes through the hard glass tube, *g*, in which it may be subjected to the action of heat and finally escape through a dilute solution of nitrate of silver at *h*

When the instrument is to be used, it is dried and a column of pure mercury poured into the bend, *b c*. The cork carrying the tubes, *e* and *s*, is put in position and the reduction tube, *g*, properly supported. Pure dilute sulphuric acid (one of acid to six of water) is then introduced through the supply tube, *s*, and a strip of magnesium, *m*, being passed through the mercury into the acid, decomposition instantly takes place and hydrogen is evolved. The rate at which this goes on is indicated by the passage of the bubbles through the solution of nitrate of silver at *h*, and is completely controlled by the rate at which the magnesium is passed through the mercury.

The apparatus having been filled with hydrogen, a Bunsen flame is applied to the hard glass tube at *g*, and a measured length of the magnesium band slowly passed into the acid. The purity of the materials is thus tested as in the case of the ordinary Marsh apparatus, with the great advantage that the length of the strip consumed is known; and the quantity used in the test for purity of materials may be proportioned to that employed in the final examination. Freedom of the materials from arsenic and antimony being thus established, by the failure to produce any metallic stain in the reduction tube *g*, the solution supposed to contain arsenic is introduced through the supply tube, *s*, and the magnesium leisurely passed into the mixture. A few moments are required to expel the pure hydrogen from the apparatus, but the newly evolved gas finally reaching the heated portion of the reduction tube, metallic arsenic is deposited in its characteristic form and manner, and any portions of the arsenide of hydrogen that are not acted on by the heat pass into the solution of nitrate of silver at *h* and produce a dark brown precipitate.

The contact of the magnesium and the mercury with the acid causes the formation of an alloy or amalgam of the two metals, which, since it does not interfere with the detection of very minute traces of arsenic, is not of any moment and may therefore be ignored.

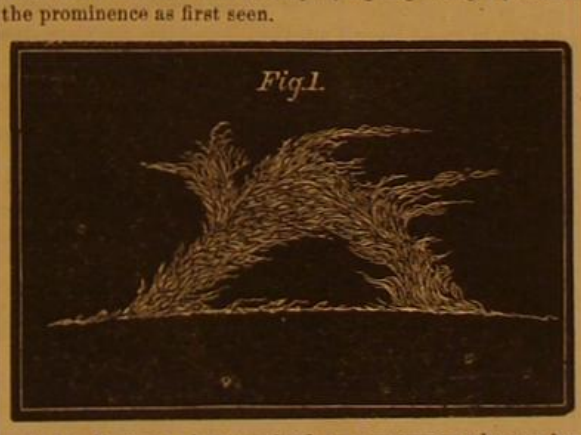
Correspondence.

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

Observed Changes in a Solar Prominence.

To the Editor of the Scientific American:

While observing the sun on the sixteenth of February, I saw a prominence which, in the many changes it underwent, will illustrate the formation of the hydrogen clouds often seen floating above the sun. This prominence was situated on the western limb of the sun, five degrees north of west, and was first seen at 11:20 A. M. At this time, it presented the appearance of two prominences, which had shot up independently, and finally joined themselves together by the interlacing of the filaments of which their summits were composed. Its greatest hight was 40,500 miles; its breadth equaled about two thirds the length of the slit of the spectroscope, or about 108,000 miles. The two stems of the prominence joined each other about 13,500 miles above the chromosphere. The size and form of the prominence were not remarkable, but the changes which it subsequently underwent were various. The accompanying engraving represents the prominence as first seen.



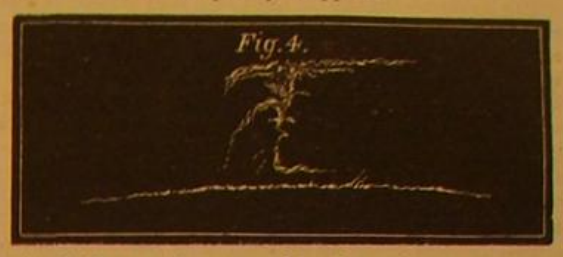
At 11:40, signs of separation began to appear where, a few moments before, all seemed a compact cloud mass; and at 11:50 the two stems were only joined by thin thread-like branches. The northern stem had begun to separate itself from the chromosphere, and was only held here and there by straggling filaments; in a moment it cut itself entirely loose from the sun at its base, but was not as yet free from the



other stem. At 2:20 P. M., when again seen, great changes had taken place; the top of the northern stem had been blown towards the pole, and strikingly resembled the long streamers of smoke often seen issuing from the smokestack of a steamer at sea. The length of this streamer was nearly



150,000 miles. The other stem of the prominence had nearly faded out, leaving only a low stump slightly joined to the northern stem, which had sunk back again to the chromosphere. Increasing cloudiness rendered further observation impossible. The morning of the next day being clear, I again turned my attention to the spot, not expecting to find any traces of the prominence; but in this I was happily disappointed, for the northern stem still remained, torn, shattered, and bound to the chromosphere by one thin thread. Faint traces were left of its former attachments in the form of light thin shreds. The hight had not visibly increased; the breadth had, however, somewhat lessened. It was now 9:20 A. M., and the changes which occurred in its form were too rapid to sketch. Here and there a thread of cloud was seen to form, and as quickly disappear.



At 10:30 A. M., it announced its determination of leaving the chromosphere for good and all by a gradual twisting off of the only thread which held it captive to the sun. This it accomplished about 12 M.; I watched it for some time, until its increasing faintness rendered it a difficult object to make out.



This prominence was seen through the C hydrogen line in the telespectroscope used by Professor Young in the Dartmouth College Observatory. The prism train consists of five whole prisms and two half prisms, the light being sent twice through the train by a prism of total reflection at the end of the train, thus making the dispersive power equal to that of 12 prisms. The cloud prominences are often seen floating above the chromosphere, but generally have their origin in the chromosphere, and are the result of the ejection of matter therefrom. Father Secchi states that he has observed the formation of these clouds in the coronal atmosphere. I have many times observed these clouds, but have, without exception, been unable to discover any increase in their size; but, on the contrary, I have met with a gradual fading out and an ultimate disappearance of the cloud mass. This fact, as has already been suggested, may point to one of the sources from which the coronal atmosphere may draw its supplies of the matter whose spectrum of bright lines was first seen in 1869 and 1870, and which the observations made during the last solar eclipse so fully confirm. JOHN H. LEACH.

Dartmouth College.

The Abolition of Models.

To the Editor of the Scientific American:

Your correspondent "B" objects to the proposal of dispensing with the models on account of their supposed superiority for investigating as to the novelty of inventions. I fully acknowledge their usefulness, but contend that the drawings are much better for this purpose in most cases, especially as the models are very far from being complete, and thousands of them are so broken up that it is impossible to tell what particular patents they belong to; and in many instances it would puzzle an expert to state what class of machinery these fragmentary models are intended to represent. Of these broken and separate pieces of models, there are cartloads stowed away up in the room over the portico, which not one person in twenty frequenting the Patent Office for the purpose of examination knows anything about, to say nothing of those fragments which lie in their appropriate cases, as mentioned in my last letter.

Besides this trouble of broken models, there is another reason, that makes the drawings more reliable, which arises from the fact that the models frequently show only the bare outline of the frame or casing of the machine—the details of construction and the smaller parts, in which may consist the essence of the invention as patented, being entirely omitted and only shown in the drawing and specification. In many cases the drawing shows several modifications of the idea embodied in the model, some of them so radically different that no one would suspect that they had any relation to it, except that they belonged to the same class of machinery. I remember an instance of an excavator patent, having only a very simple model, of which the drawings show seventy-five figures, embracing twenty-six different machines for various purposes. How much could our friend "B." tell about the novelty of an invention from an inspection of that model?

That drawings are the readiest means of making an examination is shown by the practice of the examiners, who always use them in making searches and very rarely look at the models. Speaking for myself as an inventor who has had considerable experience, I know that an examination of the drawings, in nine cases out of ten, can be made in less than half the time necessary for viewing the models. That this is so is rather amusingly shown by the experience of one of our ex-commissioners, who, when in office, issued a very stringent order that no one should be allowed access to the portfolios of drawings without a special permit, which was only to be granted for infringement searches, etc. After this gentleman resigned his position, and had resumed his prac-

tice of attorney, he found "that it was a poor rule that would not work both ways," as it prevented him from examining the drawings now that he was only an outsider. This caused him so much trouble in his researches that, through his influence, an order was issued allowing ex-commissioners free access to the portfolios at all times, but retaining the rule in force against all others.

The incident brings up the question: Why should ex-commissioners have privileges denied to other people? Is there anything inherent in the office of commissioner that should make its temporary possessor a privileged character for life? If there is anything of this kind, the world should know it, and every ex-commissioner should wear a leather medal, a "feather in his hat," or some equally conspicuous insignia, for, otherwise, the common people—such as Ericsson, Morse, and other poor devils of like character—will never discover this "divinity that doth hedge" an ex-commissioner.

This question brings up another: Why should not inventors and their attorneys have the same privileges with drawings that they have with the models? I think that it is fully shown above that an examination of the latter is not sufficient to determine the question of novelty. Such a search may lead an inventor to suppose that the coast is clear, and cause him to spend hundreds or thousands of dollars in experimenting, only to find, when he applies for his patent, that his money, time and talents have been spent in vain, all of which might have been saved had he access to the portfolios of drawings.

Washington, March, 1872. INVENTOR.

Sulphite of Soda Not a Cure for Small Pox.

To the Editor of the Scientific American:

An article entitled "A Remedy for Small Pox, etc.," in your issue of February 24, was cut out and sent to me by a friend, together with your favorable notice of the same. Not long ago much agitation was excited by the vaunted cure of cancer by means of a drug called cundurango. The false hopes of cure by the many sufferers from this dreadful malady were dashed to the ground. Again, not a few persons were led, not by the advice of a physician, to an improper use of a new remedy for wakefulness by the name of chloral hydrate.

Not only is there harm created by improper use of remedies by those who know not the nature of disease, but there is also a great obstacle thrown in the way of those who are seeking to establish the science of medicine upon a sure and firm foundation. There is great source of regret that you were led to publish an article upon the subject named in the paper alluded to, trusting more to the candor of the writer than to his powers of observation of Nature; and this has induced me to write these hasty lines, for fear that another agitation of a hopeless remedy has been thrown upon the public. The value of the contribution by your correspondent depends upon the following considerations:

1st. Can an eruption upon the skin, discovered the tenth day or eleventh day after exposure to contagion, be known as small pox? Can the constitutional symptoms referred to be only explained by supposing the child to have small pox?

2d. As physicians have often mistaken, in its early stages, one kind of eruptive fever for another, is it not possible that a non-professional as well as a physician might equally be mistaken as to the character of the eruption noted in the published case?

3d. Might not the suspicions that contagion might spread from the loaned muff suggest to an anxious parent that the child had an exaggeration of symptoms which would naturally be explained by him to be caused by small pox? When the writer of this present article was studying medicine, he was taken by his instructor to see a man who had a slight rash, accompanied with pains in the back, vomiting, etc., which might possibly turn out to be small pox, to which the man had been exposed. The student was cautioned never to state that a given case was small pox, until the peculiar vesicle of that disease was developed, on about the sixth day from the appearance of the rash. After waiting a week and without any remedies except a harmless *placebo*, the rash had disappeared and the man was well.

4th. Does one swallow make a summer? Or does one apparently successful *cure* by a given drug prove that *post hoc, ergo propter hoc?*

The writer of this present article has been occupied, for the past eight years, in studying the action of drugs by experiments upon animals and by clinical observation at the bedside. His faith in the enthusiastic testimony of the success of a given remedy in the hands of well informed and educated physicians has been often shaken; and he believes that one of the greatest obstacles, to the establishing of the science of medicine upon an exact and firm foundation, is this accepting a theory and calling it a fact. If it is difficult for an honest physician of large experience to believe that his patient recovers because he gave him warm water to drink instead of cold, how much more difficult is it for a man of slight medical education and little practical experience to determine the success of a remedy in a given case?

Now observe how the enthusiastic candor of your correspondent has led him to make mistakes: He says "the United States Dispensatory gives in an ample detail the discussion of the valuable properties of this drug (*soda sulphice*), by the French College of Surgeons, in the thirteenth editorial article of the edition of 1871." There is no such edition of the work your correspondent refers to; and in the edition of this work for 1870, almost all the articles are "editorial" articles by Drs. Wood and Bache of Philadelphia. The name United States Dispensatory was given this book by these eminent writers; but the official organ of American physicians and apothecaries is the United States Pharmacopœia, a new edition of which is now being prepared.

On pages 826 and 827 of the thirteenth edition, to which I have referred, occur the words your correspondent has quoted in his article, but unfortunately for his candor, he has omitted sentences and words which modify the apparent statements of Dr. Wood, who would feel insulted if he were told that he had written as your correspondent would dictate.

For example, at the commencement of the third paragraph, the words "locally applied" are omitted, and in the last line the word "appear" is omitted. Allow me to furnish the correct text.

"Also, *locally applied, useful* in controlling suppurative ulcers, etc. . . . . and in any disease in which purulent infection of the blood may be produced by the same cause, (parasitic or zymotic influences). They *appear* almost *to* act as specifics in such cases." "At *a* certain stage of cancer they operate *usefully* in the same way." There is no mention of a discussion of *soda sulphice* by the French College of Physicians and Surgeons, nor is there an association by this name in Paris. In 1865, there was a great excitement among physicians with regard to the use of sulphite of soda, but careful trial of it in a large variety of cases limited its action to a very small extent.

"On the whole, and not to occupy more space with a statement of claims which seem at present (April, 1868) to be excessive, we (Stillé, *Materia Medica and Therapeutics*) are disposed to adopt the conclusions of Semmola, Professor of Clinical Medicine at Naples, when he says: 'Diseases which have been attributed to morbid fermentation, such as typhoid fever, scarlatina, measles, and malarial affections' (of course including small pox) 'are in no wise influenced by the sulphites; and their grave types continue to be fatal, notwithstanding these remedies. Syphilis, malignant pustule, and purulent infection are equally unaffected by their operation." (*Bull. de l'Academie de Médécine*, XXIX, 1003).

It is unnecessary to quote from other authors who have tested, clinically, the use of this drug, as its failures in treatment are many times larger than its success in curing that class of diseases to which small pox belongs.

Crude petroleum, though very useful in the treatment of certain skin diseases, has caused death by its indiscriminate local application to the whole surface of the body.

The popular use of vaunted remedies is an exceedingly harmful matter, and occasions more work for the educated physician. It has often been truly said that the quack is the strongest ally of regular physicians. Though I have trespassed largely upon your space, permit me to point out an other fallacy. The best application for the sting of an insect or the poisonous bite of a snake, is ammonia spirits; though in snake bites it must be injected into the circulation. If your correspondent had made the local application of a strong solution of sulphite of soda, and omitted the alcohol and ammonia, he could have borne stronger testimony to the efficiency of sulphite of soda in "the sting of a male seventeen year locust."

Allow me in conclusion to state that some competent person should write a treatise upon the popular abuse of drugs, and scatter it far and wide. The effect upon the sanitary condition of our people would be marvellous.

EXPERIATUR.

Shaving with Pumice Stone.

To the Editor of the Scientific American:

I notice, in your issue of March 2, a communication on the subject of shaving, in which the writer suggests, and he probably considers it an original idea, the substitution of pumice stone for the time-honored razor and brush. Now, I do not agree with your correspondent when he claims superiority for what he suggests, as I have tested it, and the result was very unsatisfactory—a sore face.

As for the originality of the idea, I will state that, about the year 1850, an article resembling a file in shape, and which seemed to be made of a preparation of pumice stone, was patented in France, the inventor claiming that rubbing (or filing) the face with his invention was equally as good as shaving with a razor and soap. But the article did not meet with any success.

I have, on three occasions, imagined that I had become an inventor, but each time I discovered, through your valuable paper, that some one else had had the same idea before me. If your correspondent will only put his pumice stone theory in practice on his own face, he will probably be glad to resort to the usual mode of shaving. G. P.

Shaving with Pumice Stone.

To the Editor of the Scientific American:

I beg to enter my protest against the practical joker who rubs his face with pumice stone, and recommends it to those suffering with tender skin, cross grained beards, and dull razors. Now, I have experimented, from the Davenport tricks down to Solliday's paper windmill; and can truthfully assert that I have suffered nothing that can compare with this barbarous method of using pumice stone. I followed the writer's instructions to the letter, with the single exception that I rode no donkey or other hobby, for fear of aggravating the result; and what is it? The hair is off my face and the skin too, and he is laughing in his sleeve as he reads this. Yours in affliction, H. E. M.

A REVISION of the existing version of the Bible is now in in progress by companies of eminent divines, working conjointly, in this country and Europe. In about seven years the work will be completed, and it is expected that we shall then have a version embodying the best results of the most learned and accurate thinkers.

[For the Scientific American.]

THE COLOR OF THE GULF STREAM, AND ITS EXCESS OF SOLID MATTER ACCOUNTED FOR.

BY WILLIAM L. WALKER.

The Gulf stream differs in color from the surface waters through which it flows, its color being *blue*, while the *others* are green. It also holds in solution, mechanically, more solid matter than the latter. This difference in color and suspended matter is to be accounted for as follows:

"Color," as observed by Tyndall in his researches on the color of sea water generally, "resides in white light, appearing generally when any of the constituents of the white light are withdrawn. The water attacks the visual rays with different degrees of energy. The red are attacked first and extinguished; as the solar beam plunges deeper into the sea, the orange and yellow disappear; next the green, and next the blue; and if water were dark enough, and contained no suspended matter, it would work the absolute extinction of the solar beam and become as black as ink. But, in all natural water, matter is held in suspension, and a modicum of light is thrown back to the eye before the depth of absolute extinction is reached." The color, therefore, results from the relation of the solids. The stream, by reason of its greater expansion through its higher temperature, relatively contains less solids, thus cutting out the green, and leaving the blue.

It is more difficult to account for this physical difference in the stream, and why, with an excess of solid matter, it does not sink, but continues to float upon the surface.

There is a difference, generally, between the waters at the surface of the sea and those at its greatest depths, the latter being heavier, colder, and containing more suspended matter. Since all admit that an entire circulation of the oceanic waters must occur, the cold, dense waters which exist below must be hot to the surface, and *transformed* by some process into a surface current such as found in the stream. We will now attempt to point out the principle upon which this takes place.

Aside from gravity, it is heat which causes all the surface and submarine movements of the sea. The continued expansion at the equator and chilling at the poles cause the expanded particles to flow through this and similar streams on the opposite side of the globe into the polar basins. A weight added to one end of an equally balanced beam will cause that end to go down; but, at the same time, the other end must go up. In the equipoise of waters as they exist in the sea, if 1,000 cubic miles of water is carried daily through this and similar streams into the polar basins, an additional weight is thus added to the end of the beam; and, as this must go down from a loss of temperature, an equal amount must go up at the other end (the equator), through an increase in temperature. In both instances, it will be observed that the movement takes place from a change in the molecular motions in the water, a loss at the one end, and an equal gain at the other. In the polar basins, as each particle loses its temperature, it loses its buoyancy; and when it reaches its lowest temperature it attains its greatest density, and, as a matter of course, sinks to the lowest depths, where all such particles aggregate into masses and pierce their way by a slow submarine movement to the equator. These cold, dense particles, now resting upon the lowest depths of the sea, must each be expanded by heat before an upward movement can begin, and transform themselves into a current also. Two agencies operate directly in effecting this change.

First, the direct rays of the sun, as they fall upon the surface of the equatorial sea, perform the following mechanical functions: "The vast body of the thermal rays," as observed by Tyndall, "are beyond the red, being invisible. They are absorbed close to the surface of the sea, and are the great agents in evaporation." The other rays follow, and are severally extinguished; and at a very limited depth, not exceeding a few hundred feet at most, are totally absorbed. But these rays have performed their functions in expanding the particles near the surface, giving rise to a lateral movement, and in turn enabling those at the bottom to move upward; but, before any movement of this kind can begin among these particles below, they must receive some expansion by heat directly imparted from below, since the sun's rays cannot reach them. The slightest change in the specific heat, or increase in the temperature of the particles by reason of the excessive pressure and constantly diminishing weight of the column, also, by the action of the sun's rays expanding the surface, will enable them to ascend and reach the surface in a deflected motion caused by the earth's rotation, and be thrown into a compact current, such as we now find it, moving into the polar basin.

In this transformation of the dense cold water from the lowest depths of the sea into a surface current, it will be observed that no change has been wrought in its physical properties. It is the same in all respects except that it has become buoyant from expansion, and now floats upon the surface as all bodies do which are relatively lighter than the liquid in which they are immersed. Bulk for bulk, of the same temperature, the water in the stream is 15 per cent heavier, but, with its increased temperature, the stream is lighter.

It follows that no mechanical application of the sun's rays alone can produce the movement; and that the heat from the interior is related to it, is an induction from established laws.

FOR distinguishing benzole, which is made of coal tar, from benzine, which is made from petroleum, Brandberg recommends us to place a small piece of pitch in a test tube, and pour over it some of the substance to be examined. Benzole will immediately dissolve the pitch to a tarlike mass, while benzine will scarcely be colored.

[Reported for the Scientific American.]

THE PROGRESS OF STELLAR CHEMISTRY.

A very able and interesting lecture was delivered, not long ago, before the Liverpool Scientific and Philosophical Society, by Professor E. L. Davies, upon the subject of the progress of stellar chemistry. The writer of the subjoined was present on the occasion, and from notes taken at the time has given us the following:

Though it is only within the last eight or nine years that stellar chemistry has developed itself into what may now be called almost a distinct science, it is necessary, in order to thoroughly understand the discoveries of modern times, to go back, nearly two hundred years, to the time when Sir Isaac Newton first discovered the compound nature of white light. In 1675, Newton first announced this discovery. He allowed a beam of daylight to enter a darkened room through a round hole in the shutter, and interposed, in the course of the light, a prism of glass. The light thus treated he found to have undergone refraction, and moreover that it had not been equally refracted throughout, but that certain of its elementary rays had suffered a greater deviation from their original course than others, and that, as a result, instead of the image of the hole in the shutter being formed on a screen placed behind the prism, there was produced a colored band; and this colored band Newton called the solar spectrum.

This spectrum is found to consist of rays of light of the following colors: red, orange, yellow, green, blue, indigo, violet; of which the red suffered the least refraction (that is, was bent the least from its original course), and the violet, the most, the others being intermediate in the order named. Newton also found that if one of these colored rays, the green, for instance, was separated from the others, and again passed through a prism, that it did not undergo any further any further decomposition, and that it was therefore monochromatic. From these experiments, he concluded that while a daylight beam was composed of rays of different degrees of refrangibility, and also that rays that differ in refrangibility also differ in color.

Little more was done until more than a century after, when Wollaston further investigated the subject; and by admitting the daylight through a fine slit instead of a round hole, he observed that the solar spectrum was crossed by a number of fine black lines; and in 1814, Frauenhofer, an optician of Munich, further examined these lines, and counted and mapped nearly 600 of them; but he did not account for their presence except by a vague suggestion that they were in some way caused by absorption, a supposition which has since proved to be correct. To account for the appearance of these dark lines, and also for that of other bright ones which are found in the spectra of incandescent gases, it is necessary to examine the effects of heat upon matter in its two states of solid and gaseous. If we gradually heat a non-volatile solid body, and examine the light which it emits, we find that it first gives off red rays, or in other words, becomes red hot. On slightly increasing the heat, it gives off yellow rays, becomes yellow hot, and as the heat is still increased, it emits successively green, blue, indigo, and violet rays, which by their combination form white light, and the body is now said to be white hot; and when the light from this white hot solid is examined by a prism, it is decomposed into all the colors which go to make up white light; and the spectrum thus obtained is perfectly continuous, and not crossed by lines. And this being true of all solids, the spectra of solids are in every case identical, and cannot be distinguished from each other.

With gases, however, it is different; if we heat, for instance, the vapor of soda, it never becomes red hot, but at once gives out yellow rays, and however greatly the heat is increased, it never evolves rays of a higher refrangibility than the yellow; and if the emitted light of incandescent soda vapor is examined by a prism, it appears in the yellow part of the spectrum as a bright band occupying a definite and unalterable position. If, however, instead of heating the soda vapor to incandescence and using it as a source of light, we interpose a stratum of cooler soda vapor between the source of light and the prism, we get the spectrum instead of the bright yellow line, and, occupying exactly its place, a black one caused by the absorption of the yellow rays by the atmosphere of soda vapor, through which they passed before reaching the prism. And so with other gases, each gas having the power of absorbing light of the same degree of refrangibility as that which, when incandescent, it gives off. This fact at once affords an explanation of the black lines which appear crossing the solar spectrum. They show that the solar atmosphere contains certain substances capable of absorbing light; and, by the exact coincidence of these black lines with the bright lines produced by certain terrestrial elements, we are fully justified in concluding that many metallic and other elements with which we are acquainted on the earth recur also in the atmosphere of the sun. The elements which have in this manner been recognized in the solar atmosphere are sodium, calcium, barium, magnesium, iron, chromium, nickel, copper, zinc, strontium, cadmium, cobalt, hydrogen, manganese, aluminium, and selenium. Since the moon and planets shine by reflecting the light of the sun, the spectroscope can afford no information as to their composition, but it is able to afford some clue as to the presence or absence of an atmosphere; and the results of spectroscopic observation tend to show that the moon has no atmosphere, but that this is present in the case of the other planets. The fixed stars being self-luminous, give characteristic spectra, and, as in the case of the sun, many of the dark lines correspond with those of terrestrial elements. Stars, moreover, differ in color; those which are bright to the naked eye show generally a tint of red, yellow, or orange, and with the telescope we may discover, in close companionship with these other, fainter ones of a blue, green, or purple color, and the cause of this difference is revealed by the spectra. We find that in the case of white stars, the dark absorptive lines are pretty equally distributed over the whole spectrum, which gives the characteristic color of the star.

The spectroscope has also afforded important assistance in the examination of the *nebulæ*. These bodies appear in the heavens as a faintly luminous haze, some of which, when examined by a powerful telescope, appears to be resolvable into a number of bright points; and long ago Sir William Herschel suggested that these *nebulæ* were the primordial matter out of which the existing stars have been formed.

Spectrum analysis, notwithstanding the difficulty of applying it to bodies so very faint, has afforded much valuable information regarding the physical distinction which separates the *nebulæ* from the fixed stars. The spectrum of the *nebulæ* consists of bright lines, showing them to consist of incandescent gaseous matter, and the same results are obtained from those *nebulæ* which appear to be resolved by the telescope, the only difference apparently being that the bright points consist of more dense, but still gaseous, matter than that composing the unresolvable ones.

From such experiments and observations as have been described, we appear to be justified in concluding that the sun consists of a white hot nucleus surrounded by a cooler atmosphere, containing many elements which are met with on the earth; that the fixed stars have a constitution analogous to that of the sun; and that the color of the stars depends upon the nature of the elements which occur in their atmosphere; whilst, with regard to the *nebulæ*, the experiments have perhaps not been yet sufficiently numerous to allow any definite theory being formed.

Silver Mining in Nevada---A Visit to some of the Mines.

After waiting a few minutes for one of the cages, as they are called (being large sheet iron boxes drawn up and lowered down by an everlasting windlass, propelled by steam power), to arrive at the surface, we spend the time in looking down, down, until nothing is discernible but the faint glimmer of a light, no larger than a twinkling star. The cage has arrived, and all aboard, our tour of inspection has begun. We experience none of the heat that was anticipated, as the draft of air formed by our descent has dispelled it. The cages go down very rapidly, and we could hardly believe that we were in motion until we were landed at the 700 feet level with a jar. Quickly jumping off the cage and lighting the candles handed to us, we follow our guide, finding the climate at this landing quite cool, as there is a strong current of air being forced continually down from above by means of large blowers made for the purpose. The passage on this level is about five feet wide, with a car track laid on sleepers, upon which small, open cars, drawn by mules, are run, carrying ore, working material, etc. There are smaller passages or drifts, as they are called, cut through here and there, while prospecting for pay rock. Now we go down innumerable ladders and inclines, preferring this more exciting method than the cage, and have a better view of the surroundings; pass the stables used for the underground animals, where the mules stand perfectly quiet and looking as contented as if they were aware that they had plenty to eat and very little to do; we have finally reached the 1,100 feet level. Pause, reader, and only think; 1,100 feet down in the bowels of the earth, among untold wealth waiting but to be carried away. Here we find the atmosphere very warm and the perspiration starts in streams. Going in an easterly direction, as the lead runs from east to west, we arrive at one of the many drifts, and finally pause for a moment and are asked to try our hand at the pick to see what kind of a miner we would make; nothing loth, we seize hold of one and begin our new labor, but are very soon exhausted and find our progress has been slow indeed, as nothing but a blast of powder will affect the rock. Being rather warm after our exertions, we concluded to start for more genial quarters; but being asked if we would not like to go over to the Belcher mine, we conclude to do so, and we wait for a load of timber, which was coming down the tunnel on one of the cages, to follow after it, meantime looking at the pumps, machinery, and workings of the incline cars, which come and go continually, laden with ore to the station, to be hoisted up in the cages.

The lumber has at last arrived, and is quickly transferred aboard one of the cars; and we are all prepared to follow its course, but the carman, a shrewd Yankee, quickly sees that we are strangers, and immediately whips his mule up on a keen run, and we after him as fast as strength and "foot and walker's line" will admit of; our candles are blown out, leaving us in almost total darkness, and forgetting to keep our bodies in a stooping position, our heads come in close contact with the beams above. Arriving at the "Belcher" out of breath, we again halt before the face of a rock they are at work upon, which is sixty feet wide, and the ore very rich. As fast as the quartz is taken out, they fill behind them with waste and timbers as a precaution against its caving in on them. The beams are twelve by fourteen inches, and placed every few feet apart, and cross braced so as to be as firm as possible; yet we notice some of the timbers twisted and broken in every conceivable shape by the enormous weight they have to withstand. Leaving this, the fifth level, we go up to the fourth and third levels, and are shown some of the richest ore in the mine, and are given some fine specimens of crystallized quartz to carry home with us. From here we are taken to see the cave-in that was had at the "Crown Point" a short time since, when thousands of tuns of rock fell, leaving the roof looking like a huge dome. Luckily the fall happened during the hour of noon, otherwise thirty human souls would have passed into eternity. In this part of the mine it is excessively warm, so much so that the men work in six hour shifts, and where it is cooler eight and ten; but little clothing suffices, some having a cloth only tied around their loins; yet all appear to be healthy enough and very stout. Starting back on our return, we meet with no stoppages until arriving again at the 1,100 feet level in the "Yellow Jacket," where we are told by Mr. D. that we have traversed from three to four miles, and been under nearly all the city of Gold Hill, and then seen but about half of the underground works. All aboard the cage again, and in about thirty seconds, after passing station after station, with a jar we are landed from our first starting point, and with a shiver change our clothes, having come from the torrid to the freezing zone in so short a space of time. We step outside of the building and are much surprised to find the stars shining brightly, as it was in the afternoon when we started on the descent.—*Philadelphia Post.*

The "Argento" Picture, by Mr. F. A. Wenderoth of Philadelphia.

The manipulations are briefly as follows: A carbon print is made by exposing a piece of carbon tissue, sensitized by bichromate of potash, under an ordinary negative, in the usual way of printing carbon prints. A metal plate with a silvered surface is taken and ribbed by rubbing it with a sanded brush, to deaden the polish and to give effect to the picture. The plate is then cleansed with spittle, nothing else answers the purpose as well, and then laid upon a sheet of paper on a table flowed with diluted alcohol. The carbon print is now laid face down upon the print, paper laid upon it, and a squeegee (made of a piece of wood and several thicknesses of ordinary bed ticking wrapped over one end) used to force out the superfluous alcohol between the picture and the plate, and to make the one adhere to the other. The alcohol also serves to prevent the occurrence of air bubbles.

The whole is now immersed in a pan of water of about 100° temperature, and developed in the usual way, leaving on the plate a picture, the shades of which consist of the colored gelatin and the lights, or rather, the highest lights of the surface of the plate exposed under colorless gelatin. This part of the operation, as all carbon printers know, is most fascinating and beautiful—more like the developing of a collodion plate than anything else. As soon as the superfluous color is all washed away, the pictures (now on the metal plates) are removed from the water, and hung upon a line by clips to dry.

To render them more lasting still (though a carbon print on a metal plate seems to be as permanent as anything can be) they are, when dry, hermetically sealed to glass in the following manner: A little stand should be provided, made of a plate of cast iron, say one quarter of an inch thick and twelve by twenty inches in size, smooth on the upper surface, riveted to a leg at each corner. This plate is heated with gas, or a coal oil stove, the heat being applied at one end, so that the end of the plate furthest from the heat will be considerably cooler than the other. Now lay the picture upon the iron plate at the warmest end. When it becomes warm, drop upon it a small piece of white wax, which will soon melt and naturally spread over the whole surface of the picture. Now, having first heated the glass, place it upon the surface of the picture, place them under a weight on the cooler end of your iron plate, where they will gradually cool and become effectually sealed together. They are then cleaned and mounted in a case or frame, as desired.

The results are very beautiful, and are made more brilliant by the metal plate on which they are mounted. The prints are made with "cut outs," so that, when finished, the white metal plate forms the margin, which adds greatly to the effect.

Waterproof Glue.

WE have recently met with a very useful form of cement for wooden or other similar articles which are employed for holding water or non alcoholic liquids. Although the formula is not a very novel one, we know it to be useful and likely to suit the requirements of some of our readers. It stands as follows:—

Alcohol, (spirit of wine) 1 pint; sandarac, 1 ounce; mastic, 1 ounce; common white turpentine, 1 ounce; glue and isinglass, sufficient; water, sufficient. Dissolve the two resins—sandarac and mastic—in the spirit, and then add the turpentine to the solution. Make some very strong glue, and add to it a good pinch of isinglass. Now heat the alcoholic varnish until the liquid begins to boil, and then very slowly stir in the warm glue. The amount of the liquid glue to be added is determined by noting the point at which, after thorough mixture, a magma or thin paste is formed capable of being easily strained through cloth. When required for use, the strained mixture is to be warmed and applied like ordinary glue to the articles to be united. A strong junction is effected, which is not destroyed by cold water, and only after a comparatively considerable time by hot water or ordinary saline solutions.—*British Journal of Photography.*

EVERYTHING in nature indulges in amusement of some kind. The lightnings play, the winds whistle, the thunders roll, the snow flies, the rills and cascades sing and dance, the waves leap, the fields smile, the vines creep and run, the buds shoot, and the hills have tops to play with. But some of them have their seasons of melancholy. The tempests moan, the zephyrs sigh, the brooks murmur, and the mountains look blue.

WALSH'S WATER WHEEL GOVERNOR.

We have been very strongly impressed with the efficiency of this ingenious device, not so much from the numerous testimonials which substantiate its merits as from personal examination of a working model, which convinces us that all the elements of a really good water wheel governor are combined in it.

Our engravings (Figs. 1 and 2) represent two different forms of this governor, the principle of construction being the same in each. Figs. 2 and 3 exhibit this principle.

A, Fig. 3, is the vertical shaft, which revolves the balls, driven by a pulley shaft and bevel gearing, shown in Figs. 1 and 2. The balls, as their orbit widens or narrows, move the collar, B, vertically, in the ordinary way. This move-

Fig. 1.

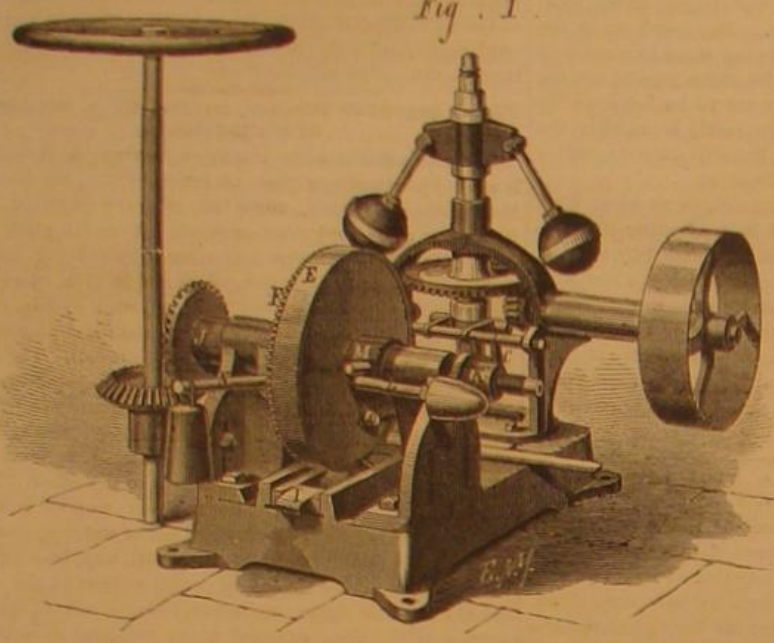
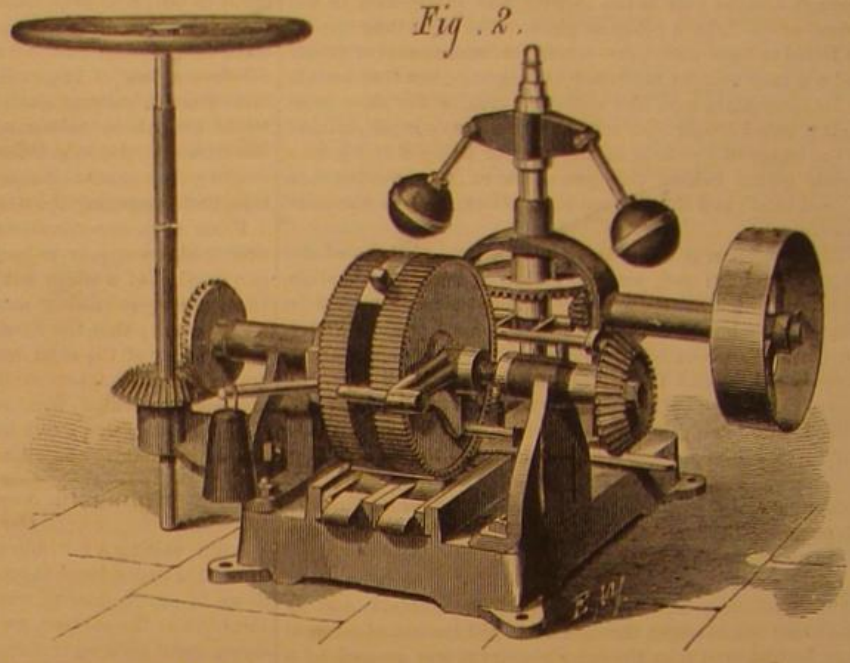


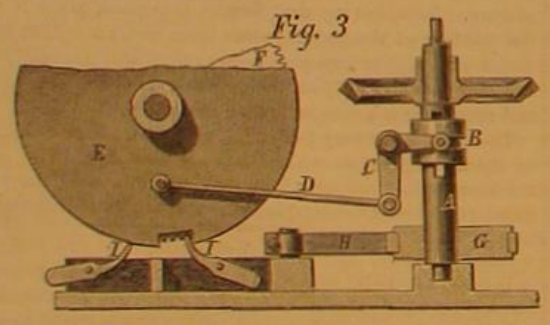
Fig. 2.



WALSH'S WATER WHEEL GOVERNOR

ment of the collar actuates the bell crank lever, C. To the bell crank lever is pivoted the connecting rod, D, which is also pivoted to the shield, E, Figs. 1 and 3. This shield consists of a disk, as in Figs. 1 and 3, or sector of a disk, as shown in Fig. 2, which has a rim upon its edge turned down at right angles. This rim covers the toothed wheel, F, Figs. 1 and 3, but has a notch cut in its lower part, as shown in Fig. 3. To understand the office of this shield, we must now refer to the eccentric, G, Fig. 3. With each revolution of the ball shaft, this eccentric, through the connecting rod, H, reciprocates a cross head carrying the gravity pawls, I. One or the other of these pawls engages the toothed wheel, F, according as the notch in the rim of the shield permits the engagement. As the collar, B, Fig. 3, moves up and down with variations of speed, the shield is moved by the connecting rod, D, above described, so that the notch in the shield permits the proper pawl to act.

Fig. 3



The toothed wheel, F, Fig. 1, is fixed to the shaft, J, which is connected to the gate shaft by bevel gearing.

It is obvious that when the notch in the shield stands midway between the pawls, I, that neither of the pawls can act. Advantage is taken of this to limit the hight to which the gate can be raised by the governor. A nut and arm, K, run in a thread cut on the shaft, J, Fig. 1. The arm carries a pin, L. By the continued action of the pawl that raises the wheel, the nut, K, is run along the thread on J, till it finally abuts against a shoulder turned on the shaft, and then turns with the shaft. At the same time the pin, L, is brought under a lug, M, formed on the hub of the shield. The shield is thus turned so as to bring the notch to the center, where, as neither of the pawls can act, the gate cannot be further raised. As soon as the speed of the general shafting, to which the governor is belted, increases, the action of the collar, B, and bell crank, C, Fig. 3, moves the notch off the center so that the proper pawl to lower the gate acts as before.

Fig. 2 represents a governor made to act by two eccentrics, two systems of pawls, and two toothed wheels, so as to raise or lower the gate faster than the single system will, this style of governor being designed for certain turbines, the gates of which are operated with screws which require many turns to open or close the gate.

A friction brake, N, Fig. 1, is employed to hold the shaft, J, from turning back, as it will in some cases during the intervals between the impulses imparted by the pawls.

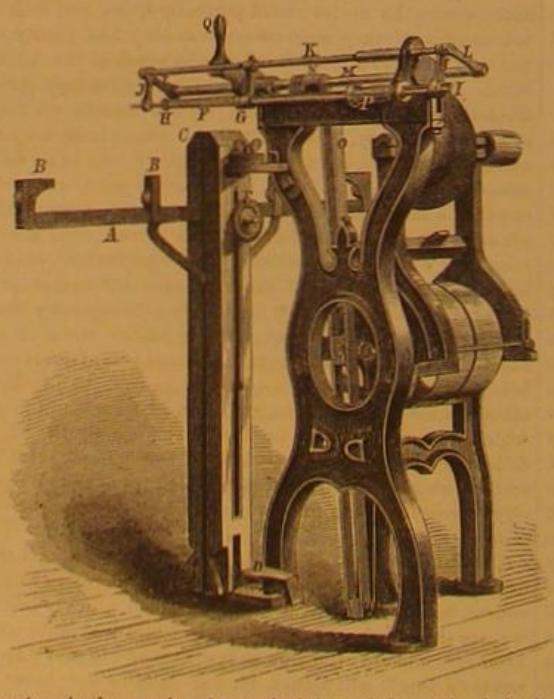
Patented, through the Scientific American Patent Agency, Oct. 6, 1868, and April 19, 1870. For further information, address A. Walsh, Cambridge, N. Y.

Professor Treadwell.

Professor Daniel Treadwell died recently at Cambridge, Mass., aged 87 years. He was born at Ipswich, Mass., in 1791, was a man of great inventive genius, and to his labors and research the world is indebted for many valuable and useful discoveries in practical science. At an early age, he invented a machine for making screws. In 1818 he produced a printing press of a new construction, and in 1819 visited England, where he conceived the construction of a power press which, upon his return to this country, he completed, and which was the first upon this continent upon which a sheet was printed by other than human power. In 1822, in connection with Dr. John Ware, he established and conducted "The Boston Journal of Philosophy and Arts." In 1825, he was employed by the city of Boston to make a survey for the introduction of water and in 1829 completed a machine for spinning hemp for cordage, which was the first ever successfully used for the purpose and is still in use at all the navy yards in the United States. In 1832, he became Rumford Professor of Technology at Harvard College, which position he held until 1845. Shortly after becoming a professor he invented a cannon, which eighteen years ago was adopted and patented in England by Sir William Armstrong, and is now known to the world as the "Armstrong gun."

CHAPMAN'S IMPROVED SAW FILING MACHINE.

The original filing machine, manufactured by the inventor of the improved machine herewith illustrated, has been before the public for twenty years, and is familiar to the majority of American lumber manufacturers. The improved machine, which forms the subject of the accompanying en-



graving, is the result of practical knowledge gained during the period named, the improvements being numerous and important. The machine, as it is represented in our engraving, still retains the best points of the old machine, although the changes are so great that the machine may be said to be entirely remodeled.

The present machine is made wholly of iron, and is much more compact than the old one. The clamps are peculiarly formed, being adjustable and adapted to filing all styles and sizes of saws in common use. By means of the swinging frame described below, all kinds of files may be used, and can be easily and quickly exchanged. Both ends of the file are held, and thus the file is guided evenly and straight across the saw tooth, so that any person, however unacquainted with saw filing, may manage this machine. A peculiar arrangement of the connecting rod causes the file to traverse much more rapidly on its return stroke than in making its forward stroke, the motion thus produced simulating, in this respect, that of the file in filing saws by hand.

A simple and cheap appurtenance, consisting of an emery wheel and proper supporting devices, may be attached at the option of the purchaser, and answers the purpose secured by the more costly ones now in use.

It is claimed that, with this machine, one man can do three times the work that can be done by hand, doing it better, and with a less number of files, than would be consumed in doing the same work by manual labor.

Referring now to the engraving, A is a bar which supports the back of the saw. This bar is provided with guides, B, at the bottom of each of which is a roller. The bar, A, is supported, as shown, between the two parts of the clamping vise, C. The inner part of this vise rests upon a pivot at th bottom. It is pivoted at the top, a small graduated arc and pointer enabling the entire clamping device to be set at any required angle, to give the proper bevel to the saw teeth; when thus adjusted, it is held by a set screw. It is instantly clamped by the foot lever, D.

The hight of the guide bar, A, is regulated by the set screw, E, which is adjustable in the longitudinal slots of the two parts of the clamping vise. The file, F, has its shank inserted at G, and its point is held at H. It is held by adjustable devices, so that different sizes of files may be used; and being placed as shown, is reciprocated through the rod, I, the arms, J being connected with the rod, K, which is pivoted to the arms L, the latter being fastened to the rod, M. The rod, M, is reciprocated by the collar, N, the latter being actuated by the oscillating bar, O. The bar, O, is oscillated by a crank pin taking its motion from the pulley shaft, and impelling a sliding block in a longitudinal slot formed in the bar, O. It is by the latter means that the quick backward motion, as compared with the forward motion of the file, is secured. It will also be seen that the rods, I, K, M, reciprocate together. But the rod, I, has V shaped grooves, in which slide suitable ways formed in the handle, P. This handle does not reciprocate, being held by a device for that purpose. It may, however, be rotated, and when so rotated by the hand of the operator, it holds the file in the proper position to act properly upon the saw tooth.

The handle, Q, does not reciprocate, but through suitable devices it is used to rotate the rod, M, on its longitudinal axis; and in so doing, it will raise the file clear of the teeth during the advance of the saw, and, by reversing the motion, lower the file to its proper position for filing again. Both this movement and the one previously described may be made without stopping the reciprocation of the file, and thus the work can proceed rapidly and be performed with superior accuracy.

The machine is, as will be seen, very compact and substantial. The attachment of the emery wheel is shown in the engraving, and needs no particular comment, except that as we have remarked above, it saves the increased expense of a costlier device.

The improvements described were patented through the Scientific American Patent Agency, January 30, 1872, by T. M. Chapman, whom address for further information at Old Town, Maine.

We have received from Washington the advertising circular of Joel Floyd & Co., under the free frank of Hon. R. R. Butler, member of Congress. We have occasion to send off large numbers of business circulars, but have heretofore been compelled to pay full postage on them. We would like to inquire of the Hon. Mr. Butler if he is open to an engagement to frank letters to other parties, and what his charges are to Floyd & Co. for attending to their postal business.

Professor Shepard, of Amherst College, Mass., has one of the largest collections of meteorites in the world. It embraces 146 different meteoric stones and 93 meteoric irons. The heaviest specimen of the irons is one from Aerotopas, weighing 438 pounds, and the largest of the stones is that from New Concord, weighing 52 pounds.

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AMERICAN ART INDUSTRY.

Prior to 1870, the manufacturers of woven and printed fabrics in this country were accustomed to depend wholly upon foreign artists for the origination of ornamental designs. No sooner was a novel pattern produced in England or France than our manufacturers copied it here without giving to the artist, by whose study and labor it was designed, either credit or recompense.

This illiberal and unjust policy was productive of a variety of evil results. First, it deprived the original artist of all chance of reward for his labors. Second, it encouraged our manufacturers in stealing the fruits of such labors. Third, it utterly prevented the development of home talent in the production of artistic works of this kind. Why should our rich and prosperous manufacturers hire home artists to prepare designs for patterns when they could steal them, ready made and free of cost, from foreign artists?

To remedy this evil, and gradually to compel our manufacturers to employ native artistic talent, Congress revised the patent law, in 1870, so as to permit foreigners to patent their designs here. This was an act of simple justice to foreign artists; at the same time, it gave protection and stimulation to home industry. The manufacturer could no longer copy his designs with impunity from foreign sources, and was compelled, as a matter of course, to call in home talent to his assistance!

This has been the practical effect of the new law thus far. Hundreds of artists have found remunerative pay for their labors, and hundreds of art students are diligently at work preparing themselves for this new field of industry. In a very few years, if this law is allowed to stand, the United States will occupy a leading position as the originator of beautiful art works, and a noble branch of home industry will be created.

These remarks are called forth by the attempt on the part of certain manufacturers to change the existing law so as to restore the old status. A bill for this purpose, preventing foreigners from registering their designs, has just passed the Senate. It bears the innocent title of "A bill to amend the statutes relating to patents and copyrights." But its title, if correctly given, would be "An act to discourage American art industry, and to assist wealthy manufacturers in stealing artistic designs." We trust that the House will reject the Senate bill.

ARE EXPERIMENTAL TESTS OF TURBINE WHEELS TRUSTWORTHY?

We answer to this query that they can be made so. The conditions necessary are simple and easily established, but so far as we are aware they have never been carried out in any series of tests yet made in this country.

It is conceded by competent hydraulic engineers that no turbine wheel will utilize the same percentage of water power under all heads. Some wheels do their best at high heads, others show greater proportional efficiency with low heads. To make a turbine that shall perform the best with a given fall of water, it should be constructed with special reference to the conditions under which it is to be used; but to do this in every instance would make the cost of this class of wheels too great; therefore manufacturers attempt to construct them so as to give the best average results under varying heads.

It is obvious, then, that to know what a turbine will do, with a given number of inches of water and a given fall, it must be tested under those particular conditions. It is not perhaps practicable to test wheels for all heads and with widely varying quantities of water; but for all heads, excluding fractions of feet, and with quantities of water varying from large to small within the limits found in ordinary practice, this might be done; and until it is done, being closely observed, the public will know little in regard to the merits of different wheels in the market.

There is no question that a friction brake properly constructed can be made to indicate accurately the power of a given wheel under any particular set of circumstances; but, if the conditions are changed, the results obtained in the first instance cannot be a sure guide to what may be expected in the second. When the wheel overcomes the friction of the brake, it is performing work just as much as though it were sawing lumber or grinding wheat. There is, therefore, in our opinion, no force in the statement made by some that the only true test of a wheel is what it does in the performance of useful work. Work is work, whether it is useful or not, and the scientific measure of work is the foot pound, not a bushel of wheat or a thousand feet of lumber. So far from discouraging such tests, we are disposed to encourage them; but we insist upon it that turbines should be tested under different heads, and that the wheels should be finished in the style of those actually put in the market.

TUNNELLING UNDER CITY STREETS---THE ATMOSPHERIC RAILWAY.

During the past year, an eight foot tunnel has been constructed under the streets of Cincinnati, O., for drainage purposes, by means of the novel boring machine, illustrated on page 154, Vol. XXII of our paper. A vertical opening or shaft was first made on Sycamore street, near Hunt street, and carried down to the intended bottom grade of the tunnel. Two of the boring machines were then lowered into the shaft and set at work boring in opposite directions, the tunnel being laid up in brick as fast as the machines advanced, the earth being removed at the shaft. The tunnel extends from Abigail street along Sycamore street to Court street, where it makes a sharp turn into Court street, along which it passes to Broadway. The crown of the tunnel is some twenty feet below the street surface, and on its route passes under two canals, the Miami Canal and a branch or raceway. This method of boring has peculiar advantages for city uses, as it permits the construction of tunnels beneath the streets of cities without disturbing the surface or the usual travel of vehicles, while the only earth to be handled is a body equal to the exact size of the tunnel.

The Cincinnati boring machines were constructed and operated substantially on the same plan as the larger machine used in building the Broadway Underground Railway tunnel now existing in this city.

This tunnel, it will be remembered, extends from the Broadway Bank, at Murray street, passing under Broadway northerly to Warren street, where, on a curve of 50 feet radius, it turns into the Company's passenger station. This railway is worked on the atmospheric plan and has been in practical operation for some two years. Thousands of passengers have enjoyed the atmospheric ride under Broadway, finding it an agreeable and novel method of travelling. In fact, the Broadway Underground Railway is one of the attractive curiosities of the city. By means of a large blowing engine, a current of air is made to traverse back and forth through the tunnel, and this current, impinging against the ends of the cars, carries them along like a boat before the wind. The car in use is of about the same size as the ordinary street car, having seats for twenty-two passengers.

The Company are applicants before the Legislature for the privilege of enlarging and extending their works, so as to carry passengers from the Battery, under Broadway, to Harlem river, a distance of nine miles. The present working section of railway was built for the purpose of demonstrating the practicability of placing a railway under Broadway without injury to adjoining property; and in this respect the work is a complete success. It was alleged and generally believed that the foundations of buildings, as well as the water pipes, gas pipes, sewers, etc., would all be damaged by such a railway. In answer to this, the Company set to work with one of the boring machines above alluded to—the design of Mr. A. E. Beach, of the SCIENTIFIC AMERICAN—and built a railway tunnel under Broadway, passing below water pipes, gas pipes, sewers and the foundations of some of the heaviest buildings. The thing was done in a few days, with the entire travel of omnibus and other vehicles passing over the heads of the workmen, and on its successful completion all reasonable objections to the construction of a railway under this thoroughfare were removed. In fact, so strongly in favor of its building have the leading property owners become that they now present themselves as rivals before the Legislature, and ask that the right of construction may be given to them and not to the Transit Company, which has begun the work and at a heavy outlay of money demonstrated its desire and ability to execute it with success. The Legislature is not likely to do such an act of injustice, and there is reason to believe that the necessary authority to proceed with the work will be shortly granted to the Beach Transit Company.

A MUNCHAUSEN COMET.

A European journal recently published a discovery (?) by a Professor Plantamour, whom it mentions as a well known Genevan astronomer, that a comet is now approaching the earth, that a collision between the bodies may be expected on the twelfth of next August, and that, if the prediction be verified, the destruction of the world is certain to occur on that day. Of Professor Plantamour we do not find any necessity to speak, never having before heard of that scientist; and our readers' patience need not be tried by a lengthy and serious consideration of his theory. But we must express some astonishment at the number of journals who have given space to discussion of the subject; and we respectfully suggest that some public provision be at once made for the education, in the physical sciences, of newspaper editors and writers.

The eccentricity of the orbits and the varying periods of the recurrence of comets have long given to these bodies a prominent place in the sidereal phenomena; but the idea of danger from their approach or of destruction by contact with them is not compatible with the enlightenment of the nineteenth century. In the year 1699, the Elector of Darmstadt informed the world that a dangerous eclipse was about to take place, but the calamity did no mischief. We are no longer to be scared by an eclipse; but the ignorance and folly of the celebrated autocrat have still their representatives in the Genevan Professor; and the public who thankfully received the Elector's warnings were little less instructed than those who read the predictions of the comet destruction, and who find nothing in them contrary to their knowledge or repulsive to their intelligence. There may be some readers of the SCIENTIFIC AMERICAN to whom a recapitulation of a few facts concerning comets will be useful, and to such we present the following:

Comets are bodies of such extreme tenuity that the planets, the Earth among others, have frequently passed through them without producing any other effect than an auroral glare, changing the color of the sun's light on the planet, while the period of transit lasted. Many secondary bodies, such as Jupiter's satellites, have been engaged in Lexell's comet without having their positions or periods affected in the least. We have already pointed out, in an article on this subject on page 279 of Vol. XXV., that the Earth passed through the comet of 1861; and this well known fact might, if duly considered, have hindered this Plantamour from gaining notoriety by talking nonsense, and quieted the fears of the writers engaged on many daily journals. While however, no comet of whatsoever magnitude has been observed to consist of a sufficient mass of matter to influence the smallest planetary or stellar body in the slightest, nearly every one which visits our field of observation is changed in its course by the attraction of stars infinitely less in proportion than itself. This is further evidence, perhaps not needed by our readers, that a comet is composed of matter so impalpable that some of the largest, such for instance as the one of 1843 which was 200,000,000 miles in length, have not sufficient aggregate gravity to render their influence of any importance in an astronomical calculation. We therefore think that the comet "scare" is not worthy of a moment's serious attention; and we regret that so many of our cotemporaries can fill their columns with matter so insulting to the understandings of their readers.

THE COMMON LAW OF TRADEMARKS.

An interesting decision has recently been delivered by the Supreme Court of Louisiana, touching the right of a manufacturing firm to the exclusive use of a peculiar name by which its goods are known to the public.

A firm in Holland sells a peculiar preparation of gin, known by the original makers' name, with a sonorous and fanciful title. The defendants had manufactured an imitation of this gin during the last ten years and sold it in bottles resembling those in which the original is sold, and labelled so like them as to be "colorable imitations." The Court expressed itself convinced that the original article was pure and exactly what it professed to be, while the imitation was adulterated. It was shown that the foreign manufacturer had devised the bottles and labels in 1851, and that he had used them ever since. A lower court had thrown out a claim for damages and merely issued an injunction restraining the defendant from the use of the personal name, but allowing the use of the peculiar name given to the gin. The Supreme Court reversed this judgment, ordered an injunction against any imitation of labels or bottles, and allowed fifteen hundred dollars as damages, with costs in both courts against the defendants.

Among the peculiar features of this case was a claim by the defendants that they had used the imitation label for ten years without interruption, and that they had gained a customary and prescriptive right to it. The Court said that the damages could not be assessed for more than one year back, but the claim that use for ten years gave the defendants a right to the trade mark could not be allowed. Another claim of the defendants, that the words on the label were not new, was also rejected, the Court saying: "His combination of those words is proved to have been new, and it is proved to indicate the origin and ownership of the liquor, and the defendants have no right to filch this combination, or any important part of it, in such a way as to mislead the purchaser as to the real origin and ownership."

Floating Fire Engines.

Among the many means now available for promptly extinguishing fires, there are none more useful in our business towns than the floating engines now in use in New York Baltimore and elsewhere. In the firstnamed city especially, the proximity of nearly all parts of the city to one or the other of the rivers, and the enormous accumulation of valuable merchandise all along the water's edge, point out the floating engine as the most ready and accessible implement for the purpose. The facility with which it can be brought to the scene, the instant supply of water, and the great power obtainable from the engines, which need not be limited in size or capacity, are additional recommendations.

LABOR AND PERSONAL CLEANLINESS.

Our attention has been called again to this subject by a statement from a committee of the Board of Health, on the condition of the street cars and the liability of their communicating disease to passengers. Referring to the line skirting the East river, which runs past many large manufacturing establishments, slaughter houses, gas works, etc., the statement referred to asserts that the cars are constantly kept in a filthy condition by workmen who enter them covered with grease and grime, and reeking with perspiration from their work. We have ourselves before noticed this fact, and have endeavored to stimulate a greater regard for personal cleanliness among workmen, but we fear with little avail.

While dirt, and dust, and soiled raiment, are inseparable from some kinds of useful toil, they are admitted even by those who endure them, to be very disagreeable concomitants of labor. Their needless infliction upon others is, to say the least, a very unhandsome thing on the part of those who could, by a little effort, cleanse themselves before crowding into a vehicle for public use, and it is a matter of just complaint. We see, however, a spirit manifested by workmen which indicates that one who tries to avoid contact with them in their besmirched state is regarded by them with disfavor. Not long since, entering a Third avenue car, we saw three men, covered from head to foot with black oil, who threw themselves into seats as though it was a good joke to soil any one's clothes that were decent. A gentleman, who quietly rose and passed to the seat opposite to avoid their contact, was abused by them, and tauntingly asked why, if he thought so much of his dress, he did not take a carriage and ride home like a gentleman.

Now it was evident this gentleman did not avoid these men simply because they were workmen. To have done this, would have forfeited his claim to be called a gentleman. It was the dirt, of which they were the nasty vehicles, he wished to escape. If workmen wish to be regarded with respect, they should avoid making themselves nuisances. One of their own craft, in cleanly garb, would have shunned these dirty and unmanly fellows.

There is no excuse for a workman, in any business, who enters a public conveyance, or even as a regular thing walks through crowded thoroughfares, in a condition that is disgusting to people of cleanly habits. Blackened hands and faces are amenable to soap and water; and greasy overalls may be left hanging in shops, or, if it be needful to carry them, they may be rolled and wrapped up so as not to be offensive to sight or touch.

There is a great lack of true manly pride among certain classes of workmen. Of unmanly pride, they have overabundance. They profess to be proud of their calling, proud to belong to the great army of producers—in this they are right; they are proud of the power of their associations, and scornful of luxury and wealth, which they claim oppress them with burdens too grievous to be borne. Were they equally proud of their personal appearance and scornful of that which is degrading in their habits, they would command more respect for their rights as members of society, and be able to enlist the sympathy of many who now stand aloof from them. Drink and dirt are the two most degrading habits of working men. No man can possess self-respect who is disrespectful to others, and no man is respectful to others who can willingly annoy them by exposing them to personal uncleanliness.

We are far from applying these remarks to all workmen, or even to the majority of them. We know many whose avocation is of a sooty order, but by whose side we would as soon sit in a car as ride next the sprucest dandy that promenades Broadway. We only ask those to appropriate what we have said, who, upon reflection, find it fits their case.

MEASURING THE HEAT OF COMBUSTION.

It has been shown, in several former articles, how the acceptance of a unit of heat, as a radical measure for the determination of relative amounts of caloric, has had most important results in placing the subjects of latent heat and specific heat in a clear light, subjects which otherwise would always have remained enveloped in much obscurity. Still more important, however, is the application of this unit to determine the results of combustion of different substances, as it settles, in the most rigorous manner, the comparative value of different kinds of fuel. At a time when steam is applied in so many and so diverse directions, or in other words, in an age when heat is continually and universally being converted into motion, the subject of investigating the nature and results of diverse kinds of combustion is of course of the utmost importance. It is an investigation of the amount of caloric or potential force hidden in the fuel, which hidden force is only changed into visible force by the intervention of evaporating water, expanding air, etc., and so the unit of heat may be directly connected with the unit of power.

In most cases, combustion is a chemical combination of the fuel with atmospheric oxygen, and in all cases it is a chemical process, by which the latent heat of dissociation is set free (see page 21, current volume). The conversions taking place always form new compounds; for instance, we convert hydrogen into HO (water), carbon into CO (carbonic oxide), or CO_2 (carbonic acid), sulphur into SO_2 (sulphurous acid), phosphorus into PO_5 (phosphoric acid) sodium into NaO (soda), magnesium into MgO (magnesia), iron into FeO (ferric oxide), etc. The amount of heat produced varies with the nature of the substance, but depends more on the amount of oxygen consumed than on anything else; so we find that the combustion of one pound of coal gives as much heat as that of three pounds of sulphur, while chemistry proves that one pound of coal is able to combine with nearly as much oxygen as three pounds of sulphur can do. The combustion of one pound of coal produces, however, only one quarter of the amount of heat produced by the combustion of an equal weight of hydrogen; but here again analytical chemistry teaches that, in the combustion of three pounds of carbon, no more oxygen has been converted into CO_2 than in the combustion of one single pound of hydrogen into HO, because the weight of O is six times that of H; six pounds of hydrogen, therefore, combine with 6×8 of oxygen, while six pounds of carbon combine only with 2×8 of oxygen.

Practical experiments with different kinds of fuel have shown, however, that this estimate of the heat produced by the amount of oxygen consumed is not strictly correct; and that other circumstances must be taken in account in order to explain the discrepancies. The principal influence on the result is the nature of the product of combustion, its gaseous or vaporous or solid condition, latent or specific heat, etc. We communicate here a table, giving the units of heat produced by the combustion of one pound of different substances, obtained by practical trial, and the amount of water which each of these substances may convert into steam, making the supposition that the latent heat of steam is 962 units of heat, and that some 150 units are required to heat the water from the ordinary temperature to the boiling point.

TABLE OF THE UNITS OF HEAT AND AMOUNT OF STEAM PRODUCED BY THE COMBUSTION OF FUEL.

Name of substance.	Formula.	Units of heat produced.	Pounds of water changed into steam
Hydrogen	H	56,000	50·4
Marsh gas	C_2H_4	23,500	20·9
Petroleum	$C_n H_{n\times 2}$	22,000	19·6
Paraffin	$C_{10}H_{42}$	21,600	18.9
Olefiant gas	C_1H_4	21,350	17·6
Oil of turpentine	$C_{20}H_6$	20,000	16 0
Spermaceti		18,000	15·6
Stearic acid	$C_{36}H_{36}O_4$	17,500	14·2
Ether	C_4H_5O	16,000	12·5
Wood charcoal		14,500	12·4
Gas coke		14,450	12·2
Anthracite coal		14,220	11·6
Bituminous coal		13,500	13·0
Alcohol	$C_4H_6O_2$	13,000	11·1
Sulphur	S	3,500	3·0

SCIENTIFIC AND PRACTICAL INFORMATION.

METALLIC DUST IN FACTORIES.

The injuries to health, arising from infinitesimal metallic particles inhaled by the breath into the lungs in cutlery and other works, are especially serious in the operation of dry grinding, used in the manufacture of steel forks. Mr. Charles Stodder, of Boston, has recently made an investigation into the quality of a similar dust produced in the process of polishing fire arms in the United States arsenal, at Springfield, Mass.; and he found that it consisted of a few organic fibers, some minute crystalline fragments, and about 66 per cent of iron and steel dust. He makes a useful and practical suggestion that magnets be placed near the grinding surfaces to withdraw the iron dust from the air breathed by the workmen; and the simplicity and feasibility of the device will ensure it a trial.

CABINETS FOR THE STUDY OF MINERALOGY.

The Department of Public Instruction of New York city has recently approved a specimen cabinet of mineralogical specimens, compiled for the use of teachers. Such a collection, if properly and judiciously selected, may be made available for laying the foundation of a highly practical technical education; and we should be glad to see similar object-teaching introduced into other branches of knowledge. The specimens were chosen and arranged by Professor E. C. H. Day, whose name is familiar to all readers of the SCIENTIFIC AMERICAN.

WINE GROWING IN AMERICA.

There is little reason to doubt that a large proportion of the territory of the United States is suited for the cultivation of grapes from which wines, not only in practically unlimited quantities but of the highest excellence, may be produced. California takes the lead of all other States in this culture and manufacture, and exhibits great variety of qualities and flavors in her productions. A writer in the *Overland Monthly* catalogues these as follows, according to the localities in which they are respectively cultivated: Sonoma county is best adapted to produce white wines, resembling those of Germany; the upper part of Napa valley and certain portions of Santa Clara county will make excellent clarets; the Sacramento valley, near the foot of the inclosing hills, is destined to produce our future sweet muscats; El Dorado county is best adapted to the production of wine resembling the far famed Burgundy; Solano county produces a wine which is a natural port; San Joaquin and Stanislaus counties give wines which closely resemble, both in flavor and taste, the best Madeira, but they have to attain an age of from five to six years before this taste is sufficiently developed; Anaheim and certain portions of Los Angelos county produce light white wines, which very closely resemble those of Chablis, in France, and they, too, must be some four years old before this peculiarity shows itself distinctly; and the last two years should be in bottle.

THE BEHAVIOR OF CADMIUM, IRON, AND TIN UNDER THE ACTION OF NITRIC ACID.

It has been observed that iron acquires, by being placed in nitric acid, a peculiar condition of surface enabling it to resist the action of the strongest acid; and a still more remarkable and important phenomenon has been observed, which is that iron so treated will form a galvanic circuit with ordinary iron, the treated metal being decidedly negative to the latter. Dr. Schönn produces further evidence of the changed character of the iron by showing that it refuses to reduce copper from the solution of its salts. He shows, also, that cadmium, in strong nitric acid, remains unacted on if platinum wire be coiled around it; but on the removal of the wire, the cadmium is at once attacked by the acid. Tin exhibits similar characteristics. The result of the experiment with iron points out electrical action as the cause of these effects, which, on further investigation, may give us some new light on the subject of electrolysis.

OBTAINING ABSOLUTE ALCOHOL.

A German *savan* has recently improved on the well known method, employed by Mendelejeff, for obtaining absolute alcohol. Alcohol of ·792 is boiled with quicklime, the pieces of the latter projecting above the surface of the liquid, for half an hour more, with a condenser inverted so that the liquid may return by its own gravity to the flask. The condenser is then reversed, and the alcohol redistilled. If the alcohol contains more than 5 per cent of water, the process must be repeated two or three times. The vessel should only be half filled with the pieces of lime, as the rapid formation of hydrate of lime may break it to pieces.

ELISEE RECLUS.

It was with much pain that we read the news of the condemnation of this eminent French geographer to a term of deportation; and we shall not be accused of political bias when we express our regret for his defection from the ranks of science to follow a chimera. Among the idiosyncracies of the talented and misguided man may be mentioned the union in one mind of the blind cruelty of the commune, and a humanity which forbade to eat meat for the reason that it is not lawful for man to slay his fellow creatures. Reclus is a native of the south of France, and was educated at Neuwied and subsequently in Berlin. His contributions to the *Revue des Deux Mondes* are well known for their learning and lucidity of style. Petitions on his behalf have been addressed to the Committee of Pardons, Versailles, having been signed by Sir Charles Lyell, Sir John Lubbock, Sir Henry Rawlinson, Professors Owen, Duncan, Tennant, Forbes, Carpenter, Richardson, Darwin, and many others. The pleadings of these men will hardly be ignored by the government of such a nation as France, and it would be a graceful act for the scientists of America to forward a similar petition, which possibly might set Professor Reclus once more free to pursue his studies and teachings for the benefit of mankind.

LEAD POISONING.

The painful effects of poisoning by lead are not by any means confined to painters, white lead manufacturers, and others whose trades bring them into constant contact with this deleterious metal. There are some persons whose obstinacy allows them to use it, in cosmetics and hair washes, in spite of the warnings of the medical profession; and the evil is augmented by the fact that such preparations may be used for years with impunity, and the palsy, paralysis, and other effects do not appear till the whole system is thoroughly impregnated. One medical man writes to a contemporary to say that he has one patient who has been paralyzed for nearly three years, her vision is imperfect, and her memory is gone; and another victim to this criminal practice has constant torture in her eyes, and is obliged to stay in a dark room. Many similar cases have been reported; but the practice still continues, and now Dr. J. M. Crocker publishes an account of a man, aged 55, who was afflicted with what appeared to be muscular rheumatism, affecting mainly the deltoid and other muscles of shoulders. When first visited, he was suffering from pains which he had felt more or less severely for a month or two. Both arms were in this manner crippled. Dr. Crocker ordered cotton batting to affected parts, lemon juice and opiates internally; and the patient made quite a rapid recovery, but when seen in the month following, he was suffering from an almost complete paralysis of extensor muscles of fingers and hands, with dropping of wrists. He could readily and forcibly grasp, but found difficulty in letting go. Subsequently, upon inquiry, it was discovered that for fifteen years he had used a hair renewer, made by himself, of three teaspoonfuls lac sulphur and two teaspoonfuls sugar of lead to a pint of water. With this he had drenched his head and scalp as often as once a week. Under use of iodide of potassium and galvanism, he has made a good recovery, the hair dressing having of course been discontinued.

THE MINERAL RESOURCES OF SOUTH CAROLINA.

Mr. A. C. Laughlin, of Columbus, S. C., informs us that corundum is found in South Carolina in inexhaustible quantities; this mineral is specially adapted for spindles and pivots of watches, and other fine machinery where the wear is constant. Sapphires and garnets are frequently found, some of the latter being perfect specimens of crystallization. Magnesian iron ore is very abundant, but is as yet almost undeveloped. Mica is another substance yielded by the soil of that state, and is daily coming into increased use. Mr. Laughlin speaks most favorably of the South Carolinian gold fields, and states that the precious metal can be obtained therefrom with great facility.

ONE cubic inch of water weighs ·03617 lbs. One cubic foot of water weighs 62½ lbs. One cubic foot of ice weighs 58½ lbs. One cylindrical inch of water weighs ·02842 lbs. One cylindrical foot of water weighs 49·1 lbs.

Mr. H. E. COLTON, an occasional contributor to this paper is now engaged on the *World* as agricultural editor.

What they think at the White House of the United States Watch Company's MARION WATCHES.

The following is from General PORTER, President GRANT'S Private Secretary:

EXECUTIVE MANSION,
WASHINGTON, D.C., October 13th, 1871.

DEAR SIR—My watch has kept excellent time since I have carried it. Yesterday, in some unaccountable way, the crystal was broken. Will you please replace it, and oil the works? they have never been oiled or examined since the watch left the factory. I expect to be in New York a day, about Thursday or Friday of next week, and I shall call at your place, 13 Maiden Lane, for the watch. Yours very truly,

(Signed) HORACE PORTER.

F. A. GILES, Esq.

The Watch referred to above, is No. 27,335, Stem Winder, Trade Mark "John W. Lewis—manufactured by the United States Watch Co., (Giles, Wales & Co.) Marion, N.J."—and has been carried by Gen. Porter for over a year. We are glad to see that our officials in high places appreciate fine American mechanism, and set the example of patronizing home productions instead of sending our gold abroad for inferior articles.

Examples for the Ladies.

Mrs. T. M. Scallin, Troy, N. Y., has used her "dear friend," a Wheeler & Wilson Machine, since 1858, in dress and cloak-making. The last six months she earned $332, and the year before, $417.

Mrs. C——, of New York, has used a Wheeler & Wilson Machine since 1857, never averaging less than $700 a year, and for the last five years $1,000. She used the same needle during 1870, and earned with it over $1,000.

For Irritation of the Scalp, apply *Burnett's Cocoaine* night and morning.

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.

Dry Steam, dries green lumber in 2 days; tobacco, in 3 hours; and is the best House Furnace. H. G. Bulkley, Patentee, Cleveland, Ohio.

To Ascertain where there will be a demand for new Machinery, mechanics, or manufacturers' supplies, see Manufacturing News of United States in Boston Commercial Bulletin. Terms $4.00 a year.

Manufacturers and Mill Supplies of all kinds. Greene, Tweed & Co., 18 Park Place, New York.

The "Safety" Hold Back for Carriages prevents runaway accidents. See Sci. Am. Feb. 24, 1872. Undivided Interest, or State and County Rights, for sale. Address N. W. Simons, Williamsfield, Ohio.

Lord's improved Screen or Separator—also Watchman's Time Detector. For particulars, address Geo. W. Lord, 232 Arch St., Phila., Pa.

Scale in Steam Boilers. We will remove and prevent Scale in any Steam Boiler, or make no charge. Geo. W. Lord, 232 Arch Street, Philadelphia, Pa.

Walrus Leather for Polishing Steel, Brass, and Plated Ware. Greene, Tweed & Co., 18 Park Place, New York.

The Exeter Machine Works, Exeter, N. H., manufacturers of Sectional Boilers and Steam Engines, will soon open, in Boston, Mass., a centrally located sales room, in connection with their works; and are willing to take the agency of a few first class Machines and Tools not already introduced in that city.

For Diamond Turning Tools for Trueing Emery Wheels and Grindstones, address Sullivan Machine Co., Claremont, N. Hamp.

Standard Twist Drills, every size, in lots from one drill to 10,000, at ⅓ manufacturer's price. Sample and circular mailed for 25c. Hamilton E. Towle, 176 Broadway, New York.

Hydraulic Jacks and Presses, New or Second Hand, Bought and sold, send for circular to E. Lyon, 470 Grand Street, New York.

All kinds of Presses and Dies. Bliss & Williams, successors to Mays & Bliss, 118 to 122 Plymouth St., Brooklyn. Send for Catalogue.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro, 414 Water st., N.Y.

Presses, Dies, and Tinners' Tools. Conor & Mays, late Mays & Bliss, 4 to 8 Water st., opposite Fulton Ferry, Brooklyn, N.Y.

Over 1,000 Tanners, Paper-makers, Contractors, &c., use the Pumps of Heald, Sisco & Co. See advertisement.

In the Wakefield Earth Closet are combined Health, Cleanliness and Comfort. Send to 36 Dey St., New York, for descriptive pamphlet.

Enameled and Tinned Hollow-Ware and job work of all kinds. Warranted to give satisfaction, by A. G. Patton, Troy, N.Y.

For Circular of the largest variety of Wood Planing and Mitre Dovetailing Machinery, send to A. Davis, Lowell, Mass.

Rubber Valves—Finest quality, cut at once for delivery; or moulded to order. Address, Gutta Percha & Rubber Mf'g Co., 9 & 11 Park Place, New York.

Best and Cheapest—The Jones Scale Works, Binghamton, N.Y.

Grist Mills, New Patents. Edward Harrison, New Haven, Conn

Taft's Portable Hot Air Vapor and Shower Bathing Apparatus Address Portable Bath Co., Sag Harbor, N.Y. Send for Circular.

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

For Steam Fire Engines, address R. J. Gould, Newark, N. J.

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

Belting as is Belting—Best Philadelphia Oak Tanned. C. W. Arny, 301 and 303 Cherry Street, Philadelphia, Pa.

Boynton's Lightning Saws. The genuine $500 challenge. Will cut five times as fast as an ax. A 6 foot cross cut and buck saw, $6. E. M. Boynton, 80 Beekman Street, New York, Sole Proprietor.

Peck's Patent Drop Press. Milo Peck & Co., New Haven, Ct.

Vertical Engines—Simple, Durable, Compact. Excel in economy of fuel and repair. All sizes made by the Greenleaf Machine Works Indianapolis, Ind. Send for cuts and price list.

Millstone Dressing Diamond Machine—Simple, effective, durable. For description of the above see Scientific American, Nov. 27th 1869. Also, Glazier's Diamonds. John Dickinson, 64 Nassau st., N. Y.

Presses, Dies & all can tools. Ferracute Mch Wks, Bridgeton, N.J.

For 2 & 4 Horse Engines, address Twiss Bros., New Haven, Ct

Opium Eaters—If you wish to be cured of the habit, address T. E. Clarke, M. D., Mount Vernon, Ohio.

Blake's Belt Studs. The best fastening for Leather or Rubber Belts. 40,000 Manufacturers use them. Greene, Tweed & Co., 18 Park Place, New York.

Wanted—An agent to sell territory for a new and valuable patent. Address, for circular and terms, P. O. Box 773, New York.

Hoisting Engines. Simplest, cheapest, and best. Send to John A. Lighthall, Beekman & Co., Office 5 Bowling Green, New York.

L. & J. W. Feuchtwanger, 55 Cedar St., New York, Manufacturers of Silicates, Soda and Potash, Soluble Glass, Importers of Chemicals and Drugs for Manufacturers' use.

New & Improved Bolt Forging Machines, J.R.Abbe, Prov., R.I.

File Grinders' Grindstones, coarse grit—Mitchell, Phila., Pa

Independence Grindstones—J. E. Mitchell, Phila., Pa.

Well auger which will bore at the rate of 150 ft. per day. Send 10c. for circular to W. W. Jilz, St. Joseph, Mo.

Improved Foot Lathes, Hand Planers, etc. Many a reader of this paper has one of them. Selling in all parts of the country, Canada, Europe, etc. Catalogue free. N. H. Baldwin, Laconia, N. H.

Parties wishing to go S. W. with cotton or woollen machinery, address Isaac Sharp, Evening Shade, Sharp County, Ark.

Wanted Situation, by a Draughtsman—competent to design any kind of Engines or Machinery; or would be found expert in carrying out designs for Engineers, and good Practical Mechanic. Good reference. Address E. M., Box 157, Mansfield, Ohio.

A young man desires a situation in a Civil Engineer Corps—understands leveling. Good references. Address Engineer, Camptown, Bradford County, Pa.

For Sale—A 2½ H.P. Stationary Engine. Address J. Abbot, Fitchburg, Mass.

Wanted, to correspond with owners of Patents—Picture Frames, Hangers, or other light metal work—view to manufacturing. Address H. J. Dorchester, 618 North Main Street, St. Louis, Mo.

For the best Match Splint Machinery made, address H. M. Underwood, Kenosha, Wis.

Manufacturers of Spoke and Last Machines, send description and price list to William Graham, Smiths Falls, Ont.

Parties desiring articles prepared for the press, describing really meritorious and useful inventions or processes, may find it to their advantage to communicate with Richard H. Buel, Consulting Mechanical Engineer, 7 Warren Street, New York.

Get your steam boilers and pipes covered with the best non-conductor in the world. Call for Circular. Asbestos Felting Company, 45 Jay Street, New York City.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin. $4 00 a year. Advertisements 17c. a line.

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.—CUTTING GLAZIERS' DIAMONDS.—Can any of your correspondents tell me how to cut worn glaziers' diamonds to a new point?—W. K.

2.—FLUID AND LIQUID.—Will some one tell me the proper and fine distinction between a fluid and a liquid? Can a substance be both at once? I assume that the difference is great, and would like to have other opinions.—H. W. H.

3.—COLORING SHELLS.—Is there any way of coloring these a bright red?—C. H.

4.—HYDROGEN GAS.—Is there any process yet discovered by which illuminating gas can be made over into pure hydrogen? Has the metallic base of hydrogen ever been discovered?—E. X.

5.—NITRIC ACID IN BATTERY.—Is the nitric acid, in the porous cup of a Grove or Bunsen battery, raised any degrees of temperature; and if so, about how many, if the acid is put in at about 60 degrees Fahr.?—E. X.

6.—FROZEN WATER MAIN.—Will some of your readers please inform me which is the quickest and cheapest way to thaw out 150 feet of frozen water main, 4 feet under ground?—C. H. J.

7.—COMPRESSION OF WOOD PULP.—Is there any way by which wood pulp can be compressed so as to be impervious to liquids, without destroying the elasticity of the wood?—H. B.

8.—FAST COLORS.—Will some of your readers inform me how I can make a dye of logwood and copperas "fast" so that it will not rub off?—F. W.

9.—BRASS COLORED PAINT.—Can any one tell me if there is any paint of the same color as brass, and of what is it made?—O. W. V.

10.—ELASTIC CEMENT.—I have broken an india rubber gas bag; will some one please give me a recipe for a good, durable elastic cement, suitable for mending it?—W. M. S.

11.—W. B. D., of N. J.—Please give us the title of the book you refer to containing notice of asbestos packing. Also extract, if convenient.

12.—BATTERY FOR PLATING.—I would like to know how to make a good galvanic battery for plating with gold and silver. I want some one to tell me how to get up the cheapest and best for that kind of work.—W. B. J.

13.—CRACKED FLUTE.—Will some one please inform me how to keep a flute from cracking, and how to stop cracks that have already appeared?—A. E. T.

14.—TANNING BUFFALO HIDES.—Can any one inform me how the Camanche Indians tan the hides of buffaloes, so that the leather does not get hard and horny, nor does the hair come out?—B. F. B.

15.—PAINTING IRON BATH TUB.—Will some one inform me what kind of paint I can use for painting my iron bath tub, that will adhere and not scale off in a short time? I have had it painted several times with pure white lead mixed with raw and boiled oil; but it scales off.—C. A. B.

16.—DISCOLORED GLASS.—Last summer I had some large glass panes put in my front windows; they have a smoky appearance. It seems to be on the surface and not all through the glass. Is there nothing that will remove it? It is not smoke; if it were, I could remove it with turpentine.—W. G. E.

17.—STAINS ON MARBLE.—What is the best method by which weather, tobacco, grease, iron rust, and other stains can be removed from marble; and by which the original polish can be restored?—A. P.

18.—PAINTING SHEET IRON.—Will some of your correspondents give me a recipe for some kind of paint or substance for coating a sheet iron smoke stack, to prevent its rusting and to stand the heat?—J. C.

19.—HEATING BY STEAM.—How large a boiler will it need to heat a building 60x30 feet, and four stories high? How can I calculate the size of a boiler required to heat any particular building?—J. C.

20.—MICROSCOPY.—I have a microscope (non-achromatic lenses) which, though it shows a transparent object clearly enough, gives little more than the outlines of an opaque one. How can this difficulty be overcome? Will a condenser make the whole top of an object plain?—A. M.

21.—MATCHES FOR MOLDING.—Can any of your readers inform me how to make sand and oil matches to mold from, and how to prevent plaster matches from softening with work?—O. K.

22.—LETTERS FOR PATTERN MAKERS' USE.—What kind of metal is used, what are the proportions of mixture, and what is the best way to make, letters, figures, etc., for model and pattern makers to use on their work?—J. M. S.

23.—PIN SPOTS IN STEEL.—How can I treat steel so as to soften the hard spots or pins in it? I have bars of the finest steel I could purchase in New York, but it all has had spots in it. I have tried many different ways to soften them and failed. How can I make steel as soft as possible without hurting its quality?—H. M. H.

24.—IRON CASTINGS.—Is there any process by which soft iron castings can be made from old castings, without the addition of new iron?—H. M. H.

25.—SUCTION FAN.—What is the best shape for the wings of a suction fan, intended to draw the shavings from four or five planing machines? What should be the shape of the spouts, and the proportionate sizes of inlet and outlet?—J. E. G.

26.—CARBON BATTERY.—In your paper of Jan. 6th, 1872, there are directions for making a carbon battery, and also for making the carbon plates. I have been experimenting in electricity, and I was anxious to try the different kinds of batteries, so I tried to make a carbon battery. I made the plates all right, but when I came to set the battery to work, it would not go; and I have failed to make it go. Can any one give me definite instruction as to what are the component parts and quantities necessary to make a carbon battery?—L. E. H.

27.—TEMPERING STEEL.—Is there any way in which I can bring a large number of small steel articles to a uniform degree of hardness, other than the slow process of "drawing?" Will dropping them into some liquid, heated to a high temperature, prevent them from becoming too hard?—E. B. T.

28.—BURNING CHARCOAL.—I am engaged in the manufacture of charcoal. I burn about sixteen cords in a pit. The wood is cut four feet in length, set up endwise, two tiers high, to form a conical shaped pit, and covered with earth in the usual manner. I have experienced difficulty in charring the ends of the lower tier, which rest on the ground, having a loss of 8 to 15 per cent in "uncharred butts" left in the pit. Will some one give me the best mode of burning? Also, tell me if any have tried or seen ovens used similar to cooking ovens for burning charcoal?—B. C. C.

29.—MEASURING FLOW OF WATER.—How can I ascertain how much water would flow over a given point, in a given time (say one minute) in a creek? The minimum of water flowing in the creek is 45 square inches. Its descent is as much as 30 feet in 30 rods. The plan given in your valuable paper a year or two ago for this purpose is useless to me, because there are so many short turns and obstructions (fallen trees) in the creek.—C. B.

30.—PLASTIC SLATE ROOF.—Is there any way of repairing a plastic slate roof which has, in three and a half years, become so cracked and torn as to be exceedingly dangerous? The roof originally consisted of a heavy coat of felt, covered with some composition which is now, with the felt, highly inflammable.—J. M.

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.

F. B., of Conn.—Your question about fire from steam pipes has been repeatedly answered in these columns, both in editorial articles and answers to queries. We do not wish to reopen the subject at present.

D. B. H., of S. C.—We have met with no explanation of the statement that the eyes are affected in ice boating when running with the wind at high speed. We have, in our own experience, suffered no such inconvenience.

W. K. R.—Sound is the vibration of the air; the rubbing of a goblet with wet fingers produces vibration in the glass which communicates it to the air and to the ear. Let him rub a goblet in a vacuum, and listen if he hears anything.—J. A. L., of O.

VOLTAIC PILE.—Let T. F. G. take disks of copper, zinc, and woolen cloth of any size, soak the cloth in a solution of sal ammoniac, then pile them up in the following order: copper, zinc, cloth, and so on; then connect the outer disks with a copper wire. The larger the disks and the greater their number, the greater is the intensity of the current.—J. A. L., of O.

VOLTAIC LIGHT.—It will take a battery of forty cells of Grove's elements to make an electric light of any considerable size. If, however, you have a battery of another kind, you can take as follows: Forty-five Bunsen's, fifty-five Daniells', or seventy-five Smee's. Grove's battery is the cheapest and best for the more striking effects of electricity. The carbon pencils should be made of the same kind of coke as the carbon in Bunsen's battery. Browning's lamp is the cheapest lamp for exhibiting the light.—E. X., of Mass.

RAISING NUMBERS TO FRACTIONAL POWER.—T. M. N., query No. 6, Feb. 24. The best way to raise a number to the power of a fraction is to take the logarithm of the number from a table of logarithms, multiply that logarithm by the fraction, and find in the table the number corresponding to that product. The number, expressed in whole numbers and decimals, will be practically accurate.—.——.

BREAKING OF CAST IRON PULLEYS.—The explanation of C. M. R.'s broken pulley is this: Cast iron is always crystalline, and wrought iron often becomes so by constant jarring. That pulley was crystalline in the interior while the surface was not. This caused the interior to expand or rather to attempt to. So long as the surface was whole, the interior was bound, so that it could not expand freely. But when the surface was broken the tension was removed, the piece expanded fully, and became too large to be replaced.—.——

CARBONIC ACID GAS IN WELLS.—With regard to carbonic acid gas in wells, the most simple plan to get rid of it is to get a blacksmith's bellows—an old one could be borrowed in almost any town—and a tin or lead gas or steam pipe. Attach it to the nozzle of the bellows and run it to the bottom of the well; so long as the bellows is worked the well will be free from gas. A well digger in this place burned shavings in a well he was digging every hour; still his workmen were so affected they were about abandoning the work, when the contractor came to me to see if I could tell him how to get rid of the gas; I told him of the bellows; he borrowed one and set a boy to working it, and his men worked for and finished the well without further trouble.—M. W., of N. J.

SPEED OF CIRCULAR SAW.—D. S. B. inquires as to this, and N. B., of Pa., answers that it will be safe to run 1,900 revolutions per minute. About 15 years ago, I gave 9,000 feet per minute for the rim of a saw to run as a proper speed, with some slight variations under certain conditions. This rule has been generally adopted. But N. B. would run it about 19,500. I assert that this is a random guess, without any practical demonstration; and, if put into practice, some one will get their brains split open. Nine thousand feet per minute for the rim will run a 52 inch saw about 698; 700 is plenty, and 400 revolutions will saw 10,000 feet per day easily.—J. E. E., of Pa.

TEMPERING STEEL BITS.—If H. G. will put in six quarts of soft water one ounce of pulverized corrosive sublimate, two ounces of pulverized sal ammoniac, and two handsfull of common salt, he will have no trouble in making his steel bits hard enough and tough enough. Let him heat the bits to a cherry red only, and plunge them in and not draw any temper.—W. M., of Ill.

THE APPIAN WAY.—Can you tell me the age of the Appian Way, and whether it was made of stone or asphalte?—L.—Answer: The Appian Way (*Via Appia*) extended from Rome to Capua, and was built by Appius Caecus the censor, in the year B.C. 312. It was made by first driving piles into the swampy ground to lay a solid foundation; then a layer of stones about the size of hen's eggs, then a course of rubble work in lime cement, then one of broken bricks and pottery, set also in cement, then a pavement of the hardest stone, fitted together with the greatest nicety. At the end of the road towards the city of Rome, the stone used is a basaltic lava. Two thousand and more years traffic has done little to wear this roadway, and the solidity of its construction is a standing reproach to the mud road makers of the present day.

BRITTLENESS OF HORSE HOOFS.—If E. E. S., query 18, February 24, 1872, will tie a woolen cloth saturated with vinegar and water (equal parts) loosely around the hoof two or three nights out of every week, he will find that the hoof will become soft and pliable. Do not let the cloth touch the hair. If the frog is hard, put a sponge soaked with weak soft soap in the bottom of the foot. At certain seasons of the year, I put this on all my horses' feet to prevent brittleness. This treatment is simple and clean, and instead of conveying disease (as many other preparations do) will prevent and cure fever in the feet, and often carry off disease.—J. A. F., of Mass.

BALANCING SLIDE VALVES.—In No. 8, current volume, you express doubts whether Western engineers balance only the ports in their slide valves. Having had some little experience this way myself, I should not hesitate to assert that any slide valve, having a greater amount of balance than this, however perfectly fitted, would not keep its seat during one revolution of the engine. At least, this has always been my experience.—F. F. H., of N. Y.

BREWING LIGHT ALES.—In answer to J. A. R.'s query, No. 9, page 138, Vol. XXVI., I would say: Let him take an ordinary firkin, put in a false bottom, full of holes, about one inch above the real bottom. Then lay a layer of clean straw over the holes. Then put in eight quarts of good malt and pour on it four gallons of hot water; after that has leached through pour on two gallons more hot water, and after that one gallon cold water; then boil the liquid of the three leachings thirty minutes, adding one quart good molasses and four ounces good hops. Stir it well; then strain it in a clean tub and, when about milk warm, add one and a half pints good yeast. Stir it well and let it stand until it rises and begins to fall, then skim off the yeast on top and save it for a future brewing. Bottle in strong bottles and set in a dark place; and you will have an excellent table beer. Lessen the quantity of malt if you want a weaker beer. This beer has been highly recommended by physicians for invalids.—C. S. P., of Mass.

FOUL AIR IN WELLS.—I occasionally find damp or foul air in wells. My plan for removing it is (if there is a pump in the well) to screw water down the well on one side. The water going down one side forces the air up the other, creating a circulation. I have tried other plans, such as throwing burning straw down the well and throwing hot stones down; but had very poor success compared to that with the pumping, as described above. Where there is no pump, I tie a common basket to a line, and operate it up and down the well; this soon gets a circulation, and so answers the purpose.—J. W. H.

Declined.

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

GEOMETRICAL PROBLEM.—L. G.
PROPORTIONING TOOTHED WHEELS.—T. H.
SMALL POX.—W. H.
SUGAR MANUFACTURE.—C.
TESTING WATER WHEELS.—N. F. B.—G. C.—W. W. H.
ZODIACAL LIGHT.—S. B. C.
ANSWERS.—C. P.—S.—H. B.—F. C.—H. B. B.—C. C. W.—G. M. T.—W. H. R.—G. P.—W. H. B.—M.—C. F.—P.—H. D. I.
NOTES AND QUERIES.—C. V. R.—W. H. K.—C.—W. T. J.—D. S. H.—I.—G. K.—G. M. T.—F.

Recent American and Foreign Patents.

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

STEAM BOILER.—Michael Smart, of New York city.—This invention relates to an improvement in steam boilers whereby the steam is quickly separated from the water, and the danger of explosion is reduced, while at the same time the heat of combustion is more fully utilized than in other boilers. The invention consists principally in the application of a steam arch or vessel above the cylindrical body of the boiler, and in its connection with the latter in such manner that a smoke passage is formed between the two.

ELECTRIC CARRIAGE.—Lawrence W. Coe, of Auburn, N. Y.—It is intended to provide carriages adapted for being propelled by magnetic engines directly applied to the hind axle to which the wheels are to be keyed, so that the turning axle will turn the wheels; and for so applying the engine it is necessary that the frame, to which the shell or frame of the engine must be connected, be arranged directly on the axle without springs, for any vibration of the engine, except with the axle, would interfere with the proper working of it. And as it is highly important that the body of the carriage be capable of springing, it is mounted at the rear on springs which are mounted on the axle independent of the engine frame, which is also mounted on the axle but without springs; and at the front of the box or body it is hinged to the frame. In making very short turns in narrow streets where a carriage has to be backed up to the curbstone, it is necessary with carriages having the steering apparatus arranged in the common way, to turn the wheels nearly around a half circle to bring them from where they stop in backing up to the right position for going forward. The inventor therefore proposes to have the hounds circular and provide the lower one, which is supported on springs, with cogs all the way round, and mount a hand shaft and pinion on the upper one, which is suspended rigidly from the carriage frame, so that the wheels may be turned wholly around, by which, in such cases, they may be brought into the required position much quicker and by a shorter movement than when turned back in the ordinary way. The wheels are made of thin disks of sheet metal, preferably steel, punching out the axial holes for the hub, and other places, to remove all surplus metal and to fit them on the ends of a long hub, against collars, springing the disks very nearly or, in some cases, entirely together near the peripheries which are beveled and curved outward for the reception of india rubber tires. The parts riveted together are attached to a concave or square grooved metal tire, in which the india rubber tire is placed. The disks are clamped against the collars by nuts screwing on the hub. This hub is preferably made of wrought iron or steel and fitted up by turning in a lathe, but it may be made of malleable cast metal. Instead of applying the brakes to the rims of the wheels, as is common in land carriages, but which cannot well be done when india rubber tire is used, a friction wheel on the axle and a friction band is used with actuating levers for working it; one end of said band being connected to the carriage frame and the other to the lever in the usual way of arranging brakes of this character.

TRAVELING BAG.—Jacob Lagowitz, of Newark, N. J.—This invention has for its object to furnish an improved mode of making traveling bags, etc., by means of which the cover of the frame, the cover of the bag, and the lining may all be sewed at the same time, and with a sewing machine; and it consists in the mode of making the bag, as hereinafter more fully described. In making traveling bags in the old way, the edges of the cover, or the frame and the edge of the cover of the bag, were brought together upon the inside, and sewed by hand. The edge of the lining was then brought over the seam thus formed and sewed by hand, thus requiring two rows of hand sewing all around each half of the bag. In making a bag in accordance with this invention, the edges of the cover of the frame are brought together at the edge of the frame and turned outward. The edge of the cover of the bag and the edge of the lining are then brought together and placed upon the inner side of the edges of the frame cover, a narrow strip of the lining being interposed between the edges, which are then sewed together by a machine, the free edge of the strip being afterward pasted down over the edges of the cover and lining.

BRUSH FOR APPLYING BLACKING TO BOOTS AND SHOES.—Nathan Eisenmann, of New York city.—This invention has for its object to furnish a simple and convenient brush for applying liquid blacking to boots and shoes, and for various other uses; and it consists in constructing the brush proper, or the parts rigidly connected therewith, so that it shall be adapted to be attached to the nozzle of a can. With this brush the blacking can be applied to the surface of boots and shoes readily, conveniently, and quickly, and at the same time without danger of soiling the hands.

CAR WINDOW.—William McCaull, of Philadelphia, Pa.—This invention has for its object to improve the construction of the windows of railroad cars, street cars, etc., so that they may be more convenient and reliable in use and more satisfactory in operation than when arranged in the ordinary manner. It consists in an elastic cord and adjustable plate in combination with the box, stile pulley, and the sash or blind of the window, so that, when the sash or blind is lowered, the cords are put under tension, and when released the elasticity of the cords shall close the sash to its proper place.

GOPHER TRAP.—John Bowman, of Santa Cruz, Cal.—This invention consists principally in providing the outer end of the trap with an appliance whereby the interior can be made light or dark at will. The gopher's habit is to repair whatever damage is done to its burrow, to close holes that may be made by outsiders, and open such that have been closed. The trap can be adjusted to suit either plan, and is made dark when put within an open hole, to cause the attempt at reopening, and light when put into a closed passage to attract the animal's attention and attempt at reclosing. The invention further consists in a peculiar arrangement of spring, trigger, and swinging gate, all being so made that the trap cannot easily get out of order, and will be convenient for use and inspection.

WELL AUGER.—Francis Spees, of Tabor, Iowa.—This invention furnishes an improved auger for boring wells and for other earth boring purposes. The upper part of the worm is preferred to be made of a larger diameter than the lower part, so as to ream out or enlarge the hole, part of the dirt being thus received upon the upper part of the worm, thus diminishing the friction of the dirt upon the worm, and, consequently, the power required to operate the auger. In this case, a lip should be attached to the edge of the lower end of the enlarged part of the worm, to shave off the sides of the hole and leave them smooth. The hole may also be reamed out by a projecting vertical knife, the ends of which are bent inward and are attached to the [illegible] of the worm. By this construction, when a hard stratum of earth is found, the knife may be detached and a smaller hole bored through said stratum, the knife being afterward attached and the hole reamed out or enlarged to the desired size. A combination, with the stem, of the rigid section of the worm, an angular bit, and a sliding worm are the features upon which a patent has been obtained.

RULING PEN.—Elliot Ingram, of Springfield, Mass.—This invention has for its object to improve the construction of ruling pens, in such a way that when different colored inks are used the inks may not become mixed while the ruling machine is being used; and it consists in the combination of a guard or shield with the pen, as hereinafter more fully described. The pens are constructed with grooves to conduct the ink to the paper in the ordinary manner. With the ordinary pens, the ink is liable to run back along the shank to the clamps, and along the clamps to the next pen so that the different colored inks become mixed. To guard against this, a guard or shield is attached to the shank of the pens so as to prevent the possibility of the different colored inks becoming intermingled or mixed. The guard or shield projects upward and rearward, so as not to interfere with properly securing and operating the pens.

DROP LEAF ATTACHMENT FOR SEWING MACHINE TABLES.—Evelyn F. French, of New York city.—This invention has for its object to provide a drop leaf, applicable to sewing machine and other tables of suitable kind, and nicely fitted to whichever table or kind of table it may be applied. The invention consists in the application, to the devices which fasten the leaf to the table, of a pair of hinged springs that insure the flush position of the leaf when swung up into a horizontal position.

MILK COOLER.—Charles A. Douglass, of Franklin, N. Y.—This invention consists of milk troughs within water troughs in gangs or series, preferably one above another, with water and milk discharge pipes and adjustable apparatus for regulating the hight of the water surrounding the milk troughs. A high, narrow, and long frame is adapted to support a series of water troughs, one above another. A milk trough in each water trough is supported above the latter to allow the water to surround the lower part. A discharging nozzle for each water pipe, with a short vertically adjustable tube, tightly fitting the nozzle and extending above the bottom so that the water that escapes must pass through it from the upper end, is adjusted higher or lower and will vary the hight of the water accordingly. Branch water escape pipes lead into a main pipe which conveys the water away. The discharge nozzles of the milk troughs extend down into bushings screwed up through the bottoms of the water troughs water tight and fitting the nozzles so as to prevent leakage around them. Both the water and milk branch pipes are provided with funnels at the upper ends, to insure the receiving of the water while allowing the nozzles to be removed and reapplied frequently as the troughs must be frequently taken down to be cleaned. This is claimed to be a simple and efficient cooling apparatus for holding milk to obtain the cream.

POTATO DIGGER.—William W. Speer, of Pittsburgh, Pa.—This is an improved machine for digging potatoes and separating them from the soil with which they are raised, which consists in the construction and combination of arms pivoted or hinged to a shaft and bifurcated or slotted to receive the cranks of another shaft, and also in adjustable bent bars in combination with the frame, crank shaft, slotted arms, shaft, shovel, and axle.

FOLDING TABLE.—Alfred C. Ballard, of Winooski, Vt.—This invention has for its object to so arrange an ordinary or any drop leaf table that it can be folded into a small space for convenient transportation; and consists, principally, in the application of drop leaves, which can be folded under the box or frame of the table top, and in their combination with folding legs. In this manner, the upper part of the table can be conveniently folded into quite a small space. The legs of the table are pivoted within the box in such manner that they can be folded into the same. When they are folded together, and the leaves also folded against and under the box, the entire table will be no larger than the box with the thickness of the leaves added to its width and depth. When the legs are swung down for supporting the table, they are held in place by means of suitable hooks or catches. The drop leaves, when extended, are supported on suitable pivoted or hinged brackets or bars

CAR BRAKE.—George H. Reynolds, of Parsons, Kansas.—This car brake is so constructed that the weight of the caboose or rear car of the train may be employed to apply the brakes to all the other cars of the train. It consists in a shaft with the bumper head chain wound around it, with other mechanism and chains, rods, etc., combined with the brake mechanism of a train of cars in such a way that the brakes will be applied to all the cars of the train with the full force required to draw the rear car. The force required to draw the rear car may be increased by applying the brakes to the said rear car in the ordinary manner. This device is designed especially for freight trains, but may be applied to other trains, if desired.

DEVICE FOR LOCKING NUTS.—Samuel B. Lowe, of Chattanooga, Tenn.—Plates having end slots and lips to lock the two end nuts, and also two central apertures to receive the two middle nuts which hold a fish plate to its rail, are not new; but this construction compels these lock plates to be rigid and unadjustable, while by employing a separate and independent plate for every two nuts each becomes adjustable, and it is no longer required that the middle nuts should be always placed in one arbitrary position. A plate having only a long slot and two long arms at each end, to adapt it to be applied adjustably to a pair of nuts, constitutes the improvement.

TROLLING HOOK.—George Sinclair, of Chicago, Ill., assignor to himself and Charles E. Sinclair, of same place.—This invention relates to a new method of attaching fish hooks to spoons, propeller wheels, and other styles of trolling hooks; and consists in forming, on the spoons or wheels, wedge shaped sockets in which the eyes at the end of the hooks are securely held. The advantages of this mode of fastening are, first, that the hook can be removed when worn or useless and replaced without difficulty; and that, moreover, a stronger connection is obtained than by the ordinary method of soldering.

STOP MOTION FOR DRAWING FRAMES.—Daniel W. Hayden, of Wauregan, Conn.—This invention consists of a combination, with the drop catch lever and trumpet and the stop wheel heretofore used for throwing off the belt for stopping the machine when the "end" or "sliver" breaks, of a weighted catch lever arranged in such manner that it holds the trumpet guide for the sliver in the working position, and is thrown into contact with the stop wheel to stop the machine in case the trumpet is pulled down by knots or bunches on the sliver clogging it.

SELF SEALING PAIL.—Chas. A. Marshall, Cleveland, Ohio.—This invention consists in providing a pail (adapted to various uses but designed chiefly for transporting milk and other liquids) with a cover which may be tightly secured by means of a detachable screw hook connecting with a screw eye in the bottom of the pail. This means of securing the cover is easy to apply at well as cheap and safe, while it does not render the pail unadapted to use without it.

RAILROAD TRACK CLEANER.—Alexander Blakely, Fairfield, Iowa.—The invention consists in removing the sand which is spread in front of locomotive wheels to produce traction, by means of a brush arranged in rear of the hindmost drive wheel and rotated by said wheel. This brush is raised or lowered, and held to or away from the track by simple and convenient mechanism.

TOOL FOR CUTTING SHEETS OF WET OR PASTED PAPER, WOVEN FABRICS LEATHER, ZINC OR LEAD.—John F. Bright, Washington, D. C.—The invention consists in a new tool for cutting leather, woven fabrics, zinc or lead with a rotary knife. It is provided with a gage and clamp by which it is enabled to cut with great accuracy and uniformity. It is adapted to be used as an independent tool or is readily attached to a bar, pitman or lever of any cutting machine. It was declared by the Patent Office to be entirely new in its principle of operation and is certainly a step forward in this class of invention.

DROPPING ATTACHMENT FOR HARVESTERS.—Byron Seneff, Chillicothe Ohio.—The invention consists in a peculiar mode of dropping the bundles of grain from an inclined slide, without scattering, of uniform size and with the straws even. The effect of this is to save much grain that is usually lost by scattering and by dropping from the bundle, as well as to enable it to be thrashed with more facility and thoroughness.

SURFACE BLOW-OFF FOR MARINE BOILERS.—Benton C. Davis and John T. Hardester, Baltimore, Md.—The invention consists in effectively and economically discharging the scum from a marine boiler, by blowing steam and water from the centre of the water surface, and drawing to a common center, automatically, all of said scum by producing a vortex at that point.

HARVESTER.—George S. Grier, Milford, Del.—The invention consists in constructing and arranging rake teeth upon endless carriers so that they will automatically fold when going under the platform and be erected as they ascend to the top. Its simplicity secures durability and cheapness of construction while its efficiency is unmistakable.

METAL FOR BRAKE SHOES FOR RAILWAY CARS, ETC.—Wm. McConway, Pittsburgh, Pa.—The patentee produces a very close grained, tough and durable brake shoe by suitable admixture of pig iron, malleable cast iron and steel. It has been practically tested and found to exceed the common shoe in durability as 20 to 1.

SEWING MACHINE.—Quinten M. Youngs, Utica, N. Y.—This invention consists in having the pulley, on the main shaft of a sewing machine, so arranged that it may be locked with the shaft to drive it in the ordinary operation of the machine, and unlocked to run loose and not work the machine when it is required to use the driving belt or the said pulley for working the bobbin winder, and thus avoid having to remove the work from the machine and readjust it again each time a bobbin is to be wound, besides saving the unnecessary running of the machine.

FANNING MILL.—John Drummond, Trenton, Mo.—This invention relates to improvements in fanning mills; and it consists in certain arrangements of the shoes holding the screws and apparatus for actuating them, calculated to work them more efficiently than they can be as at present arranged. An arrangement, with the shoe suspended in the peculiar manner, of a lever, bell crank, oscillating shaft, and the connecting rods therefor, for actuating the shoe in different directions, said lever and shaft being actuated by the fan shaft, are the features on which a patent has been issued.

MACHINE FOR DRYING PAPER, WADDING, ETC.—Elihu C. Wilson, Medway, Mass., assignor to himself and Edward Eaton, same place.—This invention consists in a long closed case, through which the bat is carried by an endless belt near the bottom, and into which air, either hot or cold, is blown above the bat and caused to impinge upon the upper wet surface in an evenly distributed way, and then escape at the opposite end, carrying off the moisture in an efficient manner. The size or paste used for stiffening the bats to adapt them for waddings, and which it is the particular object of this machine to dry, will be applied to the bat just previous to entering the case, the application being made in any approved way. This plan of drying is claimed to be much better than by the calender rollers, for in that case the wet side of the sheet is run upon the roller and the damp air necessarily forced through the bat to the outside. This destroys the crispness of the interiors of the mass, and thereby very greatly injures the quality of the goods. The improved plan of drying is applicable alike to drying paper, woven cloths, and the like.

STEAMBOAT CHIMNEY.—William J. Hamilton, Cairo, Ill.—The object of this invention is to provide suitable and convenient means for lowering and raising the top or upper sections of jointed steamboat chimneys. The apparatus is operated from the deck entirely. The device is designed to be attached to the chimneys of steamboats, for enabling them to pass under the bridges which frequently span navigable streams. Its advantages over any device for the same purpose now in use will, it is claimed, be readily understood and appreciated on inspection by all western steamboat men.

ELECTROMAGNETIC ANNUNCIATOR.—Charles E. Chinnock, of New York city, assignor to Edwin Holmes, manufacturer of burglar alarm telegraph appliances for houses, stores, etc., 7 Murray street, New York city.—This is an automatic indicator for electromagnetic alarm or call apparatus, and means for establishing currents through inaudible or other signals whenever the indicator is set in motion. It is intended for use in alarm apparatus to first indicate the locality at which the operating current was established and subsequently start the alarm, and is equally well applicable to hotel annunciators and similar apparatus for showing the number of rooms and calling the attendant. The numerous features of the invention are embraced in ten different claims upon which a patent has been issued.

CULINARY BOILERS.—Joseph Gibbs, Opelousas, La.—This invention consists in a boiler having a wide flange adapted for supporting it on the top of pots or saucepans of different sizes, so that the body of the boiler sets down on the pot or saucepan to be heated by the water boiled therein, with which boiler is combined a circular weight, adapted to rest on the top of the flange, and press it down upon the edge of the pot so hard as to prevent the escape of the steam from the pot as readily as it would without said weight.

FOLDING CHAIR.—Charles Marcher, New York city.—The object of this invention is to so construct a chair that it may be folded up to occupy but little space when it is not in use, or when packed for transportation or storing away. It is particularly useful for steamer and steamboat travelers. The back and the front leg pieces for each side of the chair are in one piece, and are pivoted to the rear legs. A track of metal, or other suitable material, is rigidly attached to each side of the seat. A metallic plate is rigidly attached to the upper ends of each of the rear legs, having a pin projecting inward, so as to bear and traverse on the track when the chair is folded up or extended for use. A shoulder forms a stop for the traverse pin when the chair is extended. The bottom is pivoted to the lower part of the back. The arms of the chair are pivoted to the seat. There are slots in the arms, and pins in the back on which slotted arms work as the chair is folded or extended.

COMBINED TABLE, SOFA, AND BED.—David Katzenstein, New York city.—This invention relates to a new article of furniture, which can be used as a table, sofa or chair, and bed, as occasion may require, and which, at the same time, is extremely simple in construction and convenient to handle. It consists in a new combination of three cushioned plates, of which one constitutes the table top, the sofa or chair back, and also part of the bed bottom, according to the position in which it is placed. The bed clothes can be kept in a drawer while the device is used as a table or sofa.

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5,563.—CARPET.—Jonathan Crabtree, Philadelphia, Pa.
5,564 to 5,568.—CARPETS.—John Fisher, Enfield, Conn.
5,569 to 5,573.—OIL CLOTHS.—J. Hutchison, Newark, N. J.
5,574.—VEST CHAIN LOCK.—K. Kaufmann, New York city.
5,575 and 5,576.—OIL CLOTHS.—C. T. Meyer, Lyon's Farms, Elizabeth, N. J
5,577 to 5,597.—CARPETS.—E. J. Ney, New York city.
5,598.—COOKING STOVE.—L. Rathbone, Albany, N. Y.
5,599.—JEWELRY BOX.—G. Schoensmann, New York city.
5,600 to 5,603.—CARPETS.—J. H. Smith, Enfield, Conn.
5,604 to 5,607.—CARPETS.—G. C. Wright, New York city.
5,608.—SUSPENSION EYELET.—G. W. Averell, New York city.
5,609.—KNIFE HANDLE.—M. Chapman, Greenfield, Mass.
5,610 to 5,618.—CARPETS.—Otto Heinigke, New York city.
5,619 to 5,623.—CARPETS.—H. Horan, Newark, N. J.
5,624 to 5,630.—CARPETS.—L. G. Malkin, New York city.
5,631.—CARPET.—W. Mallinson, Halifax, England.
5,632.—SODA FOUNTAIN.—G. F. Meacham, Newton, Mass.
5,633.—CARPET.—J. J. Patchett, Halifax, England.
5,634.—BIRD CAGE HOOK.—A. Wunder, New Haven, Conn.
5,635.—IRON BRACKET.—M. D. Jones, Boston, Mass.
5,636.—CARPET.—A. McCallum, Halifax, England.
5,637.—CEILING ORNAMENT.—G. Protin, New York city.
5,638.—CLOCK CASE.—P. B. Wight, New York city.

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

20,356.—PROTRACTOR.—J. Lyman. May 8, 1872.
20,314?—VALVE COCK.—S. Adams. May 8, 1872.
20,341.—HORSESHOE MACHINE.—C. H. Perkins. May 15, 1872.
20,649.—VAPOR LAMP.—A. M. Mace. June 5, 1872.
20,692.—GRINDING MILL.—B. A. Beardsley. June 12, 1872.
20,837.—PRESSING STRAW BONNETS, ETC.—H. E. West. June 19, 1872.
20,411.—HARVESTER RAKE.—D. O. De Wolf. May 15, 1872.
20,447.—WHITEWASH BRUSH.—D. W. Shaw and W. McGraw. May 15, 1872
20,542.—STONE CRUSHER.—E. W. Blake. May 29, 1872.

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POSTAL CARDS, ETC.—A. L. McCrea, Washington, D. C.
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REFRIGERATOR.—J. Gravenstine, Phila., Pa., D. W. C. Taylor, N. Y. city.
SEWING MACHINE.—Singer Sewing Machine Company, New York city.
STEAM GENERATOR, ETC.—A. G. Busby, Philadelphia, Pa.

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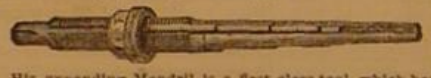
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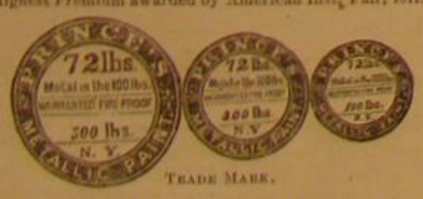
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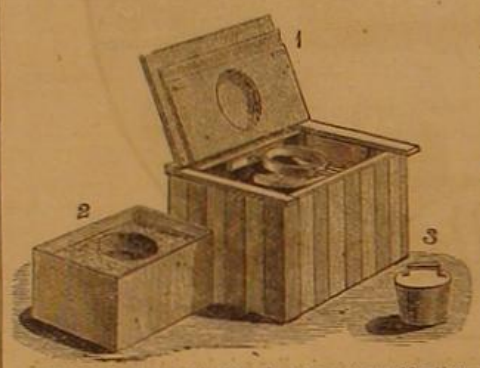


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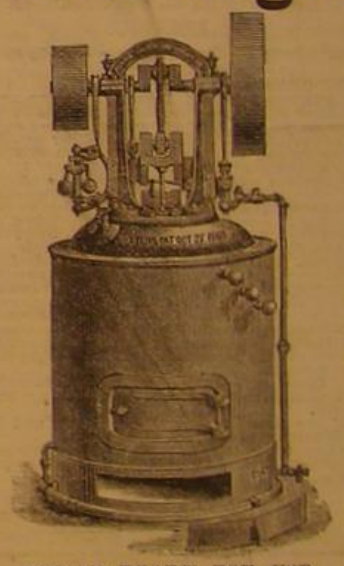
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