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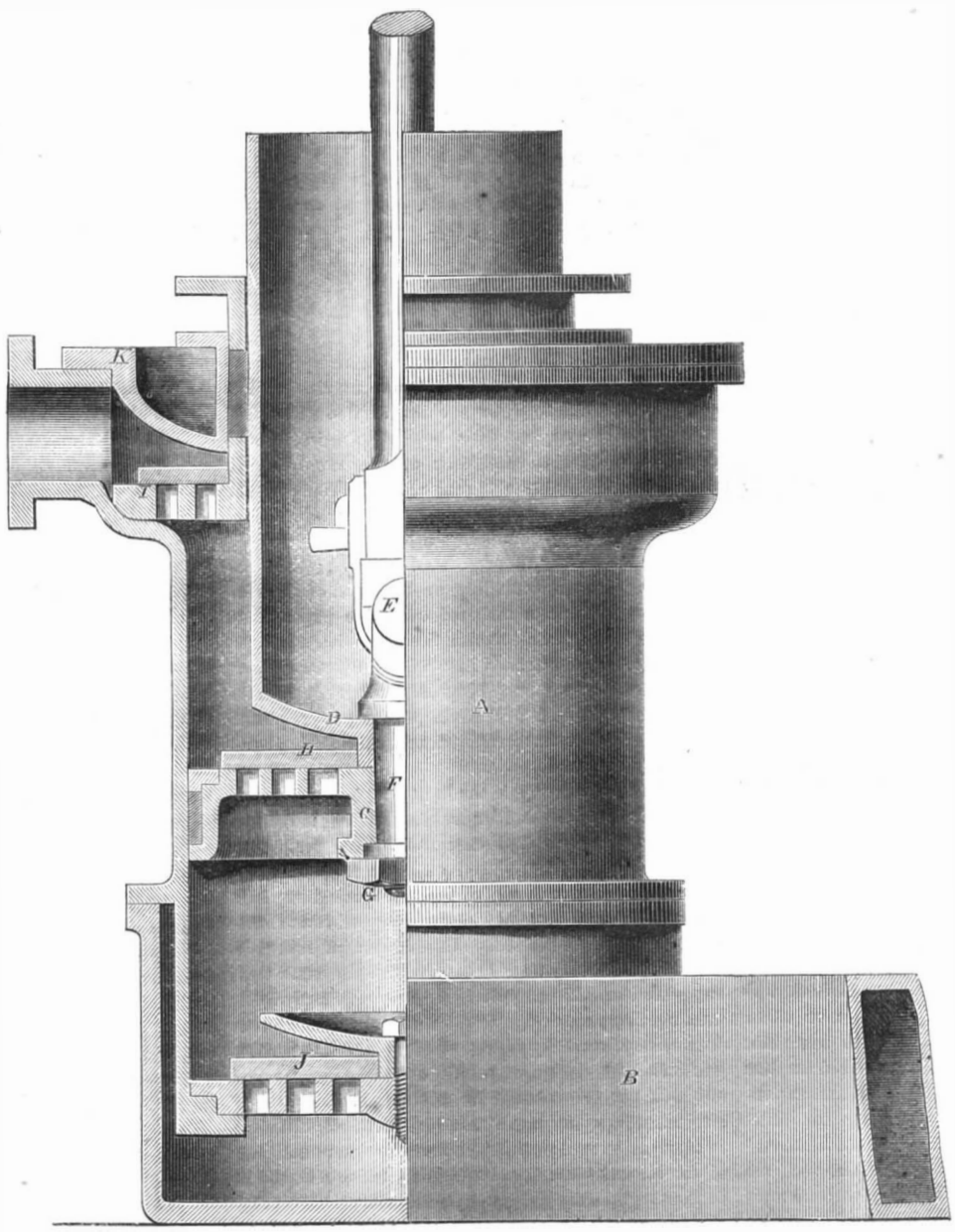
Improved Air-Pump.

Quick-working steam engines, when running at high speeds, are liable to shock and jar, from the rapid opening and closing of the valves and pistons that are brought into contact with water. The air-pumps especially, when the engines are of the condensing variety, have a heavy load to overcome; it is desirable to obviate the evil alluded to, as far as possible, by easing the bucket of the source of a portion of its labor. We herewith illustrate a device for this purpose. The pump barrel, A, sets upon and descends into the channel way, B, to which it is bolted. In this barrel the bucket, C, attached to the trunk, D, works. The spade-handle bearing, E, to which the connecting rod is attached, is a continuation of the pin, F, which goes through both the trunk and bucket and is there secured by the nut, G. The bucket has a series of radial openings or grates disposed about its center, which constitute the seat for the valve, H. A similar grating and valve may be seen at, I, there is also a foot valve shown at, J. The operation of this pump and its valves is as follows. When the condensed water flows into the channel-way, the motion of the bucket and its trunk causes the foot valve to rise and admit the hot water; as the bucket descends, its valves also raise and upon the return stroke close and carry the load with it. Now when the engine works rapidly, if no yielding surface was interposed between the water and the air-pump covers, K, the latter would be subjected to a series of severe shocks; these shocks distribute their force through all parts of the machinery and tax its endurance greatly. To obviate this the inventor employs the valve, I, which by rising as the water meets it, eases the blow and permits the water to overflow into the hot well, or out-board discharge, without further delay. This attachment would seem to add very materially to the effective action of the pump and to subtract very much from the concussion and consequently the jar of the machinery and liability to carry away important parts of the engine. This invention was patented Sept. 9, 1862, by John Vial, and for further information address him at Cleveland (west side), Ohio.



VIAL'S PATENT AIR PUMP.

THE INVENTOR OF IRON-CLAD VESSELS.

On the 22d ult., Senator Cowan, of Pennsylvania, presented a petition in the Senate from A. Stewart and others, asking for a pension to the widow of Thomas Gregg; it being claimed that he was the original inventor and patentee of iron-clad vessels. This is a new phase of this subject, and a brief history of the invention, according to the information we possess, will therefore be of some public interest just now. It is generally admitted by European engineers that although iron-clad gunboats were first brought practically into use during the Crimean war, the late Robert L. Stevens and E. A. Stevens, of Hoboken, N. Y., were the inventors of them. Vessels protected with angulated iron plates were proposed by them as early as 1816, and for coast and harbor defense a description of such vessels was afterward submitted to a Government board, consisting of Commodores Stewart and Perry and Colonels Thair and Totten, in 1841. It was stated in the document proposing the construction of such a vessel for the defense of New York, that plates of iron four inches in thickness were equal to five feet four inches of oak in resisting a ball at point-blank distance; and with the guns then in use it was supposed that none of their shot could penetrate a vessel clad with such armor. In 1843, a contract was formed between our Government and Messrs. Stevens for the construction of such a floating battery, and $500,000 was furnished by Government and expended on the battery now at Hoboken.

During the Crimean war in 1855 it was found that wooden steam frigates were totally useless in attacking granite casemated forts defended by big guns firing shells. An application of Stevens's invention was suggested, and several iron-clad gunboats were then built for the French and English navies. A few of these were employed at the siege of Kinburn and were decidedly successful. This led the Emperor of France to extend the application of iron plates to one of his large frigates—*La Gloire*—which was completed three years ago, and was the first regular iron-clad war ship ever built. Since then several have been constructed for the French and English navies—the American invention having thus been first carried into practical use in Europe. The first American iron-clad boats were those that were built for the Western rivers in the winter of 1861 and 1862, and which have been very serviceable on several occasions. The next was the *Monitor*, and now we have a considerable fleet of iron-clads in commission and a large number more in the course of construction. The *Ironsides*, built at Philadelphia, and the *Roanoke*, which is now being completed in this city, are the only iron-clad frigates belonging to our navy that may be justly called "sea-boats"—all the other iron-clads are floating coast batteries and river boats. We will now refer to the claims of Thomas Gregg. An illustrated description of his iron-clad vessel was given on page 352, Vol. VI (new series), of the SCIENTIFIC AMERICAN. It is there stated that specifications and drawings of his iron-clad boat were filed in the Patent Office 48 years ago—1815—which ante-dates the claims of Messrs. Stevens's invention by one year.

Such are the facts in relation to the history of iron-clad vessels, so far as we understand them.

Hooping Cough.

At this season of the year hooping cough more or less makes its appearance in parts of a large city like this, and many people are at very great efforts to keep their children out of its reach. If one-half the pains were taken to carry them successfully and wisely through it, that there are to prevent the infection of it reaching them, it would no doubt be found that in the great majority of cases the hooping cough is the means of conferring an actual constitutional benefit, so that the child will come out of it stronger and better in health, and with more fully developed lungs than before it was attacked. Even as it is, the benefit to a family is on the average much greater than the danger. Not above one in twenty are supposed usually to die of this disease. It may, however, be doubted if one ever dies of the hooping cough, except by its producing some other secondary affection, not a necessary part of it, but to which there has been some constitutional tendency, or which is the result of carelessness or accident. In most of these cases fatal disease either would have ensued without or might have been averted. The disease itself seems to produce no necessary effect upon the lungs at all traceable in dissection. The coughing may and generally does produce more or less inflammation, and this in turn mucus, and all these things put together may in weakly children, or where the symptoms are neglected, produce a great number of ultimate evil consequences. But the cough itself is strictly a spasmodic cough arising from a convulsion of the nervous system, as decidedly as laughing or crying, and it is not, like most coughs, a convulsion caused by some inflammation producing irritating effects, though often causing it. It is a disease, therefore, throughout all its three stages, whose bark is worse than its bite, if properly watched. Indeed, it is only astonishing the amount of suffering a child will go through from its paroxysms one minute, and except fatigue, be perfectly free from pain and all inflammatory symptoms the next. Many children are even observed to have a better appetite and finer spirits and general health, even nearly all the time that the hooping cough is upon them, than at any period of their lives.

Of course the strain of these paroxysms of itself, apart from all the expectoration, makes a heavy draft upon the constitution, and hence when the child is weakly or debilitated by other sickness, care should be taken to avoid exposure to it. Young infants, not knowing how to expectorate, should be kept from the contagion. It is also preferable not to have children take it in the Fall, as it is apt to affect them all winter. But beyond that there is no reason for taking pains to avoid it, where children are of proper age and in good health. On the contrary, it is to be allowed to pass through the family, not as a disease so much as something sent probably to produce a higher development of health than could be attained without it. Whether it is that it takes from the system a certain lymphatic or other peculiarity which, though desirable up to a certain stage, it is now equally desirable to expel from the system, or whether it is simply through the expansion of the lungs, occasioned by coughing, certain it is that it often produces a marked constitutional improvement. If any person, child or adult, will but take a quill and draw a deep, full inspiration, so as slowly to expand the lungs to the utmost, and repeat this for five minutes daily, the chest will soon measure four or five inches more in circumference, and in proportion to the greater amount of oxygen thus inhaled, the lungs will be kept freer from disease, the amount of food digested will be increased, and the vital energy, the real being and living power of the individual, will be augmented. Hooping cough, therefore, should be looked forward to, when it comes into a family, as a messenger sent indeed to make fresh demands upon parental care and watchfulness of every symptom, but sent also to prepare and as it were compel the child to expand its lungs afresh and on a larger scale, on entering on a new period of its existence, just as the cries of its earliest infancy are designed to give expansion to its lungs at first.—*Philadelphia Ledger.*

Transparent Painting on Linen.

Very fine muslin is the best material for painting upon; and before you begin to paint, a straining frame must be made of beech or hard wood. It should consist of two upright bars, mortised at each end, with holes into which top and bottom cross-bars, tenoned at the sides, can slide, much after the same pattern as the ordinary embroidery frame, but it is rarely required larger than suitable for a window-blind. Along the inner edge of the frame a strip of webbing is permanently nailed, and to this the muslin must be sewed before it is stretched. Having stretched the muslin it is ready for the first preparation, which is sizing. The best size is that made from parchment cuttings; you must have a pitkin to hold about a quart of water. Having cut up the parchment into small strips, fill the pipkin with water and put them to simmer but not to boil. When this operation has gone on for a couple of hours you will have sufficient size, which should be allowed to cool, and then you will have a clear transparent jelly. Remove the dregs from it and boil in a clean pipkin as much as you will require; but recollect the more careful you are in the preparation of the size, the better will be the result of your workmanship.

After the muslin is sized it will be found to relax in the frame and has therefore to be again fully tightened. A second or even a third coating of size is to be applied when the former is dry and the muslin again stretched if it slackens. After a couple of days or more, when the size is quite hard, it must be rubbed smooth with pumice-stone—a smooth face may be obtained to the pumice-stone by grinding it on a stone flag with water. This operation of smoothing the size is very necessary, as the colors take better to the material than when this process is omitted. The muslin being now in a fit state to receive the paint, the subject of the design must be drawn upon it. In order to secure accuracy—for no "rubbing out" can be effected on muslin—it is a common practice to draw the intended outline first upon cartridge paper with a bold stroke in ink, so that when fixed to the back of the muslin with threads it can be seen through the fabric, and the picture be traced out on the muslin with a dark pencil. Another way of tracing a design is to employ the pounce-bag and a perforated pattern; thus, for instance, take a natural leaf, such as that of the vine or ivy, lay it upon a strip of cartridge paper, then perforate the paper all round the leaf with a pointer or a thick needle fastened into a handle. On removing the leaf a few perforations may be made to indicate the arteries. If several strips of paper are placed under the leaf at once, repetitions of the designs can be readily obtained.

The best pounce-bag is made of a couple of folds of muslin tied up like a laundress's blue-bag and filled with a finely-powdered charcoal. The perforated paper patterns being placed on the muslin they are then pounced over, when the charcoal dust falls through the holes on to the muslin, and thus transfers the design of the leaf. If a border of leaves is required, it is only necessary to repeat the same leaf, but placed in different positions—now left, now right, then overlapping each other. The same may also be done with a butterfly or any similar object. Having perforated the design of a bird on the wing, it will not look like the same if its position is considerably altered, now flying up in mid-air, now alighting on to a bough, then descending; the subsequent coloring of the leaves, birds and butterflies, being also modified, changes their general appearance.

Many very elegant designs can be perforated by folding the paper once, twice or four times; thus, whatever pattern is perforated will then be repeated through the other sections. In this way corners and centers are formed. The design thus placed in outline on the linen is now to be colored. We, of course, presume that persons employing themselves thus will have some knowledge of art, and it is now that their taste can be displayed. The rules which govern art are applicable to transparent painting, but our observations are limited to the specialities required to put it in practice. A fine sponge forms a good tool to lay on the tints for clouds and sky or distant hills, and coarse honey-comb sponge does well for luxurious foliage, rocks, &c. Flat hog's-hair brushes, the same as are used for oil painting, do admirably for this work. Varnish colors, tempered with japanners' gold size and turpentine, are the best; the paints sold in tubes will be found convenient, copal varnish and pale drying oil being used as a vehicle.

Young persons who can draw, and are in want of a little occupation, either for amusement or as a means of income, can now from these hints turn their attention to transparent painting; and there are too many ugly back windows to hide in every town for them to fear any lack of employment.—*Septimus Piesse.*

Production of Copper.

The following extracts are from the *Lake Superior Miner*:—

"In 1830, the total productions of the copper mines of the world was about 25,500 tuns of metal, and of this amount Great Britain produced 13,200, or more than 50 per cent of the whole, while the United States and Canada furnished but 50 tuns or two-tenths of one per cent. The Russian Empire then produced nearly 4,000 tuns; the Austrian Empire 2,150 tuns; the whole of Asia some 2,500 tuns. In 1853, twenty-three years later, Britain had only increased her annual product to 14,500 tuns, her percentage of the whole amount receeding to 26; while Chili, in South America, which in 1830 only yielded 200 tuns, had raised her product to 14,000 tuns, or over 25 per cent of the total production. From that period forward to the present time, the copper production of the Chilian mines, we believe, exceeded those of any other country; the value of their exports in that metal alone amounting to $10,760,000 in 1857, while the value of British mine products for the same year was worth about $9,500,000. The Russians had increased the yield of their mines to 6,500 or 11¾ per cent of the whole; the Austrians to 3,300 tuns, or 6 per cent; the whole of Asia only 3,000 tuns, or 5½ per cent; while the United States and Canadas raised that year 2,000 tuns, over 3½ per cent of the total products for that year, which were about 55,700 tuns; Australia and New Zealand produced about 3,000 tuns; Cuba, 350 tuns; Scandinavia, 2,000; the German States, 1,450 tuns, and the rest of Europe, exclusive of the countries above-named, 1,000 tuns.

"During the past ten years the mines of Lake Superior have probably increased their production more rapidly than those of any other country, the exports for 1861—7,500 tuns of metal—being about twelve times greater than those of 1851. That our ratio of increase in the coming ten years will be as great should not probably be expected, as that would amount to 90,000; more by at least 40 per cent than the present product of the world's mines. Of the 80 miles of copper range east of us, and 40 to 50 miles west, comparatively few mining properties have yet been explored."

To Cure Bacon.

The following method of curing bacon in England is described by a correspondent of the London *Grocer*:—

"The general custom in the eastern and midland counties is to remove the hair and bristles, &c., by immersing the animal (after it is slaughtered) in a tub of scalding water, when the impurities are readily removed. The system of scorching the pigs first, and afterward using hot water, has been adopted by several individuals for many years. The dead pig is covered with loose straw, which is set on fire, and the hide is slightly scorched; it is afterward immersed in hot water and scraped. The bacon prepared in this way has a peculiar flavor, and is much preferred by some; but the practice is rarely adopted on account of the trouble."

Smoking and Photography.—The Paris correspondent of the London *Photographic News* states that tobacco-smoking in the room of a photographer, where the pictures are developed, has an injurious effect. He states that an artist in Paris attempted an instantaneous process in the presence of several smoking photographers, and every negative was "fogged." Next day he repeated the same process, after the room had been thoroughly aired and ventilated, and the images came out perfect. Numerous facts serve to prove the truth of these observations; and photographers who are in the habit of smoking in their operating rooms may rest assured that this is the cause of numerous inexplicable failures.

Cultivation of Tobacco.

The following is from the *California Farmer* by a contributor who has had an experience of several years in the cultivation of tobacco :—

"In order to grow strong tobacco plants the ground must be well prepared and worked very fine. In preparing the seed-bed I have found that the best way is to light a large fire on the ground ; the soil is thus rendered loose and friable, and is easily reduced very fine. If it is not convenient to make a fire, mix the earth with a large dose of wood-ashes and small charred dust. By this means the ground becomes so loose that, when the plants are ready for transplanting, a good sprinkling from the garden-pot will make the ground so soft that each plant will bring with it a small ball of earth, which almost insures the plant's growing, and it must be borne in mind that young tobacco plants require very careful handling. It is better to have a large shallow basket or box to carry the plants in when transplanting, as by this means the plants do not loose the ball of earth or get bruised so much as if taken in the hand.

"The seed-bed being made fine with the rake, take the seed and mix it well with ten times (by bulk) as much fine earth and ashes. This enables you to sow the seed so thin that in drawing the larger plants you do not disturb the smaller ones.

"The ground being prepared and the seed well mixed as directed, proceed to sow, taking care to scatter the seed as equally as possible. Do not rake in the seed, but give the bed a slight beating with the back of the spade, and see that the earth does not rise with the spade. Let the seed-bed be in a sheltered situation. When the plants are about the size cabbage plants usually are at transplanting, operations may commence, making choice of a cloudy or even a rainy day for the business. The ground for the crop must be well worked and well manured with decayed manure ; and it is better to have two shingles or other pieces of timber about six feet high, to stick on end in the ground, meeting over the plant so as to protect it from being scorched with the noon-day sun or nipped with the morning's frost. A light, sandy soil suits the tobacco well, if well worked and manured. In another communication I will explain the summer culture and gathering."

An old tobacconist of Sacramento informs the *Bee* that all the California tobacco he has seen has been spoiled in curing. It is cured in houses which are so hot that the leaf is burned and destroyed. The entire substance is taken out of it, and nothing but the coarse vegetable matter left, without any or scarcely any of the qualities of the plant. And this, he says, must ever be the result while the leaf is dried as it has been here. He proposes that it be dried under trees, through whose branches the sun does not penetrate and through which the air can freely circulate, in order that the leaf may not be bleached of all its properties.

Applications of Benzine.

Benzine is applicable to a great many useful purposes. It is the product of the naphtha of distilled coal tar, and its uses were first most clearly described in a patent granted in 1853 to F. Crace Calvert, the eminent English chemist. The method of preparing it is described as follows :—Take limpid coal naphtha and put a suitable quantity to be treated in a leaden or stoneware vessel. To this add small quantities of sulphuric acid until it ceases to produce coloration. The quantity of acid required therefore varies with the relative purity of the naphtha.

The naphtha so treated is next washed with water containing a small quantity of alkali dissolved in it ; then it is distilled in a common still. These operations, if repeated two or three times, will produce very pure benzine. In order to obtain benzine, not perfectly pure but suitable for most purposes, it is only necessary to distil common naphtha at a temperature of 212° Fah.—that of boiling water.

Benzine is useful for the removal of spots and stains caused by fatty or oily matters, tar, paint, wax or resin from cotton, woolen, silk and other fabrics ; and owing to its great volatility no mark or permanent odor remains on the fabrics operated upon. It also removes fatty or oily matters from hair, furs, feathers and wools and other articles made of leather, hair, fur and wool. It is applied to articles of small size by rubbing them with it ; but, for things of a larger size, the articles and fabrics to be operated upon are placed in a suitable vessel and the benzine is allowed to flow into the vessel, and, after leaving them in contact for several hours, the fluid is run off and the articles and fabrics are squeezed so as to remove a great portion of the benzine containing the paint, tar, grease, oily or fatty matters in solution, which is separated from the liquids by distillation in a suitable vessel, and the benzine may thus be used over again.

Furs.

It is said that London is the fur mart of the world, although the climate of England is such that furs are but little used there. Russian sable is the most valuable of all furs, and the skins are exceedingly scarce. According to the latest statistics, only twenty-five thousand of them were produced in the Czar's dominions. The prices paid for them are enormous. The sable for lining one of the emperor's cloaks, exhibited at the World's Fair in 1851, was valued at five thousand dollars. One kind of the Russian sable is called silver sable, on account of the long white hairs which are conspicuously mingled with the dark brown, which is its usual color. This commands a very high price, partly from its rarity and partly because it cannot be imitated as readily as the brown. The peculiarity of this fur is its great softness and the length and heaviness of the hair. The ermine has a value of its own from its delicacy and beauty, although it is not so expensive as the Hudson Bay sable, which ranks next to Russian. As the Hudson Bay Company get their skins very far north they are often very nearly equal in elegance to the Russian, although they cost rather less than half the amount. The American sable is got south of the dominions of the Hudson Bay Company. It stands third in the list of furs. Next are the mink and the stone-martin. For the last few years fashion has given a value to the mink which it formerly gave to the stone-martin. It has no equal for durability and in appearance is sufficiently elegant for all ordinary purposes. It varies very much in quality. The most valuable skins have long dark hair and are quite soft. French sable means any very inferior fur dyed to imitate a valuable one. The Siberian squirrels are much used, and are just as useful for warmth and fully as durable as any other. For sleigh robes the black bear is highly valued. The white fox and the black fox, which is a Canadian fur, are highly valued in Europe. Raccoon skins and muskrat are commonly used and answer very well, but are not as comfortable as those which have longer and heavier fur. The old Buffalo robe is still useful in its place.

Curious Importations.

Butcher Birds.—Many years ago, when rice was dear in Eastern China, efforts were made to bring it from Luzon, where it was abundant. At Manilla there was, however, passed a singular law, to the effect that no vessel for China should be allowed to load with rice, unless it brought to Manilla a certain number of cages full of the little "butcher birds," well known to ornithologists. The reason for this most eccentric regulation simply was that the rice in Luzon suffered much from locusts, and these locusts were destroyed in great numbers by butcher birds.

Sparrows.—A somewhat similar business is carried on between England and New Zealand. This latter country, at particular seasons, is invaded by armies of caterpillars, which clear off the grain crops as completely as if mowed down by a scythe. With the view of counteracting this plague, a novel importation has been made. Mr. Brodie has shipped 300 sparrows on board the ship *Swordfish*, carefully selected from the hedge-rows in England. Their food alone, he informs us, cost £18. This sparrow question has been a long standing joke in Auckland, but the necessity of farmers having small birds to keep down the grubs is admitted on all sides. There is no security in New Zealand against the invasion of myriads of caterpillars, which devastate the crops.

Toads.—The most singular branch of such traffic is the toad-trade. On some of the market gardens near London, as many as five crops are raised in one year, the principle object being, however, to raise the finest possible specimens for high prices. Under such a system of culture, slugs and other insects are very formidable foes, and to destroy them, toads have been found so useful as to be purchased at high prices. As much as a dollar and a half per dozen is given for full-grown lively toads, which are generally imported from France, where they have also been in use for a long time in an insectivorous way.

Cinchona—Quinine.

The cinchona or Peruvian bark is obtained from shrubs and trees in South America, and it is one of the most important medicines in use for intermittent fevers and agues.

The genus cinchona belong to the same natural order (*Cinchonaceæ*) which embraces the coffee plant. The plants of this genus are natives of the intertropical valleys of the Andes, and are found principally on the eastern face of the Cordilleras, growing commonly at hights varying from about 4,000 to nearly 12,000 feet above the level of the sea. The cinchona region extends from Santa Cruz de la Sierra, in Bolivia, through Peru and Columbia, nearly to Caracas. The plants exist both as small shrubs and large forest trees, with evergreen leaves and commonly showy flowers. They require great moisture, and a mean temperature of about 62°. The most important varieties of it are crown bark, silver bark, yellow bark and red bark. The name cinchona was given to the genus by Linnæus, in compliment to the Countess of Cinchon, whose husband was the Viceroy of Peru. She had derived great benefit from the bark during her residence in South America, and on her return to Europe, in 1639, she brought with her several specimens. The medicinal use of the bark was first made known in Europe by the Jesuits.

Whole forests of the cinchona have been destroyed to obtain the bark, without their places being attempted to be supplied, and fears have been entertained that it would soon be exterminated. Acting upon this idea, some English capitalists have lately began to cultivate it in the Neilgherry hills, in the East Indies. Several plantations of it have been laid out, and 72,500 plants have been placed in them. Peruvian bark was used in a state of powder for medicine—chiefly as a tonic—till 1820, when Pelletier, a French chemist, obtained from it the stimulating principle with sulphuric acid, forming a salt called the sulphate of quinine, in which condition it is now used. Eight grains of the sulphate of quinine produces an effect upon the human system equal to one ounce of the bark. Quinia wine is chiefly used in Italy for fever and ague, it cousists of a mixture of the sulphate of quinine with weak wine.

The Mortality and Sickness of the Army.

Mr. Elliott, Actuary of the Sanitary Commission, in a preliminary report on the mortality and sickness of the volunteers, estimates that the number of deaths in the volunteer forces of the United States during the war ("home guards" and other bodies not in active service being excluded) has been at the annual rate of fifty-three per thousand men, of which about forty-four were from diseases and accidents, and nearly nine from wounds received in action. Assuming the same rate of mortality for those discharged and deserted, and the annual rate of deaths is about sixty-five per thousand. The rate of mortality for the autumnal months is twice nearly that for the summer months, and the winter nearly double that of autumn. The mortality in the armies of the West is three times as great as that in the volunteers of the Eastern and Middle States. The deaths from wounds are five times as great in the Western army. To supply losses among the enlisted men in our Eastern armies requires recruits at the rate of nineteen per 1,000 per month, or 226 per 1,000 per annum. To supply such losses in our Western armies requires recruits at the rate of nearly twenty per 1,000 per month, or 234 per 1,000 per annum. The number of desertions from the Eastern army is double that from the Western army. To secure in the field a constant force of 500,000 effective men, recruits are required of 123,000 men per annum, as long as the war lasts, besides maintaining 58,000 in hospitals. Of these 123,000 annual recruits, 83,000 are to supply losses by death and discharges from service (exclusive of discharges for expiration of term of enlistment) ; 34,000 for desertion and missing in action ; and 6,000 to supply other losses specified and unspecified.

VICE *versus* VIRTUE.—Vice is concealed by wealth, and virtue by poverty.

A LECTURE ON THE IRON NAVY OF GREAT BRITAIN.

The following are extracts from a lecture lately delivered on the above-named subject by J. Scott Russell, Esq., before the Leeds (England) Philosophical and Literary Society.

Mr. Russell stated he was not sure that they had a fleet capable of protecting their commerce from clever, smart, well-handled, and fast pirates like the *Alabama*. The first question was, were wooden ships-of war worth anything for purposes of warfare? Sir John C. Hay, the chairman of the committee appointed by Government to make experiments on the effects of artillery upon iron armor, uttered this fatal sentence upon wooden fleets :—"The man who goes into action in a wooden ship is a fool, and the man who sends him there is a villain." The worthlessness of wood ships came from their combustible nature, and arose mainly from the invention in modern times of horizontal shell firing, which could be discharged with tolerable certainty at distances of two, three, four, and even five miles. They could, however, make iron ships incombustible. A plate an inch thick had been found to take the sting out of a shell altogether. A cast-iron shell eight inches in diameter, weighing 68 lbs., and fired with a charge of some 16 lbs. of powder, at a distance of from 200 to 500 yards, would be carried with a velocity of 1,600 feet a second, and the question was, how to stop it? Many theories had been proposed to stop the shell by coaxing, that was, by pieces of india-rubber, by bales of cotton, blankets, and other mollifying substances, but it had been proved that nothing would induce it to stop but presenting another piece of iron as strong or stronger than itself; and therefore to stop a 68 lb. shell they must take so thick a plate of iron that the piece struck by it should weigh more than 68 lbs. It was then a question of strength—if there was a certain quantity more of iron in the plate than in the shell, the plate had it, and *vice versa*, but if the plate were hit three or four times in the same place it would probably give way. Mr. Whitworth had been enabled with his cylindrical shot, under peculiarly favorable circumstances, just to punch through an iron plate of 4½ inches. Of all the hundreds of shots fired in action, very few would have similar fortunate circumstances, and they might, therefore, comfort themselves with the feeling that at present 4½-inch iron plates were practically shell-proof. When 4½ inches were penetrated by ordinary guns, they must make thicker armor, and to carry it they must build bigger ships, or limit the battery to a smaller portion of the ship.

The first case which came to their knowledge of the destruction of a wooden fleet by horizontal shell firing was the destruction by the Russians of the Turkish fleet at Sinope. During the same war, Louis Napoleon got his iron-plated ships into the Black Sea before England, and had the opportunity of practically testing them. He was enabled to capture Kinburn, and it was afterwards found that in no one place had the shot from the fortress penetrated the armor of the two ships engaged in bombarding it. Immediately after this experience, Napoleon made up his mind to have armor-plated ships, ceased spending money upon wooden ships, saved that money until he perfected his design, and the consequence was that he had got an iron fleet before we knew anything about it. What did we in England do? No sooner was this found out than they set to work building wooden ships as fast as possible, and the sum expended in this way since Napoleon began saving his money was 29 millions odd. (Laughter.) A list of the "magnificent fleet which now defends England" had been recently published, and it amounted to 1,014 ships of war. This was a very formidable inventory, but he could give them a simple analysis of the number. Of these 1,014, there were of wooden ships 1,010—(laughter)—of fast iron ships, two; and of slow iron ships, two. This was what they now had for the 29 or 30 millions expended since the discovery that wooden ships were incapable of sustaining horizontal shell firing. There was happily promise of better for the future. They were now constructing of the *Warrior* class four, of the slow class four, and of wooden ships coated with iron ten. He thought this was a very serious subject. The country was spending ten millions a year upon the navy, which was equal to a fleet of ten *Warriors*. A fleet of twenty *Warriors* would be more powerful than the whole of the 1,010 wooden ships put together—it would be maintained at a quarter of the cost of the wooden ships; and he would go further, and say, three fleets of twenty *Warriors* could be maintained for an annual expenditure of little more than half of the ten millions now expended on the navy. They would naturally ask how this was to be accomplished? He replied, they should order the Admiralty to go out of business as manufacturers. They had turned them out of business in one department—the manufacture of marine steam engines—and the economy had been enormous. The French have now six iron-clad frigates afloat; England, four; the former has ten building and the latter about the same number. For armor plates the finer kind of iron was not suitable, that required being a very cohesive metal, which would yield a little to the blow. He saw that day, in one of their own manfactories, some enormous machinery being prepared for the manufacture of these iron plates. If a five-inch plate were penetrated, they would make a six-inch plate, and by-and-bye a twelve-inch plate, and when it became known that what was wanted was a tough and plastic iron, they would obtain as much of the proper quality as they wanted. He thought no large war-ship should be built which was unable to carry coals for a voyage of 5,000 miles.

The opinions of J. Scott Russell are entirely opposed to those put forth by Mr. Wells, Secretary of the U. S. Navy, respecting Government engineering establishments. His statements deserve much candid consideration.

The Calorific Effect of Silicious Sand in the Boiling of Water and Generation of Steam.

The following is a communication from the pen of Calvin Pepper, Esq., of Albany, N. Y.; the conclusion of the article, together with some editorial comments on the same, will be published in our next number :—

The subject of facilitating and economizing the boiling of water and the generation of steam by simply placing pure silicious sand in the vessel containing the water, from recent experiments made and now being further prosecuted with all diligence, is replete with interest and practical importance. In view of these experiments I am already warranted in saying that with any vessel—however large, not less than two inches in diameter, and not containing less than one gallon of water, admitting two inches in depth of sand—I will boil water in any given quantity, and convert it into steam in one-third less time and with one-third less expenditure of fuel, by the use of sand than without it; all other circumstances being equal.

The following experiments are sufficiently illustrative to serve as a text for the brief exposition which follows, and to prove suggestive of explicit inquiry and experiment on the part of your intelligent and scientific readers. The vessels used in all these experiments were two ordinary tin cylinders of like make, ten inches in diameter, with copper-pit bottoms, each capable of holding three gallons of water. In the pit of one was placed a pint and a half of sand, covered over with fine wire gauze, to hold the sand in its place and yet permit free circulation of the water from above through the meshes into and out of the sand. This addition of sand to one of the vessels was the only difference between the two. The sand used was of mimimum quality :—

The undersigned made the following experiments with C. Pepper's silica attachment for boiling water, generating steam, &c., as very readily and very simply applied by him to any vessel containing water to be placed over any fire. Two ordinary vessels in all respects similar, with the only difference that the one contained the silica in the water and the other not, and each containing six quarts of cold water, were placed upon the fire range, side by side, at the same time, and changed—the one in the exact place of the other—every two minutes, so that the conditions of heat, as applied to the two vessels, should be made as equal as possible. The water in the silica vessel was boiled in 13 minutes, and in the vessel without the silica it required 23 minutes. One gallon of hot water was then removed from each vessel and replaced with a gallon of cold water, and the same quantity of potatoes placed in each at the same time. Again the water was much the soonest boiled in the silica vessel, and it required but 18 minutes to boil the potatoes fit for the table in that vessel, and 29 minutes in the other vessel. The vessel with the silica maintained its superiority in heating, boiling and cooking in the above relative proportions throughout, and in every stage of the experiments. The experiments were performed with the utmost care and circumspection at the Delavan House, Albany, N. Y., July 28, 1862.

WM. RACE, Steward of Delavan House, Albany.

The following tests were made at the store of Fuller, Warren & Co., Troy, on one of P. P. Stewart's stoves, July 31, 1862. The vessel tried as an experiment had, as near as I could judge, one pint and a half of sand at the bottom, covered with brass wire gauze. J. A. LAWSON.

First, At 2*h.* 17*m.* each vessel, containing four quarts of water, was placed on the stove without any cover or lid, changing the position of the vessels every two minutes. At 2*h.* 36*m.* the vessel with sand boiled; at 2*h.* 44*m.* the vessel without sand boiled. Second, At 2*h.* 45*m.* two quarts of cold water were added to each; and at 2*h.* 51*m.* the water boiled in the sand vessel, and at 2*h.* 69*m.* in the other vessel. Third, At 3*h.* 12*m.* two quarts of water were taken out and two quarts of cold water put in—the vessels being this time covered; at 3*h.* 16*m.* the vessel with sand boiled, and at 3*h.* 22*m.* the vessel without the sand. Fourth, At 3*h.* 23*m.* two quarts were added to each vessel; at 3*h.* 27*m.* the water boiled in the sand vessel, and 3*h.* 28*m.* in the other. Fifth, At 3*h.* 30*m.* two quarts were taken out of each vessel, and two quarts of cold water added; at 3*h.* 32*m.* the water in the sand vessel boiled, and at 3*h.* 35*m.* the water in the vessel without the sand boiled. Sixth, At 3*h.* 37*m.* four quarts were taken out and one gallon of cold water added. The water in the sand vessel boiled in one minute, and that in the vessel without sand in three minutes. Seventh, At 3*h.* 41*m.* one gallon of water was added, and at 3*h.* 48*m.* the water in the sand vessel boiled, and at 3*h.* 50*m.* that in the vessel without sand boiled. I believe the above experiments were fairly made, and the results, as stated, seem undeniable. P. P. STEWART.

In the application of the sand it should be observed :—

First : The sand must be pure silica. No other substance can supply its place or possess the same or equal heating properties in common. Earths soluble in water, as clay, marl and dirt, become plastic and impervious to water and heat, the injurious effects of which are well known.

Second : The sand must be placed next the fire, with but the metal intervening, or, in other words, the sand must heat the water and not the water heat the sand. It will not do to suspend the sand in the water, or have it remote without continuity from the source of heat, or its direct application, or where it cannot be readily raised to 212° of temperature.

Third : There may be excess of sand as of metal, abstracting heat without rendering back that which would otherwise be applied to the water. A little practical knowledge will always avoid that error.

Fourth : If the sand surface be small, or the space filled in with the sand narrow and of much depth, as, for example, between the outside and inside fire-boxes of a locomotive engine, there may be such rapid generation of steam as to prevent the water from circulating from above down through the sand, but this can always be remedied, and the circulation actually increased in force and completeness, by having water rise from the bottom of the sand by hydrostatic pressure upwards, acting in conjunction with the force of the steam.

(To be continued.)

APPLICATIONS FOR THE EXTENSION OF PATENTS.

The following persons have applied to the Commissioner of Patents for the extension of their patents for a term of seven years :—

Method of Insuring the Action of the Valves of Direct-action Pumping Engines.—Henry R. Worthington and William H. Baker, of Brooklyn, N. Y., obtained a patent on April 3, 1849, for a method of insuring the action of the valves of direct-action pumping engines. The said H. R. Worthington and Adelia C. Millar (executrix of W. H. Baker), of Fruit Hill, R. I., now pray for the extension of the patent. The testimony will close on March 2d, and the petition will be heard at the Patent Office on the 16th of that month.

Tool for Attaching Tubes to Boilers.—Thomas Prosser, of New York, obtained a patent on April 17, 1849, for an improved tool for attaching tubes to boilers. The testimony will close on March 16th, and the petition will be heard at the Patent Office on the 30th of that month.

Persons who wish to oppose the extension of these patents should attend to it without delay. Copies of the claims in each case will be promptly forwarded from the Scientific American Patent Agency upon the receipt of $1.

TAPIOCA is the gum or sediment of the juice of the Mandioca plant, found in Brazil. The juice is obtained from the tubers which are about a foot in length and resemble sweet potatoes.

Correspondence

The Sources and Geology of Petroleum.

Messrs. Editors :—On page 54, present volume of the Scientific American, there is a highly interesting article from the pen of one of your correspondents (E. G. Kelley), on the subject of petroleum; but it contains some statements and opinions which, with due regard to true geological science, we cannot let go unquestioned and uncontradicted.

In the paragraph explaining the chemical formula of the change or degradation from woody structure to coal, E. G. K. asserts that petroleum comes from coal. If he means that, in some other portion of the globe than the United States and Canada, petroleum may be the result of a chemical change from coal, we shall not take a "a lance" against him; but in the North American continent it is not so. On the contrary, all the rock-oil which is of any economic value has its source in rock whose geological position is many thousand, probably not less than 5,000 feet below the coal-bearing strata. I do not mean to be understood that this great number of feet intervene between the oil-bearing strata and the coal-bearing at any one point, but that this is about the maximum thickness of the strata when measured in those localities where they are best developed.

Again, in the last paragraph but one from the bottom in the middle column, he says that "carbureted hydrogen, carbonic acid and olefiant gas are being constantly generated wherever mineral coal exists in large beds, and when condensed produce petroleum." We admit the formation of the gases, but deny that of petroleum as a geological fact. From the anthracite of Pennsylvania, through the soft coals of the same State, Virginia, Maryland, Ohio, Kentucky, Illinois and Iowa, there are no petroleum springs in the coal—no signs of any such condensation, either now existing or ever having existed in previous ages. The coal comes from the mine as dry of oil as if no rock-oil were known in the world. Why should it not? The oil is the product of Dame Nature in her chemical laboratory from material (waste stock we once would have called it) produced millions of years, if not ages, before coal plants had been created. (This remark relates to the Silurian and not Devonian strata. In the latter many land plants have been found, 106 species in all, enough to show that there were large continental areas, and enough to form extensive beds of coal, but not in the region of the oil wells of North America.) It may be objected to this statement of fact of dry coal, that the oil has dripped through the intervening strata into the oil-bearing which lies below. To this we say that each coal bed has, immediately below it, a water-proof layer of clay, more or less thick, which must have held the oil if any had been formed. Again, in Ohio, Canada and Illinois, petroleum is found where no coal was ever made.

One can sit down in a laboratory, fill his flask with bog-head, light his lamp, witness the vapors slowly rise through the neck, go over through the connecting glass tube with the condenser and from thence issue as oil. It is a very beautiful experiment, very convincing that oil is the product of coal in the laboratory, but not as a necessary consequence in nature. Nature and man work differently to accomplish the same ends. Man's method of producing oil from coal, which was once woody fiber, is by destructive distillation. Nature's method is to build up by living forces the elements of hydrogen, carbon and nitrogen into organizations either of vegetable or animal, and then by degradation of the organism after death to bring forth these elements into new compounds and forms, not organic, for compounds are simpler than organisms. The Devonian seas swarmed with multitudes of organisms, both of vegetable and animal, much as the present seas do, if we may so judge from petrifactions in the rocks. Here was abundant material for the chemical degradation of structure into oil. The soft porous sandstones of Pennsylvania, the softer slates of Canada and the open limestone of Chicago were the store-houses—the vats to hold the oil. The lard oil from Cincinnati as truly represents the organization of the hog as the lard, the ham, the bristles, or even the skeleton. Geologically, we should say, coal is the chemical product of the Carboniferous age, and oil is the chemical product of the Devonian age.

In the latter part of the same paragraph the writer says "the oil-springs are found in districts where the strata have been thrown up, causing caves and fissures, which are filled with the condensed vapors under pressure that are constantly being generated from the coal beds." If the writer has visited the regions where oil is "struck," he has not read the origin of the valleys and hills with true geological eyes; and if he has not, this information as to the strata is wide of the truth. From the Adirondac mountains in Essex county, N. Y., traveling in a south-westerly direction to the city of Pittsburgh in Pennsylvania, one passes over all the rocks containing organic remains, from the early oceans stocked with life to the carboniferous continent producing land plants and consequently coal. In all that distance the rocks lie smoothly, not disturbed, gently dipping towards the south-west, never thrown up nor convulsed. The same can be said of Canada and all the North-west States containing coal. It is in the anthracite where the rocks have been thrown up; but there, who has ever "struck oil?" The fact is, in New York State and Pennsylvania, to the north of the oil wells, the rock which yields the oil can be seen coming to the surface. In the city of Chicago it is quarried and builded into churches, when the prophecy is literally fulfilled, "the rocks shall flow with oil." The same can be done in Ohio, Virginia and Canada. We shall arrive at truth when we leave speculations and confine ourselves to facts.

One kind of rock gives us magnetic ore, another dye-stone ore, another gold, another lead, another coal, and another oil. It is our business to ascertain which rock is the parent of its peculiar mineral, and not to speculate whether one may not be the product of another. The importance of this statement cannot be over-rated. If a man believes from theory that hematite ore is the decomposition of magnetic, he will spend his money vainly in searching in the primitive. Thousands of dollars have been thus lost. And if a man is led by theory to believe that oil is the educt of coal, he may be disappointed in boring and spend his money in vain. During the oil mania how many were thus disappointed! How many returned to their homes disbelievers in the science of geology and pronounced it all a humbug! Had they not humbugged themselves?

We have in the last paragraph of the same column a specimen of the same kind of reasoning from assumed premises and inferences from false theories. The writer says:—"The process of condensing and hardening the softer coals is still going on in the earth (over 100,000 square miles); in the ages to come it will approximate the anthracite; hence, the supply of petroleum will not soon be exhausted." If the theory were correct, the inference would be true, of course, and oil-spring owners might take courage. But, suppose oil does *not* come from the condensation of coal. What then? Oil wells do fail; this is too apparent. They fail in Canada, in Ohio, in Virginia, in Pennsylvania—everywhere. Others may fail. It may not be true, even, that the softer coals are condensing. What then? Why, the whole theory falls to the ground, inferences and all. S.

Our Coast Defenses.

Messrs. Editors :—The question is often asked—"Should foreign nations interfere in our deplorable civil war, are our fortifications on the sea-coast sufficient to protect us?" In the present condition of affairs our forts would hardly be strong enough to protect us sufficiently well; but with the improvements and additions proposed by Col. Jos. G. Totten we could withstand the most powerful force which any of the nations of Europe could bring against us; in proof of this assertion allow me to present to the readers of the Scientific American the following statements:—

We have for the defense of our sea-coast, from Passamaquoddy Bay to Cape Florida, forty-one old forts and batteries (most of which have been repaired), requiring 5,445 men to garrison them and an armament of 1,097 guns; we also have built four new fortifications—viz., Forts Hamilton, Lafayette, Washington and Macon—requiring a garrison of 1,870 men and an armament of 336 guns. There are about twenty forts now under construction, which will require 13,750 men and 2,750 guns. Besides all these forts on our Atlantic seaboard, Col. Totten has proposed to construct some seventy additional forts, which will require 32,600 men and 6,355 guns.

For the protection of the Gulf frontier, from Cape Florida to Sabine Bay, we have nine old forts and batteries, containing 69 guns and garrisoned by 350 men; we have also built seven new fortifications, requiring a garrison of 3,060 men and an armament of 532 guns. There are three works under construction, which will require 1,010 men and 193 guns. Besides all these forts Col. Totten has proposed to construct ten new forts, for which a garrison of 5,150 men and 928 guns will be necessary.

It will thus be seen that, if Col. Totten's plans are carried out, we shall have, in all, one hundred and sixty-four (164) forts and batteries, garrisoned by an army of 63,835 men and mounting 12,260 guns. Thus far our forts have cost about $14,000,000; $28,000,000 additional will be required to carry out the plans of Col. Totten. It must be remembered that these are all permanent forts, and these statements do not include the numerous field-works already erected during the present civil war. The term "guns" designates not only cannon, but also mortars, howitzers, &c. The garrisons mentioned are the war garrisons; and by reference to the ratio betweeen guns and men it will be seen that five men are allowed to each gun. The intelligent reader will say that five men cannot serve a gun with ease; but in action it is very seldom that more than one-fourth of the guns are in use. Allowing one hundred rounds to each gun, there would be required about 8,500,000 barrels of powder, at a total cost of $1,700,000. Polytechnic.

Philadelphia, Jan. 26, 1863.

An Electrical Phenomenon.

Messrs. Editors :—Myself and brother were recently experimenting with two cells of Grove's battery; in the experimenting we suspended two small electro-magnets with vibrating armatures, &c., by two small brass chains with links like the figure 8. These chains formed part of the circuit for the current, the balance being sent through about 20 feet of wound copper wire; we had sent a current through probably a hundred times, successfully accomplishing our desire, when, on closing the circuit, the chains instantly parted and flew about the room bursting into at least twenty pieces of from one to a dozen or more links each; they being partially straightened. We collected the pieces but could not discover anything peculiar in their appearance; we put them together and repeated the experiment many times. Will some of your numerous readers explain the phenomenon? C. P. S. W.

Springfield, Mass., Jan. 29, 1863.

A Yankee Postage-stamp Canceler.

Messrs. Editors :—Your correspondents seem to be making much unnecessary bother about the simple matter of effectually canceling postage-stamps. Let the mailing clerk place the letter upon some suitable support, and a single stroke with a rasp or coarse file will obliterate the stamp beyond restoration. Here is an apparatus without patent or restriction, as rapid and easy as stamping and as effectual as annihilation; but if "red tape" must needs have a *machine* for the purpose, it is an easy task to add as many wheels, levers, springs, &c., as will satisfy the most fastidious, though probably no such combination could equal in celerity or efficiency the simple rasp now used for other purposes. Yankee.

New Haven, Conn., Jan. 26, 1863.

Kitchen-Gardens.—Before the era of kitchen-gardens, scurvy was one of the diseases by which the English population was kept down. Cabbages were not known in England until the period of Henry VIII. George I. was obliged to send to Holland to procure a lettuce for his queen. The Egyptians made a god of the cabbage, and the Greeks and Romans took it as a remedy for the languor following inebriation.

Anger.—The beginning of anger is foolishness, and its end is repentance.

Railway Equipment.

The locomotive engine seems in most cases to have appropriated the above title, as if there was no other equipment. The great field for improvement was, to be sure, the machine department, a few years ago; but thanks to the skill and intelligence of that very worthy class of men, the master mechanics, the locomotive has made rapid strides towards perfection, within a dozen years past. Meanwhile, a department not a whit less important has remained, not quite perhaps at a stand-still, but far behind in the race of improvement. We refer to the cars, both passenger and freight. Whatever use there may be in weight as an element of success in the engine, there can certainly be no excuse for hauling fifty or a hundred tuns in railway trains, in the shape of cars. Weight here is not only of no use, but is one of the greatest evils that the railway manager has to contend with. We may improve the engine as much as we can, and we may perfect the track to the utmost extent, and yet if we leave the cars, which consume so large a per-centage of the power applied, clumsy and heavy, we still leave one of the most fruitful fields of railway economy uncultivated. The immense proportion of dead to paying loads hauled upon our railways shows how very far from perfection we are yet in the mechanical department. We might make cars of iron and steel which would not weigh over three-fourths of what our ordinary cars do now, and which would be at the same time strong and durable. The wheels, the trucks, and the body, are all susceptible of improvement; and if we could reduce the dead weight twenty-five per cent. would it not be worth while? We think it would. Much remains also to be done in the warming and ventilating of the passenger-cars. Among the various directions in which the improvement in equipment is to be made is a reduction of speed. Cars made to run thirty miles per hour need to be much stronger than those used to run only at fifteen miles per hour. This, to be sure, does not come into the mechanical, but into the managing department. There is left, however, a large field for improvement, which is the business specially of the shops; and that is the reduction of weight, but not of strength, of the cars, both passenger and freight.—*Railway Times.*

Mutton Trade of New York.

The following interesting extracts are from the *American Agriculturist*:—

"Few persons are aware of the extent to which sheep are sold in this city. Including those received at the four public market places and those sent directly to butchers, an average of over 10,000 live sheep per week were slaughtered in this city during the past year. Besides these, there are at least 1,000 dressed carcasses received weekly. If the whole number were driven in at one time, three abreast, allowing four feet of space for each sheep, the line would extend from New York to Albany, a distance of over one hundred and forty-five miles.

"Since the commencement of the war, the demand for wool has so greatly increased that farmers are adding largely to their flocks. They find that, with the high prices of wool and the good demand for lamb and mutton, sheep-raising is one of the most profitable branches of farming, and they are now holding back their stock. Prices vary somewhat with the supply, but well-fed sheep, which will weigh 100 lbs. alive, have been selling at $5½ a $6 per head, for a month past; they are now worth $6½. The rise in wool has added largely to the value of pelts, mixed lots of these selling at $2¼ each, and selected pelts at $2½ each.

"In former years the thin ewes have been bought up by farmers for store sheep, at $2½ a $3 per head. Of late this class has been mostly kept in the country. Those sent to market have been bought up by butchers at $3½ a $4 each. Contrasting with this class are a limited number of extra large fat sheep, usually sent in about the holidays and sold at high prices. A few have brought as high as $15 a $20 each. Three full-blooded Leicester sheep, from Canada, were recently sold to a butcher of this city for $70. They dressed 471 lbs. The pelts would bring $2¾ each, which would leave the cost of the mutton a little over 12 cents per pound. In view of these figures it is safe to advise the raising of more sheep and fewer dogs."

Jerusalem Underground.

An account of Signor Pierotti's discoveries in the subterranean topography of Jerusalem has been published. Employed by the Pasha as an engineer, he has discovered that the modern city of Jerusalem stands on several layers of ruined masonry, the undermost of which, composed of deeply-beveled and enormous stones, he attributes to the age of Solomon, the next to that of Zorababel, the next to that of Herod, the next to that of Justinian, and so on till the time of the Saracens and Crusaders. He has traced a series of conduits and sewers leading from the "dome of the rock," a mosque standing on the very site of the altar of sacrifice in the Temple, to the Valley of Jehosaphat, by means of which the priests were enabled to flood the whole Temple area with water, and thus carry off the blood and offal of the sacrifices to the brook Kedron.

The manner of Pierotti's explorations was interesting:—He got an Arab to walk up through these immense sewers, ringing a bell and blowing a trumpet, while he himself, by following the sound, was able to trace the exact course they took. About two years ago he accidentally discovered a fountain at the pool of Bethesda, and on his opening it a copious stream of water immediately began to flow, and has flowed ever since. No one knows from whence it comes or whither it goes. This caused the greatest excitement amongst the Jews, who flocked in crowds to drink and bathe themselves in it. They fancied it was one of the signs of the Messiah's coming, and portended the speedy restoration of their commonwealth. This fountain, which has a peculiar taste, like that of milk and water, is identified by Signor Pierotti with the fountain which Hezekiah built, and which is described by Josephus. The measurements and position of most of these remains accord exactly with the Jewish historian's descriptions. Some of the Signor's conclusions are disputed, but no one has succeeded in so disinterring the relics of the Holy City.

Revenue of Great Britain.

The total revenue of Great Britain for the year 1862, amounts to £70,996,429 sterling. In 1861 it only amounted to £68,603,851; showing an increase of £2,392,578. This increase has not been caused by a higher rate of taxation, but is the *bona fide* result of the increase of wealth and trade. In only one department, that of the excise, is a diminution shown to the extent of £627,000. The decrease is to be accounted for by the repeal of the duties upon hops; the law enacting which came into effect, we believe, late in 1861. The increase in customs is £262,000; in stamp duties £425,775; in the property tax £1,142,000, and from miscellaneous sources £1,055,761. Taking the value of a pound at five dollars in gold, the entire British revenue in 1862, amounted to the prodigious sum of $354,982,145. The British entrances and clearances of vessels for 1862 exceed those of 1861 by little short of 1,000,000 tuns. The entrances and clearances of American vessels in English ports were three-quarters of a million less in 1862 than in 1861, and most of the trade thus lost has passed into British hands.

American National Revenue.

The Secretary of the Revenue has communicated to Congress the Report of the Commissioner of Internal Revenue, respecting the operations of the Excise Law passed by Congress at its last session. The States not in rebellion have been divided into collection districts, of which there are one hundred and eighty-three, including two in Virginia—corresponding in number to the Representatives to which they will be entitled in the Thirty-eighth Congress. An Assessor and Collector have been appointed in each District—with the exception of the two Districts in Virginia. The entire number of Deputy Collectors is eight hundred and ninety-eight, and the whole number of Assistant Assessors, is twenty-five hundred and fifty-eight, making an aggregate of Collectors and Deputies, Assessors and Assistants, of thirty-eight hundred and fourteen—besides sixty male and eight female clerks, which have been appointed in the Treasury Department and assigned for duty in the office of Internal Revenue. As the result of a careful investigation recently instituted into the several sources of revenue, Mr. Boutwell is enabled to make an approximate estimate as to the probable amount that will be raised under the Excise Law. According to this estimate, there will be received from all sources, except stamp duties, during the current fiscal year, ending the 30th of June next, the sum of $61,777,799. He estimates that the receipts from stamp duties, during the same period, will amount to the sum of $15,000,000, making an aggregate revenue of $76,777,799. This result, the Commissioner states, has been reached by the most careful inquiry that could be instituted into the amount of the various kinds of manufactures, the revenue to be derived from each, and by a like careful inquiry into all the other sources of income. It may be assumed that, without material changes in the business of the country, the revenue from the same sources, for the fiscal year 1863-4, will not be less than $150,000,000.

The cost of assessing and collecting is estimated at $3,616,000, not including printing expenses.

Sugar as Food.

In the last number of the *British and Foreign Medical Review* there is an interesting paper on "Sugar as Food and as a Product of the Organism." In alluding to the uses of sugar in assisting assimilation, the reviewer quotes Mr. Bridges Adams, who says:—"I know by experience the difference in nutritious effect produced by the flesh of tired cattle on a march, and those slain in a condition arising from abundant food and healthy exercise. In the former case any amount might be eaten without the satisfaction of hunger, whilst in the latter a smaller amount removed hunger. But I discovered that certain other food of a different quality, such as grape-sugar and fruit, would help the tired meat to assimilate, and thus remove hunger." Puddings and fruit tarts are not, therefore, simple flatteries of the palate, but digestive agents; provided always they are not themselves of rebelliously indigestible materials, which, in English cookery, is too frequently the case. The reviewer alludes to the fondness of artizans for confectionery, and of patients just discharged from the hospital asking for "sweets," in preference to good substantial food, as examples of a correct instinct. There is no doubt that in children, in whom the requirements of growth call for a rapid and efficient transformation of food into tissue, the demand for sweets is very imperious; and parents should understand that the jam pot will diminish the butcher's bill and increase the amount of nutrition extracted from beef and mutton.

To Prevent the Rotting of Wood.

In order to prevent wooden posts and piles from rotting while in the ground, the following receipt has been sent to the Societé d'Encouragement, Paris. A certain paint is used which has the hardness of stone, which resists damp, and is very cheap. It has been in use for the last five years:—50 parts of resin, 40 parts of finely-powdered chalk, about 300 parts of fine hard sand, 4 parts of linseed oil, 1 part of red oxide of lead, and 1 part of sulphuric acid, are mixed together. The resin, chalk, sand, and linseed oil are heated together in an iron boiler; the red lead and the sulphuric acid are then added. They are carefully mixed, and the composition is applied while hot. If it be not found sufficiently fluid, it may be made thinner by adding some more linseed oil. This paint, when cold and dry, forms a varnish of the hardness of stone.

MODEL-MAKING.—We frequently have inquiries from inventors residing in Philadelphia and its vicinity, to know where they can have models made suitable for the Patent Office. For the general information of inventors residing in Philadelphia, we would state that we have seen some very fine specimens of workmanship in models from the shop of J. R. Sees, whose advertisement can be found in another column.

STEAM FIRE-ENGINES.—Since the substitution of steam fire engines in Baltimore, the losses by fire have been reduced almost to *nil*. Last year the insurances ran up to $120,000,000, while the absolute losses by fire do not exceed $15,000, and this in a city of at least 220,000 inhabitants!

THE Bahama *Herald* of Jan. 17th states that the British man-of-war, *Vesuvius*, recently took $1,500,000 in specie from Mobile, for Europe.

BOATING OIL TO MARKET—A "POND FRESHET."

In a recent interview with a gentleman connected with the petroleum oil operations in the mountains of Pennsylvania, we were much entertained with the account he gave of the manner of boating the oil down the creek which runs through the oil regions. As we were about to write out this narrative we met with a full printed account of the *modus operandi*, which we herewith re-publish;—

"By far the most exciting operation of our oil business is the 'pond freshet.' It will richly repay a journey of many hundred miles to see it. Imagine some two hundred boats of all sizes, loaded with oil, coming down on a rushing flood, in a narrow creek, twelve rods wide, where it requires all the skill and strength of some five hundred stalwart boatmen to avoid colliding with other boats or rocks and obstructions, and you can form some idea of it. But our purpose is to describe what a pond freshet is, and how it is caused. The bulk of oil comes from wells located from four to six miles above this point. To get this oil to Oil City, from whence it is shipped to all points, we have to haul it in wagons or float it down Oil Creek in boats.

"A great portion of the business season, the roads along Oil Creek are impassable. Besides this, teaming is an expensive and slow mode of transportation. It takes days, and frequently weeks, to transport a few thousand barrels a few miles, for the reason that when shippers are in the greatest haste, teams are scarce, and prices rule accordingly. Upon the freshet the shipper can run his cargo of oil to this port in a few hours. It being the cheapest and most expeditious mode of getting the oil out from the wells, it is of course preferred by the shippers. With this explanation we will endeavor to give the reader an idea of the mode in which the freshet is formed and finally let loose:—

"A pond freshet is a temporary rise of water in the creek, for the purpose of running out logs, rafts, boats, &c. The water rises high enough to run out boats, containing sometimes five hundred, and, in some few cases, seven hundred barrels of oil. There are usually from one hundred and fifty to two hundred and fifty boats on each freshet. It lasts from one to two hours, and is caused by letting the water out of from seven to seventeen dams on the principal branches of Oil Creek, so that the water will all meet together, making quite a flood, upon which from seven thousand to thirty thousand barrels of oil are run in boats to the river.

"The dams are built with a solid abutment at each end, and often one in the middle. Between these abutments there are timbers made very solid in the bottom of the creek, in which mortices are made every three or four feet. On the top of the abutments, which are usually from ten to twelve feet high, other timbers are fastened, spanning from one to the other. These timbers are directly over or a few inches below the row of mortises in the lower timbers at the bottom of the creek. Scantling, from six to eight inches square, and ten to twelve feet long, with a tenon on one end, so as easily to enter the mortises in the timber in the bottom of the creek, are prepared and stood up perpendicularly, the lower end in the mortise, and the upper leaning against the timbers which span the abutments. Then loose boards are placed on the upper side of these studs or posts, which are firmly held to their place by the weight of the water. Thus the dam is completed. When we wish to make a pond freshet we go to the upper dams on the different branches of the creek, some of which are twelve miles above Titusville, and commence about midnight either to pull with a lever and chain, or cut away these studs, and the water all rushes out of the dam at once. We then wait until this water gets into or commences running over the next dam, and then cut it away, and keep repeating this process until we come to the lower dam three miles below Titusville. When it, which is a very large dam, is cut, we have let loose all in one body, in some cases, the water of seventeen dams, which makes a rise of from twenty-two to thirty inches above the highest rock on the swiftest ripple. The studs are again put in, water collects, and the miil-men saw and grind until they are all stopped from twelve to forty-eight hours by the next pond freshet.

"The shippers and boatmen, having been notified of the day upon which the freshet is to take place, begin to make preparations several days previous to it. Boats are overhauled, put in order and then towed, by men or horses, to the point on the creek from which they intend to start. The boats are then loaded and everything made ready for the coming flood which is to waft them to that much-desired harbor, the mouth of the creek. About the time the freshet is expected, the boatmen stand ready to let loose their lines. A cool rushing breeze is the first sign of it, and soon after come the swirling waters. Inexperienced boatmen generally cut their boats loose upon the first rush of water. As a matter of course, their boats run ahead of the water, and get aground upon the first ripple or shoal. The creek being very narrow, and the force of the current generally swinging the boats across it, a jam, and not unfrequently a great loss of boats and oil ensues, just from the inconsiderate haste of a few. The experienced boatman waits at his harbor until the water commences to recede, then cuts his line loose, and trusts himself to the mercy of the swift current, and come into port upon the highest part of the rise. The current of a first-class pond freshet will run at the rate of six miles an hour, an ordinary one about four miles, and a small one two miles and a half. If the boatman meets with no obstacle, he soon anchors his craft at our wharf.

"There are several points of the creek where formidable obstacles are interposed to vex the navigator. Among these are the pier at the McClintock Bridge, and a pier, to support the machinery of a well, in the middle of the creek immediately below, the Forge Dam, though which is only a narrow passage for boats; the pier of the bridge at this place, and the bar at the mouth of the creek itself. One boat getting across the creek at either of these points is apt to cause a 'jam.' The boats are crushed against each other, and being generally built very light are easily broken, and if loaded with bulk oil the contents are poured into the creek. If in barrels, the boat sinks and the barrels float off, and the owner rarely recovers all of them again.

"Once landed at our wharves, the boat is unloaded, but if the water is in good boating state, the boat goes, after brief preparation, to Pittsburgh."—*Oil City Register.*

The Usefulness of Diamonds.

Many persons suppose that diamonds are only used as jewelry—for rings and other articles of personal adornment; and that they are really of no essential value whatever in the practical arts. This is a mistaken notion; they are used for a great number of purposes in the arts. Thus, for cutting the glass of our windows into proper sizes, no other substance can equal it, and it is exclusively used for this purpose. A natural edge or point, as it is called, is used for this work, and thousands of such are annually required in our glass factories. Diamond points are also employed for engraving on cornelians, amethysts and other brilliants, and for the finer cuttings on cameos and seals. Being very hard, the diamond is also used in chronometers for the steps of pivots; and as it possesses high refractive power, and little longitudinal aberation, it has been successfully employed for the small, deep lenses of single microscopes. The magnifying power of the diamond, in proportion to that of plate glass, ground to a similar form, is as eight to three. For drawing minute lines on hard steel and glass, to make micrometers, there is no substitute for the diamond point. The rough diamond is called bort, and the "points" used for glass-cutting are fragments of the borts. Great care and skill are necessary in selecting the cutting points, because the diamond that cuts the glass most successfully has the cutting edges of the crystal placed at right angles to each other, and passing through a point of intersection made by crossing the edges. A polished diamond, however perfect may be its edges, when pressed upon the surface of glass, splinters it with the slightest of pressure; but with the natural diamond the most accurate lines are produced on glass, and their surfaces are so finely burnished, that if ruled close together, they decompose light, and afford the most beautiful prismatic effect—all the colors of the rainbow flash from them as from the silvery interior of a pearl oyster shell. Diamonds are also employed as drill points to perforate rubies, and bore holes in draw plates for fine wire, and also for drilling in hard steel. Some inquiries have been made recently in regard to using them as a substitute for steel picks in dressing mill-stones. We apprehend that they are altogether too expensive for this purpose at present; but if some of our inventors would make the discovery of manufacturing diamonds as cheaply as we make charcoal, which is of the same composition, we might be able to recommend them to our millers. The coke obtained from the interior of gas retorts, in many cases, is found so hard that it will cut glass, but as its point endures but for a short period, it cannot be made available as a substitute for the natural diamond for such purposes in the arts.

Culture of Hyacinths in Glasses.

The hyacinth is the bulb most usually grown in winter in the house, and when properly treated will bloom more finely, and the flowers will continue much longer than in the open air. Culture in glasses and in pots are the most usual methods of growing this beautiful plant in the house.

In culture in glasses the largest bulbs should be selected, as it must be borne in mind that in this method of treatment, the whole substance of the leaves and flowers comes from the body of the bulb, as nothing in the way of nutriment is derived from the water. In selecting hyacinth glasses the darkest colored should be chosen, as the roots of all plants shun the light. Place the bulbs on the glasses and pour in water until it just touches the bottom of the bulb. Now set the glasses away in a dark cool place, where they may remain for several weeks, or until the roots have reached half way to the bottom of the glasses. When this is the case, remove them to a situation where they will receive a moderate amount of light, and as soon as the leaves show a healthy green color, they may be placed in their final situation, which should be where they can receive the greatest amount of light and plenty of fresh air. The top ledge of the lower sash of a window is frequently used for this purpose, and is a good situation, for here they get the greatest quantity of light, and are kept cool by the air which will always creep in where the two sashes meet. The water will need to be changed once in two weeks, and this should be done without removing the bulbs, as there is danger of the roots being injured in returning the bulbs to the glass after removal. It will sometimes occur that a slimy matter will collect around the roots. When this is the case, the bulbs must be rarefully removed, and the roots washed with gentleness and the utmost care. The glasses should be washed out before replacing the bulbs, which operation must be conducted with judgment and much caution, or the roots will be broken and the plants suffer. The water used in refilling the glasses should always be of the temperature of the room. It is recommended, by way of stimulant to the plants, to dissolve an ounce of guano in a quart of rain water, and put one teaspoonful of this solution in each glass once a fortnight, after the flowers begin to appear.—*Country Gentleman.*

To Put a Paper "Positive" into a Looking-glass.—A correspondent sends us the following, which may interest some of our readers:—Having cut out the picture, take a quarter plate glass, well cleaned, lay a sheet of tin-foil on two or three thicknesses of cloth or paper, and spread some quicksilver with a piece of cotton wool. Next, attach the portrait with varnish to the glass. All being ready, lay a sheet of clean paper on the top of the quicksilver, and place the glass, with portrait attached, on the sheet of paper. Now press hard and draw out the sheet of paper gently. The quicksilver will run round the edge of the portrait, making a beautiful looking-glass with a portrait in the center, giving an effect something like a daguerreotype.—*Photographic News.*

Sizes of Nails.—Why are nails designated by the terms sixpenny, eightpenny, &c.? In Sheffield, England, they used to be sold in small quantities by the hundred; and the terms fourpenny, sixpenny, &c., referred to such nails as were sold at fourpence, sixpence, &c., per hundred nails. The length of the nails of that day, that were so designated, was exactly the same with nails that are now known by those designations.

Inproved Patent Water-wheel.

There would appear from the plans which come under our notice, to be a constant and laudable struggle between inventors to see who can produce the cheapest and most efficient motive-power. Wind-wheels alternate with water-wheels, steam engines and caloric engines; these multiply and change themselves yet again into forms and varieties which are almost endless in their details and general construction. We herewith present our readers with an illustration of an improved water-wheel which possesses many features of interest. The wheel, A, is provided with a number of buckets, B, of a peculiar shape; the smallest circumference described by the ends of the same has wings which project laterally toward the center of the shaft, forming an angle with the main part of the bucket, which may be rendered intelligible by likening the bucket and its appendage to the letter L placed horizontally. The water-box, C, by which the water is conveyed from the penstocks to the wheels, has a number of radial openings or chutes, D, placed at a diverging line with the circumference of the box itself. The mouths or openings of these chutes are provided with gates, E, curved to suit the diameter of the circle described by the former, and connected continuously by a flange or ring, F, working loosely about the wheel. The top ring is furnished with a toothed rack, G, having a pinion gearing into it. This pinion is fastened to the vertical shaft, I. Fig. 2 represents a section of the water-wheel wherein the chutes, gates, and the buckets are plainly seen.

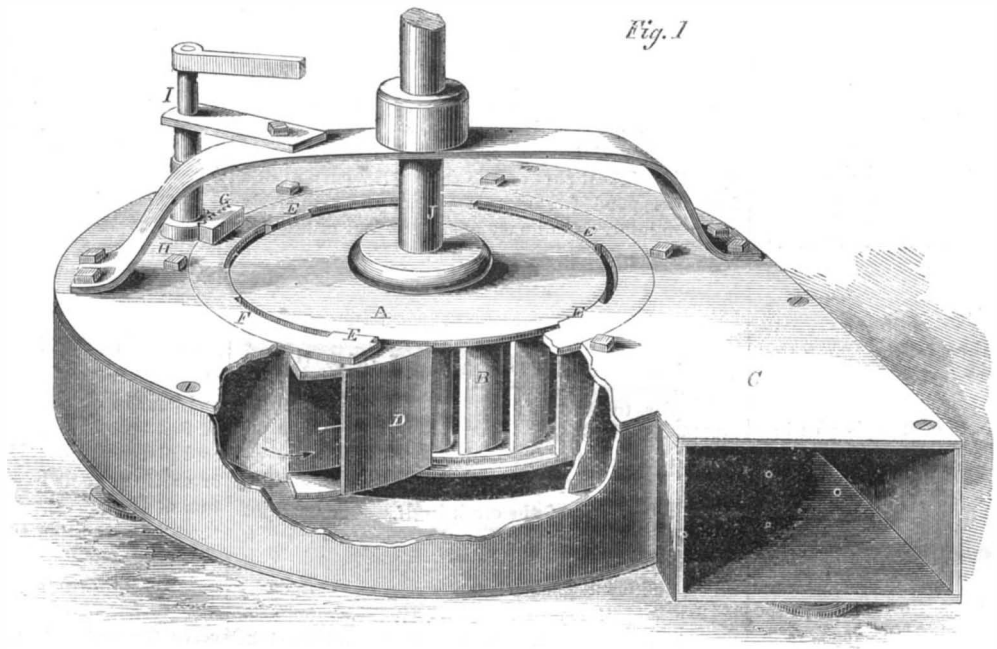
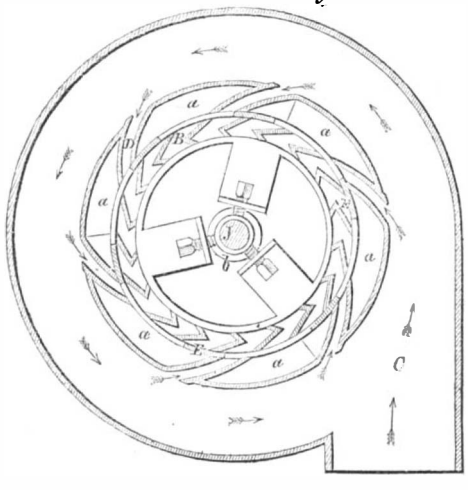


Fig. 1

CUMMING'S PATENT WATER-WHEEL.

The chutes pierce the case at regular intervals and are curved in the direction of their discharge so as produce a centripetal action of the current. The spaces, *a*, between them have an important effect upon the operation of the wheel; they serve as frictionless spaces opposing the resistance of a water cushion when the wheel is submerged, for the water to recoil against after having spent its force upon

Fig. 2.



the buckets. The arms running toward the center of the wheel carry the step, *b*, which the shaft J, runs in; the set screws afford an opportunity for correctly adjusting the same with reference to the center. The action of the current of water through the chutes, on alternate sides of the wheel, tends very much to preserve the wheel from unequal strain, caused by an indirect action of the force exerted by the current just-mentioned. It will be seen that, as the arm attached to the upright shaft is moved, the pinion engages with the rack and rotates the gates on an imaginary axis. They thus cover the mouths of the chutes or recede from the same, thereby decreasing or enlarging the volume of water which is thrown against the buckets, and proportionately diminishing or augmenting the power exerted by the water on the wheel. Also that the spaces between the chutes allow of the free egress of the water when its force is spent, and prevent any of the evils arising from back water. The arrangement of these chutes and gates is novel to us, and the wheel looks as though it might prove an exceedingly efficient one, and they also afford a quick and certain method of regulating the amount of power required by the work to be done.

The patent for this invention was granted on Dec. 2d, 1862, to D. M. Cummings, of Enfield, N. H., and further information may be had by addressing him at that place.

More about Bessemer Steel.

The extreme toughness of the Bessemer iron was proved by the bending of a cold bar of 3 inches square, under the hammer and into a close fold, without the smallest perceptible rupture of the metal at any part; and the bar was thus extended on the outside of the bend from 12 inches to 16¾ inches, and was pressed on the inside from 12 inches to 7¼ inches, thus showing a difference in length of 9½ inches between what, before bending, were the two parallel sides of a bar 3 inches square. Again, an iron cable, consisting of four strands of round iron 1½ inches in diameter, was, while cold, so closely twisted as to cause the strands at the point of contact to become permanently imbedded into each other. Each of these strands had become elongated to 12½ inches in a length of 4 feet, and had diminished one-tenth of an inch in diameter throughout their whole length.

Steel bars, of 2 inches square and 2 feet 6 inches in length, were twisted cold into a spiral, the angles of which were about 45°; and some round bars, 2 inches in diameter, were bent cold under the hammer into the form of an ordinary horse-shoe magnet, the outside of the bend measuring 5 inches more than the inside. The steel and iron boiler plates, left without shearing and with their ends bent over cold, afforded ample evidence, too, of the extreme tenacity and toughness of the metal; while the clear, even surface of railway axles and pieces of malleable iron ordnance were examples of the perfect freedom from cracks, flaws or hard veins. The tensile strength of this metal was not less remarkable. The several samples of steel tested in the Proving Machine at Woolwich Arsenal bore, according to the reports of Colonel Eardley Wilmot, R. A., a strain varying from 150,000 pounds to 160,000 pounds on the square inch. Four samples of iron boiler plate similarly tested, bore from 68,314 pounds to 73,100 pounds; while, according to the published experiments of Mr. W. Fairbairn, Staffordshire plates bore only 45,000 pounds, Low Moor and Bowling plates a mean of 57,120 pounds per square inch. Of course, the cost of production of the materials was considerably less than that of the plates put into competition with Mr. Bessemer's; and here another advantage of no slight consequence is evident.—*London Mechanics' Magazine.*

Lake Superior Silver.

The silver found at Lake Superior is native, and is the most extraordinary metallurgical paradox yet discovered, in which Nature has shown that she can completely surpass art. It is found in large quantities in the native copper mines of that district. The combinations of the silver with the copper present most varied forms; in some instances the native silver is found running through a mass of native copper in veins of varied thickness, like veins in marble; at other times it is found attached to masses of copper, in many beautiful floriated forms of a large size, and sometimes resembling the stumps of old trees, and frequently covering the whole surface of a mass of copper on all its sides, to a considerable thickness, and presenting most beautiful forms in cubes, prisms, and four-sided pyramids, which appear as though the whole mass of copper had been thickly electrotyped with the precious metal. Its varied forms and its extreme purity, although in conjunction with the copper, renders it a subject of the greatest curiosity; both metals having been subjected to a heat that must have, in any event, been equal to a refiner's smelting heat, and yet the metals are each found in perfect purity. In all the mass of copper of this vast district silver is associated with it to a greater or less degree, but not in sufficient quantity to pay for its separation. The rock in which the silver of this district most abounds is an amygdaloidal trap, of a very compact nature. The miners of this district, for many years, considered the native silver as a perquisite—as they used to say they were employed to mine for copper and not for silver; therefore the proprietors rarely used to get the silver, but the miners always had an abundance. This state of things now no longer exists, and the proprietors get a large share of this valuable production.

In a contribution to the *Washoe Times*, Mr. J. B. Truckee states that he had the most valuable collection from the Superior mines in Europe, and he was solicited by the commissioners for mines and minerals of the Paris Exhibition to form an illustration of the productions of the mines of Lake Superior, who undertook to return the collection, intact, when the exhibition should have closed. But at the time he looked for its return, he was waited on by two gentlemen, who came from the Emperor of France, to request that the collection might remain at the School of Mines in Paris, as it was the greatest curiosity that ever had been seen. As that school is the first of its class in the world, the collection is there for the benefit of the profession generally.

In the collection named there are crystals of pure native copper in clusters, in perfect cubes, to which is attached pure floriated native silver.

A Belgian glass-blower has lately blown two large bottles, each of a capacity of sixty-two and a-half gallons, and weighing fifty pounds. They were blown at the glass-works of Lefevre & Co., at Lodelingart, and are nearly double the size of the largest bottles heretofore made.

Pilot Knob, in Missouri, is a conical mound of a sugar-loaf shape, 550 feet in hight, and covering 500 acres. According to an estimate, it contains no less than 220,000,000 tuns of iron ore, having sixty-five per cent of pure metal in it.

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VOL. VIII, NO. 6....[NEW SERIES.]....*Nineteenth Year.*

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PREVENTING WASTE OF HEAT IN BOILERS.

When the temperature of the atmosphere is very low and dry, persons do not feel the effects of cold so sensibly as when it is damp and more elevated in temperature. This is attributable to two causes. One is the great capacity of moisture for heat, which affords a reason for the heat of the body being carried off so quickly when the atmosphere is charged with moisture. The other consists in the superior non-conducting qualities of dry air, by which the heat of the body is prevented from being carried off so rapidly when the atmosphere is dry. The fur of the quadruped is furnished by nature as a non-conducting covering, to enable the creature to withstand the cold of winter. There is no more heat in fur than in iron; it is only a superior agent to iron in preventing the conduction of heat, hence the reason why it feels warmer in a cold day. Air is one of the very best non-conductors, and the so-called warmth of fur, wool, and feathers is really owing to the air that is confined within their interstices. In order to economize the heat of the human body during cold weather, it should be covered with the best non-conducting material that is obtainable, and the same advice is applicable to the covering of steam boilers, cylinders, &c. In setting a steam boiler, the walls should be made double, so as to include an air space. A solid wall of brick surrounding a boiler will radiate twice as much heat outside, as a double wall of the same thickness of brick. In Constantinople where fuel is scarce and high in price, all the baths are situated between double sides with air spaces between, so as to economize the heat. Furnace doors should also be made double, to prevent radiation of heat outside. Marine boilers are usually covered with felt, which is a good non-conductor, but all such coverings are put on without due regard to an air space, which is the best non-conductor. Every boiler, stationary and marine, should be entirely covered, including an air space in the covering, for confined air is by far the cheapest non-conductor and economizer of fuel that can be employed in all such cases.

HOW TO USE CALLIPERS.

It may be safely assumed that comparatively few mechanics use callipers properly. There are many different forms of callipers with which all mechanics are familiar, such as those having springs, and those which are secured, when set, by set-screws biting on an arc. While all these have their several merits, commend us after all to the old-fashioned sort made with two legs, two washers and a good rivet. Now what is the reason that one man will always make a good fit when turning a shaft to fit a bore, or the reverse, while another man makes a botch of it? The reason is that the former knows how to take a size, while the latter is ignorant of that duty. Sizes when turning are generally taken either with a pair of callipers or a standard gage. It would naturally be supposed that with the gage, inaccuracy of measurement would be impossible. It is possible, however, and frequent, because the workman has not sufficient delicacy of touch to use the gage properly. Callipers are very sensitive and are often used for extra nice work; if, however, the work has to be multiplied many times, then the use of callipers is not economical, and we must substitute some other method; moreover, gages are costly tools, and but few shops are able to own complete sets; for general work, therefore, we must rely upon the callipers. Blacksmiths have tools which resemble callipers, but they are uncouth and rude. The majority of men of that calling, when using them, set their callipers somewhere near the size they want, and then upon comparing the work with them, *jab* them over the rod or shaft, as if they were going to cut it in two. The consequence is that the size of the work finished depends very greatly upon the resistance which the joint opposes to the blacksmith's strength. It is needless to remind the machinist that violence or pressure, applied to tools of this kind, only distorts the measurement and results in "bad jobs." The object with some workmen seems to be to find out how much the callipers will spring in going over a shaft without altering; not to ascertain how much metal must be removed before the requisite dimensions are attained. It is safer to go by the sense of sight than it is by the sense of feeling, in all cases where it is practicable to do so. When we can see that the callipers barely touch the object measured, we know it is of the proper size, but when we only feel of it, accuracy depends almost wholly upon a delicacy of feeling which all persons do not possess. When we say accuracy, we do not mean hap-hazard accuracy, that will admit of being somewhere in the neighborhood of the right size, but we mean absolute mechanical integrity, such as is obtained in the sewing machine and in the manufacture of our best steam engines. Many new inventions are rendered useless and thrown aside as impracticable, solely because rudely made; let us then endeavor in the use of all tools, but more especially in the employment of those upon which the proper working of other parts depends upon good fits, to be as faithful as our abilities will allow us to be.

DESTRUCTIVE EFFECTS OF IRON RUST.

The last published report of the Smithsonian Institution contains a translation from a German publication on the above subject, which affords considerable information of a useful and interesting character, some of which we shall present in a condensed form. It states that it has been frequently observed that in the timber of old ships the wood in the proximity of iron bolts is entirely altered in its character. Around each bolt for a space exceeding one inch, part of the wood is dissolved away, and the remainder is quite brittle and easily broken. The appearance of such wood is such as if it were produced by driving in red-hot iron bolts. This injurious effect of iron rust is one of the principal causes of the want of durability in iron-fastened ships. Rust not only originates where the iron is alternately exposed to water and the air, but also where the iron is permanently submerged under water. It is generally known that rust is an oxide of iron, but as soon as it comes into contact with wood it gives off part of its oxygen, and becomes the protoxide. The latter takes up a new portion of oxygen and transfers it to the wood, and by the uninterrupted repetition of this process, a slow decay of the wood is effected. The protoxide of iron in this case plays a part similar to nitric oxide in the manufacture of sulphuric acid.

In order to demonstrate the fact that oxide of iron is reduced by mere contact with organic substances (such as wood) not yet in a state of putrifaction, M. Kuhlman, of Lille, has instituted different experiments, the results of which confirm the correctness of this assertion. When hydrated oxide of iron, for example, was mixed with cold solutions of logwood, cochineal, corcuma and mahogany, they were decolorized, and the iron was found in a state of protoxide, the oxide having lost a portion of its oxygen by the action of the coloring matter. In every-day life the destructive effects of the oxide of iron have been noticed. For example, linen or cotton cloth containing ink stains becomes tender in its texture in the stained spots after repeated washings, and the spots ultimately fall out, leaving holes in the fabric. When cloth that is colored with copperas to form a black, is submitted to an alkaline ley, the protoxide of iron is changed into an oxide, and the cloth becomes feeble in the texture; and the usual saying in such cases is, "It is burnt in dyeing." According to Kuhlman, the oxide of iron transfers oxygen directly to the cloth, producing slow combustion of the fiber. This is useful information for dyers, as it explains the cause of an evil connected with preparing cotton cloth, which has hitherto baffled much scrutiny and experiment to discover. It is also well known to bleachers that when pieces of cotton cloth become stained with iron rust they are liable to drop out, leaving holes, as if they had been sprinkled with sulphuric acid. Every spot of iron rust should, therefore, be immediately discharged when noticed, by the use of dilute hydrochloric acid and warm water, or oxalic acid and warm water.

In shipbuilding, iron nails and bolts should never be used. In all cases copper or brass fastenings should be employed where first cost is not an essential object. In cases where the expense will not warrant the use of copper bolts, the iron bolts should be galvanized. Recently we have noticed with much satisfaction the extended use of zinc-covered iron bolts by our shipbuilders. This is a step in the right direction; but so far as we are informed, such bolts are confined to the construction of sea-going vessels. All our river boats and schooners should be fastened with the same kind of bolts, because they are nearly as essential for vessels running on fresh water as those on salt.

GUN COTTON FOR ARTILLERY.

When gun cotton was discovered by Schonbein, in 1847, it was hailed as a most valuable invention for war and other purposes in which gunpowder is used, but upon repeated trials with it in fire-arms, it was found unsuited. The following defects were attributed to it:—It was very hygrometic, and attracted so much moisture during wet weather as to render it useless. It was also deficient in granular construction. To explain this second defect, it is necessary to state that different kinds of fire-arms require powder of a different grain. Thus for fowling-pieces a fine-grained quick powder is required; for rifles, a much coarser powder, and for cannon a very large-grained powder. Every variety of fire-arm, whether the variation be as to length, twist of grooves or caliber, involves a special size in the grains of powder to obtain the best results. Gun cotton possesses no such variable qualities. It also explodes so rapidly that it could not be used in common fire-arms, because of its bursting effects; the best steel barrels of rifles having been shattered by common charges.

There are quite a number of fulminating agents which it would be convenient to use in place of gunpowder, were it not that they are violently explosive, without producing great projectile results; that is, they will shatter strong steel barrels to pieces with a small charge, but they cannot project missiles to such great distances as gunpowder. This is the case with the fulminates of mercury, silver and gold. The propulsive force of any material, such as gunpowder or the fulminate of mercury, depends on two qualities, namely, the volume of gas which it liberates when it explodes, and the time involved in the liberation of this gas. These are important distinctions. If the substance liberates its gas at once, or in a space of time infinitely short, like the fulminates of mercury and silver, it is not suitable of application for discharging projectiles, because the bursting or shattering effect of those is prodigious, while their projectile effect is small, as the volume of gas liberated by these fulminates is less in volume than the gas of gunpowder, hence the latter is a superior projectile agent. As water expands into 1,700 volumes of steam, it is evident that it must be a superior expansive motive agent to alcohol, which does not expand in vapor to more than 640 of its original volume. Gun powder and the fulminates are governed by the same law. Gun cotton, owing to its complete ignition, and leaving very little residue, was held to be superior to gunpowder in projectile effect; but its want of granular construction, its rapidity of combustion and its affinity for moisture were defects which till now have prevented its adaptation to fire-arms and artillery. All these defects have been overcome (it is stated in the *Austrian Gazette*) by Baron Lenk, and it is now used in the Austrian army. The method employed to prevent it from absorbing moisture is by immersing it, when being manufactured and before it is dried, in dilute soluble glass, which

acts the part of a varnish, without injuring the igniting qualities of the gun cotton. The same quality as granulation in gunpowder is obtained by forming the cotton into twisted strands of different sizes, and making it into cords, which are cut to form charges for cartridges. Batteries of guns in which gun cotton is used now form part of the Austrian milltary equipment. The guns are shorter and lighter than those of the same caliber for which gunpowder is employed. A military commission appointed to examine into this subject has reported that the weight of Baron Lenk's gun cotton, to produce effects either in heavy ordinance or in small guns, is to the weight of gunpowder as 1 to 3. In 1860, trials were made with it in a bronze 4-pounder, and after firing 2,000 rounds the gun was not in the least injured. In 1861, fifty tuns of this substance were made with out the occurrence of any accident. It leaves but a very slight residuum in firing, and the smoke which results from it is not so disagreeable as that of gunpowder. Some of this gun cotton was sunk under water for six weeks, then it was lifted and dried, and was found to be as powerful in projectile force as before it was submerged. These advantages stated to have been obtained from the improved Austrian gun cotton deserve general attention, for if this explosive agent can be substituted for gunpowder, of course saltpeter may be dispensed with, as the nitrate of soda is used to manufacture the nitric acid that is employed in making gun cotton. Flax will answer as well as cotton, if the latter cannot be obtained.

HUMAN VEGETATION.

The power of vegetation seems to be almost universal and perpetual. The stone taken fresh from the quarry soon becomes covered with grey lichen and green moss, and the very bread that we use becomes coated with vegetable floss when exposed for a few days in a warm damp atmosphere. Not only the face of the earth, but every object upon its surface, seems instinct with vegetable life. In some situations it springs up so suddenly and unexpectedly that many persons suppose it to be endowed with spontaneity. In its growth and development its domain is not confined to inanimate creation, but it is also extended over animal life. Bees may frequently be seen flying, with plants, nearly as large as themselves, protruding from their heads; silk worms are sometimes affected with a vegetable moldiness called muscardine, and gold fish may oftentimes be seen covered with a white vegetable mold. Insects, reptiles, fowls, fishes, and animals of the higher grades are subject to parasitic vegetation; and man himself is not exempt from the same influences. The scald head, the ring-worm, and dandruff are vegetable growths. Some forms of it attack the children of the poor almost exclusively, where sufficient attention is not paid to cleanliness; while other forms of it occur at all ages and are found in all ranks and conditions of society. The vegetable growth of scald head is described in the Bible (13th chapter of Leviticus), and it is one of the unclean diseases of the Hebrews. It appears in patches of yellow scales; the hair becomes dry and brittle, and disorganized. Examined with the microscope, the scales are found to contain masses of seeds. A very formidable type of this disease occurs frequently in Poland, and is called *plicapolonica*. The parasitic plant which causes diseases of the human scalp is called *acarion schönleinii*, and is the frequent cause of baldness. It has been noticed that baldness is almost unknown among a barbarious people. American Indians, Africans, Malays, and Chinese have all bushy heads; and it is asserted by the Rev. H. Macmillan, F.R.S., in an essay on this subject in *Macmillan's Magazine*, that baldness was unknown among the primitive inhabitants of the British Isles. Baldness has increased with civilization, but whether owing to increased intellectual activity, or vegetable parasites developed under favorable conditions from modern habits, is not a settled question.

There is also a special hair-plant called the chinwelk, which revels in the beard. It is distinguished by a red eruption of tubercules of various sizes, and it frequently destroys the hair. It was very common among the Jews of old, who, according to the Levitical law, enforced very arbitrary measures for its extirpation. Where long hair is much prized in the East, the common salutation is "May your shadow never be less, and the hairs of your head never decrease!"

There is a singular vegetable growth peculiar to the human body which has a prediliction for those parts which are habitually covered with clothing. It is called *microsporon furfur*, and consists of an efflorescence of small circular spots, which gradually coalesce and produce irregular patches, accompanied with dry scales, which are constantly renewed. These scales, when examined with a microscope, are found to contain oval seeds, tubes and knots, similar to those of miniature bamboo canes. This vegetable parasite is very common and occurs at all ages and on both sexes.

The diseases called the yaws, which is common in the West Indies; and the elephantiasis, which disfigures the Egyptians, are vegetable growths. It is also well known that in hospitals, especially during warm weather, white flocculent filaments are found on removing the bandages from wounds and sores. These are developed with wonderful rapidity in a very few hours, and are vegetable formations called mycoderms, which are similar to the spawn of mushrooms.

Vegetable growths are sometimes found in several of the internal parts of the human system, such as parasites on the teeth, and the thrush or whitish crust which frequently lines the membrane of the mouth and throat of infant children. The same vegetable growth is common with persons in the advanced stages of pulmonary consumption.

It has been proved that all these vegetable growths are due to seeds, most of which are so minute as to be almost invisible to the naked eye. They float in the atmosphere everywhere; dance in the air currents of every house; and they but await the proper conditions for their development wherever they alight. It is easy to account for parasitic affections of vegetable origin being highly contagious. Malaria fevers may be of cryptogamic origin, due to the diffusion of the seeds of these plants in the atmosphere. Several physicians have entertained such views. Formations closely resembling them have been found in the blood and kidneys of persons affected with typhus, and probably there is some connection between such plants and most epidemic diseases.

PAYING WORKMEN WITH ORDERS.

In very many parts of the country, it is the custom with manufacturers to pay only a fraction of the wages earned by their workmen in money; the residue is given in the form of an order upon a store kept by the manufacturer or those in collusion with him. This custom originated in a natural and sensible way. Whenever any capitalist desired to locate himself in a new neighborhood—one where water power was plenty or where timber was cheap, he was compelled from the force of circumstances to carry a stock of groceries and dry goods with him in order to supply the wants of his men. Of course, as the settlement increased and became a village, the trade was generally abandoned to the proper parties. This custom of giving orders in lieu of cash has been abused to an alarming extent; long after the necessity which occasioned the practice had ceased to exist. Workmen earning ten dollars per week will receive three dollars of that sum in money, while the balance is only to be obtained through an order for goods, of one kind or another, on the company's store. By this practice the mechanic is charged two or three prices for what could be procured at less rates were the business unmonopolized. The remedy is not clear, when avarice and chicanery combine to defraud the workmen of their rights. There would seem to be but one resource, and that one is for the workmen to move away from the scene of extortion. But this remedy is quite as bad as the disease. In too many cases men are lured to new villages by promises of large wages. The sums paid them are nominally high, but when the equivalent the workmen is obliged to give the manufacturer for articles of necessity is proportionately greater, it is difficult to see what is to be gained in undergoing the hardships and discomfort incident to settling in new places. Workmen as a rule are desirous of escaping from the noise and tumult of large cities, and they will gladly work a little harder provided they can be assured of comfortable houses in the country for their wives and children. When, however, they are obliged to submit to the wrongs aboye alluded to, there is no other resource but to bear it patiently; unless indeed the law steps in and either abolishes the system of orders wholly or else so limits the tender of them, as compensation for services, that they will be useless to the unjust capitalist as a means of profit.

SURFACE CONDENSERS OF MARINE ENGINES.

In the condensing engines of steamboats and ships, the common method of condensing the exhaust steam, and thus obtaining a vacuum before the piston in the cylinder, is by injecting cold water into the interior of the condenser among the steam. This is undoubtedly the most simple mode of condensation, and for steamers running in fresh water it is the best. For sea-going vessels, however, the warm condensed water which is employed to feed the boilers, and thus economize some of the heat that would otherwise be lost, such condensers do not provide a supply of fresh water to the boilers. The result of this is, that as salt water is fed to the boilers, the brine becomes saturated as the steam is evaporated, and this has to be run off from the boiler. A loss of about thirty-three per cent of hot water from the boilers and about the same quantity of fuel, compared with the use of fresh water in boilers, is asserted to be thus caused by the interior condensation system in salt water. To obviate these evils, surface condensers in which the steam is condensed inside by cold salt water applied to the outside surface have been proposed and used on many occassions, and they are now used to some extent in sea-going steamers. Two faults have been attributed to these. One consists in their liability to get out of order and leak by the expansion and contraction of their metal, arising from their complicated construction, they being usually formed of a great number of tubes to obtain a large cooling surface. The other fault consists in an unlooked for chemical action of the water obtained from condensed steam upon the metal of the boilers whereby they are soon destroyed. It will be understood that the same fresh water obtained from this condenser is used over and over again in the boilers, thus obviating blowing-off as in the case of brine in the boilers. The cause of this chemical action of the condensed fresh water on the boiler is not well understood, and it is not generally admitted to be due to surface condensed water, but some other cause not yet discovered. Some interesting facts relating to this question of surface condensers are given in a recent number of *Newton's London Journal of Arts*, by Edward Humphreys, from a paper read by him before the Royal Institution, London. He states that in 1859 he designed a set of marine engines of 400 horse-power for the Oriental and Peninsula Company's ship *Mooltan*; and believing that great benefit would result from the use of surface condensers, he therefore had a pair of surface condensers built for the engines of the *Mooltan*. The boilers of the vessel contained 4,800 square feet of heating surface; the condensers 4,200 square feet. The air-pumps of the condenser were the feed pumps of the boilers, and the air which leaked into the engines was allowed to escape by an open stand-pipe connected to the highest point of the feed-pipe, thence it was carried up inside of the mast, which was a tube of iron. Each condenser contained 1,178 seamless copper tubes of $\frac{5}{8}$-inch outside diameter; five feet ten inches in length, and the thickness was .050 inch or No. 18 wire gage. The tube plates were of gun metal, and the tubes were set apart one inch from center to center. Linen tape, $\frac{7}{16}$ths of an inch in width, was used for the packing of the tubes. The salt water supplied to cool the condenser was furnished with a centrifugal pump—a new feature in marine engines. Mr. Humphrey stated that at the time he prepared his paper—about the middle of 1862—the engines of the *Mooltan* had run 42,000 miles, and he examined them after they had run 30,000 miles, when they were found quite clean on the outside, but there was a slight coating of grease inside, resulting from the escape of the tallow employed in the cylinders. The boilers were also examined, and there was no appearance of deterioration in them. But it was noticed that the lubricating material found its way from the cylinders into the condensers and thence into the boilers, and it was often obtained in large lumps at the bottom of the water

space, below the furnaces. It was the opinion of the engineer of the *Mooltan* that the grease caused the boilers to prime. These surface condensers are known by the name of Hall's, and were first tried about thirty years ago, but prejudice operated against their introduction. The exhaust steam passes through the interior of the tubes, and the cold water is applied outside. This is the reverse mode of operating to that of several condensers most recently introduced. The condensers of the *Mooltan* have been very successful, but it is believed that the better plan is to pass the condensing water inside of the tubes.

CALIFORNIA ITEMS.

Mineral Paints.—The following extracts are from the Contra Costa *Gazette*:—Native paints are found about two miles from the town of Martinez, on the banks of El Hambre Creek at the foot of a high hill. They lie in ledges extending into the earth under the hill, the out-croppings of which alone are visible on the surface of the ground near the aforesaid creek. These ledges vary from ten to twenty feet in width, and are of unknown length and indefinite depth, perhaps miles in extent. At least four of the principal or primary colors have been found contained in the earths dug out of these ledges—viz: red, yellow, green and blue. Here are some of the varieties:—

1. Terra Sienna, a ferruginous ocher, a native of Sienna in Sicily, whence its name; an article indispensable with all painters and never heretofore found in America.

2. Lazulite, a light bluish mineral, the base of all the ultra-marines and indispensable to the manufacture of paints.

3. French yellow, a very pure article, commonly found in France, whence it is imported for use in the arts.

4. Sienite, the primary color for all manufacture of fine green paints, found in abundance here like that generally imported from Prussia.

5. Venetian red, a very fine article, superior to that which is imported from Venice for use in our country.

Resin and Turpentine.—The California *Farmer* says:—

"At the Agricultural Fair at Placerville, this year, we had the satisfaction of meeting a Mr. Jacques, who had become acquainted with the existence of fir-balsam trees in large quantities, and had engaged in tapping them, gathering the balsam in a crude state, and from it manufactured resin and turpentine. The product from these trees is a pure and transparent liquid balsam, yielding a turpentine almost as smooth as Holland gin, and a pure light colored resin, remarkably fine. During the last week the first lot of resin, about twenty barrels, very superior, arrived in this city from Placerville, consigned to Messrs. Moses Ellis & Co."

Copper.—The Stockton *Independent*, of December 2nd, says in relation to the progress of Copperopolis:—"The Union Company at Copperopolis is now working with three engines, running night and day. The Keystone, Empire and Calaveras claims are giving out better prospects of late; and the Webster, a new claim under the management of Captain Sanders, is coming rapidly into importance. Schools, Sunday schools and religious societies are taking root at Copperopolis, and altogether the town is acquiring a degree of permanence and character hardly to be expected of a place whose foundations were laid but two years ago."

Wine.—At a late wine-growers' convention, held in San Francisco, it was stated that 70,000 gallons of native wine had been exported in 1862.

The third division of the Southern Railway of Chili was lately opened to San Fernando, the Capitol of the province of Colchagua, distant from Santiago 86 miles. This railroad is stated to be well constructed, it having numerous bridges constructed in a solid and creditable manner.

The Manchester (England) *Examiner and Times* mentions as the "most gratifying news" received by the last mail from America, "the movement which has been taken up so warmly to send aid to the Lancashire operatives."

MISCELLANEOUS SUMMARY.

Thallium.—On this new metal the Paris Academy of Sciences has received a second communication from M. Lamy, from which it appears that if the discoverer, Mr. Crookes, at first discovered it to be a non-metallic substance, he was not far wrong. At least, M. Lamy finds it wanting in one of the chief properties of metals—viz., the power of conducting electricity and heat, since the power of induction developed in the metal are of but slight intensity when the circuit of the pole is successively closed and broken. If heated in concentrated alcohol a part of it is dissolved, and a curious compound is produced, called by M. Lamy "thallic alcohol." It is a limpid oil, containing great refractive power and a caustic taste.

Dummy engines are to be placed on the new railroad between Jersey City and Bergen Point. In shape, they are similar to the common horse-car, but much larger. In front is the engine-room, divided from the passenger apartment by a partition. The latter apartment is 22 feet long by 9 wide, and will seat 30 persons. The engine is of 15 horse-power, and consumes its own smoke. Such engines have also been recommended for that part of the railroad running through Brooklyn, thence to East New York and Jamaica.

A Big Pear.—There is now on exhibition at the office of the *American Agriculturist*, in this city, a mammoth pear, grown in the orchard of E. L. Beard, at San Jose, Cal. This pear weighs three pounds and seven ounces. The same tree produced a pear, a few years ago, that weighed three pounds and six ounces.

In recent gunnery experiments in Verona, Fort Wratislaw, belonging to Austria, was cannonaded first at a distance of six hundred paces, and then at one thousand, the guns being charged with gun-cotton. The impulsive force of this substance was found to be 2¼ times more than that of ordinary gunpowder.

Professor Whitney, the State geologist of California, found among the Sierre Nevadas, about 2,000 feet above the level of the ocean, an almost perfect jaw of a rhinoceros. Huge petrified oyster shells were also found among the mountains of the interior and at a great elevation.

The native copper of Lake Superior is dense, ductile and fibrous, as if it had been violently compressed when cold. It is very strong, but when melted it takes the same structure as all manufactured copper.

Spiritual "Shinplasters."—In Saugerties, N. Y., an enterprising tavern-keeper has just issued a series of spiritual "shinplasters"—nothing less than pint bottles filled with whisky, and it is said they pass current among all his customers.

The result of a general test trial of a London fire brigade showed that the average time taken for turning out, equipping, lighting lamps, and starting with the fire-escape, was one minute eleven seconds.

New Mode of Clarifying Coffee.—It is said that eggs are now so dear in Trenton, N. J., that the housewives use the white of their eyes instead of the "white of the egg" to clear their coffee.

Winter Wheat.—In many parts of the West the winter wheat is represented as being considerably injured by an insect, in consequence of the open season.

The Tomb of Washington's Mother.—Just beyond the city limits of Fredericksburg, Va., an unfinished monument, begun in 1833, marks the tomb of the mother of Washington, who died in 1789.

The number of sea-going vessels in the world is about sixty-five thousand, two-thirds of which belong to England and the United States.

Punch's Philosophy of Tight Lacing.—*Punch* says women first resorted to tight lacing to prove to men how well they could bear squeezing.

Blind Deities.—Love, Justice and Fortune are said to have no eyes; but all three deities make us mortals open *our* eyes pretty wide sometimes.

The whole number of locomotives employed in England, Scotland, and Ireland is 6,156.

The Inventor of the Fire-escape—Abraham Wivell.

Wivell now took to scheme-dreaming, some of his friends said. He proposed a plan for draining London independently of the Thames; for, said he, if all the sewers drain into the Thames, the Thames itself must become one great sewer. But this scheme fell to the ground; it was too far in advance of the times. His fire-escape was more successful; but, poor fellow, how sedulously he worked at his idea, and what time and money he spent before the design of his brain was embodied in tangible wood and iron! His first escape consisted of a rope, fastened in the inside wall of the upper story of the house, and a belt, which was to be girded around the body of the person escaping, and was also to be attached to the rope. With such an apparatus Wivell frequently descended from the topmost room of his house, to the wonder of the surrounding neighborhood. Although he had demonstrated the practicability of this plan of escape, people were slow to adopt it, and further thought led him to the production of the well-known fire-escape, now happily found at the convergence of most of our principal London thoroughfares. Even after he had completed this escape, he could not, for a long time, get any help in bringing it out. But he was enthusiastic and persevering; and he at length succeeded in calling a public meeting, when he explained his plan in detail. The formation of a committee was the result of the meeting, and Wivell was awarded with the expenses of his escape, and a gratuity of £10! Ultimately the "Royal Society for the Protection of Life from Fire" was formed, and Wivell's invention was adopted.—*Social Science Review.*

Spectral Analysis.

A practical application is likely to be made of the beautiful results of spectral analysis in the casting of steel. It is important to know the exact moment at which to shut down the cover of the furnace during the melting of metal; time must be allowed for the escape of the gaseous products which are injurious to the steel, but if that time be prolonged, an injurious effect of another kind is produced. To meet this contingency, it has been proposed to test the gases as they fly off by means of the spectroscope; and as soon as the particular color is observed, peculiar to the gas which begins to escape at the moment the molten metal is in proper condition, the manufacturer will then have an infallible sign of the proper moment for closing the furnace.

Collodion and castor-oil mixed together with resin and the carbonate of lime, make a cement of which medallions, knife handles and combs may be manufactured.

RECENT AMERICAN PATENTS.

The following are some of the most important improvements for which Letters Patent were issued from the United States Patent Office last week. The claims may be found in the official list.

Machine for Drying Grain.—This invention consists in the arrangement of ledges or lugs projecting from the sides of the cast-iron beams which support cast-iron tiles to operate in combination with said tiles, in such a manner that they form a support of the same, leaving the upper surfaces of the beams flush with the upper surface of the tiles, and that by the action of the tiles the beams are prevented from springing, and a cheap and durable platform is produced; it consists also in the arrangement of semi-circular scoops, either rigid or adjustable and moving with their concave side toward that end of the platform over which the grain is to be discharged, in combination with a reciprocating carriage, in such a manner that said scoops, in going forward, stir and move the grain along toward the discharging end of the platform and in going back, the convex sides of said scoops in passing through the grain divert the same laterally and stir it without producing a backward motion of the same. Thos. C. Vice, of New Haven, Conn., is the inventor of this improvement.

Construction of War Vessels.—The prominent object in this invention is to protect a vessel from fatal injury by completely surrounding her vital parts with water. This may be effected either by introducing water into suitable chambers extending over the hull, or by settling the vessel in the water below the sailing draught, when she is to go into action. In practice it is preferred to embrace both methods, the deck being protected by completely covering it with water placed in covered tanks, and the sides by lowering the ship in the water. The lowering of the vessel is effected by the introduction of water into suitable tanks from which it is again expelled when it is desired to elevate the vessel to her sailing draught. The invention further consists in means for imparting steadiness to a submerged or partially submerged vessel, an improved construction of armor for partially submerged vessels, and a device for relieving water chambers of the expansive force caused by the entrance of a projectile. The inventor of this device is E. A. Stevens, of Hoboken, N. J., and the patent bears date January 13, 1863.

Beer-cooler.—This invention consists in the arrangement of a series of semicircular metallic troughs placed at certain distances apart, so as to leave spaces for the air to circulate in, and connected at their ends by similar transverse troughs, in combination with pipes passing through the center of said troughs and leaving a clear channel all around, in such a manner that if beer or other liquid is made to pass through the semicircular troughs and cold water through the pipes, the beer or other liquid is brought in contact with the cold sides of said water pipes in thin strata; and furthermore, the cold air is in contact all around the troughs and passes through between them, and thereby the cooling process is completed rapidly and with an apparatus of comparatively small dimensions. Valentine Haeffner is the inventor of this beer-cooler, and his address is Newburgh, N. Y.

Mode of Cleaning Boilers.—This invention consists in the employment, in combination with a mud well or receptacle below the fire surface of the boiler, of a brush worked by a rod passing through a stuffing-box, for the purpose of sweeping the deposit from over the fire into the well and thereby preventing the burning of the boiler. G. B. McDonald, of Louisville, Ky., is the inventor of this device.

Fulton and Napoleon.

In 1803, when Napoleon was in camp at Boulogne, Fulton wrote to him, offering his invention of the steamboat as a certain means of transporting troops to any part of the English coast without regard to the direction of the wind—an offer which that potentate was disposed to accept, but which, too diffident of his own judgment in so novel a matter, he referred to the Academy of Sciences, by which body it was ridiculed, although Fulton had conducted tolerably successful experiments at Havre and Brest in the previous year. Napoleon therefore gave no more attention to the subject. Fulton also constructed the first submarine boat, and made some experiments with it at Havre. In this he remained under water one hour with three companions, without any communication with the surface, and caused it to move through the water at the rate of a mile and a-half an hour. Such a vessel he also proposed to the French Emperor for destroying English war ships, but, like the steamboat, it was disregarded by Napoleon.

VALUABLE RECEIPTS.

DAMMARA VARNISH.—"Gum Dammara," as it is called, is a resin not a gum. It is employed for making varnish by dissolving it in turpentine. The resin should be first well dried, for if it contains any moisture it will tend to make the varnish opaque. A common way to prepare it is to boil the resin in the turpentine in an open vessel; but if the resin is thoroughly dried, it will dissolve slowly in cold turpentine and form a clear varnish. A good way to prepare it on a large scale, is to use an enameled cast-iron vessel capable of containing about fifty pounds for making twenty-five pounds of the varnish. The dammara resin is put into the vessel in a solid state, the proper quantity of turpentine (five parts to four parts of resin) is then poured in, and the whole put upon the fire. As soon as the boiling begins, the water originally included in the resin is dissipated in the form of vapor, and the resin acquires a softer consistence. When all the water is expelled and the varnish boils quietly, the solution is completed, and the vessel may be removed from the fire. As long as traces of water exist in the varnish, its boiling is attended with a bubbling movement; but as soon as all the water is got rid of, the varnish boils quite quietly. When the varnish is prepared, it is poured through a fine wire sieve, and then allowed to settle sufficiently. If it be desired to give the varnish a tougher consistence, 2 or 3 per cent of good bleached linseed oil (not boiled with oxide of lead) must be added to it before boiling. This communicates great toughness to it.

ALLOY FOR JOURNAL BOXES.—Take seven and a-half pounds of pure copper and melt it in a crucible; then gradually add, in small pieces, ninety-two and a-half pounds of zinc; when this is melted and the two metals thoroughly mixed, the alloy is to be run into molds for journal boxes. A patent was granted May 1, 1855, for this alloy, to Thomas Forth, of Cincinnati, Ohio.

BABBITT METAL.—Take twenty-four pounds of copper and melt it first in a crucible, then add gradually twenty-four parts of pure tin and eight of antimony. Great care must be exercised in adding the tin to the copper. This composition is rendered softer by the use of a greater quantity of tin. It is first run into ingots, then melted and cast to form the journal boxes, &c.

FINE POLISHING POWDER.—Professor Vogel, of England, states that the finest powder for polishing optical glasses and fine metals, is made by calcining the oxalate of iron. It is superior to the common polishing powder for glass made of llxivated colcothar.

CONSOLIDATING CAST-STEEL.—Mr. J. M. Rowan, of Glasgow, proposes to consolidate cast-steel, or metal produced by the pneumatic process, by compressing it whilst still liquid or nearly so, whereby it is rendered much better adapted for subsequent processes.

A HARMLESS green for coloring confectionary may be made as follows:—Take thirty-two parts of saffron and infuse it in seven parts of water, to which add twenty-six parts of the carmine of indigo in fifteen parts of water. The yellow saffron and blue indigo when mixed form a beautiful green color, which will combine with sugar solutions.

A MOST excellent furniture paste is made by dissolving one part resin and one part beeswax in two parts of benzine.

REFINED glycerine is a very suitable lubricator for clockwork. It does not freeze in cold weather.

WITH respect to the impact of projectiles, Sir Howard Douglas has said: "No additional weight of projectile will increase the effect of its impact, the charge of powder remaining unchanged. The ignited powder is the primary force—not the shot."

ISSUED FROM THE UNITED STATES PATENT OFFICE

FOR THE WEEK ENDING JANUARY 20, 1863.

Reported Officially for the Scientific American.

*** Pamphlets giving full particulars of the mode of applying for patents, under the new law which went into force March 2, 1861, specifying size of model required, and much other information useful to inventors, may be had gratis by addressing MUNN & CO., Publishers of the SCIENTIFIC AMERICAN, New York.

37,427.—Oil Barrel.—R. N. Allen, Cleveland, Ohio:

I claim the herein-described oil barrel or cask in which the parts are constructed, combined and arranged in the manner and for the purpose set forth, the same being a new article of manufacture.

37,428.—Skate.—G. W. Ansley, Cleveland, Ohio:

I claim the arrangement of the spring, C, stem, E, pivoted or jointed to the runner, adjustable plate, H, and socket, D, substantially as and for the purpose set forth.

37,429.—Hay Rake.—Daniel Armel, Somerset, Pa.:

I claim the combination of the tread-lever, C, with the platform, A, seat, b, and arms, f' f'', substantially as and for the purpose described.

37,430.—Grain-sowing Machine.—J. Bergstresser, Berrysburg, Pa.:

I claim the shape and construction of the spiral scourer, B, with its projections, J, for scouring grain, substantially as described.

37,431.—Paper Shirt Collars.—C. K. Brown, Troy, N. Y.:

I claim a paper shirt collar having the parts at or around the button holes, d, therein, made thicker and stronger than the main portion thereof, by means of a piece or pieces, c, of thin muslin or other suitable strengthening material, pasted or otherwise cemented in or to the layer or united layers of paper constituting the main portion or body of the collar, substantially as here described.

37,432.—Machine for Printing the Addresses on Newspapers.—J. A. Campbell, Milton, Canada West, formerly of Buffalo, N. Y.:

I claim, first, The combination of the levers, E K, bar, L, wheels, I J, sleeve, n, rack, M, sills, A, and a sliding bed-piece, B, whereby the machine is automatically advanced after each depression of the platten by devices independent of the chase.

Second, The combination with an addressing machine, substantially such as described, of the sills or ways, A A, and cross-pieces, a a, adapting the machine to fit over a common chase placed upon a common table and to be moved in a right line from end to end or from side to side of the said chase.

[The distinguishing characteristic of this machine is that it is adapted for use with a chase of common construction and of any size, the machine moving automatically over the type from name to name and being shifted from column to column as required.]

37,433.—Drilling and Screw-cutting Machine.—C. W. Coe, Corunna, Mich.:

I claim the combination of the gearing, D E H, with the screw, K, ratchet, M, adjustable pawl, N, shaft, I, cam, Q, and the moving or rising and falling jaws, S S', all arranged for joint operation, as and for the purpose herein set forth.

[This invention relates to a novel and improved arrangement of parts whereby a very simple and compact machine is obtained for the purpose of drilling and cutting screws, and one by which it is believed several advantages are obtained over those now in use.]

37,434.—Fence.—F. K. Cosgrove and Rudolph Westerman, Fort Wayne, Ind.:

We claim the arrangement of the bill-shaped ends, c, of the braces, B, in combination with chamfered edges of the mortises, d, in the battens, b b', and with gibs, e, keys, f, and anchor stakes, g, all constructed and applied in the manner and for the purpose herein shown and described.

[The object of this invention is to produce a fence that will suit nearly all kinds of localities and soils, one that can be conveniently and cheaply built by a person of ordinary mechanical skill, a portable or permanent fence which does not require the use of posts in its construction, which cannot be easily displaced by frosts or thaws, storms or floods, winds or animals running at large, and which is adapted, by its peculiar structure, alike for prairie as well as timber lands. An engraving and full description of this fence were published on page 80, present volume of the SCIENTIFIC AMERICAN.]

37,435.—Screw Nut.—Lyman Derby, New York City:

I claim the construction of a screw nut, substantially as hereinbefore described, and operating in the manner and for the purposes set forth.

37,436.—Apparatus for Burning Coal Oil for Heating Purposes.—H. W. Dopp, Buffalo, N. Y.:

I claim the distributing plate, A, with solid center, a, and generator, B, or their equivalent, so arranged that the vapor shall escape from one or more small orifices into the unconfined atmosphere, and be arrested by means of the solid part of plate A, or its equivalent, for the purpose of causing its combustion after it is thus arrested, sufficient heat being obtained thereby to keep up continuous vaporization, substantially as described.

I also claim the combination of the crank pin and the cam groove to obtain an up-and-down motion of the graduating valve, C, substantially as and for the purpose herein described.

37,437.—Churn.—J. B. Edgell, E. A. Alexander and H. C. Kellogg, Quasqueton, Iowa:

First, We claim suspending the dasher, F, from the top end of a vertical shaft, C, substantially in the manner and for the purpose herein shown and described.

Second, The arrangement of the central tube, b, fastened to the bottom of the tub, A, in combination with the vertical shaft, C, constructed and operating as and for the purpose herein specified.

[This invention consists in the arrangement of a tube of metal or other suitable material surrounding the vertical shaft, which is firmly fastened to the bottom of the tub and extending up above the surface of the cream in such a manner that the tub is entirely independent of said vertical central shaft, and it can be taken off or replaced whenever desired, without permitting any portion of the cream to escape.]

37,438.—Mode of Raising Sunken Vessels.—P. E. Falcon, Cohasset, Mass.:

I claim my improved process of raising sunken vessels by means of casks or contrivances of like character, the same consisting in arranging the said casks filled with water, on or within a vessel, and with their bungholes downward, as set forth, introducing an air conduit into the bungholes of the casks successively, and forcing air through such pipe and into each cask, and expelling the water of such cask out of the bunghole and with respect to the said air pipe substantially as specified.

37,439.—Combined Washing, Wringing and Mangling Machine.—Thomas Farnsworth, Cleveland, Ohio:

I claim the sections, A B, the beater, Fig. 5, the rollers, J K, wheel, M, and pinion, N, in combination with the table, S, and endless apron, T, when all these parts are arranged and operated as and for the purpose specified.

37,440.—Grain Separator.—John Faulkner, Dansville, N. Y.:

I claim, first, a sheet-metal sieve, A, with apertures, a, arranged in the manner and for the purpose described.

Second, A sheet-metal sieve with apertures, a, in line with the flow of the grain over it, and at right tangles to the movement of the shoe, D, of the fanning mill, in the manner and for the purpose described.

37,441.—Railroad Baggage Check.—F. H. Furniss and F. R. Myers, Cleveland, Ohio:

We claim placing the number or names of stations on baggage checks, in consecutive order, with intermediate or corresponding openings or slots for the insertion of the strap, as and for the purpose specified.

37,442.—Lamp.—Benjamin Garvey, New York City:

First, I claim incombustible wicks for lamps, formed of the materials and in the manner substantially as described in the accompanying specification.

Second, I claim the application to lamps of tubes of glass, glazed pottery, or other such material, which is a bad conductor of heat, and is, at the same time, impervious to the fuel, for the purpose of protecting the wick from the cooling effects of external air, and of confining the heat of the flame, as far as possible, to the wick, in the manner set forth substantially in the accompanying specification.

Third, I claim wick tubes of any suitable materials in imitation of candles or tapers of wax, spermaceti, paraffine, &c., in the manner described in the accompanying specification.

37,443.—Beer-cooler.—Valentine Haeffner, Dobb's Ferry, N. Y.:

I claim the arrangement of the air spaces, a, between the troughs, A, when the latter are used in combination with cold-water pipes, C, substantially in the manner and for the purpose herein shown and described.

37,444.—Surface Condensers.—Peter Hammond, Castleton, N. Y.:

I claim combining the plates, A A, or their equivalents, which constitute the cooling surfaces of the condenser or cooler by means of strips, C C, applied and clamped in their places, substantially as herein set forth.

[This invention consists in combining the plates, or their equivalents, which constitute the condensing or cooling surfaces of the condenser or cooler, by means of wooden or other strips, whereby is obtained, at very small cost, a very effective condenser or cooler which is not liable to leakage.]

37,445.—Drop Press.—Wm. C. Hicks, New York City:

I claim the method of unwinding the hammer belt immediately upon its reaching the requisite elevation by the employment, in combination with the ordinary winding drum, shipping clutch and appurtenances, of auxiliary friction rolls or drums, the whole being arranged to operate substantially in the manner and for the purposes set forth.

I also claim preventing the hammer from rebounding by the means and in the manner hereinbefore described, or in any other manner substantially the same.

37,446.—Machine for Cutting Caoutchouc, &c., into Strips and Threads.—Liveras Hull, Charlestown, Mass.:

I claim my improved caoutchouc-cutting machine, having its several parts constructed and arranged in manner and so as to operate, substantially as described, such machine not only having a single drum or cylinder to support, and a revolving knife to cut a sheet of caoutchouc, as explained, but having machinery for traversing the rotary knife with reference to the drum, and also having machinery for moving such knife toward and away from the drum, as specified,

37,447.—Skate.—Benjamin Irving, New York City:

I claim, first, Actuating the clamp, k i, by means of the system of levers, m n, thereby engaging it and the adjustable clamp, d e, to the boot or shoe, when the whole are combined, arranged and operated substantially as described.

Second, The combination of the especially-adjustable heel clamp, k, with the toggle levers, when arranged and operating substantially as described.

Third, The combination of the toe, side and heel clamps, when adjustable severally and in relation to each other, substantially as described.

37,448.—Bumper and Draw-head Spring for Railroad Cars.—J. C. Jackson, Rochester, N. Y.:

I claim the draw bar, c, and disk, e, in combination with the springs, f and g, and draw box, b, for the purposes and as specified.

37,449.—Watch Case.—Adolph Lange, Glashütte (near Dresden), Saxony:

I claim attaching the bezel for the glass in a hunting-case watch directly to the movement, in the manner and for the purpose substantially as set forth herein.

37,450.—Roof.—Valentine Lasserre, Paris, France:

I claim the combination of the raised portion or boss, made upon the upper or both plates, the screw or bolt, C, the washer, B, the opening in the side washer being closed at the top by a cap, D, or by other means which shall answer the purpose.

37,451.—Carriage Hub.—Charles Leavitt, Cleveland, Ohio:

I claim the cap, I, shoulder, I′, chamber, J, and hole, L, when combined with the pipe box, B, all the parts being arranged and operating as and for the purpose herein set forth.

37,452.—Washing and Wringing Machine.—Joel Lee, Galesburg, Ill.:

I claim the combination of oscillating arms, E, with the rubber, B, the rollers, L, the link, I, and weighted levers, C, all arranged substantially as and for the purposes specified.

37,453.—Belt Fastener.—C. Liebrich and L. Uitting, Philadelphia, Pa.:

We claim the plates, C and C′, and eccentric rollers, B and B′, each roller having a portion of its surface grooved or serrated, and the whole being arranged for application to the two ends of a belt, as and for the purpose herein set forth.

37,454.—Sink.—S. N. Maxam, Shelburne Falls, Mass.:

I claim the combination and arrangement of the top slide grate, A, with the transverse wooden bars, F, and the lower slide grate, B, and the basin, C, and the movable wash-bowl, D, resting in and upon the yoke, E, and sliding upon the rod, G, for the purpose of a sink, and as above set forth.

37,455.—Steam Boiler.—G. B. McDonald, Louisville, Ky.:

I claim the employment, conjointly with the mud well, B, of the boiler, of a brush, C, having an attached rod working through a stuffing box in one end of the boiler, and operating substantially as herein specified for the purpose set forth.

37,456.—Camp Kettle.—J. C. Milligan, Elizabeth City, N. J.:

I claim the peculiar construction of the dished cover or tureen, B, and its arrangement with the kettle, A, and together with the coffee pot, H, sauce-pan, J, frying pan, M, gridiron, h, plates, g, and ration boxes, D E F, in the manner and for the purpose specified.

37,457.—Valve Gearing for Steam Hammers.—Robert Morrison, Newcastle-upon-Tyne, England. Patented in England, Dec. 16, 1859:

I claim, first, The use of a slot link or its equivalent, to operate the valves of steam hammers for the purpose of maintaining the reciprocating motion of the hammer and valve in the same relative direction during any number of strokes if so desired, or when less than the full motion of the valve is required, causing the parts, approaching contact to produce this motion, to move at a less velocity than the hammer, substantially as and for the purpose described.

Second, Connecting the valve or valves of steam hammers to the slot link as described or its equivalent, in such a manner that the whole or any portion of the motion due to the link or its equivalent, may be imparted to the valve or valves, substantially as described and for the purpose specified.

Third, The use of a valve or valves in steam hammers, so connected with the hammer as to be capable of maintaining with it a continuous movement when the hammer and valve are at full stroke, whilst at the same time, the relative positions of the valves and ports may be varied, substantially as and for the purpose specified.

37,458—Making Steel Horse-shoes.—Isaac Peacock, Shortsville, N. Y.:

I claim the combination of the forming die, A A1, having detachable punches and a shifting axis, and the pivoted jaws, D D, having incline planes and shoulders on their outer edges, and the compressor and expander, E E, having the wedge hooks, h h, and holding-down flanches or ledges on the front portions, substantially as described or the equivalent thereof for the purpose set forth.

Second, Making steel horse-shoes of the construction represented by a combination of machine and hand work, substantially as described.

37,459.—Wrench.—Norton Porter, Youngstown, N. Y.:

I claim the slide, E, fitted in the socket, D, of the jaw, C, and provided with a serrated inner surface, h, and an eccentric, c, with a thumb piece, e, attached, in combination with the serrated surface, i, of the shank, A, all arranged as and for the purpose herein set forth.

[This invention relates to an improved wrench of that class in which a sliding jaw is used in connection with a stationary one attached to a shank on which the sliding jaw works. The object of the invention is to obtain a wrench of the class specified, which will be simple in construction, and which will admit of the sliding jaw being readily adjusted in order to apply the wrench to the nut, and to detach it therefrom.]

37,460.—Meat-broiler.—G. B. Ransom, Chester, Conn.:

I claim a meat-broiler constructed substantially as above described, so as to inclose the meat or other article, and broil the same without close contact with the bottom or top of the broiler, substantially as set forth.

37,461.—Car for Carrying Petroleum, &c.—John Scott, Lawrenceville, Pa.:

I claim the employment of a railroad car, A, lined with sheet metal, substantially as herein described for the purpose of carrying on a railroad petroleum or other liquid in the bulk.

And I also claim the arrangement of the partitions, e f, perforated near the bottom with holes, h, in the interior of the car, A, as and for the purpose specified.

[The object of this invention is to arrange a railroad car in such a manner that the same is capable of carrying petroleum or other liquid in the bulk, thereby saving the necessity of carrying the load of the barrels with the liquid, and avoiding the loss occasioned by the leakage of the barrels during the passage.]

37,462.—Machine for Bending Corrugated Sheet Metal.—S. J. Seely, Brooklyn, N. Y.:

I claim, first, The combination of four rollers, corrugated around their circumferences, in a machine for bending corrugated sheet metal into corrugated cylinders, substantially as described.

Second, The arrangement of four corrugated rollers, so that the corrugations of one mesh into the corrugations of another, and all are driven by a positive motion and from a central shaft, substantially as and for the purposes set forth.

Third, The arrangement of the machine, so that the corrugated rollers may be adjusted with respect to one another, and so that the corrugated cylinders may be removed endwise from the rollers, substantially as described.

Fourth, The construction, arrangement and combination of the adjustable parts, B B1 B2 B3, stationary parts, A A1 A2 A3, rollers, C C1 C2 C, rock-shafts, I I′, worms, J J, and segments, K K, substantially as and for the purpose set forth.

Fifth, The combination of one or more movable sections, b c, with the permanent corrugated portions of the rollers surface, the said sections being adapted for finishing large or small casks with a plain flange or chine being invented, substantially as and for the purpose set forth.

37,463.—Raking Attachment for Harvesters.—Isaac B. Snyder, Clay township, Pa.:

I claim the specific arrangement of the inclined planes, O P, for giving the necessary elevation to the sweep rake at each end of its stroke, in combination with the means of holding the rake during its interval of rest, and operating it in the manner specified.

37,464.—Stove for Boiling Sap.—S. B. Spaulding, Brandon, Vt.:

I claim the peculiar air-chamber C, in combination with the stove, A, and boiler, D, the bottom of the latter being embraced by the fire space, E, and flues, whilst its upper part is embraced by the top of the hot-air chamber, substantially in the manner and for the purposes set forth.

37,465.—Seeding Machine.—C. E. Steller, Genesee, Wis.:

I claim, first, The arrangement of one or more transversely adjustable slides, G G1 G*, with two or more sets of holes or apertures, b′ c′ a′ a*, in combination with the seed-distributing roller, E, rotating close under said slide or slides, and provided with adjustable seed-cells, a b c, all constructed and operating in the manner and for the purpose described.

Second, The arrangement of the secondary hoppers, H*, in combination with the main hopper, H, slide, G*, and seed distributing roller, F, constructed and operating as and for the purpose specified.

[This invention, which is covered by three different patents, has been illustrated on page 209, Vol. VII. (new series), SCIENTIFIC AMERICAN.]

37,466.—Hydrant.—Richard Stileman, Philadelphia, Pa.:

I claim the sluice valve, D, with its casing, C C′, when combined with and arranged in respect to the stem, A, of a fire-plug as and for the purpose set forth.

37,467.—Apparatus for Stirring and Drying Grain.—Thomas C. Vice, New Haven, Conn.:

I claim, First, The arrangement of the cast-iron tiles, C, forming the platform of a machine for drying grain, &c., in combination with ledges or lugs, a, projecting from the beams, B, as and for the purpose shown and described.

Second, The arrangement of several rows of semi-circular scoops, H, either rigid or adjustable in combination with the reciprocating carriage, E, and tiles, C, all constructed and operating substantially as and for the purpose specified.

37,468.—Brake Mechanism for Carriages.—Lowell Wilber, Putney, Vt.:

I claim the application or arrrangement of the slide bar, G, its spring, H, chain, b, and pulleys, c d, relatively to the perch, E E′, and the rocker bar, C, the front axle, A, and the tongue, J, provided with a draft rod, I, operated by the chain, t, connected with the yoke or bar, L, and going around a pulley, e, as described.

37,469.—Machine for Stirring Lard.—William J. Wilcox, New York City:

I claim the employment or use, for the purpose of stirring lard, of flat perforated dashers, E E′, attached by hinge joints to staves, F F′, which are secured to reciprocating rods, C C′, moving in opposite directions, all constructed and operating substantially in the manner and for the purpose herein shown and described.

[The object of this invention is to execute the operation of stirring lard by steam or other competent power, in place of hand-power usually employed for this purpose.]

37,470.—Extension Ladder.—Frederick Willis, Marathon, N. Y.:

I claim making a hinge joint in the upper section of the ladder so that the part above the joint may be laid on the roof of a house substantially as described.

And in combination with the jointed section I claim the other sections provided with the devices described for raising or pushing them up in succession substantially as described.

37,471.—Manufacture of Soap.—Dudley B. Chapman (assignor to himself and Ebenezer D. Draper), Milford, Mass.:

I claim as an improved manufacture, a soap made in the improved manner herein-before described, viz: of a hot fatty matter or matters and a solution of alkaline silicate combined at one operation without the process of being boiled after the addition of the solution of silicate to the hot fat.

37,472.—Clothes-wringer.—Daniel B. Clement, Milton, Mass., assignor to himself and Daniel A. Schermerhorn, Boston, Mass.:

I claim, first, Raising or lowering the journals of the lower roll, B, for the purpose of applying or releasing the pressure, in the manner substantially as set forth.

Second, I claim moving the bearings, d, by the same power which opens or closes the clamps, D, substantially as described.

37,473.—Pitman.—Freeman Graham (assignor to Ralph Emerson, Jr.), Rockford, Ill.:

I claim a pitman composed of a cast-iron head to sustain friction, and a wrought iron arm to resist strains, when constructed and combined substantially in the manner described.

37,474.—Cultivator.—Charles W. S. Heaton (assignor to Jabez I. Piggott and H. Rentchler), Belleville, Ill.:

I claim, first, A cultivator frame, folding and expanding vertically on the plan of a parallel rule, substantially as and for the purpose described.

Second, The combination of the slotted beams, B B, slotted links, O O, and vertically folding and expanding parallel rule frame substantially as and for the purposes described.

Third, The combination of the elevated cultivator frame, A A1 A2 A3, clutch pulley, H, or its equivalent, propelling wheels, E, cross shaft, F, and pendent cultivator beams, Q′, substantially as and for the purposes set forth.

Fourth, The combination of the ratchet wheel, lever pawl and brake with the pendent cultivator beams substantially as and for the purpose set forth.

Fifth, The combination of the lever, M, with the pawl, brake, ratchet wheel, and pendent cultivator beams substantially as and for the purpose set forth.

Sixth, The combination of the swinging lever, P, and pendent cultivator beams in a machine operated substantially as herein described.

Seventh, Guards or poles, 6, in combination with a back yoke, 8, as set forth or the equivalent thereof.

Eighth, The poles, 6, when applied and used for the purpose set forth.

Ninth, The back yoke, 8, when applied and used as and for the purpose set forth.

Tenth, In a cultivator for cultivating growing crops and which employs pendent beams, Q′, and a verucally expanding and folding parallel rule frame, I claim the combination therewith of the adjustable standard, 3, and adjustable brace, 4, made in two pieces and with a loose joint, substantially in the manner and for the purpose described.

Eleventh, The arrangement together on the same machine of the ratchet wheel, K, the brake, N, and foot and hand levers, M L I, and P, all combined as shown and described.

37,475.—Press.—John Kuebler (assignor to J. I. Piggott and Henry Rentchler), Belleville, Ill.:

I claim the construction of a press or other similar mechanical power in such manner that the screw and nut may be alternately revolved, and when thus revolved, the connection between the follower and the screw will automatically adapt itself thereto, substantially as and for the purposes set forth.

37,476.—Jib and Stay Connection.—John E. Seavey (assignor to himself and George E. Torrey), Kennebunkport, Maine:

I claim my improved jib and stay connector, the same consisting of the hinged annulus, B, and the shackle, A, constructed, arranged and combined together in manner and so as to operate as specified.

37,477.—Casks and Barrels for Oil.—Abel Thompson, Brooklyn, N. Y., assignor to himself and Daniel Richards, New York City:

I claim lining a barrel or cask for petroleum or coal oils with sheet metal, said lining setting against the interior of the barrel or cask for the purposes and as specified.

I claim the metal screw bung hole, c, attached to the cylinder, a, and passing through the staves for the purposes specified.

And I claim the wings, e e, attached to the cylinder, a, and running between the staves for the purposes specified.

I also claim the staves formed as segments of a cylinder, tapering on the outside, and receiving the wooden heads and the hoops to form a barrel or cask as set forth, in combination with an interior lining, whereby said barrel or cask is adapted to contain coal oil, as specified

37,478.—Wash-basin Faucet.—Darius Wellington (assignor to Cornelius Wellington), Boston, Mass.:

I claim the improved basin faucet, as constructed with the leakage intercepting chamber, a, and its conduit, b, arranged within the standard, A, and with respect to the joint of the movable nozzle, B, and the plug, c, substantially as specified.

And in combination with the leakage intercepting chamber, a, and its outlet, b, arranged on the stand, A, of the faucet as specified, I claim the auxiliary intercepting chamber, e, or its equivalent, and the conduit, g, or its equivalent in the turning nozzle, B, the whole being arranged to operate together, substantially as and for the purpose or objects as herein before set forth.

37,479.—Axle.—Harmon G. Weibling, Denver City, Colorado:

I claim the peculiar construction of my axle boxes or thimbles with the flanges, H R, oil chamber, F, and aperture, l, when connected with a spiral groove, terminating in a canal in which are placed friction rollers, e, the whole combined and operating as described.

37,480.—Carriage Wheel.—Harmon G. Weibling, Denver City, Colorado:

I claim my peculiar method of constructing the axle boxes or thimbles, and attaching them to the axles, by means of the gutta-percha packing, A, and screws, when the boxes or thimbles are made to taper as described, having a canal lined with Babbits metal, in which rollers, e, are placed, the whole used in construction with the strap, d, on the underside of the axle, and the bolt, j, the friction rollers, spiral groove and lubricator, all as described and set forth.

REISSUE.

1,387.—Loom.—Alexander Frey, New York City. Patented May 7, 1861:

I claim, first, The arrangement of the plate, a, carrying the spools or cobs in combination with thread-guides and with the let-off rollers of a loom constructed and operating substantially as and for the purpose herein shown and described.

Second, The combination of the plate, a, with the guide plate, b, applied to a loom substantially in the manner and for the purpose specified.

Third, The arrangement of the rollers, d d, and g g, two or more at the front, and two or more at the rear of a loom, connected together by an endless chain or its equivalent or without such, and causing the warp threads and the fabric to progress regularly through the loom as the weaving is performed, substantially in the manner herein set forth.

Fourth, The arrangement of the drivers, t, and levers, u, acted upon by the cams, 10, substantially in the manner and for the purposes specified.

Binding the "Scientific American."

It is important that all works of reference should be well bound. The SCIENTIFIC AMERICAN being the only publication in the country which records the doings of the United States Patent Office, it is preserved by a large class of its patrons, lawyers and others, for reference. Some complaints have been made that our past mode of binding in cloth is not serviceable, and a wish has been expressed that we would adopt the style of binding used on the old series, *i. e.*, heavy board sides, covered with marble paper and morocco backs and corners.

Believing that the latter style of binding will better please a large portion of our readers, we shall commence on the expiration of this present volume to bind the sheets sent to us for the purpose in heavy board sides, covered with marble paper and leather backs and corners.

The price of binding in the above style will be 75 cents. We shall be unable hereafter to furnish covers to the trade, but will be happy to receive orders for binding at the publication office, 37 Park Row New York.

IMPORTANT TO INVENTORS.

PATENTS FOR SEVENTEEN YEARS.

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THE EXAMINATION OF INVENTIONS.

Persons having conceived an idea which they think may be patentable, are advised to make a sketch or model of their invention, and submit it to us, with a full description, for advice. The points of novelty are carefully examined, and a written reply, corresponding with the facts, is promptly sent free of charge. Address MUNN & CO., No. 37 Park Row, New York.

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The service we render gratuitously upon examining an invention does not extend to a search at the Patent Office, to see if a like invention has been presented there, but is an opinion based upon what knowledge we may acquire of a similar invention from the records in our Home Office. But for a fee of $5, accompanied with a model or drawing and description, we have a special search made at the United States Patent Office, and a report setting forth the prospects of obtaining a patent, &c., made up and mailed to the inventor, with a pamphlet, giving instructions for further proceedings. These preliminary examinations are made through our Branch Office, corner of F and Seventh streets, Washington, by experienced and competent persons. Many thousands such examinations have been made through this office. Address MUNN & CO., No. 37 Park Row, New York.

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Every applicant for a patent must furnish a model of his invention if susceptible of one; or, if the invention is a chemical production, he must furnish samples of the ingredients of which his composition consists, for the Patent Office. These should be securely packed, the inventor's name marked on them and sent, with the Government fees, by express. The express charge should be pre-paid. Small models from a distance can often be sent cheaper by mail. The safest way to remit money is by draft 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; but, if not convenient to do so, there is but little risk in sending bank-bills by mail, having the letter registered by the postmaster. Address MUNN & CO., No. 37 Park Row, New York.

The revised Patent Laws, enacted by Congress on the 2d of March, 1861, are now in full force, and prove to be of great benefit to all parties who are concerned in new inventions.

The duration of patents granted under the new act is prolonged to SEVENTEEN years, and the Government fee required on filing an application for a patent is *reduced* from **$30** down to **$15**. Other changes in the fees are also made as follows:—

On filing each Caveat	$10
On filing each application for a Patent, except for a design	$15
On issuing each original Patent	$20
On appeal to Commissioner of Patents	$20
On application for Re-issue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On filing application for Design, three and a half years	$10
On filing application for Design, seven years	$15
On filing application for design, fourteen years	$30

The law abolishes discrimination in fees required of foreigners, excepting natives of such countries as discriminate against citizens of the United States—thus allowing Austrian, French, Belgian, English, Russian, Spanish and all other foreigners except the Canadians, to enjoy all the privileges of our patent system (but in cases of designs) on the above terms. Foreigners cannot secure their inventions by filing a caveat; to citizens only is this privilege accorded.

During the last seventeen years, the business of procuring Patents for new inventions in the United States and all foreign countries has been conducted by Messrs. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN; and as an evidence of the confidence reposed in our Agency by the inventors throughout the country, we would state that we have acted as agents for at least TWENTY THOUSAND inventors! In fact, the publishers of this paper have become identified with the whole brotherhood of inventors and patentees at home and abroad. Thousands of inventors for whom we have taken out patents have addressed to us most flattering testimonials for the services we have rendered them, and the wealth which has inured to the inventors whose patents were secured through this office, and afterward illustrated in the SCIENTIFIC AMERICAN, would amount to many millions of dollars! We would state that we never had a more efficient corps of Draughtsmen and Specification Writers than are employed at present in our extensive offices, and we are prepared to attend to patent business of all kinds in the quickest time and on the most liberal terms.

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, under the new law, is $10. A pamphlet of advice regarding applications for patents and caveats, printed in English and German, is furnished gratis on application by mail. Address MUNN & CO., No. 37 Park Row, New York.

ASSIGNMENTS OF PATENTS.

Assignments of patents, and agreements between patentees and manufacturers are carefully prepared and placed upon the records at the Patent Office. Address MUNN & CO., at the Scientific American Patent Agency, No. 37 Park Row, New York.

It would require many columns to detail all the ways in which inventors or patentees may be served at our offices. We cordially invite all who have anything to do with Patent property or inventions to call at our extensive offices, No. 37 Park Row, New York, where any questions regarding the rights of patentees will be cheerfully answered.

Communications and remittances by mail, and models by express (prepaid), should be addressed to MUNN & CO., No. 37 Park Row, New York.

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We are prepared to undertake the investigation and prosecution of ejected cases on reasonable terms. The close proximity of our Washington Agency to the Patent Office affords us rare opportunities for the examination and comparison of references, models, drawings, documents, &c. Our success in the prosecution of rejected cases has been very great. The principal portion of our charge is generally left dependent upon the final result.

All persons having rejected cases which they desire to have prosecuted are invited to correspond with us on the subject, giving a brief story of the case, inclosing the official letters, &c.

FOREIGN PATENTS.

We are very extensively engaged in the preparation and securing of patents in the various European countries. For the transaction of this business we have offices at Nos. 66 Chancery lane, London; 29 Boulevard St. Martin, Paris; and 26 Rue des Eperonniers, Brussels. We think we can safely say that THREE-FOURTHS of all the European Patents secured to American citizens are procured through the Scientific American Patent Agency, No. 37 Park Row, New York.

Inventors will do well to bear in mind that the English law does not limit the issue of patents to inventors. Any one can take out a patent there.

Circulars of information concerning the proper course to be pursued in obtaining patents in foreign countries through our Agency, the requirements of different Government Patent Offices, &c., may be had gratis upon application at our principal office, No. 37 Park Row, New York, or any of our branch offices.

Notes and Queries

J. H. P., of N. Y.—The hair hygrometer consists of a human or other long hair prepared by immersion in a solution made with soda and slacked lime. One extremity of it is fastened to a hook and the other end is attached to a small weight to keep it stretched. The hair passes over a small brass pulley on the axis of which is a pointer that moves over the face of a dial. When the surrounding atmosphere is moist, the hair is elongated by absorbing an additional quantity of moisture; the counterpoise then descends and turns the pulley which moves the index hand. A solution of common salt and lime is a good hygrometric preparation, and a piece of cotton cord will answer the same purpose as a hair. With respect to the utility of barometers, we have seen several that were of no more use than a piece of wood. Their utility depends upon the accuracy of their construction.

B. and B., of Wis.—Galvanized iron is not a non-conductor of heat. The oxides of zinc and copper are poisonous. Tinned iron pans are better than zinced iron pans for concentrating sorghum sirups. Vacuum copper pans heated with steam are employed in all our large sugar refineries.

L. W. A., of N. Y.—In heating iron wire from the freezing to the boiling point of water—212 Fah—it expands 1-812th of its length. It expands and contracts uniformly. Zinc is the most expansible of all metals; a rod of it expands 1-323rd of its length in being heated 180 degrees. Two distinct inventions cannot be secured under one patent.

J. S. Q., of Mass.—Smiles's "Lives of the Engineers" is an English publication, not republished here so far as we know.

A. R., of N. Y.—G. P. Putnam, No. 532 Broadway, this city, is the publisher of Ruttan's work on the "Ventilation of Buildings."

W. H., of Ill.—Among the very first telegraphs constructed was Alexander's, which had a separate wire, as you propose for each letter of the alphabet. It would be far too expensive to construct and operate lines with such a number of wires.

L. W., of Mass.—We cannot give you much light upon the subject of frictional gearing for the reason that very little is known concerning their practical operation. There is no earthly reason to our thinking why they should not work unless it be that they absorb more power than toothed wheels; this would hardly seem possible. As you can readily understand our time is too much occupied to devote any considerable portion of it to researches bearing exclusively upon one point. The only way in which information can be obtained in regard to the efficacy of these agents is to experiment carefully. This we hope to see done, and we wil gladly publish any information we receive on the subject.

L., of Pa.—If you were to give your invention to the Government, it would be taken no notice of, unless it were brought to the notice of the War Department by some person of influence, and then it would be unwise to trust to the authorities for remuneration. Your only chance of making anything by your invention is to get some person of capital and influence interested with you by giving him a good share, take a patent and have a gun made for testing before the proper officers, and then if satisfactory be ready to execute such orders as you might obtain.

J. S., of Ohio.—A lense is not suitable to place in the wall of your dark cellar for obtaining light. Use good common window glass.

T. F., of Ind.—There is no first-class work on millwrighting extant. Since the publication of Oliver Evans's work, H. C. Baird, of Philadelphia, has published "Hughes's American Miller," which may answer your purpose.

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Money Received

At the Scientific American Office, on account of Patent Office business, from Wednesday, January 21, to Wednesday January 28, 1863:—

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Persons having remitted money to this office will please to examine the above list to see that their initials appear in it, and if they have not received an acknowledgment by mail, and their initials are not to be found in this list, they will please notify us immediately, and inform us the amount, and how it was sent, whether by mail or express.

Specifications and drawings and models belonging to parties with the following initials have been forwarded to the Patent Office from Wednesday, January 21, to Wednesday, January 28, 1863:—

P. B., of N. Y.; R. E., of N. Y.; W. M., of N. Y.; J. F. T., of N. Y.; W. L. F. of N. J.; J. B., of N. Y.; M. B. D., of Pa.; S. S. W., of Pa.; G. M. Jr. of Ill.; T. H. C., of N. H.; I. L., of N. Y.; J. M. Y., of N. Y.; J. C. P., of N. Y.; J. F. L., of N. Y.; T. and N., of N. Y.; H. W., of Cal.; E. S., of N. Y.; J. H., of N. Y.; W. J. C., of England; J. H., of Ill.; J. A. A., of Conn.; J. E., of Conn.; S. W. B., of N. Y.; H. and B., of Conn.; B. and H., of N. Y.; W. H. H., of Mich.; M. D. H., of N. Y.

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INVARIABLE RULE.—It is an established rule of this office to stop sending the paper when the time for which it was pre-paid has expired.

Models are required to accompany applications for Patents under the new law, the same as formerly, except on design patents when two good drawings are all that is required to accompany the petition, specification and oath, except the Government fee.

PATENT CLAIMS.—Persons desiring the claim of any invention which has been patented within thirty years, can obtain a copy by addressing a note to this office, stating the name of the patentee and date of patent, when known, and inclosing $1 as fee for copying. We can also furnish a sketch of any patented machine issued since 1853, to accompany the claim, on receipt of $2. Address MUNN & CO., Patent Solicitors, No. 37 Park Row, New York.

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A MESSIEURS LES INVENTEURS—AVIS IMPORtant. Les inventeurs non familiers avec la langue Anglaise e qui préféreraient nous communiquer leurs inventions en Français, peuvent nous addresser dans leur langue natale. Envoyez nous un dessin et une description concise pour notre examen. Toutes communications seront regues en confidence. MUNN & CO., SCIENTIFIC AMERICAN Office. No. 37 Park-row, New York

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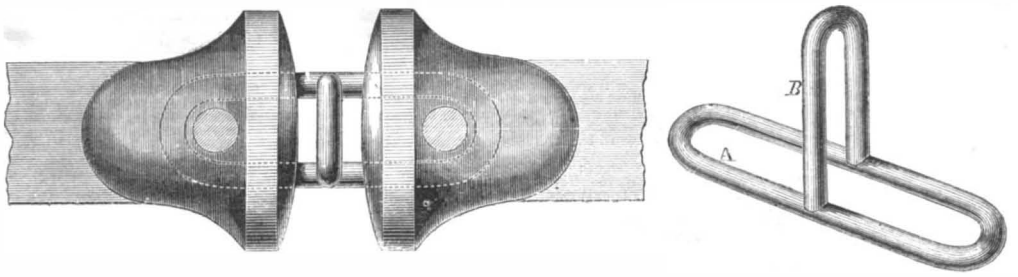
Improved Patent Car Coupling.

So many accidents have occurred and so many valuable lives have been lost while trains of cars were being coupled together, that it has become a matter of necessity to provide some method by which the danger can be averted. Our illustration represents such a device, and we think it is well adapted to the end sought for, viz.: safety. The coupling, A, is provided with a handle or staple, B, firmly riveted to it. The brakeman, or other person making up the train, grasps this projecting handle, and inserts the coupling between the bunters as the cars come together. By using this coupling the necessity for going between the cars is obviated, as the connection



BARNES'S PATENT CAR COUPLING.

can be made, if desirable, from the platform of the car itself.

The patent for this invention was procured May 13, 1862, by Henry A. Barnes, of Milwaukee, Wis., and further information can be had by addressing him at that place.

Canadian Oil Springs.

A recent writer in the Toronto *Globe* says :—

"The question most eagerly asked of persons just come from Enniskillen, is generally the all-important one of whether the wells are holding out or not. It is a fact that many of the flowing wells have ceased to flow; and others, while still continuing to flow, do no longer yield the immense quantities that they did at first. But then, there remains yet untouched a large area of what there is every reason to believe to be good productive oil territory. The work of drilling and sinking wells is still vigorously carried on, and a rise in the price of crude oil to $1 or $2 per barrel would set the drills agoing at a rate hitherto unheard of. The owners of wells which have ceased to flow do not think it worth while to drill down any further until a more remunerative demand arises for crude oil. When this takes place, every effort will be made, both by drilling further and pumping, to bring the oil up, if there is any to bring. The question whether former flowing wells will yield oil by pumping, has yet to be determined.

"Oil Springs is certainly the busiest place of its size to be seen; in fact, a perfect hive of industry, full of life and motion. The population of the whole diggings is estimated at 2,000 or more. There are still more people than can find houseroom to live in, and rents are of tiptop hight. Landlords of houses appear to have taken "Excelsior" for their motto. Think of six dollars a month for the up-stairs, merely, of a frame house about 18 by 24, and three or four competitors for it at that! People continue to come in faster than houses can be built for them. The hotels and boarding-houses are crowded, and the unfortunate inmates are fairly lost for want of a place to go to in the evening, and even for seats to sit upon after supper time."

Speed of Steamships.

A correspondent wishes to know "The highest rate a steam vessel has accomplished?" The question is a broad one, and does not distinguish between river and sea-going steamers. It has been claimed for two or three mail steamers that, under a full head of steam and canvas, with a strong wind, they have run 18 knots. Under steam alone, 17 knots has been accomplished by ocean steamers. This is equal to 19 and 4-7th statute miles. But this has been surpassed by river boats. It has been said that 31 miles per hour have been got out of an American steamer, but we do not believe it. We have not heard on this side of the Atlantic of any boat exceeding in speed the *Rothesay Castle*, registered at Glasgow in 1861, as of 191 feet 5 inches in length, 19 feet breadth, and 8 feet 3 inches depth, with engines of 110 horse-power. This steamboat is said to have run at the rate of 21 miles per hour, but whether she continued that speed for one whole hour, we cannot say. Perhaps our fast Gravesend boats have either exceeded or approached this speed. As we have no long rivers like those in the United States, we shall never have a class of powerful boats such as the Americans have, and as size gives speed, we cannot compete with them in this respect.—*Mitchell's Steam Shipping Gazette.*

[The fastest running of an American steamboat, for a continuous trip of 150 miles, was performed by the *Daniel Drew* on the 13th of October, 1860, on the Hudson river, between New York and Albany. The average speed was 25 miles per hour, and an account of the trip will be found on page 277, Vol. III. (new series) of the Scientific American.—Eds.

FIELD'S IMPROVED ICE-CREEPER.

Every person whose occupation renders it necessary for him to be out in frosty weather must have felt the inconvenience, to say nothing of the pain, which ensues from a fall upon the icy ground. These accidents are continually occurring, and are

caused by the imperfect foot-hold of the pedestrian. It is not a little mortifying to a young gentleman to be suddenly interrupted in some good thing which he was saying to his "affianced" by feeling his person come into sudden and violent contact with the pavement. To prevent all casualties of this kind the ice-creeper here illustrated has been invented. It consists of the metal plate, A, provided with a second plate, B, having a series of corrugated teeth, *a*, set at right angles with its base. The ends of the plate, A, flare outwardly in order to embrace the foot properly, and have narrow slots, *b*, in each through which the leather straps, C, are thrust and secured. The ends of the straps are provided with either buckles or strings to fasten the creeper to the foot. The small spike, *c*, seen in the detached creeper, enters the heel of the foot and the spring, *e*, prevents the creeper from slipping forward or backward from its place.

A patent is about to issue on this invention, and further information may be had by addressing the inventor, Wm. Field, at Providence, R. I.

Features of the Feet.—The French foot is meager, narrow and bony. The Spanish foot is small and elegantly curved, thanks to its Moorish blood, corresponding with the Castilian pride—"high in the instep." The Arab foot is proverbial for its high arch; "a stream can run under the hollow of his foot," is a description of its form. The foot of the Irish is flat and square. The English foot is short and fleshy. The American foot is apt to be disproportionally small.

FROM THE STEAM PRESS OF JOHN A GRAY