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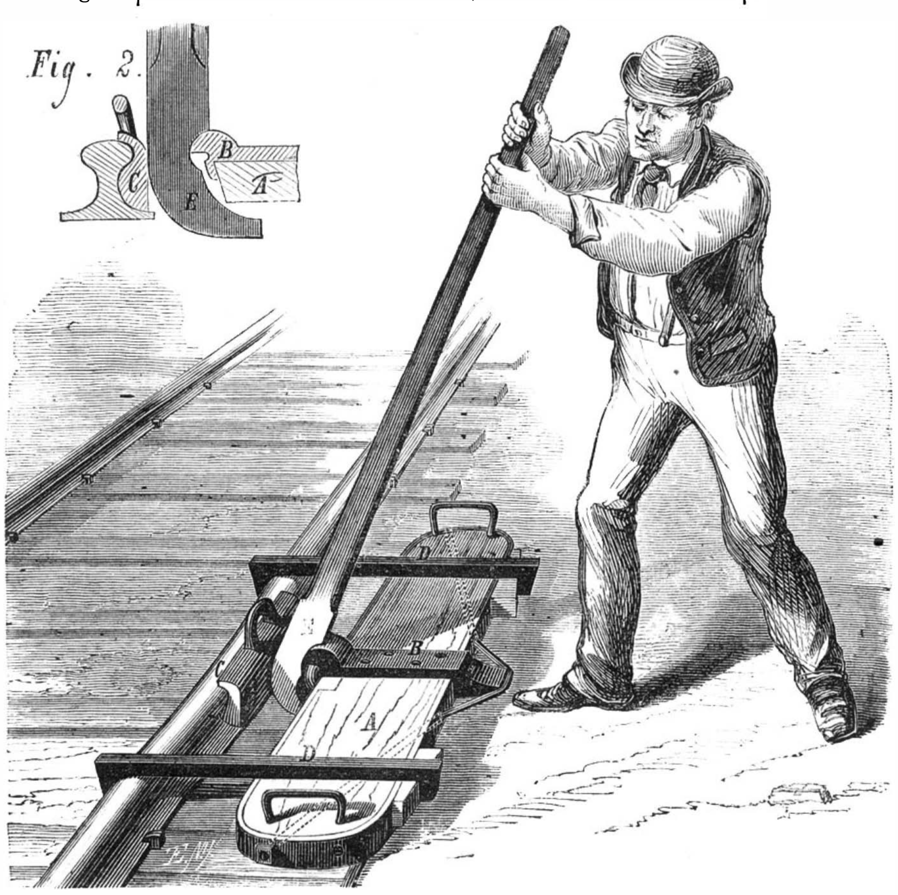
Railroad Rail Straightener.

Our engraving illustrates what appears to be a useful invention for straightening railroad rails without taking them up or drawing the spikes. A is a truss bearing bound round with a metal band, through which passes a truss rod, the course of which is partly shown and partly indicated by dotted lines. The curved center of this truss rod bears against the rear end of the bearing, B, which is firmly secured to the truss bearing, A. C is a bearing made with a bulge to fit the rail. D D are clamps, which are placed the required distance apart, and wedged so as to hold the truss bearing to the rail. E is a lever with a cam shaped end. The whole operation will readily be understood from Fig. 2, which represents, in section, the relative positions of the working parts and the rail, just before the lever is depressed to straighten it. The inventor states that four or five men will take a crook out of a rail, with this machine, in one minute; to take it up, straighten, and replace it, would occupy them twenty-five or thirty minutes. Its efficiency was proved by straightening a portion of a rail on which rested the driving wheel of a thirty tun engine. Patented through the Scientific American Patent Agency, March 26, 1872. Further information may be obtained of the patentee, G. I. Kinzel, Knoxville, Tenn.



KINZEL'S RAILROAD RAIL STRAIGHTENER.

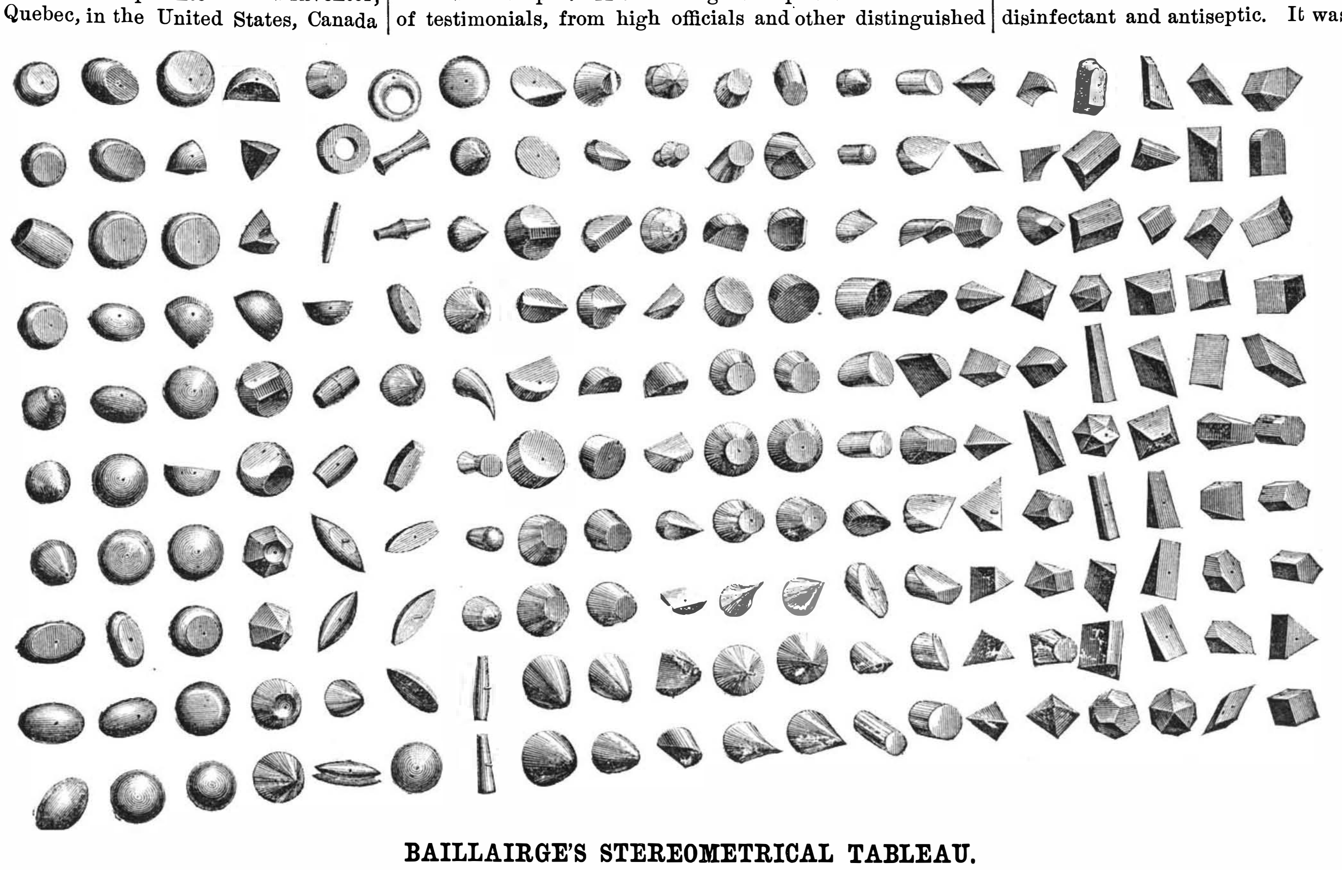
The Effect of Cold on Iron.

The effect of cold on iron, concerning which much diversity of opinion exists, is illustrated pretty forcibly by the experience of the Grand Trunk Railway of Canada, which is exposed to severe cold and a great deal of it. At the recent half yearly meeting of the company, in London, the President said that 3,500 to 4,000 rails on the line break every winter! But he found comfort in the fact that, in about 110 miles of steel track, only eight or ten rails have broken. It was feared when Bessemer rails were first introduced that their resistance to wear would be counterbalanced by unusual liability to break, and that they would be especially dangerous in severe climates, the impression being apparently that, having something of the hardness of cast iron, they had also something of its brittleness. This experience of the Grand Trunk, however, indicates that they are especially fitted for such climates.

BAILLAIRGE'S STEREOMETRICAL TABLEAU.

Our engraving is a perspective view of the above named educational device, which has been patented for its inventor, Mr. C. Baillairgé, of Quebec, in the United States, Canada and Europe. It consists of a board, about six feet long and four feet wide, with some two hundred wooden models, comprising, so to say, all the elementary forms, their segments, and sections, and numerous other solids, simple and compound.

The tableau is set in an appropriate frame, with glass covering, so as to exhibit the models while excluding the dust. The front can be opened at pleasure so as to afford access to the models, each of which is merely supported on the board by a round nail or wire, which admits of its easy removal and replacement by teacher or pupil. The instruction conveyed by this tableau, appealing, as it does, to the uneducated eye and mind, is, the inventor thinks, destined to be of great use in developing the intelligence of the untaught masses of mankind. He expects to introduce it into all the educational institutions of the United States and elsewhere, as it is now being disseminated in Canada; and he has no doubt that the tableau will also find its place in the studio of the engineer and architect, to whom the models will be suggestive of various forms and relative proportions which cannot fail to aid them in their pursuits. The rapid success attained by a school in Quebec, in mensuration of all kinds of surfaces and yet higher mathematics, including conic sections, was attributed to the use of this tableau. Every tableau is inscribed with a rule for finding the solid contents of any body, called "the prismoidal formula." This formula has been shown, by Mr. Baillairgé in his treatise on geometry and mensuration published in 1856, to be less restrictive than supposed, and he has added to the known solids, measurable thereby, a long list of others discovered by him, the whole of which are given in the tableau. Each tableau is also accompanied by a printed treatise, explanatory of every use to which the models can be put. Mr. Baillairgé is in possession of a mass of testimonials, from high officials and other distinguished men, both in Canada and Europe, together with reports of various educational and other institutions, all highly complimentary to him and his invention.



BAILLAIRGE'S STEREOMETRICAL TABLEAU.

Dr. Wilkie, of Quebec, thinks "the government would confer a boon on schools of the middle and higher classes by affording access to so suggestive a collection;" and Professor Newton, of Yale College, considers the tableau "of great use for showing the variety and extent of applications of the prismoidal formula."

Aniline Colors.

Professor C. F. Chandler recently delivered an interesting lecture on the above, before the Polytechnic Association of the American Institute, from which we take the following:

It is well understood that coal is an element of our national wealth, and that we derive from it our power. The combustion of 300 lbs. of coal under a steam boiler will produce a power equal to the mechanical force exerted by a man for a year. Another important application of bituminous coal is to the manufacture of illuminating gas. In this manufacture there are certain residual products, which were at first thrown away; and it is of these that I propose to speak to-night.

Coal tar is produced at the rate of about ten gallons to the tun of coal. Thousands of barrels of coal tar were at first thrown away; but the chemist turned his attention to this substance, and discovered so many products useful in the arts, which could be made from it, that coal tar now finds a ready market at $1·50 per barrel. When coal tar is subjected to distillation, the liquid portion passes off, and there remains the heavy black pitch which is used for roofing and for pavements. The liquid portion, which comprises about one fourth of the original coal tar, produces first a light fluid called naphtha, and then a heavy liquid which is called dead oil. The light liquid is a mixture of carbon and hydrogen, of which benzole is the type. It is $C_{12}\ H_6$, that is, taking into account the difference of weight, 72 parts of carbon to 6 parts of hydrogen. Other substances are produced from this, differing by two atoms of each, making $C_{14}\ H_8$, $C_{16}\ H_{10}$, $C_{18}\ H_{12}$, $C_{20}\ H_{14}$, etc.; but, until recently only the first two have had any practical importance in the arts. They were used simply as fuel, and as antiseptics, for preserving timber from decay. But lately one of them is claimed to be a specific for the small pox.

After the volatile portions have been removed, there remains this dead oil, which is heavier than water. This was for a long time used as a fuel in glass houses. It was then found that the carbolic acid it contains was a most powerful disinfectant and antiseptic. It was found that it would prevent the spread of the cattle disease, that cattle having the disease in its worst form might be placed with others with safety, if they were protected by this acid. It was found, too, that the durability of timber was increased four or five fold by its application.

But I wish to-night to invite your special attention to the beautiful colors which have recently been obtained from refuse coal tar. They are naturally subdivided into three groups, the aniline colors, those derived from naphthaline, and the carbolic acid colors. I shall confine my attention wholly to the chemical phase of the subject.

Benzole is a hydrocarbon. Bringing that in contact with nitric acid, an atom of nitrogen carries off an atom of hydrogen; and we have nitro-benzole, which is a very fragrant oil, an artificial oil of bitter almonds, used instead of that substance in the manufacture of soaps. When the nitro-benzole is made to give up its oxygen and take up hydrogen, it becomes aniline. Nitrogen is a protean element which gives rise to a great variety of compounds. Ammonia is $N H_3$; and these three atoms of hydrogen can be replaced by a great variety of substances. Aniline is a similar substance. It is ammonia, replacing one atom of hydrogen by phenyl, which is $C_{12}H_5$. There is no limit to the number of compounds that may be developed on this type; and it opens one of the most important fields of chemical investigation at the present day. All the aniline colors are derived from $N_3\ H_9$, converted by the process of substitution into new compounds. The first investigation in this direction, which, however, did not result in any practical product, was that of a German chemist, who found that by treating aniline with chloride of lime, he produced a violet or purple tint. Perkins, who was the first successful manufacturer of color from coal tar, manufactured a substance to which he gave the name of mauve. Then came the discovery of the rose aniline, which is produced from commercial aniline, pure aniline not answering the purpose. Subjecting commercial aniline to the action of nitric acid, and then to the action of nascent hydrogen, we obtain rose aniline, which is $C_{40}\,H_{19}\,N_3$. The chloride, hydrochlorate, arseniate, acetate, nitrate, and other salts of this substance produce the beautiful tints of which I have specimens here. Hoffmann found that he could change this beautiful red tint of the rose aniline to various shades of violet, by simply boiling it with more aniline. This introduced more phenyl in the place of hydrogen. One atom made it purple, another more bluish, and a third atom of phenyl made it the most beautiful blue that has ever been manufactured.

Replacing the hydrogen with ethyl, C_4H_5, or with methyl, C_2H_3, we obtain still further colors. In every case the beautiful rose red becomes more and more purple, until the substitution of the last atom of hydrogen converts it into a deep and perfect blue. On carrying the investigation further, it was found that by proper treatment the blue color could be converted into a green, by using ethyl and methyl. Subsequent treatment developed an entirely different base, having the form $C_{40}\,H_{17}\,N_3$, with yellow tints; and further treatment produced a brown and finally a black; so that the most durable black for calico printing is now obtained from aniline.

From the coal tar obtained from a tun of coal, three fourths of a pound of this beautiful color are produced. The coal, which is worth about $6, produces the gas, the coke, the ammoniacal water, largely used for agricultural purposes, the carbolic acid, used for the preservation of timber and as a disinfectant, and finally this beautiful color, which alone is worth nearly as much as the coal originally cost. The amount of this industry has become so enormous that at present five tuns of this raw aniline oil are manufactured daily on the continent alone, and 90,000 lbs. of iodine are used in effecting the substitution; and yet it is an industry which has started since 1860.

A word with regard to the carbolic acid colors. The carbolic acid is obtained by treating the dead oil with an alkali. This furnishes a number of coloring matters. Carbolic acid is $C_{12}\,H_6\,O_2$, or it is the oxide of benzole, which is $C_{12}\,H_6$. Treating carbolic acid with nitric acid, we produce $C_{12}\,H_3\,(NO_4)3\,O_2$. Picric acid is a substantive dye for silk and wool, uniting with them without any mordant. Treating picric acid with the cyanide of potassium, an acid is produced which gives beautiful garnet colors on silk and wool. By treating carbolic acid with soda and the oxide of mercury, it is converted into rosolic acid, which produces various shades of orange, and is used for coloring house paper. Treating this with ammonia, it produces a scarlet tint. The intimate connection, existing between the rosolic acid and the aniline colors, is shown by the fact that, by treating rose aniline in anhydrous acid, the same result is obtained. From this orange red of rosolic acid, can be produced a deep blue color by the action of aniline.

There is a series of naphthaline colors, but they are not found to be fast, and I will therefore pass them by.

When coal oil is distilled, and 25 or 30 per cent of volatile products are removed, the result is solid, and is called anthracene. Recently, from this, there has been artificially produced the coloring matter of madder. The colors from aniline had proved brilliant and durable for silk and wool, but not for cotton fabrics. It is now a question whether the colors from anthracene will supply this want, and whether they will be found to be permanent.

QUICK STEAM LAUNCHES.

BY F. J. BRAMWELL, ESQ., C. E.

For some little time past, the interest of naval architects and engineers has been excited by the reports which have from time to time been given in the newspapers of the performances of steam launches built by Mr. Thorneycroft, of Chiswick. From these reports, it has appeared that steam launches of about 50 ft. in length have attained speeds varying from seventeen to nineteen statute miles per hour, or 14 4·7 to 16 2·7 knots per hour speeds which even in this day would be considered very good for the finest sea going steamers, and speeds which have hitherto been regarded as impossible unless the vessel were at least 200 feet in length. The writer, having been much struck with these statements and with those made to him by engineers who had witnessed the performances of the launches, thought it might be interesting for the Institution to have a short paper upon the subject. He, therefore put himself in communication with Mr. Thorneycroft, who kindly allowed him to make what experiments he thought fit. These experiments, which have taken place within the last few days, have been made on the *Miranda*. The length of the *Miranda* over all is 50 feet: ditto, on water line, 45 feet 6 inches: the beam 6 feet 6 inches; ditto, on water line, 5 feet 9½ inches; the draft of water in running trim with six persons on board, and with 3 cwt. of coals, is 2 feet 6 inches, taking the extreme depth of the screw. She is built of steel, the general thickness of the plates being 1·8 inch to 1·16 inch. She has a pair of inverted direct acting engines having cylinders of 6 inches diameter by 8 inch stroke. These engines make up to as many as 600 revolutions or 800 feet of the piston per minute: their ordinary working speed, however is less than this. They drive a two bladed screw of 2 feet 6½ inches diameter and 3 feet 4 inches pitch. This screw is abaft the rudder, which is made in an upper and lower part joined by a bow, so as to pass the shaft which is placed out of the horizontal line to the extent of 1 in 28, the after end of course being the lower. The boiler is of steel, of the locomotive type, and has a total heating surface of 116 feet, and a total fire grate surface of 41¼ feet; the barrel plates are 5·16 inch thick, the fire box external plates also 5·16 inch; and the internal, which are copper plates, are ⅜ inches thick; the stays of the fire box are ⅝ inch, and 4 inches apart. The fuel is coal. The boiler is fed by a three millimeter Giffard injector. The whole weight of the engines and boiler with water in it up to the working level, and of the propeller, is about 40 cwt. to 41 cwt., or 4,448 lbs. to 4,560 lbs.

A point which the writer thought it would be interesting to note was the gross indicated horse power at each of the speeds. So far as the writer has ever heard, no one has attempted to indicate engines at anything like 500 revolutions per minute. At 300 revolutions the horse power was 11·05, at 600 revolutions, 71·61, 400 revolutions, 23·45, and 500, 42·31. The next thing to be ascertained was what was the speed of the boat at these varying revolutions. For this purpose, it was determined to take the ordnance measurement from Barnes railway bridge to Putney old bridge; this appears by measurement to be three and a half statute miles and eighty-eight yards. A counter was kept in gear; the total number of revolutions was 6,131, giving a mean of 530 a minute. It was clear a greater speed could have been maintained so far as the engine and boiler were concerned; but it was feared that the injector was hardly large enough to supply the required quantity of feed water, and therefore the link was notched back.

The total number of revolutions was 6756, giving just under 580 revolutions as the mean per minute. At the very last of the run, the engines were making 600 revolutions per minute, Mr. Thorneycroft having found that he had water enough in his boiler, and being thereby enabled to give the engines full steam without risk. The mean speed was 18·36 miles per hour. Runs were then made upon the measured mile at varying revolutions; 555 revolutions give 18·65 speed; 500 give 16·15 speed; 400, 11·82 speed; 300, 11·05 speed; 200, 4·02 speed; 100 revolutions could not be taken, as it would not have given a rate sufficient to have stemmed the tide.

The slip of the screw was for 500 revolutions 14·7 per cent; for 400 hundred revolutions, 21 9 per cent; for 300 revolutions, 12·9 per cent; and 200, 7.1 per cent. The highest point of observation on which any measurement was taken was 555 revolutions, at which point the slip of the screw was 11·3 The displacement of the boat at the draft at which she was tried was 3·73 tuns. If the speeds at the varying revolutions be reduced from statute miles into knots, and then the formula $V^3 \times D^{\frac{2}{3}} \div 1$ H. P., be employed to ascertain the coefficient of steamship performance, the following results will be obtained: At 500 revolutions, the coefficient will be 150; at 400 revolutions, the coefficient will be 106; at 300 revolutions, the coefficient will be 131, etc.

In conclusion, the writer has to thank Mr. Thorneycroft, and he thinks the Institution will also thank him, for the readiness with which he has allowed these experiments to be carried out; and more than that, for having made that which the writer believes to be a real step in the science of steam propulsion. And he trusts that these unusual and wholly unexpected results of speed will call the attention of naval architects and engineers to the subject of improving the velocity of large sea going steamers.—*Engineer.*

The Star Depths.

Mr. Richard Proctor recently delivered, at the Royal Institution, a lecture on star depths. He dwelt on the contrast between the ideas which we form from the aspect of the starry heavens, on a calm clear night

> When all the stars shine
> And the heavens break open to their highest,

and the scene disclosed to the mind's eye of the astronomer. Each star, amid the solemn depths, is in reality a sun, instinct with fiery energy and urging its way with inconceivable velocity through space. Nor are these suns exempt from mutation. Several among them are losing year by year a portion of their light and heat, equal to the requirements of our earth, or of the whole solar system even for hundreds of years; others are growing brighter; new stars have appeared, and stars known to the ancients have vanished. Thus the question arises whether our sun, a star like the rest, may not also be subject to changes. If so, the question is one of extreme interest to ourselves, not as directly affecting our wants, but as involving the very existence of more or less remote generations. To obtain a direct answer to the question would require observations of the sun continued with unflagging patience for many years. But indirectly the question may be answered by comparing the present aspect of the heavens with the scene presented to those who first studied the stars. The lecturer then proceeded to inquire whether any traces remain of those features of resemblance which first led the ancients to call certain star groups by certain names. He showed that, though the constellations of the Great Bear and the Lion as at present figured do not in the least remind us of the animals they are supposed to represent, yet the figures of these animals may be fairly traced if we include larger regions of the heavens than the present constellation boundaries permit. For instance, if *Canes Venatici* be included with *Ursa Major* and the three stars at present regarded as the tail (of a tailless animal) be regarded as forming an outline of a part of the back, then we have a figure not unlike a bear. Again, if we regard the group of stars forming the northern claw of *Cancer* as marking the place of the lion's head, the stars in *Leo Minor* as forming the mane, and *Coma Berenices* as the tufted tail of the animal, then the space thus indicated will be found to include a very fair representation of a lion. In like manner the stern of the ship *Argo* is very fairly indicated if the stars forming the hind legs of *Canis Major* are included in the configuration. Hence the lecturer arrived at two conclusions—1st, that the ancients were not solicitous to occupy the heavens with constellations fitted in like the countries in a geographical map; and 2ndly, that the stars exhibit at present the same general configuration which existed when the most ancient constellations were formed. From the second of these conclusions, we may infer that probabilities are on the whole in favor of a satisfactory degree of steadfastness in the sun's luster.

The remainder of the lecture was occupied by an explanation of the general principles on which the determination of stellar distances depends. This introduced the consideration of the enormous extension of the stellar universe when, with distances from star to star so enormous as have been proved to exist, the number of stars is so vast as to be practically infinite. Amongst the illustrations of this part of the lecture was an illuminated diagram showing 324,198 stars; but the lecturer mentioned that the Herschels' 18 in. telescope would show 530 times as many stars and the great Rosse telescope, more than 2,000 times as many.—*Mechanics' Magazine.*

Liebig on Lager.

A correspondent has interviewed Baron Liebig, the celebrated German chemist, at his home in Munich, and gleaned his views upon the lager question. "Beer," said the Baron, "is better than brandy. Man must have a stimulant of some sort. Brandy is a great evil. We find that the consumption of beer is making great headway even in wine districts—for instance, in Stuttgart. As a nourishment, beer takes a very subordinate place, not higher indeed, than potatoes; and we find that in no city is there such an amount of meat consumed as in Munich, where the greatest quantity of beer is also consumed. Beer must have meat or albumen. Before every beer cellar in Munich, you will find a cheese stand. Why? Because in cheese you will find that albumen which in beer is lacking. Therefore you see that beer and cheese go together by a law of Nature! But as an article of nourishment, beer is very subordinate. Schnapps is a great misfortune, and destroys the working power. Through our late war, we have won great respect for tobacco, tea, coffee, and extract of meat. A physician told me that, when the wounded would take nothing else, they have grasped at cigars; their eyes glistening—they felt a lifting up of the sinking nerves. Tobacco must have this effect. We could not do our wounded, frequently, a greater service than by giving them cigars. And we came to the conclusion that tobacco was valuable to us." Baron Liebig evidently looks to America for an improvement in beer and the perfection of beer drinking. Said he: "It is a peculiarity of Americans that they make everything better than we do. I am convinced that American beer will, in time, be better than German. With us everything remains as it was. The worst beer brewers are in Bavaria—though it was earlier the best. And why? Look into our brewery system. The brewers are only ignorant people, who brew good beer from routine alone. They are incapable of helping themselves. But as soon as the Americans get any thing from us they improve upon it, and we get it back again as an American discovery."

Arabian Mode of Perfuming.

How the Arab ladies perfume themselves is thus described by Sir Samuel Baker in his work on the Nile: "In the floor of the hut or tent, as it may chance to be, a small hole is excavated sufficiently large to contain a champagne bottle. A fire of charcoal or simply glowing embers is made within the hole, into which the woman about to be scented throws a handful of drugs. She then takes off the clothes, or robe which forms her dress, and crouches over the fumes, while she arranges her robe to fall as a mantle from her neck to the ground like a tent. She now begins to perspire freely in the hot air bath, and the pores of the skin being open and moist, the volatile oil from the smoke of the burning perfumes is immediately absorbed. By the time the fire has expired, the scenting process is completed, and both her person and her robe are redolent with incense, with which they are so thoroughly impregnated that I have frequently smelt a party of women strongly at full a hundred yards distance, when the wind has been blowing from their direction. The scent, which is supposed to be very attractive to gentlemen, is composed of ginger, cloves, cinnamon, frankincense, and myrrh, a species of sea weed brought from the Red Sea, and lastly the horny disc which covers the aperture when the shell fish withdraws itself within its shell. The proportions of these ingredients in this mixture are according to taste."

THE support of one of the large tuns of ale in Coolidge, Pratt & Co.'s brewery, containing from 400 to 500 barrels of boiling beer, recently gave way all of a sudden, letting the vat fall and spilling the beer. Loss, $4,000.

BEETLES.

That class of insects which naturalists term *coleoptera*, and in common parlance are known by the name of beetles, seem to have been studied with more interest and care than most other entomological species spread over the globe.

The individual species of *scarabæi* may be divided into seven principal classes; of which the first, that of the *cetoniidæ*, comprehends a series of beautiful insects, which feed on the juices of flowers. The golden beetle is one of the most charming; the country people call it the king of the beetles. It is of a golden green, with white spots; when it flies in the sun, scarcely raising the elytra, its whole body sparkles like polished metal. During the summer months, it lives in gardens, always choosing the most brilliantly colored flowers on which to rest; it penetrates to the heart of the roses and peonies, or settles on the petals of the honeysuckle, which it eats, sucking the honeyed liquid. It is perfectly inoffensive, does no harm to vegetation, and has not the unpleasant smell which belongs to many of the tribe. The females lay their eggs at the foot of trees among decayed wood, or even in the nests of ants. Here the young larvæ find their nourishment in woody morsels for three years, and then construct their cocoons, from which, in due time, the beetle emerges. One beautiful kind, found in the Philippine Islands, is so much admired by the ladies that they are kept as pets in small bamboo cages. The Brazilian species are of an immense size, and may be seen resting under the leaves of the maize plantations, or flying round the tops of the tallest trees. These, again, are surpassed in size by the Goliath, which is peculiar to tropical Africa. Collectors have been so anxious for specimens, and found them so difficult to obtain, that as much as fifty pounds has been given for one of these insects, which are the common food of the natives, when roasted.

The sacred beetle of the Egyptians belongs to the *coprinæ*; its singular instincts had, without doubt, much astonished them, for it is found on the most ancient monuments in the land of the Pharoahs, depicted on amulets, placed on sarcophagi, and treated with the greatest veneration by the dwellers on the banks of the Nile. They were an agricultural people, and valued these great black insects for their habit of clearing away noxious substances. An oily substance which they secrete keeps their skins bright and glossy, so that none of the dirty matter among which they live can adhere to them. The fore feet are armed with spines, whilst the hind ones are much longer and suited for the work they have to perform. The care which the female takes for the preservation of its eggs and the development of its larvæ is very curious. Instead of simply hiding them, like other beetles, in a lump of mud or some little cavity where the egg is laid, she surrounds it with manure, and rolls it up into a little ball with her hind legs; soon it is a solid, well kneaded mass, with the egg in the center. Already a choice has been made of a suitable place where the larvæ, when hatched, can find a living. Towards this point she sets out, rolling the ball before her; meeting with some obstacle, or a rough piece of ground, she places the lump on her broad head, and thus carries it over. But should it prove insurmountable, she flies off to seek other aid, and soon returns with five or six others, who assist her by pushing on all sides, and thus carry the precious burden to its destination. Then the hole must be dug in which to deposit it—the fore legs now come into play, being especially formed for spades,—and when it is deep enough, the ball is rolled in, the hind legs brush down the earth, and every trace of the hole disappears under the parent's indefatigable labor.

Among the class of the *melolonthidæ*, the common cockchafer may be regarded as the type of the whole, and a very redoubtable enemy it can prove itself to be. In some years, it appears during the month of April in prodigious numbers; its life lasts until June; and during all this time it is preying on the leaves of various trees,—the maple, poplar, birch, beech, and oak. But it shows a marked preference for the elm, so that in France the peasants call the flowering and fruit buds "cockchafer's bread." It is not uncommon to see whole forests on the Continent entirely bare of leaves in the spring months, having been eaten up by these insects. But this is a slight evil compared with what they have already effected underground, by living on the roots of cereals. The various metamorphoses of the insect in its underground life last for three years, during all which time it displays a wonderful voracity. When the females are ready to lay their eggs, they choose a light, well cultivated soil, and, burying themselves in it, perform their task. There are generally about forty young ones, which burst the shell in thirty days. Nature has armed them with powerful mandibles and a forked tooth, so that they set to work at once.

After a warm day, when they have been tempted nearer the surface, whole fields, covered with green shoots, are at once changed into dried-up withered leaves and stems. The roots of the vegetables, grain, or colza, have been eaten and soon perish by the same means. For this reason, the habits of this kind of beetle have been made a peculiar study on the Continent, especially where their ravages are so much dreaded.

When the ground is in course of preparation for receiving the seed, in the months of September and October, almost all the larvæ are near the surface; taking care not to plow the ground too deeply, they will, in most cases, be turned up, and the harrow, energetically used, will destroy the greater number; if, however, the plow is too deep, they will only be buried.

The Sexton beetles are well known throughout Europe, and are so called from their living on the bodies of any animal they can find. Should a dead mouse or mole be left in a field, they collect in large numbers around it; and as their intention is to lay their eggs in it, and so provide suitable food for the larvæ, they proceed to bury it, that it may not dry up or be eaten by other animals. Hollowing the ground beneath and throwing out the earth, the animal gradually sinks down and is covered with the surrounding soil. About twenty-four hours suffice to conceal a mouse. The eggs are speedily laid, and the larvæ feed upon the putrid flesh until they are full grown, when they descend into the earth for three or four feet and undergo their metamorphoses. There is a very curious tribe found in Brazil, the body being immensely distended and lying on the top of the back. They are generally found in the nests of the white ants, and do not lay eggs, but produce living larvæ. The Bombardier beetles derive their name from the apparatus of defence with which they are provided. Their habit is to hide under stones in large numbers, and when the stones are disturbed, they eject a quantity of vaporous fluid with a loud noise; it is pungent, acrid, and volatile, becoming a bluish vapor when mixed with the air. Chemical tests prove it to be a strong acid, which will produce a sense of burning on the skin.

It is to the family of beetles that the *cantharides* belong, which have been used by the medical profession from the days of Hippocrates and Aretæus. Not unlike them in appearance are the pretty glowworms, which light up the grassy banks of our southern hedgerows during the summer nights. It is the female only that possesses the phosphorescent light, which it can withdraw at pleasure; and it is not furnished with wings, so that its appearance is more like that of a larva than a beetle. Some species find their home in timber or planks, instead of the ground. Every one knows the small holes which are seen to be drilled through the wooden floors of old houses: these are made when the larvæ change into beetles; and as they are nocturnal in their habits, they discover their whereabouts to their companions by striking their mandibles against the wood. From this simple noise has arisen the superstitious dread of invalids and nurses, who, in the dead of the night, hear the death watch, and consider it as a summons to another world. Elm trees suffer greatly from the attacks of a beetle of this class, whole forests being sometimes laid low under its insidious labors. The female makes a gallery beneath the bark, and, boring side alleys, lays an egg in each; when hatched, the young ones eat away in regular directions until the whole tree is pierced. In tropical countries, the larvæ are of a much larger size, and their ravages are more serious. The Titan, which is found in Guiana, revels in the undergrowth of that hot, damp district, where vegetation is exuberant; and the mimosa trees in the West Indies have their young shoots destroyed by a *lamia*. M. Houllet, who once lived in the neighborhood of Rio Janeiro, heard the sound of falling branches of trees belonging to the *acacia* every night. On examination, he found they were sawn all round, but the pith was left untouched, so that they broke from their own weight when the wind blew upon them. It was supposed to arise from the mischief of the slaves; but on cutting into the branch, the larvæ of the *oncideres* were found, and the beetle had, no doubt, cut round with its powerful jaws, to prevent the sap flowing in, which would interfere with the growth of its young.

In such a numerous family, only the most curious examples have been selected; but we may just mention the ladybirds as belonging to it, as they are such favorites with little children. These pretty insects are common in all quarters of the globe, and are very valuable in checking the swarms of insects which infest roses and other plants. It is not in the adult state that they eat much; but the gray larvæ may be seen creeping up the stems, and swallowing the lice in regular order. During the last few years, immense numbers have appeared in the south of England, and have been described as extending in dense masses for miles. In conclusion it may be said that the uses and instincts of beetles are most wonderful. Plants grow too fast, and the larvæ settle on them; with wonderful appetite, they eat incessantly, and make haste to reach their full size. They fertilize the soil by scattering decomposing matters, and thus prevent them from vitiating the air; while their gorgeous colors compete with those of the floral world and add to the charms which Nature offers to the observer.

Mineral Sperm Oil.

This is a burning heavy oil made from petroleum; and its valuable properties as a safe illuminating agent are such as to render this product one of very great importance. The following statement of its discovery and character is given by Mr. Joshua Merrill:

"In the summer of 1869, in connection with Mr. Rufus S. Merrill, I made an important discovery relating to burning heavy or paraffin oil in lamps, for illuminating purposes. Mr. R. S. Merrill is a skillful mechanic who has devoted himself for several years to perfecting the construction of lamps and burners for hydrocarbon oils. While experimenting upon an apparatus for burning paraffin wax, with a view to increase the light from this beautiful substance over that obtained from common candles—the only form in which paraffin is burned—he one day put some lubricating oil into the lamp, instead of the paraffin wax, and we were both much surprised at the good qualities of the light yielded by it. But, after experimenting some days, we found this heavy oil to be impracticable as an illuminating material in its present form, and that some modification would be necessary. It occurred to me that if this heavy paraffin oil was passed through a partially destructive distillation, cracking it enough to lessen its viscidity but not enough to render it volatile, its increased mobility would cause it to ascend the wicks freely, and yet preserve its character as a fixed oil.

"After many trials, I obtained the product now called 'mineral sperm oil,' which is sufficiently thin to fill the wicks perfectly; but it is so far from being a volatile oil that it is comparatively inodorous, and will not take fire at any temperature below 300° Fahr., or nearly 100° hotter than boiling water. Flames of considerable size, such as a large ball of wicking yarn saturated with oil and ignited, when plunged beneath the surface of this oil, previously heated to the temperature of boiling water, are extinguished at once. It burns freely in the German student lamps, and with great brilliancy from the 'Dual' burner."

The manufacture of this oil is patented in this country and in Great Britain; and Mr. Merrill estimates the quantity that may be made as at least one quarter of the whole production of petroleum, or 160,000 gallons of the mineral sperm oil every day—a quantity more than twice that of the whale and sperm oils, obtained in the best days of the whale fishery of this country.

The present time, when government authorities and scientific men are so generally cautioning against the "dangers of kerosene," and just as French *savans* have discovered that certain heavy petroleum oils may be burned in lamps, seems peculiarly opportune for the introduction of this product of American skill and invention—namely, a hydrocarbon, or a mixture of hydrocarbons, which seems to fulfil all the requirements of an oil to be burned in lamps, yielding a steady, brilliant, and safe light. And practical indications of its appreciation may be found in the manufacturer's announcement that the demands for this mineral sperm oil are steadily increasing. It is used on ocean steamers plying between the United States and Europe, and also on several railroads.

Metal Coated Sheet Iron.

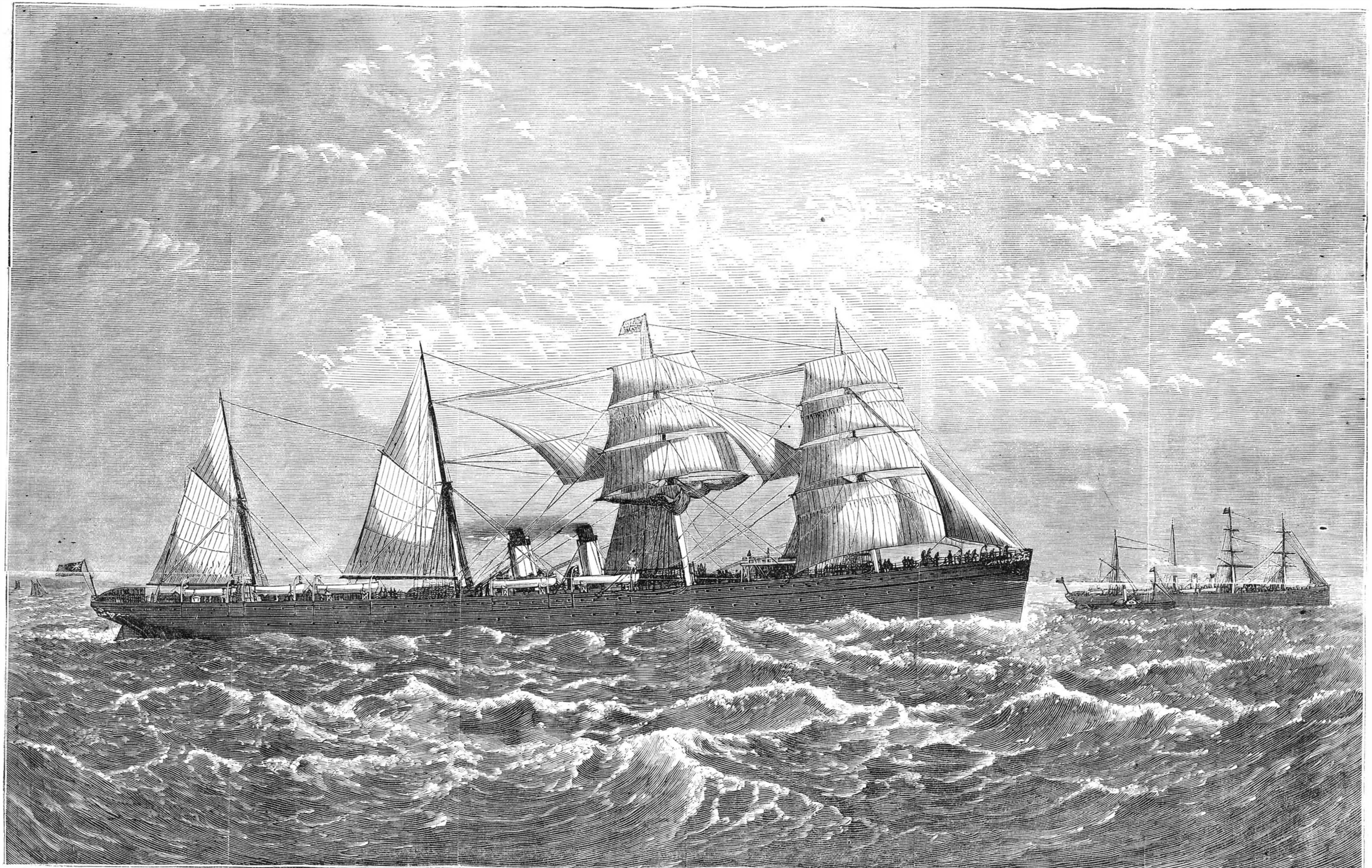
An improved method of protecting iron from injury and deterioration has been introduced by Mr. B. Morrison of Philadelphia, whose invention consists in deoxidizing the scale oxide adherent to sheet iron, and amalgamating, blending, or intimately uniting with it any of the softer and more fusible metals, so as to render such scale oxide more flexible, soft, adherent, and less liable to rust, and the sheet iron also more perfectly annealed and flexible. It is essential that the sheets be made of the best charcoal bloom iron, and that the scale oxide thereon be even, or of uniform thickness and unbroken; and in order to produce such a scale oxide, it is recommended that the usual rough and imperfect scale be removed—by means of a weak acid, in the usual manner practiced in the process of coating sheet iron with zinc by immersion—and that the sheets be then passed between a pair of smooth pressure rolls, and finally subjected to a sufficient heat to produce thereon a new and uniform scale of oxide.

Having prepared saturated or strong aqueous solutions (say) of sulphate of zinc, chloride of zinc, chloride of tin, acetate of zinc, acetate of lead, and of any other readily fusible metal that will amalgamite, unite, or combine with the deoxidized scale on the iron at a strong or bright red heat under the hydrogen or carburetted hydrogen gas, immerse the deoxidized sheets in either one or a mixture of two or more of the said solutions for five or ten minutes, or apply the same by rubbing it on by means of a sponge or rough brush; let the excess of solution drain off, and the remainder crystallize or dry upon the surface of the sheets. Now place them in a box in the heated chamber of a furnace; then introduce the hydrogen gas, and slowly heat up to a scarcely visible red, maintaining the said low heat for (say) half an hour, more or less, to allow a perfect reduction of the oxide of the applied solution; after which the heat should be increased to a bright red, or heat a few degrees above that which may be required to fuse the now reduced softer metal and cause the same to amalgamate, blend, or unite with the deoxidized and, consequently, soft and porous scale on the sheet iron.

To obtain brightness of surface when desired, it is proposed to pass the sheets severally between and in contact with a pair of cylindrical rapidly rotating bristle brushes; and, if afterward intended to be put up in packs for storage or shipment, the sheets may, as a further protection against dampness, be dipped into any suitable hydrocarbon oil, and then the superfluous portion drained or wiped off. The solution of the sulphate or of the acetate of zinc forms, with the deoxidized scale on the iron, an excellent coating. About three parts of the solution of chloride of zinc mixed with two parts of the solution of chloride of tin make, with the deoxidized scale on the iron, an excellent flexible coating of a whiter color. Three parts of the solution of the acetate of zinc, mixed with two parts of the solution of the acetate of lead and one part of solution of the chloride of tin, make, with the deoxidized scale on the iron, a very suitable coating for sheet iron intended to be used in the construction of stoves, stove pipes, coal hods, etc.; but as the predominant metal in the coating is the deoxidized scale oxide of iron, the number and proportions of solutions of whatever metals are intended to be applied thereto may be increased and varied as the coating desired may require.

Germination---Its Relation to Light.

The theory of the germination of plants, which has been heretofore admitted, requires that the germinating seed be excluded from direct sunlight. Late experiments appear to establish the fact that, while exclusion from the luminous rays of the solar spectrum is necessary to the healthy germination of seeds, yet the chemical or actinic rays are indispensable to that process. These penetrate much deeper into the soil than do the luminous rays. The exclusion of the chemical rays, and not the absence of oxygen alone, is assumed to be the cause of seeds failing to grow when buried too deeply in the earth. Will our agricultural colleges settle this question by careful experiments? Let us have all that can be known of the mysteries of plant life.



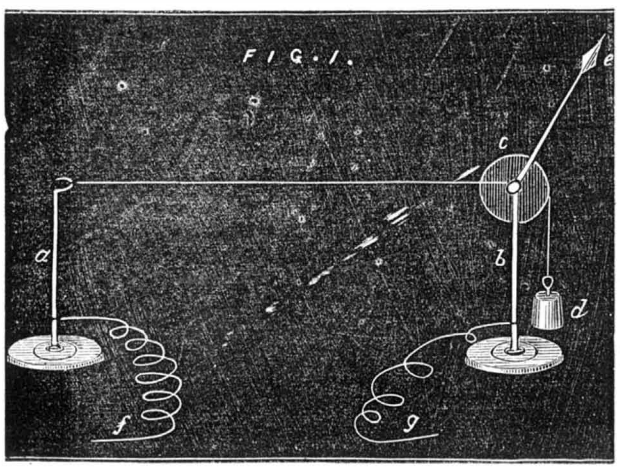
THE NATIONAL STEAMSHIP COMPANY'S STEAMER "EGYPT."—[See Page 364.]

HEAT AND LIGHT.

[Report of a recent lecture by Professor John Tyndall, before the Royal Institution.]

History shows us two different philosophical schools trying to account for the visible universe. The one school bases itself upon speculation, and the other on observation and experiments, the one trying, as it were, to develop a universe out of its own consciousness, the other seeking patiently after the outward facts of the universe, and through them after the principles that connect them. It is needless to say that in our day the school of experience has gained the upper hand. Indeed it is common, in philosophical books, to say that, in the investigation of Nature, you cannot go beyond experience. Take the idea of atoms, for example. No doubt this notion was first derived by the ancient philosophers from the observation of small sensible particles of matter. But in transmuting them to atoms, they so diminished the size of these particles as to place them entirely beyond the boundary of experience.

Most physical minds of the present day believe in atoms and molecules, or groups of atoms, though none of us have ever seen either atoms or molecules. In fact, you can have no explanation of the objects of experience without invoking the aid of objects lying beyond experience; we cannot possibly reach the roots of natural phenomena without the help of atoms and molecules. We figure them as the constituents of all bodies.

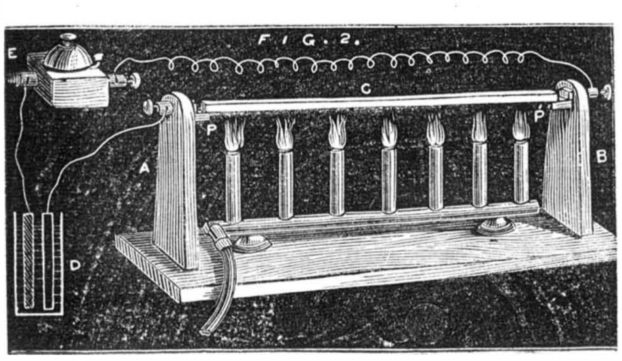


It is the play of the power we call heat among these atoms and molecules which is to occupy us during these lectures. In front of the table is stretched a platinum wire, which can be warmed by passing an electric current through it; the wire passes over a wheel, to which a straw index is attached, and a small weight is hung at the end of the wire. You are to figure that wire as an assemblage of atoms, held near each other by their mutual forces, but not in contact with each other. Heat forces them more widely apart.

The platinum wire stretched between the two stands, *a b* (Fig. 1), is lengthened when it is heated. This can be done by causing an electric current to pass through it. The wire is fastened to the hook at the top of the stand, *a*, and is carried round the axle of the small wheel, where it is made fast; over the periphery of the wheel is a cord from the weight, *d*, which keeps the wire in a state of tension; to the wheel itself is fixed the straw with a paper attached to it to act as an index, *e*. The platinum wire is pulling in one direction, and the weight is pulling in the other direction, but if the platinum wire is released the weight will instantly predominate, and the index will fall. That it does so is shown by pressing the top of the stand, *a*, towards *b*; now, making contact with the wires from a battery, at *f* and *g*, the wire becomes hot, and the index falls. Stopping the current, the wire contracts, and the index comes back again.

But here electricity might be supposed to have something to do with the effect.

Here are two wooden stands, A and B (Fig. 2), with plates

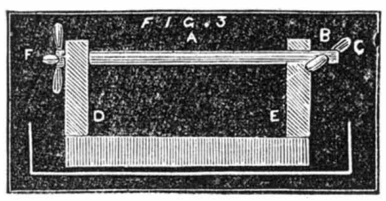


of brass, P P', riveted against them. At present the bar of iron, C, is not long enough to stretch from one support to the other. I will support them on two little projections of wood attached to the stands at P P'. One of the plates of brass, P, is connected with one pole of a voltaic battery, D, and from the other, P', a wire proceeds to the electric alarm bell, E; and again from that instrument a wire returns direct to the pole of the battery.

At the present moment the only break in the circuit is due to the insufficient length of the bar of iron to bridge the space from stand to stand. Underneath the bar is a row of gas jets, which I will now ignite; the bar is heated, the metal expands, and in a few moments will stretch completely across from plate to plate. When this occurs, the current passes and the signal bell rings, as you hear. Throwing a little water on the bar, after the gas is extinguished, the bar shrinks, the circuit is broken, and the bell ceases to sound.

The contraction of a bar of metal, which has been heated, is a very powerful force. The contractile force of cooling has been applied by engineers to draw leaning walls into an upright position.

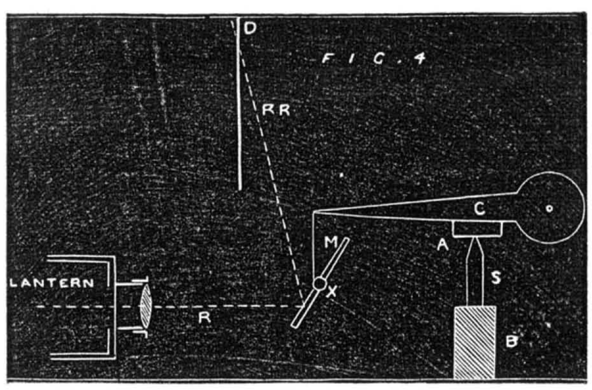
The bar of iron, A (Fig. 2), is red hot; it has a hole through it at B, through which the cold bar of steel, C, is inserted; it is then dropped into the Y shaped supports, D E, and screwed up tight by the thumb screw at F; the whole arrangement stands in a trough; and water being poured over the bar, A, it contracts, and does so with such an exertion of force that the bar at B is broken into two pieces.



But bodies expand in very different degrees, and it is necessary to devise instruments which are capable of measuring very small changes of volume. Among the most delicate of these is the apparatus before you. At the bottom of the sketch, Fig. 3, B represents the upper end of an upright bar of metal; on the top of this bar rests a little brass stem, S, the top of which acts as a fulcrum to the plate of agate, A. The arm, C, above the plate, moves on a pivot, which you see marked by a dot; a very little pushing of this arm causes it to move through a greater space than the body which pushes it. Attached to this arm is a piece of the hairspring of a watch, and that is carried round an axis, X, upon which is a mirror, M, upon which a beam of light, H, is made to impinge. Now, if you conceive the end of the bar to be lifted, and to push the arm upwards, it will cause the mirror to rotate, and the beam will travel with it, but with twice its velocity. Thus, in this experiment, instead of a straw, a ray of light is used as an index. It is exceedingly sensitive; clasping the bars of metal with both hands causes a sufficient elongation to bring the luminous index from the ceiling to the floor. Pouring a little alcohol upon it causes, by its evaporation, sufficient chilling to send the index back with great velocity; again clasping the bars, it is again brought downwards.

Putting tires on wheels, while they are still hot, is a familiar example of the way this contractile force is utilized.

Thus we make ourselves acquainted with the sensible fact of expansion. We are here in the domain of experience, but there is something within us which prevents us from resting there. What is the internal mechanism which produces this expansion? Here, again, we must help ourselves to conceptions by reference to the visible world. An experiment will make the matter clear.



On heating this flaccid bladder over a ring burner, turning it in the hand at the same time, it becomes smooth and tight.

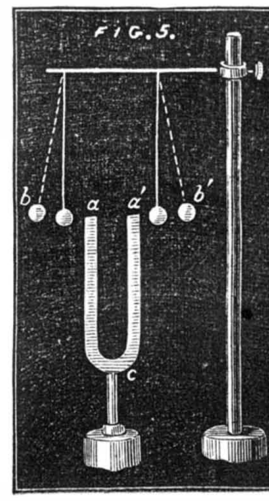
In a very natural way, this fact of the expansion of atmospheric air was transferred from the region of experience into the region of atoms and molecules. It was assumed that the atoms were surrounded by atmospheres—atmospheres of heat or caloric; and the expansion of bodies by heat was supposed to be due to the swelling of these atmospheres. We have here that theory of heat which regarded heat as a free elastic matter, surrounding the atoms of molecules of bodies as the atmosphere surrounds the earth.

We can, as I have already said, make no attempt at explaining natural phenomena without resorting to a mental imagery of this kind. The first effort at explanation is an effort of the imagination. But having assumed a distinct and definite cause, it is a duty, which Science never neglects, to verify or confute the assumption by comparing its consequences with observed facts.

The notion of calorific atmospheres was thus tested and found wanting; and it was the founder of this Institution, whose life and doings have been recently sketched so admirably by Dr. Bence Jones, who offered the most striking experiments and the most powerful arguments against it.

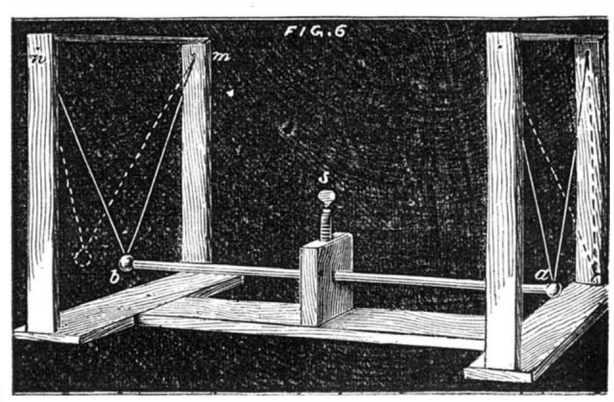
Count Rumford contended that heat could not be a kind of fine matter, because its supply by friction is inexhaustible, which matter is not. He contended that his experiments proved heat to be motion. And there was another great name, also associated with this Institution, who soon afterwards rendered it in the highest degree probable that the origin of light was a vibratory motion; and inasmuch as heat resembles light so closely, and in most cases preceded and accompanied it, the notion became irresistible that heat also was a kind of vibratory motion.

But how on this assumption is expansion of bodies by heat to be accounted for? Well, it requires no great effort of the imagination to see that when the atoms are oscillating to and fro, they require a greater amount of room than when they are at rest. In this one case the atom occupies a space measured by its own diameter; in the other it virtually occupies the line along which it oscillates.



Though the amplitude of a vibration be very small, its intensity may be great; striking a tuning fork, it is set in vibration, but the vibrations are so minute that they are well nigh imperceptible. If, however, two cork balls are suspended, as at *a a'*, Fig. 5, about a quarter of an inch away from each limb of the tuning fork, *c*, the greater space required by the fork when in a state of vibration is shown by the violence with which the balls are thrown to *b b'*.

Another example is furnished by the brass rod, *a b*, Fig. 6. When rubbed with a piece of flannel, having some powdered resin sprinkled on it, it is thrown into longitudinal vibration. The center, *s*, is a node, and remains still; but the two free halves elongate and contract in rapid alternation. I apply the rubber more briskly, and the balls *a* and *b* are thrown off with violence every time they come in contact with the ends of the rod.



In this case the amplitude of the vibration is so small that no eye can detect it, and still it is capable of projecting the ivory balls violently into space.

But the energy of those small vibrations to which we give the name of heat is immensely greater.

Dip the hand into a finger glass until the water in it is warmed one degree. An amount of energy is withdrawn from that hand sufficient to project that water to a hight of 772 feet, or if the degree be centigrade, to a hight of 1390 feet above the earth's surface—three times the hight of St. Paul's.

Let us follow this vibratory motion to its consequences. As the temperature of a solid body increases, its atoms oscillate more and more widely, the body in consequence expanding more and more. A point, or temperature, is at length attained when the hold which the atoms of the most refractory bodies exert upon each other is so loosened that the atoms are enabled to glide round each other with freedom. When this occurs, the liquid state sets in. You must not imagine cohesion destroyed in liquids, for very strong cohesive power may be associated with the power of free liquid sliding of the atoms over each other.

In the body of a liquid, each atom or molecule is surrounded on all sides by its neighbors, and thus prevented from flying away; but it requires no great stretch of imagination to see that at the surface, where on one side they are entirely uncontrolled, the molecules may be jerked away from the liquid altogether. This, in fact, is the conception of the vaporous or gaseous state of matter now prevalent. The temperature of gases—that, in fact, which keeps them in a state of gas—is supposed to be a motion of translation instead of a motion of vibration. The gaseous molecules fly through space; striking against the surfaces by which they are surrounded, striking against each other—and recoiling like little elastic balls. Here, for instance, is a vessel covered with india rubber, which is now quite flat. The air, according to this new conception, is hitting the opposite sides of the india rubber with equal force. It is, therefore, in *equilibrio*, and will remain so till the forces on the two sides become unequal.

Placed on the plate of an air pump, directly exhaustion of the air within the vessel commences, there is a loss of projectile energy on the part of the air in the interior, and the air on the exterior, retaining all its original power, drives the india rubber before it, forming a hollow within the bell glass of the air pump.

The pressure of the atmosphere being known, and the weight of the gases that compose it being known, it is easy to calculate the velocity with which the atoms must strike against a surface in order to produce the pressure. Of course the lighter the atoms, the greater must be their velocity.

The velocities of the following gaseous atoms at 32° Fah. are:

Oxygen........................	1·514 feet a second.
Nitrogen......................	1·616 " "
Hydrogen......................	6·050 " "

If the gases be heated, their velocity is augmented and the pressure correspondingly increased.

Extreme care is necessary in determining the coefficients of expansion. Such constants are the foundation stones of science; and no higher sincerity was ever exercised by man than in determining them.

Examples of solid coefficients:

Copper	from 1·000,000	expands to	1·000,017
Lead	" 1·000,000	"	1·000,029
Iron	" 1·000,000	"	1·000,012
Zinc	" 1·000,000	"	1·000,029
Glass	" 1·000,000	"	1·000,0080
Platinum	" 1·000,000	"	1·000,0088

The last is almost the same as that of glass: hence the possibility of fusing platinum into wires with glass tubes for eudiometric and other purposes. Were the coefficients different, the fracture of the glass would be inevitable during the contraction in cooling.—*Mechanics' Magazine.*

THE STEAMSHIP "EGYPT."

Our full page engraving represents the steamship *Egypt*, a splendid vessel lately built at Liverpool for the Atlantic National line of steamers.

She is 450 feet 6 inches in length, which is more than two thirds as long as the *Great Eastern;* her breadth of beam is 44 feet, and depth of hold 36 feet. She registers 5,150 tuns gross. Her engines are on the compound principle, and are of 3,000 horse power. They are supplied with steam by six double boilers arranged in two sets of three each, which carry a pressure of 75 pounds to the square inch.

She is a complete four decker. Her spar deck is flush fore and aft, the cabin entrances and skylights being the only obstructions on it. This and the deck below are plated with steel and planked with pine. The two lower decks are plated with iron amidships, where the general strain of the machinery is felt, and are also planked with pine. She carries four masts and two funnels. Her ability to spread canvas equals that of any vessel afloat, while her rate of steaming is fourteen knots an hour. The lower masts are of iron, and the lower yards and lower topsail yards are made of steel. She has steering apparatus amidships as well as aft, and is provided with five steam winches, which work the pumps, hoist the sails, and load and discharge the cargo. The saloons, staterooms, and officers' rooms are heated by steam pipes. Between the spar and main decks are accommodations for all the first class passengers, officers, and crew, besides cooking galleys, ice houses, etc.; and the entire space between the main and next lower deck is left free for the steerage passengers.

The workmanship throughout the vessel is of the highest class, and her construction is such that more than ordinary comforts are afforded to the steerage passengers.

Sensible Suggestions about Patents.

Mr. Wm. T. Hamilton, writing to the *Engineer*, gives expression to some very practical ideas on the Patent law question now before Parliament. His suggestions apply with equal force to the American Patent law, which is based on that of England. He says:

The simple system which I would propose would be that every inventor should have patent protection, as, of course, for certain proper periods, for every invention or alleged invention, no matter whence he may have taken the primary idea. I would give him protection, not only for his own original ideas, but for utilizing the abandoned ideas of others. Why not? It would hurt no one. This patent right should of course be defensible upon its being shown by any one else that he had had the same idea in practical operation prior to the date of the patent. Here commercial user would find its proper place. It would of course save to the public every useful invention now in operation; it would in jure no one, while it would open a wide field for inventors.

Thus, then, the only patent question which would arise would be one of priority of practice. This would always be a simple one, even for the county court. The issue would be not whether perhaps abstract ideas were original, but whether palpable processes were identical, and which of them had been first used. Commercial usage is notorious and of easy proof. I would thus take commercial usage not as the basis of protection, but as the element by which to prove priority; such a system would have the great charm of being almost self acting. The mere existence of such a public counterpoise would keep inventors in the right path for their own sakes. What they now fear is not what is in the light, but what is in the dark. By all means let there be competent authorities to settle these questions of priority in the last resort. The judge of the county court might be stupid; or some cases might involve very nice distinctions as to the application or principles or as to identity, or as to what is or is not essential in a scientific point of view. Let there also be libraries and museums and open registries, carefully classified, with every other possible source of information, free to inventors upon their own seeking. Let our system be for affording, not for forcing instruction; for encouragement in every direction, not for prohibition in any. Do not let us degrade what has higher grounds upon which to rest into a mere notice board against trespassers, which any preliminary inquiry, if coupled with the condition of originality, could alone be.

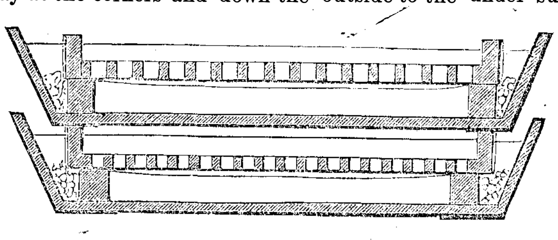
Give inventors all possible information not now accessible; give them all possible liberty, but do not meddle with them until others complain that they have taken what previously belonged to those others. Let relative rights be adjusted as all other rights; self interest will do the rest.

If England expects to maintain her inventive superiority, she must boldly open up every possible source of thought, old or new. She must break up some of the old, worn grooves in which we are now too prone—or, perhaps, too much compelled—to move. Let her, above all, give back to the inventors of the future the vast stock of thought put upon a now useless record by the inventors of the past. It would be like shedding a new light over the scene of inventive exertion.

A New and Simple Continuous Battery.

Professor Bottomley, of the Glasgow University, thus describes a new battery in use in that institution:

A shallow wooden tray, square and with slightly slanting sides, is lined with sheet lead; and this, after being electrotyped with copper, forms both the containing vessel for the liquids and the copper plate of the cell. Copper trays were used at first, but they were soon eaten through by the solution. The lead is not attacked at all. The length of a side of the lead tray is 21 in., and its depth is 3¾ in. In each corner is set a small block of wood 1½ in. high. The zinc plate, which is like a square gridiron, rests at its corners on these blocks. The zinc has parchment paper tied round its lower surface and sides. The cell is filled up with saturated solution of sulphate of zinc, and crystals of sulphate of copper are dropped in, when required, round the edges outside the parchment paper. For connecting these cells together in series, the lead lining is carried over the wooden tray at the corners and down the outside to the under surface of the bottom of it. Here it is soldered to a small squar of thick sheet tin. The cells are piled up one on the top of the other, the tin plates of the second cell resting on the first, and so on. The tin connections—a suggestion of Mr. Varley—are most excellent. Two of these cells are shown in section, Fig. 5. The resistance of each of these cells is on an average 0·19 of an ohm. They are now used at all the telegraph stations where Sir William Thomson's siphon recorder is employed.

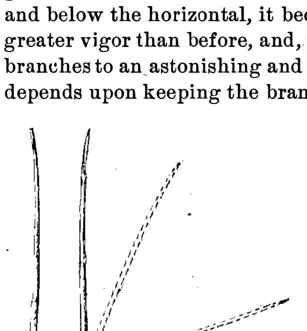


In using these batteries in a laboratory, where they are not perpetually at work, the best way of managing them may possibly be not to charge them with sulphate of copper except when they are about to be used, and only to put in as much as will do the work required. To calculate the quantity is easy; and any small excess might be worked off through a low resistance. We have been keeping them at work almost night and day. They require no attention except to be occasionally supplied with sulphate of copper crystals, and to have the sulphate of zinc that creeps up over their edges wiped away with a cloth.

At present our battery is tested very frequently, generally once in four or five days. The electromotive force and the internal resistance of each cell is determined. We have now had the greater number of the eighty cells in action for three months, and some of them for five or six months. During all that time they have been most satisfactory, the electromotive force of them having remained perfectly constant.

Increasing the Vigor of Growth in Plants.

It has been known for some time that if two branches of a fruit tree be selected, of about the same size and the same upward inclination to the horizontal plane, and one of these be bent downward toward this plane, it appears to lose its vigor, while the other gains in like ratio. It is now announced as the discovery of an ignorant peasant on the Danube, named Hooibreuk, that this law holds good only up to the horizontal position; and that if the branch is depressed still further. and below the horizontal, it becomes characterized by much greater vigor than before, and, in fact, will put out leaves and branches to an astonishing and unheard of degree. But this depends upon keeping the branches as nearly as possible in a straight line, the effect being measurably lost with a considerable curvature. In this case, only the buds which occupy the top of the arc are developed completely, at the expense of the rest which remain in their original condition, contributing neither to the extension of foliage nor of fruit. (The successive positions of the branch are illustrated in the cut.)



Duchesne-Toureace, in communicating these facts to *Les Mondes*, attempts to show the causes which seem to determine so great a flow of sap to the branches inclined below the horizontal line, and thinks that the explanation is to be found in the establishment of a siphon arrangement, by means of which the juice is carried over the bend from the main stem in excessive flow. Be this as it may, the fact remains, as illustrated by an experiment prosecuted by this gentleman. In early spring, when the sap was running in the vines, he took four plants of about the same size, and trimmed them so as to leave one stem to each, these being arranged vertically and obliquely upward, and horizontally and obliquely downward. He then cut off the stems and collected and measured what exuded, and found the amount from the branch inclined downward was more than three times greater than that from the others.

CAR VENTILATION.—A correspondent of the *Car Builder* calls attention to the fact that the problem of car ventilation is still unsolved. Whoever can invent a simple and effective system for the ventilation of railway cars will be likely to reap a good reward.

Correspondence.

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

Testing Turbines.

To the Editor of the Scientific American:

I have read all the efforts to illuminate the turbine question that have appeared in the SCIENTIFIC AMERICAN.

In the last one there are some noticeable points, by R. H. A., on page 228 of the current volume, who puts forth some quite curious ideas in relation to the efficiency of turbines; with some of which I must beg to differ. These differences may not be very important; they are certainly entitled to some consideration as historical facts or well demonstrated theories. It is very true that all engineers concede a difference of percentage with extreme variations of head; but what that proportionate variation in head and percentage is has never been satisfactorily determined. Natural causes are known to modify the efficiency of the same turbine under extremely high or very low heads. The extent to which some of these causes affect the efficiency may be readily computed and proved by actual test. That some turbines work much better under low than under high heads is no doubt true. Whether there are some which work the better under high heads remains to be proved.

That a properly formed turbine will work equally well under considerable variations of head, is certain. The following extract, from the report of some carefully made experiments, proves this beyond a doubt:

Head in feet.	Relative speed.	Efficiency.
11·772	·709 per cent.	·802 per cent.
11·952	·686 "	·802 "
11·995	·730 "	·804 "
12·175	·702 "	·808 "
13·016	·745 "	·804 "
14·084	·731 "	·804 "
14·410	·746 "	·803 "

In these seven experiments, the variation in efficiency is six tenths of one per cent. The variation in head was ·224 per cent, and the variation in relative speed was ·087 per cent. "That more patents are yet to be obtained before the best effects can be had" is quite novel; the utility is less apparent, though by substituting "will," for "can," the truth would certainly be told. It is very doubtful, to say the least, if results higher than have already been obtained depend on patentable devices. It is quite safe to say, that no material progress has been made, in the efficiency of first class turbines, during the last half century. It is now nearly, or quite, fifty years since Fourneyron obtained ·88 per cent from turbines "cast in one piece."

It is very true, in nine cases out of ten, that we "by no means" get what is claimed as the proportion of the whole power of the weight of the water." The philosophers have said that "action and reaction are equal." Many inventors, with more enthusiasm than common sense, have in consequence claimed that water has a double force, impulse and weight; and that it has really twice the power in it, under any given head, that it has ever been credited with. Hence the great variety of contrivances to use the impact, impulse, percussion, or blow of the stream of water upon one set of floats, calling it direct action; whilst upon another set in the same machine, they attempt to use the weight, backward pressure, or spirt of the water, calling it reaction. In this sense, not even 30 per cent of the sum of the forces has ever been utilized. All intelligent persons now concede that the total force of a stream of water is directly as the weight and the fall. It is believed that turbines do not act on the impact or the reaction principle; but that the action is simply a direct, gentle, and gradually increasing pressure upon the buckets of the turbine. How the results of tests can be called speculation, I am at a loss to know. We have all the evidence that any reasonable man ought to ask for. Overshot wheels have actually raised, from mines, 70 per cent of as much water as was required to drive them, the total loss in all of the machinery being 30 per cent Certainly one third of this must have been in the pumping machinery. It has been equally well demonstrated that the overshot has utilized 86 per cent of the total power of the water used upon it. It is, however, no sign that all overshots utilize 86 per cent because one has done so. Nor is it any sign that all Fourneyron or all Jonval turbines utilize 80 per cent, from the fact that their inventors got that result. There are all grades of these famous machines, from 30 per cent ones to 80 per cent ones. Because a small turbine was "accurately and nicely constructed" is no evidence that it was accurately and properly designed for the purpose to which it was applied. The test proves, positively, that this feature was sadly wanting, or else the pumping machinery was defective. It is quite possible that both were ill adapted to the purpose, whereas an hydraulic engine is the most simple and effective method of utilizing the force of a stream of water, to force a portion of the same to a greater hight than the fountain head. A turbine, with the necessary gearing, is quite the reverse of simple when applied to the raising of water.

The similarity between a rotary steam engine and a rotary hydraulic engine is quite discernible; and one is about as effective as the other; but between the turbine and any rotary engine yet before the public, there is a vast and a radical difference, from my point of view. Nor is it the aim of all inventors of turbines to imprison the water until no more work is left in it. In one turbine at least, the water is, as much as is possible, left to its own natural course after entering the turbine, except in regard to its velocity alone. The inventor, in this case, has always allowed at least 8 per cent of the total force to be left in the water, at the instant of leaving the edge of the bucket. His theory is the expansion one for all fluids. The water is received upon the bucket of the turbine at the highest attainable velocity without shock; then it is retarded in an accelerated ratio, and expanded in volume in like manner, until the moment it reaches the edge of the bucket, as above, with 8 per cent of its living force yet remaining, the 92 per cent having been expended in reaching and urging forward the turbine. A reasonable allowance of 12 per cent, for loss in reaching the bucket and friction of the machine, leaves 80 per cent as the efficiency of the turbine.

To force back 90, or even 80 per cent of the water used, by any machine, is simply out of the question for the reasons shadowed forth in the foregoing. If 70 per cent can be forced back, it may be considered excellent work. A system of weight and measurement, by proper apparatus and competent persons, is, however, infinitely superior. It tells the whole story, "The truth, the whole truth, and nothing but the truth."

A. M. SWAIN.

Metallic Roofs in Thunder Storms.

To the Editor of the Scientific American:

A communication in the last SCIENTIFIC, signed John Wise, has the passage: "While I am not prepared to say positively that a metal roofed building cannot be injured by a stroke of lightning, I have never found one so roofed, in my fifteen years' investigation, that has been injured by a thunderbolt," etc.

Will you do your subscribers the favor to give your views as to whether a metallic roof is a protection against lightning?

Wilmington, N. C. L. M.

[Answer: A metallic roof upon a building, if connected with the earth, is undoubtedly a protection against the injurious effects of lightning. Even when lightning rods are not used, a connection is generally established, between the roof and the earth during a thunderstorm, by the water spouts or the wet walls of the building. A metallic roof, if it were insulated from the earth would be a source of danger, and not a protection.—EDS.

THE INTERNATIONAL EXHIBITION OF 1872.

The second of the series of international exhibitions at South Kensington (London) was opened on the 1st of May. The leading features of this year's exhibition are cotton fabrics and paper, and the machinery used in the manufacture of those goods.

The process of envelope manufacture is illustrated by a series of machines by Messrs. Dickinson & Co., of the Old Bailey. The first is a Tidcombe paper cutting machine, which cuts the continuous paper from reels into sheets of the required size. The apparatus will cut five or six thicknesses of paper from reels at the same time, by which means the necessity for collecting single sheets, and the employment of collectors during the night hours, is avoided. The paper, after having been cut into sheets 30×22 inches by the Tidcombe machine, is placed between plates of brass and submitted to a pressure of from twenty to thirty tuns in an adjoining press. By this means it receives a glazed surface, and the sheets are then passed to the adjacent envelope cutting machine, which is one of Hughes and Kimber's. From this machine, the blanks are passed on to the next department, where they are gummed and placed to dry in a rack heated by a steam coil. When dried, the gummed blanks are passed to the relief stamping counter, where there are three machines and as many operators manipulating them. The folding is effected by means of three folding machines, mourning envelopes being previously black bordered in a machine by Mr. J. Parkins. Finally, the perfect envelopes are banded, labelled, and packed in card boxes, which are made at a stand close by.

Near Messrs. Dickinsons' interesting series of exhibits is a handy little envelope folding machine by Messrs. R. Fenner & Co. The uppermost blank of a pile is raised by a pneumatic mouthpiece, working vertically, and the end is seized by a pair of tongs having a horizontal traverse, and by which the blank is drawn under a plunger, which, descending, carries it into the interior of the machine, where it is folded and embossed in relief, the edges being gummed just before the descent of the plunger. Messrs. Goodall & Son exhibit a neat machine for a similar purpose, in which a revolving table with three plungers is used. This machine gums the envelope and works two dies at one stroke, one with the maker's name and the other with the monogram or device on the outside of the envelope. The remaining apparatus in this gallery are those used in ruling account books, marbling paper and book edges, embossing and lettering in gold, etc., Messrs. Letts exhibiting all these processes.

On the ground floor of the eastern range, the ceramic display of last year is replaced by an array of musical instruments and jewelry, the latter being of a very costly character, the exhibits of one firm being, in one case, valued at $400,000, and in another, at $100,000.

In the eastern portion of the range of building are placed the stationary exhibits, which range from a sheet of brown paper to a gorgeously appointed valentine, and from a penny account book to a banker's ledger of gigantic proportions.

In the western portion of this building are several models of machines relating to the paper manufacture. Mr. T. H. Saunders, of Upper Thames street, sends a roll of continuous paper, as supplied to the *Times* for printing with the Walter machine. The paper is 2¾ miles in length, and weighs 634 pounds. Mr. Saunders also exhibits a sheet of parchment paper, which is carrying a weight of 5 cwt., and is stated to be capable of sustaining 9 cwt.

This portion of the exhibition is devoted to those articles which come under the head of scientific inventions, of which there are several deserving of notice. Amongst the most striking is a full size model section, taken transversely, of a gun, designed by Mr. Bessemer, to carry a 5 tun projectile. The bore has a diameter of 30 inches, the metal being only 8 inches in thickness. The gun is on Mr. Bessemer's continuous low pressure principle, and will be 60 feet in length. The inventor is having one made a quarter full size, with which he intends experimenting. Mr. Bessemer also exhibits a model of the projectile to be fired by his big gun, as well as models of the Woolwich 12 inch 35 tun gun, in transverse section, and its projectile.

At the northern end of the machinery annexe is a Walter printing machine, on which the *Mail* is printed three times a week. At this point, also, M. Charles Kastenheim exhibits a set of type setting and distributing machines, as used in the *Times* office.—*Engineering.*

Wire Cut Bricks---An Interesting Patent Suit.

An improvement in brickmaking machinery, which is coming extensively into use both in this country and England, consists in forcing the clay from the machine in the form of a rectangular mass or block and then dividing the block by means of wires into bricks of the proper size. Bricks are thus more quickly made, and are found to be of better quality and truer shape than when separately pressed in molds in the ordinary manner.

In this connection, we present the report of a recent patent suit in England, which contains some interesting information concerning wire cut bricks and machinery for their production.

MURRAY *vs.* CLAYTON.—By his specification the plaintiff claimed:—"Particularly cutting the clay into the form of bricks by forcing the clay forward by means of a pushing board or otherwise against a series of fixed wires, so arranged that the clay is pushed or forced past the wires on to a 'moveable board' provided with handles, so that 12 or any other convenient number of bricks may be removed at the same time." The defendants denied the validity of the plaintiff's patent mainly on the ground that the invention had been anticipated by a patent known as Dahlke's, which was founded on an invention made in Germany by one Sachsenberg, and by a machine which the defendants themselves made after Sachsenberg, with some variations. The Vice Chancellor was of opinion that the defendants had made out their case, and he dismissed the bill. The plaintiff appealed. Lord Justice James said that the case had occupied a long time, but when the real questions between the parties came to be eliminated from the mass of the evidence, they did not require any very long time for discussion nor present any great difficulty in determination. The plaintiff had given the usual *primâ facie* evidence of his being the first inventor, and he had produced, in favor of the novelty and practical utility of his invention, a mass of evidence greater than his Lordship had ever witnessed in any similar case. There was the evidence of brickmakers, engineers, Government contractors, who had not been cross examined. One of these witnesses said that bricks made by the plaintiff's machine were worth 50 cts. per thousand more than other bricks. All this evidence was practically uncontradicted. Then came the question whether the invention was novel *de jure* as well as *de facto*—that is, whether it had been anticipated. His Lordship was of opinion that the plain meaning of the plaintiff's specification was that he claimed the machine, the combination which enabled him to effect the result, so that by one or more turns of the wrist he could cut a mass of clay into a number of bricks without their being touched by the hand of the operator. The question was whether that had been anticipated in any manner. The only things relied upon to show that it had been anticipated were Dahlke's patent and the machine made at the defendant's works, and known as the German machine. As to Dahlke's invention, it was for a thing so substantially different from the plaintiff's in principle and in all its details that, if it were made now, it could not be considered in any respect an infringement of the plaintiff's patent. The only thing common to the two was the division of the clay by a cutting wire. After leading a fruitless existence of three years, Dahlke's patent was suffered to expire. As to the machine made at the defendants' works, which they made in 1864 after the German description of Sachsenberg's machine, substituting a table for rollers, there was a mass of evidence. It appeared that this machine was made at the defendants' works, and was exhibited at work at their shop to a great number of engineers and brickmakers. It did not appear to have been made for sale, but it was a working specimen. Of all those witnesses who saw it at work, not one said that he thought it a machine of the slightest utility. The evidence on the other side showed that it was an entire failure, that it was useless for any practical purpose whatever; the labor in working it was too great. The merit of every invention of this kind was that it saved labor. His Lordship was aware of no case where the exhibition of a useless machine had been held to affect the rights of a patentee who had made a useful machine, though there might be some similarity between the two. If there were defects in the German machine which the plaintiff cured, though he did not know of that machine, he would be entitled to maintain his patent. His Lordship thought it impossible that stronger evidence should be produced than had been produced here of the novelty of the plaintiff's invention. It was so simple, and so well calculated to effect the object intended, that the only wonder was that people had gone on for thousands of years making bricks without hitting upon it. With regard to the question whether the defendants had infringed the plaintiff's patent, it appeared to his Lordship that the defendants' machine was a mere transposition; they moved the wires against the clay instead of moving the clay against the wires, as the plaintiffs did. There was nothing but a colorable variation, and it was plain that the alteration could only have been made for the purpose of evading the plaintiff's patent. The object was effected by means of a much larger expenditure of power. But as was said by Lord Hatherley, in the case of "Daw *vs.* Eley," a clumsy invention might be an infringement, though it would not have been an anticipation. On the whole, his Lordship was of opinion that the plaintiff had made out his case; that he was the first inventor of a new and very valuable invention: and that the defendants had failed to make out that there had been any anticipation of it. It was proved also that the defendants had committed an infringement, and there must be a decree for a perpetual injunction against them, and they must pay the costs of the suit.

Polarized Light.

We have all noticed that when the sun shines directly through a window hung with figured muslin curtains, the reflection of the pattern of the curtains in the window interferes with the prospect.

When this reflected image is viewed through a Nicol's prism, it disappears when the prism is rotated, leaving the prospect unobstructed; the experiment is very interesting, and can be performed by any one who has a polariscope attached to a microscope, and it is only necessary to observe that the image is viewed at the proper angle. The effect will possibly be best when the sun's rays make an angle with the curtains and the glass nearly coinciding with the polarizing angle. (In my case, the angle was 36° 52′.)

Tyndall has mentioned a case in which the haze obstructing the view of a mountain top was rendered transparent by the Nicol.

The readers of *Nature* have probably observed how completely the leaves of the ivy polarize light; viewed through the Nicol and a pink selenite, the plant appears covered with blossom.—*R. S. Culley, in Nature.*

Hunting Truffles.

As the annual gathering season comes round, the truffle hunters, who lease of the proprietors of the woods the right to dig for these delicacies, commence their operations. To discover the whereabouts of the truffles, small dogs, trained for the purpose, are used. The education of the dogs consists in hiding under the soil a wooden shoe filled with earth, and containing a piece of truffle and a piece of bacon. The smell of the latter attracts them, and causes them to scratch up the shoe to get at the morsel of food. By degrees they confound the two scents, and cannot perceive that of a truffle without thinking of the bacon, and digging up the earth.

Twenty dollars is about the price of a good truffle dog. Dogs of the sporting breeds are never trained for the purpose, as they would be liable to hunt game instead of truffles, if the former happened to fall in their way. When the trained dog comes on the scent, the truffle hunter proceeds to hoe up the ground pointed out by the animal as the bed of the truffles. In the south of France, a certain species of lank lean pigs are trained and employed in the same manner as the dogs in more northern districts.—*Once a Week.*

Improvement in Gig Saws.

Mr. Henry W. Bullard, of Poughkeepsie, N. Y., has lately patented an ingenious and useful improvement, applicable to gig saws and other mechanisms. It consists of a device to regulate the extent of throw or stroke of the saw, and is so arranged that, by merely pushing a lever, the stroke of the saw may, at any moment, be increased or diminished, at the will of the operator, without stopping or changing the driving belt. This result is accomplished by shifting the crank pin to which the saw is attached. The crank pin is so arranged that it can be made to slide in or out from the center of the head or pulley to which it is attached; and this movement of the crank pin may be made while the saw is in full operation. The invention has been in practical operation for more than a year past, and its excellence is fully established. No gig saw machine is complete without it.

Available Nitrogen.

P. P. Deherain (in *Comptus Rendus*) advances a somewhat novel theory of the reduction of atmospheric nitrogen to an available form for the support of plant life. He endeavors to prove that the free nitrogen of the atmosphere is brought into combination during the oxidation of organic matter in the soil. To demonstrate this, he dissolves glucose in a dilute solution of ammonia in water, placed in a large flask filled with a mixture of equal parts of nitrogen and oxygen. Having closed the flask, he heats the mixture gently for one hundred hours, at the end of which time the whole of the oxygen has disappeared, and 5·9 per cent of nitrogen has been taken up. The same process with humic acid and potash shows a loss of 7·2 of nitrogen. If these results are confirmed by subsequent experiments, they will throw light on the hitherto obscure subject of the production of nitric acid.

EVERY young man, after he has chosen his vocation, should stick to it. Don't leave it because hard blows are to be struck, or disagreeable work performed. Those who have worked their way, up to wealth and usefulness, do not belong to the shiftless and unstable class, but may be reckoned among such as took off their coats, rolled up their sleeves, conquered their prejudices against labor, and manfully bore the heat and burden of the day. Whether upon the old farm, in the machine shop or factory, or the thousand other business places that invite honest toil and skill, let the motto ever be: Perseverance and Industry.

Foot Power Buzz Saw.

The saw represented in our engraving is run by an application of the principle, involved in Mr. L. S. Fithian's vertical multiplier, which was described by that gentleman on page 251, Vol. XXII. of the SCIENTIFIC AMERICAN. The treadle, A, is supported, as shown, by lathe chain wound on the small drum, B. This drum is loose on the shaft, C, but is governed in its motions by a contained ratchet wheel, keyed to the shaft, and so arranged that when the treadle is depressed the drum, ratchet wheel, and shaft are made to revolve, and the chain is unwound. On releasing the treadle, a weight at its far end brings it again into position; and a weight attached to the drum reverses its motion and causes it to rewind the chain; but the ratchet, being now free, does not affect the motion set up in the shaft, which is continued by means of the balance wheel, D. This balance wheel has attached to it a small pinion on the one side and the driving pulley on the other (as seen in the engraving), which are all loose on the shaft and driven as described hereafter. E is an intermediate wheel revolving, in the position represented, on one of two arms projecting from and revolving with the shaft. This intermediate wheel, E, engages with the pinion of the balance wheel, D, and gives motion thereto. The wheel, F, also engages, on its opposite side, with the outer gearing of the reverse wheel, E, as shown. This wheel, F, is loose on the shaft, and is connected by its inner gearing at the side with a small intermediate wheel, which, in its turn, engages with the wheel, G. This last wheel, G, is keyed to the shaft, and is the conveyer of the power. The other parts of the machine can readily be understood from the engraving.

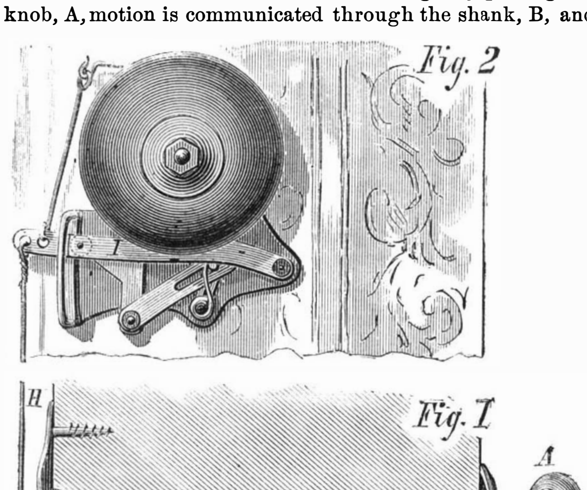
Without going into the principle of operation in this combination, we may state that, in the saw shown us, the balance wheel revolved seventeen times to one revolution of the shaft.

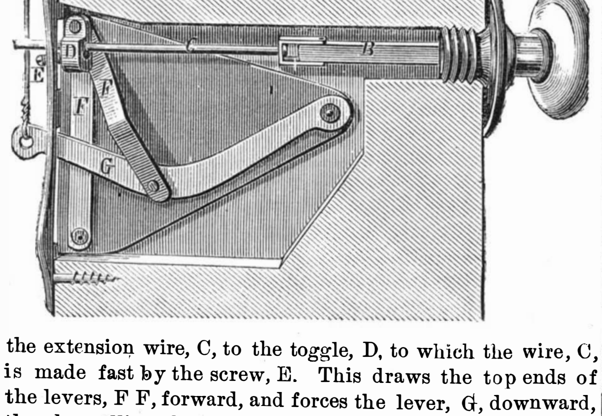
The inventor states that the revolutions in this machine are from one to one hundred and two, forty steps on the treadle per minute giving four thousand and eighty revolutions of the saw. The sawing is as smooth and true as fine planing; and to one who is accustomed to the treadle and remembers that he can do no more than put his weight upon it, the work is as easy as any manual labor can be.

Patented in the United States and Europe through the Scientific American Patent Agency. Address H. A. Miller, President, Room 9, 23 Dey street, New York, or Charles B. Fithian, 341 North Third street, Philadelphia, Pa.

BELL PULL AND BELL.

The bell pull, illustrated in Fig. 1 of our engraving, is designed to do away with the vexations attending the use of the ordinary street door pull. The engraving shows how the pull is attached to the door casing, and the whole arrangement will be understood from the following: By pulling the knob, A, motion is communicated through the shank, B, and

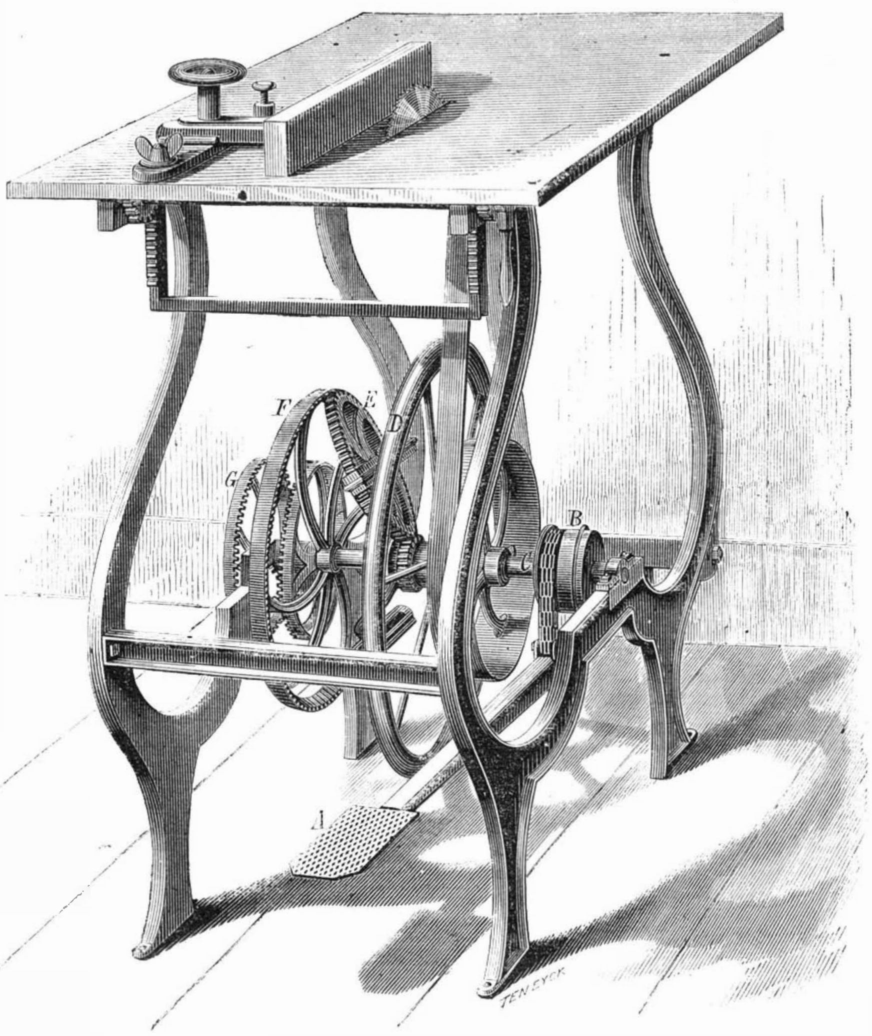




the extension wire, C, to the toggle, D, to which the wire, C, is made fast by the screw, E. This draws the top ends of the levers, F F, forward, and forces the lever, G, downward, thereby pulling the wire, H, which rings the bell. The wire, C, is cut off to the right length when adjusted. In the arrangement shown, the return of the knob to its original position is effected by the spring attached to the striking apparatus of the bell; when required, it may be effected by an independent spring attached to the pull. This bell pull insures reliable action with a very short pull on the knob. It is applicable to all kinds of bells, is easily put on in place of the old pull, and does not require a new knob.

In Fig. 2, the improved bell, the working parts are partly concealed by the bell. Suffice it to say that the lever, I, by an ingenious arrangement of levers, operates upon the striker both in its descent and recoil. Consequently two strokes are insured for each pull. It is not liable to be strained or broken by hard or sudden pulls.

Patents on the foregoing were obtained through the Scientific American Patent Agency, Nov. 7 and Dec. 26, 1871. For further information address the inventor and manufacturer, A. L. Swan, Cherry Valley, N. Y., or E. J. Swan, Laporte, Ind.



FOOT POWER BUZZ SAW.

Lead Pencils.

A lead pencil is in itself a small affair, but considered as a manufactured product, it rises into much importance. To start a first class factory, with improved machinery and stock of well seasoned wood, requires a capital of about $100,000; ground covered is about half an acre, chiefly occupied by drying houses for the storage of red cedar. The Florida red cedar is mostly used in this country and in Europe—some "iben" wood, as the Germans call it, or English yew, is used in Germany—white pine is occasionally used for a common grade of a carpenter's pencil.

The "lead" of the pencils is the well known graphite or plumbago; the best of this is the natural, found in a pure state in masses large enough to cut into strips. Of this there is but one mine now up to the standard, which is in Asiatic Siberia, and pencils made from this graphite are all one grade, and pay here 50 cents per gross special, and 30 per cent *ad valorem* duty. The Cumberland mines in England were the first discovered, but are now almost exhausted. What was formerly refuse in cutting the graphite is now ground, cleaned and refined, and then mixed with a fine clay.

In mixing the clay and graphite, great care must be taken in selecting and cleaning the clay and getting the proper proportions; the mixture, with water, after being well kneaded, is placed in a large receiver and strongly compressed and forced out through a small groove at the bottom, in the shape of a thread of the thickness and style required—either square, octagon, or round. This thread, or lead wire, is cut in bars of the proper length (done by little girls), and then straightened, dried at a moderate heat, and packed in airtight crucibles and placed in the furnaces; the grade of the lead depends upon the amount of heat it is exposed to, the amount of clay used in mixing, and the quality of the plumbago. The coloring of the lead is by various pigments.

The wood, after being thoroughly seasoned, is cut in thin strips and dried again, then cut into strips pencil length. These strips are grooved by machinery, then carried on a belt to the glueing room, where the lead is glued in the groove, and then the other half of the pencil glued on. After being dried under pressure, they are sent to the turning room and rounded, squared, or made octagon, by a very ingenious little machine, which passes them through three sets of cutters and drops them ready for polishing or coloring—the former is done on lathes by boys, and the latter by a machine which holds the brush and turns the pencils fed to it through a hopper. After the pencil is polished, it is cut the exact length by a circular saw, and the end is cut smooth by a drop knife, the pencil resting on an iron bed.

The stamping is done by a hollow die, which is heated; the gold or silver foil is then laid on the pencil which rests in an iron bed, and the die is then pressed on it by a screw lever. The pencils are then ready to go to the packing room, whence they find their way to all parts of the civilized world at prices ranging from two dollars to twenty dollars per gross.—*American Exchange and Review.*

New Carriage Mountings.

These mountings, such as shaft, whiffletree, and pole tips, the nuts and rivets for top props, hub bands, etc., are made, as is usual, of iron, brass, or white metal, and are coated with hard rubber or gutta percha, leaving exposed, to be plated with gold or silver, a small portion for ornament. A whiffletree tip, for instance, has the "dragon tongue" and the neat bead at the base plated with gold or silver, and the remainder is coated with the hard rubber. A beautiful contrast between the highly polished metal and the brilliant jet black surface of the hard rubber is produced. It has more the appearance of an article of jewelry than one intended for hard service on a carriage. In addition to their beauty, these articles combine the important feature of durability. The surface of the hard rubber will not become scratched or dented as readily as metal, even malleable iron. It will not easily chip off, indeed can hardly be broken off with a hammer; and we are informed that it does not tarnish by exposure to the weather, and will not lose its color from the same cause. They are as strong as the same articles now in use, the hard rubber coating being only a little thicker than the ordinary close plate. When the ornamental parts become tarnished, they can be cleaned or replated without injury to the rubber portion.

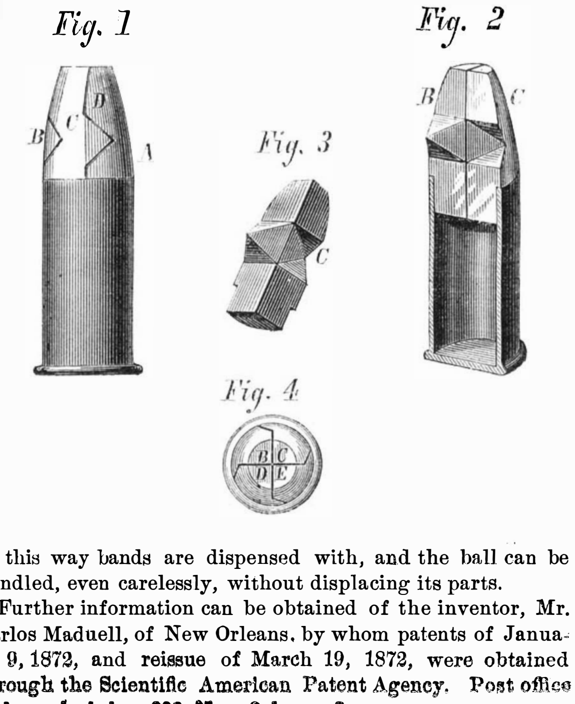
During the last few years, the public taste has been for showy gold and silver mountings, but there is a growing desire for something more quiet, which shall be at the same time rich and elegant; and our more prominent carriage builders are already using leather covered handles, prop nuts, etc. In Paris, rich gold and silver mountings, and the bright, gay inside linings of former years, have given way to things more sober, owing somewhat, no doubt, to the wide-spread affliction in that unfortunate nation. In the matter of price, we understand that the rubber mountings are of about the same expense as the best plated ones.—*The Hub.*

PROJECTILE FOR FIREARMS.

This improvement relates to that class of projectiles which are formed in sections. Hitherto the parts have been so constructed that, when fitted together, they were free to move one upon the other, and hence the slightest obstacle to the flight of the ball might cause separation of the sections and frustrate the purpose of the missile.

To remedy this defect, the inventor forms the sections as represented in our engraving, where Fig. 1 is a side view of the missile attached to a metallic cartridge case. Fig. 2 is a longitudinal section of Fig. 1, showing sections in perspective. Fig. 3 is a perspective view of one of the sections, and Fig. 4 is the top of the missile.

The missile, A, is thus composed of four parts, shown respectively at B, C, D and E, which are each provided with an angular projection and depression so that they will fit together and make a complete whole when in the gun barrel.



In this way bands are dispensed with, and the ball can be handled, even carelessly, without displacing its parts.

Further information can be obtained of the inventor, Mr. Carlos Maduell, of New Orleans, by whom patents of January 9, 1872, and reissue of March 19, 1872, were obtained through the Scientific American Patent Agency. Post office address, lock box 893, New Orleans, La.

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Contents:

(Illustrated articles are marked with an asterisk.)

A FEW WORDS OF ADVICE AND ENCOURAGEMENT TO INVESTIGATORS AND INVENTORS.

Persons enlightened enough to follow the line of pursuits of which we spoke in our last (page 351), namely, informing themselves by consulting and investigating the transactions of learned societies and the back volumes of scientific journals, complain often as to the difficulty of finding details on particular subjects; and we confess that there is some difficulty, and consequently labor of that peculiar kind which the truly scientific men understand too well, but are too wise to shun. However, the assertion, which we have often heard, that success in such researches is next to impossible, and that scientific discoveries, when inserted in the annals of learned societies or in scientific journals, are buried there, we totally deny. The finding of data on any peculiar subject is an art which, like all others, is attained by practice; besides which, a peculiar condition of mind, enabling persons to concentrate their judgment in this direction, causes some to be very successful in such labors, while others fail. We have had the experience of several assistants in our private laboratory, some of which were rather unreliable in practical experimenting and totally untrustworthy at the balance, but had always the most eminent success when sent to a library in order to hunt up, in the transactions of societies or in scientific journals, data relating to any branch of physics, chemistry, or technology.

Of great assistance are the collected indexes which some societies publish from time to time, and which some journals publish periodically. For the benefit of science, it is desirable that this example were generally followed, and that those indexes were made as full as possible, in which case such an index makes a journal almost equivalent to a scientific cyclopædia. Any one who possesses back volumes of the SCIENTIFIC AMERICAN, and consults the alphabetical index which is appended to every volume, will agree with this statement. The British Royal Society has published already three indexes to its transactions, and the French Academy, to a great portion of its *Mémoires*. The same can be said of the first thirty-one volumes of the *Comptes Rendus*, and of the first ten volumes of Wagner's *Jahresberichte*. Also the "Philosophical Magazine" has its collected indexes. The British Royal Society promised, long ago, the publication of indexes of the principal European journals, whether English, German, French, or Italian. However, these indexes will not contain the subjects, but the names of the scientific men who have labored and published their results. This may appear a drawback; however, when we then refer to the name in a biographical dictionary, we may get the references we want, and, at the same time, many other details, which not only increase the interest, but put us on the track of a great deal more.

Libraries such as the Astor, American Institute, and several others in New York, Peabody in Baltimore, and many other public libraries, in Philadelphia, Boston, and, fortunately, now in almost every large city on this continent, supply the means for ascertaining the history of almost any subject of scientific research. When such a research is once commenced, the student will, while his material accumulates, be always surprised that so much is known respecting the subject under investigation. But, in place of being discouraged, the truly scientific mind will commence to feel, not only a lively interest in it, but a sort of affection for it. It will occupy many of his thoughts, and, if the nature of the subject and his circumstances allow it, he will try experiments of his own. If, then, he is so happy as to discover something really new, his interest will not only be increased a thousand fold, but he will enjoy that delightful and noble self gratification known only to those who, in the paths of Science, discover a new fact, whether it be a geometrical theorem, a new chemical compound, a not yet discovered detail in regard to the properties of sound or light, or an improvement in an apparatus, or even an entirely new piece of mechanism; in either case, the delight is unparalleled by any enjoyment which can befall human nature.

THE GREAT MUSICAL JUBILEE.

The Bostonians are to give us another grand Musical Jubilee this year, to open June 17th and close July 4th. An immense building is now in progress of erection at Boston, which is to be supplied with a gigantic organ. The roaring octavos are to be produced by cannons fired by electricity, the electric keys being placed on the organ and operated, like the other musical keys, by the organist. The clanging notes are to be done by means of a chime of church bells, also worked by keys.

The grand choruses will be sung by twenty thousand performers, representing some two hundred musical societies, from all parts of the country.

The orchestra will be made up of one thousand selected musicians, which, with the military bands, American and foreign, will constitute in all about two thousand players. New York. it is expected, will furnish five hundred of this number; while Boston, Baltimore, Cincinnati, Chicago and other cities of the South and West will make up the remainder.

The instruments for this select orchestra will be as follows: First violins, 250; second violins, 200; violas, 150; violoncellos, 100; contra basses, 100; first flutes, 12; second flutes, 12; first clarionets, 12; second clarionets, 12; first oboes, 10; second oboes, 10; bassoons (first, second, third and fourth), 20; French horns (first, second, third, and fourth), 24; trumpets, (first, second, third and fourth), 24; alto trombones, 12; tenor trombones, 12; bass trombones, 8; bass tubas, 6; tympani (pairs), 6: small drums, 10; bass drums, 4; cymbals (pairs), 4; great drum, 1; great triangle, 1; total, 1,000.

The building, it is calculated, will seat not less than one hundred thousand people. The chorus and orchestra will occupy nearly two acres; while nearly three acres will be given to the audience. The great drum is to be twelve feet in diameter. The frame has just been completed.

Each programme will contain one or more familiar hymns to be sung by the full chorus and audience together. This will be "congregational singing" on a large scale. Among the pieces of this description named are Old Hundred.

The music, for the greater part, will be sacred. The selections announced are principally from the great masters, Mendelssohn being most conspicuous. Handel's oratorio "Israel in Egypt" will be given entire, by a chorus of singers familiar with the music, resident in Boston and its adjacent towns.

A GIGANTIC RAILWAY CAR.

Among the mechanical novelties, to be seen in operation at the Grand Central Depot in this city, is a steam railway car seventy feet wide which travels on a track of corresponding width.

This great vehicle is made in the form of a low platform car, and the track on which it runs is provided with four rails, extending from Fourth Avenue to Madison Avenue. The car is used for the lateral transfer of passenger cars from the main tracks of the Hudson River, Harlem, and New Haven Railways to the various side tracks, thus avoiding the use of turntables. The car is propelled by steam, the engine and boiler being contained within a sheet iron house carried on one side of the machine.

The cars to be transferred are run upon the great car; steam is then turned on and the huge machine trots off with its burden with as much ease as a horse draws a buggy. The machine is supported on eight wheels, arranged on independent axles. There are in addition four driving wheels arranged upon one axle. It was proposed not long ago to construct a grain railway from New York to Chicago, on a gage of 12 feet. That was considered a big thing in the way of broad gages. But it is a pigmy compared with this seventy foot gage railway and locomotive of the Grand Central.

TIN FOIL---ITS USES AND MANUFACTURE.

Every one is familiar with those soft pliable sheets of metal, generally known by the name of "tin foil," with which packages of spice, and tobacco are enveloped. The name itself is a misnomer, for the material of which these leaves are made is rarely pure tin, but generally an alloy or mixture of tin and lead, with often a large preponderance of the latter. The lead is added, not only on account of its rendering the composition cheaper, but also because it gives to the sheet a tenacity which it would not possess if made from tin alone.

Before touching upon tin foil, our subject proper, we perhaps should mention a species of foil which, though almost identical in appearance with the former, is made entirely of lead. It constitutes the linings of those tea chests in which the poorest qualities of tea are imported. The metal of which it is made is carried to China from England in large quantities, averaging some 4,000 tuns per year. The method of manufacture formerly in vogue among the Chinese was exceedingly primitive, as they merely pounded the lead until it attained the requisite tenuity, but in 1858 a rather ingenious invention was patented in England which we believe is still in use both in that country and in China. The subjoined description will doubtless recall to many of our readers the machine, constructed on essentially the same principle now employed for cutting the so-called "wood hangings" or thin veneers of wood designed to take the place of wall paper. A cylinder of lead is cast in a mold, having a mandrel or core in its center. To this cylinder, when cooled, a knife or cutter equaling it in length is gradually brought up until it shaves the surface, the cylinder rotating while being cut. The mechanical arrangement is such that the cutting blade advances gradually toward the axis of the cylinder, and the rate of this advance determines the thickness of the film. The sheet is received on a collecting spindle which is removed as soon as filled.

Tin, as is well known, is extremely malleable, being fourth in this respect on the list of metals, so that it is readily rolled or beaten into very thin sheets. The old method of producing these was simply to hammer the metal on a large flat stone or anvil. One sheet at a time was completed, and the workmen were obliged to use their long handled hammers with much skill, not only to render it of even thickness throughout, but also to avoid pounding holes through its thinner portions. Now, however, the rolling mill has superseded the hammer. For the heavier foils, plates of metal of about half an inch in thickness are cut and simply rolled between powerful steel rollers until they become sufficiently thin. For the more delicate leaves, the process is much more elaborate. Bars, for example, 14 inches long and $1\frac{1}{4}$ inches thick, are rolled out to a length of some six or eight feet. Several of these are placed one upon the other and again put through the mill, their length being thus increased to twelve feet. The sheets are then cut in two, again piled as above described, and once more rolled, this time both lengthwise and in the direction of their width; and so the process is repeated until the requisite tenuity is obtained. In order to prevent the adhesion of the rollers to the metal, the upper and lower sheets of each pile are oiled as they pass through the machine. The last stage of the process consists in piling the leaves in heaps of thirty or forty, cutting the edges and pounding them smooth with a wooden hammer. The sheets are then assorted or further cut up for smaller sizes. Massieri has lately introduced a new method for casting plates of tin of great thinness, which consists in pouring the fluid metal on a cold stone. This process has the advantage of rapidity, as a single man can easily make some 900 sheets per day, which only need to be slightly rolled to render them ready for the market.

As we stated in the beginning, an alloy of lead and tin is generally used in this manufacture. The proportions of the different metals for the purpose are not definitely fixed, but seem to vary according to the ideas of different manufacturers, each one of whom keeps his own notions on the subject, as well as all information relative to the especial details or cost of manufacture of the foil, a profound secret. We learn however that, of late, alloys containing lead have fallen into disfavor, on account of sundry cases of lead poisoning which they have been instrumental in producing. One instance of late occurrence which took place in this city was that of a devotee of tobacco who was rendered dangerously ill from masticating the foil with which his favorite weed was enclosed. To obviate such difficulties, the lead is now made in a separate sheet and placed between two leaves of tin. The whole is then rolled together, so that while the inside of the foil contains the cheap and injurious metal, the exterior, which comes in contact with the substance enveloped, is devoid of bad effects.

Pure tin foil is in use, though in a limited number of cases. Large sheets of it are employed in the manufacture of mirrors; these, of course, are extremely thin. Another variety, of not over $\frac{1}{1500}$ of an inch in thickness, is "white Dutch metal," used for ornamentation in theatres and for other purposes in which silver foil would be too costly. Dentists occasionally fill teeth with a quality somewhat thicker than the foregoing, as it packs with nearly as much readiness as gold. Lastly, pure tin is used in those soft tubes in which artists' pigments are contained. For this purpose tin is better than silver, as it has no affinity for sulphur nor is it affected by any oxidizing ingredient which the paint may hold in composition.

Ordinary foil made, as already described, of tin and lead is valuable for enveloping any material from which it is desirable to exclude the air. It is generally used in its different varieties to enclose cocoa, chocolate, spices, druggists' preparations, corks of wine bottles, etc, though it is most largely employed as wrapping for chewing tobacco, one manufacturer in this city (Lorillard) alone consuming some 20,000 pounds per month. Sign painters find a use for it in making a kind of fancy sign, the leaves being placed behind letters traced on clear glass, producing the effect of inlaid mother of pearl. This, however, is a probable imitation of Chinese lacquering, which is done on a groundwork of the same material.

In the market, three varieties of tin foil are found. Of these, tobacco foil is the thickest and cheapest (probably because it contains the most lead), selling at wholesale for 23 cents a pound. No. 2 foil, generally used by druggists, is the next quality, the price being 32 cents, while the thinnest variety is tissue foil, at 40 cents a pound. A great portion of that used in this country is necessarily imported, as there is only one manufactory now engaged in its production in the United States.

AS AN accompaniment to the Grand Jubilee at Boston, Professor King, of that city, is manufacturing a gigantic balloon, capable of carrying fifteen or twenty passengers. This great flyer is to be called the "Colossus."

THE INDUSTRIAL PROGRESS AND REQUIREMENTS OF NEW SOUTH WALES.

From the report of the Intercolonial Exhibition, held at Sydney, New South Wales, we extract the following information relative to the manufactures, requirements, and industrial progress of the colony. Prior to the discovery of gold in 1851, but few manufactures were established, and these few were confined to Sydney. Machinery was not then so generally used in every department of trade as now, and the greatest efforts at production were the manufacture of cooking stoves and other domestic articles, mill work and marine work. These, with the manufacture of soap and candles and the refining of sugar, formed the bulk of the native industries.

At the present time, although a steady progress has been made in the industrial arts, there is still room for enterprise: and the fact that imports of machinery and skilled labor from Great Britain and the United States are still large shows that the colony is as yet unable to develop completely its resources. There is a large demand for foundery and machine work for purposes of marine engineering, induced by the repairs which are constantly necessary for the steamers employed in the ocean postal service as well as in the coasting and intercolonial trade. The machinery and tools necessary for the various processes are all imported from England. Mechanical appliances on shore, flour mills, quartz mills, sugar mills, kerosene works, sheep washing apparatus, hydraulic wool presses, etc. etc., are all needed, and it has been found that they can be brought from England or America cheaper than they can be manufactured in the localities where required.

Among the minor articles of iron work, stoves occupy a prominent place. Large numbers from America find a ready market, though, as regards durability and economy, they are believed to be inferior to those of local manufacture.

Two sewing machines have been produced containing improvements invented in the colony; but these were rather curiosities than indications of a young trade. The import of machinery for 1869 was valued at £68,589, exclusive of weighing and sewing machines; the import of iron and steel for the same year amounted to 17,520 tuns, exclusive of tanks, pipes, bridge work and old iron.

Galvanized iron, for various purposes, was introduced in 1863. The work of galvanizing for the whole colony is carried on in Sydney by a single manufactory.

Wood, particularly the softer kinds for indoor work, is obtained in large quantities from Europe and America. Most of the modern steam driven tools for wood working are also imported.

There is but one paper mill in the colony. A new material for paper is found in a sedge known as *cyprus vaginalis*, which grows in considerable abundance in the neighborhood of Sydney. It is said to be as suitable as the Spanish esparto grass. We notice that reference is made also to another useful vegetable termed the "colonial cabbage tree," which is employed as a substitute for straw in the manufacture of hats.

The list of new inventions made in the colony is rather small as compared with the number which would be produced by a population of equal size in the United States. The report, however, somewhat naively admits that the inventive genius of Australia has not yet developed like that of America, although the necessity for labor saving machines is as great in one country as in the other.

In minerals, New South Wales is particularly rich, new gold fields being constantly discovered. The yield to every man engaged in gold mining has been estimated to average about £72 4s. 6d. (nearly $350) per annum. The largest amount of this metal received at the mint during a single year was 575,538 oz. in 1862. In 1869 but 224,382 oz., valued at £866,746, were received, the decrease being attributed more to lack of enterprise than to the mines becoming exhausted. Diamonds have been found in the wash dirt taken by the gold miner. The number found up to the present time is, at a rough estimate, about 5,500, the largest stone having been one of 5¾ carats, and the smallest, one tenth of a grain. They are always accompanied by rubies, topazes, and other gems.

In view of the large amount of machinery imported, and the constant demand which must arise for new labor saving inventions, our conclusion, drawn from a perusal of the report before us, leads to the belief that a promising field is here presented for the inventor and the manufacturer. The resources of the colony are great and comparatively undeveloped, a fact to be accounted for by the greater part of the population entering largely into stock farming and gold mining, and depending upon England and America to furnish, ready made, the implements and machines which might easily be manufactured from abundant native material.

BUTTER.—The German *Agriculturist* says that a great portion of the fine flavor of fresh butter is destroyed by the usual mode of washing, and he recommends a thorough kneading for the removal of the buttermilk, and a subsequent pressing in a linen cloth. Butter thus prepared is pre-eminent for its sweetness of taste and flavor, qualities which are retained for a long time. To improve manufactured butter, we are advised by the same authority to work it thoroughly with fresh cold milk, and then to wash it in clear water; and it is said that even old and rancid butter may be rendered palatable by washing it in water to which a few drops of a solution of chloride of lime have been added.

THE total production of hops in the United States for the census year ending June 1, 1870, was 25,456,669 pounds,

SCIENTIFIC AND PRACTICAL INFORMATION.

TREE PLANTING.

The great consumption of lumber, which has so reduced the acreage of forest land in Maine, Michigan, and other States of the North and Northwest, and the consequent probable scarcity of timber at no very distant date has induced the Maine Legislature to pass an act to the effect that "any landholder who shall plant or set apart any cleared lands, for the growth and production of forest trees, within ten years after the passage of the act, and shall successfully grow and cultivate the same for three years, the trees being not less in number than 2,000 on each acre and well distributed over the same, then, on application of the owner or occupant of such lands to the assessors of the town in which the same is situate, . . . the same shall be exempt from taxation for twenty years thereafter."

HONEY DEW.

M. Boussingault has recently published in the *Comptes Rendus* a communication on the chemistry of honey dew, a saccharine matter found on the leaves of many species of trees. He noticed in 1869 the formation of considerable quantities of this substance, which formed a sort of varnish on the leaves in such quantities as to fall in viscid drops to the ground. He analyzed the substance, commencing by eliminating the albumen and mucilage by the use of the sub acetate of lead; and he thus obtained a residuary sirup with distinct sugar crystals in it. The saccharine matter disappeared after fermenting the sirup with yeast, leaving dextrin, which has been proved by Berthelot to exist largely in the manna of Sinai and other parts of the East. M. Boussingault points out that the secretion cannot be the result of meteorological or atmospheric influences, and that the fact of one tree in a group being thus affected indicates the probability that it is a production of insect life. The manna of Sinai was attributed by Ehrenberg to a species of *coccus*, called by him *tamarix mannifera*.

COPPER IN COCOA AND CHOCOLATE.

Careful chemical analyses show that cocoa and chocolate always contain a small percentage of copper. The husks of the cocoa have been found to contain as high as 0·025 per cent of copper, while the kernel of the bean only contained 0·004. Samples of chocolate contained 0·0125 of copper. Substances containing copper, even in the smallest proportions, cannot be very desirable for the diet of invalids, for which the above articles are quite extensively used.

A CHEAP CONTINUOUS BATTERY.

The need for an inexpensive battery, created by the extended use of electric bells in hotels and other large establishments, has induced Herr L. Kohlfurst to describe the following invention: The negative plate is formed of a truncated hollow cone of copper, closed at the top. The inside of the cone being protected with varnish, it is filled with sulphate of copper in crystals and inverted in a glass vessel deeper than itself. The cone is notched around the rim, and the apex is pierced with a small hole. For the positive element, a thick cake of zinc is used (suspended over the face of the cone); it has a hole in the center, through which is passed a covered wire connecting with the copper. The glass cylinder is then filled with water, and the sulphate of copper begins to melt, the rapidity of the deliquescence varying with the access of the water through the notches in the cone; and so long as this latter maintains a uniform rate, the current will be uniform in power. If common or Epsom salt be used in the water, the current will be intensified. The inventor states that 1½ pounds of the copper salt will continue the battery in operation for a year.

Beet Sugar.

There must now be over a thousand beet sugar factories in Europe.

While both the manufacture of beet sugar and the growing of the beets are seen to profitable, it would seem, however, that the peculiar advantage of the industry to a country is its influence in diffusing a skillful practice of farming and of promoting agriculture in general. To show the appreciation in which it is held in France, Mr. Howard states that, at an agricultural meeting held a few years ago at Valenciennes, a triumphal arch was erected, on which appeared the following inscription: "The growth of wheat in this district, before the production of beet root sugar, was only 976,000 bushels; the number of oxen was 700. Since the introduction of the sugar manufacture, the growth of wheat has been 1,168,000 bushels, and the number of oxen, 11,500."

ARTIFICIAL WATER LIME.—It has been long known to chemists that water lime consists substantially of quick lime, burnt clay, and a small portion of the oxides of iron and magnesia, but scarcely any effort has been made to utilize this knowledge. All yellow or red clays contain iron, and most specimens of lime in use contain the required magnesia. If burnt clay or brick dust in the fine powder be mixed with an equal weight of fresh slacked lime, and twice this weight of clean, sharp sand be added, a compound will be formed which will harden under water equal to the best hydraulic cement.

CARBOLIC ACID AS A DISINFECTANT.—C. Homburgh, of Berlin, proposes to use carbolic acid as a disinfectant, by saturating sheets of Bristol board, or any thick spongy paper, with a solution of carbolic acid in water. The paper, in pieces of any convenient size, may be hung up in the room to be disinfected, or may be placed in drawers or wardrobes, where it is desired to protect clothing from moths or other insects. This suggests a convenient method of using this excellent disinfectant and insect destroyer.

THE RECEPTION OF THE MINING ENGINEERS AT THE STEVENS INSTITUTE.

A very pleasant reception was recently tendered to the American Institute of Mining Engineers by the Trustees and Faculty of the Stevens Institute of Technology, at Hoboken, N. J. The visitors were received by the members of the Faculty, and by them escorted through the different departments of the college building. The various instruments of the physical laboratory were carefully explained both by professors and students, and their uses shown by actual experiment. A Hipp's chronoscope of exceedingly accurate construction is one of the latest additions to this already large collection; its delicacy is such that it measures time to the one thousandth of a second, and enables the laws of failing bodies to be demonstrated at a height of only eighteen inches. A large induction coil of over 100 miles in length, producing a spark of twenty-one inches, is another noticeable feature.

The workshop, containing a steam engine of twenty-five horse power, with link motion and Huntoon regulator, planers, lathes, milling machine, and other mechanical apparatus, was next inspected, after which visits were made to the chemical laboratory, lecture room, and department of mechanical engineering. The latter contains a large collection of models of every description, together with a number of engineering relics in the shape of letters from Robert Fulton, Commodore Decatur, and other eminent men of times gone by. In the lecture room of the department of physics, a number of interesting experiments in magnetism were exhibited on a screen by means of the vertical lantern, and in the president's lecture room, numerous beautiful illustrations, showing by the aid of polarized light how strains are distributed in bodies under pressure, were shown in the same graphic manner.

After inspecting the departments in the upper portion of the building, the visitors met in the large lecture hall, where they remained for some time interested spectators of Professor Mayer's experiments with the huge electro-magnet belonging to the institution. A short address of welcome from President Morton followed, after which the party adjourned to the elegant mansion of Mrs. E. A. Stevens at Castle Point, where an excellent lunch was provided. Among those present were Peter Cooper, Ex-Governor Ward of New Jersey, Generals Gillmore and Barnard, President Morton, Professors Silliman, Draper, Vander Weyde, Mayer, Thurston, and Leeds, and Drs. Torrey and Raymond, besides many other eminent scientific gentlemen.

The admirable arrangement of the various departments of the Institute and its superior facilities for instruction called forth the warmest commendations from every one. The college is yet in its infancy, being barely a year old, but if the same spirit of enterprise, by which the management of its affairs has been characterized in the past, be continued in the future, we can safely predict for it a foremost position among the scientific schools of the country.

Parchment Paper.

It has long been known that certain acids exercised a wonderful effect upon woody fiber. Early in the year 1857, Mr. Gaines described before the Royal Institution a method practiced by him of making artificial parchment. His process consisted in the mixing together of two parts of sulphuric acid and one of water, and, after it had become cool, immersing in it, for about one second, blotting or unsized paper, immediately washing it in several changes of water, after which it was allowed to dry spontaneously. This treatment conferred upon it new properties. No longer weak, it was now tough and strong, semi-transparent, and resembled parchment, being capable of use for the same purpose.

This treatment causes the lignin to undergo no chemical change. The weight is the same as before, and there is no indication of the presence of the acid. The paper no longer permits water to pass through it; it is, in fact, waterproof. Paper, however, is not the only form in which the lignin may be submitted to the action of the acid, for textile fabrics, such as calico, are affected in a similar manner and rendered tough in an extraordinary degree. Fishing nets, and fabrics of that kind, may also have their strength increased many degrees by the same cause.

Another method is to dip white unsized blotting paper for half a minute in strong sulphuric acid, sp. gr. 1·842, and afterwards in water containing a little ammonia. Another method is to plunge unsized paper for a few seconds into sulphuric acid diluted with a half to a quarter of its bulk of water, the solution being allowed to cool down to the temperature of the air before being used, and afterwards washing in water containing ammonia. The latter is said to be the method employed by Messrs. De la Rue and Co., who prepare parchment paper largely for various purposes.

We may here state that as blotting paper alone must be used for this process of conversion, common paper may in turn be converted into blotting paper by immersing it for a few seconds in hydrochloric acid. Some recommend for this purpose a mixture of hydrochloric acid and water; but in the experiments that we have tried in this direction, we have immersed the paper in a bath of the ordinary undiluted acid, removing it, after a few seconds, to a vessel of water in which it was treated to several changes.—*British Journal of Photography.*

LAKE SUPERIOR TIN.—At a recent meeting of the New York Lyceum of Natural History, Professor Henry Wurtz exhibited some beautifully crystallized specimens of heavy tin stone or cassiterite, discovered a few months since on the most northerly shore of Lake Superior, near Neepigon Bay. The deposits are said to be extensive and valuable.

PATENT INFRINGEMENT CASES.

United States Circuit Court—Eastern District of Pennsylvania, in Equity.

Reeves *vs.* Keystone Bridge Company, J. H. Linville and others.

This was a suit for infringement of the complainant's patent of June 17, 1862. The patent is for an improvement in the construction of columns, shafts, braces, etc., and the invention consists in the use of three or four wrought iron bars of such shapes and dimensions that, when arranged together in the direction of their length and fastened by rivets or bolts through their flanges, they form a hollow shaft or column.

The respondents admitted the making and using of the column described in the patent, but denied its novelty on the following grounds:

1. That the invention was originally made by Jacob H. Linville and John H. Piper.

2. That it was described in the *Allgemeine Bauzeitung* for September, 1861.

3. That it was illustrated by a drawing in the *Dreyfuss Album* bearing the imprint of 1861.

We regret that our space will not permit us to give the opinion by McKennan, Circuit Judge, in full. Its essential features follow:

It appeared in regard to the first allegation that, on the 14th of January, 1862, a patent was granted to J. H. Linville for an improvement in iron truss bridges, which consists of a post composed of two rolled plates of wrought iron, semi-octagonal in form, secured by rivets passing through its diameter, or by bands shrunk around it, binding the plates firmly to distance pieces interposed between them at suitable distances to spring them apart at the middle, and terminating in cast iron bases and capitals. This was held by the judge to be essentially distinguishable from the complainant's post. It next appeared that in 1865 Linville, in conjunction with Piper, applied for and obtained a patent nominally for improvements in his post of 1862, but, really changing its fundamental organization, and seeking to fix its invention in 1860, and in fact describing and appropriating the distinctive features of Reeves' post, which had been patented three years before. It was shown in evidence that in 1860 Linville and Piper were engaged together in getting up plans for a proposed railroad bridge, and that sketches of various forms of posts, including those described in the patents of 1862 and 1865, were made; that the sketches of the post described in the 1865 patent were preserved for a time, but were lost, and, in fact, that nothing beyond making the sketches was done to embody or carry out the alleged invention until the patent of 1865 was applied for. After an exhaustive consideration of the question whether or not these sketches would carry back the date of the invention to the time when they were made, the Judge held that, whether they are to be considered as an incomplete invention not prosecuted with the required diligence, or as an experiment actually abandoned, they cannot impair the right of Reeves to be treated as the first inventor.

In regard to the second allegation, it was held that a column, constituted as described in the publication referred to, differs from Reeves' column in the necessary elements composing it and in its principles; and respecting the third reference, as it did not appear that the book was published before the patentee's invention, it was held, as evidence, to be altogether inconsequential.

The complainant is entitled to an allowance of the prayers of his bill, and a decree will therefore be entered for a perpetual injunction and an account, with costs.

George Harding and R. C. McMurtrie, Esq., for the complainant.

C. B. Collier and Theodore Cuyler, Esqs., for respondents.

The Keystone Bridge Company *vs.* The Phœnix Iron Company.

This was a case of alleged infringements of Linville's and Linville and Piper's patents of 1862 and 1865, referred to in the preceding case.

In the opinion delivered by MCKENNAN, Circuit Judge, his Honor did not deem it necessary to consider the alleged infringements of certain claims, in view of the decision just rendered in the case of Reeves *vs.* The Keystone Bridge Company, and after pointing out the essential difference between the bars claimed by the complainants and those made by the respondents, dismissed the patent of 1862 from further consideration. In regard to the third claim in the patent of 1865, which is for "the use, for the lower chords of truss frames, of wide and thin rolled bars, with enlarged ends formed by upsetting the iron, when heated, by compression into molds of the required shape," the respondents were proved to have only made *round* bars which were not employed or adapted to give vertical support to the roadway, which is an important function of the complainant's lower chords and the reason of their peculiar conformation. Further, it is not to be doubted that the patent is limited to the *use* of the chords in bridge structures. This is distinctly set forth in the specification where it is stated: "We do not claim the upsetting of bars in the manner described, nor any particular mode of performing the operation, but merely the use of chord bars," etc. Thus the exclusive right to make chord bars in any mode is disclaimed. In effect, they declare that any one may lawfully make the bars, and that no encroachment upon their rights is committed until the bars are used by being put into a bridge. Now, the respondents are iron manufacturers, and it was shown that the bridge in question was built by Kellogg & Clark, who obtained the iron for it from the respondents, and that the bottom chords used were like those claimed by the complainants. It was held that this proof of infringement fell far short of fixing any accountability upon the respondents, who made the bars, but did not use them. They only did what they had a legal right to do, and did not thereby assume any responsibility for the wrongful acts, or become involved in the unlawful purposes, of others. Bill dismissed, with costs.

C. B. Collier and Theodore Cuyler, Esqs., for complainants.

George Harding and R. C. McMurtrie, Esqs., for respondents.

United States Circuit Court.—Maine.—Miller *vs.* Androscoggin Pulp Company.

The defendants in this case were charged with an infringement of letters patent for a new and useful improvement in reducing wood to paper pulp, for which letters patent were issued, August 10, 1858, to Henry Voelter, assignor to Alberto Pagenstecher.

The Voelter patent is for an improvement in the art of reducing wood into pulp for use in paper, and also for certain improvements in machinery therefor.

In all the processes used prior to the present invention the wood has been acted upon by the stone in one of two ways: namely, either by causing the surface of the stone to act upon the ends of the fibers, the surface of the stone moving substantially in a plane perpendicular to the fibers of the wood; or, secondly, by acting upon the fibers in such a direction that they were severed diagonally, the surface of the stone moving diagonally across the fibers.

The first plan, in fact, made powder of the wood. The pulp had no practical length, and on trial proved worthless, or nearly so. The second plan was carried out by the use of a stone revolving like an ordinary grindstone, the wood being applied upon the cylindrical surface thereof, with the fibers perpendicular, or nearly so, to planes passing through the axis of the stone and the point or locality where the grinding was performed; and this plan also failed because the fibers were cut off in lines diagonal to their own length, and were consequently too short to make good pulp.

This improvement consists in grinding or rather tearing out the fibers from the bundle of fibers which makes up a piece of wood, by acting upon them by a grinding surface which moves substantially across the fibers and in the same plane with them without cutting or severing the fibers either perpendicularly or diagonally to their length as heretofore. The defense claimed that substantially the same process was shown in other patents. The invention is regarded as one of importance. Judge Shepley held the patent to be valid, and granted an injunction.

NEW BOOKS AND PUBLICATIONS.

THE AMERICAN NEWSPAPER DIRECTORY: Containing Accurate Lists of all the Newspapers and Periodicals published in the United States and Territories, and the Dominion of Canada and British Colonies of North America; together with a Description of the Towns and Cities in which they are Published. New York: Geo. P. Rowell & Co., Publishers and Newspaper Advertising Agents, No. 41 Park Row.

This book is already well known to the public, more especially to advertisers and publishers; and the new edition is corrected up to this date, and contains the full and accurate information claimed for it on the title page. Messrs. Rowell and Co. deserve credit, not only for compiling a trustworthy guide to the newspaper world, but also for the production of so handsomely printed a volume.

THE IMMIGRANT BUILDER; OR, PRACTICAL HINTS TO HANDY MEN: Showing clearly how to Plan and Construct Dwellings, in the Bush, on the Prairie, or elsewhere, Cheaply and Well, with Wood, Earth, or Gravel. Copiously Illustrated. By C. P. Dwyer, Architect, Editor of "Sloan's Architectural Review," Author of the "Economic Builder," etc. Price $1.50. Philadelphia: Claxton, Remsen, and Haffelfinger.

This book will be useful to thousands who are now pushing their fortunes on the western prairies, and to many of whom the question of a comfortable home is of chief importance, and its absence the greatest hardship. We shall probably make extracts from this volume in a future publication.

FOURTH ANNUAL REPORT ON THE NOXIOUS, BENEFICIAL, AND OTHER INSECTS OF THE STATE OF MISSOURI. By Charles V. Riley, State Entomologist. Regan & Edwards, Public Printers, Jefferson City, Mo.

This is an able and comprehensive report on the above subject, for the year 1871, made to the Missouri Board of Agriculture. It contains about 150 pages, with explanatory illustrations, and is indexed.

THE SIGN PAINTER'S GUIDE. By James T. Gardiner. Published by the Author. Cincinnati.

This little work is written with the view of helping sign painters in acquiring an adequate knowledge of their business, including glass gilding, pearl work, etc. It contains, besides, much general information, many valuable receipts, and instructions for using Callow's patent graining apparatus.

THE SCIENCE OF ÆSTHETICS; OR THE NATURE, KINDS, LAWS, AND USES OF BEAUTY. By Henry N. Day. Published by Charles C. Chatfield & Co., New Haven, Conn.

This treatise on the "general subject of beauty as perfect form" was specially prepared by the author in view of the demand for text books in this department of study. It is an elegant volume of over 400 pages, and is adorned with several fine engravings.

SELECTIONS FROM FAVORITE PRESCRIPTIONS OF LIVING AMERICAN PRACTITIONERS. By Horace Green, M.D., LL.D. New York: John Wiley & Son, 15 Astor Place.

This is a new and excellent edition of a valuable work, to which has been added a carefully prepared toxicological table which exhibits symptoms, antidotes and tests. Published at $2.50.

The History of a Great Enterprise.—In eighteen hundred and fifty-four, the original incorporators of the WILSON SEWING MACHINE COMPANY embarked in the manufacture of Sewing Machines, and from that time to the present, their time, talent, energy and capital have been employed in making *First Class Sewing Machines*, with varied success attending their efforts. It being their constant aim to produce a *Shuttle* or *Lock-Stitch Machine* that should be *simple* to handle, *durable* as steel and iron could make it, with unlimited capacity, *unexcelled* by any other machine, regardless of name or price, and withal to confine the price within the reach of all classes of people; and success has crowned their efforts in the production of the celebrated WILSON UNDER-FEED SHUTTLE SEWING MACHINES, which combine all the *Elegance, Simplicity, Durability* and *Strength* possible for any sewing machine to attain, and they are the *First* and *Only First Class* moderate priced machines put in the market. Salesroom, 707 Broadway, New York; also for sale in all other Cities in the United States.

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Manufacturers of lamps, burners, lamp goods, illuminating oils and gasoline, please correspond with T. Tully & Co., Springfield, Ill.

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Glass Work for Inventors. T. Degnan, 115 Milk St., Boston, Ms.

For hand fire engines, address Rumsey & Co., Seneca Falls, N.Y.

Small second hand or new Upright or Horizontal Boiler, requiring no Brick Work, wanted for Engine 6x6 Cyl., for cash. C. Kratz, Evansville, Ind.

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Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

For Tri-nitroglycerin, insulated wire, exploders, with pamphlet, as used in the Hoosac Tunnel, send to Geo. M. Mowbray, North Adams, Mass.

All kinds of Presses and Dies. Bliss & Williams, successors to Mays & Bliss, 118 to 122 Plymouth St., Brooklyn. Send for Catalogue.

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

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In the Wakefield Earth Closet are combined Health, Cleanliness and Comfort. Send to 36 Dey St., New York, for descriptive pamphlet.

Best and Cheapest—The Jones Scale Works, Binghamton, N.Y.

If you want to know all about the Baxter Engine, address Wm. D. Russell, office of the Baxter Steam Engine Co., 18 Park Place, N.Y.

Hoisting and Pumping Engines (Locomotive principle); best and simplest, from 6 to 40 H.P. J. S. Mundy, 7 R. R. Av., Newark, N.J.

Dickinson's Patent Shaped Diamond Carbon Points and Adjustable Holder for dressing emery wheels, grindstones, etc. See Scientific American, July 24 and Nov. 20, 1869. 64 Nassau st., New York.

Peck's Patent Drop Press. For circulars address the sole manufacturers, Milo, Peck & Co., New Haven, Ct.

T. Shaw's Blast Gauges, Ridge av. & Wood st., Phila., Pa.

Callow's New Patent Mode of Graining Wood, Makes Painters grain all woods first class who never grained before; Likewise makes Grainers lightning fast who thumbed it out before. Address, with stamp, J. J. Callow, Cleveland, Ohio.

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Absolutely the best protection against Fire—Babcock Extinguisher. F. W. Farwell, Secretary, 407 Broadway, New York.

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Self acting Screen makes 6 grades Coal, ores, &c. A State right at a bargain. Geo. Lord, 232 Arch Street, Philadelphia, Pa.

Important.—Scale in Steam Boilers—We will Remove and prevent Scale in any Steam Boiler or make no charge. Geo. W. Lord, 232 Arch Street, Philadelphia, Pa.

"Anti Lamina" will clean and keep clean Steam Boilers. No injury to iron. Five years' use. J. J. Allen, Philadelphia, Pa.

Williamson's Road Steamer and Steam Plow, with Rubber Tires. Address D. D. Williamson, 32 Broadway, N. Y., or Box 1809.

Boiler and Pipe Covering manufactured by the Chalmers Spence Non-Conductor Co. In use in the principal mills and factories. Claims—Economy, Safety, and Durability. Offices and Manufactories, foot E. 9th street, New York, and 1202 N. 2d street, St. Louis, Mo.

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Kemmer's Patent Oil Frescoing—great improvement for frescoing Ceilings and Walls. Office, No. 4 Warren St., New York. Factory, East Newark, N. J.

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To Ascertain where there will be a demand for new Machinery, mechanics, or manufacturers' supplies, see Manufacturing News of United States in Boston Commercial Bulletin. Terms $4.00 a year.

Notes & Queries.

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

1.—INDIA RUBBER BELTS.—Can an endless gum belt be made uniform in thickness and strength throughout? A substantial belt 7 inches wide and 125 feet in length is wanted.—S. S.

2.—DIMENSIONS OF AIR PUMP.—How large an air pump do I want, and at what rate of speed should I run it, to produce a pressure of 100 pounds per inch, the air to be discharged through a three eighth inch pipe, and the discharge pipe to be open all the while? How large an air chamber or receiver should I want? How much power would it take to drive such a pump?—O. O. W.

3.—FUTURE HUNTING PROSPECTS.—Can any one tell me what the West will be fifty years hence? Will there be plenty of game out there and could a man make a living by his rifle? Also, if a person had a cartridge rifle, could he find plenty of that kind of ammunition out there now, or had he better get a rifle that would use both cartridge and loose ammunition?—O. K.

4.—WELDING STEEL.—What is the proper flux to use for this purpose?—I. A. C.

5.—OXYGEN IN SULPHURIC ACID.—What number of cubic feet of oxygen gas does it take to oxidize one ounce of sulphur to form sulphuric acid?—J. T.

6.—SLOWLY DRYING GLUE.—I am doing some joiner's work which requires the glue to set or dry very slowly. Can any of your correspondents tell me how to make it do so without injuring its strength?—J.H.P.

7.—TRANSFERRING PENCIL DRAWINGS.—How can I transfer a pencil drawing on paper to box wood or type metal for engraving?—J. H. K.

8.—ACETIC ACID.—Will some correspondent inform a subscriber how to make good acetic acid on a small scale?—F. O. R.

9.—FLAVORING EXTRACTS.—Will some one tell me how extracts of vanilla and lemon are made?—E. R. T.

10.—POWER OF HEAD OF WATER.—I have a fall of 19 or 20 feet water, only 12 by 2 inches; on a 20 foot wheel, what power will it give? Which will be cheapest and best, an overshot or turbine wheel? I want to build a stone dam; how thick should the wall be? The stones are small. Is there any mortar or cement that I can use at the foundation so as to prevent the escape of any water? Please tell me how to begin and finish the dam.—J. S. C.

11.—MOUNTING PRINTS.—I wish to know if wetting (as much as will be required for the purpose of backing in map style) will injure the color of a common lithographic print? If so, is there any other cheap method of preserving it? What is the most pliant and best material for backing? What is a good varnish for the face of the print? Will soaking blur common ink writing? If so, is there anything with which either it or a lithograph may be treated to fix the colors? I have two lithographs and another paper, with considerable writing on it, which I desire to back and mount in map style.—E. D. W.

Answers to Correspondents.

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

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

TEMPERING MINERS' PICKS.—J. A. C. will find full directions on page 170 of Vol. XXV. of the SCIENTIFIC AMERICAN.

STAINING GUN BARRELS.—To S. G.—We have recently given full information on this subject. See pages 217 and 260 of the current volume.

TEMPERING STEEL SPRINGS.—To L. G.—Your question has been answered by several correspondents during the last few months. See pages 200, 249, and 313 of the current volume.

J. C., of W. Va.—The mineral you send is mica schist, of no value. No metal in it.

W. O. H., of Miss., says: I enclose you an insect picked up in a room which had been for some time unopened. Please let me know what it is. Answer: The "insect" appears to be the *puparium* of a gay colored fly, whose "rat tailed" *larva* has a long respiratory tube. The species is *Merodon bardus* (Say).

DIFFERENTIATION OF FOCI.—How should the lenses of a portrait camera tube be set so that the chemical focus and the light focus will be coincident? Can a tube that has these *foci* at different distances be remedied? And how? I noticed a few days since that, in taking a view of a house with a portrait lens, using a stop three inches in diameter, when the plate was developed there was a circle in the center of about three times the diameter of the stop, over which there was a greater deposit of silver than over the rest of the plate. How can this be prevented? Is there any combination of lenses that will prevent the image on the plate in the camera in its true position, that is, that will form a non-reversed picture? If so, what is the combination?—X. P. M. Answer: When the lenses of your portrait camera are truly achromatic, the chemical focus and the light focus will coincide; if they are not truly achromatic, or are so only in name, by the defective relations of the curves of the flint and crown glass, they cannot possibly be made to coincide. This is entirely the business of the maker of the lenses; you cannot correct this by setting. All that you can do is to find out how far the chemical focus is in front of or behind the light focus, and when you have focussed with the ground glass, to set your prepared plate so much forward or backward. In some cameras, the maker has done this by means of difference in the position of the ground glass and the plate holder, and you may correct your camera box in the same way. The new excellent landscape lenses of Lindmayer of Philadelphia, and many German lenses made in imitation of his, are not achromatic, and it is not claimed that the two *foci* coincide, but the picture is made in the chemical focus. The spot in the center of your picture, which you so admirably describe, is well known among photographers and called "the ghost;" it is a common defect in the lenses and cannot be prevented; all that you can do is to modify things so as to make your ghost as slight as possible. When the spot is between the lenses at the right place, the ghost is at its minimum. There are combinations for making a non-reversed picture, namely, a metallic reflector (in front of your lenses, placed at an angle of 45° with the axis of your camera tube), the so-called prism with total reflection, or a mirror inside the camera box, etc.

PARIS GREEN.—Query 2, page 330.—Paris green is known in chemistry as Scheele's green. It is an arsenite of copper, and is made by dissolving one part of common white arsenic (arsenious acid) and three parts of carbonate of potassium in fourteen parts of water and adding the mixture to a boiling solution of three parts of sulphate of copper (blue vitriol) in forty parts of water. The Paris green is precipitated.—L. L. F. G., of Mass.

CLEANING INSTRUMENTS.—To H. O. M., query 19, page 297.—If the lacquering is badly spotted, clean it off with strong alcohol, and then polish the brass or German silver with the following paste by means of flannel and a little water, and polish off with clean chamois leather or cotton cloth and a little whitening, after which you might revarnish with shellac dissolved in alcohol, colored with a little dragon's blood, which can be got from any apothecary: Soft soap, 3 ounces; sweet oil, ½ ounce; turpentine, ½ ounce; powdered rotten stone, 4 ounces; finest flour emery, 1 ounce; fine powdered crocus of antimony, ½ ounce. Melt the soap, oil, and turpentine together, add the powders, a little water to make a stiff paste, and mix well.—E. H. H., of Mass.

CONCRETE WALLS.—T. D. D., query 13, page 297.—Boil linseed oil over a fire for two or more hours until it forms on cooling a tough viscid mass. If while hot, or thinned a little with benzine, this is painted over the walls, I think you will find your trouble relieved, as the composition will form a perfect waterproof coating. In boiling the oil take care that the fumes do not catch fire; but if they do, put a sheet iron or tin or a thick wet mat or piece of carpet over your pot; so shut out the air and extinguish the flames. On no account throw in water. Be provided and ready for the emergency.—E. H. H., of Mass.

BENGAL SIGNAL LIGHT.—Query 2, page 313.—A white Bengal light, very powerful, is composed of saltpeter, 32 parts, sulphur, 10 parts, antimony, 3 parts, and slacked lime, 4 parts.—A. V., of Mass.

SULPHATE OF MERCURY.—F. G. V., query 1, page 297, may dissolve the metal in diluted nitric acid, and precipitate the sulphate from the solution by the addition of sulphuric acid.—E. H. H., of Mass.

GALVANIZED IRON VESSELS FOR MILK.—W. P. T., query 7, page 297, will find that the lactic acid in the soured milk or cream will act upon the zinc surface of the vessels, thus rendering the fluid poisonous. Earthen or enameled iron pans are every way better (excepting the liability to breakage) than zinc or tin. Polished iron is not so easily acted upon as the two former metals.—E. H. H., of Mass.

GALVANIZED IRON PIPES.—B., query 11, page 297, would be less liable to occasion zinc poisoning if the lead and brass connections were out of the way, for they in fact will act as the other element of a galvanic battery, the water forming the electrolyte and taking up the zinc. The amount of action of the water upon the zinc will depend partly on the salts it has in solution. Total prevention of the contamination of the water by the zinc will be almost impossible, but constant changing will lessen the evil. Antidote for zinc poisoning: Clear the stomach by an emetic, then use albuminous drinks, and the administration of tannin in ten grain doses.—E. H. H., of Mass.

PREPARING FABRICS FOR PAINT.—To F. O. L., query 21, page 203.—Paint the cloth with thin flour paste, and allow to dry. It need not render the cloth very stiff.—E. H. H., of Mass.

GROVE'S BATTERY.—Query 10, page 313.—The zinc cylinders of a Grove's battery should be amalgamated with mercury. All that is necessary is to clean them by immersing them in dilute sulphuric acid of the same proportion as that used in the battery (eight parts water and one of acid is good), and then pour over them mercury, keeping them constantly wet with the acid. Sometimes a little rubbing with a coarse rag will hasten the amalgamation. When once coated, a little mercury kept in the cup with the zinc will keep them bright. The zinc cylinder should have about twenty-four times the area of the platinum. J. C. G. will need for his arrangement a strip of platinum 8 inches long and ⅛ inch wide, if his acid touches only the inside of the zinc, and twice as wide if it touches both sides. To give needed strength, however, the platinum should be at least ⅜ inch wide, and should extend nearly to the bottom of the porous cup. The porous cup should be as large as can be put into the zinc cylinder readily.—L. R. F. G., of Mass.

PRESERVATION OF TELEGRAPH POLES.—H. R. R., query 9, page 313.—I have for some time been paying attention to this; and my opinion is that neither tarring nor charring them is done with satisfactory results. The best mode of preserving them is coating their ends with soluble glass. This method is not very expensive, and is proof against worms, as they cannot make their way through the glass; it is also proof against the decomposition of wood by moisture, as soluble glass does not melt at any ordinary temperature. If H. R. R. were to try this method, I think he would find it answer. Any chemist will tell him the mode of preparing soluble glass.—C. A. S., of O.

GROVE'S BATTERY.—Query 10, page 313.—J. C. G. is entirely wrong in supposing that the amalgamated zinc for a Grove battery is a mixture of zinc and mercury. The zinc is merely coated with mercury to prevent rapid and uneven action of the acid upon the zinc. Plunge the zinc in a bath of dilute sulphuric acid, dip it into a vessel containing mercury and water so that the mercury may cover the whole zinc; then, with a stiff brush remove all superfluous mercury. This is amalgamated zinc. His zinc cylinder should be open at both ends. The porous cup need not be larger than two inches in diameter for the size of zinc named. Platinum a quarter of an inch wide, thick as ordinary writing paper, is sufficient. He can buy a cell much cheaper than he can make it.—S. J. H., of Ala.

Recent American and Foreign Patents.

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

APPARATUS FOR SUPPLYING LOCOMOTIVE TENDERS WITH FUEL.—Henry C. Land, of Garlandville, Miss.—This consists of a platform or frame, on which the wood or coal is placed. To its lower side, at or near its central line, is pivoted the upper end of a frame, by which the platform is supported. The lower end of this frame is pivoted to a base frame or other suitable supports. Inclined rods are pivoted to the forward part of the lower side of the platform. The lower ends of the inclined rods are pivoted to the base frame, a little in the rear of the lower end of the pivoted frame, so as, when the frame and platform are swung forward, to tip or incline the platform and discharge the fuel into the tender. A strong upright frame is rigidly attached to the base frame just in the rear of the swinging frame, and by various appliances attached to the former the movements of the latter are controlled. The apparatus is designed to be placed at the side of the railroad track in such a position that the fuel may be discharged from the platform directly into the tender standing upon the track.

PICKLE AND CRUET STAND.—Thomas Leach, Taunton, Mass.—1st. The invention consists in a new pickle stand, provided with a hollow seat for pickle vessels, attached to and placed between two uprights, and provided also with a horizontal flange on which is fastened a vertical handle that straddles said hollow seat diametrically; 2ndly, in extending the said horizontal flange, and recessing the extension so as to form a compound pickle and cruet stand; and 3rdly, in combining, in one article of table furniture, a pickle and cruet stand.

WASHING MACHINE.—William G. Knowles, Jamestown, R. I.—This invention relates to a new washing machine in which a reciprocating slotted washboard is arranged to move on spring rails under and against friction rollers that hang in a spring frame. The goods pass down through the slot in the washboard into the suds, and are drawn through the washing apparatus by the friction exerted against the rollers by the reciprocating washboards.

WINDOW BLIND SLAT.—Alois Kohler, Williamsburg, N. Y.—This invention relates to the peculiar form of the slat. It may be made with any suitable molding upon its face. In cross section, the lower side of the slat presents a curved groove in front and a projection or heel in the rear; the upper side presents a tongue and a rear recess. These parts correspond, and will fit into each other when the slats are placed one over the other, forming a perfect joint.

APPARATUS FOR ELEVATING AND IMMERSING VESSELS.—Justin Jacobs, of West Salem, Wis.—This invention relates to a new device for application to river steamers, canal boats, and other vessels, and has for its object to prevent their sinking in case of a dangerous leak, and to cause their submersion in case of fire. It consists in the arrangement of vertical slides, which extend through the bottom of the vessel and are let down to serve as supports for the same on the ground whenever there is danger of the vessel sinking, also in the combination of these elevators with gates, which, when opened, let water into the vessel to sink it in case of fire.

ARMORED CAN.—William F. Thompson, of Toledo, Ohio.—This improvement consists, first, in armoring sheet metal cans with wood to protect the thin metal from injury in handling and transporting, by fastening side, bottom, and top pieces, or boards to the can by means of clamp plates, soldered or otherwise fastened to the corners of the can, and the ends bent over the edges of the boards after they are applied, whereby much is saved in the cost of the wood case or protecting armor, which up to this time, has been first made into a box, into which the can was placed and inclosed by a cover; and, secondly, it consists of an arrangement of the nozzle in one corner of the can, which is sloped off to make room for arranging it so that the top will not rise higher than the top of the can, to admit of so applying the armor on the top.

TOBACCO DRYING HOUSE.—John C. Streeter, of Hinsdale, N. H.—This invention relates to the process of drying tobacco and other articles, and consists in the provision made for suspending the article to be dried, and in the use of metallic supports, connected with the building frame. The suspending wire is bent round the rod so as to enclose it in a loop, and the two ends of the wire are passed around the tobacco and again bent at an acute angle over the top of the rod. These metallic supports or rods are placed at proper distances apart, and are arranged at right angles with each other, so that they support the frame in each direction.

GRAIN SCREEN.—David D. Schamp, of Pleasant Run, N. J.—This invention has for its object to improve the construction of the delivery spouts of thrashers and grain separators, so as to more thoroughly clean the grain before it is delivered into the receiving box or half bushel, and which shall be simple in construction and convenient in use. The spout is made with flanges along the upper edges of its sides to adapt it to be slipped into a groove formed for it in the shoe of the machine, so that it may be shaken by and with the shoe. The bottom of the spout is made of wire cloth or perforated sheet metal, to form a screen through which the dust and fine seed may escape, while the grain passes down the screen and escapes from the outer end of the spout. If the spout were left open, the part of the grain that fell upon it near its lower end would scarcely be screened at all. To remedy this a plate is placed, in the upper part of the spout near its lower end, to receive the grain and guide it to the upper part of the screen, so that it may pass over a longer portion of the screen. The outer end of the spout is extended fourteen inches and has a screen formed in or attached to the inner part of its bottom, of such a coarseness as to allow the grain to pass through, while the straws, heads, etc., which may be in the grain will slide over the screen and will drop from the outer end of the spout.

BALING PRESS.—Commodore J. Barney, of Rockport, Ind.—This invention has for its object to furnish an improved press for baling hay, straw, cotton, and other substances required to be put up in bales, and which shall be simple in construction, convenient in use, and effective in operation, enabling the work to be done much quicker and consequently much cheaper than when an ordinary baling press is used. The upright frames, which form the baling box, are securely connected by cross bars between which the doors for the removal of the bale are placed. Two followers work up and down toward and from each other in the baling box. To their outer sides are pivoted, respectively, the inner ends of bars, the outer ends of which are pivoted to levers. The outer ends of these levers are pivoted to the base frame and top frame near the outer vertical frame, and their inner ends are connected by a rope arranged with suitable machinery for compressing them. By this arrangement the levers operate upon the followers in the manner of a toggle joint, the bars coming nearer and nearer to a vertical position, and thus acting with more and more power as the bale becomes more and more compressed.

PUNCH AND DIE FOR FINISHING UMBRELLA STAFF COLLAR.—Robert Marshall, of Philadelphia, Pa.—The objects of this invention are to lessen the hand labor now required to finish umbrella staff collars in the lathe and to secure their being made to a standard size, which is accomplished by finishing the exterior of the casting in dies, and sizing the hole by means of a painted mandrel rising through the lower die.

SPADE.—Jeremy Lake and Andrew W. Elliott, of North Easton, Mass.—This invention relates to a new spade which will enter the ground with greater ease than those now in use. A notch is cut into the blade of the spade at the middle, and extends from the lower edge about half way up the length of the blade. The blade has thus the shape of an inverted letter U. Its lower cutting edges may be slightly rounded, or straight. A spade thus made will, with less difficulty, cut through the ground, and will crumble the soil with less effort than the full bladed spades, though it has sufficient surface not to break the clods while it supports the same.

SOLDERING TOOL.—John A. Tillery and Samuel A. Ewalt, Baltimore, Md.—The invention consists: 1st, in making a soldering tool adjustable radially from a hinge joint, in order to adapt the same tool to be used with caps of varying size; 2adly, in moving said tool out and in, and fixing it at the same time, at any point of adjustment, by means of a loop headed screw through which passes the holder. The advantages of this tool consist: 1st, in the arc shape by which it can be seen at a glance what point has been left unsoldered or imperfectly soldered. 2ndly, in the facility with which such defects can be remedied without removing the tool; 3dly, in the option that it allows of using either wire solder, or the cheaper drop solder, thereby saving one half the expense.

ILLUMINATOR.—Chas. F. Jacobsen, New York city.—The invention consists in combining glass plates, a flanged metallic case, a flanged metallic rim, two concave reflectors and a pair of burners, so as to form a new double night sign. By this construction the name of the business man and his special occupation or class of goods are displayed with great clearness and the attention of the public unfailingly attracted.

PLANTER.—Weisel Beall, of Hainesville, W. Va.—This invention consists in introducing certain mechanical elements into the train of mechanism which connects the axle with the seed slide of a planter, by which the number of hills planted may be indicated on a dial with which it is combined. This implement is quite ingenious, but cannot be fully explained without an engraving and lengthy description.

COTTON PLANTER.—John A. Pope and William L. D. Pope, of Charlotte, N. C.—This invention has for its object to furnish an improved machine for planting cotton seed, distributing guano or other fine fertilizers, which shall be simple in construction, convenient in use, and effective in operation. Its principal features are the combination of a perforated platform, plates and feeder within the hopper, together with a stirrer, by which the seed or fertilizer is stirred up and made to pass through the holes in the plates on its way to the discharge spout. The seed is covered by adjustable covering plows.

REVERSIBLE SHADE FIXTURE.—William B. Hazzard, of Philadelphia, Pa.—The object of this invention is to permit the adjustment of window shades in either direction, so that a shade can be placed opposite any one part of a window wherever it may be required. The invention is more particularly useful for photographic establishments, hothouses, etc., where the rays of light are to be controlled with great exactness. It consists in the arrangement of a sliding spring roller supported on wire tracks and connected with a cord, whereby it can be drawn up, while the lower end of the shade has another cord, whereby it can be drawn down.

CALENDAR.—Robert C. Ogden, of New York city.—This invention relates to calendars which have a sheet, leaf, or tablet for each month, hinged or fastened together and to the back, so that any one month may be exhibited to view by dropping that or another leaf, sheet, or tablet down; and it consists in forming the hinge or connecting device of a single wire, bent at the ends into loops of a peculiar form standing at right angles to the wire. By this construction, the calendar will rest flatly against the wall when it is hung up, and the sheets can be attached and moved much easier than if plain rings were used.

BOOT FOR HORSES.—Patrick Murray and Frederick Koch, of Morrisania, N. Y.—This invention has for its object to provide a yielding but nevertheless powerful boot for horses, whereby the muscles and tendons in the lower limbs near the hoof will be protected. A strap is made of leather, or other suitable material, long enough to fit around the horse's leg, and as wide as the section to be protected is long. A cushion is formed in the strap, and a section of rubber or other equivalent elastic material also secured therein. The cushion, which is made of suitable soft material, projects on the inner side of the strap, and is, by means of the elastic, drawn against the portion of the horse's leg which is exposed to the strain. Being thus held in contact with the parts most exposed, the cushion serves to brace or sustain such parts and protect them from injury. The strap is, by buckle, buttons, or otherwise, fastened around the horse's leg. The elastic makes it also self sustaining. The device can also be used as an "interfering boot," to prevent the animals from injuring their limbs by striking them against one another.

APPARATUS FOR TEMPORARILY INCREASING THE PRESSURE IN GAS PIPES.—George S. Dunbar, of Pittsfield, Mass.—This invention furnishes an improved device for attachment to the pipe leading from the gas holder to the street main, or from the street main to the building, to enable the pressure to be temporarily increased. The drip box or trap attached to the main pipe is provided with a valve and a compressing apparatus in the following manner: The end of the part of the pipe that leads to the gas holder is provided with a valve which opens into the drip box. With the top of the drip box is connected an open pipe which passes up the central part of a cup or receiver, in which is placed water or other liquid to serve as a seal to the open bottom of a gas holder placed in it. With this construction, when the holder is raised, it will be filled with gas at the same pressure as it has in the main holder and in the pipes. When the holder is forced down, the gas in the holder will be forced out, closing the valve and temporarily increasing the pressure in the pipes, so as to operate as a device for lighting and extinguishing street lamps and burners.

DOOR CHECK.—William Overton Clough, of Lexington, Ky.—This invention has for its object to furnish an improved device for checking a door when opened, and holding it while open, so that it cannot swing about and slam. The box or case of the device is made in two parts. One part is made thick, and is recessed to receive a catch bar. The other part is made thin, and is designed to cover and protect the catch bar. The inner end of the catch bar is rounded off, and fits into a round recess in the body of the thick part. Upon the forward side of the catch bar are formed two catches. The forward side of the forward catch is inclined, so that when the door strikes against it the catch bar may be pushed back, allowing the door to pass the catch. The other or rear projection is intended to stop the door after it has passed the first catch. Upon the forward end of the catch bar is formed a toe piece, which projects through a slot in the end of the case, so that the catch bar can be readily pushed back with the foot to release the door and allow it to be closed. The catch bar is held forward by a coiled wire spring. The case should have holes or lugs to receive the screws by which it is secured to the floor. The door has a small metallic plate attached to it, projecting a quarter or half an inch, which is designed to operate upon the catch. This enables the holder to be made smaller, and consequently cheaper, than it could be if it had to operate upon the body of the door itself.

LAND ROLLER.—Holloway W. Matthews, of Frenchtown, N. J.—This invention relates to a new manner of connecting the back frame of the third roller to the main or front frame holding the two front cylinders of a land roller. The object is to permit the application of a limbered tongue, whereby much strain is taken from the horses' necks. An L shaped bar connects the front and back frames. This bar has a long horizontal arm which is swiveled in the middle of the front frame, and extends backward under the middle of the back frame. A short vertical arm projects upward from the same, and is swiveled in the front of the back frame. This arrangement permits the frame to swing to either side on the short arm, and to incline to either side on the long arm, while vertically it is rigidly connected with the front frame. Up and down the frames will swing as though the two were one, while in every other direction the back frame has independent play. The tongue can therefore be hinged to the frame.

LIFTING JACK.—R. T. Smart and R. T. Smart, Jr., of Troy, N. Y.—This invention consists of a stand, of any suitable kind, with a long vertical slot in the upper part, and a series of transverse notches in one side crossing the slot. A lifting bar, having one end fitted to work freely in the slot, is connected, by a pivot pin, with a pair of links, one on each side, which pin projects at each end beyond the links to lie in the notches. These links extend downward in the slot, and through to the other side, and have a lever suspended in the lower ends by a pin projecting at the ends to bear against the side of the stand, opposite the one having the notches, to hold the lever against being forced back by the weight. The short arm of the lever curves upward slightly, and is rounded and shod with a metal strap or plate to act against the lower side of the lifting bar, which lies upon it. The lifting bar has a notch on the under side, into which the end of the lever comes when the load has been lifted high enough, and by which the lever is locked self actingly, to sustain the load without other fastenings, but so as not to prevent being unlocked or disconnected readily when the load is to be let down again by the raising of the long arm of the lever. The lifting bar and lever are readily adjusted to the hight of the axle or other load to be lifted by shifting the pin to the different notches.

ASH SIFTER.—George F. Millard, of Pittsfield, Mass.—This invention consists of a wide flat bottomed sieve, with oval sides and open top, suspended on a cranked shaft, which drops, through slots, from the top of a case into bearings in two sides of the case, low enough for a cover of the case to close down and confine the dust while the sifting is going on. When the ashes are sifted out, the sieve is taken out of its case to empty the coal remaining in it. The ashes which accumulate in the bottom of the case are discharged through the top from time to time, as required, by turning the case over. The sieve is swung forward and back by the crank, and, by reason of its flat bottom and oval sides, gives a quick forward and back motion to the contents, and as quickly arrests the same by the oval sides in a manner well calculated to do the work quickly.

LAMP SNUFFER AND EXTINGUISHER.—Marcus L. Battle, of Bainbridge, Ga.—This invention consists of a snuffing blade, which is mounted on the top of the vertical portion of a cranked wire pivoted near one of the narrow sides of the wick tube, in the vertical plane of the largest diameter of said tube, and having a handle portion projecting outward from the base of the lamp top for swinging the blade over the top of the tube and back again for snuffing it when required; the wick being first drawn down slightly, so that only the completely burned portion will be snuffed off. The extinguisher consists of a little plate hinged to the rear of the snuffing plate, and curved on the other edge, so that when the snuffer plate is moved over the top of the tube it will swing upward, unobstructed by the cone of the burner, to the horizontal plane of the snuffer and be moved over the flame so as to extinguish it; and when the snuffer is moved back the said extinguisher will swing down again, so as not to strike against the cone or the supports thereof, and thereby obstruct the complete withdrawal of the snuffer.

BREAD CUTTER.—Samuel H. Martin and John S. Williams, of Mount Vernon, N. Y.—This invention has for its object to furnish an improved bread cutter, simple in construction and effective in operation, enabling the freshest and softest loaves to be easily and smoothly cut, and which may be also used to contain knives, forks, spoons, or other articles required about a table; it consists of a rectangular box, which is divided into three compartments by partitions. The rear partition extends up to the top of the box, and to its upper edge is attached a narrow board, to the edges of which are hinged the covers. To the front cover, near its rear or hinged edge, is attached a flange to rest the loaf of bread against while being cut. In one side of the box is formed a narrow compartment to receive the knife, the edge of which is concaved. To the forward or free end of the knife is attached the handle by which it is operated. The rear end of the concave edge of the knife is made with a sharp angle, which may be forced through the crust in beginning the cut. The rear end of the knife is made wide, and to the opposite sides of its lower part are pivoted the lower ends of two short parallel bars, the upper ends of which are pivoted to the sides of the boards that form the knife compartment or slot near their upper edges. This construction gives the knife a free movement, enabling it to operate upon the bread with a drawing cut. The device may also be used for shaving dried beef, which may be cut readily and quickly by giving the knife a sawing movement.

CAR COUPLING.—Courney S. Servoss, of Wilmington, N. C.—This invention consists of a pair of jaws within the drawhead, closing together or nearly so behind their pivots by the action of springs to engage behind the shoulders of the coupling bar, which couples with them self actingly when the head and shoulders are forced in beyond the end of said jaws. These jaws are so pivoted in cavities in the drawhead that the drawing force is expended on said cavities and not on the pivots of the jaws, and they are provided with arms projecting through slots in the sides of the drawhead, which are acted on to open the jaws and uncouple the car by inclines on vertical bars hanging one on each side of the drawhead from a cross bar, to which a lever is attached extending toward the side of the car, where it can be reached without entering between the cars; and this cross head rests by a vertical rod on the end of the coupler to hold it level to enter the drawhead of another car; also, to cause the uncoupling of the cars selfactingly in case one runs off.

BALANCED SLIDE VALVE.—Charles H. Hutchinson, of Concord, N. H.—This invention relates to that class of balanced valves which are made in two parts, one working on the valve seat and the other on the under side of the top of the steam chest, to prevent too much down pressure, and one of the parts working in and out of the other steam tight. The first part of the invention consists in having the parts of the valves thus working together of rectangular form, corresponding to the flanges, so that the down pressure will be alike throughout the valve from end to end. The second part consists of a novel arrangement of the packing for said parts, whereby it is adapted to such forms, and may be accurately fitted in a simple and economical manner; and the third part consists of the application of an exhaust valve, which opens to withdraw the steam from the interior space of said slide valve in case the packing leaks, but which closes when steam is shut off and the engine continues to run.

TOBACCO BOX.—Wilson C. Thomas and Edwin T. Pilkinton, Richmond, Va.—The invention consists of a tobacco box having body formed of a cylindrical sheet of isinglass, and bottom and top of stiff paper, flanged so as to embrace and support the body. It forms a box cheap, easily made, and yet strong enough to bear handling and transportation.

SOLDERING IRON.—Herrman S. Saroni, Cincinnati, Ohio.—The invention consists in providing a soldering iron with a hydrocarbon reservoir, a vaporizer, a combination socket, and means for expelling the fluid in the reservoir by elastic force.

SOLDERING IRON.—John A. Tillery, Baltimore, Md.—The invention consists in centering the soldering tool with a rod which has an end tube provided with a side aperture, so that while the soldering tool is itself enabled to move in a perfect circle, the air from within the can can still freely escape.

PREPARING HORSE RADISH.—Joseph D. Husbands, Jr., St. Louis, Mo.—This invention consists of a new article of manufacture for food, medicinal, and other purposes, the same being desiccated and powdered horse radish, either alone or in combination with other condiments of salt, pepper, mustard, or spices, or other articles that will improve its flavor. The roots are desiccated in any approved way, and then ground or pulverized by any approved means, and packed together with the said condiments or not, as wanted.

WASH BASIN.—Jordan L. Mott, Mott Haven, N. Y.—This invention consists of a water closet and wash basin combined in one apparatus for use in prisons. The water closet basin and the wash basin are hinged together so that the wash basin rests on the top of the water closet basin and forms the cover thereof when in the position for washing; but when the water closet basin is to be used, the wash basin swings up and backward. This plan is calculated to economize considerably in the cost of plumbing, and simplifies the apparatus considerably, which is desirable for prisons and institutions.

PIPE WRENCH.—William C. Westerfield, Fairbury, Ill.—This invention relates to a new self acting wrench for cylindrical bodies, and consists in the combination of serrated jointed jaws with a slotted shank in the operating lever, wherein the end of one of the jaws is allowed to slide and to thereby obtain the desired self adjustment. When the lever is moved upward it brings the serrated inner faces of the jaws nearer together, thereby grasping whatever object is between them, be the same cylindrical or of other form. The motion being continued, the object will be turned with the instrument, as intended. When the instrument is reversed, it will operate when the lever is swung downward. The invention is also applicable to the moving of railroad cars and other purposes.

BABY WALKER.—George Euell, Guttenburg, N. J.—This invention relates to a new construction of baby walker, and consists in making the same of two jointed annular frames connected by upright stays. Each of the rings is made in two equal parts, that are hinged together and locked at their opening ends by suitable spring catches. The lower ring is supported on legs which are rigidly connected with it, and which may also extend up to the upper ring. Caster wheels are applied to the lower ends of the legs. A handle, cushioned at the ends, is applied to the upper ring. A seat is connected with the lower ring, and made vertically adjustable, by means of a screw, to the size of the child. The rings are swung open whenever the child is to be inclosed, and are then locked together, confining the child, but allowing it full freedom of motion and action.

MARKING POT.—Jerome L. Tarbox, New York city.—This invention has for its object to furnish an improved marking cup, and is so constructed as to serve as a can for the ink and a cup for marking. Over the ink reservoir is a sponge compressed between two perforated metal plates. On this the brush may be rubbed when required, while the superfluous ink flows through into the reservoir. It is a convenient article.

FUSE.—George F. James, Manchester, England.—This invention relates to an improved fuse and a machine for making it, which cannot be explained in detail without the aid of a drawing. A machine similar to the ordinary circular braiding machine is employed, and is supplied with a hollow central spindle, above which is a self acting feeder for placing the powder or other explosive compound in the interior of the braid. The work is drawn down the hollow spindle, instead of being passed upward as in ordinary braiding.

STEAM GENERATOR.—William V. McKenzie, Rahway, N. J.—This invention consists of a vertical cylinder boiler with vertical flues mounted in a sheet metal cylindrical shell with a furnace below; the cylinder is larger than the water boiler, so as to have an annular fire space surrounding it; the shell is jacketed on the sides above the surface and at the top, to economize the heat; the whole constitutes a simple, cheap, and efficient portable steam generator for cooking food for stock, and for other purposes.

HANDLE STRAP FOR TRAVELING BAGS.—Arthur Alexandre, New York city.—This invention has for its object to furnish an improved fastening for the handle strap for which letters patent were granted to the same inventor September 26, 1871. The strap is secured to the bag by rings, and is long enough to pass over the shoulder. In the center is a short length of strap to make the handle part thicker, and at each end of the thickened part is secured a short strap at right angles to it. The end parts of the long strap are doubled and carried through the rings up to the middle, forming a triple ply. The short straps are then passed round the long strap and fastened by eyelets to buttons on the long strap. To change the strap from a hand strap to a shoulder strap, all that is necessary is to unfasten the fastenings, when the weight of the bag will draw the folds of the strap through the rings, and expand it to its entire length.

RAILWAY TIE.—Edward J. Fenn, of Medina, Ohio.—This invention has for its object to furnish an improved railroad tie, which shall be so constructed as to form a continuous road bed, which shall be stronger and more durable than ordinary and form a smoother track; it consists in the construction following: Two inch planks of the length of ordinary ties are set on edge and arranged in pairs, the ends of the planks of each pair being securely bolted or spiked to the opposite sides of blocks twelve inches long. The outside planks of each adjacent pair are bolted or spiked to the opposite sides of blocks eighteen inches long, which are arranged upon the line of the rails, and are designed to have the rails bolted to them. This tie would have much more ground surface than the ordinary tie, and would consequently be much less liable to settle or get out of place.

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5,861.—SEWING MACHINE BED.—W. G. Beckwith, Newark, N. J.
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5,874 and 5,875.—HITCHING POST.—R. Wood, Philadelphia, Pa.

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831.—DRUGGISTS' SUNDRIES.—R. H. Watson, Philadelphia, Pa.
832.—PAINT DRYER.—A. Wheeler, Boston, Mass.

APPLICATIONS FOR EXTENSIONS.

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

20,503.—FIRE ARM.—G. W. Morse. June 5, 1872.
20,727.—CARTRIDGE.—G. W. Morse. June 12, 1872.
21,185.—STEAM HEATING.—H. G. Bulkley. July 31, 1872.
21,194.—CUTTING MITERS.—S. W. Hall. July 31, 1872.
21,207.—REAPING MACHINE.—C. W. and W. W. Marsh. July 31, 1872.
21,233.—CARPET SWEEPER.—H. H. Herrick. July 31, 1872.
21,272.—METALLIC BALE TIE.—I. C. Plant. August 7, 1872.
21,286.—TEMPERING WIRE AND STEEL.—H. Waterman, August 7, 1872.
21,331.—BRACELETS.—F. M. Sweet. August 14, 1872.

EXTENSIONS GRANTED.

28,512.—CAR WHEEL.—S. P. Smith.
20,238.—SASH FASTENER.—F. W. Brockseiper and J. B. Sargent.
20,233.—WORKING SHIPS' SAILS.—S. Very, Jr.
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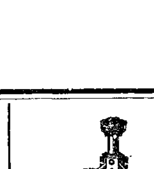

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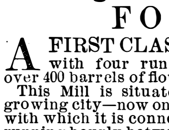

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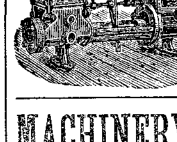

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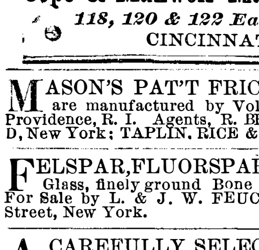

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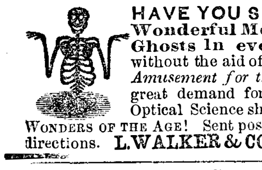

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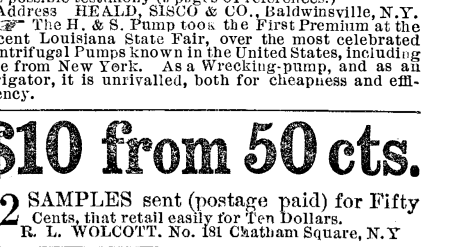

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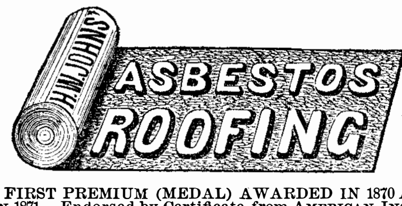

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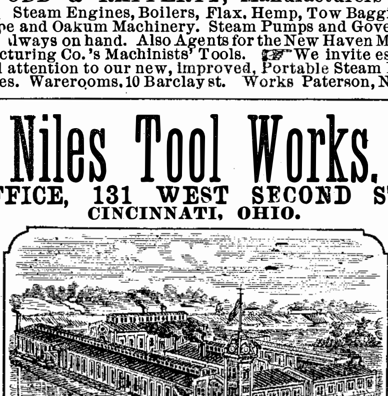

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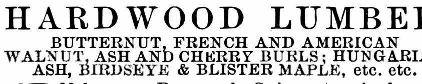

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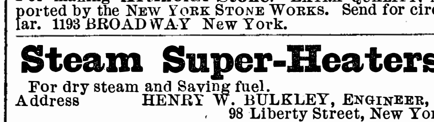

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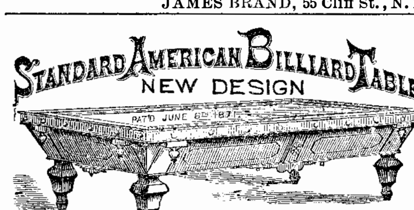

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