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MACHINE FOR BUNCHING, WIRING, AND INSERTING BRISTLES IN BRUSH BACKS.

We take pleasure in presenting to our readers engravings and a description of a machine which is so compounded of ingenious devices that it deserves to rank with such *chefs d'œuvres* of inventive skill as the machine for inserting teeth in cloth carding, the Jacquard loom, Blanchard's lathe, etc. To accomplish all that this machine does automatically, most inventors would have used more than one machine. The fertility of mechanical resources brought to bear upon its construction is a remarkable example of the power of combination, characteristic of the highest order of inventive genius.

While we shall endeavor to give the reader a good general idea of the peculiar succession of operations culminating in the final and firm insertion of the bristles in the wood, leather, hard rubber, bone, or ivory backs, we shall be entirely unable to show, in our prescribed limits, the exact means by which each step in order is accomplished. To do this would require a multiplication of diagrams, for which we have not space. Our description will not, therefore, do justice to the mechanical beauty of the machine, which must be seen in operation to be fully appreciated. In witnessing its working, the appreciative mechanic will be ready to share in the enthusiasm which compelled a bystander to ejaculate in our hearing "that machine has a brain!"

Fig. 1 is a perspective view of the machine with all the parts in adjustment for work, the brush block being in position, and two of the holes having had bristles inserted in them.

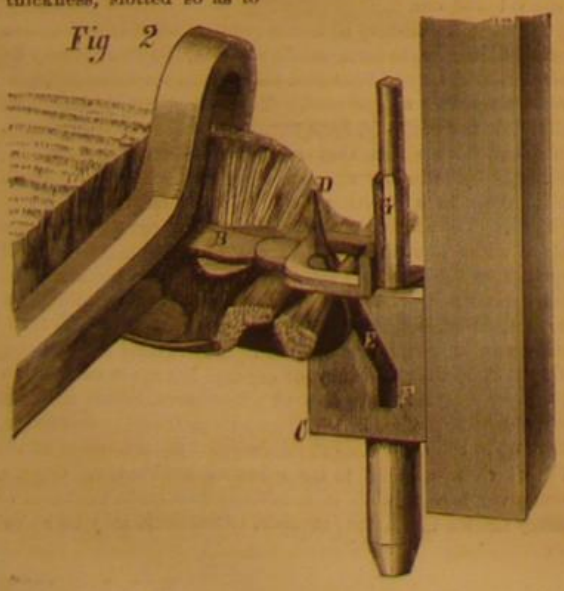
The other figures are detailed representations of important parts of the machine, which will be referred to below.

The first operation is the filling of the comb, A, with bristles. This comb is a plate of metal of uniform thickness, slotted so as to leave teeth of equal length and of uniform width throughout their length. The back of the comb being clamped in a suitable vise or holding apparatus, the bristles are drawn in between the teeth of the comb, the pressure of the teeth holding the bristles from dropping out. The bristles are so placed that the teeth hold them as near the middle as the eye can

Fig 1

WOODBURY'S MACHINE FOR INSERTING BRISTLES IN BRUSH BACKS.

Fig 2



arrange them, so that when the comb is placed in the machine, one half of the length of the bristles appears above the comb, as shown, the other half extending downward.

The comb is inserted in guideways, and is actuated by an intermittent traverse motion which, whenever the bristles are all removed from one of the spaces, moves the comb along the distance of one tooth and space to bring another filled space into position. Whenever one comb is emptied, another is made to follow it in the same guideways, the empty one being taken out at the opposite end of the guideways from that in which it was inserted. The operation is then precisely like what would be the case with an endless comb, the teeth of which should be filled in one part of the circuit before reaching the point of discharge.

As the comb is actuated in the manner described, each space is brought successively to correspond with and form a part of a twisted way or channel, B, Fig. 2. An ingenious combination of devices then forces the bristles, as they are wanted, down through this twisted channel, holding them all the time at the middle and bringing them at last into a horizontal position, as shown in Fig. 2.

At the end of the channel, the plate which forms the upper wall is bifurcated, the ends of the bifurcations being turned up as shown. Between these bifurcations, reciprocates vertically a device consisting of a body, C, which tapers off in front to a point, D, and is slotted obliquely and vertically, the oblique portion of the slot being suspended at E, and the vertical portion at F. The lower portion of this piece is a hollow cylinder, the end of which, descending, comes just flush but does not enter the hole in the brush block when the bunch of bristles is to be inserted; one bunch being put in at every descent of this part of the machine; which, from its resemblance to a hook, we shall call by that name as we proceed.

As the hook rises, it forces its point between the proper quantity of bristles for a bunch, and as the bristles cannot ascend they are obliged to move along the inclined portion, E, of the slot in the hook, and so arrive at the bottom of the vertical portion, F. Here they are acted upon by the plunger, G, Figs. 2, 3, and 4. The form of this plunger is shown in Fig. 3. Its end has two slots, crossing each other at right angles when viewed endwise. One of these slots receives the bunch of bristles, as shown in Fig. 3. The other slot (H, Fig. 3) is only of a width to allow the passage of a wire which is destined to bind the bunch together and secure it in the block. The plunger is carried by ingenious mechanism to descend till it doubles the bristles into a loop at the middle. Other mechanism then unwinds the binding wire, I, Fig. 4, from a reel or spool, straightens the wire, passes a proper length through the slightly enlarged upper portion of the slot, H, Fig 3, and cuts off the length of wire required. The plunger then descends further, now receiving as it descends a rotary motion, on its vertical axis, which winds the wire spirally by forcing it into the thread of a nut contained in the lower end of the hollow cylinder, fastening it around the doubled end of the bunch of bristles. This spirally wound wire is destined to be a screw thread for the bunch of bristles as the latter is screwed into the hole in the block, J, Fig. 4. The lower end of the wire acts as a tap, cutting a female screw in the hole of the block, which the spiral of the wire exactly fits. The upper cut end of the wire thread expands and engages with the material of the block, and acting as a pawl, prevents the unscrewing of the bunch, which is thus held with unequaled firmness and strength, so much so that to remove it from

Fig 4

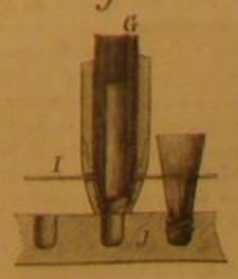


Fig 3

very resisting material will require the block to be split. These operations proceed at the rate of from seventy to eighty bunches per minute.

In order to bring the hole in the block exactly under the cone pointed hollow cylinder extending from the bottom of the hook, a guide, K, is employed which descends upon the block while the bristles are entering one of the holes. A slight movement of the guide by the operator causes the point of the guide to engage the next hole in the series. As soon as the plunger rises, the guide automatically draws the hole it engages to the exact position required to receive the next bunch.

We think the reader will agree with us that a machine, that performs so many distinct movements harmoniously and, at the same time, has nothing flimsy or weak in its construction, is a masterpiece of invention, and one which is doubtless destined to effect a complete revolution in the important industry of brush making. By its use, the difficulty of making the bunches of uniform size and fastening them thoroughly in the block, as well as all other difficulties unsurmounted in other machines hitherto designed to accomplish the same purpose, are entirely overcome. The machine, although including so many movements, is extremely simple and compact, the space being most ingeniously economized. The power required is very small. The table, S, Fig. 1, upon which the block is held, may be inclined at any angle and held by the notched arc, M, so that bristles may be inserted in blocks of any contour or pattern. Patented April 26, 1870, and Dec. 27, 1870. For further information, address Woodbury Brush Machine Co., 30 Cortland street, New York. Concerning European rights, address H. C. Covert, proprietor of the foreign patents, 643 Broadway, New York, or care of H. E. Towle & Co., 20 Budge Row, London.

SMELL.

The *Moniteur Scientifique* contains a paper by M. Papillon on this subject, having reference to recent discoveries in chemistry and physiology. We extract from it the following:

The seat of the sense of smell is, as we know, in the lining membrane of the nostrils. This membrane has a mucous and irregular surface, over which spread a number of nerves with delicate terminations. It secretes a lubricating liquid. By means of muscles, the apparatus of smell is dilated or contracted, like that of sight.

The mechanics of smell are, simply, the contact of odorous particles and the olfactory nerve. These particles are carried by the air into the nostrils. If, on the one hand, the nerve is injured, or even compressed: if, on the other, the air is prevented from passing into the nostrils, there is an absence of smell. The upper part of the nostrils is the most sensitive as regards odor. The sense of smell varies much in different people. Some are entirely without it. Others are quite insensible to certain odors, a case similar to that of Daltonism, in which some eyes fail to perceive certain colors. It is recorded of a certain priest that he perceived no odors but those of smoke and decayed cabbage, and to another person vanilla seemed quite inodorous. Blumenbach speaks of an Englishman who could not perceive the fragrance of mignonette.

Smell is sometimes voluntary, sometimes involuntary. In the former case, to obtain a lively sensation, we close the mouth, and make a long inspiration, or a series of short and jerking ones. The muscles contract the orifices of the nostrils, and thus increase the intensity of the current of air. On the other hand, when we wish not to smell, we exspire through the nose, so as to drive away the odorous air, and inspire by the opened mouth.

Smell and odors are closely connected with the phenomena of taste or gustation. Most savors perceived by us arise from a combination of sensations of smell with those of taste. There are, indeed, only four primitive and radical kinds of taste—acid, sweet, salt, and bitter. This may be shown by experiment. If we close our nostrils on tasting any sapid substance, the perceived taste will come under one or other of these four heads. Thus, when the olfactory membrane is diseased, the savor of food is altered.

How do odorous substances act with reference to the matter which separates them from the organ of smell? Prevost, in 1799, showed that if an odorous body were put in a saucer full of water, the emanations from it agitated the molecules of the water visibly. These motions, of which camphor gives a very good example, have been recently studied by M. Liégeois.

He found that some substances caused movements of gyration and translation over the water surface, similar to those of camphor. Of this class are benzoic acid, succinic acid, and orange bark. In the case of others, this motion ceases very soon, as they become encased in an oily layer over their surface.

He thinks these motions are due, not to a disengagement of gas, causing something like recoil, but to the separation and rapid diffusion of the odorous particles in the water. The fluid shows affinity for these. Similarly, a drop of oil falling on water sends out an infinite number of very small globules, which spread through the liquid, while the volume of the drop is not sensibly diminished. So with aromatic essences. Though insoluble in water, the small odorous particles tend to disperse themselves in it. A small quantity of odorous powder will thus impart perfume to a large body of water.

It is these same odorous molecules which are carried to our nostrils. And the action of water is thought by M. Liégeois to assist in the formation of them. In the morning, when the ground is moist, and the flowers are covered with dew drops, there is a large exhalation of perfume, and similarly after a shower of rain. In gustation, we have something analogous; the saliva is fitted to diffuse the odorant principle; by the motion of the tongue in the cavity of the mouth, this diffusion is promoted, for the surface of evaporation is enlarged. Now, in the same way as the small particles diffuse themselves in water do they diffuse themselves in air, which then becomes the vehicle carrying them to our nostrils.

Some odorous substances have a very great diffusibility. Ambergris, newly cast on the shore, is smelt a long way off. Bertholin states that the odor of rosemary off the Spanish coast is perceptible long before the land comes in sight. The degree of division of the particles is in some cases marvelous. A grain of musk will perfume an apartment for a whole year without sensibly losing weight. Haller mentions having kept for forty years some pieces of paper perfumed with a grain of ambergris, and at the end of that time they still retained their odor.

It is to be noted that the odorous particles are sent out, and the body emitting them does not act as a center of agitation giving rise to vibrations. It is thus a different case from those of light and heat. The odor is the odorous molecule itself; whereas light, as perceived, is not the luminous body.

We cannot tell whether oxygen has some chemical influence on the particles, nor what kind of action takes place on contact of the particle with the nerve, whether a mechanical agitation or a chemical decomposition. But the distinction of the senses into physical (sight, touch, and hearing) and chemical (taste and smell) is a just one. In the latter, contact is always implied.

An able writer has recently tried to prove a kind of music in odors. That is, different odors, according to him, affect the olfactory nerve in various degrees, corresponding to those in which sound affects the auditory nerve. Thus we may have octaves of odors. He enumerates various substances that produce the same impression, but in different degrees; for instance, these four, almond, heliotrope, vanilla, and clematis. By combination he obtains semi odors, corresponding to semitones: for instance, a rose with a geranium. He points out principles of harmony in perfumes corresponding to those in colors, and thinks it possible to produce a desired perfume from a mixture of others.

The theory is ingenious and worthy of attention, but it is open to grave objections. For the harmony in colors and sounds depends on exact numerical relations, which may be accurately determined; whereas, in the case of smell, the criterion is capricious and uncertain, and it is not possible to reduce to formula what our sense reveals.

There are many cases of hallucination as regards smell, united, generally, with insanity on other points. Lunatics have been met with who constantly complained of a fetid odor; others rejoiced in the most delicious, though imaginary, perfumes. M. Lelut tells of a patient, in the Salpêtrière, who was continually troubled with the smell of dead bodies, which she thought to have been buried in the establishment.

Capellini mentions the case of a lady who could not bear the smell of a rose, and fainted one day when a friend came in with one in her hand. Many other instances could be given. It seems to be well authenticated that in lunatic asylums these delusions as to smell are very frequent.

The intensity and delicacy of the sense of smell vary in different individuals and races. In some it is wonderfully sensitive. Woodwart tells of a woman who predicted storms, several hours in advance, from the sulphurous odor (due to ozone probably) which she perceived in the air. A young American, who was deaf, dumb, and blind, became a good botanist simply by the sense of smell. It is, however, in some of the lower animals that we find the sense most highly developed, ruminants, pachydermous animals, and above all, carnivorous mammifers. Smell is, with some of them, like an eye, which sees objects, not only where they are but where they have been. The keen scent of the dog is well known.

Humboldt mentions that when, in his travels in South America, it was desired to attract condors, all they had to do was to slaughter an ox or a horse, and in a short time the odor attracted a number of these birds, though none were visible previously. Of birds, waders have the largest olfactory nerves, and their sense of smell is most highly developed.

The olfactory organ in reptiles is large. Fishes also have an olfactory membrane, and fishermen have observed that they are driven away when certain odorous substances are thrown into the water. Sharks and other voracious fishes often gather from great distances when a carcass is thrown into the sea. Crustaceans are not insensible to emanations which come in contact with their olfactory fibers.

Entomologists say that the sense of smell in insects is very subtle, but it is difficult to determine the seat of it. When meat is exposed in the air, flies soon appear in great numbers, though none were seen before. The carcases of animals left on the ground attract hosts of insects, which find nourishment in them, and deposit their eggs. This will often happen when the object is concealed, so that their search cannot be guided by sight.

The flower of the cuckoo fruit gives forth a fetid odor, and a number of flies and other insects are often seen moving about on the corolla, in search, it is said, of decayed matter, from which, they imagine, the odor proceeds.

How Long should a Man Stick to his Engine?

A correspondent of the *Locomotive Engineers' Journal*, writing from Rutland, Vt., speaking of the duty and extent of the responsibility of an engine man in case of accident, says:

"Where an accident takes place, such as going down the dump or colliding with another train—a bridge may be gone, a culvert washed away—he may see the fatal leap; I ask you, thinking your experience is worth as much as mine, would there be anything heroic for me to stand on the foot board and plunge with my engine into certain and dreadful death? Is there anything brave about it? Have you no responsibilities here on earth, no matter if you have ten cars loaded with passengers that must follow the engine as the case may be? Now I consider an engineer's responsibility ceases, in such cases, when he has sounded his whistle properly and reversed his engine, opened his throttle, pulled open his sand box. He has done his whole duty to God and man as far as he can to stop the train, and if he has time and opportunity, if he is true to himself, he will try to get off and not go down to the bottom calling for brakes. Many engineers go down and collide and are killed, for the reason they do not have time after doing their duty. I never should feel as if a man was fit to run an engine if he had not courage to do his whole duty. But after he has stood to his post and done all that has been put into his hands to do, then I say he is a man that will try and save his own life."

Two Miles of Track Laid in One Night.

The new Baltimore and Potomac Railway, which Colonel Thomas Scott and the Pennsylvania Central are now building as a rival to the Baltimore and Ohio, a through line between the East and Washington, was completed through to Baltimore last week in a novel and characteristic manner. The opponents of the road, having failed in all other expedients, had determined to get out an injunction to prevent its passage through Baltimore. Their project becoming known to the officers of the company, all hands—some 300—were massed from all along the line, and, as soon as the court adjourned on Monday, work was begun in earnest in constructing the road and laying the track through the city. Night setting in, they were retarded a little; but the moon soon came out, and they went on the same as ever. At twelve o'clock, nearly half the track was completed, and the men, tired and hungry from their excessive labor, pitched into four wagon loads of provisions, that had been brought along, with a fine relish. Work was renewed with vigor, and before nine o'clock in the morning—the time when it was supposed the injunction was to have been made—the last spike had been driven. The distance of the track laid was about two miles, and crossed three streets, Calverton Road, Franklin and Townsend. At the two latter, double tracks were laid. The hands belonging on the lower section of the road embarked on the train for their quarters, and they moved off amid a chorus of yells and screaming of engine whistles.

Improvement in Street Watering.

An official trial lately took place at Hyde Park Corner, Knightsbridge, Eng., of the system for watering streets, public parks, and market gardens, patented by Messrs. Isaac Brown & Co., Edinburgh. The patented apparatus was shown upon the drive at the east end of Rotten Row, Hyde Park, and upon one of the large enclosed flower plots, which has been fitted with it by order of Mr. Ayrton, her Majesty's First Commissioner of Works. In one of the illustrations of the new mode of road watering, one and one half inch lead pipes are laid along close to each kerb stone, these subordinate pipes being supplied from the mains. At intervals of about two feet apart, the pipes are drilled with small holes of from a sixteenth to a thirty second of an inch, in groups of three, each of which is pierced at a different angle. These apertures from the pipes command the complete road, which at the place where they are exhibited is about nineteen yards wide. The water is, of course, supplied under pressure, with a head of about 100 feet, and a shower of a quarter of a mile in length can be commanded with a one and one half inch pipe. The other experiment for road watering was by a central pipe in the middle of the road, which throws its jets towards the kerb stones. The pipes are protected by shields, and provision is made for the surface water being sent past the sides of the pipe to the bottom, where it finds a passage. The central pipe is of course upon the crown of the road, and is protected by an asphalt covering. An apparent objection may be that the small apertures may get choked up by the *débris* of the roads. In practice, however, this is found not to be the case, as the pressure of the water, when it is put on, keeps the drilled holes open. In winter, when there is the danger of freezing, the watering pipes are kept empty, which is not found to be a matter of much practical difficulty.

The Origin of Metalliferous Deposits.

Great deposits of iron ore, says Professor T. Sterry Hunt, generally occur in the shape of beds, although waters holding the compounds of iron in solution have, in some cases, deposited them in fissures or openings in the rocks, forming true veins of ore.

The chemical history of iron is peculiar, since iron requires reducing matters to bring it into solution, and since it may be precipitated alike by oxidation and by farther reduction, provided sulphates are present. The metals copper, lead, and silver, on the contrary, form compounds more or less soluble in water, from which they are not precipitated by oxygen, but only by reducing agents, which may separate them in some cases in a metallic state, but more frequently as sulphides. The solubility of the salts and oxides of these metals in water is such that they are found in many mineral springs, in the waters that flow from certain mines, and in the ocean itself, waters of which have been found to contain copper, silver, and lead. Why then do not these metals accumulate in the sea, as the salts of soda have done during long ages? The direct agency of organic life again comes into play, precisely as in the case of phosphorus, iodine, and potash. Marine plants, which absorb these from the sea water, take up at the same time the metals just named, traces of all of which are found in the ashes of sea weeds. Copper, moreover, is met with in notable quantities in the blood of many marine molluscous animals, to which it may be as ne-

cessary as iron is to our own bodies. Indeed, the blood of man and of the higher animals appears never to be without traces of copper as well as iron.

Water, as we have seen, is a universal solvent, and the matters which it may bring and deposit in the fissures of the earth are very curious. There is scarcely a spar or an ore to be met with in the stratified rocks that is not also found in some of these veinstones, which are often very heterogeneous in composition. In some veins we find the elements of limestone or of granite, and these often include the gems, such as amethyst, topaz, garnet, hyacinth, emerald, and sapphire; while others abound in native metals, or in metallic oxides or sulphides. The nature of the materials thus deposited depends very much on conditions of temperature and of pressure, which affect the solvent power of the liquid, and still more upon the nature of the adjacent rocks and of the waters permeating them.

We are apt in explaining the appearances of the earth's crust to refer the formation of ore beds and veins to some distant and remote period when conditions very unlike the present prevailed, when great convulsions took place and mysterious forces were at work. Yet the same chemical and physical laws are now, as then, at work; in one part dissolving the iron from the sediments and forming ore beds, in another separating the rarer metals from the ocean's waters, while in still other regions the consolidated and formed sediments are permeated by heated waters, to which they give up their metallic matters, to be subsequently deposited in veins. These forces are always in operation, re-arranging the chaotic admixture of elements which results from the constant change and decay around us. The laws which the First Great Cause imposed upon this material universe on the first day are still irresistibly at work fashioning its present order. One great design and purpose is seen to bind in necessary harmony the operations of the mineral with those of the vegetable and animal worlds, and to make all of these contribute to that terrestrial circulation which maintains the life of our mother earth.

PHENOMENA ASSOCIATED WITH A HYDROGEN FLAME.

Phenomena of much interest, and possibly of future usefulness, are associated with the combustion of ordinary hydrogen.

1. To study these phenomena free from disturbing causes, three things should be attended to, although the effects to be described can be obtained without any special precaution. (1) The gas must be stored and purified in the ordinary way namely, by passing into a glass holder through a solution of potash, and then through a solution of perchloride of mercury or nitrate of silver. (2) From the holder, the gas must be led through red or black india rubber tubing to a platinum or, better, a steatite jet. (3) And then the gas should be burnt in a perfectly dark room, and amid calm and dustless air.

2. In this way, the flame gives a faint reddish brown color, invisible in bright daylight. Issuing from a narrow jet in a dark room, a stream of luminosity, more than six times the length of the flame, is seen to stretch upwards from the burning hydrogen. This weird appearance is probably caused by the swifter flow of the particles of gas in the center of the tube. The central particles as they shoot upward are protected awhile by their neighbors; metaphorically they are hindered from entering the fiery ordeal which dooms them finally to a watery grave. Dr. Tyndall has shown that the radiation from burning hydrogen is hugely ultra-red, and moreover, that it has not the quality of the radiation from an elementary body like hydrogen, but practically is found to be the radiation from molecules of incandescent steam. So that, except at its base a hydrogen flame is a hollow stream of glowing water raised to a prodigious heat.

3. Bringing the flame into contact with solid bodies, in many cases phosphorescent effects are produced. Thus, allowing the flame to play for a moment on sand paper and then promptly extinguishing the gas, a vivid green phosphorescence remains for some seconds. The appearance is a beautiful one, as a luminous and perfect section of the hollow flame is depicted. Similar phosphorescence is produced by the flame on white writing paper, or on marble, or chalk, or granite, or gypsum, etc. But no such effect is produced by coal gas, or olefiant or marsh gas. It is evidently a question of temperature, as oxygen driven through coal gas shows the phosphorescence well.

Far exceeding in generality the effect just noticed is a really magnificent blue image of the flame that starts up on almost every substance with which the flame is brought into contact. I have already drawn attention to this effect in the *Philosophical Magazine* for November, 1865, and the same effect has more recently formed the subject of a memoir, presented to M. Wurtz, of the Paris Academy of Sciences, the author of that paper evidently being unaware that the subject had already been investigated by myself.

The appearance is as follows: When the hydrogen flame is brought either vertically or sideways, say upon a white plate or a block of marble, there instantly appears a deep blue and glowing impression of the exact size and shape of the hollow flame. The moment the gas is extinguished, or the flame removed to the slightest distance from the solid, the effect as instantly ceases. If the flame be brought successively to the same spot on the solid, the effect grows fainter and finally vanishes, but instantly reappears upon an adjoining portion.

Other combustible gases, such as carbonic oxide, or marsh gas, or olefiant, or coal gas, do not yield this effect, nor does any lamp flame, luminous or otherwise; nor is it obtained in the oxidizing flame of an ordinary blowpipe; but it is imperfectly produced in the reducing flame when coal gas is used; it is not seen when oxygen is driven through coal gas, unless the latter be in excess; and it is poorer and vanishes more quickly with the oxyhydrogen flame than with hydrogen alone. This blue luminosity is therefore, not a question of heat, but some property depending either on (*a*) the chemical nature of hydrogen, or on (*b*) the physical effect of its radiation. At first I thought it was the latter, and that it was a new form of fluorescence, so closely did it resemble those phenomena. But after a weeks' incessant experimenting, the true cause was hunted down and found to be dependent on the former effect (*a*), and in every case ultimately due to the presence of sulphur. A chemically clean body, or a freshly broken surface, did not show the blue coloration; but after exposure for a short time to the air of London, the substance invariably yielded the blueness; this, however, was not the case when the clean surface was covered by a shade, or exposed to the air of the open country. The combustion of coal gas and coal fires yields sulphate of ammonia, a body often deposited in acicular crystals in the glass tube in a laboratory. Sulphate of ammonia is decomposed by a hydrogen flame, and when that salt is brought into contact with burning hydrogen, it permanently yields the blue colorescence. Hence this body is the main source of the blueness seen whenever a hydrogen flame comes into contact with glass tubes or a dirty surface. The effect must repeatedly have been seen by every one who has experimented on singing flames.

When the blueness, as is so often the case, is seen tinging the flame itself, without contact with any body, the sulphur is derived either from the vulcanized tubing, the dust of which is taken up by the passing gas, or, if the hydrogen be burnt from the bottle generating it, the blueness is due to the decomposition of the sulphuric acid spray, as will be shown further on.

As achemical re-agent for detecting sulphur, the delicacy of a hydrogen flame is extraordinary. This fact was estimated as follows: Pure precipitated silica yields no blueness with the flame; 500 grains of silica were intimately mingled with one grain of milk of sulphur. Less than one hundredth of a grain of this mixture was thrown on the surface of pure water or placed upon chemically clean platinum foil. The water is best, but in either case the blue color (absent before) now shot forth on bringing the hydrogen flame down. Tried again and again with fresh portions, the effect was very evident, but quickly vanished. The sulphur in a similar portion of the mixture could not be detected chemically by nitro prusside of sodium. The wonderful sensitiveness of the flame may be still better seen in another way. Immediately after washing, the fingers show no color when brought for a moment into the flame, but if a white india rubber tube be touched ever so lightly, the fingers not only show a vivid blueness, but for some time any clean object touched by them, such as platinum foil, shows traces of sulphur by the appearance of the blue coloration with the flame. A block of melting ice continually weeps itself free from dust, and thus presents an excellent surface upon which to try the foregoing experiment. Or a plate of platinum, after heating to redness, may be written over with a stick of sulphur. If kept covered, the invisible letters may long after be traced out by sweeping the hydrogen flame over the surface of the platinum.

Examined through a prism, the blueness derived from any source shows blue and green bands, similar to the spectrum of sulphur, but I have noticed also a red band. This mode of obtaining a sulphur spectrum suggests further inquiry White marble smeared over with a bit of sulphur, or with vulcanized rubber tubing, is a convenient source for obtaining the effect at pleasure.

Some sulphates and sulphides show the blueness with the flame, and are evidently composed by the hydrogen. Thus sulphate of soda gives no blue appearance, while sulphate of ammonia, or alum, does.

Various liquids were tried in contact with the flame. Sulphuric acid was very notable. Here a magnificent blue effect was observed. For persistence and brilliancy of the of the color, this experiment leaves nothing to be desired; the spectrum is very fine. If the liquid is in a glass dish when the flame is brought vertically down, the blueness lights up the glass in a lovely manner.

6. But the presence of sulphur is by no means the only body that a hydrogen flame reveals. The least trace of phosphorus is detected by the production of a vivid green light. It is striking to notice the wonderful sub division of matter in these experiments, and how an immeasurable trace of an element can evoke pronounced and disproportionate effects.

Might not this ready detection of minute quantities of sulphur and phosphorus be of use in the manufacture of iron? And might not hydrogen introduced into the molten metal be employed for the removal of these great enemies of the iron worker? I speak ignorantly.

7. Among the range of substances I have tried, tin was was found to yield the most conspicuous effect, after the bodies named. A fine scarlet color is almost instantly produced when the hydrogen flame is brought into contact with tin or any alloy of tin. Tin is somewhat volatile, and its spectrum is rich in red rays. The tin must be clean; or the sulphur blue, which is much brighter, will mask the effect. A charming experiment may be made by partially scraping a soiled surface of tin; the blue and the scarlet colors mingle and a lovely purple is the result. When a trace of phosphorus is present, there may be obtained a green belt encircling a rich blue, then a purple zone, and finally a glowing scarlet at the root of the flame. These colors, it must be remembered, are not imparted to the flame, but reside on the surface of the body which the flame touches. And where the combustion of the hydrogen is complete, as in the upper part of the flame, or in the luminous stream referred to (2), these effects are not produced: they are best developed at the root of the flame.

8. Passing from liquids and solids, I next tried gases in contact with the flame of hydrogen Many gases imparted a color to the flame, but here the effect was different to that previously noticed. The whole flame was tinged with the color imparted to it. A mere trace of hydrochloric acid gas imparts a reddish brown to the flame; ammonia gas gives a yellow, and burns freely. It is striking to note the combustion of ammonia gas rising from an unstopped bottle that contains the usual solution and which is placed below the flame.

But carbonic acid gas yields the most striking result in contact with the flame. A pale lilac tinge is instantly produced by a stream of this gas. This, I imagine, is due to the decomposition of the carbonic acid by the hydrogen, and the production and combustion of carbonic oxide. For it is at the lower part of the flame that the effect is most marked. One per cent of pure carbonic acid, admitted to a jar of air, can be detected on holding the jar over the flame. The breath, of course, shows the effect most strikingly.

9. Here then is an eminently practical method of noting the presence of vitiated air in rooms or public buildings. A continuous hydrogen apparatus might be employed with a wash bulb attached. The flame might be burnt from a brass burner or lava jet, placed within a blackened tin cylinder. Opposite the flame a hole might be pierced in the cylinder and closed by a lens for better viewing the flame within. As soon as the atmosphere in a room becomes unpleasantly vitiated, the flame would indicate the fact by its changed color. A similar apparatus might likewise be employed by miners, in metal mines as a warning against impure air, and in coal mines as a detector of fire damp. In this latter case the ends of the cylinder could be covered with wire gauze.

Irrigation Canal of the Rhone.

The proper irrigation of the four departments of France, the Drôme, Garde, Hérault, and Vaucluse, has been for many years under consideration, and at last the Minister of Public Works has granted a credit of small amount for the necessary preliminary steps to be taken to carry out the plans of M. Aris ide Dumont, Engineer in Chief of *Ponts et Chaussées*, who proposes to cut a canal for irrigation from the Rhone, at Condrieu, to Mornas.

The length of the canal from its source to Mornas will be about one hundred and twelve miles; all the towns by which it passes can be supplied with water, and it is anticipated that many new factories will spring up in consequence. From a reservoir at Mornas, the canal passes to the right bank of the Rhone by means of a siphon aqueduct. After passing Uyés through a tunnel more than three miles long, it reaches Montpellier at the hight of 180 feet above the level of the sea, irrigating the whole of the environs of this town by means of numerous channels which will distribute the water over the vast plains, which suffer terribly and frequently from drought, that lie between Montpellier and the sea.

The amount of water to be taken from the Rhone at its lowest level is set down at 33 tuns per second, but during about half the year the volume will be increased to 40 or 45 tuns.

The distribution is calculated in the following proportions: 20 tuns for agricultural irrigation, 10 for irrigation in the vicinity of towns, and 3 tuns for evaporation and loss.

The great importance of this canal consists in the fact that, while in the summer all the other rivers in the South of France are nearly dry, the Rhone, being fed by the snow and glaciers of the Alps, pours a grand stream into the sea, which would make the fortune of agriculture. At extreme low water, this noble river passes Lyons at the rate of 235 tuns per second, Tournon at the rate of 310 tuns, Valence at 410, Avignon at 450, and Beaucuire at the rate of 530 tuns per second. At average states of the river, the flow at the spot where the canal is to commence is equal to more than 600 tuns per second; there is little fear then of exhausting such a supply as this, and it is asserted that the abstraction of the volume of water above named will have no effect, even upon the shallowest parts.

The estimated cost of this important work is equal to ten millions of dollars for the formation of the canal and its distributing conduits, and the time required for its execution is three years.

The great hight of the source of this proposed canal will allow the irrigation to be carried to poor dry lands on the slopes of the hills, and thus greatly increase their value and the author of the plan sets down the increased value of such lands at about sixty dollars.

Grand as this scheme is, there is nothing extraordinary or even novel in it; the canal of the Muzza takes 77 tuns of water per second from the Adda, and the grand canal of the Techino, 48 tuns per second from that river.

The great quantity of water proposed to be taken from the Rhone will require the canal to be very little larger than an ordinary one for navigation.

RESTORING WASTE RUBBER.—Among the recent patent extensions is that of Baschnagel's patent of 1858, for restoring waste vulcanized rubber. The invention consists in subjecting the old rubber to a heat of from 150° to 600° F, either with or without immersion in water or other cooling liquid. This process so restores the qualities of the gum that it can be used again in the manufacture of rubber goods.

THE density of the four satellites of Jupiter has been ascertained to be nearly fifty per cent greater than that of the planet itself.

CINCINNATI.

In the city of Cincinnati we are afforded an excellent example of the rapid rise and growth of our Western towns. In the year 1800, four hundred people were settled there, in a small straggling, unpromising village, and surrounded by an uncultivated wilderness.

Great natural advantages attach to the site, which is peculiarly favorable to commerce and health. Lying on a natural plateau nearly twelve miles in circumference, which is surrounded by hills three hundred feet high and through which the Ohio river flows, it affords a large variety of position and scenery, while the situation of the city enables it to collect within itself the raw material of mines and forests, and other productions of a large extent of surrounding country, and to redistribute them after they have undergone the process of manufacture or been otherwise prepared for market.

It was estimated, in 1859, that the river imports and exports must have reached nearly $100,000,000, and the present increased prosperity of the city is perhaps best evidenced in the number of its public schools, libraries, etc., and the development of a taste for improved architecture, all of which have been much aided by the great liberality of its own private citizens. Among the benefactors are numbered Messrs. Davidson & Probasco, the well known merchants. That they have assisted the advancement of their city with no stinted hands, is proved by the present they have lately made of the magnificent fountain shown in our illustration.

FOUNTAIN PRESENTED TO THE CITY OF CINCINNATI.

Wooden Railways

The substitution of timber for iron permanent way, which constitutes the great feature of the Canadian wooden railways, is due to Mr. J. B. Hulbert, an American engineer. After a short line, 6 miles in length, had been built and worked for a considerable time, another was commenced 47½ miles long, between Carthage (New York) and Harrisville, and was opened for traffic in 1868.

In addition to this, a third line was laid down in Canada, in the province of Quebec, and known as the Quebec and Gosford wooden railway. This line is 26 miles long, but next next year its extension for 100 miles is intended. Another, the Sorrel, Drummond, and Arthabasca Counties railway, 60 miles long is finished, and several short branches are about to be made next spring, whilst the Levis and Kennebec wooden railway, in the province of Quebec, is in progress. This line will also be 60 miles in length, with 40 miles of extension to be made at a future time.

The traffic upon all of these lines is of course very light, and would not have warranted the construction of the cheapest possible form of railway in which iron permanent way was employed; nevertheless three through trains a day are, on an average, run over the railways already opened, and carry passengers and freight at least equal to what is conveyed over many lines upon which a large construction capital has been expended. Moreover, a fair speed, varying from 18 to 20 miles an hour for passenger trains, and from 12 to 16 miles for freight trains, can always be secured, and the amount of adhesion with the 30 tun engines now running, is sufficient to take any required load up the gradients which are severe. Thus on one of the lines, where 20 tun engines are employed, from 60 to 80 tuns can be taken up gradients of 1 in 60, whilst there is no difficulty, on far steeper inclines of 1 in 21, in taking up 20 tun trains with engines weighing 14 tuns. Experience has also shown that the wooden rails remain in at least as good a condition in winter as iron ones; and with the use of the snow plough, there need be no check to the traffic, even when the snow lies on the ground to a depth of 3 or 4 feet.

Screw Propeller.

An improvement in the design and construction of the blades of screw propellers, for steam vessels, has lately been patented by Hermann Hirsch, London.

This is intended to remedy the great vibration, produced by ordinary screw propellers, by obtaining the best effect in converting the force given out in rotation into a pressure directed in the line of the axis, so as to produce a maximum amount of longitudinal pressure as useful effect for propulsion. To obtain such maximum of useful effect, the improved screw propeller, or each blade of the same, is so curved that the direction in which the water yields will be a direction converging from the periphery of the blade towards the axial line of the propeller; and consequently opposed to the centrifugal action which the rotary motion of the blades tends to impart to the water. Thus this curvature of the blade counteracts the centrifugal action, and so utilizes for propulsion the power that would otherwise be wasted.

The effect will be to drive the water in a cylindrical column aft in an axial direction relative to the screw, thereby producing the most direct and economical application of the power applied to the propeller, and at the same time avoiding vibration and increasing the efficiency of the rudder by surrounding it with a column of unbroken water, thrown directly against it with considerable velocity.

The Sewing Machine and its Attachments.

We have just inspected an advance copy of a book entitled "Sewing Machine Attachments," published by G. W. Gregory, Esq. Examiner of Sewing Machines and Textile Manufactures, United States Patent Office, Washington, D. C. Mr. Gregory has collected in his work the claims of all the patents for sewing machine attachments to January 1, 1872, (nearly 400), has given a description of each, with the claims in force, with a photo-lithographic drawing, and has also added rejected cases open to public inspection January 1, 1872, and English patents on like subjects. This compilation, the first of its kind, has been prepared with much care, and will prove a most valuable work for persons in any way connected with sewing machines, either as attorneys, manufacturers, inventors, or dealers. Price $25.

The Prospective Supply of Pig Iron.

While there is, naturally, some diversity of opinion with regard to the probable course of the iron market within the next twelve months, we think it safe to conclude, from all indications, that both production and consumption will show a marked increase before the end of another year. Owing to the present scarcity of iron in the market, and the high price demanded and obtained by the furnaces, there is, just now, a temporary falling off in the consumptive demand this is particularly noticeable in the case of rails, the high price of iron having forced many of the rail mills to suspend operations, because rails cannot now be marketed at remunerative prices, since, as compared with pig iron, they are relatively cheap. There has also been a noticeable curtailment of consumption in other ways, but this cannot be other than temporary. Iron is an article in which there can be no economy of consumption. Just so much is needed, and if it is not supplied this year, it must be next year. If we build a less mileage this year because rails are high, we shall make the more rapid progress when rails become cheaper.

Thus, while the consumption may fluctuate from year to year, the percentage of increase must be and will be maintained. It need not be inferred, therefore, that because there is just now a curtailment of consumption, there is less encouragement to increase the supply than when the inquiry was more active, the consumption greater, and the supply more abundant. On the contrary, the fact that consumers are now compelled to limit their purchases, to the supplying of their immediate and imperative requirements, gives assurance of a greater and more pressing demand in the immediate future; and no better opportunity was ever offered for starting new furnaces, wherever coal and iron can be had, than that which now presents itself. Great as it was last year, the consumption of iron in the United States is capable of indefinite expansion.—*Iron Age.*

A NEW LIGHT.—At a recent meeting of the Inventors Institute, Mr. M. M. Harris, member of the council, in the chair, Mr. Carl Molchin, a native of Hamburg, exhibited lamps burning a new compound oil to be used for lighting purposes, which was found to afford a steady, even light, very closely approximating in power, clearness, brilliancy, and intensity to the electric light, at a cost somewhat less than that of colza oil. It resulted from experiments made with this oil, burnt in a moderator lamp, that a light of 17½ spermaceti candles was obtained. This light is considered as very valuable for light houses, railway signals, railway carriages, and other purposes, and received the hearty approval of those present at the meeting, opinions being expressed that its use would mark a new era in artificial light.

CARRIAGE WHEEL.

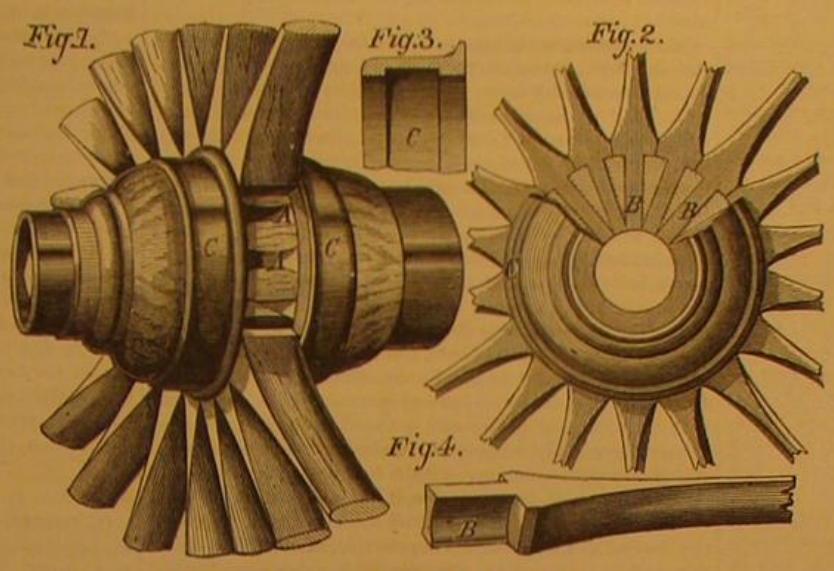
The great difficulty in effecting real improvements on the ordinary carriage wheel has lain in the seeming impossibility of retaining the elasticity which is so great a point of excellence in the common wheel. Mr. James O'Connor, of Jackson, Mo., has invented and lately patented an improved wheel which appears to overcome this difficulty. Our engraving illustrates the invention.

The first object the inventor had in view was to prevent the spokes working loose when subjected to lateral strain, which sometimes gives rise to serious accidents. This is accomplished by working the mortises in the hub of a double dovetail form, as shown at A. Fig. 1, and by shaping the tenons on the spokes to correspond, as shown at B, Fig. 4. The tenons are made slightly larger than the mortises, so as to fit tightly. In the common form of joint, the whole force of any lateral strain is exerted on the end walls of the mortises, and if the tenon is shrunk in the least, it easily works loose. In the form shown, the sides of the dovetails are made to bear a great part of the lateral strain as well as the end walls, which of course renders the hold on the spoke much more stable. The shoulders of the spokes rest on the hub on the divisions between the mortises, and may be slightly beveled so that they may fit close to and support each other, as shown in Fig. 2. The strength of this joint in resisting lateral strain has been experimentally compared with that of the old, and found to be as seven to one.

The second part of the invention consists in forming the hub band with a shallow groove in its inner face, as shown in the sectional view of the same, at C, Fig. 3, and in putting the bands on to the hubs after the metal of which they are composed has been heated. As the metal shrinks in cooling, it becomes imbedded in the wood on each side of the groove, and thereby forms a rib on the hub which fits into the groove. The bands are thus very securely fixed on the hub and remain so under all ordinary circumstances.

It is claimed that the elasticity of the common wheel is attained in this improvement, together with an increase of strength and durability, and a beauty of form, which gives it great superiority over the former. The mode of construction will apply admirably in heavy work, as the larger the surface of the tenon is, the greater will be the strength gained.

For information regarding rights to manufacture, Messrs. O'Connor & Davis, of Jackson, Cape Girardeau Co., Mo., may be addressed.



O'CONNOR'S CARRIAGE WHEEL.

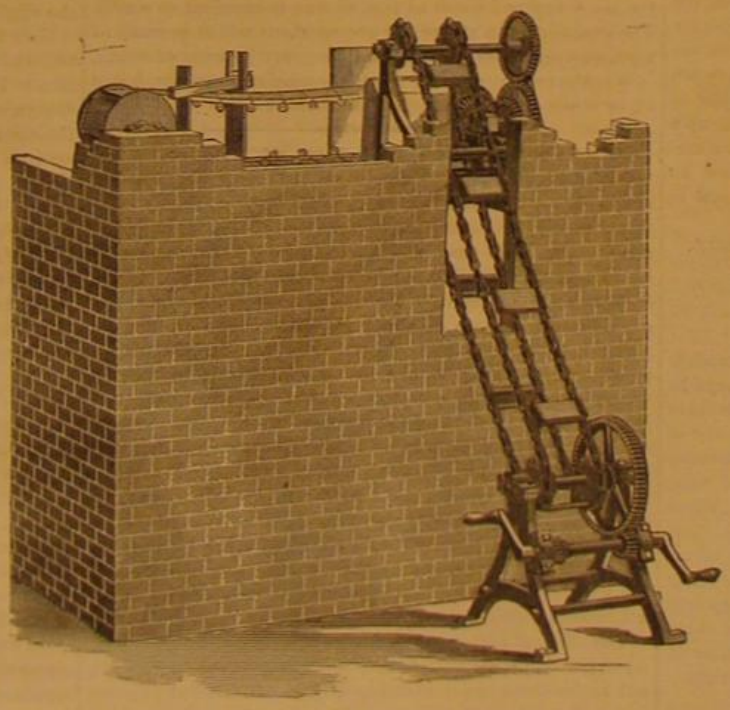
BRICK AND MORTAR ELEVATOR AND DISTRIBUTOR.

Our engraving represents a machine of considerable value for building purposes, which is designed more especially to supersede the labor of hod carrying. By its means the bricks and mortar are raised to the required elevation and then distributed among the laborers for use.

The plan, construction, and operation of the machine will readily be understood from an examination of the engraving. A frame, containing the driving drum, etc., is secured in position on the ground, and a second frame, which carries a shaft and pulleys corresponding with the drum, is secured on the scaffold or platform to which it is intended to have the bricks and mortar elevated. The drum below and pulleys above are connected by endless chains, the links of which fit between and engage with lugs which project from the faces of the drum and pulleys, in such a manner that no slip can take place. To these endless chains are attached buckets which carry up the bricks and mortar. The upper pulley shaft is geared in an appropriate manner to a drum which drives the distributing apparatus. This latter consists of the drum mentioned and another, which are placed at any required distance apart, and upon which is run an endless band by which the bricks and mortar are carried along. The band is composed of boards placed side by side and hinged together.

The operation of the machine is as follows: Upon the driving drum being operated by the winch, the buckets of the elevator, which are filled by the attendant laborers, are carried up. At the same time the rotation of the upper pulley shaft sets the drum of the distributing apparatus in motion, and the endless belt is kept moving from one side of the building to the other. When the full buckets arrive at the top, they are necessarily turned over by the action of the machinery, and deposit their contents on the moving belt beneath. A wide board is placed behind the belt at this point, which prevents either bricks or mortar falling over, and in front the descending buckets are made to pass so close to a kind of scraper set there as to insure their contents being lodged on the belt. The bricks and mortar are carried by the belt across the building, and are thus distributed among the workmen. A barrier is placed across the belt, as shown, to arrest the progress of the load and prevent any part of it being carried over the end drum.

The machine is also particularly useful in taking the material out of cellars while they are being dug, in which case it may be made to dump it directly into a cart. There is no doubt that wherever its services can be employed it will prove itself a great labor saver.



SHANKS' ELEVATOR AND DISTRIBUTOR.

The inventor and patentee, Mr. Thomas Shanks, is willing to dispose of the whole or part of his rights, and further information on the subject may be obtained by addressing him, corner Lombard and Sharp streets, Baltimore, Md.

Tunnelling by Diamond Boring Machine.

The diamond boring machine, of the company of which Captain Beaumont, R. E., M. P., is chairman, has been achieving great triumphs in the Cleveland district, in Lancashire, Cumberland, and other northern counties where it has been employed in "prospecting" for coal and ironstone. At Stanghow, in Cleveland, the borer recently reached a depth of 689ft. in two months; that could not have been got at in less than two years by hand labor. The borer is now employed at the Clifton tunnel on the Bristol Port and Channel Dock Railway. The tunnel, which is under Durdham Downs, is more than a mile long, and through hard mountain limestone. The heading is 10ft. by 8ft., into which the machine drills six holes of about 4ft. deep at a time. A core of about an inch diameter is brought out of each boring, showing exactly the material gone through. The drills made from 180 to 200 revolutions per minute, and advance about 2 inches in that time. The outside diameter of the boring is about 2 inches. Hand labor was employed at first in drilling the heading. It has been ascertained that the machine advances at about five times the speed that could be attained by as many men as could find room to work. The drill holes are in perpendicular rows, and the first blast is a wedged shaped piece taken out of the middle of the section. Dynamite is employed for blasting, and is found to answer the purpose admirably. The machine is so constructed that the drills command every part of the face of the heading, and the holes can be bored at any angle. Jets of water, under about 30 lb. pressure, are forced into each boring, and wash out the *débris*. The feed motion, which may be made absolute, is regulated by sensitive friction gear that indicates extra resistance. Compressed air is employed as a motor, but not, of course, for percussive action, as in the Mont Cenis Tunnel. The air engine has a 24 inch steam and 18 inch air cylinder, and a 4ft. stroke. The engine in the tunnel, upon which the air acts, and that, in its turn, gives motion to the drills, has a 13 inch cylinder and 12 inch stroke. The engine is worked by the compressed air, and is similar in construction and action to an ordinary steam engine. We believe that the diamond drill machine is to be employed experimentally upon the St. Gothard Alpine tunnel, and will be entrusted with the entire work should the experiment prove satisfactory, which there is little or no reason to doubt it will.—*Engineer.*

Paper Shields.

The possibility of employing paper as a material for the armor plating of vessels occupied the attention of many more or less ingenious inventors when the revolution in the construction of heavy artillery brought with it the necessity for a total change in the science of naval defence; but, in this country at least, no successful results have been attained, and the advocates of these schemes have allowed them to drop, in common with many others who, even more imaginative and less practical, have from time to time proposed to protect the sides of ships with all kinds of foreign bodies, varying from cotton bales to sugar canes, and more recently, as we have lately seen, with cork.

On the Continent, however, and especially in Italy, the idea that properly prepared fabrics may be employed successfully as armor plating material has never been abandoned, and so early as 1860, Signor Muratori, a colonel in the Italian army, commenced investigations and experiments upon the subject, which he has prosecuted ever since. In 1862, the attention of Victor Emmanuel was drawn to the results he had achieved, and which had obtained the approval of a body of officers in the Italian army. About the same time General Griffini published a pamphlet, in which he expressed his favorable opinion of Colonel Muratori's invention, and recorded all the results of the trials which had been officially conducted, and which satisfactorily proved the great power of resistance which the material offered.

In 1868 the matter was submitted to the notice of the Emperor Napoleon, who caused experiments to be conducted at Chalons, the results of which confirmed the earlier official trials made in Italy. The French report, indeed, speaks in very sanguine terms of the invention, and indicates the manner in which it could be utilized for the protection of vessels. After some delay, further trials were commenced, but before any action was taken, war with Germany was declared, and this matter, in common with a thousand others, was swept aside to make way for the pressing requirements of the time.

Colonel Muratori, who is now in England, is, we believe, making arrangements for an exhaustive trial of the armor, which has been approved of by several naval officers who have seen it, and who express an opinion that most valuable service may be rendered by it. One successful application certainly has already been made by the inventor, namely, in the construction of cuirasses, which, weighing the same as the ordinary service cuirass and costing less than one fifth as much, has nevertheless a far greater power of resistance. We have seen it turn a regulation pistol bullet fired from a distance of three feet, and it is equally capable of resisting a bayonent thrust.

By a modification of the process, fabrics suitable for military gaiters are endued with a singular power of resistance, and are thus invaluable in action, by protecting the wearers from spent balls or sword cuts.

While we refrain from advancing any opinion upon the more extended application of this process for defence against heavy guns, we speak with confidence as to its efficiency for the military purposes we have alluded to, although the Italian experiments, and later, those at Chalons, seem to point to a wider and more important use. And it appears to us as possible that this armor plating of cemented fabric may be found of service in protecting the bottoms of vessels from the explosion of torpedoes, combining, as it does, great lightness and power of resistance.—*Engineering,*

Shade Trees.

No native tree we have is better adapted to the purposes of shade and ornament than the sugar maple. Its foliage is full and dense, and its form is that of a rounded cone of beautiful proportions. It is also clean and free from insect enemies. It would be well if, in planting shade trees on our streets, there could be a suitable alternation of different kinds, some of rapid growth for temporary use, and others for permanence. Some attention should also be paid to variety. Probably the very best trees for general street planting are the different varieties of the maple. Next in value we would place the elms. For intermediate and temporary planting, the box elder and the ash may be mentioned. Here and there should be the bass wood, or linn, the tulip tree, the horse chestnut, and the buckeye.

Mechanical Table Waiters.

The dining tables of the Oneida community, Oneida, N. Y., are made double, and the central part revolves. All articles of regular use, such as bread, butter, salt, water pitcher, goblets, spoons, milk, sugar, etc., are placed on this central portion, and persons seated at the table wait on themselves, by turning the center until the thing they want swings around in front of them. These mechanical table waiters are found to be very convenient.

A friend of ours once had in regular use a little railway car on his breakfast table, which carried the sirup for the buckwheat cakes, and was propelled by strings back and forth across the table in front of all the plates. The children always derived the sweetest satisfaction from the movements of this convenient little machine.

Correspondence.

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

Crystallization of Antimony.

To the Editor of the Scientific American:

In your issue of June 22d, 1872, the interesting article on "Metallic Crystals" induces a small contribution on the part of one who, though not a deep or scientific student, has seen much to admire and venerate in the wonderful effects of laws originated and maintained, constant in power and truthfulness, by the Ruler of the Universe.

On one occasion, I was exhibiting to a friend the peculiar and wonderful action of antimony in a state of fusion cast on a plane surface; this is well known as an interesting chemical experiment, but it is not generally known that, just before fusion, the fragment of antimony is in a condition to deposit crystals of exquisite beauty and variety; some little skill in manipulation is requisite, but I have found results invariable under the following conditions: Take a small bit of the metal (in condition usually obtained from any extensive dealer in metals), weighing about two or three scruples, place it on a bit of charcoal with the broadest surface away from the flame of the blowpipe; heat it by commencing at the side nearest the lamp, and gradually working over to the broad side, getting the whole into a state of red heat; do not allow fusion. After it has been maintained at a red heat for two or three seconds, a dense, yellowish smoke will be observed to emanate from the broad side of the fragment; keep the metal hot for about one or two seconds after this smoke has made its appearance; then discontinue the heat and allow the fragment to thoroughly cool, when the broad surface will be found covered with a coating of the most delicate crystallization, which, examined under moderate microscopic power (75 to 100), will show an array of beauty and variety seldom equalled. The formation of the crystals may be clearly seen by the naked eye while the metal is cooling, but only as a dense forest of brilliant, diamond like points; under the microscope, they are seen to be transparent and somewhat polariscopic, having the shape of crosses, spears, peculiar shaped flowers, fans, etc. What the substance is that forms the crystals I cannot say, but a chemical friend suggests that it may be antimonious acid.

Another beautiful object for the polariscope is saturated aqueous solution of chloride of mercury (corrosive sublimate). About one dram may be put into a small vial (those used by homœopathists are best, say a two dram vial) and fill with water (distilled water is best). It is immaterial whether the water takes up all the chemical or not; indeed the shortest way to obtain a saturated solution is to have more of the chemical than the water will dissolve. Put a drop of this solution on a glass slide, and pass it a few times through the flame of a spirit lamp to facilitate evaporation, and the crystals resulting will be found, under the polariscope, gorgeous in color and beautiful in shape. Too much heat will result in disappointment.

I would add, in reference to the antimonious crystals, that they may be produced by making a small cavity in the charcoal and laying a flat piece of the metal over it, directing the flame from the blowpipe down on to it, as nearly perpendicular as possible; this gives a copious deposit both in the cavity and on the under surface of the metal; but I have not found them so interesting nor quite so pure in color as those produced in the mode first described. In breaking up a lump of the metal some of the pieces will assume a somewhat triangular form; these are the best to use without an an excavation in the charcoal. Do not allow the metal to fuse, and watch carefully for the peculiar smoke.

J. DE WALDEN CHURCHILL.

Buffalo, N. Y.

Sea Sickness in Railroad Cars.

To the Editor of the Scientific American:

In your paper of June 15th, there is an article on sea sickness from riding in railroad cars, in which the writer says he cannot tell why he with others "was made sick, when there was no pitching or rolling motion to the car." My theory of sea sickness is, not that we are made sick from the pitching and rolling motion alone, but from a combination of both, together with the sudden stopping of either motion. When we rise on to the crest of a wave, we take an upward motion, and when we sink into the trough of the wave, we take a downward motion, and there is a moment in each case when there is a sudden stop or almost a dead point (as in the case of the engine), reversing the mechanical action of the stomach and other viscera, causing a whirl of the brain, thus affecting the whole system. C. LEAVITT.

Windsorville, Conn.

An Invention Wanted.

To the Editor of the Scientific American:

It must be admitted by all persons who have given the matter serious thought that a great desideratum of the age is a clean and durable material for covering floors of dwellings. Carpets are certainly far from meeting the want, as they collect dust and impurities which are exceedingly injurious to the lungs of those sweeping them.

Some material susceptible of being manufactured in pleasing designs, which will be agreeable to the tread, durable, and not too expensive, would meetwith very extended sale.

San Francisco, Cal. GEORGE TASHEIRA.

RED ANTS, if made angry, discharge a very pungent acid substance, called formic acid, "formica" being the word for ant. If these ants are distilled, a substance is produced so burning that, if it is dropped on the skin, it eats into it like fire. It is also derived from the stinging nettle.

[For the Scientific American].

THE GATLING GUN. DOES HISTORY REPEAT ITSELF?

A writer, over the signature "S." under the head of "Notes and Queries," in the SCIENTIFIC AMERICAN of June the 18th, says: "In Littell's Diary, under date of January, 1690, mention is made of an expedition being fitted out against Ireland, and amongst the munitions taken are four of the new invented wheel engines which discharge 150 musket balls at once, and, turning the wheel, as many more; they are very serviceable to guard a passe." And the writer asks the question; "Does history repeat itself in this instance, and is this the forerunner of the Gatling and mitrailleur guns of all kinds?"

Many persons write upon subjects they do not understand. But this does not account for the habit some writers get into of depreciating the value of the labors of modern inventors by hunting up some ancient and obscure allusion to something that the writer (with the modern invention before his eyes to give him the idea) supposes may have been like what that he now sees. As to the case in point, it may be truly said the Gatling gun is not a "wheel engine," nor does it discharge 150, nor even 10, balls "at once." If it did, it would already have become a gun of the past, like your correspondent's antiquity, instead of promising to be the weapon of the future, as it now does.

The Gatling gun was designed expressly to secure continuity of fire. It loads itself, and fires one shot at a time, but it delivers its fire in rapid succession, at the rate of over 400 shots in a minute. Persons who are well acquainted with the history of firearms do not need to be informed that in past ages many engines of warfare have been invented which discharged a number of balls in a volley, or "at once."

Connoisseurs of the subject well know that none of these crude old ideas developed any of the essential features of the Gatling gun, which differs in principle, in method of operation, and in construction, from anything which has preceded it.

The Gatling gun is a repeating firearm, consisting of a cluster of barrels, or rather of breech loading guns, grouped about a central shaft to which they are attached and together with which they all revolve; each barrel is furnished with its own appropriate lock which revolves with the inner breech and barrels; moreover, each lock not only revolves, but moves forward and back at each and every revolution of the gun. A single stationary cam provided with inclined planes, contained within the casing of the gun, operates the breech mechanism of all the barrels, opening and closing their breeches as they successively come within its range so as to allow the cartridges to drop one at a time into line with the barrels and then be forced into their rear open ends. A single stationary cocking device effects the firing of each barrel in turn. In fact, the main characteristic of the Gatling gun is that it consists of sets of three parts, namely: locks, inner breech and barrels, all revolving at the same time; and a remarkable feature of the arm is that it cannot be loaded or fired when either of these three parts is at rest. The gun is supplied with metallic cartridges, which are of modern origin, from "feed cases" or "feed drums" through a kind of hopper in the same way and about as fast as corn is supplied to a mill. The gun also has a traversing arrangement which permits of a wide sweep of its shots during the very process of firing.

What person, previously to this invention, ever saw, heard of, or wrote about, a firearm of this kind? *

Laboring Men and Men of Leisure.

One of the prominent speakers, at the meeting of employers in this city the other day, stated very distinctly that there were in the late strikes some very marked traces of communism, and that the question had been frequently heard among the strikers "Why should we, too, not live in brown stone houses?" Twenty years ago, the sole object of a strike was to obtain a slight increase in wages; today most of the leaders, at least, look on themselves as doing something to has en a social reorganization, in which there shall be no class exempt from manual labor. Professional men, clerks, and all others whose work is mainly of the mental kind, or is at all events clean work which may be done without disfigurement of any kind, have become in their eyes nearly as obnoxious as the regular loungers. In short, the ideal society of the labor reformers, everywhere, though more vaguely held in some places than others, is one in which all shall be in a greater or less degree manual laborers, so that the social distinction now created by a man's not laboring with his hands shall disappear.

The effect of such a revolution as this on civilization—that is, of the disappearance from society of everybody who did not settle down every morning to some distasteful physical task and work at it as long as his nervous energy enabled him, and of everybody who owed anything in the way of greater social freedom, or the greater freedom in the choice of pursuits which wealth gives, to his father's accumulations or his own rapid success—would form a curious subject of speculation. It is well to remember, when we talk about "civilization" and glory in the difference it has made between us and our skinclad forefathers, that ninety-nine hundredths of it are the result of the work of what we may call the "leisured class," that is, the class whom our social arrangements permit to live in what to the manual laborer seems idleness. In fact, the first step in civilization is not made until some portion of the community is released from the necessity of toiling with its hands and allowed to occupy itself with thinking, speculating, or in other words, following the train of abstract reasoning and playing with the imagination; and the rapidity of the rise of every people into civilization has been in the ratio of the number of those whom it was able to release in this way from the common drudgery of life. A great majority of these have always, will always, to all outward appearance, think and imagine in vain, as if it were an essential feature in the moral order of the universe that there should be this seeming waste of effort in every department of human activity. But the number of those who have tried to make such contributions without succeeding, and the number of those who have made trifling contributions not great enough to rescue their names from oblivion but good enough to help the others, the Keplers, Newtons, Davys, and Harveys, to their discoveries, has doubtless been almost beyond count. But they could not have shown themselves at all, in a society of manual laborers such as some working men dream of.

God has somehow not organized society according to our notions of justice. He has made some men strong and healthy, others weak and sickly; some men wise and able, other men foolish and stupid; some women handsome, other women plain; He has imposed on one half of the human species the pains of reproduction, to the other half He has given only its pleasures, and on this inequality, human society is organized. Every man has his post, but there is an enormous difference in the comfort and dignity of the different posts.

The safety and progress of humanity, as a whole, depends on each man's serving faithfully and without murmuring. The rude fishermen of the Northern sea, as a great English writer has finely said, collects the oil which fills the scholar's lamp in the luxurious capital three thousand miles away. Should the day ever come when the fisherman will insist on the scholar's collecting his own oil, the day when there will be neither scholars, fishermen nor oil will not be far distant. —*Christian Union.*

Replanting Teeth.

[Dental Cosmos.]

On the 24th of April, 1868, a young, man C. W., called at my office to consult me in relation to three of his incisors. In a scuffle, the night before, he had these teeth knocked out by a blow,—the two central and left lateral incisors. He had replaced them as well as he was able at the time of the injury, but from the breaking of the alveolar border, the teeth did not stay in their places,—protruding about two lines. The gums were considerably lacerated and much inflamed. I administered the nitrous oxide, and with the aid of a pair of forceps, replaced the teeth. I then softened some gutta percha and molded the same over the loosened teeth, including two of the firm teeth upon either side of the loose ones, thus forming a dental splint which kept the teeth in their places until they became firm. I applied tincture of aconite and camphorated chloroform to the injured parts. At the expiration of five days, the gums were badly inflamed and the teeth sore. I continued the use of dilute aconite for one week longer, when the inflammation had subsided, and I removed the splint. At the expiration of four weeks, the teeth were sound and firm in their sockets; but from the effusion of lymph, the teeth protruded slightly from their sockets, and to avoid irritation I removed the cutting edges with a file.

Four years have intervened since the accident occurred, and the teeth remain perfectly firm, and have never given him the slightest trouble, nor have they changed their color.

Case 2.—In August, 1871, a young man, about seventeen years of age, came to me with alveolar abscess. I persuaded him to have the tooth extracted and replanted. He finally consented. I extracted the tooth, bringing away the sac at the apex of the root, containing pus. I cut three eighths of an inch from the end of the root, cleansed the socket by syringing it out by dilute carbolic acid, immersed the tooth in aconite and camphorated chloroform, and replanted it. In four days the tooth was a trifle sore, but he expressed himself as perfectly satisfied. About one month afterward I filled the tooth, which remains perfectly sound and firm until the present time.

I have replanted four others with like treatment, and with good results.

A Poor Boy's Victory.

An appointment to the United States Naval Academy having been placed within the gift of Colonel Wm. R. Roberts, member of Congress from New York city, he determined to award it to the applicant who should, in a competitive examination, prove himself to be best qualified therefor. This examination, recently took place in the hall of the Board of Education in this city. Twenty six boys were present, thirteen from the public and thirteen from the private schools of the Fifth Congressional district. Sixteen of the number were rejected by Dr. Skiff, the medical examiner. The examination was conducted by Superintendent Kiddle and his assistant, Mr. Harrison. Master John O'Keefe, aged fifteen years, of 107 Washington street, stood first in the order of merit and is to be the nominee. His parents are in very humble circumstances, his father, Timothy O'Keefe, being an ordinary dock laborer. The announcement of the decision of the committee was received with applause, as the appearance of the lad denoted his condition in life. He was heartily congratulated by all present, but by none with so much pride and emotion as his principal teacher, Mr. Duffy. Master O'Keefe, it was remarked by all present, bore a striking resemblance to ex-President Lincoln. A subscription is to be immediately started in the First Ward for the purpose of securing his necessary outfit.

IT is alleged that colored persons are never sunburned because the dark color of their skins absorbs the heat and conveys it into the system, so that it is converted into sensible heat, producing perspiration. But the white skin does not absorb the heat; the sun's rays therefore rest upon and burn it.

PRESSURE ON FOUNDATIONS.

We make the following extracts from an admirable article on this important subject lately published in the *Builder*, in which the principles governing the attainment of safety in building are laid down and classified.

The nature of the soil to be built upon is evidently the first object for consideration; and it is scarcely necessary to say that soils vary in their strength or bearing power as much as in their geological formation. They range from a soft or semi-fluid condition—such as that of marsh, mud or silt,—through all intermediate stages to the condition of the hardest rock. The inherent strength of the soil itself, therefore, and the load to be sustained upon a given unit of its surface (which is usually taken in practice as a square foot) are first to be inquired into.

Where the soil is incapable of sustaining the incumbent load of the structure to be placed upon it, it becomes the duty of the constructor either to increase its bearing power by artificial means, or else, by widening the area of the foundations, to extend and enlarge the bearing surface until it contains within it the resisting power necessary to the requirements of the case. The means by which these results are arrived at will form the second branch of the inquiry.

The materials commonly used for these purposes and the amount of bearing power obtained from them will also be considered.

Every soil is capable of sustaining a certain weight upon each unit of its surface, which varies according to the solidity of the soil. The bearing power of a soil approaching in fluidity to water itself may be assumed at zero, or the lowest point in a scale, and the bearing power of hard rocks may be assumed as the highest; and if these bearing powers be taken at from 0 to 30 tuns per square foot, it will be sufficiently accurate for practical purposes. Between these extremes lie all the intermediate soils of weak rocks, shale, gravel, sand, clay, loam, silt, etc. Supposing the soil to be capable of bearing a pressure of three tuns per square foot, it follows, of course, that either one square foot of foundation must be provided for each three tuns weight in the entire structure, or that the bearing power of the soil must be increased by some means to the required standard.

The weight of the intended structure should first be calculated, and should include all extraneous loading which may be incidental to it. Care must, of course, be taken to ascertain the proportion of weight carried on each part of the foundation, and the area of the part must be proportioned accordingly. The allowance for extraneous loading will vary according to the use of the structure.

Thus in a railway bridge, it is usual to calculate the weight of the trains at from 1 to 1½ tuns per foot run, for each single line. On a road bridge, the usual load assumed is from one half to one cwt. per superficial foot, the load of a crowd of persons standing close together having been ascertained to be a little more than three quarters of a hundred weight per square foot. In ordinary floors, the load may be assumed as similar to that of the road bridge. In a warehouse, the load must be ascertained.

It is then necessary to determine the number of tuns pressure per square foot which the constructor will put on the soil on which the building is to be erected. In this respect, great variety exists in the practice of the most eminent engineers, and pressures varying from 1 to 8 tuns have been allowed on foundations on the London clay. About 4 tuns is recommended in practice as a safe pressure on stiff clay. Loam, indurated clay or shale, as well as soils of similar strength, such as chalk, etc., vary in bearing power in degrees impossible here to indicate. The practical judgment of the constructor must determine in each case. Beds of solid gravel form, when of sufficient thickness and uniformity, one of the most unyielding of the ordinary soils, and they may be safely loaded with double the pressure which can be put on London clay.

The soils of sand vary from a compact close sand, with a clayey bind perfectly impervious to water, through all conceivable varieties of coarseness, looseness and porosity. Porous sand soils are easily removed by running waters, and they require the constructor's extreme care where this is likely to occur. The only course is to lay the foundations so deep that the current shall not lay them bare. Perhaps the most difficult of all engineering work is the foundation of bridge piers in a deep soil of this nature. The usual means employed in these cases up to a comparatively recent date have been the erection of coffer dams round the space to be occupied by the foundation of the pier, the piles forming the dam being driven till they reached solid soil. When a solid bottom could not be attained, long piles were driven all over the foundation surface and the concrete or masonry foundations were laid upon them. In the first case, the natural sustaining power of the lowest soil reached must be the measure of the pressure to be allowed; in the second, this is increased by the friction on the sides of the piles as well as the resistance of their lower ends to sinking. Of late years, these plans have been superseded by sinking, into the bed of the river, upright cylinders. (The construction and mode of operation of such cylinders are already familiar to the readers of the SCIENTIFIC AMERICAN, and need not be dwelt upon here.)

It is generally found that ordinary soils will bear more weight at great depths than nearer to the surface; which is owing to their condensation by the superincumbent pressure, and, also, to the increased difficulty of laterally displacing the soil. This may be understood by considering the action of a pointed pile, which, as it is driven, displaces the original material and renders the soil in its immediate vicinity more condensed.

When sand of good quality is protected from the influence of running water or rains, it forms an excellent foundation, and, when in thick beds, may be loaded with from 6 to 8 tuns per square foot with perfect safety.

There are, however, some practical considerations which modify the question of what constitutes a safe pressure. uppose, for instance, a solid block of masonry, 20 ft. square and 20 ft. high, and a thin wall of the same material, also 20 ft. high, were placed on the same soil. On this supposition, the conditions of both soil and pressure for each square foot of the foundations would be alike in each case; and yet the thin wall, as regards the stability of its foundation, would be far less advantageously situated than the square block. It is customary, therefore, in practice to extend the foundation courses of a wall or column to a considerable width beyond the face of the superstructure.

Rocky soils, which vary from the hardness of granite to that of soft crumbling stone easily worn by exposure to the weather or to running water, may be considered in the same category of bearing power as masonry itself.

The weight of the structure having been calculated, the pressure per square foot on the soil determined, and the area of the foundations deduced therefrom, as above described, the base of the structure must be extended, either by footings, concrete, or otherwise, so as to cover that area and transmit the pressure equally and uniformly over it.

It now remains to consider the pressures which may safely be adopted on the materials themselves which are used in foundations.

Good, ordinary brickwork will crush with a load of about thirty tons, and may be loaded safely up to ten tuns per foot. Brickwork of the best description, set in Portland cement, can be loaded with double this weight; though this should be considered extreme.

The load which can be put upon stonework depends upon the workmanship as well as upon the hardness of the stone itself. Thus, rubble walls with thick and irregular joints of mortar are weaker even than inferior brickwork, while well bedded ashlar masonry will bear loading to an immense extent. In general, from eight to thirty tuns per square foot may be taken as the practical limit.

Concrete will bear from six to twenty tuns per square foot, accordingly to the goodness and proportions of its materials.

The bearing power of timber piles is an important feature in foundations, and varies according to the nature of the soil and the size and length of the pile driven. Where long piles of whole timber are driven through a loose stratum to a firm one underlying it, to the usual extent (a tun hammer with a 15 ft. fall not driving the pile more than a quarter of an inch), they may be trusted with a load of from ten to fifteen tuns. Where their bearing power depends on the friction or adhesion of the soil on their surfaces, it may be easily ascertained by pulling up one of the driven piles by a lever. The measure of the weight required to raise it will be, of course, the friction of the ground on the surface of the pile. When the soil throughout is of a weak and fluid character, it should not be loaded with more than one sixth of the weight which will draw it.

These remarks are, of course, subject to modification in the endless variety of circumstances met with by the practical architect and engineer.

Instruments for Observing Earthquake Shocks.

Owing to the great importance of being able to foresee the eruptions of Vesuvius, the late Government of Naples was led to put up an observatory to watch its signs. The house, built in 1844 on Mount Vesuvius, stands near the hermitage, 2,080 feet above the sea, being placed on a ridge of the mountain, which has turned aside many lava currents without being itself submerged. It is founded on vaulted arches, above which is a large hall for specimens of lava and volcanic minerals. Steps lead up from this hall to the observatory proper. The whole is in charge of Professor Palmieri, of the Royal University of Naples, who, by his ingenuity and zeal, has brought the instruments to a state of great perfection.*

The most important sections of the apparatus are the seismographic or shock recording instruments, which are in a separate room, and are worked by electricity. There are also instruments for observing the electricity of the air, and the pressure of the wind and amount of rainfall, as well as the diurnal variations of the magnetic needle.

All former attempts at measuring and recording earthquakes depended directly on the shocks making their own marks; slight ones thus escaped notice, but by the use of electricity the certainty of record is invariable. The instruments are made to record the horizontal and vertical oscillations, the time of their occurrence, and their duration and direction.

Mercurial columns of ingenious forms are employed in the instruments. The agitation of the mercury, or its change of level, by any shaking of the earth, sets the delicate electrical recording apparatus at work, which instantly shows what has happened.

By means of this apparatus, the astronomical time of the first shock is recorded, as well as the interval between the shocks, and the duration of each; their nature, whether vertical or horizontal, is given, as also the maximum of intensity; and, in the case of horizontal shocks, their direction is indicated. Professor Palmieri has the instruments examined three times a day, and an assistant observer is always at hand, to hear the bell and put back the apparatus to its normal position for fresh observations. It appears that it records all the violent shocks that occur in the Mediterranean basin; thus, on the occasion of the late eruption in the Greek Archipelago, Professor Palmieri was able to announce to the Neapolitans that a great disturbance had taken place long before the news reached Italy. The shocks in connection with Mount Etna are readily observable.

It is recommended that where earthquakes are frequent the observatory should be founded on solid masonry, bedded in the earth, and should consist of a wooden house not liable to be overthrown.

The following signs of an approaching eruption are considered reliable: First, when the crater fills up and the vapor from it diminishes in quantity. Secondly, when the vapor from the crater gives much deposit of iron or sodium. Thirdly, when the water sinks in some of the springs of the neighborhood.

The phenomena more nearly preceding an eruption are the occurrence of earthquakes, increasing in intensity and frequency for some days beforehand, also the irregularity of the diurnal variations of the magnetic needle. One of the remarkable attendants of an eruption (which may be observed to a lesser degree whenever the mountain is steaming much) is the frequency of lightning flashes, attending on the condensation of the vapor of water from the crater; just as, in an ordinary thunderstorm, lightning occurs at the time the vapor is condensing, as is proved by the rain that follows.

In addition to these phenomena of Vesuvius, the volcanic activity of the district is shown by a gradual rising of part of the coast of the bay near Torre dell' Annunziata, where there is already an alteration of several feet; while on the other side of Naples, at Pozzuoli, the pavement at the edge of the harbor is sinking below the level of the water, and the pavement of the temple of Jupiter Serapis had, in the spring of 1869, sunk about 16 inches lower than in 1858.

*The late eruption, which was so extensive and so fatal, was foretold by him as about to take place, and with admirable courage he remained in the observatory at the most dangerous period, when the building ran great risk of being ruined, in order accurately to observe the records of his instruments; a service for which, it is understood, he is to be made a senator of the kingdom of Italy.

Hot July.

In New York, the heat of the first July week has not been paralleled within ten years. On Tuesday, the 2nd inst., the mercury at 3 P. M. stood at 100° in the shade. On the Sunday and Monday previous, it reached 98°, the three days averaging nearly ten degrees hotter than the corresponding days of 1871.

The suffering of both man and brute has been terrible. In the crowded business streets of down town, in the new buildings in process of erection, it was pitiable to see the laborers working unprotected by shade and sweltering in the fierce rays of the sun. Cases of sunstroke were frequent. On the 2nd inst. nearly one hundred and fifty persons were prostrated during the day. Owing to the admirable ambulance system now in working order throughout the city, the sufferers were promptly cared for, but about seventy of their number, it is stated, have died. The horses on the street cars and omnibuses seemed unable to draw their load, dozens succumbing to heat and exhaustion. Among the tenement houses and rookeries in the lower wards of the city, the misery has been appalling.

Railway in Egypt.

The staff of surveyors and assistants, nearly thirty in number, taken out by Mr. John Fowler, C. E., to make a survey for a railway in the valley of the Nile, have returned, after having successfully completed their work. The line surveyed is about 600 miles in length, and commences at Wady Kalfah, near the second cataract, and terminates at Khartum, where the Blue and the White Nile unite their waters, above the sixth cataract. For nearly three fourths of its length, the line will be on the edge of the valley of the Nile, about three fourths of a mile from the river, and constructed above the level of the periodical inundations. At the commencement of the great bend, between 18° and 16° north latitude, the railway will leave the valley, and proceed by a direct line across the desert of Bayuda to a point near the sixth cataract, whence it will follow the valley southwards to Khartum, the intended terminus for a time.

THE merchants in Birmingham, Eng., and the surrounding townships who do business on foreign account continue to receive valuable advices from nearly all the markets, as well in Southern as in Northern Europe, from the British antipodean colonies, and from British Canada and the United States. The reduced tariff which will come into operation in America on the 1st of August, by which all metals and their manufactures, except iron wire, watches, and jewelry, are to be admitted at a reduction of 10 per cent, and tin plates at a reduction of 15 per cent, is stimulating not only the demand for iron by American customers, but is also leading to an enlarged business in respect of nearly all the goods contemplated in the reduction. Valuable orders have already been sent across; and enterprising manufacturers and merchants are stimulated to greater energy with a view to the extending of their connection with the different United States markets.

THE velocity of electric waves through the Atlantic cables has been ascertained by Professor Gould to be from 7,000 to 8,000 miles per second. Telegraph wires upon poles in the air conduct the electric waves with a velocity more than double this. It is a curious fact that the rapidity of the transmission increases with the distance between the wire and the earth, or with the hight of the support. The *Journal des Telegraphes* says that wires, placed on poles slightly elevated, transmit signals with a velocity of 12,000 miles a second; and those at a considerable hight give a velocity of 16,000 or 20,000 miles.

RAILROAD CAR BRAKE.

The improved brake illustrated in our engravings is more especially adapted for use on four wheel coal cars, or such ore cars as are generally used about furnaces, though it admits of various modifications of its arrangement which would adapt it to other forms of car without altering the principle involved.

Fig. 1 represents a coal car with the brake applied to one pair of wheels. Only the upright shaft and hand wheel are shown in the engraving, the other portions of the brake being indicated by dotted lines. Fig. 2 shows the side frame of the car, in section, with the brake attached. At A are shown the brake blocks, which are made of wood or other suitable material. These are attached to a flexible iron strap, B, the ends of which are secured to the frame of the car by the nuts and screws shown at C. This strap is about three inches wide and a quarter of an inch thick. D is a vertical brake rod which is operated by the wheel seen in Fig. 1. On the lower part of the brake rod is a screw which works in the nut, E, attached to the frame of the car, and on its extreme end is the block, F, which has a groove lengthwise through which the strap passes. It is prevented falling out by a pin. The end of the brake rod works in a socket in the block in such a manner as to raise or depress the block without turning it. When it is desired to apply the brakes, the rod is screwed down by means of the wheel, and the strap is carried down with it. This brings the blocks, A, in contact with the wheels of the car and throws part of the weight of the car upon the brakes. The amount of weight sustained by the brake blocks is dependent upon the pitch of the screw on the rod, D, and upon the diameter of its wheel. When the brake is not in use, the rod, strap, and brake blocks are elevated sufficiently to relieve the wheels of all restraint. Should the strap stretch, it may be easily brought to the proper tension again by tightening the nuts at C.

It will be noticed that the brake blocks are applied directly on the top of the wheels, which prevents the strain coming upon the boxes as it does when they are placed in any other position. On gravity roads, this brake is said to work admirably. One in use on a road having a uniform grade of 200 feet per mile, did all the braking up of five cars for six months, and has been running, in all, two years in good order. It appears to be durable, and costs only an insignificant sum to keep in order. For further information, the inventor and patentee, Mr. Frederick A. Canfield, of Dover, N. J., should be addressed. Patented Jan. 9, 1872.

Fig. 1

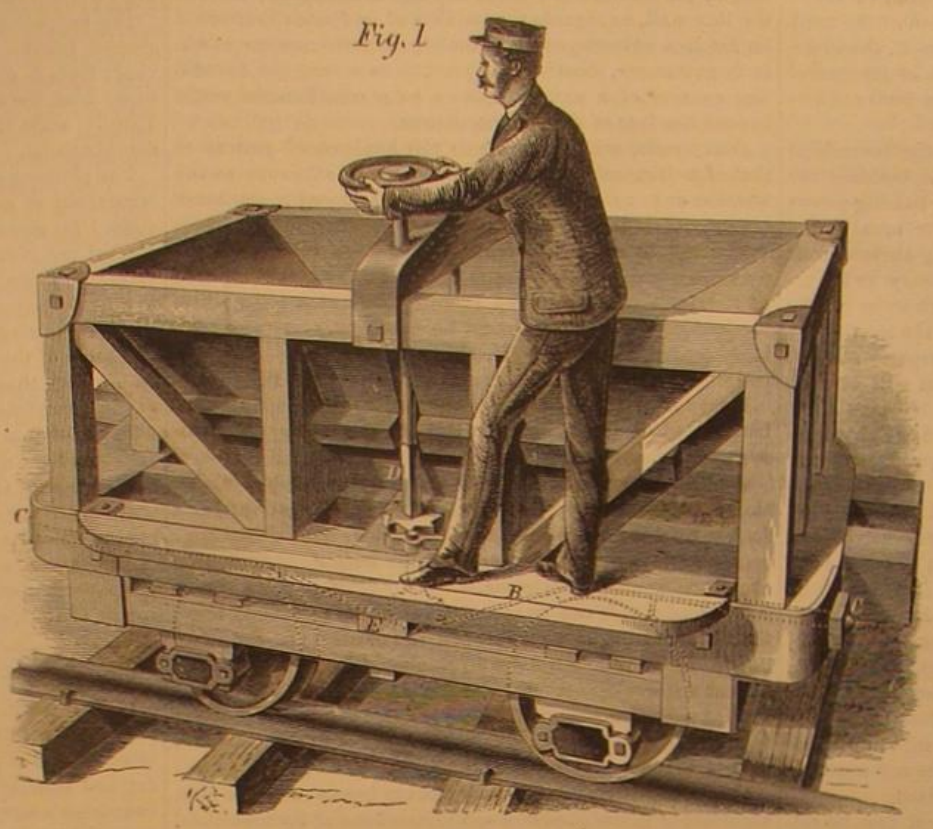
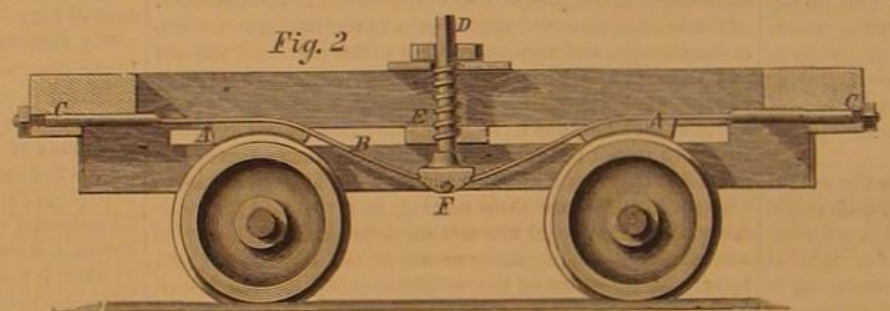


Fig. 2



CANFIELD'S RAILROAD CAR BRAKE.

RAILROAD RAIL.

The improvements in railroad rails, which we this week illustrate, are designed to give to the rail that degree of elasticity which will enable it to bear all the pressure and shocks to which it may be subjected with the least possible amount of wear and tear to itself and the rolling stock which passes over it. To effect this much to be desired object, the inventor relies on the merits of the form and construction of his rail, the material of which it is made, and his method of joining the ends of adjacent lengths. Several designs for the rail are shown in our engraving, where, generally, A is the rail and B the connecting piece, all of which are secured by letters patent.

The first patent granted to the inventor, Mr. Rufus S. Sanborn, of Rockford, Ill., dated August 8, 1871, was for the rail and joint shown in Figs. 1 and 2. It will be seen that the rail is tubular, the upper part being nearly cylindrical and the lower somewhat of a triangular figure. The material of which it is formed is steel. The rail used in practice would be four inches high and four inches wide at the base, which, it will be noticed, is slightly arched. The sides approach at the neck, C, to within about a quarter of an inch of each other. Now it will be readily seen that the effect of a weight applied on the top of this rail will be to bring the sides nearer together at C. A sufficiency of pressure would make them touch. There will, at the same time, exist a lateral thrust of the lower sides which will tend to flatten out the arched base, the yielding of which brings into play a reserve of elasticity that is available after the sides are closed at C. The closure of the neck effects a slight change in the form of the arch at the rail top, which enhances its strength without sensibly affecting its bearing surface. The joint, B, is, in effect, a hollow spring of about sixteen inches in length, which is compressed when inserted in the ends of the rails to be connected. It binds them securely and is capable of yielding with them to the influence of pressure or percussion. The joined rails are shown at Fig. 2.

Finding that there was a practical difficulty in manufacturing the exact form of rail just described, which arose from the weld required at the base, Mr. Sanborn devised the form shown in Fig. 3, which was patented December 12, 1871. Here a separate base is secured to the body of the rail by a lap joint as delineated, which very much simplifies the construction. The elliptic form of the top arch and the configuration of the connecting spring, B, shown at Fig. 4, forms the subject matter of a further patent dated March 26, 1872. In this form the sides are at once connected with the base without being doubled over, as in Fig. 3. The elliptic arch affords a wider tread for the wheels, and the connection is rendered more secure by the enlargement of the spring joint.

The three forms of rail described are similar in principle, so far as their elasticity is concerned, and in each case the limit to the yield or give of the rail is fixed by the space left between the sides at C, and by the arch in the base. The inventor claims that by this arrangement the tread is not affected by pressure sufficiently to produce an up grade for the wheels to run on. The tubular connecting joints make, virtually, a continuous rail. The junctures are made without bolts or other fastenings, and allow of expansion and contraction taking place freely while keeping the rails securely in position. In this way the violent hammering arising from the wheels striking the ends of the ordinary T rails is obviated, and consequent damage to the rails and rolling stock is prevented by the elasticity of the joint.

The rails made as in Figs. 1 and 2 have the advantage in strength and durability, and those constructed as in Figs. 3 and 4, with lap joints, possess that of cheapness. The elliptic top may go with either construction. The inventor states that all the forms presented can be readily manufactured. The first form he proposes to make by passing a round tube of proper size through rolls constructed to press it into the required shape. The other forms, and the connecting pieces for all, may be made of rolled metal plate of the requisite thickness. He claims that a length of rail of this kind, weighing forty pounds, has as much strength as a similar length of solid rail weighing sixty pounds, and that great economy of material will consequently arise from the use of the new rail.

Mr. Sanborn designs placing his invention under the control of a stock company, by whom it would be tested and its practical worth fully developed. He may be addressed, as previously stated, for further information on the subject.

Fig. 1

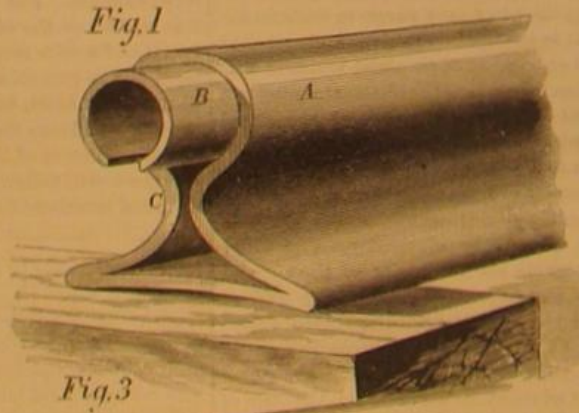


Fig. 2

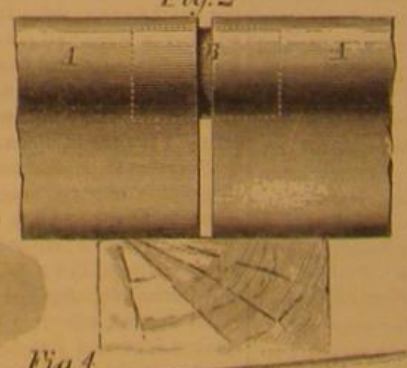


Fig. 3

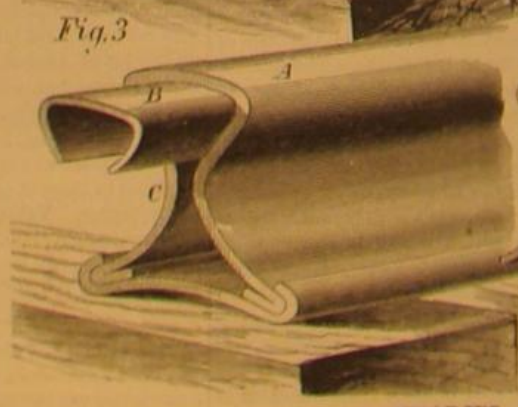
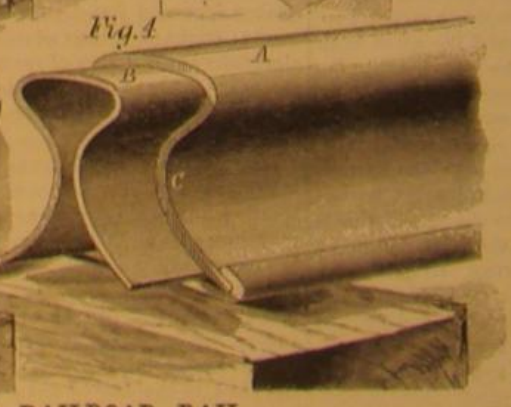


Fig. 4



SANBORN'S RAILROAD RAIL.

The Polariscope.

Most of our readers have seen an example of what is termed double refraction by looking at any object through Iceland spar, which is a crystallized carbonate of lime. When a piece of the spar is placed upon a sheet of printed paper or any other well marked object, two images of that object or print will be seen, each separated from the other by a small degree. If the rhomb of spar be turned slowly round with the same face resting on the paper, one of the images will be seen revolving round the other. By judiciously sawing the rhomb of spar in two and cementing the surfaces with Canadian balsam, one of these double images may be entirely got rid of; and a piece of Iceland spar thus treated, and which is now well known all over the world as a Nicol's prism, forms the means by which the great majority of the experiments with polarized light are at present made. This simple piece of apparatus is most extensively used wherever light and its various phenomena form the subject of research. No microscope of the better class is considered to be complete unless it has a polariscope attached to it.

The polarization of light may be employed as a means of chemical investigation. A few days ago, says the British *Journal of Photography*, a friend called upon us with two bottles of similar size and appearance, filled respectively with aqueous solutions of bromide of cadmium and bromide of ammonium, and labels on which he suspected had got "mixed up" just before being pasted on, leaving him in some doubt as to whether they were properly labelled. Instead of subjecting one of the solutions to an analytical chemical test, as had been suggested, we merely placed one drop from each of the bottles upon a small plate of glass, warmed it slightly to start the crystallization, and examined the two crystallizing solutions with the polariscope. In less than thirty seconds after placing the glass slide on the stage of the instrument, we indicated, in the most definite manner, which was the cadmium salt and which the ammonium. This is only one of many uses to which a polariscope may be put.

M. Blanquart-Evrard.

M. Blanquart-Evrard, recently deceased in France, aged 70, may justly be esteemed one of the early fathers of the photographic art, for he it was who first popularized its productions and proved that it could be applied successfully to the illustration of books. At the time when he first started his photographic printing establishment at Lille (1850), nothing was heard of in photography but daguerreotype portraits and prints from calotype negatives upon paper, in a rusty red, inartistic style. He began by entirely changing or reversing the process of Talbot in taking negatives, and established the principle which has since been observed in the common collodion process. He showed the importance of organic matter in the film as conducing to clearness and density. He discovered sulphur toning, as well as the gold toning of paper prints; and so modified the negative process of printing by development as to enable it to produce the most artistic photography upon paper yet seen. His latest discovery was a mode of intensifying a negative by exposing it with its back to the light for an hour two after it is developed but before it is fixed.

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NEW YORK, SATURDAY, JULY 20, 1872.

Contents:

(Illustrated articles are marked with an asterisk.)

THE DOMESTIC TELEGRAPH.

Not many evenings ago, an intelligent, gentlemanly looking individual presented himself at our door and asked "if we didn't want the district telegraph put into our house." At the same time he handed over for our examination a very pretty little instrument, composed of cog wheels and somewhat resembling a clock. "We attach the instrument to the wall," he said, "in some convenient position in your house, and to it we connect a wire leading to your roof, where it unites with another wire that extends to one of our district offices on Broadway." Pointing to a small knob, he continued: "If a fire breaks out in your house, you just push that lever, and in three minutes the firemen will be here. If thieves break in, you move that other lever, and in three minutes the policeman will make his appearance. If you want a special messenger to go upon any sort of business, night or day, you just turn this little button, and in three minutes the man will be at your door ready for service. The signals you thus make are all received and recorded at our Broadway office, where we keep a force of attendants, in readiness at all hours, to execute the requirements of our customers. Your wife or any other intelligent person can make the signals. We make no charge for putting the instrument into your house or for keeping it in order; but you pay us $2.50 per month for its use and fifteen cents an hour for the time occupied by our messenger in doing your business. When you go away to the country in summer, you can have an attachment put on, so fixed that, if burglars attempt to break in, an alarm will be sounded at our office, when our policemen will quickly surround the house, and catch the thief in the act."

We rather liked the idea of having such a telegraph in the house, gave the order, and it was promptly put in.

In the course of a week or so afterwards, thinks we to ourselves, that is our wife and we, "let's try our telegraph just for fun, and see whether the telegraph folks are as wide awake as they pretend, or whether they are napping." This was early in the morning, just between getting up time and breakfast—before business begins—the hour when night hands go home and day hands have not yet come—the time when the manager is probably not on hand. Now let's see what this new-fangled telegraph is good for. So we pressed the knob, and there followed a slight click and a buzz. We looked at our watch, went down stairs, took seats at the breakfast table, when we were startled by a ring at the door bell. "Messenger from the District Telegraph Office. Got your signal. Wants to know what is wanted," was the report that came to us. Looking at the watch we found that just two and a half minutes had elapsed since we gave the signal. We felt a little bit sheepish in being obliged to tell the messenger that we had sent for him "just for fun, to see if he was really awake," etc., and as we were entirely satisfied on that point, he retired, sorry that we had no real business for him to do.

After breakfast, we went to the company's office, where we found a Morse paper recording apparatus, with which the various dwelling houses in the district are connected. Whenever a signal is given from any of the houses in the circuit, a gong sounds in the office, which notifies the attendant, and at the same time the telegraph clock work is set in motion; the paper moves, and upon it a signal is stamped and restamped or repeated. Each house instrument gives a different signal, and the various signals, with the names of the occupants and numbers of the respective dwelling houses, are registered or tabulated on the wall, like a hotel indicator. By glancing at the register, the attendant sees at once from what house the signal has come, also its nature, whether a fire has occurred, a robbery going on, or a messenger needed. The office is in connection with the city fire telegraph and police offices, and instant signals are sent thither if required.

Taken altogether, this district or domestic telegraph is a most useful and valuable institution, promotive of comfort, convenience, and safety of families. That it will soon come into general use, cannot be doubted. The wires are so arranged that in case they are severed, either by design or accident, an alarm is instantly sounded at the district office and the repairs are quickly effected.

SUMMER HEATS IN VARIOUS COUNTRIES.

For the benefit of our readers who are suffering under the effects of the present heated term, we have collected, from various sources the following, relative to the extreme summer temperature of the different countries of the world.

Thibet, situated in Central Asia, between the thirtieth and thirty-eighth parallels of north latitude, is a decidedly hot country, so hot, indeed, that even the fiercest heat which the firemen in a sea-going steamer have to endure is comparatively insignificant besides its midsummer temperature. "Misery loves company," and as the reader sits slowly melting with thermometer at 98° Fah., he will probably gather consolation from the knowledge that the unfortunate inhabitants of the above mentioned country are worse off than himself. The intense heat, reaching 150°, doubtless prevents their remaining either in their houses or their garments during the day, but such is the inconstancy of the weather that if they venture to remain out doors or to continue in their primitive costume throughout the night, they may possibly be frozen to death before morning.

Senegal in Africa and the island of Guadeloupe in the West Indies are next to Thibet in summer heat; the weather is variable, but often reaches a temperature of 130°. Still more changeable is the climate of the Great Desert of Sahara, where the thermometer, after rising to 130° during the day, at nightfall descends to among the fifties. In Persia, fearful plagues and pestilences are bred by an atmosphere heated to 125°. At Calcutta and on the Delta of the Ganges, points from which the Asiatic cholera is said to begin its western march, the mercury rises to 120°, while in Central America the same limit is attained.

In the jungles of Affghanistan and in the deserts of Egypt, 110° is the maximum. Strange to say, the same high temperature is reached in some of the interior valleys of California, although the average of the surrounding country is much lower. At Cape Colony, the diamond diggings in Africa, and in some parts of Utah Territory, the midsummer heat is 105°. This is next greatest in Greece, reaching 104°; then comes Arabia, 103°, the arid deserts of that country being much less heated than the vast expanse of Sahara. Now follows a strange anomaly: it will hardly be credited that our blue nosed neighbors in Canada ever experience such a temperature, but it is nevertheless a fact that at Montreal the extreme summer heat is often as high as that of the deserts of Arabia, both being 103°.

Our own State—New York—is not far behind, its summer limit being 102°. Spain, Upper India, Canton, China, the island of Jamaica, and most of our Southern States average 100°. With the exception of New York, 98° is the highest range in the Northern States. The island of Mauritius is next on the list, having a summer temperature of 96°; then come Sierra Leone in Africa and Guiana in South America, both 94°; then Ceylon, 92°. Throughout France, in St. Petersburg (Russia), Denmark, Belgium, Burmah, Shanghai in China, Penang, the Sandwich Islands, Buenos Ayres, and the islands of Bourbon and Trinidad, the average is 90°. That of Nova Scotia and the majority of the Azores islands is 87°. England, Ireland, Sicily, Siam, and Peru in summer are of about the same temperature, not exceeding 85°. Pekin in China, Portugal, and Natal Colony in Africa all have mild summers, 80° being the extreme. In Siberia, 77° is the limit. In Western and Southern Australia and the eastern and western parts of Scotland, the temperature does not rise above 75°. In Italy, Venezuela, and Madeira, 73° is the maximum.

The thermometer in Prussia, Victoria Land, and New Zealand rarely rises above 70°; in New South Wales not above 68°, nor, in Switzerland and Hungary, above 66°. Colder still are the summers in Bavaria, Sweden, Northern Siberia, Tasmania, and Moscow, in Russia, where 65° is the extreme limit. Norway, Greenland, and Newfoundland have no weather warmer than 60°; 55° is the maximum for Central Scotland, the Orkney Isles, Patagonia, and, the Falkland Islands; and finally, amid the ice and snow of the arctic regions, the heat of midsummer is below 50°.

Iceland, however, is colder still. The northern portions of that country virtually have no summer; on its southern shores, which are swept by the Gulf Stream, the temperature sometimes rises to 45°. Last comes Nova Zembla, bleakest and most inhospitable of islands, lying frozen in the Arctic ocean, on the confines of Northern Asia. It can be truly said that in that country there is no summer; for even in these midsummer days, while we suffer under the intense heat, there the mercury fails to rise beyond 34°—two degrees above the freezing point—and this is the very extreme of temperature.

FUNCTION OF POTASSIUM IN SOILS.—According to Nobbé, the presence of potassium in soils is necessary in order to enable the chlorophyll grains of the leaves to form starch, sodium and lithium being unable to replace potassium in this function, the latter indeed being actually injurious. He has also ascertained that the different combinations of potassium vary very much in their value, the chloride being by far the most efficacious.

THE NEW PATENT LAW OF CANADA.

We are indebted to the editor of the New York *Daily Witness* for an official copy of the new patent law lately passed by the Dominion Parliament, and which goes into effect September 1, 1872.

As this new law provides for the grant of patents and caveats to American citizens, our readers will doubtless be interested to know its general features, and we therefore subjoin an abstract.

The Canadian law is somewhat peculiar. It appears to contain a mixture of the English, American, and Continental systems, together with a few original articles.

Under the English and American laws, the patentee may exercise his own discretion as to the date when he commences the manufacture of his improvements. In consideration of making known his invention, the exclusive right to it for the period of the patent is guaranteed to him, and he may do as he thinks best about introducing it. If he chooses not to work the patent until a late date, or even not at all, it is his own affair. The grant is his and holds good during its allotted term. But at the end of the term, the invention becomes public property, and all persons may then freely enjoy its benefits.

The Canadians have adopted the Continental plan by requiring that the invention shall be actually worked in Canada within two years from the date of the patent on pain of forfeiture of the grant. Provisions of this nature are generally discouraging and inconvenient to inventors. But the proximity of Canada to this country, and the fact that Americans may, during the first year of the patent, make their goods here and take them to Canada, still enjoying protection under the patent, will greatly assist them in establishing the manufacture there within the period required.

Any American invention, even if it has been already patented here, may also be patented in Canada, provided that the American patent is not more than one year old. But if the sale and manufacture of the article has been commenced in Canada before the grant of the Canadian patent, the parties so manufacturing may continue the manufacture after the issue of the patent, without accountability to the patentee. But all other persons will be required to obtain the consent of the patentee before they can sell or manufacture. Our citizens can readily avoid any difficulty on this score by applying for the Canadian patent before the American patent issues.

The Canadian law affords suitable facilities for the sale of part rights in patents and for the record of assignments. But these privileges appear to be somewhat nullified by another clause, of singular phraseology, which reads as though it was intended to empower the owner of a paltry town right to destroy the validity of the entire patent, should he choose to do so, thus sacrificing the interests of all other owners or workers under the patent, without their knowledge or consent. To effect this nullification of the patent, a part owner has only to import or cause to be imported into Canada a single example of the patented article. This section evidently needs modification.

Another incongruous section is that which punishes the patentee with fine and imprisonment if he fails to stamp the word "Patented" and the year of the patent upon every patented article. The law is specific upon this point; but compliance with it would in many cases be almost impossible. For example, upon needles, hooks and eyes, percussion caps, eyelets, etc., it would be difficult to place a legible stamp. In this country, the law directs that the stamp shall be placed upon the package when it cannot be conveniently affixed to the article.

The Canadian law is also faulty in making the omission of the stamp a penal offence. A patentee's own interests will always lead him to attach the stamp to his goods; and whether the stamp is affixed or not, the public is benefitted, not injured, by the issue of the improved goods. Surely a patentee ought not to be treated as a criminal for the omission of a trivial thing which only concerns himself.

In this country, if the patentee fails to stamp the date of the patent upon his goods, and if any persons not knowing that such goods are patented should imitate them, they cannot be held liable for infringement of the patent. This is a more just and equitable provision than that of Canada.

The Canadian method of deciding interferences is novel. If two persons apply for a patent for the same invention, they are each to choose an arbitrator, and the Commissioner of Patents is to appoint a third. The arbitrators have power to summon witnesses and take evidence, upon which they determine who is the prior inventor, and to him the patent is issued. We shall watch the workings of this peculiar mode of settlement with much interest.

ABSTRACT OF THE NEW CANADIAN PATENT LAW, TAKING EFFECT SEPTEMBER 1ST, 1872.

The Canadian Patent Office is attached to the Department of Agriculture, the Minister whereof and Deputy are, respectively, Commissioner and Deputy Commissioner of Patents. The Governor appoints clerks and assistants. No employee in the Patent Office shall hold an interest in any patent. The Commissioner shall publish an annual report, a list of patents granted, and may also print the specifications and drawings if he thinks best.

Any person having invented any new and useful art, machine, manufacture, or composition of matter, or any new and useful improvement on any art, machine, manufacture, or composition of matter, not known or used by others before his invention thereof, and not being in public use or on sale for more than one year previous to his application in Canada, with the consent or allowance of the inventor thereof, may, on a petition to that effect presented to the Commissioner, and in compliance with the other requirements of the

Act, obtain a patent granting to such person an exclusive property therein; but no patent shall issue for an invention having an illicit object in view, nor for any mere scientific principle or abstract theorem.

But an inventor shall not be entitled to a patent for his invention if a patent therefor in any other country shall have been in existence in such country more than twelve months prior to the application for such patent in Canada; and if, during such twelve months, any person shall have commenced to manufacture in Canada the article for which such patent is afterwards obtained, such person shall continue to have the right to manufacture and sell such article, notwithstanding such patent; and under any circumstances, where a foreign patent exists, the Canadian patent shall expire at the earliest date at which any foreign patent for the same invention expires.

The patent may be granted to any person to whom the inventor has assigned or bequeathed the right of obtaining the same, or in default of such assignment or bequest, to the executors or administrators or as signs of the deceased inventor.

The applicant for a patent must make oath (before any Judge in the country where he lives) that he is the inventor, must furnish a full specification of his invention, with drawings in duplicate, together with a neat working model, made on a convenient scale. If the invention is a composition, he must furnish specimens thereof and of the several ingredients.

DURATION AND EXTENSION OF CANADIAN PATENTS.

Patents shall be valid for a period of five, ten, or fifteen years, at the option of the applicant; but at or before the expiration of the said five or ten years, the holder thereof may obtain an extension of the patent for another period of five years, and after those second five years, may again obtain a further extension for another period of five years, not in any case to exceed a total period of fifteen years in all; defective patents may be corrected by reissue or the filing of disclaimers.

The Government of Canada may always use any patented invention, paying to the patentee such sum as the Commissioner may report to be a reasonable compensation for the use thereof.

Patents may be assigned in whole or in part; assignments shall be registered with the Commissioner; the assignment first registered shall be good as against any other assignment of the same patent or interest therein.

INFRINGEMENTS.

An action for the infringement of a patent may be brought before any Court of Record having jurisdiction to the amount of damages asked for, and having its sittings within the Province in which the infringement is said to have taken place, and being, at the same time, of the Courts of such jurisdiction within such Province, the one of which the place of holding is nearest to the place of residence or of business of the defendant; and such Court shall decide the case and determine as to costs. Any Judge thereof, in chambers if the Court be not sitting, may, on the application of the plaintiff or defendant respec ively, make such order for an injunction restraining the opposite party from further use, manufacture or sale of the subject matter of the patent, and for his punishment in the event of disobedience to such order, or for inspection or account, and respecting the same and the proceedngs in the action, as the Court or Judge may see fit.

MANUFACTURE AND IMPORTATION OF PATENTED IMPROVEMENTS IN CANADA.

Every patent shall be subject to the condition that such patent and all the rights and privileges thereby granted shall cease and determine, and the patent shall be null and void, at the end of two years from the date thereof, unless the patentee, or his assignee or assignees, shall, within that period have commenced, and shall after such commencement continuously carry on, in Canada, the construction or manufacture of the invention or discovery patented, in such manner that any person desiring to use it may obtain it, or cause it to be made for him at a reasonable price, at some manu factory or establishment for making or constructing it, in Canada, and that such patent shall be void if, after the expiration of twelve months from the granting thereof, the patentee or his assignee or assignees for the whole or a part of his interest in the patent, imports or causes to be imported into Canada the invention for which the patent is granted.

Whenever a patentee has been unable to carry on the construction or manufacture of his invention within the two years hereinbefore mentioned, the Commissioner may grant to the patentee a further delay on his adducing proof to the satisfaction of the Commissioner that he was for reasons beyond his control prevented from complying with the same.

CANADIAN PATENT FEES.

The following are the patent fees:

On petition for a patent of 5 years	$20 00
On petition for a patent for 10 years	40 00
On petition for a patent for 15 years	60 00
On petition for extension from 5 to 10 years	20 00
On petition for extension from 10 to 15 years	20 00
On petition for extension from 5 to 15 years	40 00
On lodging a caveat	5 00
On petition to reissue a patent	4 00

CAVEATS IN CANADA.

An intending applicant may file in the Patent Office a description of his invention so far, with or without plans, at his own will; and the Commissioner shall cause the said document to be preserved in secrecy, and such document shall be called a caveat. If application shall be made by any other person for a patent for any invention with which such caveat may in any respect interfere, it shall be the duty of the Commissioner forthwith to give notice by mail to the person who has filed such caveat, and such person shall within three months after the day of mailing the notice, if he would avail himself of the caveat, file his petition and take the other steps necessary on an application for patent.

REJECTIONS.

The Commissioner may object to grant a patent in the following cases:

When he is of opinion that the alleged invention is not patentable in law.

When it appears to him that the invention is already in the possession of the public with the consent or allowance of the inventor.

When it appears to him that there is no novelty in the invention.

When it appears that the invention has been described in a book or other printed publication before the date of the application, or is otherwise in the possession of the public.

When it appears that the invention has already been patented in Canada (or elsewhere, for more than one year), except, however, when the case is one in which the Commissioner has doubts as to whether the patentee or the applicant is the first inventor.

INTERFERENCES.—ARBITRATORS TO DECIDE.

In case of interfering applications for any patent, the same shall be submitted to the arbitration of three skilled persons, one of whom shall be chosen by each of the applicants, and the third person shall be chosen by the Commissioner or his deputy or the person appointed to perform the duty of that office. And the decision or award of such arbitrators, or any two of them, delivered to the Commissioner in writing, and subscribed by them or any two of them, shall be final as far as respects the granting of the patent.

The arbitrators, or any one of them, after having been so worn, s hall have the power of summoning before them any party or witness, and of requiring him to give evidence on oath, orally or in writing (or on solemn affirmation, if the person be entitled to affirm in civil matters), and to produce uch documents and things as such arbitrators deem requisite to the full investigation of the matters into which they are appointed to examine, and shall then have the same power to enforce the attendance of such witnesses, and to compel them to give evidence, as is vested in any court of law in civil cases.

The fees for the services of arbitrators shall be a matter of agreement between the arbitrators and the parties.

CANADIAN STAMP PENALTIES.

Every patentee under this act shall stamp or engrave on each patented article, sold or offered for sale by him, the year of the date of patent applying to such article, thus: "Patented 1872," or as the case may be; any such patentee selling or offering for sale any such patented article not so marked shall be liable to the punishment of a fine not to exceed one hundred dollars, and, in default of the payment of such fine, to imprisonment not to exceed two months. The penalty for using the stamp of patented upon an article that has not been patented is a fine not exceeding two hundred dollars and imprisonment not exceeding three months.

The above new Canadian patent law goes into effect Sept. 1st, 1872, when a large number of patents will be applied for by Americans. In fact many persons, desirous of avoiding delay, have already ordered Canadian patents, and their specifications, drawings and models, are now in preparation for deposit in the Government archives at Ottawa. Messrs. Munn & Co. have perfected their arrangements for securing Canadian patents in the most prompt manner, on very reasonable terms, and will be happy to furnish, without charge, further information upon the subject to all who apply. Enquiries may be addressed to them at the SCIENTIFIC AMERICAN Office, 37 Park Row, N. Y.

[Special Correspondence of the Scientific American.]

LETTER FROM PROFESSOR R. H. THURSTON.

PITTSBURGH, Pa., June 25th, 1872,

A visit to the works of Messrs. Sellers. The Giffard Injector. The Baldwin Locomotive Works. Mountain scenery. The Pneumatic Railway Brake. The Water Scoop.

Another of the most interesting among the great manufacturing establishments of Philadelphia is that of Messrs. Sellers & Co., the well known builders of machine tools.

Here about five hundred and fifty men are employed, and, with the ingenious machinery and the effective system adopted in doing work, they produce a larger amount per year than could two thousand men have done ten years ago in even these works, which were then, as now, remarkable as a leading establishment in the business.

The Messrs. Sellers were among the very earliest in the introduction of the system, now almost universal among the best builders, of making all their work precisely to gage, and thus securing the best of workmanship and interchangeable parts. As representing the effectiveness of this modern method of manufacturing, their shops form, as in many other respects, a model establishment. Their machines are as nearly perfect in material and workmanship as it is to-day possible to make them, and they were probably the first to prove by actual experience that such machinery can find a market in this country at remunerative prices. It must be confessed that there are, however, comparatively few builders who adhere, like this firm, to a determination to do none but the best possible work under all circumstances.

The planing machines and the steam hammers made here are, if a distinction can be made at all, particularly noticeable tools. The method of driving the table of the former, by a spiral pinion working into a rack, is found as effective as it is ingenious. The steam hammer has the weight of its drop in its piston rod, which is made very large, and the system adopted in guiding it and thus escaping the serious danger which arises in ordinary hammers from a glancing blow, is peculiarly excellent. The valve gear is at once the simplest and most effective that I have seen. Taken as a whole, it is a splendid tool.

THE GIFFARD INJECTOR.

The Giffard steam boiler injector—that wonderful substitute for the steam pump—is another of the most interest ng machines made here. I well remember the incredulity with which I first heard, a dozen years ago, of this apparatus in which steam left the boiler, picked up a quantity of water while passing through the instrument, and carried it into the boiler again without the loss of a drop of water or of a particle of steam. I remember that the story appeared still more absurd when it was added that the new pump needed neither valve, plunger, nor any other moving part. It required a visit to the works of the Messrs. Sellers shortly afterward to remove all doubt, and, as a matter of course, the wonder, once seen, became the simplest thing imaginable. The manufacturers have greatly improved the injector since that time, and now there are few railroads in this country on which it is not in regular use.

Every minute spent in this establishment afforded useful information, and I only regretted that I had not a week to spare, instead of but a few hours.

THE BAIRD LOCOMOTIVE WORKS.

An afternoon was spent very pleasantly, and most profitably, in the great Baldwin Locomotive Works of Messrs. Baird & Co. At this establishment, more than twenty-five hundred men are at work, turning out from seven to nine completed locomotive engines every week, and the orders still increase. The proprietors of the works were working men who have, by their industry, intelligence and good management, become the employers of this industrial army, and who have shown what may be done by labor in the acquisition of capital, teaching the same lesson that may be learned in nearly all of the most successful manufacturing estal lishments here and abroad. All work is here, also, made to gage, and the several parts are "assembled," to make the complete machine, without the expense attending the old process of "cutting and carving" in fitting up. Some of the engines in progress here are for Russian railroads. Like the majority of great industrial establishments, this immense manufactory has been many years in process of growth. It was established half a century ago, and its first locomotive was built in 1830. In 1831, an engine was built here for the Philadelphia and Germantown railroad, which is said to have run a mile in a minute.

Good material, good work, and a plain finish, seem to be the practice here.

There are many other large manufactories and interesting places that attract the attention and afford valuable information to the engineer, and a dozen of them would each afford material for a full column in the SCIENTIFIC AMERICAN; but my time was limited, and I was compelled reluctantly to leave the "City of Brotherly Love," and to pursue my journey westward over that most excellently managed road, the Pennsylvania Railroad.

THE PENNSYLVANIA RAILROAD AND ITS SCENERY.

The excellence of the road bed and the smoothness with which the train ran—sometimes over forty miles an hour—allowed the passengers to enjoy, without annoyance, the beautiful scenery of the Alleghanies. The atmosphere was slightly hazy, but not so much as to interfere seriously with the view of distant mountains and adjacent valleys. At this season, when every mountain side is clothed with the fresh verdure of early summer, and the atmosphere still gives that softness to the distance that is only seen when the heats of summer or the low temperature of winter has not deprived it of its moisture, the scenery is most lovely. This oldest of our mountain chains certainly presents studies for an artist which, if surpassed in grandeur by those of younger ranges, cannot be excelled in quiet beauty.

The run down the western slope of the mountains gave an excellent opportunity of watching the operation of the Westinghouse air brake, which has been many months in use on the Pennsylvania railroad and, we were told, giving perfect satisfaction. We were much pleased with what we saw of it. A continuous brake, not liable to break down just when most needed to "brake up," powerful but controllable in action, and directly under the hand of the engineer—all of which merits are claimed for this—is a much needed invention, and its successful introduction would undoubtedly save many lives, a large amount of property, and perhaps considerable of the expense of running fast trains making frequent stops; and, still further, it would save time to a very important degree. Something of this kind must, sooner or later, be adopted.

At Altoona, a station house roof truss attracted attention by its neatness and simplicity. We noticed also, at two points on the road, troughs of considerable length laid down between the rails and filled with water. The engine was supplied with water, without stopping, by letting down a curved pipe until its mouth entered the water; and, at the high speed at which it ran, it scooped up a quantity while running the length of the trough to replace that previously drawn from the tender. This device has been for some time in use abroad, but the Pennsylvania railroad is probably the first to introduce it in this country. It will probably be found a very valuable device on long lines of road running through express trains.

We finally arrived at Pittsburgh on time, after a quick and pleasant run, and are perfectly willing to agree with those who claim for the Pennsylvania Railroad the credit of having an excellent road bed, good rolling stock, and the best of management.

R. H. T.

Facts for the Ladies.—Mrs. H. F. Taylor, Brasher Falls, N. Y., has used a Wheeler & Wilson Lock-Stitch Machine since 1858 in dress-making and family sewing, without any repairs and has broken but 2 needles in 13 years. See the new Improvements and Woods' Lock-Stitch Ripper.

Barnett's Cocoaine gives new life to the hair.

To Lead all Competitors is the aim of the proprietors of the New Wilson Under-Feed Sewing Machine. It is founded on the very best principles known to the sewing machine science, and improvements, in advance of all other sewing machines, are being adopted constantly. The Wilson is rapidly gaining the preference of all parties that are acquainted with sewing machines, and it has already taken the front rank among the first-class machines of this country; and its price, owing to its being manufactured where labor and material are much cheaper than in eastern cities, is fifteen dollars less than all other first-class machines, which fact alone is sufficient to induce all to examine the New Wilson before buying any other. Salesroom, 707 Broadway, New York; also for sale in all other cities in the U. S.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4 00 a year. Advertisements 17c. a line.

The best recipes on all subjects in the National Recipe Book. Post paid, $2.00. Michigan Publishing Company, Battle Creek, Mich.

The official report of the Master Mechanics' Association will be published in full in the RAILROAD GAZETTE, 72 Broadway, New York, beginning July 6. Send $1.00 for 3 months' subscription.

We will Remove and Prevent Scale in any Steam Boiler or make no Charge. Two Valuable Patents for Sale. Geo. W. Lord, Phila., Pa.

Wanted—To hear from parties who make a specialty of manufacturing small patent articles. Address H. D. Chance, Llewellyn, Pa.

Steam Boiler and Pipe Covering—Economy, Safety, and Durability. Saves from ten to twenty per cent. Chalmers Spence Company, foot East 9th Street, New York—1232 N. 2d Street, St. Louis.

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

For Sale—To R. R. Contractors: Two second hand direct-acting Locomotives, 12 tons and 20 tons weight—in good running order. Address Grice & Long Loco. Works, 1340 Beach St., Philadelphia, Pa.

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

For Marble Floor Tile, address G. Barney, Swanton, Vt.

Wanted—A 2d Hand Boiler of about 3 horse power. Whitney Arms Company, New Haven, Conn.

Wanted—A situation under instructions in draughting room by a young man who is a machinist. Address J. S. C., care of B. F. C., Princeton, New Jersey.

For the simplest, cheapest, and best Rotary Pump in use for thick or thin liquids, send for circulars to Hersey Brothers, So. Boston, Mass.

Wanted—Iron Planer, of 5 to 6 ft. square by 12 to 16 ft. long, capacity. Must be new, or as good. Will exchange for some choice selected lands situated within 5 to 10 miles of Rail Roads in Northern Iowa. John Cooper & Co., Mount Vernon, Ohio.

The best Bolt Forging Machines are those that work vertical, and forge Bolts any length horizontally. For such, address John R. Abbe, 39 Charles Street, Providence, R. I.

To Capitalists—Two valuable Patent Rights for Sale or exchange for other property. For particulars, address John J. Baringer, Germantown, Columbia Co., N. Y.

Upright Drills—The best in the world. Built by Hawes Machine Co., Fall River, Mass. Send for Circular.

For the most beautiful Site, Building, and Water Power for manufacturing purposes, address Harris Brothers, Newport, N. Y.

Three fourths saving of fuel, by the Ellis Vapor Engine (Bisulphide of Carbon) is running the Haskins Machine Co's Works, Fitchburg, Mass. To whom apply.

Old Furniture Factory for Sale. A. B., care Jones Scale Works, Binghamton, N. Y.

Steel Castings to pattern, strong and tough. Can be forged and tempered. Address Collins & Co., 212 Water street, New York.

The Waters Perfect Steam Engine Governor is manufactured by the Haskins Machine Co., Fitchburgh, Mass.

Presses, Dies, and Tinners' Tools. Conor & Mays, late Mays & Bliss. 4 to 8 Water st., opposite Fulton Ferry, Brooklyn, N. Y.

Portable Baths. Address Portable Bath Co, Sag Harbor, N. Y.

Standard Twist Drills, every size, in lots from one drill to 10,000, at ¼ manufacturer's price. Sample and circular mailed for 25c. Hamilton E. Towle, 30 Cortlandt st., New York.

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.

If you want a perfect motor, buy the Baxter Steam Engine.

Manufacturer's and Mill Supplies of all kinds. Greene, Tweed & Co., 18 Park Place, New York.

Blake's Belt Studs. The best fastening for Leather or Rubber Belts. 40 000 manufacturers use them. Greene, Tweed & Co., 18 Park Place, New York.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro, 414 Water st., N. Y.

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.

Machinery Paint, all shades. Will dry with a fine gloss as soon as put on. $1 to $1.50 per gal. New York City Oil Company, Sole Agents, 116 Maiden Lane.

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.

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

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.

Dry Steam, dries green lumber in 2 days; tobacco, in 3 hours; and is the best House Furnace. H. G. Bulkley, Patentee, Cleveland, Ohio.

The Patna Brand of Page's Patent Lacing is the best. Orders promptly filled by the Page Belting Co., No. 1 Federal St., Boston.

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

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

Belting as is Belting—Best Philadelphia Oak Tanned. C. W. Arny, 301 and 303 Cherry Street, Philadelphia, Pa.

Diamond Carbon, of all sizes and shapes, furnished for drilling rock, sawing stone, and turning emery wheels or other hard substances also Glazier's Diamonds, by John Dickinson, 64 Nassau st., New York.

Boynton's Lightning Saws. The genuine $500 challenge. Will cut five times as fast as an ax. A 6 foot cross cut and buck saw, $4. E. M. Boynton, 80 Beekman Street, New York, Sole Proprietor.

The Baxter Steam Engine is safe, and pays no extra Insurance.

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

Better than the Best—Davis' Patent Recording Steam Gauge. Simple and Cheap. New York Steam Gauge Co., 46 Cortlandt St., N. Y.

The most economical Engine, from 2 to 10 H.P., is the Baxter.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

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

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.—COLORING LINSEED OIL.—How can I color linseed oil red or brown? Aniline in alcohol will not do.—J. P. W.

2.—TAXIDERMY.—How are birds and animals stuffed?—J. H. Y.

3.—CLEANING MARBLE.—What is the best way of cleaning polished marble slabs from grease, oil, or red wine stains?—C. R.

4.—POLISHING KNIVES.—Will some one inform an old subscriber how the English polish is put on knives, how the wheels are made and what kind of leather should be put on?—J. G.

5.—WALNUT STUMPS.—What is the value of walnut stumps and in what shape should they be sent to market? Are the white walnut, black walnut, or butternut the most valuable?—E. C.

6.—VINEGAR.—Will some practical man inform us of the best mode of making vinegar from the best materials, that the public may not continue to be poisoned by vitriolic and other mixtures?—G.

7.—SKIN DISEASES.—I notice in your paper of May 11th, 1872, a communication from a sufferer from skin disease, attributing the cause to the use of a certain kind of soap. I am one of many shop mates who have the same disease, and I think we contracted it from using sand paper, as it is altogether on the hands. I have had it two months, and have had two of our best doctors here at work on me, but without success. What they give me to use are washes for the hands, which apparently drives it away for a few days; but just as soon as I commence to work, out it comes again. I have been using carbolic acid and glycerin, bathing the hands in strong salt brine, nitrate of lead, and sulphuret of potassium; the latter apparently does the most good, but the cure is not permanent. We should be grateful to you if you could get, from some of your eminent physicians in New York, a radical cure. I think some medicine should be taken to purify the blood, but both the doctors I have seen do not give me any.—C. N.

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.

J. D., and others.—Multiply together the area of the piston in inches, the mean boiler pressure in pounds per square inch, the length of the stroke in feet, and the number of strokes per minute; divide by 33,000 and you have the horse power of your engine.

To R. P. P.—There are positive and negative poles to the induced currents of the electrical machines that you speak of. As to method of manufacture, consult books on electricity. It is not new to place a wheel at the bow of the canal boat, nor to have side pieces extended forward to prevent lateral movement of swell or waves. This plan was illustrated in last volume of SCIENTIFIC AMERICAN.

W. S. M.—The clearest and most dense ice will keep the longest and produce the most refrigeration. Placed in water, the temperature produced by two cubes of ice, one of porous or snow ice, the other of dense clear ice, will be the same. But the clear ice will refrigerate a larger quantity of water than the porous ice.

MILK SOURED BY A THUNDER STORM.—Milk, beer, and other fluids turn sour by oxygenation. After a thunder storm there is always in the air a considerable excess of ozone, which is oxygen in its most active condition, ready to attack any matter that can be affected by it.—D. B., of N. Y.

PROPORTIONS OF STEAM ENGINE.—D., query 5, page 26, is informed that James Watt determined that the condenser and air pump should each have one eighth the capacity of the cylinder. In more modern practice, however, the air pumps are made larger, especially in marine engines. Some engineers also make their condensers larger, but the practice is not justified by any economical result.—D. B., of N. Y.

DIMENSIONS OF BELT.—Query 7, page 416, Vol. XXVI.—W. J. S. can ascertain the width of belt required for his purpose by calculation from the speed of his driving pulley. A belt one foot wide running at the speed of seventy feet per minute will develop one horse power; a belt three inches wide, to develop the same power, must run of course at 280 feet per minute.—T. L., of Mass.

GILDING ON GLASS.—In answer to J. F., query 5, page 416, Vol. XXVI., I would say that gilding on glass is done by the use of what is termed a water size, made by the use of some mucilaginous substance, such as the white of egg reduced with water. I conclude that English gelatin is best, but great care is necessary not to make it too strong; and it should be perfectly clean, therefore straining it through thin muslin is a good precaution. The gilding is done upon the back side of the glass. First clean the glass perfectly with alcohol; then apply the sizing with a flat camel hair brush, and immediately lay the gold leaf. Stand the glass on edge and allow the surplus size to settle from under the gold. The gold will flatten and have a burnished appearance. When dry, lay out your designs on paper and transfer by the use of some sharp pointed instrument, pricking through the paper; then paint your design on top of the gold; asphaltum varnish is a good material for that purpose. When that is dry, wash off the surplus gold, and shade the letters or other design with paint of any color desired and let it dry. If you desire a colored ground, then paint the whole surface with the color desired. Experience is necessary for this class of work.—R. F., of Mass.

OCEAN CABLES.—H. F. H., query 1, page 416, Vol. XXVI.—The Atlantic cables mostly lie at the bottom of the ocean, but there are many stretches between the submarine mountain peaks. The specific gravity of the cable causes its sinking and remaining at the bottom of the sea.—E. H. H., of Mass.

CEMENT FOR LETTERS ON GLASS.—To J. F.—This is frequently made by diluting white of egg with water to a suitable degree of fluidity, and adding a little carbolic acid to prevent decomposition, and then filtering. Paint the glass by means of a badger hair brush, allow it to partially dry, and apply gold or silver leaf, and allow it to become thoroughly dry. Now put on the stencil plate, and with a needle point mark out, down to the glass, the letters or design. Then put the whole plate into a shallow dish of tepid water, and by means of a stick, finger, or finger nail, etc., rub off the extraneous metal, and you will have your perfect letters left, and if the cement has not been too thick, with a perfect brilliancy.—E. H. H., of Mass.

SLACK COAL AND SAWDUST.—To J. F. T.—Mix them together with enough gas tar to stick and make into bricks. A machine like the pug mill of a brick machine would do, or indeed a brick machine at once would probably answer, especially such a one as would press the mass into a mold, and not such as would drive out the stuff in a stream, then to be cut with wires. This last style of machine would inevitably make very poor work, but by the former you would get, I think, a splendid fuel, and only take a very small quantity of the cheap tar.—E. H. H. of Mass.

SLACK COAL AND SAW DUST.—J. F. T. can burn all his sawdust for fuel if he has proper grates and has a good draft to his fire box. I am sawing green hemlock with a five feet circular saw, and burn every bit of sawdust made. I use no coal or extra fuel.—N. J., of N. Y.

CUTTING STEEL AUGERS, ETC.—To A. V., query 10, page 354, Vol. XXVI.—I would say, first, that the diameter should vary with the diameter and pitch of thread, and should be about two inches for threads from 24 to 32, three inches from 16 to 24. The number of revolutions should be from 12,000 to 16,000 per minute, and a pulley 2 x 2 (on a steel arbor running in Babbitt boxes) will be large enough to run it. A. V. will find he will have to harden his cutters and temper to a straw color in order to have them stand.—C. M. P., of Mass.

TEST FOR ZINC.—To J. B.—The simplest method for an amateur to employ is probably to evaporate a gallon of water to dryness, put the residue on to a platinum wire, and moisten with a solution of protonitrate of cobalt. Apply the blowpipe flame, and the little mass will yield a green colored appearance if zinc be present. Other means of testing are adopted, but to any but a professional will be found complicated. The presence of five grains in a gallon would eventually prove injurious, but it would probably be only after a lengthened use of such water. The antidote for acute zinc poisoning is the exhibition of an emetic, and afterwards the drinking copiously of albuminous fluid and large doses of tannin or oak bark tea, etc.—E. H. H., of Mass.

UNITED STATES COINAGE.—To F. R. E., query 16, page 10.—Copper cents were issued first in the year 1793 and ceased in 1857. In 1815, there were none coined. The half cents made their first appearance in 1793, and were discontinued in 1857. In 1798, 1801, 1812 to 1824 inclusive, and 1852 there were none coined except a few pattern pieces in 1813, 1832, 1840, and the eight succeeding years, and 1852. The eagle head nickels were first issued in 1857, and in 1859 were supplanted by the Indian head.—E. T. P., of N. Y.

Recent American and Foreign Patents.

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

HORSE SHOE NAIL CLINCHER.—Wm. H. Lyman, Springfield, Mo.—Many efforts have hitherto been made to construct this tool so as to afford the greatest leverage to the hand of the smith, to avoid side strain upon the screws and pivots, and to prevent the liability of the jaws to slip from the nail. Some clinchers have one of these advantages and some another, but none have hitherto combined them all. This clincher has the following advantages: 1st: It is constructed so as to take off all side strain from the fastening screws or pivots and thus to allow none of the parts ever to lose their true relative position to the others. 2nd: It is provided with double leverage jaws, so that the grip of one hand will easily and accurately clinch the nail. 3rd: It has a peculiar shape of underjaw which prevents that jaw from slipping and causes it to rock on the nail head. The effect of these several advantages is to give the smith complete control of the horse's foot, while he is being shod to enable him always to turn off perfect work, and witha to furnish him with a most durable tool that is not liable to get out of order.

HARVESTER REEL.—George S. Grier, Milford, Del.—The invention consists in supporting an adjustable reel by means of a pivoted crank shaft, which passes through the hollow shaft of said reel and moves up or down with it.

FIRE KINDLER CASE.—David W. Thompson, St. Joseph, Mo.—The invention consists of a screw capped can for holding the oil and kindler, so that the former is prevented from spilling or waste in the event of the can being accidentally upset, and the latter is kept from rattling or moving about in the can while the can is being handled; at the same time the kindler is always saturated and ready for use.

ROSSING MACHINE.—Charles Gilpin and James T. Hill, Cumberland, Md.—The invention consists in causing the knife of a rossing machine to change its position automatically according to the thickness of bark passing between the rolls, and in the peculiar arrangement of devices by which this new idea is carried out.

PEANUT AND COFFEE POLISHER.—Benjamin F. Walters, Norfolk, Va.—The invention consists in combining a rotary and stationary brush with a feed hopper, so that coffee or peanuts may be readily, conveniently and effectually polished for market.

CIRCLE FOR CARRIAGE.—Edwin Wilson, Prattsburg, N. Y.—This invention relates to an improved method of connecting the reach, front axle, head block and circle of a carriage. The reach and head block are rigidly attached to a three armed plate or strap which rests upon the circle. The straight part of the circle is attached by clips and yokes to the axle. The ring bolt is attached to the upper side of this straight part, and passes through the strap and the head block. The whole is strengthened by braces.

COVERING TUBULAR FABRICS WITH RUBBER.—William H. Bates and Hugh Faulkner, of Leicester, England, assignors to Ezra Thomas Sawyer, of East Hampton, Mass.—This invention relates to a new machine for applying an outside coating of India rubber, gutta percha, or other analogous elastic gum to tubular fabrics that are to be made water tight. It is more particularly adapted to, and intended for, the manufacture of rubber hose, but may also be used for other tubular fabrics. The tube to be covered has a core placed within it and is joined at the ends. It is passed over two drums, and by their means carried repeatedly through the waterproofing solution, drying cylinders, and an annular scraper until the covering is thick enough.

WATER WHEEL.—James P. Lamoree, of Mexico, N. Y.—This invention relates to that class of water wheels in which the buckets are arranged in diametrical pairs, and are thrust in and out as they rotate. It consists in adjusting the throw of the buckets so that the maximum protrusion thereof takes place at different points, which is accomplished by means of a shaft, axle and axis which are arranged adjustably in a rectangular slot in the ymiddle part of each pair of buckets.

PROJECTILE.—John Rigney, of West Point, N. Y.—In this invention a composition or soft metal cap is applied to the rear end of the projectile in such a manner that its sides are forced over a conical part of the shot and expanded into the grooves of the gun when the same is fixed. The cap is connected to the shot by means of interior projecting studs which are passed into corresponding zigzag grooves formed on the end of the projectile. These grooves are so formed as to prevent the backward escape of the studs, but they admit their forward movement when the cap is driven forward by the explosion.

CULTIVATOR.—William C. Percy, of Bayou Sara, La.—This invention furnishes an improved plow for cultivating cotton and corn, especially of use when it is desired to simply loosen and pulverise the soil and destroy the weeds without turning a furrow. The plow, which is made pointed, is curved forward so as to form the arc of a circle ten inches in diameter. The middle part is cut away, forming a hole or opening of about the same shape as the body of the plow. The curvature and the opening cause the plow to pass easily through the ground and destroy the weeds, stir up and loosen the soil, and leave it loose and level.

WOOD FILLING.—Frank Seabury, of Yarmouth, Me., assignor to himself, John S. Seabury, Ammi D. Seabury, Adolphus Grant, and Nicholas Grant, of same place.—In varnishing or otherwise finishing wood the varnish sinks into the grain and it is impossible to make a level surface by using varnish alone. If the wood is oiled the grain is left open, and in use fills with dirt. To remedy this various fillings are used; but all have to be colored to imitate the wood, and thus all the finer shades of color are destroyed, as the same color of filling is used for the whole piece. To obviate these difficulties the inventor employs the substance known as *terra alba*. It is finely ground or powdered, mixed with oil, and applied in the ordinary manner. This filling is transparent, does not injure the color of the wood, allows all the shades of color and the grain of the wood to show, and, at the same time, is hard and perfect.

LAMP CHIMNEY CLEANER.—Adelbert Austin Ford, of North Abington, Mass.—This invention relates to an improved lamp chimney cleaner, and consists in constructing the same of a stem or handle of wood to which are attached a swab and wiper. The swab is made of manilla and fastened to one end of the handle; the other end is slit or quartered a portion of its length by a saw, and the wiper is simply a square piece of paper or cloth, so folded or crimped that it enters the slits, and is then folded down by turning the stem with one hand and holding the wiper loosely with the other. A thimble slides loosely on the stem, and is crowded up on to the wiper to hold it in place. The thimble is made slightly tapering so that it does not tear the paper while gathering and confining it tightly to the stem.

STOVE PIPE DAMPER.—Charles Reed, of Beaver Dam, Wis.—This invention supplies a self cleaning damper for stove pipes. It consists of a metal disk which is slotted across its face, and an upper grating the bars of which fit into the slots of the disk and nearly close them. These are mounted on the same axis, so that the bars may be turned down through the slots and the passage opened. The turning is effected by thumb screws, which are so arranged that the grate may be turned alone, or the grate and disk together.

NUT LOCK.—Rasselas G. Peterson and Jonathan Coulter, of Perryville, Ohio.—This invention relates to a new nut lock for use on railroad rails and for other purposes, and consists in the use of a hook in connection with a grooved nut and recessed fish plate by means of which the nut is locked. The nut on its inner face has a number of grooves. The plate is also grooved or recessed close to the aperture which admits the bolt, the recess being L-shaped. When the nut has been screwed on to the bolt as far as necessary, and until one of its grooves is in line with the longer part of the recess, the hook is inserted in the recess and pushed under the nut into the groove. The nut is then slightly unscrewed, carrying a projecting ear of the hook into the L-shaped recess. The hook in this position properly locks the nut, as during a jar or motion of any kind the tendency of the nut to become unscrewed will only the more firmly apply the hook to its place and insure the lock.

BRIDGE.—Reuben L. Partridge, of Marysville, Ohio.—This invention furnishes an improved bridge which is simple in construction, light, and strong and consists in the construction following: The upper and lower chords are made in two sections. The ends of the ties or posts are securely bolted to and between the sections of the chords, and stand at an angle of sixty degrees with the horizontal plane. The main braces are arranged in pairs, and stand at an angle of forty-five degrees with the horizontal plane. The two braces of each pair are parallel with each other, pass upon opposite sides of the ties or posts, and are bolted at their middle parts to the middle part of the said ties or posts. The ends of the braces rest against iron foot pieces which are interposed between the ends of the braces and the ties and chords. The sides of the foot pieces are flanged so that the ends of the braces rest squarely against them, and their rear sides are notched to fit up on the ties or posts.

WIND WHEEL.—James J. Hosey, of Cape Girardeau, Mo.—This invention relates to a new self regulating windmill, the motion of which does not vary with the strength of the wind, but is always steady. It consists in surrounding the fan, or wheel, with an upright stationary cylinder which is provided with about eight large openings through which the wind is admitted to the fan. Each opening is furnished with a gate which is pivoted vertically near the middle in such a manner that the wind when striking it has a tendency to close it. It is also furnished with a weighted lever which tends, on the other hand, to keep it open. In this way, aided by other attachments, the wind is admitted to the fan in quantity proportionate to the work to be done.

STREET CARS.—John Stevenson, of New York city.—This well known street car and omnibus builder, whose passenger vehicles may be seen in nearly every country on the globe, has recently received patents for various improvements in their construction which consist as follows: The first invention relates to securing the metallic connection between the running gear and the body of the car, which is accomplished by interposing rubber or other elastic material between the parts so as to reduce the discomfort experienced by passengers from the noise of the wheels, the clattering of the parts, and the jar occasioned by applying the brakes. The next improvement consists in making the axle journal without a shoulder and placing a spring check at its end, by which arrangement, as the car is forced from side to side through inequalities in the track, the concussions are relieved by means of the spring check. The third invention provides means for securely holding and fastening the caps of car axle journal boxes, and the fourth improves the construction of car brakes so as to simplify the same and facilitate repairs.

MOWING MACHINE.—Benjamin Attwood, of Stanstead, Canada.—This invention furnishes an improved reaper and mower which is simple in construction, light, strong, and durable, not liable to get out of order, and which readily adapts itself to inequalities of the surface of the ground, has a very light side draft, and consists in a peculiar arrangement of a lever, suspension bar, and brace bar, in combination with the driving pitman and frame, by means of which these objects are attained.

CAR COUPLING.—Samuel G. Northrop, of Wilmington, N. C.—This invention furnishes an improved car coupling which is simple in construction, and is adjusted to couple itself when the cars are run together. The cavities of the bumper heads of the car are divided into two compartments by horizontal partitions. The coupling pins pass down through the bumper heads and through the coupling link or bar which enters the lower compartments of the bumper heads. One end of this link or bar is made thick, so as to hold the link in a position to enter the bumper head of the adjacent car when the cars are run together. The thinner end of the link has a slot ormed through it to receive the coupling pin. In each partition, at the rear side of the hole through which the coupling pin passes, is formed a recess to receive the lower end of the pin so as to hold it suspended while the cars are being run together. The recesses support the pins with their lower ends below the upper surface of the partitions, so that they may be sure to drop into their holes when pushed out. Levers are pivoted to the sides of the bumper heads at the rearedge of the horizontal partitions. Their upper ends are bent forward, so as to nearly touch the coupling pins when in position to couple the cars. As the cars are run together the forward end of the coupling link strikes the lower end of the lever and pushes the coupling pin out of the recess and allows it to drop through the slot in the link.

APPARATUS FOR MOVING BUILDINGS.—William N. Hemenway, of Pecatonica, Ill.—This invention furnishes an improved truck for moving buildings, which is simple in construction and effective. Two short rollers are placed end to end upon a shaft which is attached to the centers of the lower sides of three longitudinal bars. The lower sides of the bars are beveled toward their ends, so as to prevent them catching upon the ground. They are connected at their ends and at their center by cross bars. The central cross bar is made thicker at its middle part, and to its center is attached a king bolt or pivot to receive a swinging bar or bolster upon which the building rests while being moved, and to which are attached two or more upwardly projecting spikes to prevent the bolster turning or getting out of place beneath the building. To the under side of the end parts of the bolster are pivoted the ends of bars or straps by which the bolster is rigidly connected to the framework of the truck when adjusted. This construction enables the truck to be adjusted with respect to the direction in which the building is to be moved, or to change it without disturbing the connection between the bolster and the building.

BUTTER TUB AND COOLER.—Arthur J. Connelley and Theodore Benjamin, of Philadelphia, Pa.—This invention furnishes an improved cooler for preserving and transporting butter, milk, lard, and other articles. It consists of an oval cooler which is strengthened by hoops. At the ends are ice chambers, and along the sides, which are made double, is packed some suitable non-conducting material. The cover, which is in two parts, hinged, is also made double, and the cooler has a false bottom, both of which are filled with similar material. The waste water is conducted so as to run off freely through a stop cock.

PURIFYING SACCHARINE JUICES.—Theodore E. O. Allaire, of Paris, France.—This invention consists in purifying sugar and all kinds of saccharine juices, and in extracting nearly all the crystallizable sugar therein contained, by means of the hydrofluosilicate of ammonia, or the double fluoride of silicium and ammonium, or other double fluoride containing silicium, whereby more or less insoluble precipitates are formed, whose presence in the saccharine juices would have prevented the crystallization of a certain quantity of sugar; and, also, in the after treatment of the precipitates.

SEWING MACHINE.—Theodore A. Weber, of New York city, assignor to Lebbeus W. Lathrop, of same place.—This invention consists of an improved arrangement of apparatus for working a spool carrier in a continuous rotary course; the combination, which includes several ingenious contrivances, and mode of operation would hardly be understandable from a verbal description.

WARDROBE BUREAU.—John H. F. Lehmann, of New York city.—This invention provides a useful and convenient piece of furniture which is so constructed as to serve a variety of purposes. It may be used as a bureau or expanded into a wardrobe, and admits of service as a writing desk also.

APPARATUS FOR DRAINING AND COOLING SUGAR.—Branch Tanner, of Cheneyville, Louisiana.—This invention consists of a simple apparatus by means of which sugar may be cooled and strained readily and inexpensively. An open case or cooler is mounted on trunnions so that it can be turned upside down, and in this the hot cooked sugar is placed and allowed to stand uncovered until it is cooled. Then perforated tubes with conical ends are forced through the sugar to the bottom of the case and equally distributed throughout; after which a straining cover is fastened on the top of the case, and the same turned over. The molasses is thus allowed to escape through the tubes and strainer and the sugar is retained.

STOP MOTION FOR KNITTING MACHINE.—Thomas F. Wynn, of Atlanta, Georgia.—This invention has for its object to provide an improved stop motion for looms and knitting machines of the class in which the motion of the machine is arrested, immediately on the breaking of a thread, by means of a drop weight or its equivalent, which operates by aid of suitable intermediate mechanism to disconnect the driving wheel or shaft. The invention consists in the arrangement of certain wires, rotary rings, and other connected parts, whereby a simple, inexpensive, but efficient piece of mechanism is produced.

MEDICAL COMPOUND AND DISINFECTANT.—Joseph Walton, of Newark, Ohio.—This invention furnishes an improved medical compound for driving away mosquitos, flies, etc. from the person or house. It is a disinfectant and preventive, especially in cases of cholera, small pox, etc., and is useful as a lotion and for other purposes. It is composed of camphor, one ounce; carbolic acid, twelve ounces; aqua ammonia, ten drams; and salt soft water, eight drams.

HORSE POWER.—William G. Halbert, of Columbus, Miss.—This invention is an improvement in horse powers. Some distance below the main wheel are fitted, through the shaft, two radial beams, each of which is somewhat longer than the diameter of the wheel and is slotted at both ends. The inner end of each draft beam is, by an inclined brace, connected with the under side of the wheel, while near its middle it is, by a pin or bolt, connected with the end of one of the radial beams. The pin plays in the slot of the radial beams. The four ends of the two beams may in this manner be connected with as many draft beams or levers. By this arrangement considerable leverage is obtained, the power increased and equalized, and the machine made more valuable.

MILL PICK.—Frank Kortick, of Mendota, Ill.—This invention relates to certain improvements in mill picks, which consist in holding the movable blade firmly in position between two jaws, one of which is rigid and the other a spring jaw, which latter is pivoted to the further end of the former so as to allow of its swinging laterally. The blade is firmly lodged against steps in the rigid jaw, from one to another of which it is shifted as it wears out. The handle is provided with pivoted clamps by which the set of the pick may be adjusted.

BROOM AND BRUSH HOLDER.—George B. Cunningham, of Northampton, Mass.—The object of this invention is to improve the machinery employed in the manufacture of brooms and brushes; it consists of a holder for the broom or brush handle which is used while putting on the corn and which does not injure the handle. It is constructed of a tube, from the interior circumference of which at one end project spring wires with jaws at their ends. A cap is screwed on to the end of the tube and compresses the jaws more and more as it is further screwed on. The broom or brush handle is inserted in the tube and held by the compressed jaws as described.

STEAM ENGINE.—John Donnelly, of Hudson, N. Y., assignor of one half his right to Horace R. Peck, of same place.—This invention relates to that class of steam engines in which rotary motion is established by the cross head or a projection thereon acting against spiral ribs on a cylinder; and it consists, first, of a jointed piece on each of the flanges or ribs, with a spring which rises and allows the cross head to pass from one rib to the other at each end of the stroke, the pieces being returned to their positions again by the spring. The invention also consists of a shifting idle wheel, two drums and gearing, for shifting the connection of the main shaft from one to the other of the cylinders to reverse the motion, the cylinders being arranged for driving in opposite directions. It also consists of a brake for arresting the motion, which is formed by a cam wheel on the driving shaft and a secondary steam piston arranged to be forced against the wheel, said secondary piston being in the end of the steam cylinder opposite to the main piston.

RAILWAY GATE.—George A. Kristie and Samuel Horn, Fort Seneca, Ohio.—This invention is an improvement in railroad gates which are designed to be operated automatically by means of a spirally grooved or flanged roller, arranged so as to be acted on by the wheels of the locomotive. The roller is placed outside the track, but is secured to the rail, and is connected to the pivoted gate by a link, or bar, which, when the gate is closed, assumed a vertical or inclined position over the roller. In this way great leverage is obtained on the gate, and it can be raised rapidly and without liability to injury.

ATMOSPHERIC WATER ELEVATOR.—Frederick Baldwin, Janesville, Wisconsin, assignor to Alexander Graham, of same place.—The object of this invention is to obtain a self acting water elevator or conveyer, which is operated entirely by air pressure derived from a reservoir of compressed air. The invention consists principally in a new combination of air and water chambers, floats, and automatic valves, all arranged to subserve the desired purpose, in the most economical and practical manner.

STONE TRUCK.—George A. Davidson, of Malden, assignor to himself and Horace T. Caswell, of Troy, N. Y.—This invention consists in detachably connecting the front end of the platform of the common two wheeled hand trucks used in stone yards to a front truck which is provided with gear for readily hitching thills to it and unhitching them, whereby all the advantages of a hand truck are combined with those of a horse truck, so that the loading of large flat stones, by tilting the rear end of the platform down to the foot of the stone, throwing the stone over on to it, and then tilting the stone and platform back on the wheels, may be performed in the same way with the horse truck that it is done by the hand machine, by simply detaching the platform from the front truck. After the stone is loaded, the front and rear trucks can be again connected.

WATER ELEVATOR.—Eli Deaver, of Rokeby, Ohio.—This invention relates to a novel arrangement of a sliding delivery trough with a well curb. With the exception of an opening through which the bucket passes into and out of the well, the curb is closed at the bottom. The sliding delivery trough is composed of a spout and an enlarged part which is designed to cover the opening. The spout is made of sufficient length to protrude through the side of the curb, and when the bucket is to be lowered it is drawn out so as to uncover the opening. So soon as the bucket is again elevated, the trough is pushed in and the bucket lowered to allow it to rest in the trough and occasion the delivery of its contents by means of a valve in its bottom. By this arrangement tilting or lateral movement of the bucket is obviated; the trough spout does not protrude when water is not being drawn, and no filth can get access to the well.

MOLD FOR CASTING AND CHILLING SLEIGH SHOES.—Volney A. Butman, Ironton, assignor to himself and V. L. Benjamin, Fond du Lac, Wis.—In this invention the improvement consists in forming the lower part or nowel of the flask with a cast iron bed mounted on wheels, whose surface is so shaped as to give the requisite curved form to the shoes cast upon it. The sides of the nowel are cast separate and firmly fastened to the bed by means of bolts. The ends are made detachable, being held by means of hooks to the projecting side pieces. This is for the purpose of preserving the flask, as, if the ends are made in one with the bed, they are very apt to crack off in casting. The patterns used have at their lower edges projecting dowel pins that fit into corresponding apertures in the bed. The dowels serve the double purpose of keeping the patterns in place and of core prints. In the process of casting, the metal is chilled as it comes in contact with the bed, and the shoes are thereby made ready for service.

STILL.—Allan M. Ring, St. John, N. B.—This invention provides a simple, cheap, and durable portable condenser for obtaining fresh water from salt water, to be used in connection with a galley for generating the steam. The worm tub is constructed of an inner and outer cylinder, and the condensing coil, which is of lead pipe, extends from the top of the inner one downward about two thirds of the way, where it discharges into a narrow space between two inclined plates which traverse the remaining portion of the cylinder. This affords a large area for condensation. A stand for the condenser is also provided, and is furnished with shelves underneath to support a boiler and lamp if required.

LINIMENT.—William H. Wagoner, of Hurd Post Office, Pa.—This invention provides a liniment which is compounded of equal parts, or thereabout, of alcohol, spirits of turpentine, rye whiskey and sweet oil.

APPARATUS FOR THE MANUFACTURE OF WARP AND PAPER PULP FABRICS.—Lindley M. Crane, Ballston Spa, N. Y.—This invention consists in combining with the ordinary machinery for paper making (where the pulp is taken from the vat and delivered to the apron continuously) a spool stand, from which the warp threads are arranged on one of the pulp rollers in such a manner as to be drawn in between the two layers of pulp as they are delivered to the endless apron, thus forming an improved fabric of paper and warp threads. Weft threads are also added by means of a shuttle and the employment of another pulp roller.

CULTIVATOR.—Abel Merrill, Ingersoll, Canada.—This invention furnishes an improved cultivator which is light and easily drawn and runs steadily and smoothly. The frame is in the shape of a right-angle triangle, the beam forming the hypothenuse of which carries the plows. The lower edge of each plow is bent outward so as to form a share, and the inner edge is bent upward and attached directly to the side of the beam. The forward edge of this part serves as a coulter, and is notched or slit so as to form a guard by means of which rubbish is turned aside and not allowed to obstruct the plow. The gang of plows is adjustable and can be set to work at any required depth, or entirely raised from the ground.

IRONING TABLE.—James T. Plowman, Sr., Baltimore, Md.—The object of this invention is to furnish a cheap, convenient, and durable table for ironing, which may be used for other purposes; and it consists in providing the ordinary framework of a table with a top which is in three pieces. The two side pieces are fastened down to the frame and the middle piece is arranged to be drawn out from between them so as to form an extension leaf to be used in ironing. To prevent weights placed on the leaf overbalancing the table, the opposite end is fastened to the floor with a hook.

SHUTTLE BINDER ACTUATING MECHANISM.—Henry H. Law, Gloucester, N. J.—This invention consists in an ingenious arrangement of mechanism by which an arm attached to one of the rods that connect the lathe of a loom with the crank shaft is made to operate the shuttle binding levers in such a manner as to retain the shuttle when driven into the box until the time for throwing it arrives.

BEDSTEAD FASTENING.—T. W. Moore, New York city.—In this invention which relates to a new and useful improvement in the mode of attaching the cast fastening plate to the rails of bedsteads, the fastening plate is let into the inside of the rail by cutting away the rail at the end, so that the joint end of the rail will be even with the post. A recess cut in the rail receives the hub or center, which serves to hold the plate securely in place. Orifices are made through the plate, which, in fastening the plate to the rail, receive glue or pins, and serve to hold the plate.

CARRIAGE RUNNING GEAR.—William Hemme, of Michigan Valley, Kansas.—In this invention the axles are pivoted in the center to plates which are attached to the under side of the wagon body. The hounds connected with the axles are joined at their extremities by means of a sliding swivel and pivot. This uncture forms a knuckle joint for the two axles, by which they are caused to move simultaneously when the wagon is turning a corner into such a position that the front and hind wheels run in the same tracks. An extension rod is connected with each axle, and adjusted so as to prevent too much play in them.

CARRIAGE CURTAIN FASTENER.—Timothy D. Marsh, of Jersey, O.—This invention furnishes an improved cam or lock button hole for carriage curtains and other similar uses. The locking button hole is composed of two metallic plates, one of which is attached to the curtain, and the other is so arranged as to admit of being turned round over the face of the first one to which it is connected by a ring. They are each pierced with a hole, a little on one side of the center, which is large enough to freely pass over the curtain knob. The fastening is made by turning the movable plate until the shank of the knob is clamped between that and the one attached to the curtain.

BRAKE MECHANISM FOR SEWING AND OTHER LIGHT MACHINERY.—John M. Cayce, Franklin, Tenn.—The invention consists in providing the needle cam of a sewing machine with an adjustable sleeve and spring brake whereby the needle can be made to pause within or without the fabric; and also, in providing a speed regulator which is very delicate, easily graduated, governs the period of retardation, and determines the stoppage of machine.

CIGAR MOLD.—Isaac Guthman, Morrison, Ill.—The invention is a cigar mold in three pieces, hinged together, and consisting of a semi-circularly, grooved bed plate and two quadrantally grooved covers.

PROCESS OF DESICCATING AND SEASONING LUMBER.—James F. Gyles, Chicago, Ill.—The invention consists in desiccating green lumber by applying pressure on a line at right angles to the grain thereof and gradually changing said transverse line of pressure by keeping the lumber in motion between two pressure surfaces.

MACHINERY FOR DESICCATING AND CUTTING LUMBER.—James F. Gyles Chicago, Ill.—The invention consists in a peculiar mode of constructing and combining tools and machinery for tonguing, desiccating, and cutting lumber into lengths, whereby green lumber may be sawed, dried, tongued, grooved, and applied to immediate use.

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Steamer, culinary, F. A. Hine..... 128,396
Stench traps, construction on, N. Thompson..... 128,263
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Stove, base burning, C. Y. Robbins..... 128,425
Stove, cooking, J. Duffy..... 128,374
Stoves, heating, J. J. Prendergast..... 128,247
Stoves and furnaces, fire pot for, B. Franklin..... 128,296
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Stoves, platform for, W. Westlake..... 128,442
Straw cutter, H. Baldwin..... 128,273
Switch stand, P. Carrigan..... 128,282
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Table, J. H. Osborne..... 128,242
Telegraphic transmitter and receiver, automatic, G. Little..... 128,405
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Thread guard and cutter for spools, L. P. Laffray..... 128,317
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Tobacco, manufacturing plug, L. W. Spencer..... 128,434
Torpedo for wells, A. Hamar..... 128,222
Torpedoes, automatic tamping device for, A. P. Gotham..... 128,299
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Trap, animal, A. A. Mattern..... 128,233
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Vault cover, T. Hyatt..... 128,311
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Ventilator, E. M. Greenway..... 128,301
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DESIGNS PATENTED.

5,944 to 5,948.—CARPETS.—J. M. Christie, Brooklyn, N. Y.
5,949 to 5,954.—BEDSTEADS.—M. Fitzsimmons, Cincinnati, O.
5,955 and 5,956.—BUREAUS.—M. Fitzsimmons, Cincinnati, O.
5,957.—SIDEBOARD.—M. Fitzsimmons, Cincinnati, O.
5,958.—FLOOR CLOTH.—J. Meyer, Lansingburgh, N. Y.
5,959.—CARPET.—G. C. Wright, New York city.
5,960.—CARPET.—J. Dornan, Philadelphia, Pa.
5,961.—LETTER BOX PLATE.—W. Gorman, New Britain, Conn.
5,962.—TOY BANK.—D. A. Stiles, Middletown, Conn.
5,963 to 5,966.—GLASS HEAD FOR DOOR KNOBS.—A. E. Young, Boston, Mass

TRADE MARKS REGISTERED.

869.—TREES, SHRUBS, ETC.—J. A. Bayles, Lee's Summit, Mo.
870.—CONFECTIONERY, ETC.—H. Maillard, New York city.
871.—OVERSHOES.—H. E. Starratt, Lawrence, Kan.
872.—BEVERAGE.—A. S. Taylor, San Francisco, Cal.
873.—WHISKY.—E. Walters, Baltimore, Md.

EXTENSIONS GRANTED.

16,097.—POWER LOOM.—A. Smith, H. Skinner.
20,503.—FIRE ARM.—G. W. Morse.
20,542.—STONE BREAKER.—E. W. Blake.
20,557.—SEWING MACHINE.—A. C. Herron.
20,564.—ROUND BELTING.—M. Jewell.
20,616.—BOILER FURNACE.—G. Banta.
20,618.—HARVESTER.—Division A.—T. Berry.
20,619.—HARVESTER.—Division B.—T. Berry.
20,622.—CAR SEATS AND BERTHS.—S. C. Case.
20,626.—SHINGLE MACHINE.—J. R. Hall.
20,658.—COMBINATION LOCK.—S. Perry.
20,678.—RESTORING WASTE RUBBER.—F. Raschnagel.
20,679.—SAFETY VAULT COVER.—E. L. Brown.
20,681.—SKIRT HOOP.—R. J. Mann.
20,685.—RIVETING MACHINE.—P. B. Tyler, W. Jones, and B. Lathrop.
20,686.—SEWING MACHINE.—A. F. Johnson.

EXTENSIONS REFUSED.

20,635.—REPAIRING CAST IRON CYLINDERS.—S. Falkenbury.
20,840.—BOILER FURNACE.—H. Yates.

DISCLAIMER.

20,638.—SHINGLE MACHINE.—J. R. Hall.

FOR THE WEEK ENDING JULY 2, 1872.

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Bridle bit, J. Burns..... 128,592
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Car spring, T. F. Allyn, (reissue)..... 4,959
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Chimney cowl, C. Turner..... 128,514
Chimney top, J. D. Kennard..... 128,625
Churn, Kittinger and Ruch..... 128,549
Churn, J. Springer..... 128,512
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Cultivator, R. E. Mason..... 128,497
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Drawing frame, J. T. Harris..... 128,615
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Drilling machine, W. Sellers..... 128,665
Door hanger, barn, J. A. Cauldwell..... 128,590
Dough cutter, F. E. Chadwick..... 128,462
Earthenware, manufacture of ornamental, C. L. Fleischmann..... 128,479
Eaves trough hanger, H. S. Bishop..... 128,457
Electromagnetic burglar and safe alarm, A. O. Willcox..... 128,691
Elevator, hay, A. Chapman..... 128,537
Engine, rotary steam, G. H. Whitcher..... 128,572
Engine, traction, L. A. Hermann..... 128,543
Fan, automatic, G. F. Case..... 128,589
Fastener, window sash strip, C. Purnell..... 128,507
Felly plate, F. B. Morse..... 128,558
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File, newspaper, R. K. Viele..... 128,681
Fire extinguisher and lightning rod, combined, N. Carl..... 128,534
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Fire arms, revolving, W. Mason..... 128,644
Flask, powder, T. L. Startevant..... 128,672
Fruit gatherer, Myers and Corl..... 128,648
Fuel from coal dust, etc., manufacture of, Kloczewski and Mindeleff 128,626
Fuel, slab from green grass for, C. L. Fleischmann..... 128,478
Furnace for roasting ore, Knox and Osborn..... 128,627
Furnace, hot air, J. Mealey..... 128,555
Furnace, smoke consuming, J. C. Baum..... 128,525
Furnaces, heat regulator for hot air, I. Hayes..... 128,485
Gate, R. H. Hudgin..... 128,490
Gate and signal for railroad crossings, combined, A. Orlich..... 128,649
Gage, steam pressure, C. Anderson..... 128,452
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Gun, magnetic, C. R. Stickney 128,671
Hackling machine, W. Montgomery 128,647
Hammer, shoemaker's, A. and A. Clarke 128,463
Harrow, J. Dawson 128,601
Harvester, M. Hallenbeck, (reissue) 4,960
Harvester, M. Laflin 128,638
Harvester, T. S. Brown 128,584
Harvester dropper, R. A. Roberts 128,564
Harvester cutters, apparatus for grinding, J. F. and R. J. Kirkwood 128,634
Harvester reel, G. S. Grier 128,616
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Hatchway guard, E. H. Ball 128,523
Hinge, A. A. Cluff 128,593
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Hoisting apparatus, automatic stop for steam, W. H. Lavinia 128,495
Hoisting apparatus, safety pawl for, Crane and Lavinia 128,467
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Hoop poles, machine for splitting, J. Penney 128,561
Horses, sun shield for, H. D. McGovern 128,554
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Inkstand, W. F. Jones 128,630
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Jars, pipe connections with soda fountain sirup, A. D. Puffer 128,506
Key blanks, die for making, E. Parker 128,650
Last, G. B. Whitney 128,688
Leather, machine for dressing, H. P. Reed 128,658
Leather lacings, instrument for cutting, C. A. Woodbury 128,519
Level, spirit, J. A. Traut 128,513
Lightning rod, J. W. Hankensen 128,617
Lock, auricular permutation, E. E. Stubbs 128,672
Loom, J. S. Templeton 128,675
Loom, H. Wyman 128,694
Loom harness actuating mechanism, J. F. Foss 128,480
Manure, artificial, W. S. Ames 128,578
Match for lighting cigars, etc., J. Howe 128,626
Mattress and cushion tacker, Watson and Phillips 128,571
Mattress, frame for wire, G. C. Perkins 128,652
Medical compound, J. C. Hassell 128,620
Medical compound, J. Wiley 128,692
Medical compound, M. D. Britten 128,528
Metals, machine for routing, H. Cottrell 128,596
Mirror, toilet, W. F. Patterson 128,651, 128,505
Miter machine, L. Henkle 128,486
Mowing machines, track clearer for, W. J. Andrews 128,453
Musical tone index, W. H. Clarke 128,591
Musical instrument, W. Standing, Sr 128,566
Nail clincher, horseshoe, W. H. Lyman 128,642
Nest, wood bird's, J. A. Deknatel 128,538
Oil from cotton waste, etc., apparatus for separating, A. N. Cole 128,594
Ore concentrator, M. Hungerford 128,628
Ore separator, F. Cazin 128,536
Packing for stationary joints, metallic, I. J. Saunders 128,664
Palette, painter's, O. L. Andrews 128 522
Paper pulp, apparatus for straining, L. Hollingsworth 128,625
Paper, suction box of machines for the manufacture of, F. Curtis 128,469
Paper, manufacture of printed sand and emery, W. Adamson 128,574
Pavement, wood, J. Defoe 128,471
Pavements, manufacture of slabs for, R. E. Stevens 128,670
Pavements, etc., composition for forming blocks for, J. C. Tucker ... 128,680
Pea nut and coffee polisher, B. F. Walters 128,515
Pipe, molding and casting, I. M. Kenworthy 128,493
Pitchers, lining metal ice, Wilbur and Tyler 128,690
Plane, rabbet, G. M. Darley 128,470
Planter, corn, D. H. Gobin 128,613
Plow, R. D. Porter 128,505
Plow, E. T. Bussell 128,588
Plow, gang, M. W. Barris 128,482
Printing, copper plate, W. Conisbee 128,595
Pump, M. J. Althouse 128,576
Pump, force, J. L. Kitchen 128,635
Pump, force and vacuum, J. O. Joyce 128,631
Rail and chair, self acting expansion, W. Close 128,592
Railway, E. Crew 128,597
Railway, inclined, J. G. Taylor 128,674
Railway switch, J. P. Herron 128,488
Railway rail splice, J. P. Herron 128,487
Railways, apparatus for removing snow from, C. T. Geslain 128,611
Refrigerator, R. M. MacMunn 128,643
Register for street cars, electromagnetic passenger, W. H. Mumber. 128,500
Rossing bark, machine for, Gilpin and Hill 128,612
Saddle tree, gig, P. H. Wiedersum 128,689
Safe, milk, H Haskin 128,483
Sash holder, J. C. Bobie 128,661
Saw sharpener, gin, J. McBride 128,553
Saw clamp, T. L. Kenworthy 128,548
Sawing machine, W. H. Doane 128,472
Sawing machine, Carey and Harris 128,461
Scaffold, T. Anderson 128,579
Scale, spring, J. E. Thomson 128,677
Scraper, revolving road, W. Pinn 128,654
Screen, mosquito and fly, J. W. Boughton 128,582
Seat, stump joint jump, J. D. McAuliff 128,645
Sewing machine, S. W. Wardwell, Jr 128,684
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Sewing machines, needle grinding attachment for, J. N. Wilkins 128,518
Sewing machines, treadle for, A. Brill 128,460
Sewing machines, tucker for, T. M. Farrand 128,475
Ships, etc., refrigerator chamber for, J. F. Baldwin 128,581
Shoes, hook or clasp fastening for, J. W. H. Doubler 128,603
Signal alarms, motor for, J. Walk 128,683
Signal, railway, Townsend, Chamberlain, and Walker 128,679
Spark arrester, R. N. Williams 128,693
Spittoon, J. Hillin 128,544
Stove bottom, D. Schuyler (reissue) 4,961
Stove, car, C. L. Holbrook 128,624
Stove, cooking, J. Barnes 128,524
Stove, cooking, J. F. Quimby 128,655
Stove, heating, S. D. Vose 128,682
Stove pipe thimble, E. J. Durant 128,474
Straw cutter, T. Hazard 128,621
Sugar, apparatus for making, J. Guardiola 128,541
Table, sewing machine, W. P. Uhlinger 128,568
Telegraph, printing, T. A. Edison 128,604, 128,605, 128,606, 128,607
Telegraph, printing, J. P. Humaston 128,627
Telegraph instruments, printing, T. A. Edison 128,608
Tents, folding frame for, F. A. Guthrie 128,542
Thermostats and fire alarm signal box, Rosenbusch and Kreitz 128,662
Thill coupling, J. Lamb 128,639
Thrasher and separator, grain, J. H. Shireman 128,666
Thrashing machine, J. Hemingway 128,622
Ticket, fare, T. A. Jebb 128,629
Tile mold, P. McIntyre 128,498
Tobacco, treating smoking, W. A. Wright (reissue) 4,962
Torch, G. Brueck 128,586
Toy money box, H. Quinn 128,508
Toy, N. S. Warner 128,516
Tucking attachment, T. M. Farrand 128,476
Valve, double acting supply, P. Harvey 128,484
Vehicle wheels, hub for, P. Jones 128,546, 128,547
Vehicle wheels, hub for, D. Davis 128,600
Vehicle wheels, A. J. Caywood 128,535
Vehicles, spring brace for, Steele and Hodgin 128,669
Vehicles, axle for, C. Ahrenbeck 128,475
Ventilator for buildings, J. O'Neil 128,502
Vessels, propelling, C. A. Reed 128,657
Vinegar, process for the manufacture of, A. H. Low 128,496
Vise, lathe, J. B. Low 128,641
Wagon brake, W. D. Johnston 128,545
Wagon bodies to perches, connecting, S. G. Rowe 128,511
Wagon, lumber, J. Skeen 128,607
Wagon seat support, J. H. Fellows 128,477
Washer, clothes, H. J. Noyes 128,501
Washer, elastic, D. Dittman 128,602
Washing machine, R. Brooks 128,529
Washing machine, D. C. Fisher 128,540
Washing machine, C. Turner 128,567
Watch case spring, J. L. Wilson 128,573
Water pipe, pressure regulator for, J. Johnson 128,492
Waters, apparatus for the manufacture and bottling of, O. Kropff ... 128,494
Windmill, M. J. Althouse 128,577
Windmill, O. B. Knapp 128,550
Wood, transferring the natural grain of, J. R. Cross 128,468

DESIGNS PATENTED.

5,967.—MILITARY SHOULDER KNOT.—D. C. Hall, Boston, Mass.
5,968.—RAIL FOR HAT RACK.—D. Heald, Milford, N. H.
5,969.—TEA POT.—C. Hodgetts, Brooklyn, N. Y.
5,970.—FINGER OR OTHER RING.—F. W. Martin, Springfield, Mass.
5,971.—MONUMENT.—J. M. Martin, Cleveland, O.
5,972.—LEGAL BLANK.—J. B. Shaw, Brooklyn, N. Y.
5,973.—SCHOOL FURNITURE.—I. Wachob, Scranton, Pa.

TRADE MARKS REGISTERED.

874.—PIG IRON.—Bay State Iron Company, Boston, Mass.
875.—PLATE METAL.—Bay State Iron Company, Boston, Mass.
876.—LARD.—R. Bullymore, Buffalo, N. Y.
877.—WHISKY.—M. Crichton, Baltimore, Md.
878 to 880.—BOOTS.—Friedman, Bros., Memphis, Tenn., and Boston, Mass.
881.—WHITE LEAD, ETC.—F. S. Pease, Buffalo, N. Y.
882.—CHOCOLATE.—H. L. Pierce, Boston, Mass.
883.—GINGER ALE.—Vincent, Hathaway & Co., Boston, Mass.

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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:

17,236.—COUPLING.—W. and C. Sellers. September 4, 1872.
21,554.—INKSTAND.—S. Darling. September 4, 1872.
21,566.—KNITTING MACHINE NEEDLE.—J. K. and E. E. Kilbourn. Sept. 4, 1872.
21,572.—CANAL BOAT.—J., S., and J. McCausland. Sept. 4, 1872.
21,587.—HARVESTER.—McC. Young, Jr. Sept. 4, 1772.
21,603.—TEMPERING STEEL.—R. G. Gardiner. Sept. 11, 1872.
21,659.—FOLDING GUIDE.—A. Douglas. Sept. 18, 1872.
21,745.—SEWING MACHINE.—C. O. Crosby. Sept. 25, 1872.
21,756.—CENTRIFUGAL PUMP.—W. C. Hibbard. Sept. 25, 1872.
21,712.—HAY RAKE.—G. Whitcomb. September 18, 1872.
21,856.—CUTTING STAVES.—W. Steele. October 2, 1872.
21,991.—SAFETY STEAM BOILER.—F. Stebbins. October 2, 1872.

EXTENSIONS GRANTED.

20,631.—EVAPORATING CANE JUICE.—D. M. Cook.
20,692.—GRINDING MILL.—B. A. Beardsley.
20,719.—HARVESTER.—W. F. Ketchum.
20,736.—FIRE AND BURGLAR PROOF SAFE.—T. Sharts.
20,775.—SEWING MACHINE.—L. R. Blake.
20,777.—RAILROAD CAR SEAT AND BERTH.—Z. Cobb.
20,815.—SAUSAGE FILLER.—J. G. Perry.
20,837.—PRESSING STRAW BONNETS, ETC.—H. E. West.

EXTENSIONS REFUSED.

20,728.—HAND DRILL.—H. H. Packer, Mass.

DISCLAIMER.

30,509.—BELL ATTACHMENT.—A. E. Taylor.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]
From June 14 to June 17, 1872, inclusive.,

CUT NAILS.—J. H. Garey, East Weymouth, Mass.
HARVESTING MACHINE.—S. Johnston, Brockport, N. Y. (Two Patents.)
IRON.—W. Sellers, Philadelphia, Pa.
IRON AND STEEL.—J. W. Middleton, Philadelphia, Pa.
IRON AND STEEL.—T. S. Blair, Pittsburgh, Pa.
SEASONING WOOD.—G. M. Wells, Boston, Mass.

FOREIGN PATENTS---A HINT TO PATENTEES.

It is generally much better to apply for foreign patents simultaneously with the application in the United States. If this cannot be conveniently done, as little time as possible should be lost after the patent is issued, as the laws in some foreign countries allow patents to any who first make the application, and in this way many inventors are deprived of valid patents for their own inventions. It should also be borne in mind that a patent is issued in England to the first *introducer*, without regard to the rights of the *real* inventor; therefore, it is important that all applications should be entrusted to responsible agents in this country, who can assure parties that their valuable inventions will not be misappropriated. The population of Great Britain is 31,000,000; of France, 40,000,000; Belgium, 5,000,000; Austria, 38,000,000; Prussia, 25,000,000; German Confederation, 40,000,000; Canada, 4,000,000; and Russia, 70,000,000. Patents may be secured by American citizens in all of these countries. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency.

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Practical Hints to Inventors.

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

How Can I Obtain a Patent?

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

How Can I Best Secure My Invention?

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

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

Preliminary Examination.

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To Make an Application for a Patent.

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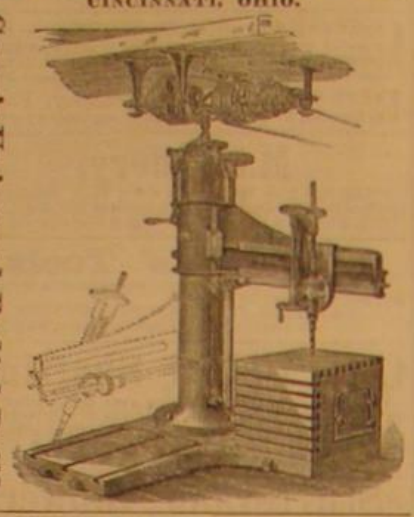

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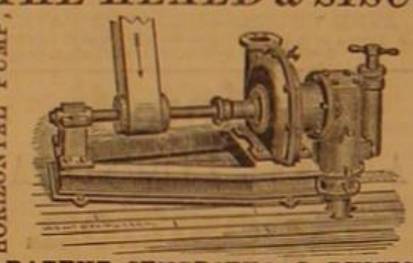

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