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Improved Turn-Table.

Our engravings illustrate an improvement in turn-tables which secures some important advantages.

The improvement is the direct combination of the ends of the centrally divided truss-beams in a turn table, with each other as well as with the central supporting box upon which the table is balanced, in such a manner, that, when united, each beam shall be continuous, independently of the box, and be also more firmly secured thereto, and suspended thereby, than has hitherto been done.

The central box is thus relieved from the strain of the load, this strain being borne wholly by the truss-beams; accidental displacement of the connections of the beams by sudden and violent jars upon the turn-table is also obviated, while the table may as readily be taken apart and put together before and after transportation, as heretofore.

The letters, A, in Figs. 1 and 2, represent the truss sections alluded to. They are so formed that when brought together and secured, end to end, the under side of the continuous beam thus formed is an arc of a circle, of which the upper side is a chord.

Each section is a metallic plate with holes formed therein, as shown, to reduce weight, and each has a flange on each side, projecting all around its edge, except at the inner end.

The inner ends of the truss sections are faced to fit very closely, and exactly against each other, so as to form, when put together and secured, one continuous truss-beam. The two divisions are bound together at the top by broad-headed tie-straps and keys. At the lower side they are connected by a cross-tie bar, also held by keys or wedges, which not only operate to secure the cross-tie, but to draw together the faces of the joints.

Two truss-beams thus constructed are bolted centrally against or upon the ends of a hollow rectangular box, F, this box being cast in a single piece with an enlarged aperture in the bottom to fit over and receive the pintle, D, Fig. 2, upon which the table is pivoted.

The ends of this box fit snugly under the inner flanges of the edges of the beams, so that the latter overlap and embrace the ends of the box, and form a support for the beams. Projecting strips cast on the inner faces of the beams, parallel to the inner ends of each division also bear against the sides of the box.

A system of key wedges, having screw threads on their points, which project through apertures in the beam, and to which nuts are fitted, are used to tighten and clamp the beams upon the box, and also to level and nicely adjust the same with reference to the axis of the pintle, and the surface of the cap-plate, in the central box. This system of supports relieves the bolts in great measure from strains, consequent upon jars or pressure.

B, Fig. 2, is the central pier supporting the pintle, D, upon which the cap-plate, E, bears.

A friction box consisting of two circular plates (one being secured to the cap-plate, D, and the other to the upper side of a socket plate), between which are interposed conical steel rollers running in concentric grooves formed in the faces of the plates facilitate the rotation of the table. The upper end of the pintle is rounded as usual so that the table may tip or vibrate thereon as well as turn upon the rollers in the friction box.

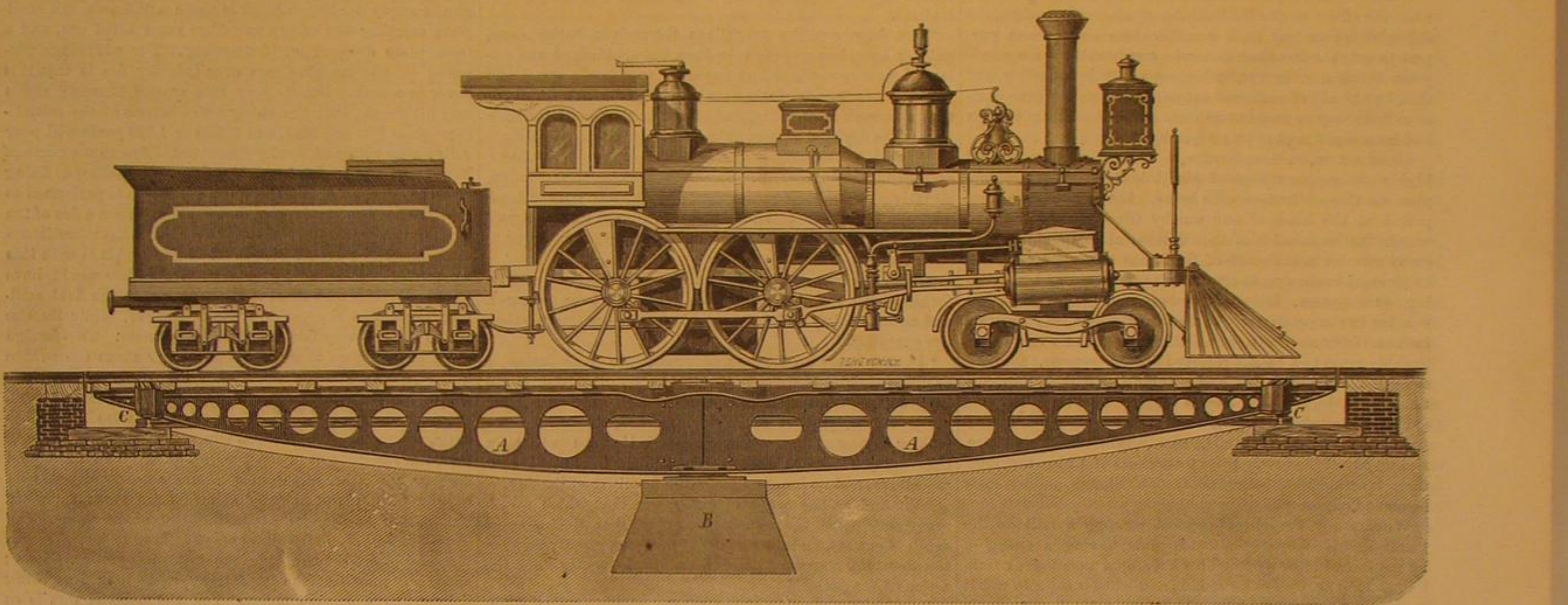
The outer ends of the beams are connected by cross-bars provided with rollers, C, which swing over a concentric track but do not touch except when the table is tipped out of its horizontal plane.

The inventor states that the friction is so reduced by this method of mounting the table that one weighing 25,000 lbs. may be turned with the point of a lead pencil without breaking the point.

The plates and rollers are made of steel, and are very durable. They also, of course, turn with less power than the old cast-iron center. A table fifty feet in diameter, weighing 25,000 pounds, it is stated, turns with a weight of only 1½ pounds attached by a cord running over a pulley to one of the arms.

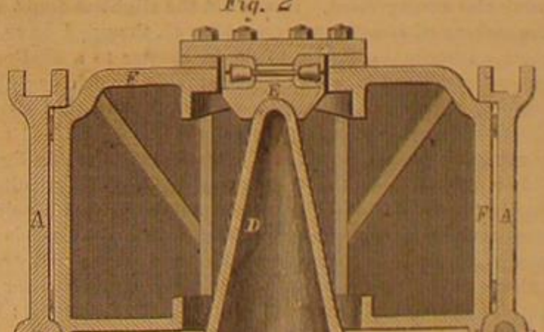
Testimonials, speaking in the highest terms of the good qualities of this table, have been shown us, from presidents and superintendents of several important Western railroads where they are in use.

Patented, February 8th, 1870, by Clements A. Greenleaf, of Indianapolis, Ind. These tables of various sizes, from 9 to 60 feet in diameter, are manufactured by the Greenleaf Machine Works, of the above place.



GREENLEAF'S IMPROVED TURN-TABLE.

Fig. 2



NEW BREAD.

Why is it that we must refrain from eating new bread, as if it were poison; unless, indeed, one happens to possess the stomach of an ostrich and the constitution of a rhinoceros?

Every one knows how palatable is the steaming loaf fresh from the bake-house, and we can all remember with what eager eyes we regarded as school-boys the new loaf, as it stood in its unshapely modesty, wreathed in vapor, in the cupboard. Which of us, during his melancholy days of satchel and Latin-root-hood, has not eyed the forbidden morsel with an eager craving out of all proportion to its merits—a craving which seemed to develop and increase as our loved and venerated mother assured us that new bread was decidedly unwholesome for little boys? And when a crummy slice from a two days' old loaf was placed in our unwilling hands, smeared and diagrammed as it usually was with molasses or other saccharine decoy, and we were told how good it was for us—but for the molasses how odious it seemed! Probably this repugnance was strengthened when we recollected how many other unpalatable circumstances were daily happening—all for our good. We were hurried to bed at the most objectionable hours; we were reminded in the morning of the sluggard, his complaining voice, and his unhappy end we were soaped, scrubbed, bolused, and birched—all for our good; so that, schoolboy-like, we sometimes longed to make a surreptitious trial of the bad, by way of a change. Nevertheless, as a rule, our watchful parents and maiden aunts almost invariably succeeded in defeating our cunningly contrived schemes, especially those having for their object the consumption of new bread.

Now, why is new bread unwholesome, or rather, how does it happen that its alleged unwholesomeness is only experienced here and in England? In Paris or Vienna even the most dyspeptic eat, with a feeling of perfect safety, the exquisite new bread, which is usually baked three times a day and served fresh with each meal. So far from the cry being raised, "Waiter, some stale bread," the *garcon* who dared, either accidentally, through hygienic belief, or from motives of economy, to fetch yesterday's rolls, would have to run the denunciatory gauntlet of the table, and make certain of retiring copperless at the hands of the diners, even if no worse fate overtook him. Can it be that our climate is inimical to the production of bread in the highest state of perfection; that our flour is inferior to, or our bakers less skillful than theirs? Something is evidently wrong, so it may be interesting to look into the chemistry of bread-making here, previously to describing how they manage the production of the staff of life in the south of sunny Spain.

When wheat is ground and sifted, it gets divided into bran and flour. The bran is the outer coating of the grain, which resists the crushing of the millstones longer than the interior, but when reduced sufficiently to pass through the sieves, so darkens the color of the whole as to render it inferior in market value, although really superior in nutritive qualities to the white flour alone. For the former reason it is generally sifted out, and sold for fattening farm stock. The flour consists of the interior. If pure flour be mingled with a sufficiency of water to moisten it, a little yeast and salt added, and the mass kneaded thoroughly together, then placed in a warm atmosphere, it ferments and increases in bulk. Carbonic acid gas is disengaged in the substance of the dough, which speedily becomes cellular. Placed in a hot oven, the swelling increases until the mass has nearly reached 212° Fah., when fermentation is arrested, the bread retaining the shape it has then assumed. This fermentation is the result of the chemical action which yeast exercises upon moist flour, in changing a portion of the starch into sugar, and then converting the latter into alcohol and carbonic acid. The dough being glutinous and highly elastic, the gas cannot escape, so the mass swells and increases until, the heat killing the yeast plant, further evolution of gas ceases, while the alcohol evaporates and is lost in the oven.

But flour contains other nitrogenous substances than gluten, and others non-nitrogenized, besides sugar. Such substances readily undergo transformation, acting in turn as ferments, converting the starch into dextrine and sugar, and occasionally into lactic acid. When dry flour has been, through any accident or carelessness, exposed to heat and moisture, the albumen it contains passes into this peculiar condition, and is incapable of yielding good bread; because, during the manufacture, the conversion of starch into dextrine and sugar, which always happens in a limited degree, then occurs on a large scale. The bread produced is sure to be saccharine and sodden, being destitute of lightness, porosity, or cellular division; besides having acquired a dark and objectionable color, owing to the presence of diastase, should there have been a slight admixture of bran. In order to counteract the injurious action of diastase alum is sometimes employed, which enables bakers who are unscrupulous to use many qualities of inferior flour, which, they excuse themselves by saying, would otherwise be wasted.

The dyspepsia so frequently complained of after eating some descriptions of bread, whether new or old, may easily be accounted for. A gentleman who was in the habit of visiting a certain town found himself invariably seized with pain in the stomach whenever he took his meals there. Suspecting the bread, he caused an analysis to be made, when sulphate of lime was detected in considerable quantity. The baker asserted his innocence, but a search of the miller's premises revealed a large quantity of plaster of Paris.

Without entering on the discussion of the question as to what the effects of the habitual use of alumed bread on the digestive organs may be, it is sufficient for our present purpose to note the fact that, as a rule, our bread has too much yeast introduced into it, undergoes too little kneading, and that, by the aid of a mineral substance, inferior, or even damaged flour may be made to do duty in bread-making as if it had been sound, and of prime quality.

About six miles from Seville is situated the pretty and highly picturesque village of Alcalâ de Guadaira, which supplies the City of Oranges with bread. Let us halt for a brief period at the house of our worthy friend Panaderos, and watch the preparation of that delightful compound, which every traveler in the south of Spain has remarked as being so pleasant to the eye, so agreeable to the taste, and nourishing to the system. His wife and daughters are seated on low benches in the porch, sorting the wheat, which they separate both carefully and with expedition, consigning every objectionable grain to a basket reserved for the purpose. Singing some musical old ballad, and laughing merrily as they continue their light and pleasant employment, their lustrous eyes, blushing cheeks, pearly teeth, neatly braided hair, scrupulously clean small hands, and bright, fanciful attire, remind one of the pretty little tea-pickers of China warbling their favorite Moh-li-Hwa or Jasmin Flower amidst their heaps of Congou.

When ready, the wheat is passed through a mill on the premises, driven by a blindfolded mule, having a string of bells attached to its neck, which keep up a monotonous tinkling so long as it paces its round; and when it stops to rest it is again set in motion by the cry, "Arre, mula." The whole arrangement is as primitive, simple, and unpretending as that in use, according to the delineations on Egyptian sculptures, two thousand years ago. The resulting flour is passed through three sieves of different degrees of fineness, the wires of the last being so close together that only the pure flour is sifted through.

Evening is the time for bread making at Alcala de Guadaira, when the female portion of the community may be seen in their own houses making dough, into which, in contradistinction to our method, only a minute quantity of leaven is introduced. "A little leaven leaveneth the whole lump," we are taught in Scripture; here it is practiced—whereas at home, in order to avoid the labor of kneading, which, it must be admitted, is very severe, many of our bakers, where carbonic acid machinery is not employed, use as much yeast for one batch of bread as those simple people consume in a week. The dough, being ready, is placed in bags, and conveyed on the backs of mules to the great village oven, which is conveniently situated so as to accommodate the thrifty housewives around. It is there divided into three-pound lumps, which are tossed on a long narrow table. These are immediately seized by a multitude of sturdy brown bakers, who knead each portion with all their strength for about four minutes, passing it on from one to another, until it has gone under the knuckles of all. Here again the process is similar to that of preparing tea, and reminds one strongly of the long rows of stalwart manipulators seen in the tea districts of China, making the fragrant leaf ready for market.

Such is the energy which those *panaderos* infuse into their work, that in course of time the palms of their hands, and the second joints of their fingers, bristle with corns; and the guttural "aha, aha," uttered by them as they thump and squeeze the yielding, gratefully smelling billows, is suggestive of the exclamations breathed by the hard-working tea-bearers among the mountain defiles of Hounan and Oopack, as they trot down with their precious burdens to the various shipping ports.

Immediately on leaving the kneading table, where the lumps have, as a final process, been shaped into loaves, they are transferred to the oven. It is heated with wood, mingled with twigs of sweet majoram and thyme, vast quantities of which cover the adjoining hill slopes, scenting the air with their rich perfume. There being no fire under the oven, the bread is never burned, the hottest period being when the loaves are introduced, which, being full of moisture, quickly acquire a crust that protects the crumb.

In this primitive Spanish village it is evident that an answer to our inquiries has been found in the simple words—pure flour, little yeast, much kneading.—*Good Health.*

Steam Cultivation.

England, with fewer land-owners than the State of New York, and with nearly all her farmers working leased land, has about eight hundred steam plows and cultivators in active use—cultivating not far from three hundred thousand acres; and the system of steam cultivation has there been an established success for a dozen years.

The story of the rise and progress of the improvement is really a wonderful one, and as I read of the impediments to its general adoption, through the long list of small fields, uneven surface, crooked fences, and crooked landlords, I long to see it gain a foothold on the prairies of our Western States, where every circumstance that could promote its efficient application seems ready-made to its hand. Thence, I am sure, by a reversal of the old rule, the course of its empire would eastward wend its way.

In the Journal of the Royal Agricultural Society for 1867, three hundred and thirty pages are devoted to the reports of the committees that had been detailed "to inquire into the results of steam cultivation" in use by one hundred and thirty-five farmers and stock companies of England. From the conclusions which they deduce from their investigation, I extract the following:

"In nearly all the cases reported, it will be seen that the expenses of cultivation are very much reduced, and yet that a larger amount of produce is said to have been realized.

"Not only are the operations themselves better done, quicker done, less expensively done, but all kindred and collateral movements have had imparted to them a speed and 'whirr' characteristic of steam; men acquire the habit of doing the day's work in the day, and of not leaving it for the morrow. The day's labor, too, on a steam farm, represents more work, with less distress to the physical power of the laborer, and better remuneration. Steam is working a revolution, slightly manifested as yet, so that we can speak only of tendencies in farm practice, and in the character of the rural population; they are being trained for the age of machinery in agriculture.

"Before steam can be as generally used for tillage as it is for thrashing, the fields below ten acres must be enlarged, and areas of thirty and forty acres become more the rule than the exception."

"In most cases, an increase of produce, in some instances as much as eight bushels per acre, has resulted from steam cultivation. We may state, as our general conclusion, that steam tackle, whether of Fowler, Howard, Smith, or other makers, is now so far perfected and settled in form and details, that it may be classed among old-established, standard farm machinery, and no longer among the novelties of the day."

"We find, as the result of experience, that which we already anticipated theoretically—namely, that the increased depth of surface, and the absence of pressure, greatly increase the absorbing powers of the soil, and consequently assist the action of the drains."

Mr. Clarke, a member of one of the committees, in a lecture on steam cultivation, delivered before the Central Farmers' Club, in December last, said (with reference to a trial of steam apparatus at the recent show of the R. A. Society):

"Now some persons may think it astounding to talk about from fifty to seventy acres a day being cultivated. I admit that it is very astounding; but I also assert that I saw the thing done—and there are other persons also who saw it done. I may tell you, too, that the apparatus was not in a perfect state; it was one of the earliest trials made of that particular arrangement. I have not the slightest doubt that the makers of steam plows are prepared, though I have not their authority to say so, to do, in answer to a challenge, an extent of land in a day which would astonish every one present. I have not the slightest doubt myself, that seventy acres—I should not stare particularly if one hundred acres could be cultivated, provided the work was tolerably light."

In a discussion by the members of the Royal Agricultural Society, it was declared that the advantage of steam cultivation amounted, on average soils, to at least eight bushels per acre in the increased produce of the grain crops; that arable culture is by means of it annually becoming cheaper and better; that the drainage of clay soils is facilitated; that even when coals are twenty shillings ($5) per tun, the power obtained from sixpence (12 cents) worth of them is equal to the day's labor of a horse—and that the system, wherever it is adopted, is improving all the classes interested in agriculture.—*Handy-Book of Husbandry.*

The French "Mitrailleuse."

To destroy your enemy in the shortest time, in the easiest manner, and at the least possible expense, is the first maxim of war. The stone that whistled from David's sling, the bullet of the "zundnadelgewehr," and the volley of the "machine gun" had all the same object. Since the days of Roger Bacon the aim of all improvements in fire-arms has been to carry the greatest possible number of deaths to the greatest possible distance. Grape, canister or case, and shrapnel all contain bullets, and are all means for multiplying deaths. The field gun mows down its hundreds by showers of case at close quarters, or at longer distances rains bullets from the bursting shrapnel. The mitrailleuse, or machine gun, on the contrary, sends a large number of small projectiles independently, and with precision, to a considerable distance. We may divide arms on the latter principle into two classes, first, those which discharge their bullets from a single barrel, fed by a many-chambered breech; and, secondly, those in which each cartridge has its corresponding barrel, the charging and discharging of which is direct and more or less simple. It is obvious that for rough usage and continuous firing it is better that a large number of rounds should be fired from a considerable number of barrels so placed as to support each other, and add strength to the whole machine. The French mitrailleuse, as well as the Belgian Montigny, belongs to the second class, and the following brief description is equally applicable to both arms: The machine gun consists of a cluster of barrels either bound together or bored out of the solid, and mounted on the same principle as an ordinary field gun. At a few hundred yards, indeed, it would be difficult to distinguish between these weapons, so far as outward appearance goes. To the barrel is attached a massive breech action capable of being opened and closed by a lever. In the Montigny arm the cartridges are carried in steel plates perforated with holes corresponding in number and position to the holes in the barrel. This steel plate, in fact, forms the "vent piece" of the system. The central fire cartridges being dropped into the holes in the steel plate, stand out at right angles from it, and the plates, thus ready charged, are so carried in limber and axletree boxes specially fitted for their reception. When the gun comes into action the breech is drawn back, a steel plate full of cartridges is dropped into its corresponding slot, and the breech block thrust forward and secured. The gun is now on full cock, and contains from thirty to forty cartridges, which are fired by a "barrel organ" handle, either one by one as the handle works round click-click, or in a volley by a rapid turn of the wrist. When the gun is empty the breech block is again withdrawn, the steel plate carrying the empty cartridge cases lifted out, and a fresh plate dropped in, if necessary. The advantage possessed by the machine gun over infantry fire is that it is never in a funk. Bullets may rain around, bursting shells may fill the air, still the thirty seven barrels of the mitrailleuse shoot like one man, and at 800 or 1,000 yards will pour volley after volley of deadly concentrated fire into a circle of from ten feet to twelve feet in diameter. No boring or fixing of fuses is required, and the whole operation is performed so rapidly that two steady, cool men could maintain a fire of ten discharges per minute. On the other hand, the mitrailleuse could not well compete with the field gun, and it is with this weapon it will assuredly be met. Its bullets would have comparatively slight effect at the ranges at which field artillery projectiles are perhaps most effective, while its size would offer a very fair mark to the gunner. The foreign press are welcome to write *fanfaronnades* about the sudden death of wretched horses at incredible distances. This is peace practice. The horses came from the knacker's yard, not from the banks of the Elbe, and there were no Uhlans sitting on them. We are also tempted on such occasions to take the square root of the reported distance as the actual range. The future of the mitrailleuse, however, depends on coming facts. The day's experiments are over; there are hundreds of machine guns trundling toward the Rhine. The drum-like roll of their volleys may ere long be heard in the vineyard of Rudesheim or on the edge of the Black Forest; and the "thud" of the bullet may come from something softer than a wooden target. Yes, the machine gun is *en route* for the Rhine; the experiments will now be on a gigantic scale; and Mr. Cardwell may adjourn his special committee until after Christmas, at any rate. By that time the voice of war will have given the verdict; by that time the Chassepot, the Zundnadelgewehr, the shrapnel, and the volley gun will each be credited with a ghastly account, and we shall each know which engine destroys human life in the shortest time, the easiest manner, and at the least possible expense.—*London Globe.*

Opening of the Thames Embankment.

The London papers teem with descriptions of the formal opening of the Thames embankment, a great engineering work that has been in process of construction for several years. It consists of an immense water wall laid along the edge of the Thames river, in the heart of London. The back of the wall has been filled with earth, forming a noble avenue, some portions of which are widened into the form of parks and adorned with trees. The work was designed and constructed by Mr. Bazalgette.

The wall of the embankment is a work of extraordinary magnitude and solidity. It is carried down to a depth of 32 and a half feet below Trinity high-water mark, and 14 feet below low water; and the level of the roadway is generally 4 feet above high water, rising at the extremities to 20 feet. The rising ground at each extremity is retained by the increased hight of the wall, which is built throughout of brick, faced with granite, and founded in Portland cement concrete. The river front presents a slightly concave surface, which is plain from the base to mean high water level, and is ornamented above that level by moldings, stopped at intervals of about 70 feet by plain blocks of granite, intended to bear lamp-standards of cast iron, and relieved on the river face by bronze lions' heads, carrying mooring rings. The uniformity of line is broken at intervals by massive piers of granite, which flank recesses for steamboat landing stages; and at other places by stairs projecting into the river, and intended as landing places for small craft. The steamboat piers occur at Westminster, Charing-Cross, and Waterloo bridges, and both are united opposite Essex street. It is intended eventually to surmount the several blocks and pedestals with groups of statuary.

The violet ink sold by stationers has a pretty color and flows freely. But in respect to permanency it is worthless. Writing done with violet ink, if exposed to sun light soon des.

MAGNETISM AND DIAMAGNETISM.

Diamagnetism is a term introduced by Faraday in connection with his discovery of the influence of magnetic force upon all bodies. By a diamagnetic is meant any substance which, when placed in a field of magnetic force, does not conduct itself in the same way as the magnetic bodies, iron, nickel, and cobalt. Before Faraday's discovery in 1845, the known properties of almost all the diamagnetics in relation to magnetic action were merely negative. It was known, indeed, long previously, that masses of bismuth and antimony act in a remarkable way upon a neighboring magnet, repelling the nearest pole, instead of attracting it as iron does; but this remained an isolated and barren fact, and seems to have received little attention till it was reduced by Faraday's discovery to a case of general magnetic action.

It was in the course of experiment in relation to circular magnetic polarization that Faraday first observed the new mechanical action of magnets upon bodies placed in the field of force. A bar of heavy glass was suspended centrally between the poles of a powerful horse-shoe electro-magnet. When the force of the magnet was developed, the bar no longer swung indifferently, but moved round its point of suspension into a direction at right angles to the lines of force, or at right angles to the direction that would be taken by a bar of soft iron placed in the same part of the field. Round this position the bar made a few vibrations, and finally settled in it. If displaced from it by the hand, it returned to it and settled as before, showing that this position of the bar, which Faraday calls the equatorial, was a position of stable equilibrium.

When the bar was placed originally, at rest, in the axial position, or in the position of stable equilibrium of an iron bar, it did not move out of this position under the action of the magnet; but if displaced a little in either direction it moved on into the equatorial position and settled there as before; showing that the axial is a position of unstable equilibrium.

It was observed further, that if the bar was placed near one of the poles, it was not only *directed* round its point of suspension, as above-mentioned, but was also repelled as a whole by the nearest pole, the center of gravity of the bar sensibly receding from that pole, and so remaining while the magnet was retained excited. The effects are simplified by the employment of one electro-magnetic pole instead of two. In this case, the bar is always repelled by the pole in the direction of the lines of magnetic force passing through it; and it moves at the same time into a position perpendicular to the lines of force.

The effects are further simplified by using a cube or ball of heavy glass instead of an oblong bar. When such a body is acted on by one pole, it moves constantly outwards in the direction of the lines of magnetic force. When subjected to the action of two poles, the effects are more complex; but there is a simple law that explains them all. It is this, that a particle of heavy glass or other diamagnetic tends constantly to move outwards, or into the positions of weakest magnetic action. The directive tendency of an oblong diamagnetic across the lines of force when one or two poles are employed can be easily accounted for by this law. It is a simple result of the joint tendency of all the particles towards the positions of weakest force.

The property of being repelled by magnetic poles is not peculiar to heavy glass; it is, on the contrary, common to the most of natural and artificial bodies. It may be said, without exception, that every known substance, when subjected to electro-magnetic forces of sufficient power, will give some positive result, either of the magnetic or the diamagnetic character. And it is in comparatively few cases that the results are of the common magnetic kind presented by iron and nickel. Faraday himself tested a great number of bodies taken from all classes, amorphous and crystalline, liquid and solid, organic and inorganic. In this examination, the liquids were experimented on by being inclosed in glass tubes, the action of the glass under the magnetic forces being taken into account.

Some of the results may be stated. Transparent bodies were the first examined, as was natural in the circumstances of the discovery. And it was found that even such transparent bodies as the singly and doubly refracting crystals, whose magnetic rotary action upon light is too feeble to be observed, are yet subjected to directive and repulsive actions by magnetic poles in their neighborhood, as other diamagnetics are. Of opaque bodies again, whose condition under magnetic action could not be tested by means of light, some are found to act very powerfully. Phosphorus may be mentioned as equal, if not superior, in its mechanical indications, to heavy glass. Sulphur and india-rubber are also well directed and repelled. Among liquids, alcohol and ether are evidently diamagnetic, and water still more so. Of organic bodies, the most are clearly diamagnetic. Wood, starch, sugar, leather, beef, mutton, apple, bread, and blood are instances; they are all repelled by the magnetic poles, and, when in oblong volumes, directed equatorially.

With regard to the gases, Faraday obtained no positive result in the first series of his experiments in this field. It was discovered, however, by Bancalari, that flames are mechanically affected by magnetic forces; and the subject was resumed by Faraday and other philosophers with success. It was found in the first place, that a current of heated air ascending between the poles of an electro-magnet conducts itself as a diamagnetic, separating under the magnetic action into two streams which ascends on different sides of the axial line. On the other hand, a descending current of cold air is not divided under the action of the poles, but keeps to the axial line. A descending stream of oxygen acts as a powerful magnetic body; if its proper line of descent is on either side of the axial line, its direction is changed by the action of the magnet, so as to intersect the latter line. All the other gases, when treated similarly are found to be diamagnetic, with the exception, perhaps, of nitrous gas.

To render the effects of the magnetic action more evident, Faraday inclosed the gases in soap-bubbles, and set them afloat in the magnetic field; and this test was found to be very delicate. Oxygen in these circumstances was powerfully attracted, and the other gases gave results in accordance with previous experiments. By employing glass tubes as the envelopes of the gases, in connection with a delicate torsion-balance, Faraday has even compared the gases magnetically with each other, and with themselves in different states of density and temperature. The contrast brought out by this method between the two principal components of our atmosphere is very interesting, and highly important also from its bearings on the theory of terrestrial magnetism.

The magnetic power of oxygen suffers evident diminution by a diminution of density, and also by an increase of temperature; though the gas cannot be rarefied or heated to such an extent as to lose all magnetic power. Nitrogen, on the other hand, which is a diamagnetic, undergoes no sensible change in its magnetic relations by the utmost attainable changes in density and temperature. In this brief view of the natural bodies in their magnetic relations, we have to refer finally to the metals.

Iron, nickel, and cobalt, have been long known as magnetic metals, though the second is far inferior in power to iron. To these metals Faraday has added the following: Platinum, palladium, titanium, manganese, cerium, chromium, and perhaps osmium. Some of these are inferred to be magnetic from direct observations of their actions in the field of force, while the character of others has been determined by the actions of their chemical compounds. The rest of the metals appear to be non-magnetic in the common sense of the term. They are found to be all subject to the influence of the magnetic force, and they produce the same general effects as heavy glass and the other diamagnetics already referred to.

The repulsive forces are manifested on the diamagnetic metals in very different degrees. Some of the metals, as gold, copper, silver, are inferior as diamagnetics, even to water; and with the exceptions of antimony and bismuth, they are all inferior to heavy glass. The last-mentioned metal has been characterized by Faraday as one of the best substances for the exhibition of the entire diamagnetic phenomena of the mechanical kind. The conduct of the various compounds of the metals under magnetic action has been studied with great attention. We may merely state the general law which has been arrived at upon this point by a very extensive induction; that the decidedly magnetic and the decidedly diamagnetic metals preserve their magnetic characters throughout all changes of mixture and chemical composition and solution.

By inference from this law, Faraday has determined the magnetic character of some of the metals, whose indications in the magnetic field could not be depended upon. It need hardly be observed that it is not meant by the above statement, that a solution of salt of iron, for example, will act evidently under magnetic force in the same same way as iron itself does; for it may or may not so act, according to circumstances. The magnetic action of a mixture or chemical compound of different matters is the resultant of the actions of all its constituent parts; and the law is, that the action of each part is proper in kind and quantity to the part itself, and independent of the circumstances of mixture and chemical composition into which the part may enter. A solution of iron then will be magnetic or diamagnetic according to the strength of the solution—that is, according to the proportion of water or other diamagnetic matter with which it is diluted.

It is interesting to observe generally in this connection that the magnetic and diamagnetic properties of the parts of any mixed body, while they oppose each other in their effects, appear to interfere in no degree with each other in their proper actions. The delicacy of the experimental researches that have been conducted in this field is well illustrated by the phenomena of mixed bodies.

Glass in a pure state is evidently diamagnetic, but in the common forms of green-bottle and crown it is as evidently magnetic, in virtue of the small quantity of iron present in its mass. Wood in a pure state is diamagnetic; but to obtain a chip that will conduct itself as a magnetic body we have only to detach it with a common knife. Common paper again has been sometimes found to possess magnetic properties; and the fact has been explained by the contact of iron with the paper in the process of manufacture.

In the previous part of this article, bodies have been considered in their magnetic relations without reference to the *enveloping matter*, and they have been spoken of as absolutely magnetic or diamagnetic. This view has preserved us from unnecessary complication in the statement of elementary facts, but it now requires an important correction. The conduct of a body in the magnetic field depends as much, in fact, upon the nature of the enveloping matter as upon the nature of the body itself. As a simple instance: There are certain substances which set equatorially and are repelled in air, while in water they set axially, and are attracted; in other terms, they act as diamagnetics in a magnetic field which is occupied by air, while in the same part of a precisely similar field which is occupied by water, they act as magnetics. Phenomena of the same kind are presented by other media.

There are certain remarkable experiments of Faraday's that are worthy of notice in this connection. Glass tubes were filled with solutions of iron of different strengths, and were hermetically sealed. Vessels were also filled with the solutions, and placed successively in the magnetic field. The tubes in succession were immersed movably in the vessels when occupying the field of force; and though all the tubes were magnetic they sometimes pointed equatorially. The phenomena presented this constant law—that if the solution in the tube were stronger than that which enveloped it, the tube conducted itself as a magnetic bo y; if, on the other hand, the internal solution were the weaker, the tube was repelled and directed equatorially, and could be distinguished in no way from a diamagnetic. These facts have an evident bearing upon the nature of the distinction between bodies as magnetic and diamagnetic. But we consider them at present merely with an inductive view, and without reference to theoretical questions that may be raised in connection with them.

From the above statements it is evident that we cannot properly speak of a body as magnetic or diamagnetic without reference to the medium in which it is placed. But in practice we can dispense with the reference without any danger of mistake, by agreeing that where no medium is mentioned the air is understood. After this, the action of media, as far as determined, may be easily described. A magnetic body will act as a magnetic in every diamagnetic medium, and in every medium of less magnetic power than itself, but as a diamagnetic in every medium of greater magnetic power.

A diamagnetic will act as a diamagnetic in every magnetic medium, and in every medium of less diamagnetic power than itself; but as a magnetic in every medium of greater diamagnetic power than itself.

In conclusion, we may observe, that these and other facts are powerfully in favor of the idea, that bodies differ from one another as magnetic and diamagnetic only in virtue of the difference of degrees in which they possess the one common magnetic property. And that therefore a mass of bismuth or heavy glass recedes from the magnetic pole, not because of a repulsive action of the pole upon the diamagnetic, but because of a greater attraction exerted upon the surrounding medium; just as smoke ascends in air, and light solids in water, in opposition to the proper attractions exerted upon them.

This view was stated by Faraday as probably the true one, in connection with his singular experiments on solutions of iron already described; but he has seen reason to question it, and to speak of the movements of diamagnetics in the field of force as due to a proper repulsive action of the poles, an action therefore entirely different from the common and long-known action of magnetic force.

Whatever view be taken upon this point, there can be only one opinion as to the importance of the discovery of "the new magnetic condition." Magnetic science has received from it a very great extension. Those subtile forces that were formerly known only as exerted upon iron and two other metals are now recognized as acting effectively upon all bodies, and as exercising, in all probability most important functions in various departments of the great system of nature.—*Prof. Nichol.*

The Philosophy of the Earth Circuit.

It was at one time imagined that the earth completed the circuit precisely in the same manner as a return wire; this opinion is now considered incorrect. Gavarret explains the action thus:

"The poles of a battery, when disconnected, have equal and contrary tensions.

"When insulated conductors are placed in contact with them, they themselves become the poles of the battery, the battery having furnished a current sufficient to charge them, but not of *sufficient duration* to move a galvanometer needle.

"If the conductors are enlarged, the time occupied in charging them will increase, until, as they are still further enlarged, a limit will be reached at which the flow of electricity into them will last long enough to affect the galvanometer; and when the conductors become infinitely long or infinitely large, the time occupied in charging them also becomes infinite, or, in other words, the current will pass precisely as if the poles were connected.

"Thus, when the extremities of a circuit are connected to the earth, which is an infinitely large conductor, their respective tensions are diffused in all directions without producing any appreciable tension in the earth itself, so that the current will continue to flow.

"The earth acts as an ordinary conductor and opposes some resistance to this diffusion."

Another view is, that as whenever one kind of electricity is produced, an equal quantity of the opposite is also produced; and as both these tensions are ultimately transferred to the earth, its tension remains unaltered, the opposite tensions neutralizing one another through the earth's conductibility.

When a layer of soil placed in a box is compared with a similar layer forming part of the earth's surface, it is found that the isolated portion offers the greater resistance. Its resistance follows the same laws as that of any other substance, depending on its dryness or dampness, its nature, and its length and section.—*Culley's Handbook of Telegraphy.*

Mr. U. B. Vidal, of Philadelphia, proposes to provide the street cars with strong skirts or nets, supported on frames to extend from the flooring down to or near the ground. The object of the improvement is to save persons who fall from being run over by the car. The frame which supports the net is to be elastic, vertically, so as to yield when any portion touches the ground. Such an improvement is greatly needed.

It is stated on excellent authority that a constant current runs through the central portion of the Suez Canal, from the side of the Mediterranean to that of the Red Sea.

[For the Scientific American].

THE LEAF-CUTTER BEE.

[By Edward C.H. Day, of the School of Mines, Columbia College].

Would you enjoy sensations of genuine, worthy pleasure, such as are not to be obtained in a stroll on Broadway, or even amidst the artistic luxuries of a wealthy mansion—of pleasure unaccompanied by feelings of envy and jealousy, and unal loyed by the thousands of petty cares, and the follies and vices, that, amongst your fellow men, jostle you at every corner? Do but have recourse to Nature, and watch her operations. No knowledge of hard words is required for this—a pair of willing and patient eyes is all that is needful; the name of the creature you are watching is immaterial to you—its habits, its history, and itself are before you—note accurately in your mind what you observe, and when opportunity offers, you will be able to find out all that is recorded about it in books. There are but few persons, we trust (though, alas! we have our doubts on the point of number), who do not pay some attention to the truths of Nature that surround us; but many things that are the most interesting we only half comprehend, because their salient features are so familiar that we do not think it worth while to inquire further. We thus wander through the world, unconscious of its wonders, failing to discern its half-hidden beauties, and ignorant of the lessons of wisdom that it is ever willing to teach to those who are not too self-satisfied to learn.

THE LEAF-CUTTER BEE (*Megachile centuncularis*) AND ITS NEST.

Every child in its first reading lessons is taught something *in words* of the habits of the honey bee; and there are few children that have not, with childhood's yearning after natural knowledge, endeavored to learn more by their own *observation*, watching the little gatherers collecting honey, or wearily struggling homewards with overladen thighs. They have been told of the waxen cells these insects make, and "honey-comb," in the course of years, becomes a familiar idea in their minds, and a useful term in their stock of words. If, by chance, they have seen a swarm, they may have realized the multitudes that make up a society of bees; and if happy enough to have been able to watch a hive in summer, they have probably learnt what a busy community it is. The result of all this is that they come to think of bees as only social creatures, and many of their teachers, we fear could scarcely enlighten them by telling them of bees that are solitary in their habits. "Who ever heard of *one* bee making honey?" was the sally uttered by the wit of a party on the cars one day, and due appreciation of the joke was manifested by the laughter that greeted it. For our part, it reminded us of Lord Dundreary, but it was a Dundrearyism without a Dundreary point—a bird with only one feather is really a ludicrous idea, but a solitary bee making honey is an every-day fact.

So much of an every-day fact is it, that the bees are divisible into social and solitary species; and these groups differ in one very important feature. As the neuter bees—the workers of the hives—are an "institution" having its origin in the necessities of the societies of the social bees, we do not find such forms among the solitary species. There is no need here that any female should have their natural course of development arrested in order to promote a division of labor; among these each female has to perform all the labors preliminary to the deposition of her eggs; she has herself to build the nest and store it with food for her future progeny: nor does she accomplish the latter by easy rapine, as do the wasps, but by patiently collecting and garnering with many a toilsome journey. These solitary bees abound under our eyes in the garden and the field, and as industrious and laborious in their tasks and as ingenious in their unassisted constructions. They are, in one respect, even more instructive than their sisters of the hive; for in a study of their simpler habits lies our first step towards even comprehending the mysterious instincts that govern the social species.

Some of these solitary forms are sufficiently well known, as the carpenter-bee, for instance, which labors steadily for days boring a hole into the wood-work of a trellis or into a beam, until it perfects a tunnel often eighteen inches in length, and as truly and as neatly finished as if drilled by the most skilled carpenter. Within this tube she makes her cells, depositing in each a mass of pollen and honey, inclosing an egg, and closing each cell by a partition of agglutinated sawdust—if we may give that name to the results of her rasping.

Again, there are many kinds of mason-bees that build their cells of clay or sand, cementing the particles together, and smoothing the inside with the most exact nicety. One species of these makes its cells and an extra edifice, inclosing them as hard as the most durable cement work of mankind, and lest such solid walls should altogether immure the forthcoming brood, she leaves a means of egress at the point next to the cell from which the first bee is to escape. By what wonderful instinct does she know which is to be the first? Extraordinary as such instincts are, they are less bewildering to our comprehension than those of the upholsterer, and leaf-cutting bees. Why should these creatures hang the walls of the cells they excavate with the finest silk or with the tenderest rose leaves, or choose the gaudy red-poppy petals as the material for furnishing these little "homes of taste?" These small species do not so frequently attract attention as the larger carpenter-bees, for their nests are generally more concealed; but the traces of the operations of the *Megachile centuncularis*, or the "leaf-cutter" bee, must often be noticed. The observer may frequently find upon a rose bush leaves out of which a portion of a circle has been cut with remarkable accuracy. If he succeed in seeing the worker in the act, he will observe that the feat is accomplished rapidly as well as dexterously by the little creature's jaws; and should he discover her nest, he will learn that she disposes of the fragments with equal skill. The reader may best understand this by a glance at the accompanying engraving, and by the following extract from Kirby and Spence; we merely premising that these bees hollow out the tunnel, they afterwards tapestry, sometimes in decayed wood, or in the pith of a stem, or in the ground, or, as recorded by Putnam, under a board in a roof.

"This cavity she fills with six or seven cells, wholly composed of portions of leaf, of the shape of a thimble, the convex end of one closely fitting into the open end of another. Her first process is to form the exterior coating which is composed of three or four pieces of larger dimensions than the rest and of an oval form. The second coating is formed of portions of equal size, narrow at one end, but gradually widening towards the other, where the width equals half the length. One side of these pieces is the serrate margin of the leaf from which it was taken, which, as the pieces are made to lap one over the other, is kept on the outside, and that which has been cut within. The little animal now forms a third coating of similar materials, the middle of which, as the most skillful workman would do under similar circumstances, she places over the margins of those that form the first tube, thus covering and strengthening the junctures. Repeating the same process, she gives a fourth and sometimes a fifth coating to her nest, taking care, at the closed end or narrow extremity of the cell, to bend the leaves, so as to form a convex termination. Having thus finished a cell, her next business is to fill it within half a line of the orifice with a rose-colored conserve composed of honey and pollen usually collected from the flowers of thistles; and then, having deposited her egg, she closes the orifice with three pieces of leaf so exactly circular, that a pair of compasses could not define their margin with more truth; and coinciding so precisely with the walls of the cell as to be retained in their situation merely by the nicety of their adaptation. After this covering is fitted in, there remains still a concavity which receives the convex end of the succeeding cell; and in this manner the indefatigable little animal proceeds until she has completed the six or seven cells which compose her cylinder.

"What other architect could carry impressed upon the tablets of his memory the entire idea of the edifice which he has to erect and, destitute of square or plumb-line, cut out his materials in their exact dimensions without making a single mistake?"

When such are the marvelous works of an insect, are we wrong in inviting you to give a little of your spare time to the observation of Nature? And would it not be better for ourselves and ours had we but a wider knowledge of her material ways?

Gymnastics as a Remedy for Physical Debility.

The following extract from a paper by Archibald Maclaren, of the Oxford Gymnasium, published in the last number of the *Herald of Health*, shows in a striking manner the power of properly-directed exercise to restore muscular power and to develop that of persons naturally weak:

"The first detachment of non-commissioned officers, twelve in number, sent to me to qualify as instructors for the army, were selected from all branches of the service. They ranged between nineteen and twenty-nine years of age, between five feet five inches and six feet in hight, between nine stone two pounds and twelve stone six pounds in weight, and had seen from two to twelve years' service. I confess I felt greatly discomfited at the appearance of this detachment, so different in every physical attribute; I perceived the difficulty, the very great difficulty of working them in the same squad at the same exercises; and the unfitness of some of them for a duty so special as the instruction of beginners in a new system of bodily exercise—a system in which I have found it necessary to lay down as an absolute rule, that every exercise in every lesson shall be executed in its perfect form by the instructor previous to the attempt of the learner; knowing from experience how important is example in the acquisition of all physical movements, and how widely the exercises might miss of their object if unworthily represented by an inferior instructor. But I also saw that the detachment presented perhaps as fair a sample of the army as it was possible to obtain in the same number of men, and that if I closely observed the results of the system upon these men, the weak and the strong, the short and the tall, the robust and the delicate, I should be furnished with a fair idea of what would be the results of the system upon the army at large. I therefore received the detachment just as it stood, and following my method of periodic measurements, I carefully ascertained and registered the developments of each at the commencement of his course of instruction, and at certain intervals throughout its progress.

"The muscular additions to the arms and shoulders and the expansion of the chest were so great as to have absolutely a ludicrous and embarrassing result; for before the fourth month several of the men could not get into their uniforms, jackets, and tunics, without assistance, and when they had got them on they could not get them to meet down the middle by a hand's breadth. In a month more they could not get into them at all, and new clothing had to be procured, pending the arrival of which the men had to go to and from the gymnasium in their great-coats. One of these men had gained five inches in actual girth of chest. Now, who shall tell the value of these five inches of chest, five inches of additional space for the heart and lungs to work in? There is no computing its value, no power of computing it at all; and before such an addition as this could be made to this part of the body, the whole frame must have received a proportionate gain. For the exercises of the system are addressed to the whole body, and to the whole body equally, and before this addition could be made to the chest every spot and point of the frame must have been improved also—every organ within the body must have been proportionably strengthened.

"But I tried another method of recording the results of the exercises. I had these men photographed naked to the waist shortly after the beginning of the course and again at its close; and the change in all, even in these small portraits, is very distinct and most notably so in the youngest, a youth of nineteen, and as I had anticipated in him, not merely in the acquisition of muscle, but in a re-adjustment and expansion of the osseous framework upon which the muscles are distributed.

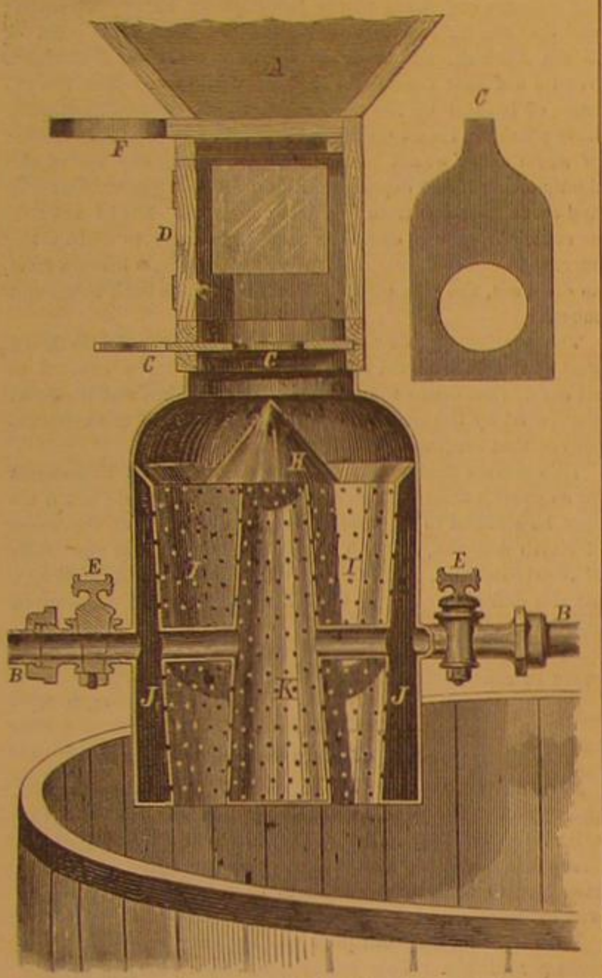
"But there was one change—the greatest of all—and to which all other changes are but means to an end—are but evidences more or less distinct, that this end has been accomplished, a change which I could not record, which can never be recorded, but which was to me, and to all who had ever seen the men, most impressively evident; and that was the change in bodily activity, dexterity, presence of mind, and endurance of fatigue; a change a hundredfold more impressive than any thing the tape measure or the weighing chair can ever reveal."

The inventor is as much a creator as the sculptor.

HARRIS' PATENT SELF-ACTING MASHING MACHINE FOR THE USE OF BREWERS.

This machine, after having been tried for a considerable length of time in one of the largest breweries in this city with success, and its merits thoroughly tested, is claimed to be a great improvement upon any other machine now in use, and its construction to be founded upon a more scientific basis.

From the porous structure and absorbent nature of malt, all that is really requisite to produce complete saturation is to bring each separate crushed grain or particle of grain into conjunction with the mashing water. More than this, such as violently striking or stirring the malt with quickly-revolving arms, rakes, or oars, does positive injury. It destroys the pores, beats the grain into a paste, and prevents the water



from flowing readily into and dissolving its soluble parts.

Before proceeding, however, to describe this new invention it may be well to give a slight sketch of the different means heretofore employed.

Up to the present time there have been three methods of mashing, each method having various modifications. The original course was to mash by hand with oars (stout bars of wood with sundry cross pieces at the end). The great objection to this was that the cover necessarily being off the tub, the temperature of the mash fell too low, rendering the ale produced from it liable to sour, besides the impossibility of properly stirring the contents of a large tub towards its center. Machinery was then introduced to do the work while the tub was kept closed, and the loss of heat avoided. These machines were of a variety of forms, but nearly all of expensive and complicated construction. The principle was the same in all—namely, to thoroughly mix the malt and water together in a closed tub. So far they succeeded, but it was afterwards discovered that the presence of machinery in the tub, among other evils, was a great hindrance to drawing off the whole of the extract. Water sprinkled on the top, instead of equally permeating the grain, dissolving, and carrying with it all the soluble portion, would form channels, and run down cracks and fissures, caused by the shafting preventing the grain from evenly rising through the sprinkling water.

The next improvement was to mash the malt and water together as they passed through a machine before entering the tub, leaving the latter clear of machinery. This machine consisted of a cylinder, down the center of which passed a shaft with cross arms made to revolve with immense rapidity. The malt and water coming together and flowing through the cylinder, were in this way completely mixed. The very rapid motion necessary, however, has been found to prove destructive to the internal structure of the grain, beating it too much into the form of a paste, and preventing the sprinkling water from properly permeating its pores.

An efficient machine that would be unaccompanied with any of these drawbacks has been a want felt by all thoughtful and scientific brewers; the being able to dispense with the aid of extraneous power being a further desideratum.

Such a machine, it is claimed, has now been invented. Its construction is shown in the accompanying engraving. The mode of working is as follows:

The ground malt being put in the hopper, A, and the water being heated to the proper temperature in a boiler or vessel (placed on an upper floor), from which the pipes, B, lead, one of a set of slides, C, having different sized openings, according as a thick or thin mash is desired, is inserted. The door, D, is closed, the two cocks, E, are opened to their fullest extent, and the slide, F, drawn out to the edge of the box. The malt runs down past the window, G, enabling the operator to see that it is working properly, and notifying him when it is all down. The malt falls on to the conical cap, H, dividing and passing on in a narrow stream to the space, I. Here it is met with, and has to pass through a large number of fine jets of water, discharged with great force from the vessel, J, and chamber, K, thoroughly saturating the grain, but without injuring its porous structure. The mash then falls into the proper tub placed under the machine. As soon as the malt is all through, the water is shut off, the slide, F, pushed in, the open slide, C, withdrawn, and a blank one inserted. This fitting in a double frame effectually prevents the escape of steam. The door, D, offers a convenient means for afterwards washing the machine off with a hose or sponge.

Among other things, the inventor claims these important advantages:

Simplicity of construction and cheapness, as no belting or connecting machinery is required. The machine being self-acting, all expense for steam or other driving power is absolutely saved; while the result is greatly superior—a much larger extract being obtained from the same amount of grain than when mashed by any of the old methods.

Patented, July 12, 1870. Machines manufactured at John Trageser's Steam Copper Works, 447 to 453 West Twenty-sixth street, New York city, where all information regarding them can be obtained.

PATENT METALLIC POST BUTT.

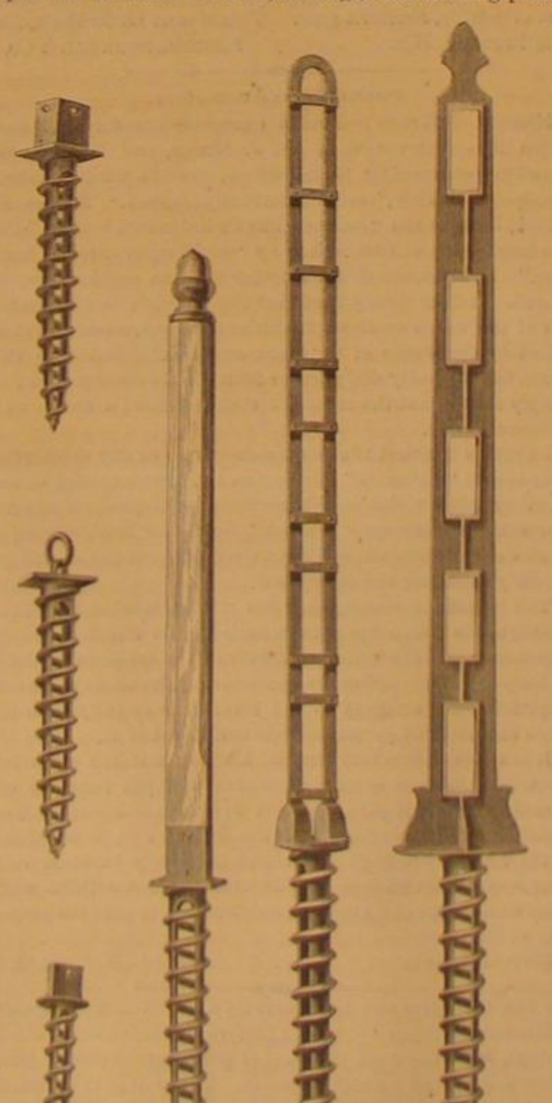
It is well known that a wooden post, having the butt sunk into the ground, will last for a few years only; the part in the earth will rot while the body of the post remains good. Many devices to make a cheap and durable post butt have been tried, but most have failed to give satisfaction.

The patent metallic screw post butt, shown in the accompanying illustrations, is designed to supply this want, and while it makes a cheap and durable post butt, it has another merit equal to, if not greater than its durability, and that is, that it can be put down without digging, saving time and labor.

This butt consists of a screw and a water-proof socket, having a flange that fits to the ground when the butt is sunk into the earth. The screw is gimlet-pointed and skeleton in form, so that in entering the earth the ground fills up the inside of the screw, making the butt solid. The body of the post is fitted into the socket with a small shoulder, when the post is complete, having a metallic butt that will last a long time.

The body of the post may be of any cheap wood, or the entire post may be cast iron, or the top wrought iron cast into the butt, as shown in the different engravings.

These butts are made of different sizes, and are equally well adapted for all kinds of fences, awnings, and hitching posts,



trellis work for yards and gardens, grape arbors, vineyards, telegraph poles, hop poles, ornamental seats for yards and parks, and for every purpose for which the old style of wood or iron post is used. The hitching post can be put down by removing but half a brick.

These butts are especially suitable for grape arbors and vineyards, as no digging around the roots is necessary. For prairie fences they are gotten up with a wrought-iron top for wood or wire. Those for ornamental seats have been adopted by the Superintendent of the State Capital Park, at Harrisburgh, Pa. We are informed these butts have been tested thoroughly for various purposes, giving entire satisfaction for strength, durability, and convenience.

A company to manufacture these butts has been formed, of which W. O. Hickok, of the Eagle Works, Harrisburgh, is President. Parties wishing to manufacture on royalty may address for further particulars the Harrisburgh Patent Screw Post Manufacturing Co., 411 Market street, Harrisburgh, Pa.

Poison Ivy.

I will pluck a leaf with a pair of fire-tongs, at arm's length, press it dry so as to make an exact drawing of it, and write a full account of this venomous plant. I will try to make the whole matter so plain that everybody can detect and avoid the vile thing which is making me so much trouble. These were some of my midnight thoughts, as I feverishly turned

in bed while suffering from its effects. Water saturated with salt, was my only remedy. The poison was followed by two generous crops of boils, about fifty in number, lasting for over two weeks. Now I can only look at the plant with a sort of subdued feeling, as though it were more than a match for me. Look out for *Rhus toxicodendron*, which trails in the sand, or among the bushes, or lurks in the grass like a treacherous serpent! To touch it means a face swollen to blindness, great irritation, itching, and smarting, and burning of the parts affected.

Poison ivy, or poison oak, is a humble shrubby vine, with light-green leaves and clusters of greenish flowers, looking something like the flowers of the grape vine. The leaves are compound, consisting of three leaflets, the size and shape of which are shown in the annexed cut, which illustrates the veins of the underside. It belongs to the sumach family, a group of plants which has rather a bad reputation, on account of several poisonous species it contains.

To some people it is harmless, even when the sap is rubbed on the skin, while others are sure to be affected even by touching the naked stems and buds. I have known instances in which some members of the same family were easily poisoned while others were not at all affected. Why do we not get vaccinated, as it were, and never get poisoned a second time? Do our entomological friends find any insects that can eat the leaves?

The plant most likely to be mistaken for poison ivy is the Virginia creeper.—*Entomologist.*

A 35-tun Gun.

We abstract from the London *Standard* the following description of the forging of a double coil which is to form a part of a 35-tun gun, now making at the Royal Gun Factory at Woolwich:

"Prior to the celebration of the chief work of the day the visitors present were taken to see the operation of coiling a 7-tun iron bar, drawn red-hot over a previous coil weighing about 4½ tuns. This coil was intended for one of the 10-inch guns, or 400-pounders, of which nearly one hundred will be made in the course of the present financial year. Some of them also took a glance at the colossal boring machine, where the trunnion-hoop of the 35-tun gun was being bored with a cylindrical aperture sufficiently large to receive the breech coil. The weight of the metal is twenty tuns, and the diameter of the aperture, as produced by the punching, is 40 inches. This is several inches too small for the gun, and the aperture is brought to its proper dimensions by the process of boring.

"About four o'clock the visitors were taken in the building known as 'the forge,' preparatory to the appearance of the great coil, which had been subjected to the action of the furnace for 24 hours. The men being all at their posts, and the gigantic tongs of 12 tuns weight being brought into position, the iron door of the furnace was raised. The tongs, swinging from one of the steam cranes, and manned by nearly twenty men, were thrust into the furnace, and drew out the massive coil. This being slowed round, the coil was thereby carried to its place, and deposited under the steam hammer, Concerning the coil itself, it may suffice to say that the outer coil weighed nearly 11 tuns, being formed of eighteen ordinary bars joined together at the ends, the total length being 201 feet. The inner coil, 170 feet long, weighed about 9 tuns, making, therefore, a total of 20 tuns as the weight of the whole. In a minute after the coil was withdrawn from the furnace the great hammer began its work, thundering down upon the whole hot metal, speedily reducing the hight of 9 feet or more, which the cylinder originally possessed. The broad face of the hammer, having a diameter of nearly 5 feet, was insufficient completely to cover the upper end of the coil, but the latter was shifted, so as to secure equal pressure. Presently a hollow mandrel of suitable size, in form resembling an ogival-headed shell was placed, point downwards, on the upper end of the coil, and driven fairly into the center of the mass, so as to fill up the otherwise open space. The coil was then skillfully thrown on its side, and made to rotate on the ground while the hammer struck its sides, the inserted mandrel preventing any distortion of figure. Lying on its side the coil still stood fully 5 feet high. The entire operation was most satisfactorily performed, its object being to weld together the whole of the coiled bars into one compact mass. To complete the operation the coil would have to be re-heated to the welding point, and hammered at the other end. So far there were no signs of failure, and we can only hope that the gun will stand as well in the proof as this portion of it has in the heating.

"Concerning the 35-tun gun, we may observe that another formidable operation has to be gone through, namely, the welding together of the trunnion hoop and the breech coil, when about thirty tuns of metal at a white heat will have to be dealt with. As for the time when the great gun itself will be ready for proof, our original estimate will most likely hold good, and we must not expect to find this stage arrived at until nearly the end of the year, though if it were needed the process would be expedited. In regard to the rifling of the gun, the twist will be sharper than that which has been observed in other big guns of the Woolwich pattern. A greater spin will thus be given to the projectile, which is the more necessary, as the smallness of the bore, coupled with the extreme weight of the projectile, renders the latter unusually long."

Correspondence.

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

Wharves and Piers for New York.

MESSRS. EDITORS:—As I understand, the question as to the best mode of constructing the wharves and piers for the city of New York is undecided, consequently still an open one. In reading the plans presented in your columns, though varied and differing materially in detail, yet I do not find them covering points that are to my mind important, and should be considered in the reconstruction of the wharves and piers for your city. As they may aid in making the present attempt a success, I venture to present them for the consideration of the commission appointed to decide upon the best plan presented for this great work, so necessary to meet the wants of trade and commerce, and as a sanitary measure for the protection of the health of your crowded city. Although wood has heretofore been the principal material used in the building of wharves and piers, yet it will be generally admitted that, though least expensive at first, it is, in the long run, the dearest, as it is less serviceable than stone or iron, and from its perishable quality requires constant repairing and renewal, and its absorbing nature makes it an active agent in poisoning the atmosphere with its exhalations drawn from the liquid filth floating in the docks washed from your streets and sewers. Stone and iron not being subject to these influences, the most durable of the two should be the one selected as the proper material for the principal part and the most exposed parts of the structure; and believing iron that one, I would propose that cylindrical piles of iron be sunk down to a solid ground base, and when thus set the piles be filled with stone and cement up to or above high water mark. The frame-work for the piers to be of iron, and the parts forming the water wall to be plated with iron, rolled to the desired size, these to be fitted in grooves in the sides of the piles, one above the other, up to the "string piece," which should be of heavy timber, and laid so as to extend a sufficient distance beyond the face of the pier, to prevent vessels from being chafed by the face of the walls. The plates forming the sides of wharves and piers to be set down below low water mark, and the open space within to be filled in with stone, coal ashes, and earth above high water. A double advantage would be thus gained, the prevention of floating decaying matter finding lodgment beneath the wharves and piers and giving additional anchorage to the structure, both of which are desirable and necessary. I would propose conducting the sewerage through sewers of iron, these to be laid under the piers to the end where they would discharge their contents in the currents, and would be thus more readily carried off to sea. To lessen the jarring caused by heavily loaded teams passing over the piers, I would lay the cartway with heavy planking, down the center of which I would lay a double-track iron railway for vehicles to pass on and off the piers.

Objections have been often made against the extension of piers out into the river, as interfering with the natural currents of the river, thereby increasing their force by these encroachments, and making navigation more difficult and perilous. As piers are necessary for the accommodation of your shipping, and the demands for additional facilities in this particular must increase, the present is the time, it seems to me, whilst remodeling your system of wharves and piers, for this to be considered, and, if possible, provided for. To that end I would suggest the abandonment of the present plan of arrangement of the piers by the substitution of one that will secure additional length to them without the necessity of extending the heads beyond their present line. As now constructed the piers extend almost in straight lines from the river front out into the river, and as a consequence their further extension brings out the objections mentioned. I would propose that the piers be constructed so as to head "*down stream*," which would prove an important increase of accommodation in the miles of piers extending around your city, and in the form suggested the washings of the streets, which now finds a quiet harbor in your docks, would more readily float out with the tide in its course to the sea, and vessels could enter them with equal if not greater facility than now. For the several reasons that I have offered I think my plan for docks and piers has some advantages over those hitherto presented.

U. B. VIDAL.

Philadelphia, Pa.

Speed of Circular Saws.

MESSRS. EDITORS:—We notice in your issue of July 23d, that Mr. C. H. Crane writes you from Greenville, Ala., the result of twelve hours' sawing with one circular mill, showing a total of 34,050 feet of boards and plank cut. He seems to think it a remarkable day's work. We think he did very well; but Ruddock & Gifford, of Manistee, Mich., within *eleven hours*, cut 220,773 feet of boards, joists, and scantling, with two circular mills, one a 54-inch, and the other a 56-inch saw, and a siding mill 36-inch saw. They also had in use two edgers. Doubtless Mr. Crane's "circular" did not edge the boards. But, in any view, it will be perceived that this is vastly in excess of the Alabama feat. There is no doubt of the correctness of this statement, as we have the lumber inspector's certificate. Besides, the lumber was sold in Chicago by the same "tally."

The first full day's sawing done at Danaher & Melendy's new mill (two circulars), in Luddington, Mich., tallied 73,000 feet for an eleven-hour's run. Your correspondent asks, "Has it (his sawing) ever been equaled?" We ask, has Ruddock & Gifford's ever been nearly approached?

In explanation, we would further say that the *great day's* sawing was done in Norway pine timber, on trial. Logs scaling 160,000 feet were selected for the day's work, supposing this would be enough; the balance was taken as it came, from the boom. The work of Danaher & Melendy is their ordinary average now.

If your correspondent claims an advantage of timber in our favor, we will state that Cook, Gibb & Co.'s mill (one circular and edger) *averages* 25,000, and on one trial cut 40,320 feet of boards, *Southern* pine. This was at Little Rock, Ark.

Milwaukee, Wis. MENZEL, STOWELL & Co.

Pocket Chronometers.

MESSRS. EDITORS:—Pocket chronometers seem to have fallen into disfavor with Mr. J. Muma, and he asks some questions concerning them, which, from a "watchmaker's standpoint of view," seem ignorantly foolish. It does not follow, because the "balance has an unlimited motion," that the hair spring can be broken by "winding or careless handling." I very much doubt whether such an accident *ever* occurred. It is certainly true that the very life can be shaken out of the watch by sheer muscular strength, so can a rat be killed by the shake of a "black and tan." But does that prove the rat badly designed or faulty in its construction? It simply shows that the rat can't stand as hard a shake as a terrier can give.

I venture to assert that no watchmaker, or any other man, ever saw so "valuable" a spring as Mr. Muma speaks of, and the very same violence and accidents will produce exactly the same deleterious "tension" upon the lever spring as upon the chronometer, and with the *additional* damage of inevitably breaking the ruby jewel.

The reason the watchmaker has "such trouble to get the spring to his notion" is not the fault of the chronometer escapement; it is the honest endeavor of the artist to adjust it to keep the most perfect time possible. The same pains-taking "trouble" attaches to the lever hair spring, when the same exactness of performance is demanded of it.

It is a lamentable fact that all kinds of watches are often treated in the most barbarous manner, and yet they are expected to endure it patiently, and without resentment. The watch, a machine as delicate as the human eye, is subjected to the violent windings and shakings of any ruthless man who may be rich enough to purchase one, but without sufficient knowledge of its delicate construction, to take the proper care of it.

Cleveland, Ohio. R. COWLES.

To Stain Butternut in Imitation of Black Walnut.

MESSRS. EDITORS:—To stain butternut in imitation of black walnut, wash the wood thoroughly with lime water (*Liquor calcis, u. s.?*) and varnish or polish. This will give a perfect imitation of the fine lines and grains, as desired. Have never experimented on other soft woods.

Cherry washed with lime water will make *good mahogany.*

Derby Line, Vt. FRONTIER.

Change of Course in the Gulf Stream.

MESSRS. EDITORS:—In the SCIENTIFIC AMERICAN, May 7, 1870, is a brief notice of a paper by Dr. Hayes, on the Northmen of Greenland, joined with Prof. Henry's remark that it devolved on some one to find data for the climatic changes, and suggests the theory of the first cooling of the earth at the poles.

I think that on reflection, Prof. Henry will abandon that theory as untenable, when he remembers that these changes have occurred within the historic period (A. D. 986), and not quite one thousand years ago.

It seems to me that another theory will account for the changes.

The uniformity of climate in Ireland, and the comparatively mild climate of Western Europe, is attributed to the Gulf Stream. Now from what we know of all large streams of water, they are constantly changing their courses. These changes are sometimes due to an obstruction to the current by some impediment that the stream *cannot* carry away in solution, and sometimes to a cut which the stream *does* make. Let us suppose that in A. D. 986 the Arctic current came down through Baffin's Bay, as it does at present, bringing with it innumerable icebergs and fields of ice loaded with stone and earth; and that the Gulf Stream then ran closer in to the coast of North America, and near to the east coast of Greenland. Would not East Greenland then have had somewhat the climate of Ireland or Norway, and would not the Northmen have considered it a very desirable country? Now this stream of warm water would be continually melting the ice of the Arctic current, and depositing along its west border the earth and stone it brings from the Arctic regions. Might not this be sufficient in the course of some centuries to deflect the current to the east, and so, deprived of its warm breezes from an open sea, the east coast of Greenland goes back to ice and snow.

The pouring of this current of water into the Arctic Ocean west of Norway, would render it necessary for a current to set *out* of that ocean somewhere, and if it takes the direction southward by the coast of Greenland, of course the temperature of that continent is still more reduced.

This deposit theory is not, however, sufficient to account for so great a change in so short a time (350 years); but if we may be allowed to suppose a gradual elevation of the coast of North America, and the bed of the ocean about the banks of Newfoundland, I think we will have a cause sufficient for the deflection of the Gulf Stream, and the consequent change of climate.

At any rate, I should look for the cause of the change, in ocean currents, and not in the cooling theory.

G. B. N.

Speed of Circular Saws.

MESSRS. EDITORS:—In Vol. XXIII., No. 4, new series, page 51, and signed C. H. Crane, an article appears on "Speed of Circular Saws and Saw Mills." Is it to be understood that Mr. Crane has made any new discovery on the speed of circular saws? or to feed three inches to each revolution is in any way extraordinary?

I have seen a fifty-four inch saw running at 1,000 revolutions per minute. This would run the periphery of the saw a little more than 14,000 feet per minute. I have also seen a thirty-six inch saw running 2,000 revolutions per minute, or a little more than 1,800 feet. If a circular saw is kept nicely balanced, made of good material, and of even temper, a very high rate of speed may be obtained with safety. The very best millwrights and sawyers differ widely on the proper speed and feed of circular saws.

Steel is possessed of an amount of elasticity, varying according to the quality and temper. A circular saw running at a very high rate of speed must be hammered open between the center and rim. This is in order to give the rim a chance to expand by the velocity. A saw may be hammered so that the center will be loose and drop each way, like the loose bottom of a tin pan, and so that it will not maintain a true or straight position on the mandrel when standing still. But when at a high rate of speed, the rim will be so expanded that the saw will become true and do admirable work. But the saw will only bear a certain amount of expansion and contraction, and, as I before stated, this somewhat depends upon the quality and temper of the saw. If very soft, it would bear expansion, but not much contraction. Saws running at great velocity are more likely to become expanded on the rim. Practically it is not a question of how great a speed may be obtained, but what rate of speed is most practical for all purposes or general use.

Three-inch feed for a sixty-six inch saw would be considered light by our Western sawyers, and 34,050 feet of inch lumber to be sawed on a test day's work moderate sawing. There are plenty of circular saws in Michigan and Wisconsin that run regularly on five inch feed, and some even on six. And many of those mills average 35,000 feet of lumber per day with one circular saw running ten hours. I will mention one mill that I timed three years ago. It is owned by Messrs. McCarther & Co., at Winne Conne, Winnebago county, Wisconsin, on the Wisconsin river.

I held my watch. A log sixteen feet long, that squared eighteen inches and four side boards, was rolled on to the carriage and sawed into inch boards, splitting the last plank in 4½ minutes. Eight boards sixteen feet long were sawed in one minute. This mill was not sawing on a test at the time, but was in the usual course of running. Allowing this log to make 424 feet of lumber, and five minutes time to saw each log, the mill would cut 5,088 feet per hour, and 120 such logs in ten hours, making 50,880 feet of lumber. I was told that this mill sawed 42,000 feet in ten hours. Other mills on the Wisconsin and Saginaw rivers claim to beat that amount. McCarther & Co.'s mill feeds 3⅜ inches, and the saw runs 750 revolutions per minute. I have known trouble to arise in consequence of running saws at too great a speed, and also in feeding too heavily. It should not be a question of how much speed a circular saw can be run, or how much feed can be crowded on. But what is desired is to ascertain what a saw will do, and do it well, day after day. I am inclined to think if Mr. Crane would reduce the speed of his sixty-six inch saw one fourth and add one fourth to the feed that the result would be more satisfactory in the long run. This, however, is a matter of opinion, and Mr. Crane may be correct. I hope we may hear from other experienced millwrights and sawyers on this subject. We cannot have too much light on this subject in this timbered country. J. E. EMERSON.

Pittsburgh, Pa.

The Workman in Switzerland--His Favorable Condition.

In the course of a series of articles in *Chambers' Journal*, entitled "The Artisan in Europe," the writer shows in a favorable light the condition of the workingman in the Republic of Switzerland, as compared with that of his fellow-workmen in monarchical countries:

"In Switzerland the mass of manual workers are better off than in countries of prouder pretensions. Not that the Swiss workmen are paid highly—we fancy few of them make so much as a pound a week—but they are helped in so many ways, that we hardly know how to set about the enumeration. In the first place, all Swiss children being bound to attend school up to the age of fifteen, first-rate schools are provided, which, if not in all cases free, provide education at a trifling cost, not exceeding (except in Basle) a charge of three francs—in Berne it is one franc—per annum, and even this is lessened in the case of poor people. So well is Switzerland covered with public schools, that private ones are scarce, and in some Cantons do not exist at all. After leaving the primary school the young artisan can continue learning at the 'Repetition Schools,' or the evening and Sunday schools, and can obtain a higher degree of instruction afterwards at the industrial schools to be found in the most populated districts. Then, in several localities, there are special institutions for special subjects. Geneva has its drawing school; Stanz, its school of design; Lausanne, its school for modeling, carving, and sculpture; and Lugano its school for instruction in the application of chemistry to art and industry.

"Nearly every commune boasts a circulating library, well stocked with general literature and technical works, and every town has its museum of art, archæology, and natural history. Since in the more lucrative trades, premiums are required with apprentices, institutions abound for the purpose of paying for the instruction of poor lads. At Locle, there is a school for instructing them in the mystery of watchmaking; and similar schools exist at Chaux-de-Fond and Geneva, where, for the payment of five francs a month, apprentices are taken and taught so well, that in three years' time they are able to earn their own livelihood.

"Most artisans either own or hold from their commune small plots of land, which contribute something towards their maintenance when work falls off or fails altogether. In the latter unhappy contingency, if he cannot get employment through the agency of some society, the workman has little difficulty in borrowing sufficient to supply his necessities for a time, either by depositing some article of his manufacture at a 'bazaar,' and receiving an advance upon it; or by borrowing upon his future wages from the savings bank, people's bank, or mutual credit society. In fact, there is too great a facility for borrowing, and in some towns the evil effects of the borrowing system are heavily felt.

"At all Swiss factories it is customary to sell food to the hands at cost price; then co-operative stores for the supply of provisions and other home necessaries are well supported, so that the workingman gets his meat and other food as cheaply as possible. His bath costs him nothing, and washing very little; in the principal towns there are public wash-houses, for the use of which, with their machinery for bleaching, drying, and ironing by steam, from three farthings to three half-pence an hour is charged. In forest districts it is usual to distribute fuel gratuitously; in other districts, the like is done by corporations, employers, and benevolent individuals. Almost the only thing for which the artisan is thrown entirely upon his own resources is clothing; the co-operative societies afford him no assistance that way.

"House room is in many cases provided by employers, in order that the men may be near them; where the employers fail the philanthropist and co-operative society step in. The accommodation consists generally of two or three rooms, kitchen, cellar, loft, and small garden, for which the occupier pays from 13s. 4d to 18s. 4d. a month, or less than that in some parts; while a single man can get board and lodging for the sum of six to eight shillings a week. There is not so much solicitude shown for him as for the married artisan. But the traveling workman is not entirely forgotten, free sleeping accommodations being supplied him by many public institutions. In Neuchâtel he can always be sure of a bed, and at Olten of a meal as well, without having to open his purse; while the 'hospices' and houses of refuge scattered over the summits of the Alps, over the St. Bernard, St. Gothard, the Grimsel, and other passes, are ever ready to open their doors to him, supplying him not only with a bed and as much food as he can desire, but when illness attacks him, providing kindly attendance for days together, with a parting gift of good shoes and warm clothing. All operatives are also very considerate to each other, and give a hearty welcome to their itinerant brothers.

"Although the Swiss works under very favorable conditions, he is not without his grievances. Like the jury-women of Wyoming, who were locked up four days and nights, he finds the privileges he enjoys are not without their accompanying evils. The exercise of his political rights involves a great loss of time; and in some Cantons he cannot escape exercise of them, fines being levied upon all citizens declining to take part in the various elections. Then his working days are diminished by the drill and field days which every Swiss, up to a certain age, is compelled to attend; while an over-abundance of religious festivals, in the Protestant as well as the Catholic Cantons, further limits his earning capacity. Those artisans—and they are many—who work at home suffer from too sedentary a life, although the evil is counteracted in some measure by the national fondness for walking and gymnastic exercises.

"Employers mix so much with their workpeople, and are so unwearying in their efforts to improve their condition, that a very enviable state of good feeling exists between masters and men; and the conflict between the two, which arose two years ago, at the instigation of the International League, was one of foreign origin, and left no ill feeling behind."

Improved Bogie Engines and Elastic Self-Adjusting Railway Carriage Wheels.

Mr. George Smith, M. Inst. C.E., of Belfast, Ireland, has, according to the *Mechanics' Magazine*, just introduced to the public some improvements in bogie engines, which consist of an arrangement of segmental-headed pins or bolts attached to framings of the engine and bogie, and so constructed as to allow of a true motion round the center, and admitting also of a compound transverse and circular motion by means of slots made in the slides. The engine, carriage, and bogie frames are always in contact, and sliding upon each other. The weight is equally distributed amongst the wheels of the bogie by means of a system of compensating levers connected to the springs.

The novelty of these wheels consists in the body, hoops, spokes, or disks being suspended to the tires. By such an arrangement the tires are in compression as well as the body, spokes, or disks, while the hoop is always in tension; the reverse in principle to the constructions at present adopted.

The advantages are cheapness, lightness, durability, greater safety to the trains, especially at high speeds, as the tires cannot separate or break from the body, hoops, spokes, or disks of the wheels; nor can they mount the rails. As the tire shears, instead of biting, there are less jolts, less tear and wear to engines or carriages and permanent way; no skidding or sliding or lateral concussions, nor any necessity for double rails at sharp curves. The improvement also prevents torsion to cranks and axles. As the tires regulate themselves to the irregularities of the permanent way, there will be less straining or vibration of the bridges on account of the elasticity of these wheels. Lastly, it is found that with these wheels in use there is no need to loosen the ballast, as is often done, to give elasticity to the rails, so as to lessen the hammering of the rigid wheels as at present constructed. The jolts and jars now felt in going over loose joints of the rails, and especially on bad, rigid, or frozen roads, are greatly if not entirely prevented (a boon to passengers, especially in long journeys). The arrangement also enhances the safety of the body's spokes, or disks of the wheels, whether made of wrought or cast iron; as they are loosely suspended in elastic steel or iron hoops, they may expand or contract without strain or contortion to the several parts, under all changes of temperature, whereas in the tire and body of the old wheel there is a constant danger, in consequence of their unequal expansion and contraction, more particularly in sudden changes of the weather. These improvements are obtained by suspending the axle from the top of the wheel by means of an elastic steel or iron hoop, which allows for any inequality in the rails, while at the same time the tire is free to revolve independently of the body of the wheel.

The disadvantages or defects of the present wheels are their tendency to mount the rails, and their liability to sliding and lateral concussions, thereby occasioning oscillations of the train, matters which not only engineers but ordinary railway passengers cannot fail to have observed; but, beyond these defects, and not so obvious to the uninitiated, are loss of power in traction by the unequal wear and tear of the tires; also unequal expansion and contraction of the tires and body, torsion of the cranks and axles; and these defects are greatly increased, should the frames of the engine or carriages get out of the square by twisting or straining, leaving out of the question bad roads, unequal lengths of the rails at the various curves, all of which have to be taken into consideration, independently of the straining and vibrations of the bridges when passing over, as well as the enlargement of the engine tires, when they have to be taken off and reset. There is also the ever-present danger of the tires, when at high speed, separating or breaking from the body of the wheel, to the destruction of the train and danger of life, all owing to their being fixed on the axles.

The object of the self-adjusting, elastic, or suspended wheels is to obviate the above-mentioned disadvantages or defects of the fixed wheels now in use, to obtain which is to have the elasticity as close as possible to the working point between the wheel and the rail, as all unnecessary weight interposed between the axle and the rail is adding inertia, thereby increasing the wear and tear of the wheels and rails.

An Excellent Opportunity for a Fortune.

The editor of the *Working Farmer*, one of the best of our agricultural weeklies, makes the following suggestion regarding improvements in agricultural machines:

"There is a large field open for inventors in the line of efficient labor-saving agricultural implements of several kinds, and especially as it regards subsoil plows. There are several kinds of instruments now constructed for the purpose of pulverizing the substratum beneath the surface soil; but, they are all very far from possessing the efficiency which is of pre-eminent importance in an implement of this character. The implements in use, at the present day, which are employed to loosen and pulverize the subsoil, often render a portion of it more compact than it was before the plow was driven through the stubborn ground. When the substratum is composed largely of argillaceous and unctuous clay, if a subsoil plow be employed to pulverize a portion of it, say a few inches in depth, the share and flange will pass through the clay, almost like a "mole ditcher," compressing the compact clay into a still smaller compass than the particles ever were before. If the flange of the plow be elevated so as to lift the furrow slice higher than usual, much of it will drop back in its original bed, without having been pulverized to an extent that would be of any practical value to the growing crops.

"The great desideratum in a subsoil plow, is an implement so constructed that it will reduce the compact substratum beneath the surface mold, to such a fine state of comminution, that water will settle down through it as fast as the rain descends. One great object in subsoiling is to render the lower portion of the seed bed so fine and mellow that roots of growing plants will meet with but little resistance in their passage through the compact particles. When the impervious substratum is broken up and rendered firm the process obviates the necessity for underdraining. Hence, the construction of the implement must be of such a form that it will break up and pulverize the furrow slice thoroughly, and leave the fine particles in the bottom of the furrow that was made by the common plow. When the surface soil and the subsoil are both of such a character that it is desirable to turn the subsoil to the surface above the fertile mold that constitutes the soil, a subsoil plow is not required. On the contrary, when the character of the surface soil is such that it is of eminent importance to keep the mold on the surface, a subsoil plow is indispensably requisite.

"Inventors can readily perceive by these suggestions what are the operations to be performed in subsoiling. Hence, the person who will bring out an efficient implement for this purpose, can scarcely fail to secure a fortune, provided he will manage judiciously with his invention.

A Murderous Sea Flower.

One of the exquisite wonders of the sea is called the opelet, and is about as large as the German aster, looking, indeed, very much like one. Imagine a very large double aster with ever so many long petals of a light green, glossy as satin, and each one tipped with rose color. These lovely petals do not lie quietly in their places like those of the aster in your garden, but wave about in the water; while the opelet generally clings to a rock. How innocent and lovely it looks on its rocky bed! Who would suspect that it could eat anything grosser than dew or sunshine? But those beautiful waving arms, as you call them, have another use besides looking pretty. They have to provide food for a large, open mouth, which is hidden deep down among them—so well hidden that one can scarcely find it. Well do they perform their duty, for the instant that a foolish little fishlet touches one of the rosy tips he is struck with poison as fatal to him as lightning. He immediately becomes numb, and in a moment stops struggling, and then the other beautiful arms wrap themselves around him, and he is drawn into the huge, greedy mouth and is seen no more. Then the lovely arms unclose and wave again in the water, looking as innocent and harmless as though they had never touched a fish.

Improvements in Medical Instruction.

Optics and photography are now employed with success in imparting medical instruction to students. The leading medical hospitals and colleges in this country and Europe now regularly employ skilled photographers whose business it is to take photographs from the patients of all peculiar manifestations of disease or surgery. Faithful representations of the general appearance of a patient, or of a diseased member, such as the limbs, the throat, the eyes, the hair, are obtained. These may be subsequently enlarged or reduced as desired, and reproduced on glass in the form of transparencies, then colored with transparent pigments. By means of the magic lantern the pictures are thrown upon a screen and magnified so that the minutest parts are rendered clearly visible to large audiences. For medical instruction this method is of great value by reason of its extraordinary accuracy and distinctness.

Reading by Machinery.

Peter F. Carr, of Camptown, Pa., says he has invented a method of reading books by machinery, which he avers will be one of the marvels of science, calculated to astound the world.

We are not informed as to the particular form or advantages of the invention, but we presume that it is intended, like some other labor-saving machines, to do the work of at least one hundred men. If so, one may read a hundred books at once, or perform the literary labor of an entire week in half an hour. For editors, lawyers, and other scribblers, what a boon will this invention prove! With two or three of these machines a man might make himself immensely learned, for he would be able, in one year, to read up all the principal books in the world.

Mr. Carr wishes the assistance of inventors, artisans, capitalists, and men of means and education in order to develop his grand discovery.

THE composite roller now in use by printers was the chance discovery of one Edward Dyas, printer and parish clerk of Madeley, in Shropshire, England. His glue-pot having been upset, and Dyas not having a pelt-ball ready at hand, he took up a piece of the glue in a soft state, and inked a form with it so satisfactorily that he continued its use. He afterwards added treacle to keep the glue soft.

Improved Shingle Machine.

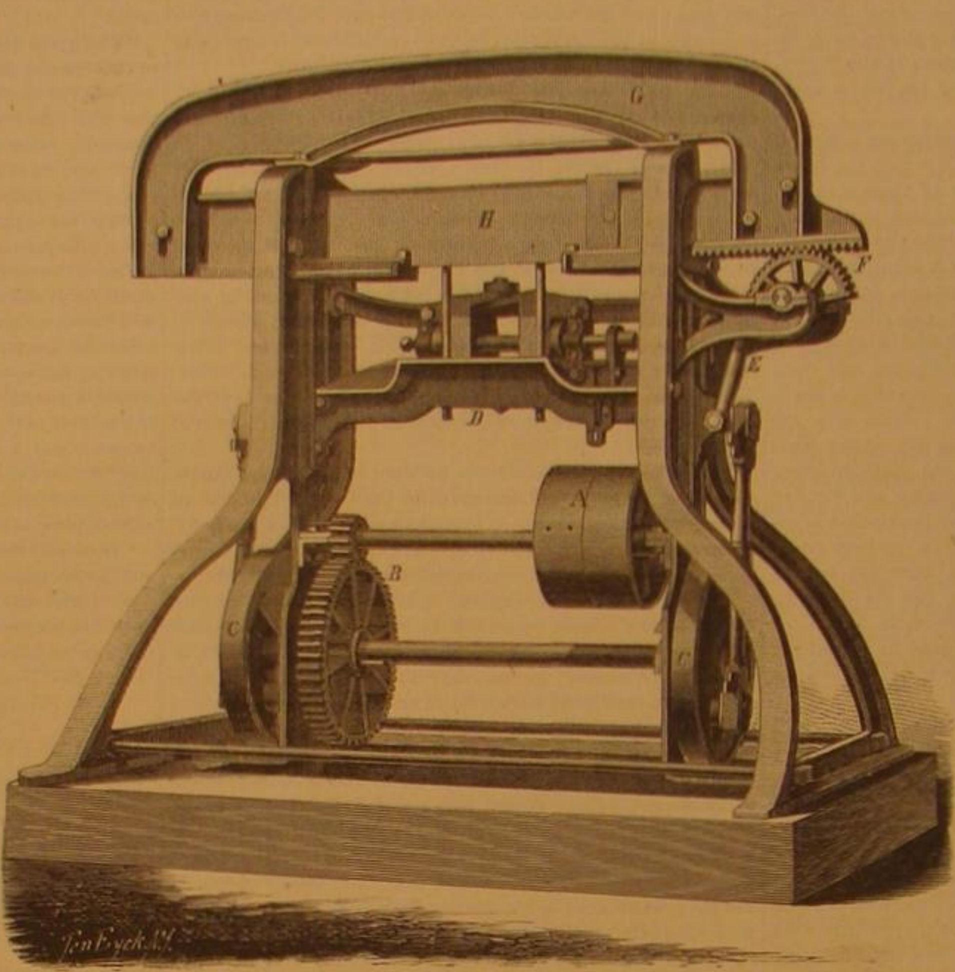
Our engraving illustrates a new machine for cutting shingles from steamed bolts, whereby much better shingles are made than we have ever seen produced by any other machine operating on a similar principle. In fact, shingles which have been shown us as samples of the work done by this machine, and which the inventor assures us are only a fair average of its work, are certainly better than sawed shingles, being remarkably uniform in thickness and taper, smooth on the surface, and totally free from checks.

This result is obtained by using a very thin, broad knife, and giving it a drawing stroke in cutting by means hereafter to be described. The parts are few in number and of simple form. They are all well shown in our engraving, except the device for gaging the taper of the shingles, which is partly concealed by other more important parts of the machine, but the principle of which will be easily comprehended from the description below.

The machine receives motion at the fast and loose pulleys, A, transmitting it through the gear and pinion, B, to the crank wheels, C. These impart vertical reciprocating motion to the beam, D, which carries a table upon which the steamed bolt is placed in cutting.

The pitman, E, which has its lower end pivoted to one end of D, operates a radial lever, not shown, which gives reciprocating motion to the toothed sector, F, and to a rack attached to the straining beam, G. This straining beam is very rigid, is arched, as shown, and carries a long, thin, and broad knife, H, stretched very tightly between its extremities by means of screws. This knife is from one foot to fourteen inches in width, and its thickest part is not more than three eighths of an inch.

The rack and toothed sector, F, cause this knife to traverse from end to end, while the beam, D, carrying the table and bolt, is pressed upwards towards its edge, thus securing a drawing stroke lengthwise of the grain.



AUSTIN'S IMPROVED SHINGLE MACHINE.

The bolts are placed by the attendant upon the table, and held up against guides which operate automatically, in conjunction with the other movements of the machine, to thrust first one end forward and then the other, so as to give a uniform taper to the shingles. This movement is effected by two cones affixed to a shaft in such a manner that the action of the cams upon their bases and a coiled spring between them causes the cones to reciprocate in a longitudinal direction with reference to the bolt; and the cones acting on suitable devices produce the alternate advance and retreat of the guides as required.

Each ascent of the table cuts a shingle, and the extreme thinness of the knife, rendered possible by straining it like a saw in the arched straining beam, obviates the checking and splitting, hitherto the chief objection to machines of this class.

The machine makes seventy twelve inch cuts per minute, and hence works with great rapidity; and while in our opinion it makes a better shingle than can be done by sawing, it saves all the waste of saw kerf. This saving is itself a large profit to the manufacturer.

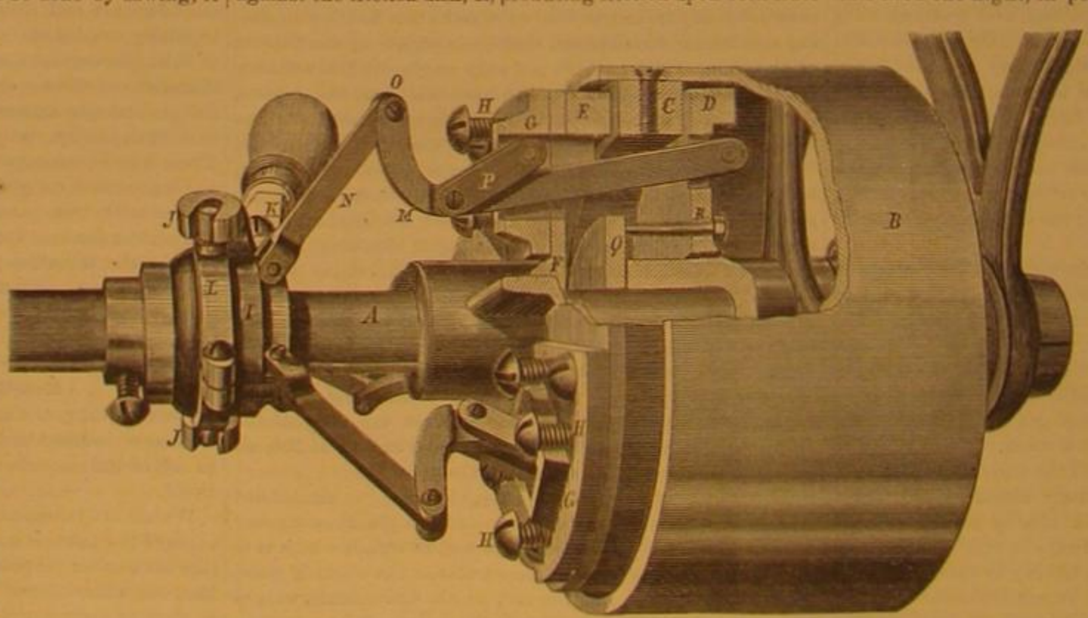
The tension given to the knife is ten tuns, and this prevents all trembling or stammering in its cutting.

The shingles made by the machine have, we are informed, been laid and tested in actual use, proving themselves equal to all requirements of first class shingles.

Patented July 19, 1870, by James E. Austin. Address for further information James E. Austin & Co., Syracuse, N. Y.

Improved Friction Clutch.

The convenience and freedom from shock in the use of friction clutches have rendered them almost essential to many kinds of machinery. Many devices of this kind have, however, proved unsatisfactory in use, as they were likely to get out of order, had in some instances no provision for taking up the inevitable wear, and otherwise proved troublesome to manage.



LULL'S FRICTION CLUTCH.

The device herewith illustrated, fulfills, it is claimed, all the conditions of a first-class friction clutch, and although we have not seen it in operation, except on the working model sent us, this operates excellently. We have also been shown certificates from those who have used this clutch in saw mills and in gang saws, testifying to its very satisfactory working for these purposes, perhaps as good a test of such a clutch as can be made.

Our engraving is a perspective view of the clutch, with portions broken away to show details of construction.

A is the shaft, and B a pulley arranged to revolve on, and independently of the shaft when not clutched.

C is an annular disk, or ring, attached to the inside of the rim of the pulley by screws, or in any other desirable manner. D is an interior disk, and E an outer annular disk or ring. The disk, D, is made to approach and gripe the fast ring or disk, C, and thereby produce the required friction.

The friction disks, D and E, are connected with the disk, F, by a link system, F being keyed to the shaft.

The triangular plates, G, are attached to F by screws, and these plates have also adjusting screws, H, which take up the wear of the friction disks.

The hub, I, revolves with the shaft, and is made to slide thereon by the forked lever, J. This lever has its fulcrum at K, and is connected with the hub by a band, L, fitting a groove in I. The band, L, is made like an eccentric band, in two parts, and has lugs with which the lever, J, engages.

The inner friction disk, D, is connected with the sliding hub through links, M and N, the links, M, being bent, as shown; M being pivoted to D, and N to the hub, and the two being pivoted together at O.

The outer friction disk, F, is connected with the links, M, by the links, P, pivoted at both ends. The links, P, are placed at an angle with the links, M, so that when the outer ends of the latter are moved away from the shaft, the disk, D, is pressed against the ring, C, drawing it and the pulley, B, against the friction-disk, E, producing friction upon both sides of C, and thus clutching the pulley to which C is fixed. A collar, Q, is pulled back by the bolt, R, which connects it with the disk, D, whenever the pulley is released from the action of the friction disks, and draws the pulley away from the disk, E, so that it revolves without friction, or remains at rest, as the case may be.

The principle of the toggle-joint is embodied in the system of links, so that great purchase is obtained, and the motion of the lever necessary to clutch or release the pulley is very slight. Patented, May 31, 1870, through the Scientific American Patent Agency, by Orrin Lull, of Rochester, N. Y.

Address, care of Kidd's Foundery and Steam Engine Manufacturing Company, 106 Mill street, as above.

Remarkable Illumination of the Sea.

A correspondent of a German journal, writing under date of April 11, from the Gulf of Siam, says:

"Last night, between two and three o'clock, I had the opportunity of witnessing an illumination of the sea of the most peculiar kind. It had become quite calm, after a sharp breeze which had sprung up from the N. N. W., caused by a passing storm in the distance. Heat-lightning was still very frequent in the west horizon, and the sky was covered with light clouds, through which the moon shone rather brightly. We took in sail and set the engines going. I then noticed in the water large white flakes which I had at first taken to be reflections of the moon; they were about a fathom in diameter, apparently lusterless, and of no particular shape, like objects seen lying deep in the water. By the rising and falling of the sea's surface these flakes floated off to a short distance from the ship without imparting any noticeable increase of brightness to the water illuminated by the moon's rays. After steaming further forward for six or seven knots, a most wonderful spectacle presented itself. On both sides obliquely in front of us, long white waves of light were seen floating towards the ship, increasing in brightness and rapidity till at last they almost disappeared, and nothing was observed but a white lusterless, whirling (*schwirrendes*) light upon the water. After gazing for some time it was impossible to distinguish between water, sky, and atmosphere, all which were but just now clearly distinguishable, and a thick fog in long streaks appeared to be driving upon the ship with furious swiftness. The phenomenon of light was somewhat similar to that which would be produced by the whirling round of a ball striped black and white so rapidly that the white stripes seem to be lost and blended with the dark ones. The light was just as if we were enveloped in a thick white fog. The direction of the waves of light upon the ship was always on both sides obliquely from the front. The phenomenon lasted about five minutes, and repeated itself once more afterwards for about two minutes.

"Without doubt, therefore, shoals of small creatures in the water were the cause of this luminosity, and the waves of light find their cause, according to my conviction, in the white flakes above described. Yet their moderate velocity of one and a half geographical miles per hour, and the weak light at first emitted by each flake, so weak as not to influence the tint of the surface-water, does not seem calculated to call forth a phenomenon of such magical effect as the one described. The luminous appearance commonly seen in the wake of a ship, or in water disturbed by oars or rudder, is not to be compared with such a phenomenon as the above. In the former the light is lustrous, glaring green and blue, like phosphorus, often very splendid in deep clear water, mingled with a reddish white foam. We saw a beautiful instance of this kind one night, in perfectly still and smooth water, in a lonely bay of Nipon. It was pitch dark and perfectly quiet, when a heavy shower of rain came on, in large but not dense drops. Every drop as it struck the water became illuminated, little drops of fire sprang up in the air, and a little luminous circle formed itself. It seemed as if the bay was suddenly filled with little flowers of fire. This phenomenon was almost immediately dissipated by a puff of wind."

Rustic Picture Frames.

Rustic wood for this and other purposes is in great favor now-a-days. With a little care in selection of material, and skill in handling tools, we may frame our engravings and paintings at slight cost. Oak wood, denuded of the bark, presents a beautifully corrugated surface, out o which the knife easily removes the few fibres which adhere, and it is ready for varnishing as soon as it is seasoned. The "season cracks," should they occur, may be filled with dark brown putty, and will even heighten the general effect.

Take a thin board, of the right size and shape, for the foundation or "mat;" saw out the inner oval or rectangular form to suit the picture. Nail on the edge a rustic frame made of the branches of hard, seasoned wood, and garnish the corners with some pretty device, such, for instance, as a cluster of acorns. Ivy may be trained to grow around these frames with beautiful effect.

THERE are 12,000 windmills in Holland at the present day, for the simple purpose of drainage.

Scientific American,

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Contents:

(Illustrated articles are marked with an asterisk.)

IMPROVED WEAPONS IN EUROPEAN WARFARE.

The busy, progressive, unresting brain of the nineteenth century is pressing into its service all the powers of nature for the purpose of ameliorating the condition of mankind. It has made the ocean its highway, electricity its messenger, and fire and water its willing slaves. Chemical and physical forces have been, so far, compelled to bear the burden of the primeval curse that, were it not for the ever-increasing desires and artificial wants of man, it could hardly be said that he is compelled to eat his bread in the sweat of his face. Aside from the pleasure that is experienced in triumphing over difficulties; the sense of power which is felt in subduing the forces of nature, which makes inventing, to a certain class of minds, the most fascinating of pursuits, the pecuniary results of any successful and useful invention, in days when all are making haste to be rich, are so tempting that inventive genius everywhere is called into untiring, ceaseless activity.

Well would it be for the human race, were our civilization sufficiently advanced, so that this inventive genius, almost omnipotent for good, should never be called into play for the purposes of evil. But a power for good is always a power for harm. The same class of brain, which, if benevolently directed, ameliorates, saves, and blesses, may curse, kill, and destroy. The same faculties that have given us the telegraph, the railroad, the steamship, the mower and reaper, the sowing machine, the printing press, the sun picture, in short, devices innumerable for our comfort and happiness, have also given us engines of destruction which more than rival the thunderbolts of heaven, and which are scarcely exceeded by the earthquake and the volcano.

Now, when the vast armies of two of the great European powers stand confronting each other, and the civilized world is awaiting with breathless anxiety the shock which will be felt throughout Christendom, one shudders to contemplate the terrible means of mutual destruction, almost mutual annihilation, in the possession of both parties. Our own recent terrific civil war called into play American inventive genius to an extent and with a success which astonished the world. Artillery of unprecedented range and power, projectiles of apparently irresistible force and unlimited destructiveness, were met by contrivances for defense almost impregnable. Strategy, traditional military method, personal courage, individual prowess, all that had, in former times most largely contributed to the success or defeat of armies, occupied but a secondary place when compared with mechanical ingenuity in constructing appliances of attack or defense.

The *Merrimac*, which, in her iron armor, could defy and destroy almost our whole wooden navy combined, was disabled by the little nondescript looking *Monitor*, and, from that moment, the existing navies of the world were obsolete. It was a struggle on the one hand to make irresistible ordnance and projectiles, and on the other to construct impenetrable armor for vessels on the water and impregnable fortifications on land. Shot that almost reminded one of the mountains hurl- by the combatants in Milton's war of the celestial powers, glanced harmless from plates of steel, or imbedded themselves in yielding but still obstinate earth-works. And yet, the improvements in cannon and their projectiles are really not half so important as modern advances in small arms. The invention of the hollow-based conical bullet so fearfully effective in the Crimea, in the war between Russia and the allies, and which, fired from the Springfield rifled musket, was in most general use in our army, and above all, the introduction and perfection of the breech-loading carbine or rifle, have worked, or are working, as great changes in military operations on land as iron armor has wrought in naval warfare. Napoleon I. is said to have asserted that "Providence was on the side of the heaviest battalions," but in modern warfare, not to speak irreverently, Providence is likely to be, as it was at Sadowa, on the side of the best small arms. In that remarkable and decisive battle, it will be recollected that the Austrians, with their comparatively ineffective weapons, were completely at the mercy of the Prussians, with their fearful needle gun, and, although we have mysterious hints about certain terrible agencies which are to be brought into play in the coming struggle by the wily French Emperor, yet it is altogether probable that the relative efficiency of the small arms of the contending powers will be really the important and most decisive element in the contest.

It is the fearful *Chassepot* against the terrible *Zündnadelgewehr*. It is to be the first great contest in which both contending armies are provided with breech-loading weapons. At Sadowa the needle gun, and at Mentana the chassepot wrought unpecedented destruction, but these weapons were not opposed by those of a similar character. In our civil war, only a comparatively small portion of the troops were armed with breech-loaders, and, as we have said, the principal small arm was the Springfield rifled musket, which was confronted on the part of the Confederates by the Enfield rifle, or by a weapon of nearly the same make as ours. But now armies of immense numbers and perfect discipline, wielding the most destructive of all weapons, the breech-loading rifle are to confront and do battle with each other. What is to be the result? It is not possible to foretell. If the battle should be tried, as of old, "man to man and steel to steel," if there is to be anything like "square, stand-up fighting," the result must be speedy victory to one side, or annihilation to both.

On the side of the French, it is said the *Mitrailleuses*, or *les filles du commandant*, as they have been sportively called, are to play an important part. It is stated, that recently three hundred horses, bought from a "knacker," for a few francs each, for the purpose of the experiment, were killed by two of these weapons in three minutes, and that, subsequently, five hundred horses were destroyed with still greater rapidity. It is quite possible that there may be something sensational about these reports, as with regard to other marvelously destructive devices, the possession of which is darkly shadowed forth by report and rumor as in possession of the French, and to be operated in the coming contest. But about the small arm there can be no doubt. Although, in the opinion of experts, neither the chassepot nor the needle gun is in any way superior, if equal to our best breech-loaders, yet both theory and experiment have demonstrated them to be so murderous in their effects, that protracted open-field fighting between armies provided with these weapons is impossible. It must, as we have said, either terminate speedily or annihilate both. Yet it is questionable whether this will really tend to shorten the war itself. One of the most striking practical results of the use of the breech-loader is the advantage thereby given to the defensive in military operations. The advantage of the initiative, the offensive, the sudden dash, the brilliant charge, is gone, and gone forever, between troops at all equally matched in numbers and *morale*. With breech-loaders, well-drilled soldiers can load and fire in any position—as well lying flat upon the ground as in any other. The soldier, in working his piece, is not compelled, as with the old muzzle loader, to elevate or expose his arms, and without in the least checking the rapidity or impairing the efficiency of his fire, he can place himself so as to be covered by any slight advantage which the ground may offer; or, if not covered at all, by lying flat upon the ground and only elevating his head sufficiently to sight his piece, he is very little exposed as compared with one who is delivering his fire from a standing position. These points are of immense advantage, not only in skirmishing, but in fighting on the defensive in line of battle. But suppose both parties to fight without cover, to stand up and give and take. The defensive, standing firm, has decidedly the best of it over the offensive, advancing to attack, in steadiness and accuracy, as well as rapidity of fire, and it may be laid down as impossible for any body of troops, no matter how courageous or well disciplined, to advance directly upon and under the fire of a line of battle, armed with breech-loaders, and delivering, at short range, steadily and accurately, ten, eight, or even six discharges per man per minute. But this is not all. A very slight intrenchment, a breastwork such as our troops in the Army of the Potomac used frequently to construct in an hour, suffices completely to cover a line of battle, and to render it, as far as any attack by the front is concerned, invincible. Even with the Springfield or Enfield muzzle-loading rifle and conical bullet, this was nearly the case with the armies of both sides, in our civil war. Two hours' time, with intrenching tools, rendered the defensive as good as an odds of three to two, or two to one. But with the breech-loader, discharged from a rest, under the cover of an intrenchment, and with the steadiness and confidence which troops feel under such circumstances, a very slight intrenchment is, as against troops advancing, and, of course, entirely exposed, absolutely impregnable. It was this, though to a less extent, with our muzzle-loading arms, which rendered many of our most sanguinary conflicts so indecisive. Unless the worsted party was completely routed, and at once, a skillful retreat of a few miles, a judiciously chosen position, and a very few hours' work, and the apparently defeated force stood like a rock. From all this, it would seem by no means impossible that the destructiveness of modern arms, which would appear, at first, calculated to make the present war in Europe "short, sharp, and decisive," may really prolong the conflict. The saber, the bayonet, the solid assaulting column of infantry, the thundering charge of masses of cavalry can no more succeed against implements of modern warfare, than the spears, the shields, and the solid squares of the old Greek phalanx.

It may take the warring forces a few months to learn fully all the lessons taught by the breech loading rifle, but it seems not impossible that, unless the contest is decided by one or two murderous engagements, as at Sadowa—which is scarcely probable—the result may become more a question of resources and endurance than of brief campaigns and brilliant, decisive battles; that we may see magnificent armies confronting each other, in intrenchments, for weeks and months, neither daring to hazard the attack, and that maneuvering for position, cutting off communications, raids upon bases of supplies, etc., may become the order of the day to even a greater extent than with us during our recent war, and thus the conflict may become much more protracted and less sanguinary than has been anticipated.

THE LAW OF COMPENSATION.

All about us is silently working a law by which all life continues, from the tiniest plant to the loftiest forest tree; from the microscopic animalcule up to man himself. This law may be called the law of compensation.

Farmers in certain sections find their wheat destroyed by weevil, or the plum trees by the curculio. They cease to grow wheat and plums. Years pass, and finally some individual concludes to sow an acre or two of wheat, or plant a plum tree. He is surprised to find the weevil and the curculio gone. His neighbors follow his lead, and soon the wheat and plums are restored to their former favor among the crops profitable to the section. The food of the insects being removed, the insects die. By and by they will gradually creep in again from distant sources, and the same result will be experienced.

The husbandman kills off one scourge only to find that some other as bad as the first multiplies to ruin and desolate. The sparrows brought to New York and Brooklyn could not be kept in the parks until the squirrels were removed. The sparrows have done the service they were expected to perform, and have effectually destroyed the disgusting and destructive caterpillars which infested the trees previous to their importation. Now the number of these brisk little chatterers has so increased that they are themselves becoming a nuisance. They roost in large flocks in trees before residences, and cover the walks and fences with filth. It would seem almost necessary to go back to squirrels again in order to diminish the numbers of the sparrows by the destruction of their eggs.

Death is necessary to life. Smellie, in his "Philosophy of Natural History," has attempted to show that the total destruction of any species must ultimately destroy all. The total destruction of life was recently prophesied by an able chemist from the ultimate conversion of all the carbon on earth into carbonate of lime, through natural processes now going on.

It is probable that neither of these authors has taken into account the possible compensations which might prevent the results named. If in the case of the destruction of a species the food of another species were destroyed, and if this latter species could, under impulse of keen hunger, feed upon no other species, and if this were the case with each successive species deprived of food by the destruction of a preceding species, the reasoning would hold good. But such a supposition does violence to our knowledge of the magnificent compensations of nature. The higher we ascend the scale of existence the less we shall find the sustenance of any one species limited to single sources, and the more difficult the conception of its possible extinction. So in the geological changes the earth is destined to undergo, it is quite possible to conceive compensating influences which shall avert the disasters some are fond of predicting. The cycles of nature are so vast, and man in his weakness can see only such a small portion of a cycle, that it seems the hight of rashness to attempt the filling out of the portion we cannot see from the comparatively few cosmological data we have been able to grasp.

The law of compensation is, however, capable of being applied to the benefit of mankind. We have seen how the decrease of one species involves the increase as well as decrease of others. When a rival is destroyed, that which fed upon it loses a portion of food; that upon which it fed has one less destroyer.

We are at present in this country overrun with hosts of destructive insects. Not a flower grows, not a single fruit reaches maturity without attack from these voracious hordes. Horticulturists are sorely perplexed to relieve themselves of these ravages. Relief, if it ever comes, will come by a wise recognition of the law of compensation. Before resolving upon the destruction of any race of animals whose numbers have so increased as to become a nuisance, it should first be known what pest will unexpectedly rise in its place, and to what extent its numbers may be reduced without incurring greater damage than is at present sustained. In this way man, acting intelligently instead of blindly, as heretofore, may so reduce the numbers of such insects as dispute with him for food that they will cease to greatly annoy him. This cannot, however, be done without thorough knowledge of insect life, and it is thus that the science of entomology becomes one of paramount importance to the human race.

Few are prepared to believe that insects devour and destroy more vegetation than all other animals, including mankind, do; yet such is undoubtedly the case; and man finds that although he can cope with any of these insects individually, their vast numbers render them formidable enough to often render famine imminent.

But if we remember that not one of these races of insects exists which is not food for some other insect, bird, or animal, we have the clew to the remedy for their ravages. Keep the power of the eaters and the eaten properly balanced, and their mischief will cease to terrify.

SARATOGA SPRINGS.

This popular summer resort seems to have lost none of its prestige, judging from the crowds of people who have visited it during the present season. Its hotels are filled, its numerous springs still flow abundantly, and their waters are eagerly sought for by those who are sick, or imagine themselves so, and those who, being well, desire to remain so.

In our recent visit to this watering-place, although we must confess its attractions are many, and its hotels conducted in model style, we were led to entertain some doubts as to whether more benefit than harm is derived from the profuse and indiscriminate drinking of the water by visitors who are accustomed to hear of the generous rivalry that goes on respecting the virtues of the various springs. The celebrated Congress Spring, though declared to be weak in comparison to former years, still maintains its supremacy, and this famous water can be purchased in London, Paris, Calcutta, and Hong Kong. The Empire Spring sends forth a clear, delicious, and healing water, superior in its medicinal effects upon some diseases to the Congress. The new "Hathorn" is a fine spring, recently discovered, and is already very popular. Since the last year this water has cleared up, and no longer irritates the intestines of its habitual drinkers. The "High Rock," the "Star," and the "Excelsior" are also excellent springs, and deserve to be noticed favorably.

But the greatest natural curiosity among them is what is called the "Geyser" Spring, discovered last winter by the proprietor of a bolt factory directly underneath the center of the building. Noticing traces of mineral water at this point, he caused a boring to be made to the depth of 150 feet, where he struck water in a stratum of bird'seye limestone. This remarkable stream spouts intermittently but rapidly to a hight of twenty feet into the building which has been transformed into a bottling establishment.

An analysis by Professor Chandler shows this water to be particularly rich in mineral ingredients. It contains chloride of sodium, chloride of potassium, bromide of sodium, iodide of sodium, fluoride of calcium, bicarbonate of lithia, bicarbonate of soda, bicarbonate of magnesia, bicarbonate of lime, bicarbonate of strontia, bicarbonate of baryta, bicarbonate of of iron, and sulphate of potassa, with traces of phosphate of soda, biborate of soda, alumina, and silica. The water is agreeable to the taste of those who like it. It is a powerful cathartic in its action, and the spring is considered one of the best ever discovered. It takes a long time, however, to obtain a widely extended popularity for any of these springs; hence the waters are always freely given to those who will come for them. Yet, although the waters are free to all comers, he that hath no money, though invited to come, will find no rooms at Saratoga. The hotels are crammed with visitors, and private houses are called into requisition to hold such as the hotels cannot accommodate, the prices visitors are willing to pay being such as to tempt people in moderate circumstances to accept the inconvenience for the sake of gain.

But to go back to the use of the waters by old and young, sick and well, alike. At the mineral springs in various parts of Europe the waters are generally taken under the direction of physicians. In this country few of the frequentors of such places act under advice, but proceed to swill down the waters of first one spring and then of another without regard to quantity or quality or adaptability to their physical condition, apparently going it blind in the hope of being benefited before they get away.

Now this is entirely wrong, these waters are strong solutions of mineral salts, of greater or less therapeutic power, and it is just as rash and senseless to drink them in this manner, as it would be to rush into an apothecary's shop and, shunning all the violently active poisons, to go the rounds of his bottles and jars, taking a sip from one and a pinch from another, without regard to their probable effect.

An instance in point occurred while we were at Saratoga this season. An old gentleman, afflicted with a heart disease, drank in rapid succession some ten or a dozen glasses of the "Washington" spring water, the tonic power of which is well known. His circulation was so accelerated thereby that his heart could not endure the increase of labor demanded, and he fell dead upon the piazza of the hotel.

We have no doubt that, while these waters are of immense value, as remedies for general debility, and various forms of disease, many are injured rather than benefited by their use, simply because they use them without proper discrimination, which can only be obtained through competent medical advice.

NINETY DEGREES IN THE SHADE.

The above expression, with the numeral adjective changed according to circumstances, is very commonly met with, and yet as giving anything but an approximate index to the real temperature of the air it is of little value.

The indefinite character of the phrase creeps in at the last word. Ask almost anybody what they mean by "in the shade," and they will tell you "out of the sunshine."

Now in two different places in this office the thermometer will often vary by a number of degrees when both are out of the sunshine. This variation cannot certainly be attributed to differences in the temperature of the air at the points where the thermometers hang, since there is free and rapid circulation throughout the entire building. Directly opposite the room where the writer now sits is a large brick building, against which the sun shines during the afternoon. The radiation of heat from this building is such that the thermometer will sometimes stand several degrees higher with the shades raised than with them down.

It is evident, therefore, that if the exact temperature of the air be sought, it is not enough to place a thermometer out of the sun. It should be placed in a total heat shadow where it may be read by reflected or diffused light, but be protected, as nearly as may be, from the effect of all heat except that of the air itself.

A common error in regard to thermometers may be mentioned here. It is thought by many that when air is blown over the bulb of a thermometer it will indicate a lower temperature. This notion grows out of the fact that the body feels cooler in a breeze than in still air. The latter result is due solely to the facts that the power of air to convey heat from a body hotter than itself is increased by free circulation, and that evaporation, the great cooler, is also greatly promoted thereby. Neither of these facts apply to the thermometer, since the mercury in the bulb of that instrument, if properly placed, is of the same temperature as the air, and no evaporation, under ordinary circumstances, takes place therefrom. But wet the bulb with water even a degree or two higher in temperature than the mercury; the result will be that after an instant or so the mercury will commence falling, and will mark a lower temperature than that of the air in which it stands. The effect will be still more remarkable if ammonia or ether be used instead of water.

This experiment illustrates the effect of wind upon the thermometer when the bulb is wet. But when the bulb is dry, a precisely reverse effect is produced, although much less in degree. Tyndall shows, in his lectures on heat, that the friction of even the gentlest zephyr upon a fixed body generates a perceptible amount of heat therein. Therefore if air at rest causes a given expansion in the mercury column, when in motion it will cause an increased expansion from the heat generated by friction. Of course this increase is very small. In fact it is less than can be perceived upon the column itself, and can only be determined by the most refined methods. The fact remains, however, that if there be more it cannot be less, which is sufficient for our present purpose.

When we hear of the thermometer standing at one hundred in the shade at any point north of Philadelphia we are always inclined to doubt that the indication is a fair exponent of the temperature for anything more than the immediate vicinity of the instrument. We very much doubt that in any locality on the continent north of the fortieth parallel the thermometer ever indicated one hundred degrees in open air when shielded not only from the sun's rays but from the radiation of surrounding bodies.

THE ACTION OF WATER ON LEAD, TIN, AND COPPER.

Mr. Paul Casamajor, an accomplished chemist in the sugar refinery of Messrs. Havemeyer & Co., has been making some original experiments upon this vexed question which we find published in the *American Chemist*, and the importance of the subject leads us to make an abstract of the results of his researches. The presence of lead in Croton water, after standing in the lead pipes for the night, has been incontestably shown by Professor Chandler. Mr. Casamajor also proves that it is often present in the tin-lined boilers, and accounts for its presence there by the voltaic action resulting from the contact of the lead in the lining, or in the connecting pipes with the copper of the boiler. To prove this he took pieces of lead and copper and put them in contact in two flasks which he left in the dark at the temperatures of 75° Fah. and 150° Fah., for forty hours. In both instances the surface of the lead was corroded, and that metal was found to be in solution in the water. It therefore becomes a serious question what influence the imperfect lining of boilers may exert. It is essential that so much lead is used in their construction, instead of block tin, that every one of them is a galvanic battery, producing more or less lead poisoning. This fact has been overlooked, and while many families have taken the precaution to remove all lead pipes, they have forgotten to inquire into the composition of the kitchen boiler. On this point Mr. Casamajor remarks: "These results leave no doubt on the hurtful effect of exposing drinking water to the simultaneous action of both lead and copper. The effect of an untinned copper boiler must be felt on the cold water as well as on the hot, as all the lead pipes are in communication with the copper boilers by metallic conductors. Whether an untinned copper boiler may not even have an injurious effect on the water of a neighboring house is an inquiry before which we must pause."

The next point to be examined was how far lead and tin react upon each other when placed in contact in water at 75° and 150° Fah. To ascertain this he instituted experiments similar to those previously described.

"At the end of twenty-four hours the flasks were examined and replaced in the dark. The lead in contact with tin was slightly tarnished, while that of the other flask (tin in water alone) remained perfectly bright. At the end of six days the tarnish of the lead in contact with tin persisted, but did not seem to have increased. This is apparently due to this circumstance, that a voltaic couple of tin and lead in aqueduct water is very weak, tin being slightly more positive than lead. Under the influence of the weak current at first produced, the lead, being more electro-negative, becomes slightly oxidized, until the coat of oxide presents such a resistance to further action that the two metals are put on a par, and no current is afterwards produced. The lead of the other flask, which had now been in water for over a week, was as bright as when first put in the water." Mr. Casamajor was unable to detect the least trace of lead in the flask where the lead or tin had been left in contact. And his experiments would seem to throw great doubts upon the assertions frequently made that tin and lead mutually act upon each other and poison the water. A great objection to tin-incased lead pipe and tin-lined lead pipe has been that in places where there was a fracture or where the surfaces came in contact under water a voltaic current was produced and some of the lead was carried into solution. Mr. Casamajor's experiments do not confirm this theory, but, on the contrary, he could find no lead whatever, although he put the metals in the most favorable conditions for accomplishing the reaction, if any could be expected. Lead and copper in contact under water at once react upon each other, but lead and tin appear to be neutral after the formation of the first coating. It would be gratifying to have these experiments confirmed, as a good deal of disquieting doubt has been cast upon the security that was supposed to be offered by the tin-lined and tin-incased lead pipe. In reference to the danger of leaving water in contact with lead alone there appears to be no doubt in the mind of any person. And this danger is greatly increased by the presence of nitrates and chlorides in the water. Lead is a subtile poison, and too much care cannot be taken to prevent its presence in water that is required for domestic use.

THE USES OF SOLUBLE GLASS.

Although liquid quartz, or soluble glass has been known for more than fifty years it does not, even at the present day, have half the applications in the arts of which it is capable. It was accidentally discovered by Prof. Fuchs, of Munich, while engaged in searching for a method by which to prepare pure silicic acid, and was afterwards very thoroughly studied by him, and all of its properties made known.

It is a very simple thing to make either in the dry or the wet way, and the choice of the methods depends upon the quantity to be prepared. Pulverized flint stones or quartz pebbles, or fine sand, can be dissolved in a solution of caustic soda or potash, when boiled under a pressure of 7 or 8 atmospheres. Infusorial earth or Tripoli is also admirably adapted for this purpose. In the dry way it is usual to fuse 45 pounds of quartz, 30 pounds of potash, and 3 pounds of charcoal powder; or 45 pounds of quartz, 23 pounds of calcined soda, and 3 pounds of charcoal.

For certain purposes it is also customary to make a glass of soda and potash combined. This mass fuses easily, and is readily soluble in hot water. As the solution absorbs carbonic acid from the air it must be kept well sealed.

Soluble glass is sold in liquid form of a given strength, usually 33 degrees, meaning 67 parts of water and 33 parts of the dry powder. When required for use it is necessary to dilute it, as the above concentration is too strong for most purposes.

There was at one time a proposition to boil gold quartz in the alkali of the West, and thus to bring it into solution by which the metal would settle and the liquid quartz could be converted into building stone or employed for any other purpose for which it is adapted. The quantities to be dealt with—the great amounts of soda required for the operation—appear to have stood in the way of the practical application of this method, but theoretically it was perfectly feasible.

It would not be easy to detail all of the uses to which soluble glass has been applied, but it may not be out of place to recapitulate some of them: To protect wood from the action of water, air, and fire; in fresco paintings on walls; to repair stone buildings; to make artificial stone; for cementing broken glass; to make hydraulic cement; to protect metals from rust; as a solvent for corallin; to mix with mineral colors; as a solvent for various substances; as a lubricator; to preserve the elasticity of leather bands on machinery; for painting on paper hangings and calicoes; to give glass the appearance of enamel; as a detergent; as a reagent in the laboratory; to impregnate petroleum barrels, beer casks, butter tubs, and milk pails, so as to render them tight; for glazing clay pots as a substitute for lead; and the manufacture of of artificial gems. Its chief value is in the restoration of stone buildings, in fresco painting, and to render fabrics uninflammable. As a means of preserving iron from rust, and as an external application to wooden buildings, it has been attended with so many failures as to throw doubt upon its practical value for these purposes. Its usefulness on leather belting we also deem extremely doubtful, although it has been recently asserted to keep such belts soft. It is an article that ought to be manufactured on a large scale and more generally used.

WHO DISCOVERED NITRO-GLYCERIN.

It is somewhat remarkable that the date of the discovery of nitro-glycerin should be a matter of dispute after all that has been published on the subject. The honor is sometimes ascribed to Professor Williamson (1853), and again to M. Nobel, the Swedish engineer who has done so much towards making its properties known; and to the late Professor Pelouze is also given the credit. In the transactions of the Turin Academy of Sciences for July 5, 1847, may be found a memoir on fulminates, and the action of nitric acid on certain organic compounds, by Professor A. Sobreso. In this paper the author gives an account of long and dangerous researches made by him on this subject.

He states how he prepared nitro-glycerin, mentions the properties of the new compound, and gives its principal reactions and its poisonous effects on the animal system. Professor Pelouze, in 1865, gave full credit to M. Sobreso at a meeting of the French Institute, and it is therefore somewhat remarkable that any question of priority could now arise.

M. Sobreso, at the time he made the researches (in 1847) was Professor of Applied Chemistry in Turin, and there is no doubt about his being entitled to the honor of having discovered nitro-glycerin.

COMPRESSED AIR AS A MOTOR FOR SUBTERRANEAN RAILWAYS.

BY J. DUTTON STEELE, C.E.

[Read before the American Institute of Civil Engineers.]

It is scarcely necessary for me to state that compressed air may be used in all respects as steam, and worked in the same engines; that its chief characteristics are perfect ventilation and cleanliness, and that it may be carried in pipes long distances without loss from condensation, and similar causes, to which steam is liable. At Mont Cenis the air pipes must be as much as five miles in length, and the loss of pressure is not such as to impair the working of the drills, but I am without accurate information as to its extent. At Hoosac they are one and a half miles long, and the loss is two pounds to the square inch. At Nesquehoning they are one third of a mile in length, and there is no appreciable loss of pressure. In all these cases the air is worked at about fifty pounds per square inch; and the difference in pressure at the steam valves, when the power is generated, and the air after it is compressed, may be taken at about ten per cent when the best compressors are used. It will then be seen that the loss of power from the friction of the compressing machinery, and from the movement of air in the pipes, is not of a very serious character, and, if the pipes are tight, the pressure is well maintained while the machinery is standing.

With this brief reference to the leading characteristics of compressed air as a motor I will proceed to consider its possible application to subterranean railways; and in doing so will assume as a basis for discussion, that we have a double track railway ten miles in length, with moderate curvature and reasonable grades, and an air pipe along its center of ten or twelve inches in diameter, with compressing machinery at either end driven by steam of sufficient capacity to maintain a pressure in the pipes of any given standard.

Let us also assume that we have an endless wire rope passing along the center of each track, supported upon pulleys, and that it can be kept tight; and to compensate for its expansion and contraction, by changes of temperature, that it is passed around movable pulleys of large diameter at stated intervals, say every half mile. These durable pulleys may be arranged in vertical plains, so that one of each pair may move in its pedestal, and be weighted to take up the slack, while those in the top, which receive the rope at the level of the rails, are fixed upon their axles and provided with cranks for the application of power. I would next propose that at each of these main pulley stations, a stationary engine be placed to move them; each engine drawing its power from the air-main in the center of the road. We should then have a drawing rope moved by twenty stationary engines distributed along the line, acting in unison, connected by telegraph signals, and working under the same pressure.

There is no doubt as to the unity of action in such engines: their connection by means of the drawing rope would be perfect, and their speed would be regulated by governors; they would require but little attention, and their exhaust would produce the most perfect ventilation. If it is conceded that we may thus obtain a satisfactory motion in air-drawing ropes, either of one continuous rope, or of ropes in sections (and I apprehend either is practicable), it only remains to transfer that motion to the cars.

In this connection and explanation of the principle in view, I would invite your attention to the new tramways now building in Europe for the transportation of ore and fuel in the mining and manufacturing districts. They consist of endless wire ropes supported upon pulleys, which are fixed to strong posts and elevated more or less above the surface, with the moving power at the end; upon these wire ropes, boxes or cars are suspended at intervals, which contain the load, and which move with the rope, and are passed without difficulty over the pulleys, the opposite rope taking back the empty cars.

Many of these wire tramways are now in use, some of them as much as four miles in length, and so satisfactory in their operation that as much as one hundred miles are said to be under construction in England.

It will be observed that the hight of the suspended load produces the necessary friction for transmitting the motion of the rope to the cars, and that they are passed with ease over the pulleys. The rope, as proposed for a subterranean railway, is in a better position for such use than in the wire tramway, and if it is possible to make use of the load, as a means of transmitting the motion to the cars in the latter, there should be no difficulty in doing the same thing in the former. Let us then suppose brakes dropped from the cars upon the driving ropes, so as to transfer only so much of the weight of the cars to the rope as may be necessary to communicate the motion, we would then have, by the use of the breaks on the rope and brakes upon the wheels, the means of stopping and starting the car at pleasure. The grades upon which such a system may be worked, will be about the same as with locomotives: and the advantage of air over steam as a motor, will be found in its perfect ventilation and cleanliness; the nearly uniform pressure under which the several engines can be worked; and the distribution along the line of the power which is generated at the ends. But the air in the mains may be used for other purposes, with profit and advantage, such as driving printing presses and other light machinery to aid the industry of large cities, and, wherever used, pure air and a reduction of the liability to fire will be the result.

In submitting these general views, I have avoided as much as possible mechanical details, which those who may take an interest in the subject will have no difficulty in supplying. They are speculations as to growing wants in advancing cities, and if they aid in ever so small a degree in giving direction to the stronger mental currents which these wants will attract, the writer will be compensated for the little thought he has given to the subject.

COMPRESSED AIR, AMMONIA, AND RUBBER VS. MULE POWER.

New Orleans, with all its other attractions, is fast becoming a home for new inventions, especially those relating to motive powers. The city rests on a dead level, and so easy is it there to propel railroad cars, that the whole team consists of a single mule, which answers all requirements admirably. Any one would naturally suppose that this is about as good and economical a motive power as could be employed. But genius will assert itself, and, according to the New Orleans *Republican*, "the death knell of the mule is already sounded."

The first improvement over the mule, proposed by the inventive geniuses of New Orleans, was to place tanks on the cars, within which air was compressed to a pressure of 300 pounds to the square inch. To run the car, you simply turned a faucet, and away it went from one end of the town to the other, and back. This style of pneumatic car was tried not long ago in New Orleans with success, a stock company formed, and everything for a time looked lovely.

But another genius soon improved upon the improvement, and got up a plan to drive the car by substituting compressed ammonia for the common air. This car is said to have been run with so much success, that the pneumatic stock immediately went down, and the ammonia began to rise.

But before the full effect of the ammonia had been experienced, still another genius enters the field and astounds the Southern community by the announcement of a third motive power, far cheaper and better than either of the two systems before made known.

This remarkable motor is nothing more nor less than *india-rubber*. It is the discovery, says the *Republican*, of "Mr. Solomon Jones, a gentleman of a mechanical turn of mind, who has heretofore distinguished himself by the invention of the most intricate and remarkable descriptions of machinery. He had, in his experiments, his attention called to the wonderful power possessed by india-rubber when contracting after having been stretched.

"After a long series of experiments, he discovered that the Para rubber was capable of stretching ten feet for every one of its ordinary length, and that the retractile power was enormous. He made a system of turnings, windings, and twists of this rubber power, which would enable him to place it under any car without altering its present build, and which would give him a power capable of propelling that car through the streets at a rate always at the command of the man in charge, and capable of lasting the wear and tear of constant service for years.

"His machinery was very simple, the rubber was wound upon a drum, and the drum once let loose the car commenced to move at a speed more than could be desired were it not that it is under perfect command from a simple system of cogs working under the leverage power in the hands of the conductor. His model was sent to Washington to the Patent Office, and although it was not all he could wish, as he was compelled to use a common gas-pipe rubber in place of the prepared material he proposes to use, it passed the rigid scrutiny of that office, famous for the care and strictness of its examinations, and a patent was issued to him, in connection with Mr. Bernard Terfloth, one of our well-known mechanics, for this new invention.

"For street cars two bands of the rubber, two and a half inches in diameter and fifty-six feet in length each, will be used. Each piece will be attached to a separate drum, and as the stretch of the rubber will be ten feet for one, five hundred and sixty feet will be run off the drum before it becomes necessary to use its fellow-drum. In running off this five hundred and twenty feet, a distance of 14,175 feet, over two miles, will be traversed by the cars; the other drum is then called into requisition, and while it is propelling the car the exhausted drum is wound up by the same leverage which the conductor uses to stop and control the car; the only trouble the conductor has is to throw the lever off the drum in motion, a simple operation, which can be reversed in a minute if it becomes necessary to stop the cars.

"This invention is not by any means intended to be confined to the propulsion of street cars; it is intended to be adapted to everything now monopolized by steam. It can be made useful in the household or the factory to run sewing machines, and our citizens will soon have an opportunity of seeing it tested working fans in one of our churches. Its remarkable cheapness, and the economy with which it can be used, make it all the more desirable.

"The Mobile city railroad companies are preparing to accommodate their cars to the new invention, and the death-knell of the mule is already sounded there, and perhaps in a few months we shall be able to witness the astonishing spectacle of our own cars running the streets by india-rubber power.

"The inventor holds his patent, we understand, at the service of Northern and Western railroad men, and will give them rights at remarkably low rates. A New Orleans inventor is not by any means an anomaly, but our sharp and shrewd mechanics have held themselves too closely to business heretofore, and we welcome Mr. Jones' enterprise as creditable to the city and the State."

SCIENTIFIC INTELLIGENCE.

EXPERIMENTS WITH THE DIAMOND.

According to Morren, the diamond heated to bright redness in a current of illuminating gas becomes covered with a deposit of graphitic carbon, which can be partially rubbed off, and can be entirely removed by polishing; if it be afterwards cautiously heated to redness on platinum foil, it recovers its original luster and weight.

In hydrogen gas the diamond can be heated nearly to the point of fusion of platinum without undergoing any change; it rather increases than diminishes in luster. In carbonic acid it loses slightly in polish and weight, and the resulting gas contains carbonic oxide and oxygen; the carbonic acid is not decomposed by the diamond, but by the white hot platinum, and the loss of weight in the diamond is due to partial oxidation.

The diamond not only burns in oxygen gas, but in the air when heated to redness before the oxyhydrogen flame; it takes fire and burns like coal, but goes out when the heat is intermitted. It then becomes white like ground glass, and does not blacken, nor swell up, nor splinter, unless previously cracked. The unconsumed portion exhibits under the microscope innumerable triangular facets, evidently derived from actahedra. Diamonds with native lenticular faces and such as are used for glass cutting, look, after having been strongly heated in the air, as if they were composed of so many prisms inclosed in triangles. Whether black diamonds would exhibit the same behavior under similar circumstances has not been determined, as no experiments have thus far been made upon them.

PRESERVATION OF MEAT.

Mr. Georges, in Montevideo, S.A., preserves meat by immersing it in a liquid composed of 85 per cent water, and a mixture of glycerin with acid sulphite of soda and hydrochloric acid, and afterwards strewing dry sulphite of soda upon it, and sealing hermetically in cans. After the lapse of a year the flesh was perfectly fresh. Before using, it must be rinsed with dilute vinegar, and left exposed for a short time in the air. Meat thus prepared costs, in Paris, five cents a pound, and is said to be a valuable article of food. Meat can also be kept perfectly sweet by being immersed in melted paraffine, and when required for use only needs to be greatly heated to melt off the covering of paraffine, which can be saved for further use.

PLATING COPPER AND BRASS WITH ZINC.

According to Böttger, copper and brass can be easily coated with zinc by immersing them in a boiling bath of sal ammoniac containing zinc foil or powder. The deposit of zinc made in this way is brilliant, and adheres firmly to the copper and brass. Whether iron could be coated or galvanized in the same way is not stated by the author, though the use of sal ammoniac in the ordinary process is well understood.

METHOD FOR PURIFYING ILLUMINATING GAS.

E. Pelouze modifies the Lamming mass now generally employed for the purpose of purifying illuminating gas, by adding sulphuric acid. He sprinkles the purifiers containing oxide of iron and sawdust, with water, to which 20 per cent of sulphuric acid, of specific gravity 1·53 (53° B.), has been added, and after the mass has dried up sufficiently, passes the gas through. After use it is necessary to restore the sulphuric acid, and to remove the sulphate of ammonia that may have been formed. It is said that napthalin is not removed from the gas by this method.

A mixture of oxide of iron and sawdust thus prepared would serve an excellent purpose as a disinfecting agent to be added to the earth in the earth closet, in stables, cess pools, and the like, but where it has to come in contact with metals care must be taken not to have free sulphuric acid present.

Ordinary copperas or sulphate of iron and sawdust, with native hematite, or bog-iron ore, would also make a valuable disinfecting mixture, and would be cheap.

SYNTHESIS OF ACETIC ACID.

Berthelot has succeeded in making vinegar from acetylene, one of the products of the distillation of coal, and a frequent constituent of illuminating gas. He accomplished this in one way by first producing alcohol from illuminating gas and subsequently oxidizing the alcohol into vinegar in the usual way. The process is curious scientifically but not practicable on a large scale. The most important method proposed by Berthelot is to dilute acetylene with twenty times its volume of air, and allow it to stand for six months at ordinary temperature exposed to the light in a closed jar over a solution of caustic potash—it then changes spontaneously into acetic acid—

$$C_4\,H_2 + O_2 + H_2\,O_2 = C_4\,H_4\,O_4$$

Only one half the hydrocarbon of the acetylene is thus transformed, the other half being converted into a resinous mass. It would certainly be a great triumph of modern science to be able to make alcohol and vinegar out of illuminating gas, as that would save us the loss of sugar, and suggest a good many refuse articles that could be made useful by distillation. Perhaps some of the natural gas springs of the world could be turned to good account in such an industry.

Western papers chronicle the death of "the first white child born in Ohio," at the age of eighty years. A rather backward infant that.

THE MITRAILLEUSE.

Why not call things by their right names? The French are just now making a great fuss over what they style the *mitrailleuse*, and expect great things from its use against the Prussians.

This new word may add to the French military vocabulary, but the invention is nothing more or less than a modification of the Gatling gun, illustrated and described on page 353, Vol. XXI., of the Scientific American. The inventor, Dr. Richard J. Gatling, of Indianapolis, furnished drawings and a description of this famous gun to the Emperor Napoleon, in 1863, and since that time a large number of guns on substantially this plan have been secretly constructed at the French Armories. The new christening does not render it any the less an American invention.

Dr. Antisell, U. S. Chemist, Washington, D. C., will visit the silver region of Colorado, during next September, and is open to engagements to examine and report on mines and mining interests. Address, Box 100, Washington, D. C. Reference to Prof. Torrey, U. S. Assay Office, New York.

NEW BOOKS AND PUBLICATIONS.

The Handy-Book of Husbandry. A Guide for Farmers, Young and Old. Containing Practical Information in regard to Buying or Leasing a Farm; when and where to Buy; Commencing Operations; Key-note of Practical Farming; Fences and Farm Buildings; Farming Implements; Drainage and Tile Making; Plowing, Subsoiling, Trenching and Pulverizing, Surface Soil; Manures; Rotation of Crops; Root Crops; Forage Crops; Live Stocking, including Cattle, Horses, Sheep, Swine, Poultry, etc., with Winter Management, Feeding, Pasturing, Soiling, etc. With Directions for Medical and Surgical Treatment of the same; the Diary in all its Departments; Useful Tables for Farmers, Gardeners, etc. By George E. Waring, Jr., of "Ogden Farm," formerly Agricultural Engineer of the Central Park, New York, Author of "Elements of Agriculture," "Draining for Profit and for Health," "Earth Closets and Earth Sewage." Illustrated. New York: E. B. Treat & Co., 654 Broadway.

It is only ignorant men who indulge in ridicule of what is called "book farming." Not but that many errors are contained in books, and of course followed in practice, by those who rely upon books for guidance. It is, however, as foolish to denounce agricultural books on this account as it would be in any other department of the arts. We never knew a farmer who understood the art of reading, who did not become a better farmer by the perusal of agricultural works. Only those who are ready to receive mere opinions as facts, and are unable to discriminate between faulty and accurate experiments are likely to be misled. To the latter class, however, the book before us will scarcely offer opportunity to go astray. Its facts are demonstrated facts, and when anything of doubtful merit is discussed, its doubtful character is unmistakably indicated. Its author is too well known to the agricultural world to render it necessary to speak of his ability to treat the subject thoroughly and practically. The style of treatment is very agreeable, and even entertaining, and the table of contents shows that little, if anything, of importance is omitted. The question of tile draining is thoroughly and ably discussed, and the farmer seeking information on this important subject, whether in regard to the best way to do it, its cost or advantages, cannot fail to be benefited by its perusal. A considerable portion of the work is occupied with the discussion of the subject of implements and machines. Those seeking for light on the subject of steam plowing will find in this portion of the work much interesting matter relative thereto. The adaptability of soils to crops has received special attention, in connection with the advanced state of knowledge on the subject of fertilizers. In short, the work is all that its name implies, a handy-book, to which the farmer may refer in the case of the sickness of animals, or in other emergencies, with the certainty that the results of the best experience has been obtained for his guidance. The book is handsomely printed and bound, and will, we are informed, be sold by subscription.

Trow's New York City Directory. Compiled by H. Wilson. Vol. LXXXIV., for the Year Ending May 1, 1870. New York: John F. Trow, Publisher, 52 Greene street. Price, $5·00.

This volume contains a large increase of names over that of last year, the whole number being 204,617. The same system of collecting names having been used, it seems fair to suppose that the population, especially that of the business portion of the inhabitants, the names of which are most easily obtained, has increased correspondingly. The difficulty in obtaining a full list of names is well set forth by the editor of the work. We make the following extract from the preface: "The great difficulty in making the Directory adequate to the public wants, is to keep down its bulk and its cost. Even now it is becoming unwieldy in size, and it is only by a very rigid economy, which is the result of constant study, and an organized force which it has required many years to bring to the degree of perfection which it has reached under the control of the present manager, that it can be published at the low price which enables all to purchase it who need it in their business. The Directory is one of those beneficent institutions which everybody abuses, and most people seem to regard as a spontaneous production, which naturally comes round with the season, like green peas and strawberries. People do not drop into baker-shops, and say, "Please give me a loaf of bread," nor into the grocers and ask for a pound of butter and walk out without offering to pay, as they do when they rush into anybody's office or store, and say, "I'll look at your Directory," and having extracted from it the valuable information they were in pursuit of, rush out again, as if it were all a matter of course and an order of nature that directories should be furnished by somebody for their special benefit.

Woodhull & Claflin's Weekly.

This new claimant for public favor caters to a particular class of mind, n a very spirited and plucky manner. Many of its articles, particularly those from the pen of Stephen Pearl Andrews, appear to our matter of fact udgment rather speculative. His system of Universology, as he styles it is one which, never having thoroughly examined, we are unprepared to either commend or to criticize. The short expositions and allusions made o it in his articles contributed to this new weekly, certainly do him or the system injustice. Without clear definitions of what he means by the principles of Unism, Duism, and Trinism, or the "Spirit of the Number One, which concenters and unifies; the Spirit of the Number Two, which separates, distributes, or differentiates; and the Spirit of the Number Three, which combines or unites the Unism and the Duism in a Hinge-wise (partly united and partly separated) Complexity—the type of all real being," Mr. Andrews must expect most people to regard these terms as savoring of transcendentalism. Perhaps his full explanation would only confirm this view. We confess the short exposition given by him in the issue of August 6th has had this effect upon our mind. Nevertheless, as we honor independent thought, we say "God-speed to all independent thinkers, and to any publication which encourages such thought."

Lloyd's Topographical and Railway Map of the Seat of War in Europe 1870. E. Lloyd, Publisher. New York: 23 Cortlandt street. London: 83 Fleet street. Projected by J. T. Lloyd. Price, fifty cents, free by mail.

APPLICATIONS FOR THE EXTENSION OF PATENTS.

Putting Up Caustic Alkalies.—Geo. Thompson, Philadelphia, Pa., has petitioned for the extension of the above patent. Day of hearing Oct. 5, 1870.

Arrangement of Buckles of Paddle Wheels.—Matthew A. Crooker, New York city, has applied for an extension of the above patent. Day of hearing Oct. 12, 1870.

Water Wheel.—John Tyler, West Lebanon, N. H., has petitioned for the extension of the above patent. Day of hearing Oct. 12, 1870.

Breech-loading Fire-arm.—George W. Morse, Greenville, S. C., has applied for an extension of the above patent. Day of hearing Oct. 12, 1870.

Cartridge.—George W. Morse, Greenville, S. C., has petitioned for an extension of the above patent. Day of hearing Oct. 12, 1870.

Machinery for Operating the Pawl Cases of a Ship's Windlass.—Christopher Amazeur, New York city, has applied for an extension of the above patent. Day of hearing Oct. 19, 1870.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address correspondents by mail.

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 should be by volume and page.

C. E. M., of N. Y., describes a shaft on a wood planing machine, carrying a fast and loose pulley at one end, and two wide drums in the center, 24 inches in diameter, with edges in juxtaposition, making a drum of 36 inches width. Each of these pulleys has only one set of arms, and its rim is only three-eights of an inch thick. These pulleys are balanced by iron plates, or counter poises, screwed upon the inside of the rims. When tested upon parallel steel bars, the shaft with its pulleys is found to be in perfect balance, but when run at a speed of nine hundred revolutions per minute, the system is out of balance, and causes great shaking of the machine. The causes of this phenomenon are requested. —It is undoubtedly the effect of centrifugal force, acting to expand the rims of the pulleys on the side of the counterpoise, or if the shaft is too light, to spring that also. The size of the shaft not being given, we cannot decide whether one or both these defects exist. Pulleys of such great width, designed to run at high speed, ought to have more than one set of arms.

J. C. D., of Ind.—A cement called marine glue will resist the action of water, and holds wood and similar materials with great firmness. You can purchase it ready made at druggists' stores, or make it as follows: Dissolve by heat, one part, by weight, of india-rubber in naphtha, and when melted, add two parts of shellac. The proportion of naphtha is simply that necessary to dissolve the rubber and shellac. It varies somewhat with the specific gravity. Pour the mixture, while hot, on smooth metal plates to cool. To use it, it should be melted and applied with a brush. Use a water bath about the vessel employed in dissolving the rubber and shellac, as the naphtha is very inflammable. The operation should also be performed when there is no danger of setting fire to buildings.

C. H. B., of ——.—The pressure of the liquid in a vessel is what causes it to flow through an aperture or faucet. The rapidity of flow increases with the hight of the liquid, because the pressure increases with the hight. The velocities of flow of liquids through apertures in the sides of vessels, are as the square roots of the heads in theory, but there are many circumstances which modify this law so as to apparently change it. It is only accurate for liquids destitute of viscosity, flowing through apertures in their walls, without the attachment of pipes, faucets, etc.

E. B. G., of N. Y.—It is impossible to say, without knowing the character of the coal burned, what the substance was which so rapidly destroyed the Russia ironpipe to which you refer in your communication, or to prescribe a remedy. If you have a chemist in your vicinity, it would be interesting to refer the subject to him. The matter is one of practical importance. Such an instance as you describe, where in a single season the pipe was destroyed, has never come under our notice.

J. P., of Pa.—You can give iron a beautiful brilliant green, while retaining a metallic luster, by first coating it with Dutch metal, and then varnishing over it with distilled verdigris dissolved in alcohol. This last should be varnished over with a white transparent varnish, made of white seed lac. A very good green may also be made by mixing Prussian blue with turmeric in alcohol to the shade required, and after applying the same, varnishing with the lac varnish, as above.

A. W., of Vt.—The static force of a toggle joint, or system of toggle joints, or lazy tongs, exerted at the ends, is found by multiplying the power applied at the joint into the distance between the extremities, dividing this product by the length of a perpendicular drawn from the joint to the line joining the extremities, and subtracting the friction. This rule applies for all positions of the joint, or system of joints, as found in the lazy tongs.

R. M. R., of Mass.—A microscope is a most useful instrument in the examination of fine cutting edges, and the effect of different hones upon them. A cheap instrument, capable of magnifying sixty to one hundred diameters would be sufficient for the purpose. You can ascertain for yourself the price of such an instrument, by applying to an optician.

J. B., Jr., Ohio.—There is no more disagreement between different persons about the apparent size of the moon than would be the case about anything else to which they could apply no common standard of comparison. These differences are to be ascribed to mental and physical peculiarities in the observers.

J. G. P., of Ill.—Wooden pulleys may be balanced by boring holes on the light side, and driving in lead plugs, or by driving nails into the wood. If iron pulleys are badly out of balance, the only way to remedy the trouble is to fix counter poises upon the arms opposite to the light side.

W. H. P., of Ala.—The idea that the return of sap from the tops of vegetation into the roots, increases the flow in water courses, has no basis in fact. Evaporation from the tops of trees is the way they get rid of their moisture.

J. L., of N. B.—The lead rings, the drawings of which you send us, appear to us to be chucks, probably made for some special purpose which their form does not indicate.

J. L. L., of N. Y.—The French "*beton agglomere*" may be worked on a small scale. You will find an article on this subject on page 124, last volume, of the Scientific American.

G. L. W., of Mass.—The mixture of plumbago with silicate of soda, to be used as a stove polish, has been tried, and has proved a failure, as we are informed by several correspondents.

Inventions Examined at the Patent Office.—Inventors can have a careful search made at the Patent Office into the novelty of their inventions, and receive a report in writing as to the probable success of the application. Send sketch and description by mail, inclosing fee of $5. Address MUNN & CO. 37 Park Row New York.

Business and Personal.

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Caveats are desirable if an inventor is not fully prepared to apply for a patent. A Caveat affords protection for one year against the issue of a patent to another for the same invention. Patent Office fee on filing a Caveat, $10. Agency charge for preparing and filing the documents from $10 to $12 Address MUNN & CO., 37 Park Row, New York.

Recent American and Foreign Patents.

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

Self-Lubricating Axle Box.—J. B. G. M. F. Piret, Paris, France.—This invention relates to certain improvements in the construction and arrangement of axle and journal boxes, and consists more particularly in a novel construction of a winged lubricating wheel, and in the application to the axle box of a reservoir under the axle.

Gang Plow.—John Alloways, Decatur, Ill.—This invention relates to certain new and useful improvements in gang plows, and it consists in a new and improved means for connecting the plow beams to the machine, whereby the former are allowed an adjusting movement, independent of the axle, so that the rising and falling movement of the latter, caused by the wheels passing over uneven ground, will not affect the depth of the penetration of the plows in the earth.

Carriage Spring.—R. E. Walker, Dresden, Mo.—The object of this invention is to construct springs for carriages, wagons, and other wheeled vehicles, so that the same may be of equal service for heavy and light loads. The invention consists in forming a spring of one continuous piece of steel, in three layers, the layers being so formed as to constitute to a certain extent, separate, independent springs.

Wire File for Bills etc.—F. C. Senseman, Philadelphia, Pa.—This invention has for its object to construct a file for bills, letters, etc., in such a manner that any one bill or letter can be reached and removed without requiring the separate removal and re-attachment of all those above it. The invention consists in the combination of a wire file with a tubular slotted holder, the parts being so arranged that the wire can be withdrawn with some of the bills, leaving the remainder on the holder.

Grate for Furnace.—William Kearney, Belleville, N. J.—This invention relates to a new manner of strengthening and bracing fire grates for boilers and furnaces of all kinds. The invention consists in a novel construction of brace, with a view of preventing longitudinal or transverse shrinkage of the grate.

Vegetable Cutter.—John Lusher, La Porte, Ind.—This invention relates to a new apparatus for slicing vegetables, such as potatoes, turnips, etc., into pieces of suitable thickness. The invention consists in constructing the cutting edges of a vegetable slicer by the turned out edges of slots that are formed through sheet metal plates.

Cake Pans.—J. H. Smith, Brooklyn, N. Y.—This invention relates to improvements in cake pans, and consists in improvements in the manufacture of cake pans, whereby a press stamped octagonal pan, with nearly vertical sides, is produced from a disk of sheet metal.

Passenger-Car Register.—John Rhoads, Harrisburg, Pa.—This invention relates to improvements in apparatus for registering the number of passengers entering street cars or other vehicles, and consists in an arrangement of the doors on vertical pivots, to be revolved a part of a revolution by each person entering, and move a register, the said doors being provided with means to prevent moving too far, and to prevent turning backward—the door at one end being arranged for the entrance, and the one at the other end for the exit of the passengers.

Coffee Mill.—John C. Milligan, Brooklyn, N. Y.—This invention relates to improvements in coffee mills of the class known as box mills, and consists in the arrangement of the nut-holding dog and spring, with the handle detachably connected to the top of the spindle, and with the nut thereon for adjusting the spindle for grinding fine or course, the said arrangement being intended to facilitate the adjustment, and to admit of readily detaching the handle for packing.

Action for Stops on Cabinet Organs, etc.—H. A. Clifford, Rockville, Conn.—This invention has for its object to furnish an improved attachment for cabinet organs and other suitable instruments which shall be so constructed that the whole power of the instrument can be brought on instantly by a slight movement of the knee, thus preventing any break in the music caused by delay in drawing the stops, and which will enable the power to be thrown off by another slight movement of the knee.

Ditching Machine.—A. J. Stephens, Milford, Ill.—This invention has for its object to furnish an improved machine for forming open ditches which shall be so constructed as to enable a ditch to be opened of any desired depth and breadth, leaving the ditch so formed that a team may be conveniently driven across it when desired.

Adjustable Link.—A. J. Dexter, North Foster, R. I.—This invention has for its object to furnish an improved adjustable link which shall be so constructed and arranged that it may be attached to and detached from its place conveniently and easily, and which when attached will be strong, durable, and not liable to become accidentally detached.

Corn and Cotton Cultivating Plow.—W. R. Blanchard, Hertford, N. C.—This invention has for its object to furnish a simple, convenient, and effective plow for cultivating corn, cotton, and other plants, which will do its work well and thoroughly, and may be easily adjusted for cultivating different sized plants.

Sifting Machine.—George Sidey, Brooklyn, N. Y.—This invention relates to a new and useful improvement in machines for sifting, more especially intended for sifting paints, but applicable to other substances, and consists in a reel with revolving rollers thereon operating in a suitably constructed box with a circular bottom formed of wire gauze or wire cloth.

Tube Wells.—S. S. Ayers, Plainfield, N. J.—This invention has for its object to furnish an improved drive well which shall be so constructed and arranged as to prevent the well from being choked up with sand or gravel, and which will enable the tube to force its way through slaty rocks or soils.

Process for Manufacturing Pure Carbonate of Potash.—C. F. Moll, Kenton, Ohio.—This invention relates to a new and useful improvement in a process for manufacturing the granulated carbonate of potash, more generally known in commerce as pearlash.

Cotton Seed Planter.—T. C. Garlington, Chambers Court House, Ala.—This invention relates to a new cotton seed planter in which a vertical screw is employed within a hopper for gradually and steadily feeding seed to the ground.

Traction and Locomotive Engines.—J. K. Lake, Chicago, Ill.—This invention relates to improvements in traction engines. The first part relates to the mode of applying the power and varying the speed of the driving wheels relatively to the engines, and consists in the employment with the driving axle to which the propelling engines are connected and with the driving wheels which are fitted loosely thereon, of friction clutches for making or breaking the connection with the engines, and in connection therewith, it consists in the employment of a secondary set of driving and auxiliary supporting wheels, of smaller diameter than the first geared down by means of belts, chains, or, it may be, gear wheels, working on loose drivers on the main driving axle, to be connected therewith for transmitting motion, also by friction clutches, the said secondary set of wheels being mounted on the frame in supports, wherein they may be vertically adjusted, so as to shift the burden of the carriage from the primary to the secondary set, or *vice versa*, without interrupting the forward motion of the carriage. The invention also comprises several other important improvements relating to the construction and arrangement of the operating gear.

Sawing Machine.—I. A. Elston, Elston Station, Mo.—This invention relates to a new sawing machine, which is so constructed that it can saw horizontally as well as vertically, through trees or logs of suitable thickness, and which can be adjusted to saw at any suitable hight and in any desired position.

Process of Separating Fibers from Crushed Cotton Seed.—Jules Duval, New Orleans, La.—This invention relates to a new process by which an entire separation is effected of the fiber which adheres to the hull of the cotton seed after said seed has been crushed, in the production of the oil known as cotton seed oil.

Faucet.—H. B. Tiffany, Medina, Ohio.—This invention relates to improvements in faucets, and consists in a combination with the hollow plug, through which the liquid is discharged, of a turning plate and operating devices therefor, to cover the hole at the end when the plug is closed, to prevent flies and other insects from entering (being attracted by the liquid) and being washed out with the liquid into the vessel receiving it when the faucet is opened.

Cake Pan.—J. H. Smith, Brooklyn, N. Y.—This invention relates to improvements in pans for baking cakes, the shells of which are made in one piece of sheet metal, and with spiral corrugations, the grooves and ribs of which extend from the top, or near the top, to near the center, at the bottom, and the invention consists in an improved article of this character, formed by being struck up in dies, the shell being made in one piece.

Grain Deliverer.—Franklin B. Isett, Hollidaysburg, Pa.—This invention relates to improvements in grain-delivering attachments for reaping machines, and consists in a combination with a grain-receiving platform or apron, on which the cut grain falls, or is delivered by a raker, of a pair of vibrating racks, a receiving and binding table, and certain operating gear for working the racks, so arranged that the said racks will, automatically, take the grain from the platform and deliver it on the table in gavels for binding.

Cut-off for Electro-Magnetic Instrument.—F. M. Perry, Barton, Vt.—This invention relates to improvements in cut-off apparatus for electro-magnetic instruments, and consists in a platinum point, mounted on a line, pivoted adjustably to the brass plate of the relay, or machine, by means of a yoke and set screw, so arranged that the wire may be attached and the point may be adjusted relatively to the armature, without taking the machine out of circuit.

Excavating Machine.—John A. Bailey, Detroit, Mich.—This invention relates to improvements in excavating machines, and consists in a combination with the horizontally-revolving platform for turning the scoop and the pivot thereof, of cylinders and pistons, so arranged that the turning may be effected by water, or other liquids, or air pumped or otherwise forced into the cylinders, and acting on the pistons. The invention also consists in a combination with the scoop, and the pistons and cylinders heretofore used for working the scoop, of other pistons and cylinders, arranged to aid in forcing the scoop into the earth; also, for turning the scoop on its axis while filling, and for discharging it; and the invention also consists in an improved arrangement of tripping and closing apparatus for the bottom of the scoop, made to open and dicharge thereat.

Wind Wheel.—J. C. Coleman and Geo. Strayer, Clinton, Kansas.—This invention relates to improvements in horizontally-revolving wind wheels, and consists in an improved arrangement, at the ends of horizontal arms, on a vertical shaft, of pairs of vanes, one above and the other below the said arms, and hinged to swing vertically in frames, and hinged to swing horizontally on vertical rods, supported in the arms, the said frames being attached by rods to springs on the next arms behind, to resist the action of the wind, and the vanes being connected by cords to weights rising and falling near the shaft to hold them against the action of the wind, and to allow them to rise and present less surface thereto when it blows too strong. The arrangement is such, that the vanes are held diagonally on the returning side, so as to obtain a reactionary effect of the wind, while it is acting directly on the other side.

Animal Trap.—Samuel Arnold, Silver Springs, Wilson County, Tenn.—This invention relates to an improvement in traps for catching rats and other animals.

Joint for Tongs, etc.—W. E. Clark, Troy, N. Y.—This invention relates to a new joint for ice and other tongs, and similar devices, being particularly adapted to tongs made of wire, although it may also be used on articles made of different material.

Folding Chair.—Asahel C. Boyd, Worcester, Mass.—This invention relates to certain improvements in folding chairs whose front legs extend upward, and are jointed at their upper ends to the chair-back. The invention consists in the combination of the seat and longitudinally-slotted back legs, with the side posts of the chair-back, provided near their lower extremities with pins which enter the slots in the back legs; also in the combination of the above with the jointed ones with bars, whereby when the chair is folded together, the back may slide upward in the slots of the legs, and, by means of the connecting bars, raise the chair-bottom until it becomes parallel with, and stands in close proximity to, the back; and when the chair is opened, the back may slide downward in the slots in the legs, and, by means of the connecting bars, draw the chair-bottom downward into a horizontal position.

Cephalic Meter.—Horace Bonham, Philadelphia, Pa.—This invention consists of a band of lead or such other material as can be readily bent to conform to the shape of the head, and such as retains any form which may be given it; such band being covered with leather, and combined with a socket furnished with a set screw, and attached to one end of the band, and with a graduated tongue fastened to the other end of the band, which tongue enters the socket, and may be clamped therein by the set screw, so as to retain the measurements after they have been obtained.

Washing Machine.—Jeremiah A. Morelock, Silver Run, Md.—This invention consists in a box with a corrugated or furrowed bottom, combined with a rubber having a vertical slot in each of its side plates, and a crank-shaft, whose offsetts pass through said slots, and which is supported in the sides of the box; the rotation of the shaft causing the rubber to slide back and forth owing to the pressure of the offsets alternately against each side of the slots; the rubber being provided with feet for turning over the clothes.

Wagon Seat.—R. O. Knowles, Coolville, Ohio.—This invention consists of a perforated metal plate attached to the upper surface of one side of a wagon body, combined with a wagon seat, furnished with clasps for embracing said plates, and with a spring-pin for fastening the seat at any desired point on the plates.

Stand and Waiter.—George Gill, Taunton, Mass.—This invention relates to a waiter combined with a stand for holding water pitchers, or other vessels that require to be inclined in order to discharge their contents, the stand being therefore provided with a swinging frame in which the vessel is placed; said improvements consisting mainly in details of construction, and the addition of wings to the waiter for the purpose of increasing its capacity.

Spoon, Cup, and Bell.—Thomas Leach, Taunton, Mass.—This invention consists in providing a call bell of that class in which the tongue is driven against the sounder by the operation of a spring, with a threaded bolt projecting from the top of the sounder, and forming a stem upon which a cup of any sort may be screwed.

Hay Lifter.—William H. Misner and G. E. Marker, Heyworth, Ill.—This invention relates to new and useful improvements in machines for gathering hay from the swathe and conveying it to the stack; and it consists of a three-wheeled carriage with a rake mounted on the axle of the two wheels which are arranged in advance of the other, by which the machine is guided, the horses being hitched between the rear and front wheels, on each side of the connecting bar, over which the long arm of a lever projects rearward, which lever is arranged to vibrate the rake and rake support, to lift the hay when gathered from the swathe to carry it away.

Grain Binder.—W. H. Payne, Janesville, Wis.—This invention relates to improvements in machines for attachment to harvesters for receiving the grain from the apron, separating it into gavels, and binding the said gavels, and it consists in the combination on a horizontal shaft, and working beneath a shield open at the top to admit the grain thereto, of two or more sets of securing and holding arms, and two or more compressing arms, arranged to receive the grain, separate it into gavels, move it to the place for the action of the binding head, or twister, and compress and hold it while binding, at which time another set of receiving arms is brought to the place of receiving for the next gavel, the separating and compressing arms being arranged to hold and guide the wire supplied mainly from one side and suspended across the receiver, placed so that the grain being delivered to the receiving arms will drop upon it.

Harvester.—Isaac H. Palmer, Lodi, Wis.—This invention consists in an inclined platform, so placed in a harvester frame as to conduct the cut grain from the sickle to the tilting table, in combination with a spring rake head on the revolving reel, which, pressing upon the platform, as it is drawn over it, allows more of the cut grain to slip under it as it ascends the platform.

Official List of Patents.

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FOR THE WEEK ENDING August 2, 1870.

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105,877.—Paper Bag.—Alfred Adams, Chagrin Falls, Ohio.
105,878.—Twine and Thread Cutter.—S. W. Adams, Providence, R. I., assignor to T. B. Doolittle, Bridgeport, Conn.
105,879.—Gang Plow.—John Alloways (assignor to himself and W. Cummings) Decatur, Ill.
105,880.—Animal Trap.—Samuel Arnold, Silver Springs, Tenn.
105,881.—Peat Machine.—Aime N. N. Aubin, Portland, Conn.
105,882.—Tube Well.—S. S. Ayres (assignor to himself and Abram Sebring), Plainfield, N. J.
105,883.—Excavating Machine.—John A. Bailey, Detroit, Mich., assignor to himself, L. E. Webb, Joseph Lederle, Anthony Lederle, and John H. Wells.
105,884.—Preparation of Paper Stock.—H. M. Baker, Washington, D. C., assignor to John M. Smith, Brooklyn, N. Y.
105,885.—Bedstead and Cot.—Virginia L. Baker, Richmond, Va.
105,886.—Steam Heater.—William C. Baker, New York city.
105,887.—Molds for Casting Mackerel Jigs.—Greenleaf Bassett, Taunton, Mass.
105,888.—Sliding Door for Railway-Box Cars.—John Bassler, Galesburg, Ill.
105,889.—Manufacture of Artificial Stone.—Wm. A. Battersby, Brooklyn, N. Y.
105,890.—Ball Valve for Injecting Air.—J. B. Bennett, Brooklyn, N. Y., assignor to himself and E. S. Bennett, New York city. Antedated July 19, 1870.
105,891.—Wool-Dryer.—L. S. Blake, Racine, Wis.
105,892.—Corn and Cotton Cultivating Plow.—Wm. R. Blanchard, Hertford, N. C.
105,893.—Stirrup.—A. H. Blossom, Miamisburg, Ohio.
105,894.—Paper-Cutting Machine.—John Bole, Grand Rapids, Mich.
105,895.—Head-Measure for Hatters.—Horace Bonham, Philadelphia, Pa.
105,896.—Hollow Augur.—Charles S. Bonney, Syracuse, N. Y.
105,897.—Device for Riveting.—Samuel L. Bower, Auburn N. Y.
105,898.—Folding Chair.—A. C. Boyd (assignor to E. W. Vaill), Worcester Mass.
105,899.—Whiffletree Trace Hook.—C. C. Bradley, Brodhead, Wis., and B. F. Upson, Rockford, Ill.
105,900.—Attaching Caps to Bases of Bell Levers.—E. W. Brettell, Elizabeth, N. J.
105,901.—Egg Holder.—Adna Brown, Springfield, Vt.
105,902.—Grading and Ditcing Plow.—S. N. Caldwell, Pilot Grove, assignor to himself and William Burton, Newton county Ind.
105,903.—Folding Chair.—Walter E. Cameron, Taunton, Mass.
105,904.—Coupling for Wheel Fellies.—Chandler Cheney (assignor for one half to Wm. Nash), Milford, Mass. Antedated July 27 1870.
105,905.—Combined Swift and Reel.—C. H. Clark, Pittsfield, Me.
105,906.—Bit Stock.—C. H. Clark, Pittsfield, Me.
105,907.—Branch Attachment for Water Tubes.—J. S. Clark, Philadelphia, Pa.
105,908.—Joint for Tongs, etc.—W. E. Clark (assignor to Mary E. Dean), Troy, N. Y.
105,909.—Stop Action for Cabinet Organs, etc.—H. A. Clifford, Rockville, Conn.
105,910.—Sawing Machine.—Wm. M. Cochran, Indianapolis, Ind.
105,911.—Extension Gas Fixture.—H. Coester, New York city.
105,912.—Machine for Securing Sheet-Metal Lining in Pump Stocks.—N. T. Coffin, Knightstown, Ind.
105,913.—Pump Valve.—Nathan T. Coffin, Knightstown, Ind.
105,914.—Chignon.—M. M. Cohen, Boston, Mass.
105,915.—Wind Wheel.—J. C. Coleman and George Strayer, Clinton, Kansas.
105,916.—Cough Sirup.—John Conzleman, St. Louis, Mo.
105,917.—Horse Collar Cap.—Dexter Curtis, Chicago, Ill.
105,918.—Shutter-Worker.—George L. Danforth, Lebanon, N. H.
105,919.—Tool Handle.—John B. Davids, New York city.
105,920.—Seed Harvester.—Fredericke Decker, Delaware, Ohio.
105,921.—Adjustable Link.—A. J. Dexter, North Foster, R. I.
105,922.—Frame for Potato Diggers and Shovel Plows.—James Millen Dick (assignor to himself and Wm. H. Albro), Buffalo N. Y.
105,923.—Process for Separating Fibers from Cotton Seed.—Jules Duval, New Orleans, La., assignor to himself, R. T. Sprague, Boston, Mass., and C. D. Sprague, New York city.
105,924.—Machinery for the Manufacture of Ice.—W. T. Duval, Georgetown, D. C.
105,925.—Stop-Plate for Hydrants.—James C. Eastman, Nashua, N. H.
105,926.—Wheel Hub.—William F. Ehlers, Pottsville, Pa.
105,927.—Clothes Line Fastener.—E. K. Elliott, Cuyahoga Falls, Ohio, and Uri J. Baxter, Washington, D. C.
105,928.—Sawing Machine.—J. A. Elston, Elston Station Mo.
105,929.—Turbine Water Wheel.—Enos Emerson, Smithport, Pa.
105,930.—Traversing Machine.—Valentine Foland, Indianapolis, Ind.
105,931.—Boat Detaching Apparatus.—James Foster, Jr. Camden, N. J.
105,932.—Mode of Operating Sewing and other Machines.—S. C. Foster, New York city.
105,933.—Soda Fountain.—E. M. Fowler, Washington, D.C., assignor to himself and Andrew McCallom.
105,934.—Mode of and Device for Making Gaskets for Steam Packing.—M. C. Gardner, Rochester, N. Y.
105,935.—Cotton Seed Planter.—T. C. Garlington, Chambers Court House, Ala.

105,936.—Reed Musical Instrument.—Wm. H. Gerrish, Boston, Mass.
105,937.—Device for Transmitting Rotary Motion.—H. J. Hancock, New York city.
105,938.—Hat and Cap Holder and Bracket.—John R. Hartmann and Martan Kals, Peoria, Ill. Antedated July 28, 1870.
105,939.—Wheelbarrow Wheel.—Geo. Harris, Weedsport, N. Y.
105,940.—Lamp Shade.—Andrew W. Haskell, Boston, Mass.
105,941.—Direct-Acting Compound Engine.—W. M. Henderson, Philadelphia, Pa.
105,942.—Grate Bar.—Mark Hodgson, East Saginaw, Mich. Antedated July 19, 1870.
105,943.—Paddle Wheel.—William H. Holland, Boston, Mass.
105,944.—Trace Buckle.—Alfred Henry Hopson, Taylorville, Ill.
105,945.—Grain-thrashing and Clover-hulling Machine.—Monroe Hubbell, Reynoldsville, N. Y.
105,946.—Binding Attachment for Harvesters.—F. B. Irett, Hollidaysburg, Pa.
105,947.—Eaves-trough Hanger.—J. J. Kauffman, Ashland, Ohio.
105,948.—Grate Bar.—Wm. Kearney, Bellevill, N. J.
105,949.—Bucksaw Frame.—George R. Kimball, Middletown, N. Y.
105,950.—Machine for Rolling Metals.—Andrew Kloman, Pittsburgh, Pa.
105,951.—Mechanical Motion.—Andrew Kloman, Pittsburgh, Pa.
105,952.—Iron-rolling Mill.—Anthony D. Kloman, Pittsburgh, Pa.
105,953.—Fluting and Sadiron.—M. H. Knapp, Bay City, Mich.
105,954.—Water-pipe Mold. — Henry Knight, Brooklyn, N. Y.
105,955.—Sliding Wagon Seat.—Richmond O. Knowles, Coolville, Ohio.
105,956.—Traction Engine.—James K. Lake, Chicago, Ill.
105,957.—Round Comb.—George T. Lincoln, Providence, R. I.
105,958.—Vegetable Cutter.—John Lusher, La Porte, Ind.
105,959.—Refrigerator.—William B. Mason, Boston, Mass.
105,960.—Manufacture of Carpet Lining.—W. A. Mauran, Providence, R. I.
105,961.—Sewing Machine.—John N. McLean, Philadelphia, Pa.
105,962.—Railway Rail.—Fenton A. Meredith, Mount Airy, Md.
105,963.—Fly Trap.—Modest Merk, Rochester, N. Y.
105,964.—Means for Communicating Motion to Machinery.—C. H. Miller, Buffalo, N. Y., assignor to himself and Emory Cummings, New York city.
105,965.—Car-seat Lock.—Ezra Miller, New York city.
105,966.—Coffee Mill.—John C. Milligan, Brooklyn, N. Y.
105,967.—Hay Rake.—W. H. Misner and G. E. Marker, Heyworth, Ill. Antedated July 22, 1870.
105,968.—Manufacture of Pure Carbonate of Potash.—C. F. Moll, Kenton, Ohio.
105,969.—Washing Machine.—Jeremiah A. Morelock, Silver Run, Md.
105,970.—Car Coupling.—Anthony T. Morgan, Pottsville, Pa.
105,971.—Apparatus for Automatically Regulating the Flow of Gas Used in Heating Vulcanizers, etc.—J. M. Osgood (assignor to himself and Flagg & Osgood), Somerville, Mass.
105,972.—Musical Box.—Amedee Paillard, St. Croix, Switzerland, assignor to M. I. Paillard & Co., New York city.
105,973.—Harvester.—I. H. Palmer, Lodi, Wis.
105,974.—Grain Binder.—William H. Payne, Janesville, Wis.
105,975.—Cut-off for Relays and Other Electro-magnetic Instruments.—F. M. Perry, Barton, Vt.
105,976.—Sash Holder.—W. E. Phelps, Elmwood, Ill.
105,977.—Lubricating Apparatus for Axle and Journal Boxes.—J. B. G. M. F. Piret, Paris, France.
105,978.—Eyelets for Fastening Buttons.—S. M. Porter, New York city.
105,979.—Urinal Attachment to a Bed.—Daniel Price, Lockport, N. Y.
105,980.—Passenger Register for Vehicles.—John Rhoads (assignor to himself and W. H. Harrison), Harrisburg, Pa.
105,981.—Machine for Pressing and Sheeting Tobacco.—George W. Rucker, Oswald C. Swan, and Thomas W. Rucker, St. Louis, Mo.
105,982.—Windlass.—Albert Russell, Newburyport, Mass.
105,983.—Boat-detaching Apparatus.—W. S. Ryerson, Geo. Stancliff, and O. T. McIntosh (assignors to themselves, S. G. Tripp, and Chas. Chambers), New York city.
105,984.—Adjustable Railway Truck.—A. V. Sanford, Union Center, N. Y.
105,985.—Top Prop for Carriages.—Anson Searls, Newark, N. J. Antedated July 21, 1870.
105,986.—Valve for Steam Engines.—William C. Selden, Brooklyn, N. Y., assignor to himself and Adam Carr, Paterson, N. J. Antedated July 19, 1870.
105,987.—Paper File.—F. C. Senseman (assignor to himself A. E. Steel), Philadelphia, Pa.
105,988.—Fence Post.—Charles J. Shuttleworth, Springville, N. Y.
105,989.—Sifting Machine.—G. Sidey, Brooklyn, N. Y.
105,990.—Interfering Pad for Horses.—John Smith, Boston, Mass.
105,991.—Cake Pan.—J. H. Smith, Brooklyn, N. Y.
105,992.—Cake Pan.—J. H. Smith, Brooklyn, N. Y.
105,993.—Metallic Chair Seat.—Silas Allen Snyder, Clarendon, N. Y.
105,994.—Apparatus for Carbureting Air.—J. F. Spence, Brooklyn, N. Y.
105,995.—Ditching Machine.—Andrew J. Stephens, Milford, Ill.
105,996.—Apparatus for Cutting Grass Under Water.—P. J. Stone, Athens, Pa.
105,997.—Planing Machine. — William Teal, Rochester, N. Y.
105,998.—Machine for Cushioning and Ventilating Leather.—Edwin Thomas, Philadelphia, Pa.
105,999.—Smut Mill.—W. C. Thompson, Williamson county, Tenn.
106,000.—Faucet.—H. B. Tiffany, Medina, Ohio.
106,001.—Railway Car Wheel.—Fred'k H. Trevithick, Jr., New York city.
106,002.—Automatic Fire Extinguisher for Railroad Cars, etc.—William P. Van Deursen and William C. Davis, Cincinnati, Ohio.
106,003.—Sulky Plow.—J. L. Van Gorder, Sidney, Ohio.
106,004.—Combined Harrow, Cultivator, Wheelbarrow, and Sled.—J. E. Wagner, Macada Hill, Pa.
106,005.—Carriage Spring.—Robert E. Walker, Dresden, Mo.
106,006.—Saw Table for Sawing Irregular Forms.—G. A. Watkins, Cavendish, Vt., assignor to himself and C. S. Greenwood Gardner, Mass.
106,007.—Faucet or Tap.—Abel L. Webster, New York city.
106,008.—Device for Drawing Liquids by Compressed Air.—A. L. Webster, New York city.
106,009.—Hair Pin.—Wm. Wickersham, Boston, Mass.
106,010.—Means of Attaching the Soles to Boots and Shoes.—Wm. Wickersham, Boston, Mass.
106,011.—Wire-driving Machine for Manufacturing Boots and Shoes.—Wm. Wickersham, Boston, Mass.
106,012.—Manufacture of Boots and Shoes.—William Wickersham, Boston, Mass.
106,013.—Boot and Shoe.—William Wickersham, Boston, Mass.
106,014.—Stave-jointing Machine.—William Widdowson, Rochester, N. Y.
106,015.—Spike Drawer.—Benjamin B. Wood, Negaunee, Mich.
106,016.—Lap Board for Dress Makers.—R. L. Woodbury, Lexington, Mass.
106,017.—Stocking. — Ferdinand Woodward, Sacramento, Cal.
106,018.—Accordeon.—Carl F. Zimmermann, Philadelphia, Pa.
106,019.—Preserving and Delivering Beer, Ale, etc., on Draft, by Means of Carbonic Acid Gas.—Theodore Ahrens, Louisville, Ky.
106,020.—Beer Faucet.—Theodore Ahrens, Louisville, Ky.
106,021.—Broom, etc.—James H. Anderson, Terre Haute, Ind.
106,022.—Cotton Picker.—William Apperly, Louisville, Ky.
106,023.—Bung.—J. F. Applegate, New Albany, Ind.
106,024.—Fabric for Head Covering.—Eugene Arnheim, New York city.
106,025.—Knitting Machine.—V. G. Arnold, Providence, R. I.
106,026.—Machine for Manufacturing Needles.—J. B. Blanchard, Boston, Mass.
106,027.—Cooking Range.—Daniel Bosworth (assignor to J. L. Mott), New York city.
106,028.—Spring Bed Bottom.—S. M. Brooks (assignor to himself and C. G. Thompson), Memphis, Tenn.
106,029.—Washing Machine.—Daniel Broy, Quincy, Ill.
106,030.—Boot and Shoe.—Andrew Burke, New York city.
106,031.—Cable Stopper.—E. R. Cheney, Boston, Mass., and John J. Emery, Owl's Head, Me.
106,032.—Sewing Machine.—John V. Coon, Elyria, Ohio.
106,033.—Handle for Children's Carriages and Perambulators.—W. E. Crandall, New York city.
106,034.—Corn Planter.—J. W. Crume, Troy, Mo.
106,035.—Fence Post. — Samuel A. Darrach, Newburgh, N. Y.
106,036.—Cork Screw.—Walter Dickson, Albany, N. Y.
106,037.—Trace Holder for Harness.—R. M. Dill, Morgantown, Ind.
106,038.—Loom Temple.—W. Whitney Dutcher, Hopedale, Mass.
106,039.—Wheel Cultivator.—J. Eshleman (assignor to himself and L. E. Miller), Canaan Centre, Ohio.
106,040.—Portable Cooking Stove. — Edward Evans, Philadelphia, Pa.
106,041.—Pipe Coupling.—Louis Alex. Farjon, Brussels, Belgium.
106,042.—Seed Marker.—S. D. Fisher, Normal, Ill.
106,043.—Snap Hook.—J. A. Fletcher, Eyota, Minn.
106,044.—Bridle Bit.—Masculine Foreacre, New Harrisburg, Ohio.
106,045.—Roller Skate.—J. A. Fremon and J. H. Carkeet, Montgomery, Ala.
106,046.—Harrow.—August Friedemann, Waverly, Iowa.
106,047.—Machine for Separating Mineral and Fossil Substances.—Robert George, Denver City, Colorado Territory.
106,048.—Machine for Separating and Concentrating Ores and other Materials of Different Specific Gravities.—R. George, Denver City, Colorado Territory.
106,049.—Apparatus for Separating and Concentrating Ores.—Robert George, Denver City, Colorado Territory.
106,050.—Carriage Jack.—A. R. Giles, Adams, N. Y.
106,051.—Stand and Waiter. — George Gill, Taunton, Mass.
106,052.—Car Brake.—H. A. Goodman, Omaha, Neb.
106,053.—Lubricating Compound.—H. Grogan, Flatbush, N. Y.
106,054.—Lime Kiln.—P. J. Gerbault-Guichard, St. Berthevin-le-Laval, France.
106,055.—Combined Seeder and Cultivator.—H. Haines, Cedarville, Ill.
106,056.—Elevated Railway.—Jas. M. Hannahs, Chicago, Ill.
106,057.—Car Coupling.—John B. Hards and Wm. Hodnett, Chicago, Ill.
106,058.—Potato Digger.—Uriah R. Harlow, Farmersville, Cal.
106,059.—Portable Stove.—M. S. Harsha and W. M. Van Nortwick, Batavia, Ill.
106,060.—Steam Former for Shaping and Finishing Corsets.—Charles Hepstonstall (assignor to himself and Pardon M. Stone), Providence, R. I.
106,061.—Rotary Pump.—R. A. Horning, Lenark, Ill.
106,062.—Tile Machine.—John B. Hughes, Terre Haute, Ind.
106,063.—Rolling Mill.—D. I. Jones, Newburg, Ohio.
106,064.—Clod Fender for Plows.—Wm. B. Kidder, Pike township, Ind.
106,065.—Mode of Attaching Looking-glass Frames to Bureaus.—Cheney Kilburn (assignor to Kilburn & Gates), Philadelphia, Pa.
106,066.—Cup and Bell.—Thomas Leach (assignor to H. G. Reed, George Brabrook, and H. H. Fish), Taunton, Mass.
106,067.—Combined Chair and Step-ladder.—August Liesche, Syracuse, N. Y.
106,068.—Manufacture of Imitation Braids, Trimmings, etc.—Henry Loewenberg, New York city.
106,069.—Spring for Beds, Sofas, etc.—William Lord, San Francisco, Cal.
106,070.—Gas Heater.—John Lundgren, New York city.
106,071.—Machine for Grinding Hand-saw Blades.—D. M. Mefford, Norwalk, Ohio.
106,072.—Pump.—C. L. Merrill, Watertown, N. Y.
106,073.—Manufacture of Blades of Pocket Cutlery.—W. H. Miller and G. W. Miller, Meriden, Conn.
106,074.—Bed Bottom.—L. L. Newman, East Saginaw, Mich.
106,075.—Baling Press.—G. W. Nutter, Santa Cruz, Cal., assignor to himself and Charles Keeton.
106,076.—Coach Cleaning Sponge.—H. D. Ohlsen, Chicago, Ill.
106,077.—Pipe Boring Machine.—T. W. Purcell, Fond Du Lac, Wis.
106,078.—Motive Power Engine.—James Robertson, Glasgow, Scotland.
106,079.—Churn.—J. R. Sapp, Danville, Ohio.
106,080.—Photographic Print Cutting Apparatus.—T. M. Saurman, Norristown, Pa.
106,081.—Regulator for Spirit Meters.—Louis Schulze, Louisville, Ky.
106,082.—Umbrella.—Nathaniel Sehner (assignor to himself, J. C. Keller, and Abraham Huffner), Hagerstown, Md.
106,083.—Breech-loading Fire-arm.—T. D. Simpson, G. B. Gray, and J. H. Romans, Mount Vernon, Ohio.
106,084.—Two Horse Equalizer.—Z. B. Sims, Bonham, Texas.
106,085.—Tanning.—J. H. Slocum and G. F. Turner, Fayette, Maine.
106,086.—Manufacture of Carriage Axles.—A. E. Smith, Bronxville, N. Y.
106,087.—Hay Tedder.—F. R. Smith, Ilion, N. Y.
106,088.—Portable Fence.—J. O. Smith, Reily, Ohio.
106,089.—Water Closet Receiver.—William Smith, San Francisco, Cal.
106,090.—Suspended Shelf.—J. B. Stockton, Edmunton, Ky.
106,091.—Apparatus for the Treatment of Fracture of the Lower Jaw.—John Stowe, Lawrence, Mass.
106,092.—Needle for Sewing Machine.—Edwin Strain, Newton, Mass.
106,093.—Cock.—T. H. Thayer, New Haven, Conn.
106,094.—Spittoon.—W. H. Topham, New York city.
106,095.—Stock Barn.—John Tyler, New Carlisle, Ohio.
106,096.—Lubricating Journals for Railway Axle Boxes.—Ernest Von Jelmsen, Omaha, Nebraska.
106,097.—Paneling Machine.—D. F. Walker, Minneapolis, Minn.
106,098.—Device for Moistening and Closing Envelopes.—R. W. Walker, Washington, D. C.
106,099.—Adjustable Gage.—T. E. Warren, Shelburne Falls, Mass.
106,100.—Bung.—Albin Warth, Stapleton, N. Y.
106,101.—Machine for Cutting Textile and Other Material.—Albin Warth, Stapleton, N. Y.
106,102.—Clothes Rack.—C. H. Wolcott, Jamestown, N. Y.
106,103.—Meter.—George Sewell, Brooklyn, N. Y.

REISSUES.

4,084.—Printing Press.—R. Hoe & Co., New York city, assignees of Stephen D. Tucker.—Patent No. 45,350, dated June 28, 1864.
4,085.—Division A.—Water Supply Regulator for Water Works.—Birdsill Holly, Lockport, N. Y.—Patent No. 87,413, dated March 2, 1869.
4,086.—Division B.—Water Supply Regulator for Water Works.—Birdsill Holly, Lockport, N. Y.—Patent No. 87,413, dated March 2, 1869.
4,087.—Division C.—Water Supply Regulator for Water Works.—Birdsill Holly, Lockport, N. Y.—Patent No. 87,413, dated March 2, 1869.
4,088.—Mode of Fastening Skates.—Nathaniel Ladd, Brooklyn, N. Y., assignee, by mesne assignments, of the administrators of the estate of Edward Behr, deceased.—Patent No. 28,544, dated March 29, 1859.
4,089.—Harvester Rake.—Amos Rank, Salem, Ohio.—Patent No. 96,353, dated November 2, 1869.
4,090.—Paper Cutting Machine.—G. H. Sanborn, New York City, assignee of T. C. Robinson.—Patent No. 97,120, dated November 23, 1869.
4,091.—Grain Drill.—J. H. Thomas, P. P. Mast, and C. O. Gardiner (assignees to J. H. Thomas and P. P. Mast), Springfield, Ohio. Patent No. 96,369, dated August 3, 1869.

DESIGNS.

4,267.—Type.—Richard Smith, Philadelphia, Pa., assignor to Mackellar, Smiths & Jordan.
4,268.—Bracket.—J. H. Bellamy, Charlestown, Mass.
4,269.—Arm Chair.—W. E. Cameron, Taunton, Mass.
4,270, 4,271.—Knitted Fabric.—Martin Landenberger, Philadelphia, Pa. Two Patents.
4,272.—Shawl Fabric.—Martin Landenberger, Philadelphia, Pa.
4,273.—Flower Pot.—James Leak, Geddes, N. Y., assignor to himself, T. G. White, and William Holmes.
4,274.—Refrigerator and Water Cooler.—C. C. Savery, Philadelphia, Pa.

EXTENSIONS.

Printer's Composing Stick.—O. F. Grover, Middletown, Conn.—Letters Patent No. 15,358, dated July 15, 1856.
Machinery for Cleaning Top-flats of Carding Engines.—Horace Woodman, Saco, Maine.—Letters Patent No. 15,313, dated July 8, 1856; reissue No. 2,292, dated March 13, 1866.

Inventions Patented in England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

PROVISIONAL PROTECTION FOR SIX MONTHS.

1,042.—Millstone Dress.—John Fairclough, St. Joseph, Mo. April 8 1870.
1,722.—Harmoniums, etc.—G. W. Scribner, Chatham, Canada. June 21, 1870.
1,727.—Machinery for Binding, Wrapping, and Forming Cigars.—S. Schofield, Providence, R. I. June 16, 1870.
1,767.—Slashee Sizing Machine.—D. Hussey, Lowell, and F. A. Leigh Boston, Mass. June 21, 1870.
1,783.—Process for Obtaining Glycerin from Soap-makers' Lyes.—B. T. Babbitt, New York city. June 22, 1870.
1,786.—Packing Cases.—J. McCree, Toronto Canada. June 23, 1870.

Advertisements.

500 Agents wanted to sell the beautiful Photograph Marriage Certificates. For particulars, send stamp to Crider & Bros.,Publishers,York, Pa.

WANTED — An Experienced Practical Smelter to go to Northern Mexico. One who is competent to plan, superintend, and erect an English Reverberatory Furnace, in all its details. An unmarried man preferred. Address Box 3,133, New York Postoffice.

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Proposals.

Office Depot Quartermaster, Jeffersonville, Ind., July 15, 1870.

SEALED PROPOSALS, in duplicate,will be received at this office until 12 m., the 30th day of August,1870, for the manufacture of two thousand (2,000) Common Tents, and one thousand (1,000) Wall Tents and Flies, more or less, without poles or pins, from material (except sewing twine) to be furnished by the United States and delivered to the contractor at the Depot of Jeffersonville, Indiana.

The Tents, when completed, will be delivered at the same place for inspection.

The right to reject any or all bids, if regarded as disadvantageous, is reserved by the Government.

Bidders are invited to be present at the opening.

Proposals must be addressed to the undersigned, and distinctly indorsed, "Proposals for the Manufacture of Tents."

For specifications, conditions,and further information apply at either of the Quartermaster's Offices at Chicago, Ill.; St. Louis, Mo.; New York; Philadelphia, Pa.; Louisville, Ky.; Jeffersonville, Ind.; or Washington, D. C.

By order of Quartermaster General.

C. H. HOYT, Captain and A. Q. M. U. S. Army, Depot Quartermaster.

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Corner 9th and F sts., Washington, D. C., **Opposite Patent Office and Masonic Temple,and** One Block from GENERAL POSTOFFICE DEPARTMENT. The F street cars, communicating with the Capitol, Executive Mansion, Treasury, War, and Navy Departments, and the B. and O. R. R. Depot, pass the door. MRS. E. A. POLLARD, Proprietress.

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THE 23D ANNUAL EXHIBITION OF AMERICAN MANUFACTURES and the MECHANIC ARTS,under the Superintendence of the MARYLAND INSTITUTE, will be opened in its spacious Hall, in Baltimore, Sept. 20, 1870, and continue four weeks. The Hall will be ready for the reception of goods Sept. 19. No medals or premiums will be awarded, but the Committee on Inventions have discretionary power to report on articles of merit and utility. For particulars,address JOSEPH GIBSON, Actuary. JAMES YOUNG, Ch. Com.

MILLER'S FALLS CO. Manufacture Barber's Bit Brace, No. 97 Beekman st., New York.

NOTICE

RELATING TO ARTIFICIAL LIMBS.

War Department, Surgeon General's Office, Washington, 15th July, 1870.

Congress having provided by Acts approved June 17 June 30, and July 11, 1870, for the reissue every five years of Artificial Limbs, or the value thereof in money, to officers, soldiers, seamen, and marines, who have lost limbs in the service of the United States, the following instructions are published for the benefit of those interested:

Applications should be made direct to the Surgeon General, from whose office the necessary blanks will be furnished on request.

Upon applications for limbs in kind, orders will be given by the Surgeon General, upon any manufacturer selected, who shall first have filed a bond in the sum of Five Thousand Dollars, with two sureties, to furnish good and satisfactory limbs, without extra charge to the soldier, and make good all defects of material or workmanship without additional charge, subject in all cases to the inspection of such persons as the Surgeon General may designate.

Blank forms of bonds will be furnished by this Office.

Transportation to and from the place of fitting the limb will also be furnished upon a written request addressed to the Surgeon General.

Applications for commutation will be certified by the Surgeon General, and transmitted to the Commissioner of Pensions for payment, through the local pension agents.

As full instructions will be forwarded from this Office, with the blank form of application, the expense of employing an Attorney or Agent will be in no case necessary.

J. K. BARNES, Surgeon General U. S. Army.

RIFLES, SHOT GUNS, REVOLVERS,etc., at reduced prices, warranted and sent by express, C. O. D., to be examined before paid for. Liberal terms to the Trade, Agents,or Clubs. Write for a price catalogue. Address GREAT WESTERN GUN WORKS, 179 Smithfield st., Pittsburgh, Pa. N. B.—Army Guns, Revolvers,etc., bought or traded for.

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DESIGNS AND PLANS

FOR THE

New City Hall.

OF

San Francisco, Cal.

OFFICE BOARD OF CITY HALL Commissioners,Southeast corner of Sacramento and Montgomery sts., San Francisco, June 22, 1870.

The Board of City Hall Commissioners hereby give notice that they will be prepared to receive at their office, on or before the 1st DAY OF NOVEMBER NEXT, designs and plans for the new City Hall of San Francisco.

The Commissioners, in order to obtain the very best design and plan, invite the fullest competition among architects, and to this end have resolved to offer the following premiums:

1st—For the design and plan selected and adopted..$2,500
2d—For the second best design and plan............ 2,000
3d—For the third best design and plan 1,500
4th—For the fourth best design and plan............ 1,000
5th—For the fifth best design and plan............... 500

The premiums payable in City Hall warrants, equivalent to Gold Coin.

As a guide to architects, in the preparation of the designs and plans, the Commissioners have prepared a pamphlet containing full instructions and suggestions, as well as the terms and conditions upon which the premiums will be awarded.

Pamphlets, containing instructions to Architects, can be had at Wells, Fargo & Co.'s, 84 Broadway, New York.

Any design or plan in which the requirements of the Board, as set forth in the printed instructions, have not been reasonably complied with, will be rejected from the competition.

P. H. CANAVAN, Chairman,
JOS. G. EASTLAND,
CHAS. E. McLANE,
City Hall Commissioners, San Francisco, Cal.

WOOD-WORKING MACHINERY GENerally. Specialties,Woodworth Planers and Richardson's Patent Improved Tenon Machines. Nos. 24 and 26 Central, corner Union st., Worcester, Mass. Warerooms 42 Courtlandt st., New York. WITHERBY RUGG, & RICHARDSON.

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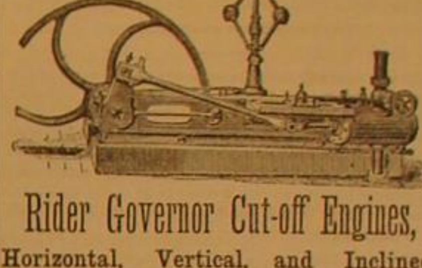

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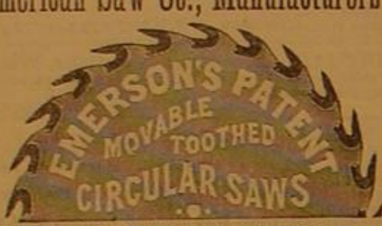

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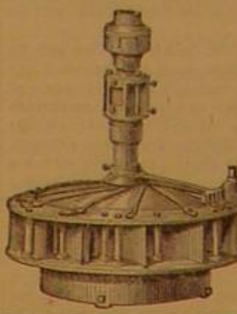

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