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Improved Engraving Machine.

We illustrate herewith a beautiful device, whereby letters or figures traced upon patterns may be exactly copied upon metal by engraving, with, it is claimed, greater facility and accuracy than by a skilled hand engraver.

In order that our readers may fully understand the operation of this machine it will be necessary first to explain how the movements of the tracing point, A, are repeated by the engraving tool at B.

The engraving tool is fastened in a spindle or chuck, C, which chuck is held by vertical bearings in a swinging frame. This frame swings on a pivot, D, above, and a corresponding pivot below, in the crotch of the swinging arm, E, which is pivoted at F and G. It will now be evident that all motions of the arm, H, not radial to the pivot, I, which joins the arms, H and E, will move the arm, E, which will carry the swinging frame, with it. But the swinging frame, is connected to the arm, H, also by an arm, J, pivoted at K and L, so that all radial motion of the tracing point, A, about the pivot, I, is also transmitted through the arm, H, and the arm, J, to the swinging frame. Thus all the motions of the tracing point, A, are repeated by the graver, B, but diminished in extent according as the pivots, I and K, and F and D, with their corresponding pivots below, are placed near to, or more remote from each other.

These pivots work in counter-sunk holes, properly spaced so that five or more different sizes of letters can be cut from the same patterns.

The patterns are shown at M. It will be seen that they are metallic plates with the letters cut upon them, and having a portion bent down at an acute angle. These patterns are gripped by a joint in the table, N, which joint is drawn together by thumb-screws, O. The patterns or types, M, are cut by machinery, and are as perfect as they can be made.

In order that the graver, B, shall cut properly, it is necessary that it shall always maintain a certain relative position to the direction in which it moves. This is very ingeniously provided for. The spindle which carries the tracing point may be rotated between the thumb and finger of the operator, and this rotary motion is transmitted to the graver spindle through a cord belt connecting the pulleys, P and Q. Thus the operator always keeping a particular side of the tracer spindle in the direction it moves regulates the position of the graver.

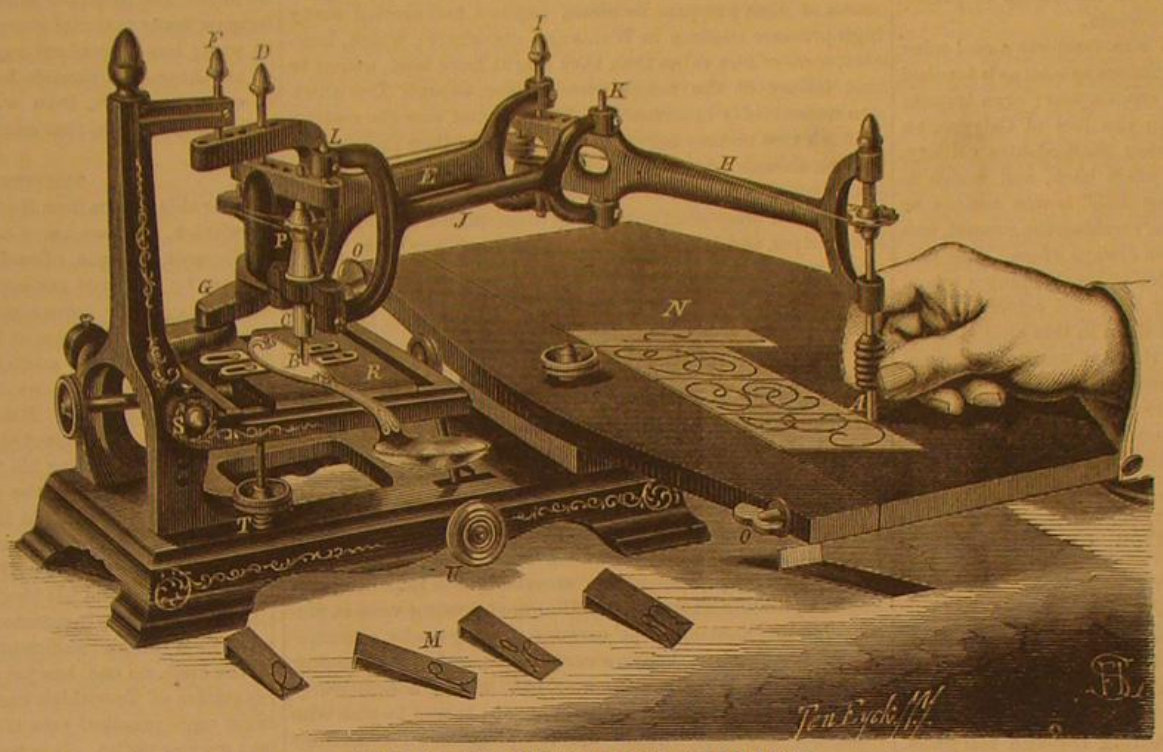
The pulleys, P and Q, are formed of disks of sheet metal, which are cut radially about the perimeters and alternate divisions bent in opposite directions, so as to form grooves broken at their edges. This prevents the slipping of the cord belt, and insures a positive motion.

The article to be engraved is placed and clamped upon a spring bed, R, pivoted at S. The spring shown at T regulates the pressure against the graver, its tension being altered as desired by a thumb-screw.

During the process of engraving the pressure against the graver is also varied so as to perform shading, by means of a milled thumb-nut, U, which, through the agency of a link, raises or depresses the pivoted spring-bed, R.

The inventor informs us this machine has been thoroughly tested, practically, and that its operation has given perfect satisfaction.

Patented, February 15, 1870, by J. C. Spencer. Address, for further information, Spencer, Banta & Harris, Phelps, N. Y.



SPENCER'S ENGRAVING MACHINE.

Positive Action Scroll Saw.

Our engraving shows a novel form of that most useful machine, the scroll saw, whereby the following advantages appear to us, upon personal examination of the machine in operation, to be secured.

It is extremely simple in construction, as will appear from the description below. The parts are so proportioned as to secure durability, the shafts being of ample size, and running in self-adjusting metal boxes. Its motion is remarkably steady, the saw apparently running as well at a speed of 700 as at half that speed. It can be set at any length of saw, from eight to thirty inches, and will run any width down to less than one eighth. The taking out or putting in of the saw, can be done in a moment of time, and the proper tension secured.

The saw has a direct action from the two crank shafts, A, without the use of a spring or any similar device liable to get out of order, thereby giving the saw a positive motion, the saw being *drawn each way*, so that in the event of the pin breaking at either end its motion at once ceases, and it can neither break nor bend, nor damage the most delicate work.

The crank shafts, A, impart motion to the crank wheels, B. The saw is stretched between the cranks as follows. The lower crank pin carries a collar from which a leather strap, C, extends to the end of the lower crosshead. From the upper end of the saw extends a light iron rod, D, connected to the crosshead at the top of the saw by a toggle joint and lever, E, by which the saw is put under tension. The rod, D, passes up and through a fixed nut in the crosshead, F, so that by simply turning the rod the tension may be adjusted as desired. The crosshead, F, receives motion from a pitman, G, connecting it to the upper crank pin. The two shafts, A, are further connected by means of the pulleys, H, and the connecting rod, I, the belt J, being employed simply to carry the upper shaft over the dead center.

The crosshead at the top of the saw is made adjustable vertically by a simple device at the back not shown in the engraving, whereby its position may be very quickly regulated for any required length of saw, and the "rake" of the saw may be also fixed as desired.

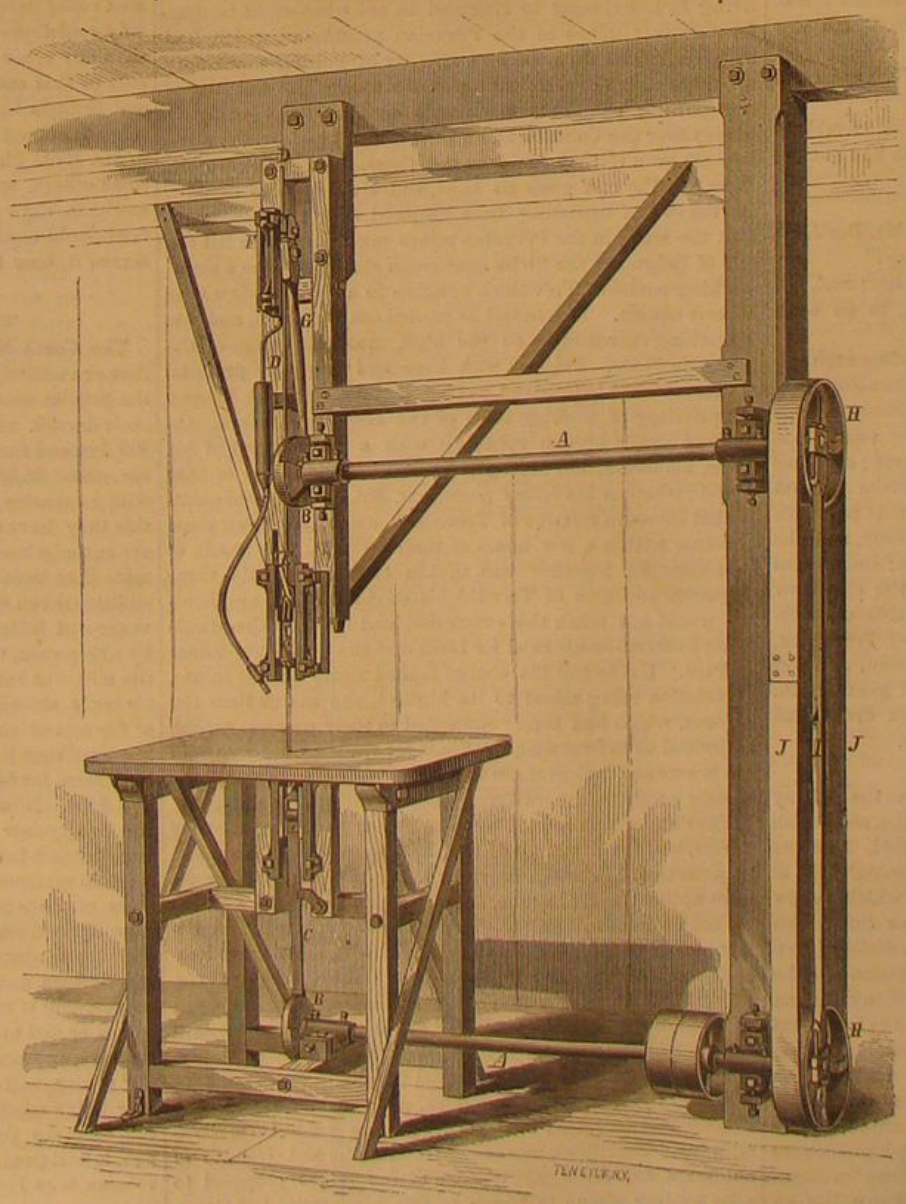
The crossheads are made of metal with wooden gibs, which may be replaced quickly and cheaply anywhere, without resorting to a machine shop.

All the wheels and revolving parts are accurately balanced so that the objectional jar often met with in other forms of scroll sawing machines is entirely removed. The usual appliance for blowing away the sawdust, completes the working parts of this simple machine.

A considerable number of these saws are now running in large wood-working establishments in this city, and the parties using them testify in high terms to their superiority in the respects above enumerated.

An experiment is also in progress, having for its object the application of this principle of mounting saws, to such as are used in sawing lumber from the log.

For further information, address the manufacturer, Henry L. Beach, at Montrose, Pa., or at his office, 42 John Street, New York city, where a machine may be seen in operation.



BEACH'S POSITIVE ACTION SCROLL SAW.

Coal Mines on Fire.

There are many instances of vast masses of coal which have ignited and have been burning for years. When once well ignited, and all communication with the external air is not entirely cut off (and some imperceptible fissures are quite sufficient to prevent this), then the devouring element pursues its course without interruption. It partially burns the coal and calcines the sandstone and adjacent schists, changing their colors to a sort of red, and altering their composition. At Brule, near Saint Etienne, there is a coal mine which has been on fire from time immemorial. The soil at the surface is baked and barren; hot vapors escape from it; sulphur, alum, sal ammoniac, and various natural products are deposited on it; it might be supposed to be a portion of the accursed cities formerly consumed by the fires of heaven and earth.

Other burning coal mines are cited in France; for example, those of Decazeville, in Aveyron, and of Commentry, in the department of Al-

lier. The inhabitants have even for a long time kept up these fires for the sake of working the aluminous salts which are given off from the coal and are deposited on the surface of the soil as a whitish efflorescence.

In the carboniferous basins of the Saarbruck and Silesia, there are likewise coal mines which have been on fire for a long time. In Belgium, between Namur and Charleroi, at a place called Falizolle, the fire has been alight for many years. The inhabitants formerly were in the habit of working the coal on their own account. Now it frequently happened that two parties came in contact, causing endless disputes and sometimes sanguinary fights. A favorite way of keeping rivals or competitors at a distance, was to throw pieces of old leather on a burning brazier, causing an insupportable stench. One day the fire extended also to the coal, since which time it has never ceased burning. The fire, which burns underground, is seen through fissures in the surface. Sulphur deposits itself round these vents, and acid gases are evolved.

In England, especially in Staffordshire, the ignition of the coal has produced surprising effects of alteration in the measures containing coal. The sandstones have become vitrified, baked, and dilated by the fire, the banks of plastic clay hardened and changed into porcelain.

In the environs of Dudley there was formerly a coal mine on fire. The snow melted in the gardens as soon as it touched the ground. They gathered three crops a year; even tropical plants were cultivated; and, as in the Isle of Calypso, an eternal spring prevailed. In another Staffordshire colliery, the firing of which dates many years back, and which is called by the inhabitants, "Burning Hill," it was noticed as at Dudley, that the snow melted on reaching the ground, and that the grass in the meadows was always green. The people of the country conceived the idea of establishing a school of horticulture on the spot. They imported colonial plants at a heavy expense, and cultivated them in this kind of open-air conservatory. One fine day the fire went out, the soil gradually resumed its usual temperature, the tropical plants died, and the school of horticulture was under the necessity of transferring the gardens elsewhere.

Near Mauch Chunk, Pa., is a burning coal mine, which has been on fire for many years.

RICHARD TREVITHICK, INVENTOR OF THE LOCOMOTIVE.

[From All The Year Round,]

Trevithick finally made a steam carriage for common roads set it in motion, and away went the creature, tearing like mad along the road to Plymouth, breaking down walls, rushing into the gardens of sober-minded gentlemen intent only on their roses and their peaches, careering through toll-gates, flung open free of pay by terrified tollmen—who thought that this, too, was an invention and device of Satan; perhaps his ordinary chariot, with himself inside, sitting among the live embers. As Trevithick and one Vivian were steaming along the road, the latter caught sight of a closed toll-bar, just as they had torn down the front rails of a gentleman's garden.

"Captain" Vivian called to his partner to slacken speed, which he did, and came dead up to the gate, which was opened like lightning by the toll-keeper.

"What have us got to pay?" asked Captain Vivian, careful as to honesty if reckless as to grammar.

"Na—na—na—na!" stammered the poor man, trembling in every limb, with his teeth chattering as if he had got the ague.

"What have us got to pay, I ask?"

"Na—noth—nothing to pay! My de—dear Mr. Devil, do drive on as fast as ever you can! Nothing to pay!"

This story rests on the authority of Mr. Coleridge; and, "if not true, is too well found," as the Italians say, to be overlooked.

Trevithick's wonderful engine, after performing such exploits, and generally choosing to upset its passengers in a hedge, or over a stone wall, midway to their destination, was exhibited in London. Its owner and originator showing it off with wonderful effects, in Lord's Cricket-ground; carrying it along the new road, and Gray's Inn lane, down to that coach-builder's who had supplied the phaeton that ran with it. The next day it was exhibited in a cutler's shop, and the machinery worked for the pleasure of all comers; then it was run on a temporary tram-road laid down on the spot now called Euston square, and thrown open to the public as an ordinary sight of the time. But on the second day Trevithick, "in one of his usual freaks," closed the exhibition, and left hundreds waiting round the ground in a state of great wrath. The engine was about the size of an orchestra drum, and could be attached to a phaeton or other carriage.

TREVITHICK'S LOCOMOTIVE.

But a more useful triumph over difficulties was the railway locomotive, which Trevithick was the first to make, and which was used for the Merthyr Tydvil Railway, in 1804. This was an engine of an eight-inch cylinder, placed horizontally, as at present, with a four feet six-inch stroke, and which "drew after it upon the railroad as many carriages as carried ten tuns of bar iron, from a distance of nine miles, which it performed without any supply of water to that contained in the boiler at setting out, traveling at the rate of five miles an hour." This was considered a great triumph at the time; but Trevithick, like all the earlier locomotive projectors, was retarded and much troubled by the false idea that smooth wheels on a smooth rail would have no bite, and that, when dragging a heavy weight, they would just slip round, and do nothing else. Consequently, he put sundry rough projections on his wheels, much on the same plan as "roughing" a horse-shoe; and even we may well wonder at the five miles an hour, with ten tuns of bar iron, under all these disadvantages. Trevithick made another engine for the Wylam wagon-way, which at first could not be got to move at all, and, when it did, flew all to pieces, as its best exposition of the laws of motion. Near this Wylam wagon-way George Stephenson lived, whom all other men's railway failures and short-comings set to thinking and planning how he could make things work more easily together. And the result was an engine "which included the following important improvements on all previous attempts—namely: simple and direct communications between the cylinder and the wheels rolling upon the rails; joint adhesion of all the wheels attained by the use of connecting rods; and finally, a beautiful method of exciting the combustion of the fuel by employing the waste steam, which had formerly been allowed uselessly to escape into the air."

This was in 1815; but we have no business with such a date yet, and must go back to the time of Trevithick's traction-engine and Lord's Cricket-ground.

TREVITHICK'S INVENTIONS.

Shortly after the creation of that "chariot of the De'il," which ran shrieking along the road from Camborne to Plymouth, Trevithick and Vivian took out a patent for the application of high pressure to steam engines, and erected many high-pressure engines in Wales and elsewhere; which, however, were of less value than they might have been, owing to that fallacy of the rough wheels. For, though Trevithick was undoubtedly in advance of his age, and saw the coming of much that neither science nor society was then prepared to receive, though he was a man of vast genius and grand ideas; yet he could not look to everything, and it was reserved for another and more practical man to disencumber the wheels of locomotives, and take them out of leading-strings. But Trevithick was very fast, very universal, in his science. In the Catalogue of the South Kensington Museum he is described as "inventer and constructon of the first high-pressure steam-engine, and of the first steam-carriage used in England; constructor of a tunnel beneath the Thames, which he completed to within a hundred feet of the proposed terminus, and was then compelled to abandon the undertaking; inventor and constructor of steam-engines and machinery for the mines of Peru (capable of being transported in mountainous districts), by which he succeeded in restoring the Peruvian mines to prosperity; also of coining-machinery for the Peruvian Mint, and of furnaces for purifying silver ore by fusion; also inventor of other improvements in steam-engines, impelling-carriages, hydraulic engines, propelling and towing vessels, discharging and stowing ships' cargoes, floating docks, construction of vessels, iron buoys, steam boilers, corking, obtaining fresh water, heating apartments," etc. Surely a sufficiently wide range for one mind to travel over! It was he also who conceived the first idea of a screw-propeller; for nothing seemed to come amiss to him, and his science had a kind of prescient, prophetic character only found when there is genius as well as knowledge.

TREVITHICK'S ADVENTURES IN PERU.

Now we come to the most romantic and stirring period of Trevithick's career. In 1811 M. Uville, a Swiss gentleman, living in Lima, came to England to see what could be done for the silver mines in the Peruvian mountains, which had been abandoned from the impossibility of getting machinery out there which could clear them of water. The difficulty of transporting cumbrous machinery on the backs of feeble llamas over the Cordilleras, and the difficulty of working the engines even if they could be got there, seemed imperative. Watt and the rest gave no hope, and Uville was in despair. On the eve of departing from England with the conviction that the water in the Peruvian mines must stay there till the day of judgment, the Swiss gentleman chanced to see a small working model of Trevithick's engine in a shop window near Fitzroy square. This model he carried out with him, and saw it working successfully on the high mountain ridge of the Sierra de Pasco. Flushed with hope and busy with projects, Uville returned to England, having obtained from the Viceroy the privilege of working some of the abandoned mines. On his way hither he was speaking with a fellow-travel of his plans, his model, and his desire to discover the maker of that model; whereon his fellow passenger, Mr. Teague, said quietly that he was a relative of Trevithick, and could bring them together within a few hours of their arrival. The result of that bringing together was, that in September, 1814, three engineers and nine of Trevithick's engines—Watt and Boulton would not touch the enterprise, and laughed the whole thing to scorn—embarked for Lima and the rich silver mines of Peru. Uville and his charge landed under a royal salute, expectation being raised to its highest, and in due time the engines, which had been "simplified to their greatest extent, so divided as to form adequate loads for the weakly llama, and the beams and boilers made in several pieces, were transported over precipices where a stone may be thrown for a league."

The engine was erected at Lauricocha; in the province of Tarma, and the first shaft of the Santa Rosa mine was drained to perfection. In 1817, Trevithick, hearing of this success, gave up family and fortune, home, wife, and children, and embarked for South America. The whole of Lima was in a ferment. When he landed he was received with the highest honors; his arrival was officially announced in the Government *Gazette*; the Viceroy met him with enthusiasm, and the Lord Warden of the Mines was ordered to escort him with a guard of honor to the "seat of his future labors." When the people found that his engines cleared the mines of water, that the mines yielded double produce, and that the coining machinery was increased six fold, they were beside themselves with joy. Trevithick was created a Marquis and Grandee of old Spain, and the Lord Warden of the Mines proposed to raise a silver statue in honor of this commercial Las Casas, the Columbus of the Cordilleras, this greatest of all living engineers, this most valiant of the Cornishmen, Don Ricardo Trevithick.

Everything looked bright until the revolution began, and the Cornish engineer found himself in a sufficiently disagreeable position between the two parties. The patriots kept him in the mountains, in a kind of honorable captivity, holding him as the Plutus of the war; while the royalists, holding him as precisely the same thing, "as the great means whereby the patriots obtained the sinews of war, ruined his property wherever they could, and mutilated his engines." They sold his shares, and alienated his mines. Trevithick, never very patient, soon determined to put an end to this kind of thraldom, and so made his escape by stealth, ran many dangers, but finally cleared himself and his liberty from the oppressive love and veneration of the mountain patriots. On the 9th of October, 1827, he returned to England, bringing a pair of spurs as the sole remnant of the colossal fortune made—but not realized—in the Peruvian mines. But before he returned he spent four years in Costa Rica, in the countries now so well known as the route of the Nicaraguan transit, and the scene of General Walker's filibuster warfare. Here he mined and projected mines, had magnificent designs, and foresaw many material improvements which afterwards came to pass; but he realized no permanent good for himself out of anything—not though he had an estate with a mountain of copper ore on it, from which he proposed to lay down a railroad to the sea, that so the working of it might be profitable.

TREVITHICK'S MERITS.

After this return from South America, we hear but little of Trevithick. All we know is, that he prepared a petition to Parliament, wherein, after distinctly stating his claims on his country by reason of the superiority of his machinery, he asks for some grant or remuneration. The saving to the Cornish mines alone by the use of his engines, he calculates to be £100,000 per annum: adding that but for his invention many of these mines, which produce £200,000 per annum, must have been abandoned. Before presenting this petition, Trevithick met with a moneyed partner, who supplied him with the means of perfecting his "never-ceasing inventions." And this was all he wanted, the petition was laid on one side, and never taken up again. In 1833 he died, at Deptford, in Kent, and since then his name has almost died out too. Mr. Hyde Clarke is the only man who has attempted a sustained biography of him, and his biography is not longer than this notice. Though the Institution of Civil Engineers offered a reward for a full and sufficient biography of one of our greatest of the craft, no one has yet come forward to claim it. The reputation of Trevithick has suffered, as often happens, because more practical men took up his ideas and worked them into greater notice. It is well said by one of his friends and greatest admirers, "his reputation has been purposely kept back by the partisans of Watt, on account of the high-pressure engine; of Stephenson, on account of the Thames Tunnel. But as he was clearly the inventor, not only of the high-pressure steam engine and the steam carriage, but also of the boiler, without which (or a modification of which) no steamboat could have ventured to cross the Atlantic, he has undoubtedly contributed more to the physical progress of mankind than any other individual of the present century." The first part of this statement may be questioned; the Stephensons and Brunels having been leading members of the Institution when it offered a prize for Trevithick's memoirs. Thanks be to Mr. Hyde Clarke, Mr. Edmonds, Mr. Neville Burnard, and some others, we may hope for the fuller recognition of his merits in days to come, and the application to them of that famous old motto, the best of its kind, "Let him who has deserved it, bear the palm!"

The Gas Wells of Erie, N. Y.

The Canal Mills of Oliver & Bacon, of Erie, N. Y., are now run entirely by gas from a well sunk on their premises the present season. It is perhaps a month since they erected their derrick and started to drill. They penetrated the rock 493 feet and the entire cost foots up, for drilling, casing, pipe, etc., about $1,500. Their mill contains four run of stones with a capacity of ten barrels per hour. To obtain power for this they have two boilers of forty-horse power each, which are entirely heated by the gas from the well, and they estimate they have enough in addition to produce power for two additional run of stones. On Monday morning last when the water and boilers were entirely cold, they turned on the gas by a stop cock, touched it with a match, and in forty minutes the mill was running. This is getting up steam with a celerity truly astonishing. As to the saving, the mere statement of the cost of coal for the month of June will exhibit it in a more striking light than any words of ours. Their bill for coal, then, for fifteen hours per day running, for that month, was $400. Now they have a constant supply of fuel the entire twenty-four hours capable of producing power to run six run of stones instead of four, at a permanent outlay of $1,500. A slight mathematical calculation will show that if the proprietors of these mills only wish to keep them at the present capacity, and run them the same number of hours, they make a saving of about $5,000 per year, to say nothing of the wages a fireman and other labor which machinery run by coal entails. But if they should wish to add the other two run of stones, or add to the number of hours run with their present capacity, the amount will show still larger. But the enquiring reader will ask, will this supply of fuel last? We can only judge what will be by what has been. The Altoff well in the southern part of the city, put down eight or ten years ago, is still producing gas as strongly as when first sunk. Its volume is as large, if not larger, than this one immediately under consideration. The wells put down on Ninth street and also near the corner of Holland and Seventh streets, from

which the fuel is furnished to carry on the Petroleum Brass Foundery of Jarecki & Co., and Brevillier's soap works, still hold out with no perceptible diminution. From these facts, we can answer that experience and time, the only criterion, all show that this source of fuel is permanent and reliable. So well convinced of this are all those who have investigated the subject that very many of our manufacturers are preparing to avail themselves of the advantages which this hitherto neglected source of wealth furnishes in the production of fuel for their mills and factories, even for dwellings.—*Erie Republican.*

OF THOUGHT WITHOUT LANGUAGE.

[George S. Burleigh in the Rhode Island Schoolmaster.]

In a former article I offered a few hints aiming to show that language, in its comprehensive sense, was an exponent of power, and the measure of a soul was, everywhere, its ability to express itself in some form or other, by word or sign. But soul can only speak to soul; to be understood there must be a common language, the nerves and motions of a common nature. The moaning of the wind will give the same mental impression as the moaning of a sufferer, but the mind refuses to be moved because it does not find the chord of sympathy; or, if by a play of the imagination, it does shape some tortured spirit in the hollow air, its pain is the genuine confession of relationship.

Words, though beyond computation graphic and vital, for purposes of expression, are far from necessary to thought, though the methods of that thought are inconceivable to a mind not endowed with them. Has it ever occurred to you, thoughtful reader, to imagine what must be the form of wordless thought?—in what fashion a mind that has never learned a language will hold and combine its ideas.

We are so accustomed to that automatic play of association, by which a name carries with it the image of a thing, and a word is always the symbol of some idea, that we are scarcely conscious of any thinking which is not in verbal language. A misty veil of undefined expression so hovers about the very inception of our ideas, that we are apt to pronounce the thought unformed, till the words that express it are brought into some ordered coherence. And yet, if one may trust what is so evanescent, in his own mental operations, he will often discover that what seems to be the laborious evolution of a theme, is only the slow embodiment in words of a picture set clear and vivid by an instantaneous impression on the mind.

When our consciousness is awakened by any telegraphic signal of the senses, the idea so aroused hurries to catch up some word or phrase with which to clothe itself, like a timid bather surprised on the margin of a pool. You lift the eye, and behold a tree, a house, or a river, and unconsciously the mind utters to itself the name of the object. Or you see some unknown thing, whose image, just as vivid in your mind, has yet no name to express it, and words to imply that fact arise immediately, "What is it?" "I know not what that may be."

Picture to yourself the image which an idea must take in the mind of a deaf mute who never heard nor uttered an intelligible sound, nor learned its silent symbol. That he has ideas, quick, varied, and intense, you see by a glance in that speaking face and that earnest, asking eye, which always seem, in their half-sad expression, to mark the efforts of a soul to grasp the unutterable, the yearning of a fettered spirit for the freedom of clear utterance to ease its nameless hunger. How that face lights up at a smile of loving recognition; how that eye flashes with indignation at what seems to the imprisoned soul a wrong or outrage. How the keen, silent questioner looks into your face for the secret of its mobility, for what it means, and by what power we who are blessed with some strange other faculty than theirs, can draw one another, excite laughter and tears, and a thousand actions, all mysteriously moved, all wonderful to that poor, fettered soul, all strange and fantastic as the revels of the northern lights.

To enter the sphere of that ineffable consciousness for an hour, would interest me more than to visit the palaces of all the crowned heads in Europe. To know precisely how, to him who is deprived of one of our finest senses, and one of our noblest faculties, this complex universe of mind and matter stands related, and to feel by what strange methods the remaining faculties of such a mind translate the facts of being which belong to the lost one, into their own language, would be well worth a momentary loss of one's identity.

A blind man attempting to express his notion of scarlet, said it resembled the sound of a trumpet, and he did not intend by it the slang that there was anything "stunning" in the color. We are constantly reminded of the impressions of one sense by the operations of another. To my ear the bass note in music is what a dull black is to the eye, and behind both organs they give the same mental emotion. The reverberations of deep thunder seem like boulders with worn angles, with profiles blunt and irregular, as if drawn by the jerking pencil of the lightning; and one who never had the pleasure of seeing stars from a blow on the head, may get a tolerably correct idea of that kind of galaxy by snuffing at a bottle of volatile salts!

Language is full of the mental effort to report the impressions of one sense by the symbols of another. We say that an apple is sweet, that a rose is sweet, a face is sweet, a strain of music is sweet, and love is sweet, not to mention the saccharine reaction of the "uses of adversity." Here taste, smell, sight, hearing, and a social sentiment, use the same word for that pleasurable sensation experienced by the mind through each distinctive organ. And they are right, though we may fancy it a mere poverty of language, for the equivalent emotion demands a related word, and all words are primarily things of the senses. We assist the organs of one sense by that of another. We open the lips and part the teeth a little when we are eager to hear; we listen and turn the eyes' attention inward, when we would detect a delicate taste, or remember a faded impression. Clairvoyants who see the invisible, shut their eyes and look with their foreheads or the palm of the hand.

But this mutual accommodation of the senses is not so marvelous as it may seem, when we remember that the whole five, six, or seven, as you please, are but one power of nervous perception, specialized into a variety of functions, differentiated, as the learned say, that we may have more perfect work by a division of labor.

The same necessity which developed nerve-contact into sight on the one hand, and hearing on the other, might also express through one of these the sensations proper to the other, when the other was wanting. Some sort of impression of things can be given, without the proper organ. Seal up the eyes of a bat, say the naturalists, and let it loose in a room crossed with wires in every direction, and he will fly clear of them all, as if he had other means of perception as sensitive as the optic nerve.

Laura Bridgman, with neither sight, hearing, nor smell, could detect the presence of a stranger in the room, without contact. Her mind then must have as distinct an image of every person as we have, yet not one of what we call our senses could go to the making up of that image. It could not be form as we know it, nor a voice, nor an odor, but it was itself other than all, exciting emotions of love or hate, gratitude or repugnance, and the thought it excited must have had shape, though it is not easy to imagine how.

In some other world we may get at the bottom of the mystery, and find the one language of which our varied senses are the idioms and provincialisms; but here the suggestion of that common basis is mainly useful as encouragement, to supplement the deficiencies of one gift by the culture of another. If we have not words, then speak in deeds; if we lack vocal melody, sing with the concord of harmonious lives, and let the soul come forth in expression through whatever door the good Father has left open.

Pure Air in Factories.

How imperfectly this requirement is supplied in large manufactories, and what a powerful source of mischief is at work in such places may be indicated by the following facts. In 100,000 parts of pure air, there are rarely found more than 30 parts of carbonic acid; in rooms in cities freely ventilated, the proportion rises to 80 parts in the same volume, while in ill-ventilated rooms and workshops there have been found from 100 to 700 parts, or twenty times nature's allowance. The working classes are exposed to no more fruitful cause of disease than this excess of carbonic acid in the air which surrounds them. When a high percentage of carbonic acid prevails, the circulation of the breathers is generally observed to become enfeebled, the frequency of respiration to increase, and nervous power to fail. Much of the consumption and scrofula of town populations is due to an atmosphere overcharged with this gas. Nothing affects its power for ill so much as an elevated temperature. "Thus even 1 per cent of carbonic acid may be endured at a temperature under 50° Fahrenheit, which at 70° or 80° would be absolutely intolerable." On entering a close room in which a number of persons have been employed for many hours, the atmosphere seems quite unbearable, and we gasp for an open window; while the workpeople, accustomed to the vitiated atmosphere, seem to breathe with ease, and say they do not feel any inconvenience. Is the closeness innocuous because it is not felt? By no means. Acclimatization is dearly bought. By the gradual depression of all the functions, less oxygen is absorbed, and the vitiated air then suffices for an enfeebled organism, just as it would for the respiration of a cold-blooded animal. This kind of vital depression when frequently experienced is destructive to the elasticity and vigor of those exposed to it. In such an atmosphere, rapid and efficient work, to say nothing of comfort and happiness, is out of the question. It is gratifying to find where sanitary regulations have been established, that very decided physical improvement has been effected.

A sufficient cubic space should be allowed to every factory hand; and regard should be had no less to the quality than the quantity of the air supplied.

Plainly, to manufacture perfectly pure air and deliver it on the premises, is impossible; we must, therefore, do what we can to keep it wholesome, by devoting strict attention to ventilation, by the adoption of disinfectants for drains and sewers, so as to kill or render innocuous all organic impurities, and by the preservation of open spaces in and near the great centers of industry. The ventilation of mines should be under legislative regulation, and the most beneficial results would follow, for many lives would be thus saved annually. The ventilation of lodging houses should also be subjected to police supervision in the interests of their casual occupants. Surely the thousands who spend their lives in the workshops and manufactories have even a greater claim on the care of the State.

Much also might be done by the working classes themselves, by the cultivation of habits of personal cleanliness. The fact must not be disguised, that a most baneful consequence of overcrowding is the vitiation of the air by the emanations from the bodies of diseased or uncleansed persons. French scientific investigation has disclosed the unpleasant fact that skin dirt, composed of perspiration, oily matter, and dust contains myriads of microscopic existences, both vegetable and animal. These cutaneous emanations are dissipated in and affect the air; add to these the pulmonary exhalations of consumptive and scrofulous persons, and some idea may be formed of the risk to health incurred by those whose days are spent in an atmosphere so highly charged with organic impurities. "The greater the aggregation of unwashed human masses, the more horrible must be the resulting atmospheric impurity."—*Good Health.*

An Instrument to Measure the Relative Pressure and Velocity of the Wind.

Dr. W. Smyth, of Maidstone, recently read a paper at a meeting of the London Aeronautical Society, describing an instrument which he exhibited, intended to measure the relative pressure and velocity of the wind. "It carries two brass rods resting on friction rollers. At their ends, on one side, are attached two dynamometers of equal known power; at their other ends can be fixed disks or vanes of various sizes to receive the pressure of the wind. Attached to each rod near its center are two arms carrying pencils pressed against this cylinder, round which is fixed a sheet of paper ruled to numerical divisions of the dynamometers. The cylinder being placed parallel to the brass rods, and moved by clockwork at a known rate, the paper receives the marks of the pencil across certain lines, according to the pressure of the wind, like other ordinary anemometers. To estimate, however, the velocity of the wind at these pressures is a matter of great difficulty; we have not a single philosophical instrument in the whole circle of the sciences capable of doing so. And in bringing the instrument in this state before the society I am desirous of having its opinion as to whether I have succeeded in overcoming that difficulty. It, doubtless, has occurred in the experience of many here that they have had the pleasure of observing a field of standing corn waved by the wind; if you give attention to this interesting country sight you will notice that in a level or upland field the waves pass with the greatest regularity in the direction of the wind. Now if we could measure the velocity of these waves, it would be the velocity of the wind; or, again, if we could discover the interval of time from the first stalks of corn to the windward bending to the breeze until the last move at the opposite side of the field, the distance being known, it would give us the velocity. Those who have had still more experience in the country may have noticed, especially in the morning, with the quickening breeze, or again at evening, in the last pulsations with which the wind "sighs itself to rest," its intermittent effects on certain objects. Should they be walking between two groves of trees standing some little distance apart in the direction of the wind, they may have suddenly noticed the quick rustling of the leaves in the trees to the windward, and after an interval of silence the same rustling in the grove further on, the interval representing the velocity of the wind. Now these two vanes are intended to represent two stalks of corn growing apart in the direction of the wind, or two groves of trees similarly situated. And just as the standing corn on the upland lea bends regularly to the breeze, so these two vanes, most carefully adjusted and placed at a known distance, bend successively in the wind and register their movements. Behind each vane is a contact breaker in electrical connection with these two armatures, which have pencils touching the cylinder. Now the moment the first vane bends in the wind, the electrical connection being complete, the pencil makes a mark on the paper, and after a short interval of time, during which the cylinder is moved round some distance by the clock, the second vane is depressed by the wind and registers its movement by the other armature. The distance between the two marks gives the time the pulsation was in passing from one vane to the other, while the other part of the instrument shows the exact pressure of such pulsation. The vanes may be placed from ten feet to a hundred yards apart, depending on the velocity with which the cylinder revolves. For an observatory ten feet would answer best, and would give, perhaps, the most accurate results. It may seem after all that this instrument is not likely to give us correctly the velocity of the wind. The atmosphere is an ocean of such extreme tenuity that we can scarcely think of measuring its fleeting waves. But it is not possible a pulsation of air, after bending this first vane, could acquire an increase or suffer a diminution of its velocity in passing from one vane to the other. If, therefore, when it arrives at both, the conditions be agreed, the effects must also be agreed, differing only in time corresponding to the velocity. Again, this only gives us the velocity of the pulsation and not of the general current. But if we had a table of pressure and velocities from the highest to the lowest pulsations we would certainly be able to calculate the velocity of a current of continuous pressure. But waiving this, when after a storm we have announced to us the enormous pressure of the wind at its highest on the square foot, it would be interesting also to be told its actual velocity, which this instrument to my mind, if well constructed, is capable of doing."

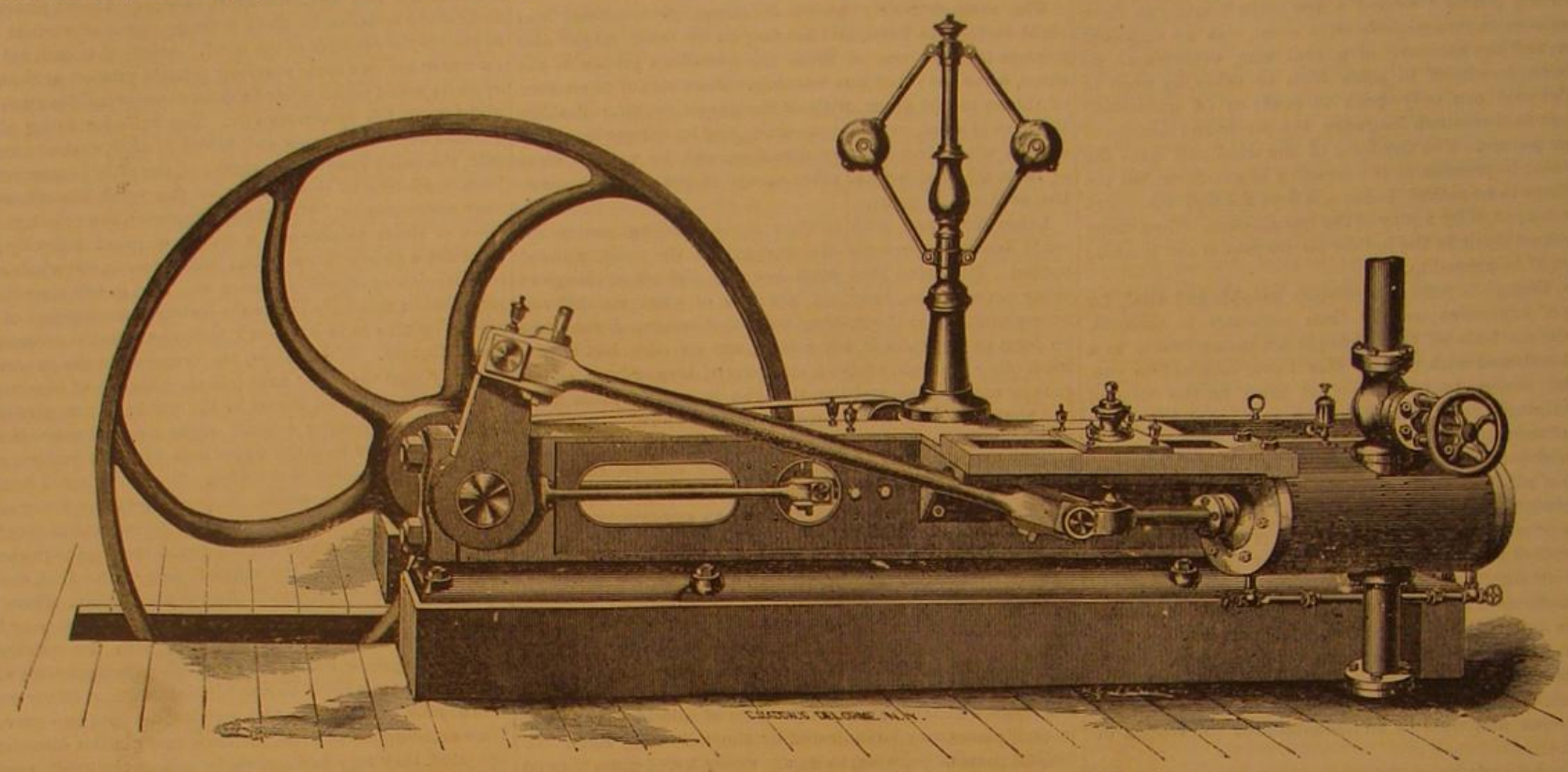
Rescue of Life by Swimming.

M. Farrand, a member of the Board of Health of the city of Lyons, France, says: "The method which has most interested me is that performed by an Englishman named Hodgson, of Sunderland; and after having experimented on and developed it, I recommend it for its precision and efficacy. It consists in holding the drowning man by the hair, and turning him on his back. Then the salvor turns over rapidly with his face upward, places the head of the man on his breast, and thus swims to land. This method is so simple and easy that in an experiment which I had the pleasure of making this autumn with my friend Dr. Bron I was able with ease to practice simultaneously the rescue of two persons more or less motionless. One of them did not know how to swim, and that was a great difficulty, for he grew stiff with fear, lost the floating line, so important to aid us in advancing, and hindered me considerably by lying along my side like an immovable oar on the side of a boat."

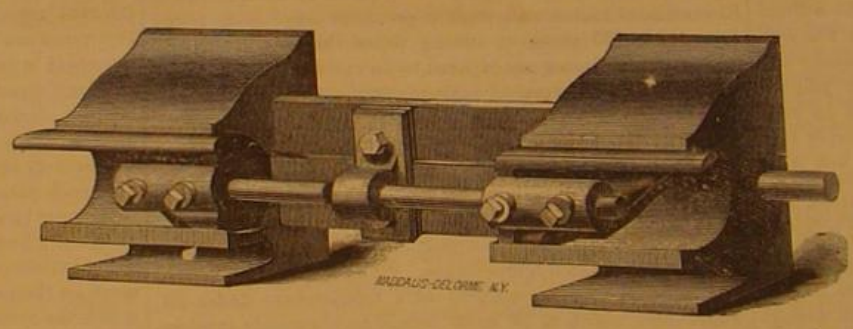
The Rider Horizontal Engine.

The vertical Rider engine which, as well as the horizontal one, takes its name from the inventor of the valve gear, constituting its most prominent feature, was illustrated and described on page 363, last volume of the Scientific American. We herewith present to our readers engravings illustrating the horizontal engine, to which the same valve gear is applied, with the exception of some slight changes in details which we will proceed to describe.

The main valve, instead of being cast in such a way that the cut-off valve ports are quite near together, as in the vertical engine (see Fig. 2 in the article above referred to) is so constructed that they are widely separated, as shown in Fig. 2.



THE RIDER HORIZONTAL ENGINE.



The object of this construction, as will be at once comprehended by experts, is to avoid clearance, which is by this means and by the most approved construction of other parts, reduced to a minimum. The two main portions of the main valve are connected by a strong piece of metal cast with them, and which has on the side not shown in the engraving, a strong rib, so that the section of the connecting piece, with its ribs, is T-shaped. The two principal parts of the main valve are thus rigidly connected, so that their faces are kept perfectly parallel. The cut-off valves are two in number, connected by a stem sliding in a guide bolted to the connecting piece of the principal portions of the main valve, as shown in the engraving. On the vertical engine the reader will recollect the cut-off valve is cast in a single piece.

In the vertical engine the valve moves vertically, while in the horizontal engine the two valves move horizontally, the lower parts of the main valve being brought forward and under the cut-off valves, so as to give them natural and easy seats. This is well shown in the engraving, Fig. 2.

As some who read this article may not have seen the one describing the vertical engine above referred to, we will recapitulate the description of the valve gear, premising that in the description the words "cut-off valves" should be changed to the singular wherever the vertical engine is meant.

The cut-off valves are seated upon the back of the principal valve, as shown. Their faces are true segments of cylinders, working in corresponding recesses upon the back of the main valve. The ends of the cut-off valves nearest the ends of the steam chest are not square, but are inclined towards each other, forming contours resembling lines of screw threads cut in opposite directions but having the same pitch. The ports in the back of the main valve are cut at a corresponding angle. It is evident that if the cut-off valves be placed so as to cover the ports in the principal valve, a reciprocating motion of the valve spindle will open and close the ports alternately. It is also evident that if the spindle uniting the cut-off valves be rotated in the direction of the widest parts of the faces of those valves, while it has no other motion, both ports will be simultaneously uncovered, and covered again by reversing the direction of the rotation. This rotation is imparted to the spindle from the governor, as the velocity of the engine increases or diminishes, while the reciprocating motion is received from a special eccentric on the crank shaft. The combined action of these motions produces a variable cut-off, cutting off at any part of the stroke. For when the spindle is rotated towards the wider part of the faces of the cut-off valves, which is the case whenever the speed of the engine slackens, the cut-off is retarded, and the reverse takes place whenever the engine runs faster than the correct speed.

The rotary motion is imparted to the valve stem by a toothed segment and rack, not shown, the stem being connected to the rod of the eccentric by a swivel joint. The speed of the engine is determined by weights upon the rack.

This valve gear secures a very sensitive action of the governor. We found on an examination of a sixty-horse power engine of this kind that, while the engine was in motion with full head of steam, it was possible to easily turn the cut-off valves by grasping the stem (only one and one fourth inches in diameter) with one hand. Many have doubted that with such an extent of surface subjected to pressure, such delicate action of the valve can be secured. The explanation of the fact, is based upon another fact, that, so far as we are aware, has not been recognized by writers upon the subject of friction, but which is practically recognized almost daily by everybody. The fact may be thus stated: When a body is moving upon a bearing surface in one direction the increase of friction generated by deflecting its course, is almost nothing in comparison to the tabulated co-efficient of friction between the bearing surfaces as ascertained by experiment when the same body moves in a *single* direction. A simple experiment will convince any one of this. Place a flat-faced body upon a plane surface, and incline the plane until the body resting upon it slides. The angle of inclination is a measure of the static co-efficient of friction, the weight of the body itself being considered as a unit. Now, by moving the plane from side to side, so as to impart a sliding motion to the body resting upon it, it will be found that the body will move towards the bottom of the inclined surface, although the latter be ever so slightly inclined from the horizontal position. This fact is also practically recognized in the drawing of corks, in the sliding of boxes upon floors, and in various other ways that we need not mention, and it may and ought to be set down as a mechanical principle that motion in one direction lessens the friction caused by motion in another direction.

Doubtless this fact might well account for some anomalies in results obtained by experimenters upon the subject of friction; as a slight end thrust backward and forward in a revolving shaft would modify the co-efficient of friction of its bearings.

The steam chest, cylinder, slide, frame, and main pillow blocks of this engine are now cast in one piece, which secures permanent parallelism in all these parts and also saves the labor and expense of fitting joints. Formerly these parts were cast separate and fitted together at a considerable cost.

The parts of the engine are all perfectly accessible, and the bearing surfaces are all accurately calculated to correspond to the weights supported so as to give maximum durability to each.

We are informed that the manufacturers are now extensively putting the Rider cut-off or propeller engines, as the lightness of the friction gives very great convenience in slowing and stopping, and in other respects it is found well adapted to this purpose. A 150 H.P. engine of the kind we have described, may be seen at the Kings Co. Mills, Brooklyn, E.D., N. Y., one of 60 H. P. at the Delamater Iron Works, at the foot of West Thirteenth street, New York, and one of 400 H. P., at Wm. Moller & Sons' sugar refinery, 83 to 93 Vandam street, New York

Many others are in use in and about the city and in other places, and are, so far as we are able to learn, giving good satisfaction. Indicator diagrams taken from several of these engines which we have seen, show a very high degree of economy.

For further information address A. K. Rider, Delamater Iron Works, foot of West Thirteenth street, New York.

Heat of the Gulf Stream.

Mr. James Croll, of the Geological Survey of Scotland, has recently been making a calculation of the amount of heat transmitted by the Gulf Stream, and has come to the conclusion that the total quantity of water conveyed by the stream is probably equal to that of a stream 50 miles broad, and 1,000 feet deep, flowing at the rate of four miles an hour, and that the mean temperature of the entire mass of moving water is not under 65° at the moment of leaving the Gulf. He thinks we are warranted to conclude that the stream, before it returns from its northern journey, is on an average cooled down to at least 40°; consequently it loses 25° of heat. Each cubic foot of water, therefore, in this case carries from the tropics for distribution upwards of 1,500 units of heat, or 1,158 000 foot-pounds. According to the above estimate of the size and velocity of the stream 5,755 ,680,000,000 cubic feet of water are conveyed from the Gulf per hour, or 133,816,320,000,000 cubic feet daily. Consequently, the total quantity of heat transferred from the equatorial regions per day by the stream amounts to 154,959,300,000,000,000,000 foot-pounds.

SCIENTIFIC INTELLIGENCE.

TO RENDER FABRICS UNINFLAMMABLE.

The best agent for this purpose is the tungstate of ammonia. Take a concentrated solution and dilute with water until it has the specific gravity of 1·140, and shows 28° (Twaddle).

The goods are moistened with this solution just before being starched, and they may be afterwards ironed and finished without the least difficulty. Delicate colors are not injured by the tungstate, and goods thus prepared cannot be set on fire, they can be charred, but not ignited.

The tungstate of ammonia can therefore be thoroughly recommended for muslins and children's clothing, and it is especially adapted to render indestructible the dresses of ballet dancers.

DECOMPOSITION OF ALCOHOL BY CHLORINE.

Absolute alcohol can be decomposed by chlorine with artificial light as readily as in the direct rays of the sun. If we pass chlorine into the alcohol in the dark, and then burn a piece of magnesium wire, or employ electric light, the hydrogen of the alcohol immediately combines under a slight explosion with the chlorine. This is another confirmation of the analogy of magnesium light and electric light with the chemical rays of the sun.

FORMIC ACID IN ANALYSIS.

Professor Mohr recommends the use of formic acid in the analysis of minerals. To the aqueous solution after the resolution of the mineral, is to be added formic acid, and the whole must be evaporated to dryness. The silicic acid will remain undissolved, and by heating the residue in a platinum crucible the formciates will be decomposed into carbonates, and can then be determined in the usual manner.

Corsets and Chignons.—Medical statistics in France, it is said, have proved that mortality among the female sex has diminished since corsets have become less fashionable; but that the wearing of the chignons increases diseases of the brain, with frequently fatal results. We imagine that the increased mental disturbance is mostly occasioned by the efforts and anxieties of the fair ones in adjusting their chignons.

[For the Scientific American].

THE HYMENOPTERS.

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

The Hymenopters are not only the most interesting of insects, but it may even be questioned whether in the variety and nature of their instincts they do not afford us more cause for admiration than do the members of any other group of animals—the Vertebrates, omitting man alone, not excepted. It is true that we do not find amongst them that fitness for close association with the human race that follows from the sagacity and intelligent fidelity of the dog or of the elephant, or from the tractability and docility of the horse; nor do we find the powers of mimicry possessed by the monkeys, nor the articulate utterances of the parrot; but, as mechanics, architects, and engineers these little creatures are unrivaled amongst brutes. Some birds display the exercise of great ingenuity and of patient labor in the construction of beautiful and secure nests, solitary or social habitations, as the case may be. The galleries of the "blind mole" are elaborate works, and the canals, dams, and villages of the beaver are marvels of construction, all the more wonderful from the very slight interchange of ideas that is possible amongst the members of these industrious societies. But all these undertakings sink into insignificance beside those of the Hymenopters.* What artificer is there more exact and yet withal more ready to adapt herself to circumstances than the bee? What manufacturers more expert than the various wasps? What engineer is more daring and more persevering than the ants? An ant, tunneling successfully, as ants have been known to do, beneath a wide South American river, may well laugh at us, hoping in the course of years really to have a bridge between New York and Brooklyn, or deriding as impossible the scheme of an international roadway under the Straits of Dover. Size for size, his race has time and again overcome far greater difficulties. We cannot travel readily from the Battery to Harlem River—the ants at times are impeded on their journeys by what to them are many miles of impediments; we may traverse the surface, or go above it, or beneath it, or even around on the water—the ants frequently have no choice but to mine beneath their obstacles; we have steam and gunpowder to assist us—they have only their jaws and jegs; they accomplish a road while we—we ignominiously remain content to travel—hampered by an ever-increasing traffic—stopped by snow or delayed by heat, nipped by the frost, or devoured by—well, look at the coat collar of your neighbor in the car and you will see what causes your own uneasy sensations. The difference is, that the little ant accomplishes at once that which we take years to talk about, and the cause of the difference is that each little ant labors for its community, while each of us!—why we—we have each our own ax to grind. But, says some one, the ant disregards the rights of the property owners along its proposed road. That, alas! is true; but are not Arcade and other railway companies, boulevard commissions, and city corporations sometimes accused of the very same thing? And here again the Hymenopters have the best of it; for ants, like lawyers and scissor-blades, do not cut each other—they allow no monopolies, and know no jobs except to take effect outside their own community. Would mankind but adopt this idea, we should very soon ride the length of Manhattan Island swiftly and in luxurious comfort.

Excuse this digression, good reader, but these Hymenopters are, as we said before, very suggestive of hints to humanity.

The class of Hymenopters may be divided into Stingers and Piercers accordingly as the ovipositor of the female serves chiefly as a poisonous weapon, or as an instrument to aid in the safe deposition of the eggs. This distinction might seem to imply a great difference in the structure of this organ, but this is not the case in its essential features. On the one hand the eggs of the bee, in the act of deposition, pass along the sting as do those of the Piercers, while on the other, the glands that secrete the venom of the former are, according to Newport, equally present in the latter, secreting a fluid that is discharged into the puncture in which the egg is deposited. Both the Stingers and Piercers are interesting to us for other causes than the merely wonderful nature of their habits, as these have frequently a great bearing on our economy, and we may say that in the majority of cases the Hymenopters are our friends. The lower of the Piercers—the Sand-flies, the Horntails, and the Gall insects—are, it is true, our foes—they deposit their eggs in the tissues of plants, and their grubs feed upon the wood and the leaves, or sap the life of the plant by the diseases which their presence engenders. The Ichneumon flies, on the other hand, which lay their eggs in the eggs and caterpillars and living bodies of other insects, are the firmest allies of the agriculturist, his foes are the habitations and store-houses of their progeny.

Among the higher or stinging Hymenopters—if we except the ants—and even they are useful scavengers, we find either producers, as the Honey-bee, or allies, as the various wasps, that store their nests with the bodies of noxious insects. Some of these, however, may be injurious to a slight amount, thus the bee-eating Sandwasp is an undesirable neighbor to the bee-keeper, and the Carpenter-bee gives occasional employment to his human namesake. The lower group of the Stingers are the Ants—above these we find various families of wasp-like insects, such as the Mud-daubers, the Sand-wasps, Wood-wasps, Esca—then the True-wasps, and, finally, the Bees, the highest of the insects.

THE SAD CEMONUS AND ITS NEST.

The nesting habits of these are of infinite variety; we lately gave a description of the Bee-eating Sand-wasp; the accompanying engraving, from Blanchard, represents a European wood-wasp, *Cemonus lugubris*, or the "Sad Cemonus, so called from its uniform dark hue. It makes its nest in the stem of the bramble, a location that, according to Kirby and Spence, is a very favorite one for the larva of wild bees and wasps, and of the ichneumon flies that prey upon them. The partitions of the cells of the nest are formed of the pith of the bramble. There is a similar species in this country, mentioned by Packard, the *Cemonus mornatus*, that burrows in the elder. The food of the larval Sad Cemonus is not specified, but we presume that the nest is stored with some kind of fly. This insect, although the location of its nest is so different, belongs to the same family as the Sand-wasp It is curious that the various wasps do not in all, nor probably in most cases, kill the insect they carry to their nest. They merely benumb it by their sting, so that, when the egg laid with it hatches out, the larva may find its food fresh. It has even been questioned whether the poison may not have a preservative effect, preventing decomposition in case of the death of the insect stung.

The strength of the Hymenopters is remarkably evidenced by the large size of the insects they capture. One of our native species makes the cicada, or "locust," its prey. Although this burrowing wasp is a large insect—in fact, a medium sized specimen now before us is longer in body than the locust, yet placed by the side of its prey the difference in bulk is remarkable, and it is almost incredible that it should so readily secure such a powerfully flying and strong insect; yet we can corroborate the observers whom Packard cites.

* After this article was written, on reference to Kirby and Spence, we found that this idea of the superior building instincts of insects was almost a plagiarism of theirs. It was not wittingly so, and it is well as it is—for if our limited observations have brought us to the same point that their superior knowledge led them the reader will the more readily acquit us of all exaggeration, and of a wish to elevate these "little objects" to a n beyond their ju st claim."

Improved Mode of Working Artillery.

The war-cloud that has recently threatened Europe has assumed such proportions as to set military engineers to serious consideration as to the probable demand for new engines of warfare.

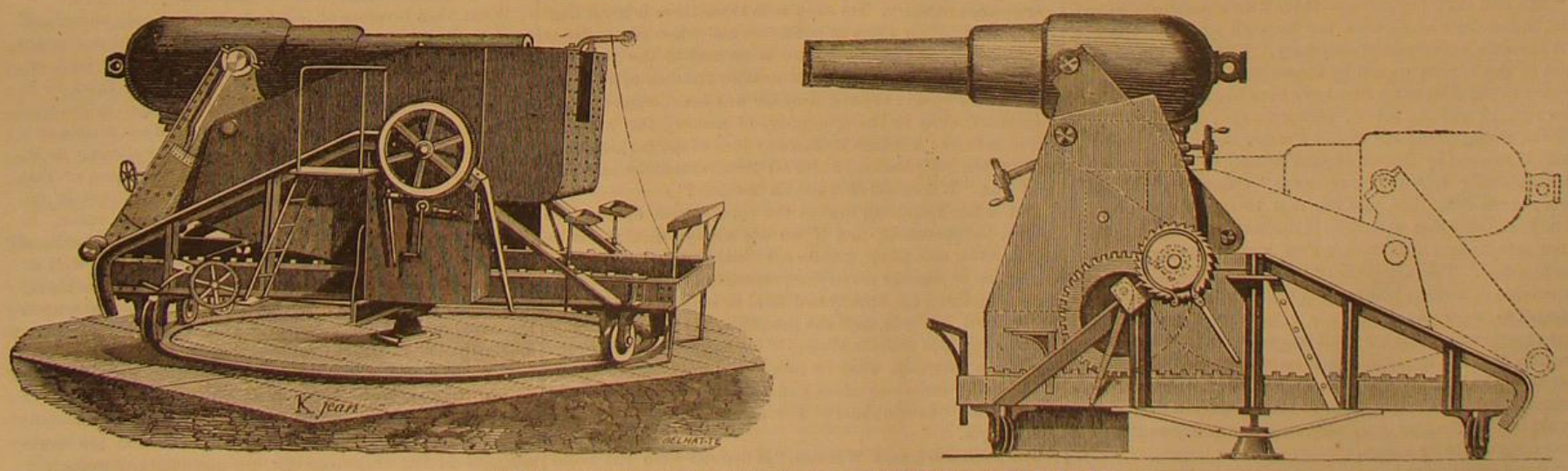
It is perhaps safe to say that modern advances in military engineering have done much to prevent nations from resorting to arms in the settlement of their difficulties. So terribly destructive are the agents which man has devised for the conduct of war that the responsibility of nations in a resort to arms has been fearfully increased. Let us hope that in the end war will become exterminated, and the reign of peace commence upon this blood-stained earth.

Among the most prominent of recent improvements in this field, and one which will probably receive a thorough trial in the event of a European war, is the Moncrieff system of mounting and working guns for ships, and for coast defenses, illustrated herewith. It is proper to say, however, that the general principle adopted by Capt. Moncrieff has been adopted, and by many thought to be utilized in even a more efficient manner by Capt. Eads, a celebrated American engineer, than by Capt. Moncrieff.

The method of Capt. Moncrieff, as described by himself, is as follows:

"The system is indeed a simple one; it does not require either brute strength or heavy expenditure for its application; nor does it need mighty forges to weld iron walls to protect our guns and gunners; it only calls to our aid the simplest and most docile forces of nature. Instead of trying to meet force by force, I make my guns bow to the inevitable conditions which science has imposed; and instead of wasting energy, money, and skill in attempts to raise a buttress against the new artillery, I employ the hitherto destructive force of recoil to lower the gun below the natural surface of the ground, where it can be loaded and worked in security and in comfort; and, at the same time, I have made that destructive force so much my servant that I compel it at my pleasure to raise the gun again into the fighting position whenever it is required.

"In 1855, while watching the interesting operations before Sebastopol, and endeavoring, as well as I could, to understand the conditions under which the siege-artillery was used, I conceived the idea which is now realized. It was then that I saw the value of earth and the importance of simple expedients. It was plain that the weak point of a battery was the embrasure, which formed a mark to fire at, an opening to admit the enemy's shot, and required constant repair even from the effects of its own gun, which, in firing, injured the revetments of the cheeks. I also came to the conclusion, in my own mind, that a remedy for some of these defects could be devised. Afterwards I worked at various plans, of which sketches were made or models; but each design had defects which discovered themselves to me as my experience increased.



THE MONCRIEFF SYSTEM OF WORKING ARTILLERY

"The real difficulty of the thing arose from the necessity of providing for the enormous strain of the recoil. These early designs which were sometimes excellent in other respects, broke down at this difficulty, and although some of them no doubt would answer with small guns, they were not calculated to meet the tremendous recoil of large rifled pieces. At last I hit on a simple principle that would meet this difficulty to advantage, the interposition of a moving fulcrum between the gun and platform. Then I knew that the problem could be solved; and, feeling the great importance of the subject, I resolved to devote my efforts to working it out completely. While directing my attention to this simple and then apparently obscure matter, I was neither an idle nor dis-

interested watcher of the progress of artillery. Every step in advance was riveting the certainty in my mind that the system would one day be required, and with this conviction I refused to allow either discouragement or delay to make me desist. I shall now endeavor to explain shortly the system which bears my name, as far as it relates to coast defense. It consists of three parts: 1st, The mechanical principle of the gun carriages. 2d, The form internal and external of the batteries. 3d, The selection of ground for placing the batteries, and the arrangement for working them to the greatest effect; or, in other words, the tactics of defense for positions where the system is employed.

"The principle on which the carriage is constructed is the first and most important part of the new system, because on it depends the possibility of applying the other parts. This principle may be shortly stated as that of utilizing the force of the recoil in order to lower the whole gun below the level of the crest of the parapet so that it can be loaded out of sight and out of exposure while retaining enough of the force above referred to, to bring the gun up again into the firing or fighting position. This principle belongs to all the carriages; but the forms of these carriages, as well as the method in which this principle is applied, vary in each case. For instance, in siege guns, where weight is an element of importance, the recoil is not met by counterpoise. With heavy garrison guns, on the other hand, which, when once mounted, remain permanent in their positions, there is no objection to weight. In that case, therefore, the force of gravity is used to stop the recoil, because it is a force always the same, easily managed, and not likely to go wrong; and as these carriages are employed for the most powerful guns, it is a great advantage to have the most simple means of working them.

"It has been already mentioned that the principal difficulty arose from the enormous and hitherto destructive force of the recoil of powerful guns; and here I shall point out the manner in which that difficulty is overcome. That part of the carriage which is called the elevator may be spoken of and treated as a lever; this lever has the gun-carriage axle at the end of the power arm, and the center of gravity of the counter-weight at the end of the weight arm, there being between them a moving fulcrum. When the gun is in the firing position the fulcrum on which this lever rests is almost coincident with the center of gravity of the counter-weight, and, when the gun is fired, the elevators roll on the platform, and consequently the fulcrum, or point of support, travels away from the end of the weight arm towards the end of the power arm, or, in other words, it passes from the counter weight towards the gun. Notice the important result of this arrangement. When the gun is fired, its axle passes backwards on the upper or flat part of a cycloid. It is free to recoil, and no strain is put upon any part of the structure, because the counter weight commences its motion at a very low velocity. As the recoil goes on, however, the case changes completely, for the moving fulcrum travels towards the gun, making the weight arm longer and longer every inch it travels. Thus the resistance to the recoil, least at first, goes on in an increasing progression as the gun descends, and, at the end of the recoil, it is seized by a self-acting pawl or clutch. The recoil takes place without any jar, without any sudden strain, and its force is retained under the control of the detachment to bring up the gun to the firing position at any moment they may choose to release it. The recoil, moreover, however violent at first, does not put injurious horizontal strain on the platform. In my experiments at Edinburgh with a 32-pounder; I found that so slight was the vibration on the platform caused by firing that the common rails on which the elevators rolled in that experiment, and which were only secured in the slightest manner, did not move from their position, nor even when heavy charges of double shot were used did sand and dust fall off their curved tops.

"At a still earlier experiment made with a model of a 95-cwt. gun, the model was fired on the ice with excessive charges, and nevertheless remained stationary. This valuable concomitant of the system cannot be appreciated fully without referring to the difficulties that have been experienced, and are now felt, in getting pivots, platforms, etc., on the ordinary system, strong enough to mount the new artillery, where the recoil is stopped by friction applied directly by means of what are technically called "compressors," attached to the platform; these difficulties, that the first two 12-ton guns on ordinary carriages that were fired in casemates (which happened a few months ago) at Gilkicker Fort, were both *hors de combat* the first shot. This alarming event showed that, with all the experience of ancient and modern artillery (and the carriages referred to were the legitimate exponents of the results of that experience), there was still room to doubt whether the problem of meeting recoil had been at that time completely solved by the existing system. The accident referred to was serious, because it might occur in action, and, in that event, would disable the gun *pro tempore* as completely as if it had been dismounted by a shot.

"Some credit may be claimed for the new system on the ground that it provided a carriage for a heavy piece of artillery on an entirely new principle, in which not a single part was copied from anything that had been formerly used, dealing with new conditions and performing new functions that no other carriage had done, and yet this new carriage (the first complete one of its kind) has now fired two hundred rounds. This practice has been carried out with only a few accidents, which pointed to defects in the gearing, which were easily remedied. By treating this violent force in the manner above described, a good deal of the strength that is required in other systems becomes unnecessary, and, at the same time, the recoil, however violent, can not only be met, but utilized. Together with the carriages there are some improvements of minor importance, such as trunnion pointers, reflecting sights, graduated racers, and so on, which it would be out of place to discuss at present, but which contribute to the efficiency and completeness of the system, and are more or less required for carrying it out as a consistent whole for coast defense."

Correspondence.

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

Inertia.

MESSRS. EDITORS:—Misnomers are the stumbling-blocks of philosophy and science. Somebody says that "language was not made; it *grew*." And it *grew*, not to express the ideas of philosophers, metaphysicians, and scientists, but with the wants and advancement of the common people. Philosophers, in attempting to express their uncommon ideas by means of common language, have been compelled to adopt such words as most nearly express their meaning, and in doing this have frequently been most unfortunate. The word employed, unless the greatest care is taken in its use, always carries with it more or less of the common meaning or acceptation, and this common acceptation not unfrequently carries with it a popular error, which the most discriminating, painstaking thinker frequently experiences great difficulty in eliminating. As a familiar illustration it is doubtful if the highest degree of astronomical science ever enabled any one to use the expression "sunrise" without an indefinite impression similar to that which he received in his childhood from the phenomenon, and from the word used during his whole life to express, not the *fact*, but the apparent phenomenon. To be sure the astronomer does not allow language in this particular instance to vitiate his thinking; and, indeed, language expressing apparent phenomena does not perhaps largely mislead real thinkers. But as such language not only conveys but perpetuates the errors of the superficial, or those who merely observe and consider phenomena, without reasoning as to their connection or order, so erroneous philosophical expressions, or expressions first used scientifically to denote a mistaken idea, not only convey but *perpetuate* the error which gave rise to them.

The writer has observed the discussion upon the subject of inertia which has taken place in the SCIENTIFIC AMERICAN during a year or so past, and is desirous of aiding in the attainment of correct views upon this subject. It is his view that the use of the word inertia is one of the best illustrations of what has been set forth above than any other word to be found in the language of science, and that this word is more unfortunate, more unfit to express the real truth, and more vicious in the errors carried with it and perpetuated by it than any other word used in scientific discussion.

The idea of philosophers seems to have been that matter has no power to move itself, no power to stop itself, no power to change the direction of its own motion, no power to retard or accelerate it; and this *absence* of power was denominated inertia. In other words, it is not a property but the *absence* of something which is sought to be named. The first thought that strikes one in this connection is the vastness of the category which a nomenclature of negatives would necessitate. Suppose we attempt to carry it out, and say that matter has no power to illuminate itself, therefore it has a property of *non-self-lumination*; that it has no power to organize itself, therefore it has the property of *non-self-organization*; it has no power to give life to itself, therefore it has the property of *non-self-vivification*, etc. It is not necessary to enlarge upon this. Names negative certain particular things, as the word darkness negatives the word light, or the word cold negatives heat, as also general words of a similar character which negatives all existences—such as *nothing*, *space*—are necessary. Yet even with these there is great danger of considering them as positives; and when a negative is which follows. The writer recollects an instance of a village sage, whose openly avowed atheism was based upon the impossibility, even to the Almighty, of making the universe out of *nothing*; not that he had any idea of the perpetuity of matter, but his question to him all important and unanswerable was, "Where did God get his nothing?"

But while negatives are, in the construction of our language, indispensable, and if we are always careful not to treat *nothing* as a thing, and do not vitiate our reasoning, yet the notion of *negative properties*, properties of *not* doing or *not being* something are absurd and fatal so long as we continue to use them. Words, says the grammar, "are certain sounds used by common consent as *signs of our ideas*." Words growing into a language used by people whose ideas are erroneous convey erroneous ideas, and they not only perpetuate but become the stronghold of the errors in which they had their origin.

The word *inert*, says Webster, "is derived from the Latin *in* and *ars* (art). The English sense being drawn not from *art* but from the primary sense, *strength* or *vigorous action*;" and he defines it in these words, "Destitute of the power of moving itself, or of active resistance to motion impressed, as matter is *inert*."

Inertia is a substantive derived from the adjective, and means the quality of being *inert*. Of course matter does not and cannot move itself. The proposition that matter could move itself would be logically absurd. It is an example of that too frequent error of making the subject and the object of a proposition the same; always absurd except in the loose common mode of expression which may be properly enough used to convey the idea of one portion of a compound acting upon another portion of the same compound, as when we say one cuts himself, a proposition confutes itself, a machine breaks itself. When we speak of things not compound we can properly say it *does* or it *does not* act, but must not say it compels itself to act; and when we say the same thing of both the subject and object of the same transitive verb, however the usage may be sanctioned, we talk nonsense.

But it may be said, "*inertia* merely means that matter does not move without something to move it or cause it to move," and this brings us to the discussion of both phenomena and facts of motion in connection with matter. When we say that matter does not move without something to move it have we done anything more than to enunciate a portion of the great general law—the law of all laws—that nothing in nature takes place without certain antecedent conditions which it is the true province of philosophy to determine? It is a fact that matter does not move, or, being in motion, does not move more rapidly or more slowly or does not change direction without certain conditions for the motion or the change; but is this fact any more worthy to be called a property and to have the name *inertia* assigned to it than the fact that coal will not burn without heat? than oxygen is entitled to be considered as a property and to be named *non-self-combustibleness*?

But, it may be urged, the word inertia has been used so long and so extensively and is so interwoven with all works and discussions on the subject of physics that we cannot dispense with it, and we can, after carefully defining it, retain it in our formulas and use it in our thinking and our talking without consequent error.

The answer is that it is impossible. The word has absolutely no meaning, and can never be safely used unless as we use a letter in algebra to denote a quantity simply and nothing more.

Suppose now we drop the word inertia with its errors and absurdities and make an effort to enunciate the *positive* facts relative to motion and matter. The first fact is that matter *does move*; not move *itself*, as we have said, but it *moves*. Of course it moves, as every phenomenon in nature takes place, in uniform routine, or, as is generally said, according to unvarying laws.

The historic apple, the descent of which, under the eye of the philosopher, suggested meditations which resulted in the discovery of the law by which the universe is guided, was but matter moving; not *moving itself*, but *moving*. Newton did not discover the fact that matter moves. Every schoolboy knew that as well as he. The philosopher discovered the mode or manner or law of its motion. The *law* does not move the matter. It is merely the enunciation of the *manner* of its moving. Matter moves always and everywhere. It moves faster, slower, or changes direction, according to the conditions present. And these conditions for the motion or change of motion are as numerous as the possible combinations of chemical substances or the physical properties of elementary substances. Why does matter thus act? All philosophy seems to answer that matter has ever acted thus, and that it ever will act thus. That matter and its laws or modes of action are eternal. But of this we can know nothing. The universe as it is moves on from the greatest to the most minute of its operations, from systems of worlds in their incomprehensively vast career down to the development of an animalcule is simple matter *moving*; sometimes suddenly and with resistless and distinctive force; sometimes almost imperceptibly, gently, and beneficently. Supply the necessary conditions for any particular motion, and that motion always begins. A minute spark is dropped by a careless hand in a powder magazine, and, from the introduction of just this little particle of heated substance, particle springs away from particle, molecule from molecule. What was before a solid changes to heated gases, and matter moving shatters a mighty ship to atoms or lays a city in ruins. Wooed by the sun and air "the mists go up and water the earth."

What then becomes of inertia? It is not only absurd and meaningless, but even so far as it is claimed to have a meaning it is false. In no sense can matter be said to be inert. Let us study its conditions; we shall not find them to be capricious. No thinking man can doubt that millions of millions of ages ago matter moved toward other matter as it now does when not prevented, with a force directly as its mass and inversely as the square of the distances, or that oxygen would not combine under certain conditions in the same proportions as now with hydrogen to form water. In one continued round of condition and sequence the operations of nature have proceeded. Our highest pleasure as well as our most useful employment is to study and to utilize them; but all our theories and experiments must be based not upon the time-honored error that matter is inert, but upon the momentarily demonstrated fact that all matter moves.

Albany, N. Y. PHILOSOPH.

A Theory of Thunder.

MESSRS. EDITORS:—It occurs to the writer that the cause assigned in the text-books for the phenomenon commonly called thunder, is neither satisfactory nor correct. In substance, it is this: The electricity in passing from one cloud to another, or to the earth, makes a vacuum along its course; and what we call thunder is the result of the subsequent collision of the divided atmosphere.

This is perhaps true, if we accept it as a statement of a result; but I think it affords a partial explanation only. My theory in regard to this phenomenon is this: The electricity in passing from one cloud to another, or to the earth, decomposes the water in the cloud into its component gases; and the great heat of the electricity ignites and explodes these gases, and reforms them into water.

If something like this does not occur—if an explosion does not take place—I cannot understand why the mere passage of electricity, either through the cloud or through the open

air, should not be quite as noiseless, as the passage of any solid body would be through either or both of these media.

The violence of the explosion depends on the volume of electricity set free, and the amount of water decomposed; or, if a volume of electricity pass through a perfectly dry medium, there could be no decomposition of water, and consequently no detonation.

And may not the fact that we can see electricity at all depend upon the combustion of gases evolved in the decomposition of water in the atmosphere? R. S. MERSHON.

The Bachelder Extension.---Interesting Letter from the Commissioner of Patents.

MESSRS. EDITORS:—Referring to the communication in relation to the Bachelder extension, copied in your issue of the 16th ult., from the N. Y. *Sun*, I think it proper to say that, while it may not be expedient for a public officer to attempt to vindicate himself in the newspapers against criticisms upon his official action, the direct charge of this unknown correspondent, that the Commissioner of Patents "is using all his influence to get the Bachelder patent extended for ten years," requires notice.

I desire to say that this statement is absolutely untrue; that until I saw this communication I did not know that an application to extend the Bachelder patent was before Congress; or, if I had ever heard of it, I had forgotten it; that I have never spoken or written to any one concerning said extension, nor has any one, that I remember, ever spoken or written of it to me; that I have never heard or decided, and shall not hear or decide any application for the extension of any patent in which I have ever been retained or have acted as counsel; that my views upon the subject of extensions are set forth in several printed opinions, which speak for themselves; that I do not now own, and never did own any interest whatsoever in any patent or application for a patent, except that, nine years ago, I received a small interest in a patent as security for moneys advanced to a poor inventor to enable him to develop his machine, and, in that case, I lost my money, and the security proved worthless.

I think I may safely add that if, during my administration, any man should so far forget what is due to himself, this office, or the present incumbent as to attempt to influence me corruptly, he will neither be any former client of mine nor any one who comes from that portion of the country in which all the years of my professional life have been spent.

SAMUEL S. FISHER.

Washington, D .C., July 16, 1870.

Interesting Patent Decision.

MESSRS. EDITORS:—Inclosed we send you a newspaper notice of the recent decision promulgated by Judge Woodruff at the recent session of the United States Supreme Court, at Canandaigua, relative to our "Soft Tie" patent suit *vs.* J. M. Hurd Paper Bag Co.

This patent is one of those we have obtained through your house, and although well fought by the defense, seems to have been impregnable. We congratulate you.

Canajoharie, N. Y. ARKELL & SMITHS.

DECISION.

James Arkell *et al vs.* The J. M. Hurd Paper Bag Company. For infringement of patent. Decision in favor of plaintiffs for amount of damages and injunction. J. C. McClure for plaintiffs; D. Wright for defendants.

The Judge, in his written discourse, says the plaintiffs (Arkell & Smiths) have the sole undoubted right, by any means, for the "soft tie" sack and that the patent given to Hurd was a "mere artifice" to appropriate the right of the plaintiffs.

Wanted---Free Trade in Boiler Iron.

MESSRS. EDITORS:—I see in your issue of 9th inst., on page 20, current volume, under the heading," "How to Make a Perfect Boiler," that we are to "use the *best American iron*." And then says the writer, "Thanks to protection, we can now produce an article equal to the best in the world." If *protection* don't make the boiler any *better*, please give us a little "free trade in ours out West, and we will get "the *best* in the world," *a great deal cheaper* than we now get the "equal."

Champaign, Ill. THOS. B. GREGORY.

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections for the month of May, 1870:

During the month, 495 visits of inspection have been made, and 861 boilers examined, 792 externally and 251 internally, and 135 were tested by hydraulic pressure. The number of defects in all discovered, 427; of which 59 were regarded as dangerous. These defects in detail are as follows:

Furnaces out of shape, 27—3 dangerous; fractures in all, 77—11 dangerous; burned plates, 42—6 dangerous. These defects not unfrequently arise from mismanagement in blowing down (or out) boilers.

Our attention has been called to several cases were boilers were leaking badly in the joints about the furnace, and around the ends of the tubes. On inquiry it was found that the boilers were blown down with steam up, fires burning, and the furnace and bridge wall nearly red hot. It will be seen at once that such practice cannot but injure a boiler; for, as the water is blown out, the sheets become very hot, and any sediment that remains in the boiler will become hard and fixed on the sheets. Many boilers are ruined in that way. First, draw the fires, and then open furnace doors and allow a current of air to pass through the flues or tubes of the boiler. Blow off with little or no pressure of steam. Parties who are troubled with leaky boilers, and loose tubes, will doubtless find, on examination, that the boilers are blown down with steam up, and fires on the grates.

Blistered plates, 39—2 dangerous; cases of incrustation and scale, 78—4 dangerous; cases of external corrosion, 28—5 dangerous; internal corrosion, 6—2 dangerous; water gages out of order, 25—4 dangerous; blow-out apparatus out of order, 9—2 dangerous; safety valves overloaded, 45—6 dangerous; pressure gages out of order, 80—6 dangerous; boilers without gages, 1; broken braces and insufficient staying, 9—3 dangerous; boilers condemned, 3. We are not a little surprised at the gross carelessness found in the management of safety valves. They are often put in most inaccessible places, as though they were of little or no account; they become corroded in their seats, and of no practical value whatever.

We recently found one on a steam pipe directly underneath a second-story floor. The floor had settled, and was resting upon the lever in such a manner that no pressure of steam which the boiler was capable of sustaining, could have raised the valve. This is only one of many similar instances which have come under our notice. Engineers should, for their own credit, and the safety of those who are employed in manufactories, examine frequently and carefully all the attachments to their boilers, and especially the safety valve.

[For the Scientific American.]

EXPERIMENTS WITH HYDRATE OF CHLORAL.

BY DR. F. A. HOWIG.

June 17th, 1870.—Weather clear and warm; temperature of the room, 74° Fah. At precisely 4 o'clock P.M., three hours after a hearty dinner, I dissolved 10 grains of the salt in one ounce of sweetened coffee and drank it. In 6 minutes after I lay down; in twenty minutes experienced a sensation of drowsiness; remained passive and quiet, conversing a moment occasionally, the desire to sleep continuing to become more marked; experienced no unusual feelings except languor, nor became at any time unconscious, but was aware of sounds in the street near and about the house. At 5 o'clock arose and sat up in a chair for a few moments but still feeling drowsy; lay down again for another half hour, when I again arose and went about my usual business.

June 18th.—Weather clear and warm; temperature of the room, 80° Fah. At half-past 4 P.M., three and a half hours after a moderate dinner, I dissolved 16 grains of the salt in about two ounces of sugar and water, and drank it. In ten minutes after I lay down; experienced some drowsiness immediately, and at 5 o'clock was in a sweet sleep and unconscious, remaining so (says the attendant) about 15 minutes—could easily be aroused at any time—the breathing and rest seeming natural. I observed no unusual symptoms except a slight fullness of the veins and arteries in the temporal region; arose at 20 minutes to 6 as if from ordinary sleep, with skin moist and pulse perfectly natural. I had anticipated some nausea, but experienced none.

June 19th.—Weather clear and warm; temperature of the room, 80° Fah. Lunched at 2 P.M.; at 5 o'clock dissolved 20 grains of the salt in 2 ounces of brandy and water sweetened, and drank it; sat up in a chair during the following 20 minutes. The pulse continued gradually to rise from 70 to 94, and the skin was perceptibly moist. No other unusual symptoms whatever. At the end of 20 minutes a perceptible drowsiness coming on I lay down, and in perhaps 40 seconds was asleep. Slept sweetly but not very soundly for fifteen minutes; arose as the clock struck 6, feeling partially refreshed, and pulse nearly natural.

June 21st.—Weather clear; temperature of the room, 71° Fah. At half-past 1 o'clock P.M, five and a half hours after a light breakfast of toast and coffee, I dissolved 26 grains of the salt in about three ounces of brandy and water sweetened, and drank it. In six minutes began to feel its effects by a marked lightness and wildness of the brain. Continued to walk about for twelve minutes until such was the intense desire to sleep that I lay down. I now examined the pulse, and found it rising, and as near as I had power to recollect it was 84. I almost immediately became semi-unconscious, and remember of experiencing an inordinate desire to laugh aloud—the attendant says *did* laugh aloud at intervals—and that much restlessness was exhibited. No disagreeable feelings of any kind were present. The senses were somewhat confused, though consciousness seemed lost as in natural sleep. I had given orders to test the sensibility of the muscles, but other evidence of sensation rendered it unnecessary. I was spoken to three or four times, and rational answers were always obtained, though of this I have only an indistinct recollection; arose of my own accord at 10 minutes past 3 o'clock feeling partially refreshed. I now examined the pupil of the eye, and found it much dilated. No nausea occurred, and as late as 5 o'clock felt no desire to eat although having fasted so long.

July 8th.—Weather cool; temperature of the room, 70° Fah. At half-past 2 o'clock P.M., one and a half hours after a moderate dinner of vegetables and fruit, I dissolved 20 grains of the salt in 1¼ ounces of peppermint water (sweetened) and drank it. The pulse now rapidly rose from 73 to 95. I continued walking about the room for fifteen minutes, experiencing no unpleasant sensations whatever, and only a slight drowsiness. At 15 minutes to 3 o'clock I again dissolved 15 grains more of the salt in about the same quantity of mint water (making 35 grains in all), and drank it. I still continued walking about—approached the mirror and found the pupils of each eye strongly contracted, although the room was partially darkened. Feeling an almost overpowering sense of drowsiness coming on, I was now obliged to note the symptoms rapidly while consciousness remained. I again examined the pulse, and found it 100. It quickly reached 112, and remained from 111 to 112 for six or eight minutes. At 8 minutes to 3 o'clock the pulse was 111, and at this time I had not power to stand erect, but reeled like a drunken man, and therefore lay down at once, and in a few moments was unconscious unless aroused. From that time time until 6 o'clock P.M. I have only a faint recollection of what occurred; remember of changing my position from one room to another, and of the attendant pricking my ears, which seemed more annoying than painful. Although consciousness and memory were lost for the time, yet sensation was always present in a great degree, as the attendant says, pricking the hands, feet, or ears invariably aroused me, and that evidences of pain were exhibited. I was called to tea at 7 o'clock; felt very little desire for food, but experienced no unpleasant sensations whatever. The drowsiness had not entirely passed off when I retired for the night at 10 o'clock. P.M. I may remark that on being called at 7 o'clock the pupils of the eye were very much dilated, and continued so for some time.

Banishing Nitro-Glycerin.

The peculiar danger of using nitro-glycerin, as of gun-cotton and all other nitrate compounds, except gunpowder, are unavoidable, because the sources from which they arise are totally unknown. The characteristics of gunpowder are understood. It is a compound stable and trustworthy enough; never exploding, except under conditions which everybody knows. But nitro-glycerin—to speak in the present connection solely of that article—has tricks wholly beyond the comprehension of the ablest chemists. Though under some circumstances it is less liable to decomposition than gunpowder, under others, which cannot be foreseen and provided against, "it goes off of itself." In a word, it is an "unstable compound," in the language of chemistry, resembling in that respect the powders made from chlorate or picrate of potash, chlorate of nitrogen, and other products in which the nitrogen is not held in a grasp sufficiently firm by the other agents with which it is united. Some of the dreadfully disastrous nitro-glycerin explosions that have occured may be directly traceable to the carelessness of employés, but the most of them undoubtedly have resulted from causes inherent in the composition of the substance. It is a great misfortune that this should be the case, for if nitro-glycerin could be depended upon with the sense of security as gunpowder, it would entirely supersede the latter in heavy blasting business on land and under water, being far the superior of gunpowder in cheapness and efficiency. Since these mysterious perils accompany the use of nitro-glycerin, we have no hesitation in suggesting that its manufacture and employment should be forbidden by legislation. It chills the blood to read, as we so frequently have to, of men blown to atoms, rows of houses shattered to the ground, and devastation spread far and wide by the explosion of factories by a can of this terrible agent of death. The loss to the world by its banishment will be slight, after all, compared to the dangers resulting from its use, for in gunpowder we shall still possess an agent powerful enough to remove mountains, and do all the gigantic work required by the engineering genius of the age.—*N. Y. Journal of Commerce.*

How to Make Tin Fruit Cans.

In reply to an article on fruit cans, published on page 400, last volume of the SCIENTIFIC AMERICAN, Mr. F. M. Mills, a correspondent who has much experience, writes us as follows:

"I take the best No. 14 tin plate and solder with block tin. I have used some of the cans four years, and they are not rusty inside or out, and they are just as good as when first used. About the fruits being poisoned by the cans, I don't pretend to know, but if they are I would just as soon eat it as that canned in glass with zinc tops. I have used six glass jars, but don't want any more. The fruit canned in good tin cans keeps its flavor one quarter better than in glass. I never lost any fruit canned in tin cans; I have never seen any mold in them as I have in glass cans. I have canned peaches, cherries, tomatoes, blackberries, raspberries, etc., and they keep all right. I don't believe there is any danger if the cans are made of good tin and soldered with tin."

A NEW DODGE IN HAIR DYES.

When iodide of potassium is added to a solution of salts of lead under ordinary circumstances a beautiful yellow precipitate of iodide of lead is immediately formed.

A correspondent of the *Journal of Pharmacy* having received a notice, from a party in New York who manufactures hair-dye, containing a caution to those who buy "hair restorers" "to have their druggists first test them for lead and mercury by means of the iodide of potassium, suspected the secretion of a cat beneath the meal, made an examination of the article, and communicated the result to the editor of the journal alluded to. It was found that although the preparation contained lead, the test recommended by its manufacturer would not give any indication of the presence of the poison, the reaction being in some way adroitly masked. A test with sulphuric acid, however, at once revealed its presence by the formation of a heavy, white, insoluble precipitate of sulphate of lead.

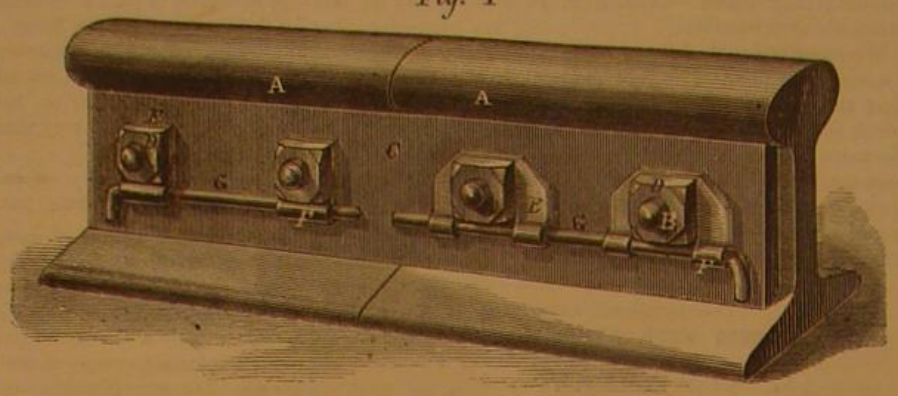
TO REMOVE SILVER STAINS.—One of the best ways is to wash the spots with a concentrated solution of sulphate or chloride of zinc and to rub the worst places with metallic zinc. Then rinse in pure water and complete the washing with soap. Ink stains can be removed in the same way.

Improved Nut Lock.

Many devices having for their object the secure locking of nuts have made and are now making their appearance. The merit of a large number of these appears to be nearly equal. Experience can only demonstrate which will ultimately bear off the palm in the competition. Certain it is that for the bolts of fish joints the application of methods of locking the nuts removes the only objection of note which formerly acted as a drawback to their many points of excellence and will do much toward extending and perpetuating their use.

Our engravings illustrate a new nut-lock, invented by Mr. Henry Beagle, Jr., of Philadelphia, Pa. The advantages claimed for the device are, that in its use nuts may be locked or unlocked as often as may be desired without injury to any part, and that, as it requires no modification of the bolt, or of any part through which the bolt passes, it may be applied to bolts of joints now in use by simply removing the nuts and placing the washers on the bolts as hereinafter to be described, replacing the nuts, and inserting the small rods which constitute a portion of the device.

Fig. 1



BEAGLE'S IMPROVED NUT LOCK FOR FISH-PLATE BOLTS.

Fig. 1 shows a fish-joint, having its nuts locked by the device under consideration, Fig. 2 being a section through one of the bolt holes.

The rails to be joined are indicated by the letter A, and the fish bars by the letter B. The bolts are shown at C. The nuts, D, are screwed down upon the washers, E, which washers are made double, as shown in the section, Fig. 2, or in another way described below, and formed with a loop, F, through which small rods, G, are passed after the nuts are turned down.

The washers turn with the nuts as soon as the latter are turned down enough to engage with the loops on the former, and consequently when the nuts are turned square with each other, the washers are also turned square, so that the rods are easily inserted. After the rods are driven in, it is evident the nuts cannot turn until the rods are withdrawn.

Two forms of the washers are shown in Fig. 1. Those to the left are formed in the manner shown in section, Fig. 2, those to the right are formed of only one thickness of metal, the eyes being formed by bending projecting portions of the metal back upon itself.

In some cases it may be advisable to make the rods, G, U-shaped, and adjust the washers so that their eyes may be toward each other, so that one arm of the U-shaped rod may pass through the eye of one washer, and the other arm through the eye of the other washer, the rods thus locking the nuts from turning.

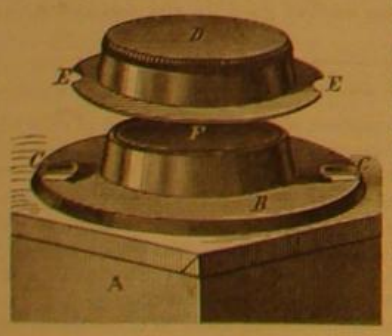
The washer and rod may be modified for locking single nuts, by inserting a pin in the object through which the bolt passes, in such a position that the edge of the washer and the rod may both abut against the pin, and the nut may be turned freely without touching the pin while the locking rod is withdrawn.

Patented, May 31, 1870, through the Scientific American Patent Agency, by Henry Beagle, Jr., 410 North Fifth St., Philadelphia, Pa., who may be addressed for the entire right, or State or railroad rights.

ALEXANDER'S SAFETY-CAP FOR MOLASSES, VARNISH, AND OIL CANS.

Our engraving illustrates a neat little device for the purposes indicated in our heading, which the inventor assures us has been tried and approved by parties who can oil. It is certainly very simple, and easily applied, while it is an effectual preventive of leakage during transportation.

A represents a portion of the upper part of the can; B is a a cap of brass, or other suitable material soldered over the hole in the can. To B are attached snugs C. A second cap, D, is formed with notches, E, in its edge so that when placed upon B, the snugs pass through the notches. The upper part of D is milled, as shown, for convenience in turning the lower edge under the snugs, C. A cork disk is fitted into the cap, D, so that when the edge of the latter is turned under the snugs, C, the cork is brought down firmly upon the upper part of the cap, B. The cap is opened so that its contents may be poured out by removing the cap, D, and cutting a disk out of the cap, B, at the part indicated by the letter, F. The cap, D, being again replaced, the can is again effectually sealed.



Patented, through the Scientific American Patent Agency, July 12, 1870. Address H. C. Alexander, care W. P. Converse & Co., 54 Pine street, New York city.

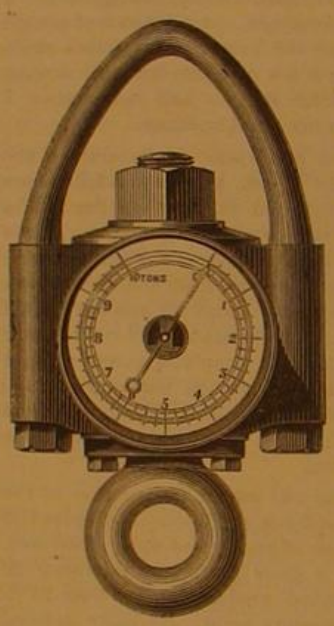
IN the States north and east of Pennsylvania, the production of anthracite iron, in 1869, was 260,256 tuns.

DUCKHAM'S HYDROSTATIC WEIGHING MACHINE.

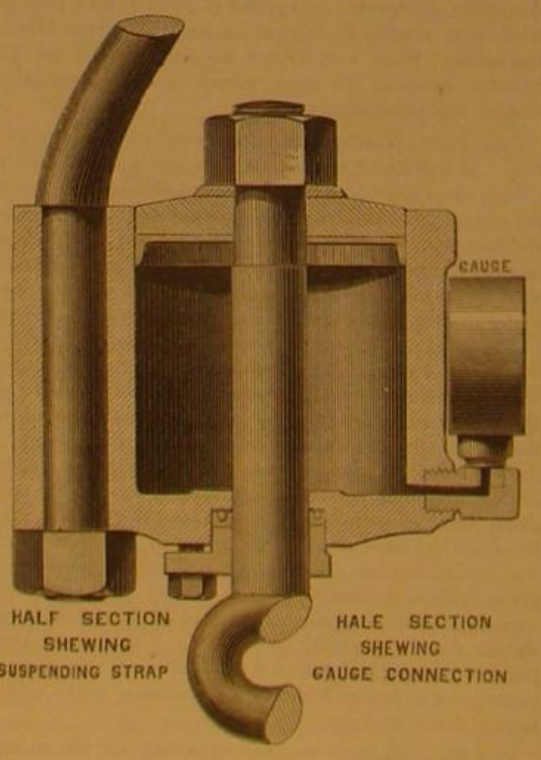
We reproduce from the *Engineer* drawings of a weighing machine, which has been invented by Mr. F. E. Duckham, of Millwall Docks, England, which seems likely to be very useful in weighing heavy bodies in process of shipment or unshipment.

Weigh-bridges, or even portable weighing machines, are incapable of the performances of the new contrivance. The principle of Mr. Duckham's machine is very simple, and consists of the filling of an open-top cylinder with water or oil by preference, and suspending the machine to a crane. A piston passes downward through the cylinder, and terminates in an eye, to which the articles to be weighed are attached.

The machine is connected with a dial gage, the indicator of which is worked by the liquid displaced from the weigher. On the load being removed the liquid is returned to the machine. A peculiar merit of this machine is its lightness, an 84-lb. weight machine being equal to weighing ten tuns. Others much lighter are capable of performing very delicate work, and others, again, can be made proportionate in weight, which can weigh up to 100 tuns.



Mr. Duckham's machine has been rather crucially, but quite successfully tested, in weighing the armor plates of the iron-clad turret ship *Abyssinia*, now in process of construction by Messrs. Dudgeon, of Millwall. The plates are weighed on delivery, no weigh-bridge being necessary in the process. They are from 8 inches to 10 inches thick, and weigh from seven to ten tuns each, and are shipped and weighed by one process—lifted, slung, and weighed all at once.



For weighing coals the machine is very convenient, as it can be so adjusted as to allow for the weight of the skip, and also to show the exact weight of the out-pull. The leakage is obviated by cup leather packing, which becomes tighter as the pressure to which the machine is subjected becomes greater.

SPECTACLES were invented by one Alexander de Spina, a monk of Florence, in the year 1285.

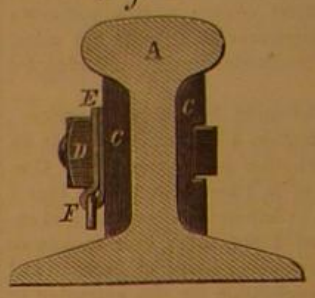
FLOATO-STATIC BREAKWATER.

This invention is based on two well-known laws connected with the motion of waves.

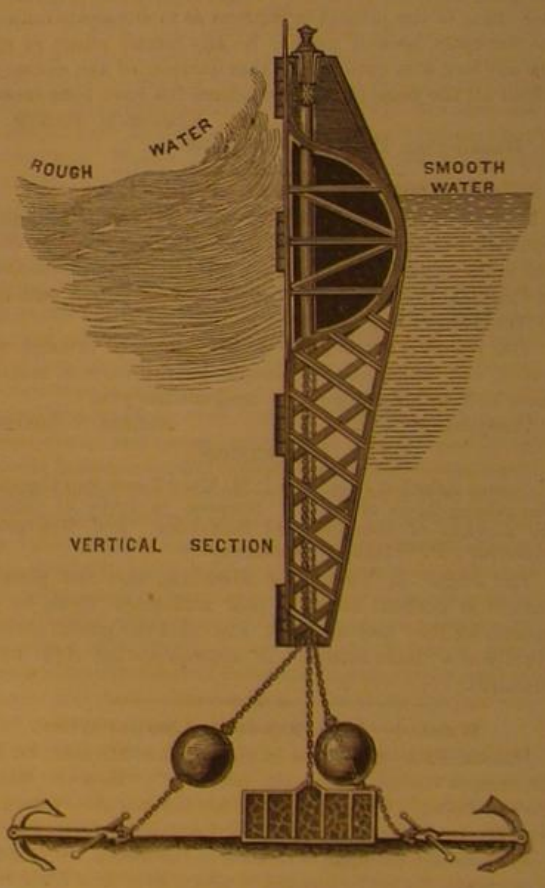
It is known, in the first place, that the wavy agitation of water by wind does not extend very deep beneath the surface of the water; secondly, that the motion of the water in forming waves is almost entirely a succession of undulations, and has very little forward motion until the waves reach comparatively shallow waters, when they become waves of translation and exert their greatest destructive power.

According to the *Engineer*, from which we copy the annexed engraving, the inventor proposes to construct a wall of iron or other suitable material, which is to be placed vertically in the water to seaward of the place to be protected, and to be of sufficient hight, that its lower edge will reach below the waves to comparatively calm water, while its upper edge will project above the water a sufficient distance to form the breakwater. It will be supported by a water-tight compartment, or by a series of water-tight compartments, placed near the upper edge of the vertical plate or wall, as shown in the accompanying engraving.

Fig. 2



The whole structure will be strengthened by vertical ribbed horizontal girders, to insure stiffness and locality by T and angle irons. It will be anchored laterally by anchors, the chains of which will pass through hawse pipes in the lower edge, up through the floating drum, by means of water-tight pipes, to the upper edge, where they will be fastened, and where they may be tightened or slackened as may be necessary. The chains may also have weights attached to them to take up the slack at low water.



In seas such as the Mediterranean, where there is little or no rise and fall of tide, there may be attached in addition a vertical weight of stone or other material, which shall rest on the bottom of the sea for the purpose of holding the structure rigidly down. The floating power is by preference placed on one side of the vertical wall, so that the structure will incline toward the sea when in its normal position, and when the force of the waves drives against it a vertical plane will be presented to them, with no projections on which water may catch.

The floating power will be made so great that the horizontal force or pressure of the water at the top will not be sufficient to submerge the structure, which will be made in sections of convenient length, connected by hinges to admit of a slight lateral movement. When waves strike at the top the structure will only yield to a slight degree, owing to the great surface exposed to the still water on the opposite side, and the force of the waves will be almost completely checked.

For the coast of Chili, for instance, the inventor proposes to make a breakwater of this description in sections of 300 ft. long by 60 ft. deep, 44 ft. of which will be under water; each section will weigh about 500 tuns, and cost about £10,000, inclusive of anchors, chains, etc.

DURING 1869, the rails imported from Great Britain amounted to 336,500 tuns, an increase of 36,340 tuns, as compared with 1868.

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NEW YORK, SATURDAY, JULY 30, 1870.

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To Advertisers.

The circulation of the SCIENTIFIC AMERICAN is from 25,000 to 30,000 copies per week larger than any other journal of the same class in the world. Indeed, there are but few papers whose weekly circulation equals that of the SCIENTIFIC AMERICAN, which establishes the fact now generally well known, that this journal is one of the very best advertising mediums in the country.

BESSEMER STEEL---AMERICAN IMPROVEMENTS.

The late report of the Massachusetts Railway Commissioners, and the opinions and practice of engineers and railway managers generally, are so favorable to steel as a material for rails, structures, and machinery, that we may now look for the rapid development of the Bessemer manufacture in this country.

But in order to compete with the cheap labor of foreign countries, American manufacturers, however legislation may protect them in the starting of new enterprises, must depend, in the long run, as similar enterprises have depended before, upon the better and more economical carrying out of the manufacture, upon various labor-saving economics, and upon a greater production from a given expenditure.

We already find, and are glad to record, as a guarantee of the success of this new manufacture among us, that the old rule so often illustrated, holds good in this as in other industrial arts: While the British manufacturer is slow and wedded to precedents, right or wrong, the impatient and hard pushed Yankee strikes out boldly into new paths. The steel-making "plant," down to the smallest detail, that Bessemer planned ten years ago, is still almost religiously adhered to by all his licensees in England, while in an American works Bessemer himself would hardly recognize the machinery by which his wonderful process is carried out. The talent and enterprise of our pioneers in this new production, have not only overcome the manifold and serious difficulties of untried materials and unskilled labor, but they have been directed to a radical improvement of works and machinery.

These facts became specially apparent by an examination of the Bessemer steel works of Messrs. Griswold, at Troy, N. Y., which have been rebuilt, and are now running under the management of Mr. A. L. Holley, late Superintendent of the Harrisburg Steel Works. Official statistics show that the largest production of one pair of five-tun converters in Great Britain is 50 tuns (ten conversions) in twenty-four hours. The Troy works are regularly producing 60 tuns (twelve conversion) per twenty-four hours, and are preparing to work up a still larger product which the converters seem to be able to make without crowding.

The principal cause of this large production is an improvement developed by Mr. Holley, in renewing the tweers of the converters. It is not perhaps generally known to unprofessional readers, that the perforated fire-clay blocks, through which the air is blown into melted cast iron to convert it into steel, are so much burned away after four to six conversions, as to require renewal. The usual process of renewal is to knock out the tweers from the fire sand lining of the converter, insert new ones, pour into the converter a mixture of sand, clay, and water, to level up the lining around the tweers, and then wait for the semi-fluid mass to set; or, the whole bottom of the converter containing the old tweers is removed, and a newly prepared bottom, containing the new tweers and the lining about them, is fastened to the converter, and the space around it is similarly filled with the semi-fluid mass of refractory material. This takes time and involves great risk of the steel running through the loosely set lining thus formed. A safer method is to wait from twelve to twenty hours, till the converter is cool enough to enter, and then to make the lining good around the tweers by ramming and molding the refractory material from within. This, of course, largely diminishes the product of the works.

The improvement to which we have referred consists in a simple method of getting at and ramming the annular space between the converter lining and the new bottom, from the *outside of the converter*. The result is, that instead of depending on a loosely set and dangerous mud joint, or of taking a day to make a sound joint by getting into the converter, a perfectly sound, rammed joint is made in *four hours*—that is to say, four hours from the pouring of the last conversion on an old bottom, the new bottom is set and heated ready to receive a charge of steel.

Another improvement, from the same source, has been more recently introduced at Troy, but gives promise of a considerable economy. The lining of the converter is a mass of fire-sand, crushed quartz, and clay, wetted and rammed into the iron shell of the converter, around a circular pattern, so as to form a wall, say ten inches thick. The pattern is then withdrawn. As the material has to be rammed very solid, the process occupies some two days; and as the linings only last some 200 conversions—say a month—the time thus lost is considerable. The improvement now in use at Troy consists in ramming up four immense hollow bricks, of suitable shape, which are dried and set into the converter, and form its entire lining. These bricks, the largest of which is a hollow cylinder of 8 feet outer, and 6 feet inner diameter, and four feet high, are rammed up in wrought iron shells which fit the converter, and are secured by set screws. As there are always duplicate bricks prepared, the converter is thus out of use only while they are being set in, or about half a day.

Mr. Holley's various other improvements, which are in use in all the other works running in this country, are calculated to produce more steel from a given "plant;" and consists chiefly in the arrangements of casting pit, cranes, and machinery, by which more steel may be manipulated in the same time by a given number of men. There are also many improvements in details.

The early difficulties of the Bessemer process in this country are now so far overcome—indeed, the steel plant and machinery are so much better here than in Europe, that several new establishments are about to be built, both in the Eastern and Western States. The only remaining problem is the production of pig iron suitable for Bessemer steel, from mineral coal. Extensive and hopeful experiments are, however, in progress, the results of which we shall duly record. The English Bessemer irons are at present chiefly used in the American works.

NEW MECHANICAL MOVEMENTS.

The success we met in securing good solutions to the problems given out some time since, encourages us to repeat the experiment. It also amply demonstrates the fact that combinations for effecting peculiar movements are by no means exhausted. We think our readers will agree with us that problems of this kind are as a means of mental discipline not inferior to those of a purely mathematical character.

Without further parley we will, however, present a few more subjects upon which to exercise their inventive talent:

PROBLEM 1.

It is required to produce continuously, in one direction, four revolutions in one shaft, to every one of the shaft from which it originally derives its motion, without the intervention of belts, or any rotating device between the two shafts, such as gears, pinions, or pulleys, although the shafts may themselves have upon them pulleys or other rotary device, but they must not be placed in contact or connected by belts.

PROBLEM 2.

Required to produce continuous rotation in one shaft from the rotation of a second shaft, the shafts to revolve in opposite directions, without the use of endless belts, toothed wheels, or friction gearing, pitmans, rocking levers, cams, or fly-wheels, and the shafts to be separated to any reasonable required distance.

PROBLEM 3.

Required to drive one shaft by means of a belt and pulleys, the power to be received from another shaft lying in the same plane but not parallel to the first, the inclination of the second shaft to the first to be forty degrees if necessary, and no intermediate friction pulleys or idlers to be used, that is, the belt must run straight, without any intermediate device, from the pulley on the driving-shaft to that on the driver.

PROBLEM 4.

Required by means of a *belt alone*, to not only transmit rotary motion from one pulley to another pulley, but to impart to the shaft of the driven pulley a longitudinal motion, the same as would be given to it by a screw thread cut upon it, but without the use of a screw or cam groove on the shaft, which shall be simply a plain shaft of the ordinary kind, running without shoulders in plain bearings, and the pulley to be also a plain pulley of the ordinary kind keyed to the shaft.

The solutions of these problems may be accompanied by diagrams, if they cannot well be explained without them.

A NEW BLEACHING AGENT.

Chemists have long known that permanganic acid was one of the best bleaching agents in the whole repertory of science, but the cost of the material has hitherto prevented the application on a large scale of this valuable substance. The recent attempt of Tessie du Motay to manufacture oxygen from the atmosphere, by means of soda and the black oxide of manganese, has disclosed the important fact that permanganic acid can, according to his process, be economically made in any quantity, and with great facility. It is only necessary to fuse lime, soda, or potash, and peroxide of manganese in a current of air, and the work is done. This discovery has revived the proposition made long ago to employ the permanganates as bleaching agents on a large scale. For this purpose the permanganates of soda and potash are preferred.

In the case of wool, for 100 pounds of well scoured fleece a bath is made of 4 pounds of permanganate, mixed with 1½ pounds of sulphate of magnesia in a barrel of water. The goods to be bleached are suspended in the bath, which has a beautiful purple color, until the liquid becomes colorless, and the oxide of manganese has been precipitated as a yellowish brown deposit.

The next step is to free the goods of the adhering precipitate of manganese, and to complete the bleaching. This could be done by employing oxalic acid, or oxalate of ammonia; but on a large scale it is found more economical to use aqueous sulphurous acid, into a bath of which acid the articles are plunged immediately after the action of the permanganates has ceased.

To prevent the yellowing of the yarns and tissues, the articles are well washed and placed in a fluid bath composed of 48 lbs. of water, 1½ pounds of soft soap, ¾ pounds of caustic ammonia of 0·9 specific gravity, well mixed. Cotton, flax, hemp, and paper stock, can be bleached in a perfectly analogous way by varying the proportions of the permanganates to suit the circumstances.

We have previously referred to the use of permanganate for bleaching old engravings, where it has proved the best agent of any we have at any time employed. The cheap manufacture of permanganic acid suggests its use as a disinfecting agent, also in the refinery of molasses, sorghum, beet sirup, and a host of other industries, and it has further extensive scientific value in the analysis of iron ores, in the production of pure oxygen gas, and as a re-agent in our chemical laboratories.

Although soda and potash have generally been employed in its preparation, it is a question whether lime would not be cheaper and better. The permanganate of lime is less liable to fuse, and from it, by means of sulphuric acid pure permanganic acid can be isolated for further use.

The old way of making the manganate or chameleon mineral, as described in our books, was to fuse the black oxide of manganese with an excess of caustic soda and some nitrate of soda in an open crucible. A dark green mass results, chiefly composed of manganate of soda. It is possible that this mass, mixed with a proper proportion of sulphate of soda, would answer every purpose for bleaching. This old method will probably be superseded by the modern one above described, of passing a current of air over the fused mixture of soda, potash, or lime, and the black oxide of manganese, as the same process can be used in the preparation of oxygen gas.

The method of making aqueous sulphurous acid, suggested by Professor Wieser, of Carlsruhe, is probably the best. Anhydrous sulphate of iron (ordinary copperas previously heated to 212° F.) is mixed with sulphur in a cylindrical iron vessel, and heated to redness. The sulphurous acid thus generated is conducted into a vessel filled with water, which absorbs thirty to forty times its volume of the acid. A concentrated aqueous sulphurous acid is thus formed ready for use in the bleaching operation. During the process of bleaching, the bath is warmed to 88—100° F., as, according to numerous experiments, this temperature has been found to be most effective.

Permanganic acid associated with sulphurous acid appears destined to play an important part in the arts, both as bleaching and disinfecting agents.

CAN MINERAL MATTER BE ASSIMILATED IN THE ANIMAL ECONOMY?

Some months since, a controversy arose between some of our correspondents in regard to the assimilation of mineral matters in the animal economy. The discussion was not a very satisfactory one, as it was conducted by those who evidently had not given that attention to physiological and chemical facts demanded by the nature of the subject.

In the October number of *Good Health*, a writer made the following remark:

"Phosphorus is a very essential ingredient for the nerve cells, while sulphur is a most necessary constituent of human bile. In no way can we substitute either in an artificial way We might eat all the sulphur and all the phosphoric acid we please, without adding the least particle to our blood formula."

This statement transferred the controversy from our columns to those of the periodical referred to.

It was ably replied to in the June number of *Good Health* by Professor Horsford, who plainly proved, first, that phosphorus does not, as implied in the above quotation, exist in the nerve cells and the blood in any other form than as a constituent of phosphoric acid.

Second. Professor Horsford showed that the statement that "phosphoric acid cannot be supplied to the blood by taking some form of phosphoric acid as food," is wholly erroneous. He says:

"When we prepare acid—phosphate of lime, magnesia, potassa or iron, by treatment of burned bones or mineral phosphate with sulphuric acid, and spread it as superphosphate on soils, it is taken up through the roots and deposited as phosphate in the bran and flour of the wheat, and we eat it as a constituent of the gluten. When we add the same phosphate to the flour, in making the bread, it enters the stomach just as much a phosphate as if it had come in with the bran, and it passes from the stomach to become a constituent of the

chyle and the blood, just as much in the one case as in the other."

How any one, at all acquainted with the chemistry of cereal foods, or with the physiology of assimilation, can dispute these plain *facts*—for undeniable facts they are—passes our comprehension. Nevertheless, a man who, at least, pretends to knowledge of both physiology and chemistry (with how much reason will be seen further on), has been bold enough to deny that they are facts.

But let us cull a few more facts from Professor Horsford's article before we pay our respects to his opponent. The following passage contains the gist of his argument:

"The experiments of Chossat, in 1844, demonstrated that pigeons could not be sustained on pure wheat. In time, their bones became spongy and friable, and at length the birds perished. But supplied with lime—either as phosphate or carbonate, with the wheat, their health was maintained, or entirely restored, after having been greatly impaired from eating pure wheat alone. The explanation is simple: Wheat contains a great excess of phosphate of potassa, and but little phosphate of lime. With lime introduced into the stomach in the form of carbonate, mutual decomposition yields phosphate of lime, which is essential to the formation of bones, and, to a less extent, of other tissues. To show how absurd the doctrine that mineral matter cannot add to the 'formula' of the blood is—let us consider for a moment what a thoroughly pure mineral substance water is! Will it be maintained that none of all the water we drink becomes part of the organism!

"There is another consideration that should have place in the discussion of this question: the assimilation of mineral matter is an essential condition of organized life. It is the plain law of development—of growth and repair—the law of nature.

"The observations of Pasteur showed that humbler plants and animals alike possess the power of appropriating the phosphates of purely mineral origin to build up their tissues; and nothing has yet been discovered to show that the higher forms of animal life, including man, are deficient in any of the powers of assimilation, possessed by the humbler types of animal life."

This was replied to by Dr. Carl Both, in the July number of the magazine referred to. His assumption of knowledge is quite astounding. Dr. Both appears to have grasped the secret of life. To him, all that has been mysterious to the profoundest physiologist, hitherto, has been unveiled, and he hurls this astounding discovery forth without even the minutest note of preparation. Well may the scientific world stand thunder-struck at the fact that he has found out the mystery of mysteries—what is life.

He does not deal in glittering generalities. He does not tell us, like Coleridge, that life is "unity in multeity," but, in his first sentence, he utterly overwhelms us with the following definition:

"The chemical combinations, exchanges, and reactions of the fourteen elementary minerals composing the human body in connection with warmth, light, electricity, galvanism, and magnetism, constitute what we call life."

There is nothing doubtful about this. The Doctor evidently thinks that a "wayfaring man, though a fool, may not err therein."

But will the Doctor, whose profound erudition we greatly admire, do us the favor, by the aid of this definition, to draw a boundary line between things living and things lifeless. Of course he should be able to determine the precise time when life ceases, since then—to do full logical justice to his definition—some one or more of the elements of life ought to to cease in the animal organization.

We are willing to wager the Doctor will say, "if he does us the favor to respond," that it is galvanism or magnetism, since, from some subsequent remarks, we are inclined to believe he makes the use of these agents a marked feature of his practice. Surely, it can not be chemical action, or heat, or light, which ceases at death. It must then be electricity, or galvanism, or magnetism, since, in the Doctor's philosophy these appear to be distinct forces. We are anxious to obtain more light upon this theory of life, which, however, is rather too dogmatically enunciated for a mere theory.

Dr. Both commences by a point-blank denial of facts stated by Prof. Horsford, quoting only as authority for such denial a single writer on therapeutics, whose name, we venture to say, not one medical man in a hundred, in this country, has ever heard mentioned. But what he lacks in authority he makes up in assumption, as he denies *in toto* the very general belief, among physicians, that iron is a useful remedy in cases of the impoverishment of the blood, and charges this belief upon their "credulity and imagination."

He, however, gives us his opinion of the office which iron performs in the blood, namely, that it "serves principally as a necessary body for the production of animal magnetism, and that it appears as metal, or perhaps as oxide, but, probably, in a form as yet entirely unknown."

Now we confess to never having heard of Dr. Both until his name appeared as the author of the article under consideration, but we are satisfied that he is one of the "universal remedy" school of practitioners, and we would be willing to risk something that animal magnetism is his hobby. It is these hobby-ridden and hobby-riding medical men who claim to have got deeper into science than any others, and who are always ready to frame theories which have no basis in fact.

But the Doctor at length makes an admission which seems to us a surrender of his position. The laws which control assimilation are admittedly the same for all warm-blooded animals. But Dr. Both admits that fowls take lime into their stomachs to form the shells of their eggs. Now, if fœtal growth, from the earliest period be not a process of assimilation, will Dr. Both tell us what it is? If not assimilation, it must be mechanical accumulation, and we hardly think any man can be found so bold as to claim that the shells of eggs are mere mechanical deposits of raw material.

Dr. Both does not deny that it is assimilation, but he does deny that, because the fowl can digest lime, the lion, or the cow, or the human organism can do the same. In doing this, however, he makes the statement that "lime serves a similar purpose in the body of the fowl that salt does in the human body," which is certainly an acknowledgment that the human economy can directly assimilate mineral matter contained in common salt. Thus, the whole question of the assimilation of mineral matter, and the determination of how many and what kinds of such matter can be assimilated stands just where it did before this discussion.

PROGRESS OF INVENTION ABROAD.

Our European exchanges bring us accounts of some inventions of interest, from which we collate some of those of a suggestive character, as well as some which perhaps may find a useful application in this country.

A protective coating for iron and other metals has been invented by Mr. J. Crouziers, of Ollioules, France, to which the inventor has given the name of Electro-Cathodic Insulating Mastic, which to the scientific reader will convey the fact that its application will prevent the corrosion of metal when immersed in fluids calculated to generate galvanic action. Its composition and application are as follows: Take of sulphur, (say) 38 per cent; coal tar, 20 per cent; gutta-percha, 5 per cent; minium, or red lead, 6 per cent; white lead, 7 per cent; pitch, 10 per cent; resin, 10 per cent; spirit of turpentine, 4 per cent; total, 100. Melt the sulphur in one vessel, and coal tar, gutta-percha, minium, white lead, pitch, and resin, all together, in another, but before adding the gutta percha to the coal tar, dissolve it, as far as possible, in the spirit of turpentine, and when all these ingredients have melted pour in the sulphur very gently from the separate vessel, then thoroughly mix the whole, and apply the composition hot by the aid of a brush, by dipping the article to be coated into it, or in any convenient manner.

Mr. Crockford, of Dublin, Ireland, has invented several new processes for utilization of waste products. One of these is a method of treating what is known as flux skimmings, produced in the process of galvanizing or coating iron with zinc. For this purpose he adds a sufficient quantity of hydrochloric or sulphuric acid to the flux skimmings to dissolve all the zinc, and then precipitates all the zinc with the ammoniacal gas arising from the distillation of gas liquor, by which means he obtains oxide and sulphide of zinc and hydrochlorate or sulphate of ammonia. Sometimes he passes through the solution, toward the end of the operation, a stream of sulphureted hydrogen for the purpose of rendering the precipitation quite complete.

A second process by the same inventor consists in the treatment of the liquor from paper mills resulting from boiling esparto grass, wood, or other materials in caustic soda. He first evaporates the liquor to dryness, and then submits the dry product to distillation at a red heat, whereby the volatile and other matters are collected, and he afterwards extracts the carbonate of soda left in the furnace or retort in which the distillation has been effected by lixiviation, at the same time extracting a quantity of black, similar to "lamp black."

The same inventor has devised a method of condensing and collecting the fumes and gases from the flues of furnaces in which lead and other ores are smelted. To do this he draws off the mixed fumes and gases from the flues of furnaces wherein lead or other metal is smelted, and forces them, by means of a fan or other similar means, into and through a quantity of filtering material, such as canvas, cotton, or fine coke, which material may be renewed from time to time when it becomes clogged; before passing the fumes and gases through the said material they are cooled by passing them through showers of water or otherwise; thus materials which would otherwise be destroyed by the heat are utilized.

An Hungarian gentleman has, we are told, constructed a railway five miles in length on a mountain in the heart of Hungary. A remarkable peculiarity is the total absence of all permanent way. Square beams of oak 8 in. high and 14 in. broad are laid on the ground, and only at rare intervals, where the great unevenness of the ground absolutely requires it, cross sleepers are laid under them. Each of these longitudinal beams has a length of 18 ft., and on the two edges of the beams are the rails, which are only 2 in. broad, and so thin that they weigh about 1 lb. per foot. These beams and rails may be taken up at any moment, and the railway thus relaid whenever it is required. The trucks run on two pairs of wheels 8 in. in diameter; the bodies of the trucks are about three times the width of the rails, and are placed so low on the wheels that they have just room to pass over them. The arrangement of the weight and the system of breaks are said to be so perfect that the train may be stopped when on a gradient of one in seven, and going at the rate of twenty or thirty miles an hour, within six to eight yards. The five miles cost $10,000, and after the experience now gained the work may be done for about $1,000 per mile.

The substitution of heavy paraffine oils for high-pressure steam used to obtain high temperatures for the evaporation of liquids has been made in an establishment at Lambeth, England. These oils may be heated safely to a temperature of from 600° to 700° Fah., and they circulate in heating exactly like water. In the establishment alluded to the apparatus used is as follows: A close system being made, the oil heated in a coil of pipe placed in a furnace rises first to an air-tight tank, from which it runs through pipes and the jackets of pans, descending as it cools to the coil of pipe in the furnace. It is claimed that the method besides being safer is more economical than steam. A pyrometer is contrived to show the exact temperature of the oil as it leaves the tank, and means are provided for regulating and keeping the temperature uniform. This method appears to us to possess great promise, and if it prove entirely successful, is capable of extension to many important branches of industry.

M. Ducomet, of Paris, has invented a simple and ingenious method of cutting glass tubes. It consists in the employment of a metallic rod with a diamond set in one end, the rod being covered with plaited cotton and supplied with a movable gage to regulate the length. To use this instrument all that is necessary is to introduce the end carrying the diamond into the tube to be cut, and then turn it round so as to make a scratch with the diamond around the interior of the tube at the point where it is desired to separate the latter. The correct position of the cut can be insured by the use of the guard, which can be fixed at any desired point on the rod by a screw. After the cut or scratch has been made in the manner described, the tube can be at once divided at the desired point by merely bending it, or, if the piece to be cut off is very short, all that is necessary is to hold the tube above the flame of a lamp or candle, when it will at once divide at the point where the diamond cut was made. M. Ducomet states that it is absolutely necessary that the rod should be covered with cotton or similar soft material, or that otherwise tubes cut in this way—gage-tubes for instance—will subsequently break when in use. The instrument is particularly adapted to cutting gage-tubes.

LIEBIG'S EXTRACT OF MEAT.

If the value of Liebig's extract of meat were fully understood no household would be without it, and no one bound on a hunting, fishing, yachting, or pedestrian tour would omit to include it as an indispensable part of his stores. It has been recently subjected to trial by an English traveler, Mr. W. T. Suffolk, and we find a note of the results in the *Chemical News*.

Mr. Suffolk says: "The action of the extract is very marked when used as a remedy for the exhaustion so frequently attending long and fatiguing walks, closely resembling in its effect the well-known restorative, tea and brandy, but it is much more permanent, acting not only as a stimulant, but also as nutritive matter.

"The extract cannot well be used by itself as a substitute for ordinary food, but when accompanied by a quantity of less nutritious and digestible matter greatly augments its dietetic value. With Liebig's extract, bread or biscuit, and, if possible, hard-boiled eggs, the pedestrian will be provided for nearly every emergency. For the sake of variety of flavor, pepper, salt, curry powder, or other condiments may be used.

"I prefer, when possible, to use the extract in the usual way—dissolved in hot water as soup—but where hot water cannot be procured it may be thinly spread upon bread or biscuit and eaten with equal effect. In either way it gives strength almost immediately, and stands very much in the same relation to ordinary food that petroleum does to coal as a steam-producing fuel, enabling power to be speedily obtained.

"It must, however, be borne in mind that stimulating food can only be employed as an auxiliary, and not a substitute for proper rest, the only true restorative. In long pedestrian journeys everything depends upon intervals of rest and proper food, if the exertion is to be continued for many days in succession.

"Spirit of any kind should always be used cautiously; as its stimulating power is at the best of short duration, nothing is added to actual bodily strength. It is sometimes of value in cases of difficult breathing, caused by steep ascents, a teaspoonful of strong brandy or whiskey generally giving instant relief; also in the nervous giddiness which occasionally affects travelers, especially solitary ones, when walking on narrow elevated paths. This may seem somewhat like acquiring 'Dutch courage,' but nevertheless the discreet use of spirit in such cases is not to be undervalued."

It appears to be certain that we obtain strength by burning up the blood within us, and to replace this waste food is required. We obtain temporary relief by the use of stimulants, but this is very much like using the furnace as fuel, for our relief is at the cost of the tissues of the body. The extract of meat, on the contrary, stimulates and supplies nourishment to the blood.

According to recent researches the extract contains constituents analogous to some of the alkaloids, quinine, morphine, theine, and it is therefore similar to tea or coffee in awakening and sustaining both the appetite and digestive powers, without possessing any of the after-effects that follow these stimulants. The extract has the further advantage over tea and coffee in the mineral matters which it contains, such as phosphorus, lime, potash, and sulphur.

As the extract is a waste product in South America and Australia there is no reason why it should not be furnished to us in unlimited quantities and at reasonable rates.

OUR CORRESPONDENCE.

One of the most interesting and useful features of the Scientific American has been and is its correspondence. Our columns have always been open to receive information from those who have anything important to communicate,

and to impart such facts and suggestions as we may, in answer to the queries of our correspondents.

Invariably, at this season of the year, however, our correspondence flags. Neither mind nor body works with such vigor and freedom during the heat of midsummer, as in the more temperate portions of the year. Still we receive for each issue something of interest from the pens of various volunteer contributors, and would like to receive more.

Facts are above all else of value, but useful suggestions rank next to them in worth, as they serve to elicit facts and turn thought into new channels.

We wish it distinctly understood that every communication sent to this office receives careful attention. If not used or likely to be used, it is nevertheless read, and its contents well considered. Of course all who write expect us to be the judges whether what they write is meritorious or otherwise, and also whether, if found meritorious, it is adapted to our columns. The want of adaptability causes the rejection of more correspondence than any other cause. This may arise from our having already discussed a subject as much as in our judgment its interest will warrant, or that the nature of a communication may be foreign to the scope of our paper.

Facts connected with processes or materials employed in the useful arts, no matter how rudely clothed in language, are always welcome. We correct or re-write them if needful, and so do not reject any useful information on account of the style in which it is communicated.

Theories, unless in our opinion they aid in the explanation of facts, or guide research in the discovery of new truths, are apt to be rejected. We have little space to spare for speculative theories, and, unless upon careful consideration such speculations appear likely to suggest new and valuable trains of thought, we do not admit them.

A word now to those who make inquiries to be answered in the column devoted to that purpose. Our correspondents are, doubtless, little aware of the labor and pains willingly taken by us to give accurate answers to their queries. We trust, however, that they will take in good part a few hints upon this subject. The most common fault in these inquiries is that they are not sufficiently explicit. Correspondents should carefully consider their questions and be sure that they are so put that their meaning is unmistakable. To answer definitely a query whose meaning is either ambiguous or obscure, is a very hard task—one which, though always cheerfully attempted by us, might be easily lightened by a little more care on the part of inquirers.

We trust these remarks will encourage rather than deter any who wish to obtain or impart information through our columns, and we here re-assert our intention to fully maintain this feature of our paper, as we consider it of great practical value.

HOW INVENTORS ARE APPRECIATED IN CONGRESS.

In our last number we gave the result of the vote in Congress on the memorial of the surviving children of Jethro Wood, inventor of the cast iron plow. We have now before us the speech made in behalf of the claim by Hon. Leonard Meyers, of Philadelphia. When we find such sentiments of eulogy upon inventors, uttered in the halls of Congress, we are glad to transfer them to the columns of the SCIENTIFIC AMERICAN. Mr. Meyers said:

"I desire now to place on record my views favoring the measure which has just passed the House by the decided vote of two thirds.

"Mr. Wood was a citizen of New York, but his fame belongs to the American people. Eli Whitney's cotton gin did not bring such practical benefits to the whole country as did Jethro Wood's modern plow. The useful results of his genius may properly be placed in the scale with those produced by Robert Fulton. Like Fulton and like Whitney, Jethro Wood died unrewarded. He spent a handsome fortune in introducing his invention, which every agriculturist now finds indispensable, and he has left a large family unprovided for. We propose to do what Congress did in 1846 for the heirs of Fulton—to pass a bill for the partial relief of his family, while we recognize, as representatives, that the people are grateful for benefits conferred.

"But there is another reason why a bill of this kind is peculiarly appropriate. The Constitution contemplates a reward to inventors by grants of the exclusive right to their inventions; yet the acts passed by Congress were, at first, so defective that, when publicity was almost requisite in order to introduce an invention like Wood's, he lost by that publicity the very advantages which the constitution intended to give him. It was not until 1839 that Congress gave an inventor two years before application for a patent to test his invention without forfeiting his right thereto; and not until 1842 did the law give the right to patent the principal feature of an invention like that of Wood, namely, the shape or configuration of the mold-board. The people felt that injustice had been done to Jethro Wood in these respects. In the Senate of three Congresses bills passed for the relief of his children. One of these gave a royalty of twenty-five cents for each plow made under his patent. Small as this cost would have been to the farmers, it would have paid the heirs handsomely, for we have two million cultivators of the soil—there are five hundred plow manufacturers in the country, and they make over two hundred thousand plows annually, which would have given $50,000 a year to this deserving family.

"When we remember that this invention reduced the cost from thirty or twenty-five dollars to ten dollars a plow, when we think of the expense necessary, and the great loss of time for repairs to the old wooden or 'Bull' plow, or the Rotherham plow formerly used, with its badly-formed mold-board and its undetachable wrought-iron share, compared to the cast-iron, adjustable, and well-shaped parts of that of Jethro Wood, it might seem that every farmer in the land would have been glad to pay for its important results the sum of twenty-five cents per plow. But while approving of an appropriation of money, they insisted that the patent had expired, and the House of Representatives several times refused to pass the Senate bills for its extension. The feeling, however, that justice, in some way, should be done these heirs has, on many occasions, found expression in the public prints, through legislative and other bodies, and particularly among the agriculturists of the country.

"Mr. Brainerd, Examiner of Agricultural Implements, in the Patent Office, in a letter dated April 13, 1870, writes:

"'Jethro Wood's plow I believe to be the first in which the parts most liable to wear could be replaced in the field, with no other expense than the price of the casting. In this particular alone the invention is priceless. His form of mold-board is another feature of great importance, a feature that has, in one form or another, been incorporated into numbers of the more modern improvements in plows. In short, I can say that there is scarcely a plow now manufactured that does not embrace in its structure the leading features brought to the notice of the public by the patient and persistent efforts and skill of Jethro Wood.'

"I should tire by attempting to quote the many requests that have been submitted to the Committee on Patents that justice should be done the family of this meritorious inventor, and will conclude these references with what Hon. William H. Seward expresses in a letter on the subject:

"'I am fully satisfied that no citizen of the United States has conferred greater economical benefits on his country than Jethro Wood; none of her benefactors has been more inadequately rewarded; none has left a purer, or better, or more helpless family to appeal to her justice and gratitude.'

"I am happy to say they have not appealed in vain. Other countries have frequently rewarded those whose genius added to the fame and wealth of the people. The occasions for our doing such justice, by special enactment, are, and must ever be, rare; for, under our liberal laws, the utmost protection is now afforded.

"The nation rejoices, that, thus aided, men like Morse, Hoe, Goodyear, Howe, and hosts of others, pioneers in science and art, have won substantial rewards as well as honor. Contemplating with regret that the defects of our earlier patent system prevented a few illustrious men from reaping like results, we respond to the wishes of the people that their gratitude may be evinced to Jethro Wood by the bill we have passed to relieve his deserving family."

ACTION OF SEA WATER ON THE METALLIC FASTENINGS OF SHIPS.

We extract from the proceedings of the Institution of Naval Architects, London, the following short but comprehensive paper read by William Poole King at a recent meeting. Of course the facts stated apply equally to all similar fastenings employed in stationary floating structures and docks:

"The small fastenings of ships are trenails, iron bolts, and copper metal bolts. Each have their advantages and defects.

"The trenail, generally an oak bar of 1¼ in. to 1½ in. in diameter, is a cheap fastening. It carries no galvanic influence from the outside copper on the bottom of a ship to create rust in the ironwork within, and is vulgarly considered the very stamina and constitution of a ship; still it must strike every one not blinded by routine that nothing can be more absurd than to prepare oak timbers square, and cut out all the sap from them, at the cost of about a crown per foot cubic, and then drill this expensive timber full of holes from 1¼ in. to 1½ in. wide, in order to drive in trenails, and thus take at least half the strength out of the timber.

"About seaports, where old ships are broken up, many old timbers are met with in the fields spotted with two large holes in about every foot of their length; decay will be observed in all these holes, caused by the woody fiber being bruised by trenail driving, for bruised fiber gives nourishment to dry-rot fungus. Trenails having been squeezed in driving become rotten and weak, cease to hold the planks to the timbers with firmness, get bent, and allow a ship to bend and yield throughout its whole frame; this is called hogging and sagging.

"Iron bolts and spikes are the cheapest strength that can be put into a ship. They are the handiest fastenings that a workman can use; and a little rusting allows a very small fastening to take a very strong hold; in fact it is everything that could be wished did it but last without decay.

"In a ship iron bolts are always damp and always rust; rust frets away woody fiber. Iron bolts, too, always contain a portion of sulphur, which gets converted into sulphuric acid, which decomposes both the salts always found in oak, and also salt water, never absent at sea. A ring of decomposed wood surrounds every bolt; and as the salts and oxide of iron are not prejudicial to fungus growth dry-rot fungus takes possession of the ring of decomposed wood.

"Iron bolts are inadmissible in the bottoms of ships sheathed with copper; the salt water acting on so large an extent of copper sends such quantities of electricity through the iron bolt that the substance of the bolt is carried away, and a vacancy, which lets in leaking water, is left in its place.

"Copper bolts and cupreous metal bolts are more expensive and less strong than iron, but unlike iron bolts, instead of fretting the wood in which they are inserted, actually preserve it, for the verdigris which is formed on the copper bolt poisons the dry-rot fungus. But the copper bolt has the serious disadvantage of having little hold on the wood through which it passes, and this little holdfast becomes less after the wood has shrunk with age, so that the only value of the fastening power of copper metal bolts is left in the riveted ends of the bolt, and when this end breaks off, as it frequently does in nine or ten years, by getting crystallized, the fastening is of no value at all.

"Trenails are too cheap and useful, as plugs for keeping out leaking water, to be given up in wooden ship construction; but the disadvantage of their unwieldy size, boring through and destroying everything, should be reduced as much as possible. Trenails should be always of the best materials, creosoted to prevent the introduction of dry rot, kept small in size to prevent their doing immoderate harm to the worthier parts of the ship, and driven short to obviate the destruction of timbers and floors.

"It is agreed on all sides that iron bolts must never be used in the wake of copper sheathing. Indeed, to insure the durability of the structure of a ship iron bolts should never be driven at all, except in situations where they can be removed and replaced.

"Covering iron bolts with zinc (called galvanizing) does not protect the iron from rusting, as the acid of the oak surrounding the bolt soon dissolves off the zinc cover, and corrosion proceeds with all its concomitant evils.

"A large quantity of copper metal fastening is now required in first-class ships. It is expensive. Let us inquire how the greatest strength, at the lowest cost, can be got from it.

"The screw form, I believe, will be found the strongest and cheapest method for the use of copper metal. This form gives a secure hold, and does not injure the wood if the pitch of the screw be kept high, that is, the threads of the screw be kept far apart. I have been accustomed to use screws 7 in. long instead of trenails.

"The bolt is molded in threads three turns in an inch, cut in a ¾ in. bolt of Prince's metal, weighing 13½ oz., and costing 9d. This screwed through a 3 in. plank penetrates the timbers 4 in. and requires no rivet, as I have tried to start a deal end from a 4 in. thick piece of oak secured in this manner, with a strain of 36 cwt. suspended, without having been able to produce the least separation of the deal from the oak. The necessity of a through fastening does not exist, as the timber can be secured to the ceiling by a similar screw to keep it exactly in place; thus a long length of metal bolt is saved, the timber but slightly wounded, and the strength of the frame immeasurably increased.

"For larger fastenings, such as those for securing timbers and floors to iron riders, I have used a thread ½ in. in hight, placed round outside a ⅝ in. Prince's metal bolt, instead of cutting into the body of the bolt, in order to preserve its lateral strength and rigidity. The turns of the screw are three in 2 in.; a length of 14 in. weighs 3 lb., and cost 2s. 6d. I found a strain of 49 cwt. was barely sufficient to tear this screw through a 3 in. deck deal end, and of course a longer length screwed into oak would require a heavier strain for its removal.

"Pure copper cannot be cast into a screw form any strength, and therefore I have used Prince's metal (a mixture of 16 oz. copper, 3 oz. zinc, and ½ oz. tin). This mixture runs into every sinuosity of the casting mold, is so tough that it will bend more than double cold, and I believe will not crystallize and break when it has grown old."

PUBLIC PARKS AND FLORAL DECORATIONS.

The *Albion* discourses very pleasantly of the beneficial effects of peoples' parks in the seething centers of population:

Such gardens of recreation and health have been aptly called "the lungs of great cities," and New York and Boston have, to some extent, been mindful of a public duty, in the provision of breezy places of retreat from the hot and crowded thoroughfares. It is not enough to have a Central Park, or Common, as a resort for the tired artisan and his family, for these are at some distance from the localities inhabited by the population which most needs the opportunity of breathing the fresh air, and recuperating both body and mind by intercourse with nature. The chances of social improvement by the introduction of foliage, flowers, and shrubs into the closely-packed quarters of densely populated cities, have been almost universally overlooked in this generation, more especially devoted to utilitarianism. This is the more unpardonable, because the return in pocket, as well as moral benefit to the people, has been abundantly proved before the eyes of every one.

Whatever may be Napoleon's faults, he has ever kept in the foreground the material comforts of the working man, and by far the larger portion of the extravagant outlay in the improvement of Paris has been devoted to these purposes, the results of which have not only been astonishing, but very suggestive as an example to all other cities, small as well as great.

Regarding the subject from this standpoint, a correspondent of the London *Times* lately referred to "Robinson's Gleanings from French Gardens, Parks, and Promenades," for the scientific and cheap ornamentation of open spaces in cities and towns. The beautiful and healthful fringing of the streets with foliage, is not unusual in the cities of the United States, notably so in New York and Savannah, the latter being quoted on both sides of the Atlantic, as one of the best laid out cities in the world. It is singular that in the spread of sanitary, artistic, and economic science so specially affected by Americans, this branch of the popular service has been in a great measure overlooked in the hurry of building, for the purpose of both rapidly and effectively filling the purses of speculators, although in the long run the increased accommodation of the site and its surroundings, would amply repay the extra outlay required for street gardening and ornamentation.

But in Paris this is cared for by the authorities, and well cared for. There, public horticulture follows closely on the

street builder with trees and flowers. It turns the squares into gardens unsurpassed for good taste and beauty, drops graceful fountains here and there, and surrounds them with beds of shrubs and flowers, presenting to the wearied eye of the hard worked laboring man, every charm of fresh vegetation, bringing him pure air, and aiming directly and effectively at the recreation and benefit of the people. It is true that, independently of the Central Park, something of this kind has been attempted in Union, Madison, and other squares, in this city, but these are all in rich and business quarters, while neglect and utter desolation have been the fate of Tompkins Square and such unfashionable neighborhoods. Still more flagrantly is this the case at the Battery, a site to rival which one must go to Naples, or to Palermo, and then not find the varied charm of sea and land view, river, meadows, islands, the distant mountains, the nearer Highlands, the Narrows, the lighthouses, besides the endless rush of the commerce of the whole world into the bosom of the unrivaled bay and harbor of New York. A few hundred dollars' expenditure would turn this desolate and deserted mud heap and dust reservoir into one of the most charming promenades on the continent of America. With foliage and fountains it might be made to surpass the boasted Alamedas of Spain and Mexico. The population of the crowded neighborhood and the whole city would enjoy it with a zest at least equal to the listless *abandon* of the strollers of Cadiz or Havana. However, here as elsewhere, "what is everybody's business is nobody's business," and for the want of some Peabody the crying disgrace goes on year after year without redress. Perhaps when the new Barge House, with its granite-faced promenade, takes the place of the foul weeds and mud blistered boulders at the one end, the Castle Garden Commissioners at the other will reflect a little on the name, and how sadly its present condition falls off from our conception of a garden. It is not the business of the journalist, however, to point out the particular body whose duty it is to put this or any other manifest public boon into operation. Suffice it to call the attention of the residents of New York to its shortcomings, and the ease and desirability of an alteration. A cheaper and more remunerative method of attracting popular attention was never offered to a public man—besides the additional incentive which still weighs with some minds—the certainty of greatly benefiting one's fellows both now and for all time to come—than by moving in this matter.

ROGERS' PATENT PRICE CURRENT BOOKS.

This ingenious application of the well-known method of producing a number of copies of writing or drawing at once, by means of placing prepared carbonized paper between the sheets upon which the copies are to be made, and marking with a stylus, is, we understand, meeting with much success. By it, from ten to twenty copies of a price current can be made at one marking, the names of the articles being first printed upon the leaves of the book. This must prove a great convenience to merchants who are in the babit of sending regularly price lists to their customers.

The inventor, Mr. H. D. Rogers, of 98 West Second street, Cincinnati, Ohio, is desirous to sell the right for the State of New York.

Death of Chevalier De Loosey.

We are pained to record the death of Chevalier Chas. F. De Loosey, for many years the Austrian Consul in this city. He was stricken down in the street with apoplexy, superinduced by the recent severe heat, on Thursday evening, July 21st, while returning to his hotel after making some visits in West Thirteenth street. Mr. Loosey was a liberal patron of American inventions, some of which he introduced into his native land. He obtained a number of patents here for his countrymen, and took a keen interest in all new improvements, from whatever source they emanated. He was in the habit of visiting our office frequently, and was ever eager to be informed concerning the latest and best inventions. Mr. Loosey was liberal in his dealings, pleasing in manner, and wore a genial face which his friends will never forget.

EXPERIMENTS WITH HYDRATE OF CHLORAL.—The reader will find on another page an account of some experiments with hydrate of chloral, made upon himself by Dr. F. A. Howig, of Jackson, Mich. The doctor writes us that he is forty years old, in tolerably good health, and of a decided nervous temperament. The first four experiments were made with chloral bearing the name of Powers and Wightman, the last manufactured by E. Schering. The reader curious to learn more of the effects of this new remedy, will find the experiments described of interest.

IN view of the successful result of the Suez Canal undertaking, two new lines of twenty-three steamers are spoken of intended to run between England and China *via* the Canal. It is expected other companies, with similar intentions, will be shortly organized.

APPLICATIONS FOR THE EXTENSION OF PATENTS.

HOSE COUPLING.—Lewis M. Ferry, Chicopee, Mass., has applied for an extension of the above patent. Day of hearing Sept. 21, 1870.

MAKING AX POLLS.—David P. Estep, Pittsburgh, Pa., has petitioned for an extension of the above patent. Day of hearing Sept 28, 1870.

PLOWS.—Samuel A. Knox, Worcester, Mass., has petitioned for an extension of the above patent. Day of hearing Sept. 28, 1870.

MACHINE FOR CLEANING EMERY WHEELS.—Stephen A. Whipple, Shaftsbury, Vt., and Heman Whipple, Baldwinsville, N. Y., have petitioned for an extension of the above patent. Day of hearing Sept. 28, 1870.

SHIP'S CAPSTAN.—Charles Perley, New York city, has applied for an extension of the above patent. Day of hearing Oct. 5, 1870.

SMUT MACHINE.—Harvy B. Ingham, Camptown, Pa., has applied for an extension of the above patent. Day of hearing Oct. 12, 1870.

CLOTHES DRYER.—Samuel Morrill, Andover, N. H., has petitioned for the extension of the above patent. Day of hearing Oct. 26, 1870.

Business and Personal.

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

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4·00 a year. Advertisements 15c. a line.

Stationary Engine and Boiler, 2d-hand, in first-rate order, cylinder 16x24. For sale cheap. Address Howard Iron Works, Buffalo, N.Y.

Rawhide Carriage Washers are cheaper than leather, and run with less noise than any other. Darrow Manufacturing Co., Bristol, Conn.

For Sale.—Entire Right of best Jeweling Lathe ever invented. Sets a jewel in two minutes. Address H. H. Heskett, Le Roy, Ill.

Wanted.—A competent Superintendent in a business in the West, requiring a knowledge of the manufacture of white metal goods and electro-plating. Address P. O. Box 5,502 New York City.

Wanted.—Circulars and price list of steam meat-chopping and sausage stuffing machine. Address A, Lock Box 1,301, Mobile, Ala.

Wanted.—A 2d-hand fire dryer for paper mill, or 2d-hand steam dryer and boiler. A customer may be found by addressing Box 2,851, New York P. O.

Artificial Skin, absolutely water-proof. Applied immediately. Bruises, cuts, & burns. 50c. by mail. Try it. Ward & Co., Skaneateles, N. Y.

Wanted—To furnish dealers with baled corn husks by cargo or car. M. H., Owing's Mills, Md.

For Sale—A good set of Bolt Machinery—Bolt cutters, swedges, nut tapper, etc., etc. For particulars apply to Laverty, Heughes & Co., Rochester, N. Y.

Japanese Paper Ware—Spitoons, wash basins, pails, milk pans, etc. Perfectly water-proof, and will not break or rust. Send for circulars. Jennings Brothers, 352 Pearl st., New York.

Scroll Saw.—First Prize Fair American Institute, N. Y., and Richmond, Va., State Fair. For price, etc., address T. L. Cornell, Derby, Conn.

Pictures for the World.—Prang's latest publications: "Wild Flowers," "Water Lilies," "Chas. Dickens," for sale everywhere.

Crampton's Imperial Laundry Soap, washes in hard or salt water, removes paint, tar, and grease spots, and, containing a large percentage of vegetable oil, is as agreeable as Castile soap for washing hands. "Grocers keep it." Office 84 Front st., New York.

Peck's patent drop press. For circulars, address the sole manufacturers, Milo Peck & Co., New Haven, Ct.

Millstone Dressing Diamond Machine—Simple, effective, durable. For description of the above see Scientific American, Nov. 27th, 1869. Also, Glazier's Diamonds. John Dickinson, 64 Nassau st., N. Y.

The best boiler tube cleaner is Morse's. See cut inside page.

"Your $50 Lathes are worth $75." Good news for all. At your door. Catalogues Free. N. H. Baldwin, Laconia, N. H.

Wanted.—Situation as Superintendent or foreman in Machine Works. Fifteen years' experience. Address P.O. Box 1016, Worcester, Mass.

Foundery and Machine Shop for sale, with fine lot of patterns. Is doing a good business; excellent location for general jobbing, and for m'f'g agricultural implements. Address S. Moore & Bro., St. Peter, Minn.

Patent Water-proof Building Paper for Carpet for halls and stairways, shoe stiffening, walls, ceilings, and roofs, manufactured by Mc Neil, Irving & Rich. Patentees, Elwood, Atlantic Co., N.J., or 59 Duane st., New York, 520 Commerce st., Philadelphia, Pa.

The best hand shears and punches for metal work, as well as the latest improved lathes, and other machinists' tools, from entirely new patterns, are manufactured by L. W. Pond, Worcester, Mass. Office, 98 Liberty st., New York.

Scientific American.—Back Nos., Vols., and Sets for sale. Address Theo. Tusch, City Agent, Sci. Am., 37 Park Row, New York.

Wm. Roberts & Co., Designers and Engravers on Wood, 36 Beekman st., New York, would respectfully announce that they are now prepared to receive orders from Manufacturers, and others, for engraving of machinery, views of stores, factories, trade marks, etc., etc.

$15 for the best Saw Gummer out. Address The Tanite Co., Stroudsburg, Pa.

Machinists and others using Fine Tools, send for illustrated catalogue. Goodnow & Wightman, 23 Cornhill, Boston.

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Pat. paper for buildings, inside & out, C. J. Fay, Camden, N. J.

For solid wrought-iron beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Keuffel & Esser, 71 Nassau st., N.Y., the best place to get 1st-class Drawing Materials, Swiss Instruments, and Rubber Triangles and Curves.

For tinmans' tools, presses, etc., apply to Mays & Bliss, Plymouth, st., near Adams st., Brooklyn, N. Y

Glynn's Anti-Incrustator for Steam Boiler—The only reliable preventative. No foaming, and does not attack metals of boiler. Liberal terms to Agents. C. D. Fredricks, 587 Broadway, New York.

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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.

— S., of D. C.—The use of silicate of potash or soda as a protective coating for iron may have been successful somewhere, but, if so, we have not seen it. The difficulties you mention, namely, the crawling, as though the surface were greased, while applying it, the cracking after application, and the rusting in fine points, have been, so far as we have been able to observe, common when these substances are used on iron, either separately or mixed. We think there is little choice between them for this purpose, and do not think their use in this way desirable.

P. K., of Kansas.—We do not think there is any work containing full information up to the latest date upon the subject of the manufacture of grape sugar from starch. You will be obliged to search for it through standard works upon chemistry and the industrial arts, in the transactions of various chemical and scientific societies, and in files of journals devoted to chemistry, pharmacy, and industrial information in general. In Dr. Ures' "Dictionary of Arts and Manufactures," Miller's "Organic Chemistry," and "Muspratt's Chemistry," you will find much information upon this subject.

W. W. A., of ——.—It is a common error among men who know little or nothing of theoretical mechanics to suppose that a fly wheel adds to the *power* of an engine. Some, in using the word power, mean by it usefulness, or efficiency to perform the ordinary work in a uniform manner. Others mean by the word probably something near what is really meant by it in mechanics. The usefulness of the engine is increased by the fly wheel, but the motive power developed in the cylinder is in no way altered thereby. Of course the same reasoning applies to the "large and small grindstone question."

N. Z., of D. C., asks: In what solution or mixture does a chemist obtain the best conception of an atom? We answer that many philosophic minds of a high order believe the atom of Dalton, a perfectly inconceivable thing, as much so as a "differential" in mathematics. We agree with this view, and therefore must answer to the above query that in no solution does the chemist get any conception of such atoms.

G. B., of N. Y.—A boiler rated at fifteen-horse power, if properly constructed, ought to produce economically steam for a fifteen-horse power engine. What advantage there would be in purchasing a larger boiler to do the same work we fail to discover, so long as there is no demand for steam except to supply the engine. Boilers are generally rated below their actual power; hence a boiler rated at fifteen-horse will yield a surplus of power.

E. H. H., of Md., is making wagon hubs of "black gum," and finds great difficulty in preventing their cracking. He now, having tried various methods for five years, appeals to our correspondents for the benefit of their experience. Can any one give a method that will prove reliable?

C. A. M., of La.—We do not believe soluble glass to be well adapted to the protection of frame buildings, as an outside application. Nevertheless, if you wish to try it, you need simply to cleanse the surface from dirt, and apply a solution of the glass, made with hot water, with a brush, as you would paint or varnish.

D. H. S., of Conn.—The flaking off of your paint is undoubtedly due to the use of glue in the first coat you used to fill up the interstices of your brick wall, made of glue, whiting, and lead. Glue size will not stand as a vehicle for the priming of outside work, and even on inside work it is apt to flake off. You should use good linseed oil for the purpose.

W. C. H., of Ohio.—We are informed that Brazilian pebbles for lenses of spectacles are still used, but that owing to improvements in glass manufacture, their use is on the decline. It is said that their only point of superiority over the best glass now made is their hardness, which enables them to retain their polish longer.

A. L. W., of Va.—The volumes of the gases are inversely, as the pressures to which they are subjected; thus, if a gallon of air be forced into a vessel already containing a gallon at ordinary atmospheric pressure, it will take fifteen more pounds of pressure to the square inch to force it in.

S. S. R., of Tenn.—We do not approve of steamboat racing, and have our doubts that even horse racing is a blessing to mankind. As the well written article you send us seems to favor both these practices, we prefer not to publish it.

C. H. O. of Ga.—The pumping of water back over the dam to propel a water wheel, after once used is neither new or feasible. Better use the power which you propose for pumping, direct to your machinery.

E. H. A., of Chicago.—We do not know the address of Mr. Binko. The item referred to was sent to us by M. Piesse, a celebrated London chemist.

G. F. G., of Mich.—The wire used in telegraph magnets, is covered with silk or with gum. It is not uncovered, as you suppose.

S. D. V., of Ala.—The term "caustic" is properly applied in chemistry only to hydrated alkalies, potassa, soda, or ammonia, or to the hydrated and anhydrous alkaline earths, baryta, strontia, lime, and magnesia.

Recent American and Foreign Patents.

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

STEAM PACKING FOR PISTON RODS, ETC.—Leopold Katzenstein, New York city.—This invention relates to a novel steam packing for piston rods, etc., and consists in the application of an elastic plate, which is, by an oblique incision cut, so that it will not only serve as a spring for pressing the several parts of the packing together, but also as a portion of the packing itself to keep the steam from passing by.

WATER WHEEL.—Charles D. Wright, Leesville, Conn.—This invention has for its object so to construct water wheels that the full power of the water may be utilized. The invention consists in making the wheel entirely open in the center, so that the water passing through it will not be obstructed by a shaft, hub, or other central structure.

METHOD OF GRAINING WOOD.—J. J. Callow, Cleveland, Ohio.—This invention consists in a new method of graining wood—namely, by first painting the colors of the wood to be imitated on the door, panel, or other article to be grained; second, immediately thereafter covering the same with a pattern plate indented all over at short intervals; third, rubbing th said plate with a rubber cloth, these several steps being taken in the order specified, and the grained surface being then finished off in the usual manner.

RAILWAY SPRING.—Joseph Mitchell, Sheffield, England.—This invention of improvements in railway and other carriage springs, has for its objec to construct flat or elliptical springs in such a manner that they will be stronger and less liable to break than springs of the ordinary c "

COMBINED KEY RING AND DOOR FASTENER.—B. H. Melendy, Manchester, N. H.—This invention has for its object to improve the construction of the improved key ring and door fastener, patented by the same inventor, May 17, 1870, and numbered 103,068, so as to make it simple in construction, and more convenient and effective in use.

FOLDING CARRIAGE FOR CHILDREN.—Thomas G. Stagg, Brooklyn, N. Y.—This invention relates to a new and useful improvement in carriages for children, whereby they are made much more convenient than they have hitherto been.

HORSE HAY RAKE.—W. H. Fay, Camden, N. J.—This invention has for its object to furnish an improved horse hay rake, which shall be so constructed as to work with the same facility upon uneven as upon even ground, which will collect the hay and grain from dust or dirt, and which will not injure or tear up the roots of the grass.

COMBINED HAY RAKER AND LOADER.—Addison Buck, Hebron, Ind.—This invention has for its object to furnish an improved machine, which shall be so constructed as to rake the hay and carry it up in a bunch, and discharge it upon the wagon.

COMBINED PLUG-TOBACCO PRESERVER AND SHOW CASE.—Adolph Bernstein, St. Louis, Mo.—This invention has for its object to furnish an improved device for preserving plug tobacco (which is required by law to be retailed from the original box or package) from dust and other impurities, and which will at the same time serve as a show case for the tobacco.

CAR COUPLING.—R. N. Allen, Pittsford, Vt.—This invention has for its object to furnish an improved car coupling, which shall be so constructed that the cars can be easily coupled, after they have been run together, without its being necessary to insert the link as they are being run together, and which will allow the link to be easily detached while the cars are standing together, thus removing the necessity of any one going between the cars while they are being run together.

APPARATUS FOR OPERATING WINDOW CURTAINS.—John Stevens and Jairus Collins, Fairview, Ohio.—This invention relates to a new and useful improvement in the method of raising and lowering window curtains.

WEATHER STRIP.—William Henry Burghardt, Curtisville, Mass.—This invention relates to a new manner of securing weather strips to doors, with an object of making them automatically adjustable, so that they will only be projected from their sockets when the doors are closed, and drawn in when the same are opened.

HARNESS RINGS.—Samuel Aldred, Avoca, Wis.—This invention has for its object to so construct the rings which are used on the several parts of a harness that the straps cannot slide and play on the same, and consequently not be as readily worn as on the ordinary rings. The invention consists in forming inner projections on the rings so that by their means the straps are held secure and prevented from being chafed by lateral play.

WATER WHEELS.—H. J. White, Chatham, Iowa.—This invention relates to new and important improvements in water wheels, whereby such wheels are made more effective than they have heretofore been, and the invention consists mainly in movable guides (attached to or forming a part of the gate) for regulating the flow of water according to the rise of the gate.

FOLDING CHAIRS.—George McAleer, M.D., Boston, Mass.—This invention has for its object to furnish an improved folding chair simple in construction, strong, durable, not liable to get out of order, and which may be folded into a compact form for storage or transportation.

LEATHER SCOURING MACHINE.—D. P. Burdon, New York City.—This invention relates to a new machine for dressing and scouring hides, skins, and leather, and has for its object to facilitate the operation by providing for a perfect adjustment of all parts to hides varying in thickness and quality.

ICE CREAM REFIGERATOR.—Carl Vignal, New York City.—This invention relates to a new apparatus for making and keeping ice cream, and consists in the use of a box constructed of non-conducting material and provided with a series of vertical cylindrical openings in which the various flavors of ice cream can be prepared and kept for use.

MACHINE FOR MAKING PRINTERS' LEADS.—Karl M. Klees, New York City.—The object of this invention is to construct a machine by means of which printers' leads of the requisite width, length, and thickness can be produced in a continuous process. The invention consists chiefly in the general arrangement and use of a pair of grooved and ribbed rollers, between which one or more continuous strings of heated metal are pressed and rolled into the requisite form.

DEVICE FOR PREVENTING LOCOMOTIVE WHEELS FROM SLIPPING ON RAILWAYS.—John R. Richardson, Max Meadows, Va.—This invention consists in arming the driving wheels of locomotives with an outside row of spurs projecting beyond the periphery of each wheel, and in laying down outside the main track rails, auxiliary rails toothed on their upper sides, with which teeth the spurs of the driving wheels engage, rendering it impossible for the wheels to slip on the track; the said spurs being provided with spring arms, which press them against pins with force sufficient to keep the spurs up to their work, and not too great to prevent them from slightly yielding against a shock.

VAPOR BURNER.—Thomas Moore, Bloomington, Ill.—This invention consists of a wick tube perforated at its upper end, and containing a piece of pumice stone or other porous iron-combustible material above the wick, the function of which is to absorb the oil from the wick and give forth the same in the form of vapor when subjected to heat. Inclosing the wick tube is a sliding cap also perforated at its upper end and subserving the double purpose of a seat for the flame and an extinguisher to it.

MARBELIZING WOOD.—Francis G. Pokorny, New York city.—This invention consists in a composition of matter to be used for imparting to wood the appearance of marble; it does not blister under the action of heat like the ordinary paint, and it is able to withstand the application of water; it is therefore peculiarly adapted to mantel shelves and washstands.

TUCK MARKER.—Nathaniel Jones, Chicago, Ill.—This invention relates to improvements in tuck making, and consists in an improved construction and arrangement of a tuck marker for attachment to the presser foot to be raised by the feed plate and pressed down by the presser foot. The invention also consists in a lateral prolongation of the presser foot, both for the connection of the tuck marker and for smoothing the folds of the tuck.

MANUFACTURE OF FELT.—Samuel Kingan, New York city, administrator of James Anderson, deceased.—This invention relates to felt fabrics, for roofing and analogus purposes, and consists in a process of preparing sheets of felt, whereby its fibers will be caused to cohere firmly, while moisture will be entirely excluded.

WASHING MACHINE.—Peter B. Shoemaker, Plattsburg, Mo.—This invention has for its object to furnish an improved washing machine, simple in construction, effective in operation, and easily operated, and which shall be so constructed as to wash the clothes by alternate pressure and saturation, without rubbing, and, consequently, without injuring even the most delicate fabrics.

PENCIL SHARPENER.—Moses W. Dillingham, Amsterdam, N. Y.—This invention relates to a new and useful improvement in instruments for sharpening lead pencils, whereby they are made more useful than they have hitherto been, and consists in combining with a pencil sharpener, an eraser for lead marks, and, also, a spring for holding the sharpener on a pencil.

SUCKER-ROD CONNECTION.—George M. Backus, Oil City, Pa.—This invention relates to a new and useful improvement in mode of fastening the wooden sucker-rod to the iron ferrule of the joint of an oil well, and consists in fixing steel springs (one or more), in the rod, and forming grooves or notches (one or more) in the ferrule, with which grooves or notches the steel springs are made to engage.

THREAD CUTTER FOR SEWING MACHINES.—John Crowe, Guelph, Ontario, Canada.—This invention relates to improvements in sewing machines, and consists in the combination with the plate, wheel, or other part of a sewing machine, of a thread cutter, conveniently arranged to cut the thread when running the work, in a more ready manner than to take up a scissors, as is now required.

WATER REGULAUOR FOR STEAM BOILERS.—G. N. Jones, Chicago, Ill.—This invention relates to a new and useful improvement in apparatus for regulating the supply and indicating the quantity of water in a steam boiler, and consists in placing a float on the surface of the water, the rise and fall of which shall, by means of rods connecting the float with a lever, control the water supply, indicate the hight of water in the boiler visibly to the eye, and sound the alarm in case of either extreme low or high water.

SHAWL STRAPS.—G. B. Broad, Waterville, Me.—This invention relates to improvements in the straps used for securing shawls and other like articles in small bundles, and carrying them by the hand, and consists in a combination with the straps, to which the handle and the binding straps are connected, of a wire frame for stiffening and strengthening it, the said frame being stitched between the upper and lower layers of the said strap, which is made of two parts or layers. The invention also consists in an improved way of attaching the binding straps to the other by metallic loops.

STOP CHAIR.—S. H. Smith, Altoona, Pa.—This invention relates to improvements in stop chairs for employment in connection with railroad rails to prevent end movement of the same under the action of the driving wheels of the locomotives, and the invention consists in chairs formed of short, narrow plates of iron or steel, twisted spirally between the ends, and shaped so that while one end lies flat upon the tie, so as to be spiked thereon, by the side of the rail, the other end will fit against the side of the rail at some distance from the tie, at an acute angle with the rail, whereby, being bolted to it, the tendency of the rail to move, acting on the holding spike in a line parallel with the rail, or nearly so, will be more easily overcome by one bolt than by two bolts in the stop chairs now used.

SWINGING STANCHIONS.—W. C. Gifford, Jamestown, N. Y.—This invention relates to a new and useful improvement in the construction and arrangement of stanchions for securing cattle in stables or barns.

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Issued by the United States Patent Office.

FOR THE WEEK ENDING July 19, 1870.

Reported Officially for the Scientific American

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105,404.—EAVES-TROUGH HANGER.—J. P. Abbott, Cleveland, Ohio.

105,405.—HOE.—Luna J. Aderhold, Wedowee, Ala.

105,406.—RING FOR HARNESS.—Samuel Aldred, Avoca, Wis.

105,407.—CAR COUPLING.—R. N. Allen, Pittsford, Vt.

105,408.—TOBACCO PIPE.—John H. Anthony, Cambridge, Md.

105,409.—SHUTTER FASTENING.—S. D. Arnold (assignor to P. & F. Corbin), New Britain, Conn.

105,410.—SUCKER-ROD CONNECTION.—G. M. Backus, Oil City, Pa.

105,411.—IRON RUNNING GEAR.—Albert Ball, Canton, Ohio.

105,412.—MODE OF ATTACHING SLEIGH BELLS.—William E. Barton, East Hampton, Conn.

105,413.—COKE OVEN.—L. F. Beckwith and Arthur Beckwith, New York city.

105,414.—TOBACCO-BOX SHOW CASE.—Adolph Bernstein, St. Louis, Mo.

105,415.—TRACE FASTENING.—C. W. Blakeslee (assignor to himself and Joseph Peck), Watertown, Conn.

105,416.—SHAWL STRAP.—Gustavus B. Broad, Waterville, Me.

105,417.—CUTTERS FOR TONGUING AND GROOVING.—Caleb Brobst, Winamac, Ind.

105,418.—HAY LOADER.—Addison Buck, Hebron, Ind.

105,419.—LEATHER-SCOURING MACHINE.—David P. Burdon, New York city.

105,420.—WEATHER STRIP.—W. H. Burghardt, Curtisville, Mass.

105,421.—MITER BOX.—H. N. Burr, Mansfield, Ohio.

105,422.—LOW-WATER INDICATOR.—R. R. Carpenter, Tippecanoe, Ohio.

105,423.—METHOD OF FORMING STUMP JOINTS FOR CARRIAGE BOWS.—A. P. Casey, Plantsville, Conn.

105,424.—PAPER-FOLDING MACHINE.—Cyrus Chambers, Jr., Philadelphia, Pa.

105,425.—MEDICAL COMPOUND FOR TREATING RHEUMATISM, ETC.—H. A. Chase, Tully, N. Y.

105,426.—ANTI-FRICTION GEARING.—Thomas Chase, Washington, D. C.

105,427.—GRAIN METER. — Francis G. Chesman, Lemont, Ill.

105,428.—PACKING TOBACCO BOX.—Wm. Cills, Philadelphia, Pa.

105,429.—GATE FOR RAILWAY CROSSINGS.—John H. Clark, Flemmington, N. J.

105,430.—HOMINY MILL.—E. M. Coombes, Memphis, Ind.

105,431.—MANUFACTURE OF WHITE LEAD.—James Cuddy, Pittsburgh, Pa.

105,432.—TENONING MACHINE.—John J. Curnan, Lyons, Iowa.

105,433.—NEEDLE FOR SEWING MACHINE.—C. R. S. Curtis, Quincy, Ill.

105,434.—ROOFING COMPOSITION.—H. L. Davis (assignor to himself and G. W. Ingalls), Worcester, Mass.

105,435.—DROP-LIGHT GASALIERS.—Charles Deavs (assignor to "the Archer and Pancoast Manufacturing Company"), New York city.

105,436.—STEERING APPARATUS.—David De Haven, New Orleans, La.

105,437.—HULL OF VESSELS.—David De Haven, New Orleans, La.

105,438.—ARRANGEMENT OF UPPER WORKS IN RIVER STEAMERS.—David De Haven, New Orleans, La.

105,439.—WASHING MACHINE.—Samuel Deveau, Syracuse, N. Y.

105,440.—PENCIL SHARPENER.—M. W. Dillingham, Amsterdam, N. Y.

105,441.—HINGE FOR BLINDS.—Adolf Ecard, Washington, D. C.

105,442.—COLLAR.—H. G. Emery and Margaret Cate Fuller, Boston, Mass.

105,443.—HORSE COLLAR.—Joseph Englaender (assignor to to himself and Eugene Lungstras), Sedalia, Mo.

105,444.—WASHING MACHINE.—Martin P. Flanders, Jay, N. Y.

105,445.—SWINGING STANCHION.—W. C. Gifford, Jamestown, N. Y.

105,446.—PLOW.—J. S. Godfrey, Leslie, Mich., assignor to himself and S. M. Loveridge, Pittsburgh, Pa.

105,447.—ELECTRO-MAGNETIC ALARM.—T. S. Hall, Stamford, assignor to Hall's Electric Railway Switch and Drawbrige Signal Company, New Haven, Conn.

105,448.—GRINDING MILL.—Daniel Halladay, Batavia, Ill.

105,449.—ELEVATOR.—D. D. Hanson, Weare, N. H.

105,450.—HYDRAULIC MOTOR.—James Harris, Boston, Mass.

105,451.—GRAIN AND SEED SEPARATOR.—Reason Hawkins, Sugar Creek, Ind.

105,452.—SHOEMAKERS' EDGE PLANE.—A. P. Hazard, North Bridgewater, Mass.

105,453.—WASHING MACHINE.—Benj. Hockabout, Antioch, Cal.

105,454.—KNITTING MACHINE.—Joseph Hollen, Fostoria, Pa.

105,455.—PRESS DYEING.—John Holt, Lowell, Mass.

105,456.—PIPE COUPLING. — Richard Hoskin, Dutch Flat, Cal.

105,457.—CONDENSER FOR MARINE ENGINES.—John Houpt, Springtown, Pa.

105,458.—SOAP-CUTTING MACHINE. — Willis Humiston and H. N. Humiston, Troy, N. Y.

105,459.—ALARM TICKET NIPPERS FOR COUPON TICKETS.—Isaac Hyde, Oakland, Cal.

105,460.—CULTIVATOR. — Moses Johnson, Three Rivers, Mich.

105,461.—HIGH AND LOW-WATER ALARM.—George N. Jones, Chicago, Ill.

105,462.—PACKING.—Leopold Katzenstein, New York city.

105,463.—MACHINE FOR MAKING PRINTERS' LEADS.—Karl M. Klees, New York city.

105,464.—APPARATUS FOR THE MANUFACTURE OF ALBUMENIZED PAPER.—Jakob Klein, Hesse Darmstadt, North German Confederation, assignor to Dreyfoos, Klein & Co., New York city.

105,465.—PISTON FOR STEAM PUMPS.—Lucius J. Knowles, Worcester, Mass.

105,466.—PISTON PACKING.—Lucius J. Knowles, Worcester, Mass.

105,467.—HAIR-SPRING TESTING APPARATUS FOR WATCHES.—John Logan, Boston, Mass.

105,468.—PARLOR ROULETTE.—Alexis Marais (assignor to himself and John O'Brien), St. Louis, Mo.

105,469.—SAW FOR MAKING STUFFING FOR UPHOLSTERING.—George W. Marble (assignor to himself and Charles Way), Charlestown, N. H.

105,470.—CAR COUPLING.—Charles Markley, New York City.

105,471.—CHURN.—James Mayhew, West Tisbury, Mass.

105,472.—FOLDING CHAIR.—George McAleer, Worcester, Mass.

105,473.—CORN PLANTER.—Joseph A. McClure, Mount Carroll, Ill.

105,474.—COMBINED KEY RING AND DOOR FASTENER.—Bryant H. Melendy, Manchester, N. H.

105,475.—CHURN.—J. P. Meranda, Springfield, Ohio.

105,476.—WHEEL FEED.—Joseph B. Merritt, Abington, Mass.

105,477.—HAY ELEVATOR AND CONVEYOR.—Charles A. Miller, Marengo Township, Mich.

105,478.—RAILWAY CAR SPRING.—Joseph Mitchell, Sheffield, assignor to William Edward Newton, London England. Patented in England, May 18, 1868.

105,479.—MAKING BUTTER.—Adolphe Mot, Washington, D. C.

105,480.—ORE SEPARATOR.—David Nevin, Georgetown, Colorado Territory.

105,481.—STRAW CUTTER.—Harrison Ogborn, Richmond, Ind.

105,482.—SHOE FASTENER.—Julius E. Otto, Elmore, Ohio.

105,483.—CLOTHES LINE CLAMP.—T. W. Owens, Granville, Ohio.

105,484.—PRESERVING VARIOUS ARTICLES OF FOOD.—Henry L. Palmer, Stillwater, N. Y.

105,485.—PRESERVING VEGETABLE EXTRACTS.—H. L. Palmer, Stillwater, N. Y.

105,486.—PATTERNS FOR MEASURING THE BODY FOR GARMENTS.—Moses Palmer, Jr., Boston, Mass., and E. Willoughby Anderson, Washington, D. C.

105,487.—MACHINE FOR MILLING THE KNUCKLES OF BUTT HINGES.—Emery Parker (assignor to Russell & Erwin Manufacturing Company, New Britain, Conn.

105,488.—MACHINE FOR CENTERING BUTTS.—Emery Parker (assignor to Russell & Erwin Manufacturing Company), New Britain, Conn.

105,489.—DOOR BOLT.—Russell B. Prindle, Norwich, N. Y.

105,490.—MACHINE FOR MAKING HORSE SHOE BLANKS.—Abram Reese and Jacob Reese, Pittsburgh, Pa.

105,491.—BUFFER HEADS FOR CAR COUPLINGS.—William Rickards, Jr., Franklin, Pa.

105,492.—MARINE COMPASS.—Edward S. Ritchie, Brookline, Mass.

105,493.—ELECTRO-MAGNETIC GATE AND SIGNAL APPARATUS FOR RAILROADS.—William Robinson, Brooklyn, N. Y.

105,494.—ELECTRO-MAGNETIC GATE-OPERATING APPARATUS.—William Robinson, Brooklyn, N. Y. Antedated July 8, 1870.

105,495.—OYSTER TONGS.—Joseph W. Sands, Annapolis, Md.

105,496.—HANGING MILL STONES.—Charles Schneider, Galion, Ohio.

105,497.—BRIDGE.—Jacob Seebold, Kantz, Pa.

105,498.—MACHINE FOR SPLITTING WHALEBONE.—James A. Sevey, Boston, Mass.

105,499.—MANUFACTURE OF LUBRICATING COMPOUNDS.—E. B. S. Shoemaker, Towsontown, Md.

105,500.—WASHING MACHINE.—P. B. Shoemaker, Plattsburg, Mo.

105,501.—BOOT AND SHOE STIFFENER.—Nathan J. Simonds, Woburn, Mass.

105,502.—CONCRETE PAVEMENT.—Robert Skinner and Bonnet Bonnet, San Francisco, Cal.

105,503.—GAGE COCK.—Levi F. Smith, Philadelphia, Pa.

105,504.—RAILWAY RAIL CHAIR.—Samuel Hulbert Smith, Altoona, Pa.

105,505.—FOLDING CARRIAGE FOR CHILDREN.—T. G. Stagg, East New York, N. Y.

105,506.—MACHINE FOR REMOVING GREASE FROM LEATHER.—James Starratt, Salem, Mass., assignor by mesne assignments to Handle Starratt and Benjamin McKeen. Antedated March 28, 1870.

105,507.—VISE.—Anson P. Stephens, Brooklyn, N. Y.

105,508.—APPARATUS FOR OPERATING WINDOW CURTAINS.—John Stephens and Jairus Collins, Fairview, Ohio.

105,509.—TRACE BUCKLE.—Charles H. Stevens, Fayetteville, N. Y.

105,510.—CABLE STOPPER.—James Stitt, San Francisco, Cal.

105,511.—PREPARATION OF CEMENT FOR THE MANUFACTURE OF CEMENT PIPE.—J. W. Stockwell, Portland, Me.

105,512.—SECRETARY SAFE.—T. J. Sullivan, Albany, N. Y.

105,513.—DEVICE FOR INSERTING THE PINTLE OR PINS IN BUTT HINGES.—L. P. Summers (assignor to P. & F. Corbin), New Britain, Conn.

105,514.—CONDIMENT OR RELISH.—W. F. Swasey, San Francisco, Cal.

105,515.—CONSTRUCTION OF CHAIRS.—D. E. Teal, New Lisbon, N. Y.

105,516.—CONSTRUCTION OF CHAIRS.—D. E. Teal, New Lisbon, N. Y.

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105,518.—GAGE PIN FOR TYMPAN SHEETS.—R. W. Thing, (assignor to himself and D. T. Pray), Boston, Mass.

105,519.—DEVICE FOR CURLING HAIR.—S. L. Tibbals, Dutch Flat, Cal.

105,520.—CENTRIFUGAL SUGAR DRAINING AND MOLDING MACHINE.—Patrick Tully, San Francisco, Cal.

105,521.—ICE CREAM REFRIGERATOR.—Carl Vignal, New York City.

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105,523.—SAD IRON HOLDER.—E. H. G. Von Doehren and F. P. L. Reimers, Davenport, Iowa.

105,524.—CAR SPRING.—Richard Rose, New York City.

105,525.—REGULATOR FOR STEAM HEATING APPARATUS.—Alfred Walker, Portland, Me.

105,526.—MODE OF PROTECTING FRUIT TREES FROM CURCULIO, ETC.—H. J. Walker, Goshen, Ohio.

105,527.—QUARTZ MILL.—Thomas Walker, Philadelphia, Pa.

105,528.—GANG PLOW.—E. W. Walton, San Leandro, Cal.
105,529.—WEED CUTTER.—E. W. Walton, San Leandro, Cal.
105,530.—CORN POPPER AND COFFEE ROASTER.—L. A. Warner, Freeport, Ill.
105,531.—PLOW.—George Wharton, Jerseyville, Ill.
105,532.—WATER WHEEL.—H. J. White, Chatham, Iowa.
105,533.—OSCILLATING CHURN.—N. E. Wilson, Wilsonburg, West Va.
105,534.—LIFTING JACK.—G. W. Windsor (assignor to himself and J. F. Bellstein), Allegheny City, Pa.
105,535.—BASE-BURNING STOVE.—G. A. Wing, Albany, N. Y. Antedated July 12, 1870.
105,536.—WATER WHEEL.—Charles D. Wright, Leesville, Conn.
105,537.—KNITTING MACHINE.—Wm. H. Abel, Bennington, Vt.
105,538.—KNITTING MACHINE.—W. H. Abel, Lowell, Mass., assignor to himself, Robert H. Brown, and J. E. Crane.
105,539.—KNITTING MACHINE.—W. H. Abel, Lowell, Mass., assignor to himself, R. H. Brown, and J. E. Crane.
105,540.—SHINGLE MACHINE.—James E. Austin, Oswego, N. Y.
105,541.—OVEN.—Hosea Ball, New York city.
105,542.—HORSE HAY RAKE.—Newcomb M. Barnes, Tiffin, Ohio.
105,543.—MACHINE FOR SHARPENING SAWS.—J. A. Borthwick, Philadelphia, Pa.
105,544.—WINKER FOR HARNESS-BRIDLES.—William Boyd, Mansfield, Mass.
105,545.—COFFEE MILL.—T. W. Brown, Boston, Mass, assignor to Charles Parker, Meridan, Conn.
105,546.—CARRIAGE WHEEL.—Seneca B. Buck, Elyria, Ohio.
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105,555.—BLACKSMITH'S TONGS.—A. J. Dexter, North Foster, R. I.
105,556.—WARDROBE BEDSTEAD.—James F. Dodge, Nashua, N. H.
105,557.—APPARATUS FOR GENERATING AND BURNING GASES IN METALLURGIC FURNACES.—J. W. Ells (assignor to himself and S. M. Kier), Pittsburgh, Pa. Antedated July 6, 1870.
105,558.—GAS AND AIR-HEATING APPARATUS FOR METALLURGIC FURNACES.—J. W. Ells (assignor to himself and S. M. Kier), Pittsburgh, Pa. Antedated July 6, 1870.
105,559.—SPOOL-STAND AND SHOW CASE.—Eben B. Fenton and Henry S. Penfield, Chicago, Ill.
105,560.—PRESERVING AND BEAUTIFYING CRYSTALLIZED SALTS UPON GLASS, MICA, ETC.—Oscar S. Follett, New York city. Antedated July 8, 1870.
105,561.—GAS APPARATUS FOR RAILROADS, ETC.—William Foster, Jr., New York city, and G. P. Ganster, Reading, Pa.
105,562.—ELECTRO-MAGNETIC ATTACHMENT FOR SHIPS' COMPASS.—Alfred Foucaut, Orleans, France.
105,563.—BLOTTING PAD.—John F. French, Boston, Mass.
105,564.—HAND TRUCK.—Leonard Gilcon (assignor to himself and E. Stone Goodwin), Boston, Mass.
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105,566.—COMBINED HORSESHOE AND BOOT.—H. G. Haedrich and E. M. Haedrich, Philadelphia, Pa.
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105,569.—BOLT THREADING MACHINE.—Mahlon Hamlin, Catawissa, assignor to himself and B. G. Welch, Danville, Pa.
105,570.—SHOVEL TEETH FOR CULTIVATORS.—Thomas Harding, La Fayette, Ind.
105,571.—ORGAN STOPS.—Albert K. Hebard, Boston, Mass.
105,572.—FRUIT CAN.—Gustav E. Heinig, Louisville, Ky.
105,573.—SHADE-CORD FASTENER.—E. T. Higham (assignor to himself and Daniel Higham), Philadelphia, Pa. Antedated July 9, 1870.
105,574.—WHIP-SOCKET RING.—John J. Hillman, Boston, Mass.
105,575.—COMBINED CORN PLOW AND GRAIN DRILL.—Caswell Hollar, Abingdon, Ind.
105,576.—PROTECTING AND BEAUTIFYING CRYSTALLIZED METALLIC SURFACES.—Henry M. Johnston, New York city. Antedated July 5, 1870.
105,577.—BINDING AND HEMMING ATTACHMENT FOR SEWING MACHINES.—A. C. Kasson, Milwaukee, Wis.
105,578.—CORN PLANTER.—Isaac A. Keeler, Middleville, Mich.
105,579.—ANIMAL POKE.—William Kelly, Saranac, Mich.
105,580.—HORSE COLLAR.—Lester B. Kenney, Charlotte, Mich.
105,581.—AMMONIACAL GAS ENGINE.—Emille Lamm, New Orleans, La.
105,582.—HOOK.—R. V. Laney, Cumberland, Md.
105,583.—CAN OPENER.—William W. Lyman, West Meriden, Conn.
105,584.—COFFEE OR TEAPOT.—E. B. Manning (assignor to Manning, Bowman & Co.,) Middletown, Conn.
105,585.—PROCESS AND APPARATUS FOR THE MANUFACTURE OF PAPER.—G. E. Marshall, Laurel, Ind.
105,586.—MACHINE FOR PACKING SALT.—John McGrew, West Columbia, W. Va.
105,587.—BASE-BURNING STOVE.—J. H. Meissner, Pittsburgh, Pa.
105,588.—VISE.—George Mitchell, Trenton, N. J.
105,589.—VAPOR BURNER.—Thomas Moore, Bloomington, Ill.
105,590.—TREATING OIL WELLS TO REMOVE OBSTRUCTIONS TO THE FLOW OF OIL.—B. G. Noble, Brooklyn, N. Y.
105,591.—CHECK VALVE.—L. E. O'Brien, Latrobe, Pa.
105,592.—GRINDING MILL.—G. O'Connor and H. O'Conner, Mishawaka, Ind.
105,593.—RAILWAY RAIL CLEANER.—Carlos Ortiz and Hilario Valladares, Matanzas, Cuba.
105,594.—MANUFACTURE OF PAPER.—Henry Pemberton, Allegheny City, Pa.
105,595.—DIES FOR TRIMMING AND STRAIGHTENING AXLE CLIPS.—E. H. Plant, Plantsville, Conn.
105,596.—PAINT FOR MARBLEIZING WOOD.—F. G. Pokorny, New York city.
105,597.—HARVESTER.—Amos Rank, Salem, Ohio.
105,598.—LOCOMOTIVE WHEEL.—John R. Richardson, Max Meadows, Va.
105,599.—CONCRETE PAVEMENT.—J. J. Schillinger, New York city.
105,600.—GANG PLOW.—D. A. Sears, Rockford, Ill.
105,601.—PRUNING HOOK.—D. B. Seeley, Sterling, Ill.
105,602.—WATER WHEEL.—W. L. Selleck, Beetown, assignor to D. W. Perkins, Milwaukee, Wis.
105,603.—MORTISING MACHINE.—Henry C. Smith, Lawrence, Kansas, assignor to American Mortising Machine Company, Boston, Mass.
105,604.—WRENCH.—O. J. Smith, Wauwatosa, Wis.
105,605.—POWER PRESS.—C. M. Stratton and O. G. Stratton, Greenfield, Mass.
105,606.—BUNG CUTTER.—Nicholas J. Templeton, Cincinnati, Ohio.
105,607.—EARTH-CHAMBER PAIL.—Henry Terry, Waterbury, Conn.
105,608.—HARVESTER RAKE.—James Toay, Mineral Point, Wis.
105,609.—APPARATUS FOR COOLING AND REFRIGERATING.—P. H. Vander Weyde, New York city.
105,610.—MILLSTONE CURB.—Alexander Van Vleck and Thos. Phillips, Jordan, N. Y.
105,611.—COMBINED HORSE HAY RAKE AND TEDDER.—Henry C. Varnum, Hartford, Vt., assignor to himself and J. E. Larkin.
105,612.—HARVESTER.—H. C. Velie, Poughkeepsie, N. Y.
105,613.—BUNG.—Albin Warth, Stapleton, N. Y.
105,614.—CLAMP NUT FOR SCREWS.—Robert White, Rockville Center, N. Y., assignor to himself and Joseph J. Walton, Newark, N. J.
105,615.—WEATHER STRIP FOR DOORS.—Franklin Whitmore and Edward Conklin, Channahon, Ill.
105,616.—WASHING MACHINE.—G. L. Witsil (assignor to himself and T. L. Bates), Philadelphia, Pa.
105,617.—FURNACE FOR STEAM ENGINES.—G. M. Wyne and Wm. Mac Grove, Dennison, Ohio.
105,618.—FLOUR-BOLT ATTACHMENT.—Obert Turner (assignor to Turner & Lutes), Rochester, N. Y.

REISSUES.

4,074.—MANUFACTURE OF WHITE LEAD.—Daniel C. Colby, Washington, D. C., and Thomas Woods and Benjamin F. Pine, Philadelphia, Pa., assignees of H. S. Hannen.—Patent No. 80,168, dated July 21, 1868.
4,075.—Division 1.—PRIMING CARTRIDGE.—Arthur Moffatt, Washington, D. C.—Patent No. 53,168, dated March 13, 1866.
4,076.—Division 2.—PRIMING CARTRIDGE.—Arthur Moffatt, Washington, D. C.—Patent No. 53,168, dated March 13, 1866.
4,077.—MODE OF ATTACHING CORNICE TO WINDOWS.—A. Peple, East Billerica, Mass.—Patent No. 101,158, dated March 22, 1870.

DESIGNS.

4,225.—JELLY CUP.—J. S. Atterbury and T. B. Atterbury, Pittsburgh, Pa.
4,226.—STOVE DOOR AND PANEL.—M. C. Burleigh, Great Falls, N. H.
4,227.—HANDLE OF SPOONS AND OTHER ARTICLES.—Augustus Conradt, Philadelphia, Pa.
4,228.—NET FABRIC.—R. J. Jefford (assignor to A. G. Jennings), New York city.
4,229.—NET FABRIC.—Abraham G. Jennings, New York city.
4,230.—KNITTED FABRIC.—Martin Landenberger, Philadelphia, Pa.
4,231 and 4,232.—KNITTED GOODS.—Martin Landenberger, Philadelphia, Pa. Two Patents.
4,233 to 4,235.—SHAWL.—Martin Landenberger, Philadelphia, Pa. Three Patents.
4,236.—STOVE.—I. T. Montross, Peekskill, N. Y.
4,237.—CLOCK CASE.—Nicholas Muller, New York city.
4,238.—MATCH SAFE.—A. P. Seymour, Hecla Works, N. Y.
4,239.—STOVE.—G. T. Spicer, C. H. Peckham, and W. A. Spicer, Providence, R. I.
4,240 to 4,246.—STOVE PLATE.—N. S. Vedder, Troy, and Tobias S. Heister, Lansingburg, N. Y., assignors to N. S. Vedder. Seven Patents.
4,247.—TEA AND COFFEEPOT.—H. C. Wilcox (assignor to the Meriden Britannia Co.), West Meriden, Conn.
4,248.—PICTURE FRAME.—John H. Bellamy, Charlestown, Mass.
4,249.—HAND-GLASS FRAME.—John H. Bellamy, Charlestown, Mass.
4,250.—BRACKET.—John H. Bellamy, Charlestown, Mass.
4,251.—STOCKING FABRIC.—Conyers Sutton, Philadelphia, Pa.
4,252.—CARPET PATTERN.—Hugh Christie, Morrisania, N. Y., assignor to Israel Foster, Philadelphia, Pa.
4,253.—CARPET PATTERN.—Jonathan Crabtree (assignor to John Gay), Philadelphia, Pa.
4,254.—MUFF.—J. H. Kappelhoff and Samuel Rauh, New York city.
4,255.—SAW.—Edward Rhodes (assignor to Henry Disston & Son), Philadelphia, Pa.
4,256.—BRACELET.—Frederick Wessel, New Britain, Conn.

EXTENSIONS.

METALLIC HOOK FOR LABELS.—S. B. Fay, New York city.—No. 15,226, dated July 1, 1856.
METHOD OF MAKING BOXES.—Arasmus French, New Haven, and Charles Frost, Waterbury, Conn.—No. 15,228, dated July 1, 1856.
BREECH-LOADING FIRE-ARM.—Wm. Mont Storm, New York city.—No. 15,267, dated July 8, 1856; reissued January 1, 1867, No. 2,445.
BREECH-LOADING FIRE-ARM.—William Mont Storm, New York city.—No. 15,267, dated July 8, 1856; reissued January 1, 1867, No. 2,446.
FOLDING GUIDE FOR SEWING MACHINES.—Sady D. Boyes, Philadelphia, Pa., administratrix of the estate of Burritt C. Boyes.—No. 15,402, dated July 22, 1856.
PROCESS AND APPARATUS FOR MAKING ICE.—Alexander C. Twining, Hudson, Ohio. No. 10,221, dated November 8, 1853; patented in England July 3, 1850; extended June 21, 1864; again extended by Act of Congress; approved July 7, 1870.

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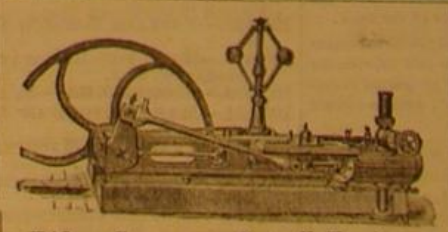

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The following affidavit is respectfully submitted:

Benj. Coit, being sworn, says that C. H. Phelps & Co., have made bona fide sales of Patent Rights, Coal, and Manufacturing Properties to amount of $144,000 since June 10, 1870; that $60,000 thereof was paid in cash, balance in real estate. Sworn to before me this 12th day of July, 1870. E. H. BROWN, Notary Public, N. Y.

(Signed) BENJ. COIT, with C. H. PHELPS & CO., N. Y.

Chas. H. Phelps, being duly sworn, deposes and says, that the above affidavit of Benj. Coit is true in every statement. Sworn to before me this 25d, July, 1870.

C. T. MORSON, Notary Public.

(Signed) CHARLES H. PHELPS.

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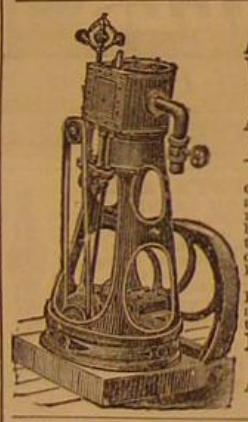

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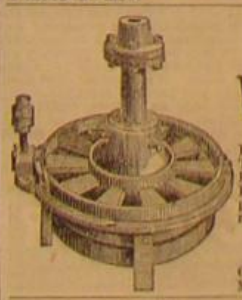

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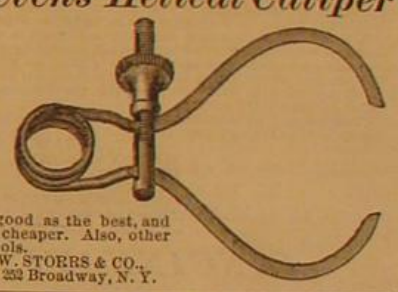

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SCIENTIFIC AMERICAN

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

Vol. XXIII.—No. 6. [NEW SERIES.] NEW YORK, AUGUST 6, 1870. $3 per Annum, [IN ADVANCE.]

Universal Wood Working Machine.

Our engravings illustrate an improved wood working machine which we are informed is now in successful operation in over one hundred and twenty of the best shops in the country, representing almost, if not quite, every variety of wood working, sashes, doors, and blinds, furniture and bedsteads; in railroad car shops, wagon and carriage shops, manufactories of distillers' and brewers' tubs, machine shops, brush factories, etc., etc. Its uses are rabbeting, plowing, gaining, beveling, jointing, hand-matching, planing out of wind, etc. It has capacity for heavy or light work, gaining from $\frac{13}{16}$ in. wide to 4 in. wide, and 3½ in. deep at one cut in hard wood, also half round or bevel gains for boxing, and is specially adapted for planing turned work, such as bedstead posts, stand and table legs, and routing for the post and rail irons, making glue joints, rolling joints for table leaves, also shallow mortices for joint bolts, planing out of wind, smoothing, jointing, and rabbeting blinds at *one operation*. It is not complicated, and is quickly adjusted, requiring no more time than to remove one head and put on another. It may be converted into a saw table by the same operation, and then adjusted by turning the hand wheels.

Fig. 1

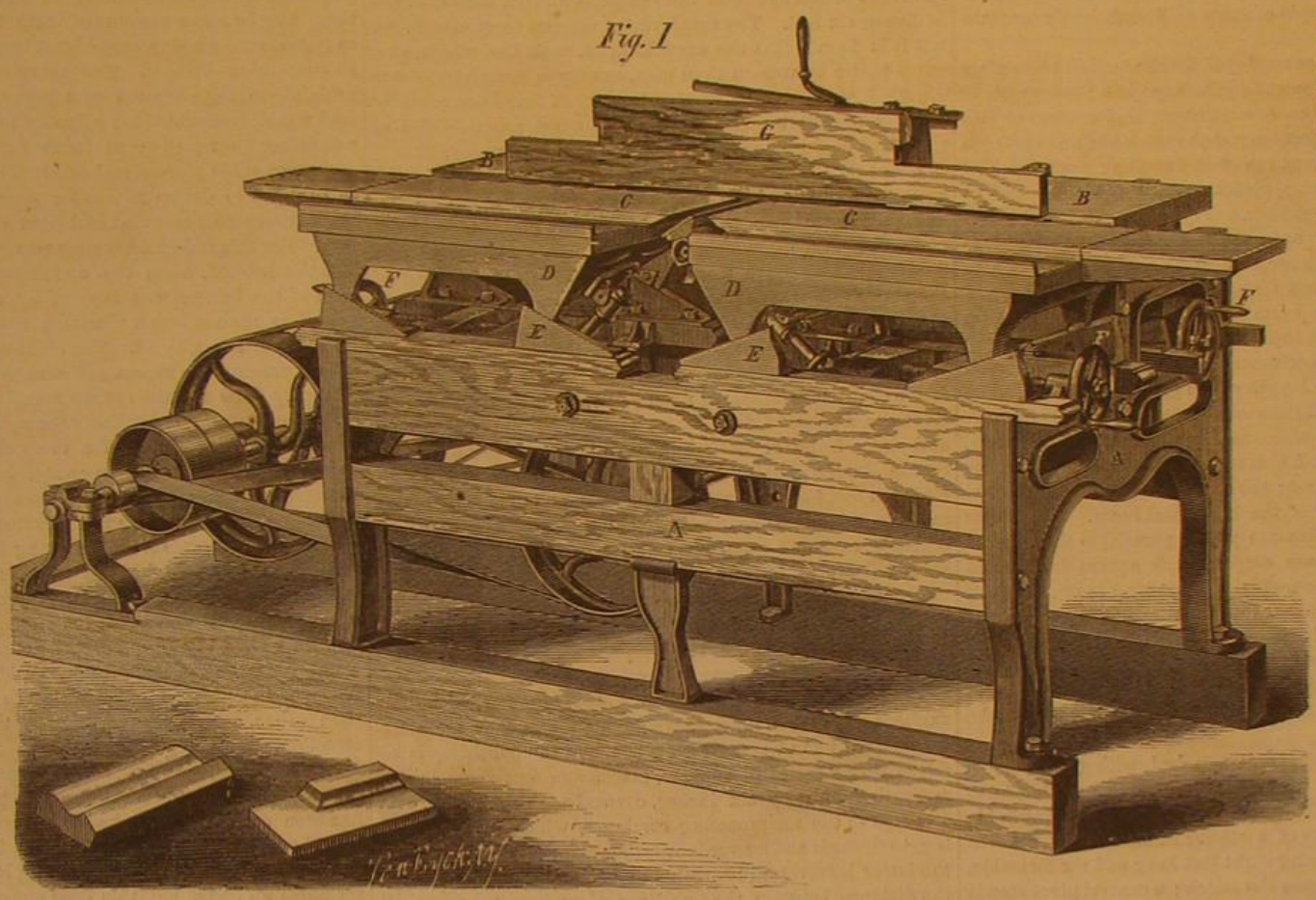
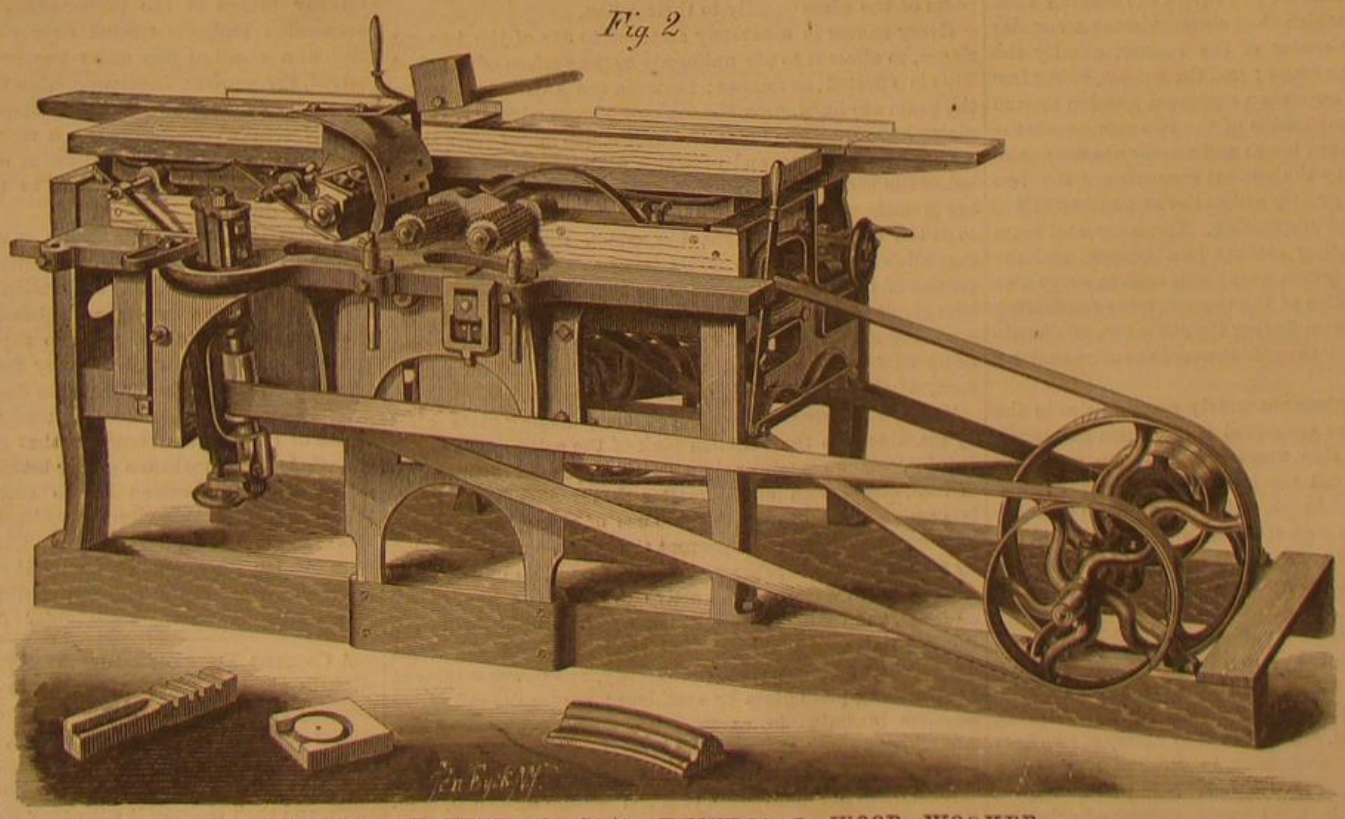


Fig. 2



McBETH, SHAFFER & CO.'S UNIVERSAL WOOD WORKER.

In Fig. 2, showing sticker side or molder attachment with side-head, the fence, which is used for squaring, beveling, jointing, rabbeting, etc., is removed, giving a view of the tops of the three beds, which are made of *iron* and planed straight, the front ones having a recess for slide boards, used in sawing, gaining, etc. The feed rollers never rise out of gear and are always straight with the bed (or parallel), thus holding the work firmly on both sides while being passed through. It will stick sash or an eight-inch crown molding, and has a fifteen-inch drop. Two persons can work on it at the same time advantageously.

Three kinds are made, one with boring and routing attachment, one with sticker or molder attachment for planing one side (without side-head), and one for planing two sides. The principal parts are lettered for reference in Fig. 1, and the following description will give the reader a general idea of the construction and capacity of the machine:

A is the main frame. B is an adjustable table extending the full length of the machine. C and C are also adjustable tables, independent of each other and of table B, sliding upon beds, D, which rest upon the inclines, E. These inclines are bolted to a sliding frame, and all the tables are raised and lowered by forcing the inclines backward and forward by means of the screws, F.

G is an iron fence, graduated in half and quarter inches, fastened to and forming an exact right angle with the table, B, and held by wing nuts through slots in the arms, and which can be moved over the tops of the knives.

For dressing straight work the bed, C, in rear of the bits, is adjusted to the exact hight of the circle described by the bits in revolving. The bed, C, in front of the bits must be adjusted as much lower than the rear bed as the thickness of the cut required. Thus as soon as the work has passed to the rear bed it has a solid bearing on both sides of the bit, and will be dressed entirely straight and out of wind. In squaring the fence is used so as to have an exact right angle. For rabbeting, gaining, or fluting both beds are lowered to the desired depth below the knives. For tapering one end of the work is rested on the rear bed before cutting, and the front bed is depressed to the depth of the taper required. The work is then passed over as usual. When access to the bits is desired, either for the purpose of sharpening them or changing the head, a wing nut underneath the table, C, (not shown) is loosened, which permits the tables, C, to slide backward and forward, and to be adjusted for a saw or head of any size required. There is also an arrangement shown attached to beds D and A, and to cross-ties below, whereby the tables are made to move, in lowering and raising, in an oblique direction, and are carried toward the bits in raising, and away from them when lowering, thereby preventing the bits from striking the beds, when adjusted, while running. The bevel nut and fence are made in a single piece, and can be adjusted at any angle. A sticker attachment is also made, with feed rollers, etc., for planing one and two sides in place of the boring and routing attachment. It will plane eight inches wide and has a fourteen-inch drop.

We have seen specimens of the work done on this machine, which for variety and quality is very remarkable. One of the pieces sent us has, after being first planed, had rabbeting, gaining, plowing, beveling, routing, and cornering done upon it in a most superior manner, and all the work gives evidence that this machine is one of the most useful of its class.

For further information address the manufacturers, McBeth, Shaffer & Co., Hamilton, Ohio.

Glucose.

In Europe glucose is manufactured from wheat, potatoes, and starch, and though the first named, as important staples of food, are not generally supposed by those unacquainted with the science of chemistry to contain any such sweetening properties as sugar, repeated experiments have demonstrated the fact that they in reality do, and, with confectioners who require the addition of an almost colorless preparation for the more delicate kinds of their manufacture, and with brewers who are interested in making the paler sorts of ale clear and sparkling, it is gradually taking the place of sugar, the well-known embodiment of sweetness in its more perfect form. The characteristics of glucose are almost the opposite of those of its celebrated rival, as, at the same time, that it can be made into a solid, consisting of minutes granules, more or less soft and hard, similar to those of raw sugar; it can also be worked into a thick whitish liquid, semi-transparent, and is, as the first syllable of its name implies, rather *glucy*, to which may be added gluten, a substance highly esteemed for its powers of strengthening and nourishing the animal system. Owing to its comparative weakness, however, glucose will never successfully compete with sugar as expressed from the cane juice alone, but, for the peculiar purposes to which it may be applied (as, for instance, those above referred to), it will no doubt become more freely used, its decided cheapness being no small recommendation to those who have not yet ventured upon giving it a fair trial. A cheap method of transforming glucose into cane sugar is a chemical desideratum.

THE GRINDING AND POLISHING OF PLATE GLASS BY MACHINERY.

[From the Handbook for the Artisan.]

This is perhaps the largest example of the production of plane surfaces by grinding.

The plates of glass, as they come from the annealing oven, measure about half an inch thick, and the surface is full of small irregularities, presenting a mottled appearance, the roughest side being generally that which was placed downwards upon the bed of the annealing oven, and copied all the irregularities of the bricks of which the bed of the oven is formed. The side of the glass that was uppermost in the oven is comparatively smooth and bright from the action of the fire, although in many cases this surface is not so nearly flat as the lower. The plates have therefore to be ground flat, and polished on both sides; formerly this was effected entirely by hand, but of late years the rough grinding with coarse sand, and the polishing with crocus, are almost always done by machinery, and hand labor is only resorted to for the intermediate process of smoothing with fine emery.

The grinding and polishing machines employed for plate glass differ somewhat in construction in various manufactories; but a single example of each will sufficiently explain the general method.

The grinding machines employed for the largest plate glass are arranged in pairs along the grinding room; every pair of machines is driven by one central beam, and consists of two benches of stone fifteen feet long, eight feet wide, and eighteen inches high, placed about ten feet asunder; upon each of these benches one or more plates of glass are embedded in plaster of Paris, close together, and quite level. Other plates of glass are cemented upon the lower faces of two swing-tables, or runners, which are traversed over the fixed beds by a horizontal frame or beam about thirty feet long; the machinery for driving the beam is fixed in a frame about six feet square and eighteen inches high, placed between the two grinding benches. A horizontal shaft, fixed underground, extends throughout the length of the grinding room between the lines of benches, and the motion from the shaft is communicated to every pair of machines, by a pair of bevel wheels, leading to a central crank that revolves horizontally, and has a radius of about two feet; the arm of the crank is attached by a pivot to the center of the horizontal beam. Four other cranks of the same radius are placed parallel to the central driving crank, one at each corner of the square frame, and serve to guide the traverse of the horizontal beam, which is thus swung in a circle of four feet diameter in a manner somewhat similar to the grinding bed for marble. The beam is supported at various parts of its length by chains suspended from the roof of the building, which allow of the traverse of the beam, and serve for raising it by means of levers for the removal of the work.

Near each end of the beam is attached, with the power of adjustment for position, a small sliding frame, carrying bearings for the reception of the central pivot of the swing table or runner, which consists of a strong frame of wood covered with boards, and measuring eight feet long and six feet wide, placed face downward upon the bench; a central pivot stands up from the back of the runner, and enters the bearing fixed on the horizontal beam, which thus communicates a circular swinging motion to the center of the runner, exactly the same as that of the driving crank; and the runner, being free to revolve upon its pivot, acquires a continual rotation around its own axis. By the combination of the two movements the relative positions of the fixed bench and runner are continually changing: this tends to the mutual correction of the two surfaces of the glass, and greatly assists the equal distribution of the sand and water used in grinding. The horizontal beam makes about fifty circulating strokes in a minute, and the runners revolve upon their own axes about once to every five or six strokes. The position of the runners upon the driving beam is shifted once or twice during the grinding, to distribute the action as uniformly as possible over the entire surfaces of the glass plates.

The largest plates of glass are nearly equal in size to the fixed bench, and these are embedded singly upon the bench with the most irregular side upwards; but more generally plates of medium and small size are ground together; they are selected of uniform thickness, and arranged close together upon the bench, with the largest plates in the middle and the smallest at the ends. The runner is covered by one or two plates at most, as small pieces would be liable to be thrown off by the centrifugal force.

All the irregularities of the surfaces are first ground out with sharp river sand that has been washed and sifted into two sizes; the sand and water are thrown on by hand occasionally, and when the plates have been ground quite flat, the finer sand is employed, and followed by emery of two finer sizes, applied as usual in succession, in order to remove the scratches made by the coarser powders. The plates of glass are thoroughly washed between every change of grinding powder, and when the one side of the glass has been ground with the finer sizes in succession, the plates are inverted, and the same routine is followed on the second side.

The grinding machines do not, however, admit of being employed with very fine emery, as the close approximation of large surfaces, traveling over each other at a considerable velocity, causes so much friction that it would be liable to tear the surface of the glass, and, consequently, as the plates become sufficiently smooth to require the application of fine emeries, the velocity and pressure should be proportionally reduced, and a greater degree of care and management is required.

The plates are smoothed upon stone benches of suitable size, about two feet high, made very flat upon their surfaces, and covered with wet canvas. One large plate, nearly equal to the size of the bench, and two or three plates of about half the size, are usually given out as a set of work. The large plate is laid upon the wet canvas, which serves to hold it firmly; emery and water are spread over the surface; and one of the small plates is used as a grinder or runner. If the plates be large, a few flat lead weights of about fourteen pounds each are laid near the middle of the runner, to distribute the pressure uniformly, and the runner is traversed over the lower plate with a swinging stroke backwards and forwards, so as to describe nearly a semicircle around the center of the runner, which is at the same time shifted a few inches during the stroke. Every stroke follows a slightly different path from the preceding one, and the runner is also gradually twisted round as the smoothing proceeds. The combination of these movements serves to expose every part of the surfaces of the bed plate and runner to an equal amount of grinding, and also to distribute the emery very uniformly.

Small plates are smoothed by young girls; and large plates, which require greater dexterity and a proportionate increase in the amount of traverse, are smoothed by two women, who stand on opposite sides of the bench, and, placing their outstretched hands flat upon the runner, swing it with a stroke of five or six feet. The employment appears most masculine, but it is found that the smoothing is, upon the whole, executed better by women than men, as only a moderate force is required, and, from the greater delicacy of touch possessed by females, they more readily appreciate when any particles of grit have become accidentally mixed with the emery.

About six sizes of carefully washed emery are used in the smoothing, and between every size the plates, canvas, bench, and hands are thoroughly washed; perfect cleanliness in the clothing is also quite essential, as a particle of coarse grit would make a scratch that would require the smoothing of the plates to be recommenced. The fine emery last employed gives a very smooth and partly polished surface, which is completed with the machine next described.

The polishing machine has a bed fifteen feet long and eight feet wide, that is mounted upon rollers, and slowly traversed sideways, a space of four feet, to and fro, by means of a rack and pinion beneath. A few inches above the bed are reciprocated, longitudinally, two beams or carriages, each about eighteen feet long and nine inches wide, and consisting of two cast-iron side plates connected together at intervals, and supported at each end upon two small wheels, that run upon a short railway at the end of the traversing table. The carriages are placed four feet asunder, and reciprocated about two feet, by means of two cranks fixed opposite to each other on the same axis, so that the beams work in opposite directions—the one advancing as the other recedes.

The plates of glass are embedded close together, with their surfaces quite level, upon movable platforms that are afterwards fixed upon the traversing bed, and the polishing is effected with a series of rubbers, placed one foot asunder and measuring eight by six inches, covered with thick felt, and attached to the reciprocating carriages, which drag the rubbers backwards and forwards over the surface of the glass, while the latter is traversed beneath the rubbers a space equal to the distance between the two lines of rubbers, to expose all parts of the glass equally to their action.

Every rubber is separately attached to one of the two carriages, to allow it to ply uniformly to the surface of the glass. This is effected as follows: Between the two side plates of the beam are fixed, near the top and bottom edges, two cross-pieces having square holes, through which slides vertically a square bar, the lower end of which projects about two inches below the beam, and is rounded semi-cylindrically. The rubber is made quite detached, with a central cavity at the back to fit the end of the upright bar, which thus forms a joint that allows the rubber to adjust itself to any trifling irregularities of the surface over which it is traversed, and the rubbers admit of being readily removed while the plates of glass are being exchanged. The pressure is given separately upon every rubber by two lead weights of about fifteen pounds each, fixed one on each side of the upright bar.

The powder generally employed for polishing plate glass by machinery is the Venetian pink of the colorman, a cheap powder, which contains only a small proportion of the oxide of iron, mixed with earthy matter that renders the powder less active, and allows of the free use of water, which serves to reduce the friction and prevent the glass becoming heated by the action of the rubbers. Tripoli, crocus, and putty powder used with water, are too active to produce a high polish on glass, and therefore they are generally employed dry for the last finish of glass polished by hand. But the great amount of rubbing surface, the velocity, and power employed for polishing plate glass by machinery, render the use of dry powders inadmissible, as the surface would be torn by the friction, and the heat evolved would be liable to break the glass.

Sometimes old plate glass, that has become scratched, is repolished; when the plates are large, and sufficiently numerous, they are repolished by machinery, just the same as new glass, but more generally old plates are repolished by hand, as the process can be then restricted principally to the scratched portions of the surface.

The polishing is commenced with tripoli on cloth rubbers of the usual form, and finished with putty powder or crocus. The pressure is generally given as in hand calendering, by attaching the rubber to the lower end of an upright pole, suspended from a long horizontal spring fixed overhead, like that of a pole lathe. The elasticity of the spring supplies the pressure, and the workman has only to push the rubber backwards and forwards, but the process is both laborious and tedious with large plates, and from the irregular action of the hand, the surfaces of glass thus polished present a wavy appearance much inferior to those polished by machinery.

Suspension Bridges.

There is a close resemblance in the relation of cast-iron bridges to railway traffic to that occupied by those of the hanging or suspension type. The similarity is not, however, fully borne out, for in this country there are numerous bridges of cast iron, which have served the purposes of conveying locomotive traffic for many years, whereas there is not a single instance in which a suspension bridge has done duty in that capacity. The difference, therefore, is, that the use of cast iron for railway bridges is restricted within narrow limits; that of the suspension principle prohibited altogether. Where the analogy exists most forcibly is in the reason or cause of this restriction and prohibition. It will be found to be identical in both instances and to have emanated from the circumstance of actual failure having attended both of these descriptions of structures in the early days of steam locomotion. Many may be inclined to argue that, bearing in mind the very imperfect manner in which the theory and practice of iron bridge construction were understood at that time, this circumstance is really of little value, and that the bridges may be more sinned against than sinning. It is possible that there may be some amount of truth in this argument, so far as regards the employment of cast iron, but it does not extend to suspension bridges. The complete unsuitability of that principle to the purposes of a heavy isochronously moving load was demonstrated too palpably to allow of any hesitation respecting its rejection in future for that purpose. In the early part of his professional career Sir William Fairbairn was called upon to devise means for strengthening one of these suspension structures that had been erected on a line of railway. For this object a staging was erected, and piles driven into the ground, when the undulations into which the platform of the bridge was thrown by the passage of a train, caused so tremendous a vibration that it actually drew the piles out of the ground. The point worthy of notice in this failure presents an aspect different to that to which we shall presently draw attention when touching upon cast-iron bridges. It indicates, unmistakably the radical unsoundness of the principle when employed for the conveyance of loads that have a tendency not only to create, but, in conjunction with the system of structure adopted, to accumulate vibration and oscillation. This unfortunate predisposition to accumulate vibration *a crescendo* from a moving load is the bane of the suspension principle. If the cause, such as the measured tramp of a number of people, the march of troops, or the passage of cattle, be continued long enough, the bridge would infallibly yield to the disturbing action, and the chains give way. A suspension bridge may be said to contain in itself, by virtue of the principles which govern its construction, more than other descriptions of bridges, the elements of self-destruction.

Reference is usually made when this subject is touched upon to the Niagara Suspension Bridge as a proof that this principle has been successfully applied to railway traffic. This argument is specious and shallow to the last degree. It is true that railway cars do creep across the Niagara bridge at about six miles an hour, but this does not constitute that bridge a railway bridge in the proper sense of the term. When a suspension bridge is erected over which a mail express can rush at a speed of fifty miles per hour, the problem will be solved, the present insurmountable difficulty overcome, and we shall have in reality a "rigid suspension bridge." In the eyes of English engineers it is a mere farce to put forward the Niagara Bridge as a successful example of the application of the suspension principle to the conveyance of locomotive traffic.

Besides the structure is such a mass of stays, struts, and braces above and below that it is scarcely possible to consider it in the light of a genuine suspension bridge. In all probability the design was originally based on that principle, but the exigencies of actual practice required it to be so materially modified that it retains very few of its normal characteristics. There is no difficulty in designing a bridge on the suspension principle, and subsequently introducing such elements of trussing and bracing that may ultimately convert the whole structure into a girder bridge. This is really what occurs when a suspension bridge is stiffened to such a degree that it cannot possibly vibrate, oscillate, or deflect. But when this is accomplished, not only is all the value of the principle nullified, but the amount of material required is a great deal more than what would suffice to build a bridge on another plan altogether.—*London Mechanics' Magazine.*

A Cooling Drink in Hot Weather.—A delicious and slightly aperient effervescing citrate of magnesia may be made by thoroughly mixing 3 ounces of powdered loaf sugar with 2 ounces of powdered citric acid, then add ½ ounce of calcined magnesia, 1¼ ounce of bicarbonate of soda, and 1¼ ounce of tartaric acid. Pass the whole thrice through a fine sieve, and then moisten it with very strong alcohol. Granulate it by passing it through a coarse sieve, and dry on a wooden tray at a temperature of 50° C. When dry add ten drops of essential oil of lemons, and then bottle at once in clean dry bottles.

Every year the sugar manufactory of Halfweg, situate between Amsterdam and Haarlem, sends into the province a seed-sowing machine for use in the fields devoted to the culture of the beet. Advances are even made to the proprietors of the ground, on condition that they sell their products at the manufactory above mentioned at a merchantable price. In this way the population is initiated in the employment of agricultural machines, at the same time being engaged in a work advantageous to the country.

Summer Rules.

Dr. Hall, in his *Journal of Health*, says: If you have walking or riding to do, ride first, because if you walk you may get over heated, and then, when you ride, you may be exposed to an open window or a draft of air while you are in a still position, to be followed by a chill, a pleurisy, or lung fever, which is pneumonia.

If on any occasion you find yourself the least bit noticeably cool, or notice the very slightest disposition to a chill running along the back, as you value health and life, begin a brisk walk instantaneously, and keep at it until perspiration begins to return; this will seldom fail to ward off a summer cold, which is more dangerous than a cold taken in winter to all persons having the slightest tendency to consumption.

DRINKING WATER.—If very thirsty and warm, take but a swallow at a time, taking the glass from your lips, with a dozen seconds between the swallows, then you will never fall dead while taking a drink, as many have; in this way half the amount of water will abundantly satisfy the thirst.

Soda water is an agreeable beverage, but half a glass of cold water will better and more safely satisfy the thirst and costs nothing. Besides, in taking a glass of water, you stop when you feel you have had enough; this you never do with a glass of soda, but keep on drinking after it is positively disagreeable; and you hate to stop, but drink on again, to prevent wasting it.

Never sleep in the day-time uncovered, in summer; it is always dangerous, even if it be but half an hour on a bed; a lace shawl is better for a covering than nothing. Many lie down for a few moments, especially ladies coming from a walk, visit, or shopping; they do not intend to go to sleep, just to rest a minute or two; but many times they go to sleep and wake up with an indistinct chilly feeling, followed in many cases by serious illness.

When you reach home tired and weak, and may be accompanied with an indefinable feeling of sadness or depression, without being conscious of any adequate cause for it, don't take a drink of ice water, however thirsty, nor a glass of soda, nor a drink of wine, but a cup of hot tea, as hot as you can swallow comfortably; the heat is of more value than the tea itself, but both combined, are of incalculable value; if you are sitting down to a meal in this tired condition of body, and mental depression, some hot tea, taken before anything is eaten, will rouse the circulation, exhilarate the stomach, rally the spirits, and make you a different, a better, and a happier man in less than ten minutes, because the increasing debility and downward progress of the system is arrested by the warmth of the water and the active quality of the tea, until strength begins to be imparted to the system from the food taken.

It is safe to cool oneself off by dabbling the hands in cold water; safer and more natural if the water is warm, by the rapid evaporation every time the hand is lifted out of the water. But it is positively dangerous to wash the face in cold water when much heated. It is not dangerous but pleasantly efficacious if warm water is used.

Summer Clothing.

For all persons, especially invalids, and those who take cold easily, a thin material of woolen gauze, next the skin, is safest and best, because—

First, it is a non-conductor, carries heat from the body more slowly than cotton, linen, or silk; all colds are caused by the body becoming colder than natural, especially if it is made colder rapidly, and woolen material next the skin is the best thing known to prevent this rapid cooling, especially after exercise which has caused perspiration, and does not cause that disagreeable sepulchral dampness which wet linen does when it comes in contact with the skin.

The warmer the weather the more need for woolen next the skin; hence British sailors are required to wear woolen next the skin, in tropical latitudes, in summer, as the best observed protection against disease.

All garments worn next the skin during the day should be removed at night and spread out for thorough airing and drying.

Cotton is the best material to be worn next the skin at night. All changes from a heavier to a lighter clothing in summer, should be made by putting on the lighter clothing at the first dressing in the morning.

It is greatly safer for children, for invalids, and for old persons, to have too much clothing than too little.

Testimonial to the Family of Niepce de Saint Victor.

We recently noticed the death of this distinguished man. He was the nephew of Nicéphore Niepce, the first inventor of photography, and was worthy of the name he bore, for he consecrated his life to researches and discoveries in photography. Among his numerous labors may be cited the following: Researches into photographing and fixing natural colors; memoirs upon the persistence of luminous rays; heliographic process; and it is claimed for him that he was the first to take negatives upon glass, an invention that opened the way to the use of collodion, which is at the base of all actual progress in photography.

If he had taken out a patent for this discovery he would have secured a fortune to his family, but he belonged to the class who, oblivious of all selfish gain, sacrifice their lives to the good of their fellow men.

He is now dead, leaving a widow and two children without any means and with no pension, as the emoluments of his office terminated with his life. In view of these facts it is proposed to raise a fund for the support of his family. Subscriptions may be sent to the President of the Photographic Society of France, No. 9 Rue Cadet, Paris.

The Camphor-Tree of Sumatra.

Among the most luxuriant and valuable trees of the island of Sumatra the first place belongs to the *Dryobalanops camphora*. The tree is straight, extraordinarily tall, and has a gigantic crown, which often overtops the other woody giants by 100 feet or so. The stem is sometimes twenty feet thick. According to the natives there are three kinds of camphor tree, which they name "mailanguan," "marbin tungan," and "marbin targan," from the outward color of the bark, which is sometimes yellow, sometimes black, and often red. The bark is rough and grooved, and is overgrown with moss. The leaves are of a dark green, oblong oval in shape, and pointed; they smell of camphor, and are besides hard and tough. The outward form of the fruit is very like that of the acorn, but it has around it five petals; these are placed somewhat apart from each other, and the whole in form much resembles a lily. The fruit is also impregnated with camphor, and is eaten by the natives when it is well ripened and fresh. The amazing hight of the tree hinders the regular gathering, but when the tree yields its fruit, which takes place in March, April, and May, the population go out to collect it, which they speedily effect, as, if the fruit be allowed to remain four days on the ground, it sends forth a root of about the length of a finger, and becomes unfit to be eaten. Amongst other things, this fruit, prepared with sugar, furnishes a tasty comfit or article of confectionery. It is said that it is very unhealthy to remain near the camphor tree during the flowering season, because of the extraordinary hot exhalations from it during that period. The greater the age of the tree the more camphor it contains. Usually the order of the rajah is given for a number of men, say thirty, to gather camphor in the bush belonging to territory which he claims. The men appointed then seek for a place where many trees grow together; there they construct rude huts. The tree is cut down just above the roots, after which it is divided into small pieces, and these are afterwards split, upon which the camphor, which is found in hollows or crevices in the body of the tree, and, above all, in the knots and swellings of branches from the trunk, becomes visible in the form of granules or grains. The quantity of camphor yielded by a single tree seldom amounts to more than half a pound, and if we take into account the great and long-continued labor requisite in gathering it, we have the natural reply to the question why it fetches so high a price. At the same time that the camphor is gathered—that is, during the cutting down of the tree—the oil, which then drips from the cuttings, is caught in considerable quantity. It is seldom brought to market, because probably the price and the trouble of carriage are not sufficiently remunerative. Whenever the oil is offered for sale at Baros the usual price is one guilder for an ordinary quart wine-bottleful. The production of Baros camphor lessens yearly; and the profitable operation of former times, say in the year 1753, when fully 1 250 lbs. were sent from Padang to Batavia, will never return. Since time out of mind the beautiful clumps and clusters of camphor-trees have been destroyed in a ruthless manner; young and old have been felled, and as no planting or means of renewal has taken place, but the growth of the trees has been left to nature, it is not improbable that this noble species will ere long wholly disappear from Sumatra.—*Journal of Applied Science.*

The Culture of the Mushroom.

As the culture of mushrooms is attracting increased attention in this country, the following directions, found in the *English Mechanic* will be of use to those interested in this subject:

"Those who wish to succeed in their cultivation should first procure a quantity of horse droppings, free from straw and stones, and pile them into a heap, which must be patted down firmly, and allowed to heat; when well warmed all through it should be shaken out, and again made into a heap, changing the sides into the middle. After two or three of these "heatings" the dung will become sweet, which may be known by placing a piece of glass on the heap, and if the water that condenses on it is clear, the material will be fit to form into a bed. The bed may be of almost any dimensions, but a rounded form is best, as giving a greater surface from which to gather the mushrooms; some say 2 feet broad by 2 feet thick, rounded off, others 18 inches or 2 feet thick sloping to nothing. It must be put together rather firmly, and should be neither too hot nor too dry. In a few days the heap will in all probability heat violently, and when the temperature has fallen to 70° or 75° Fah., will be about the best time to put in the spawn. After the insertion of the spawn, which should be broken into pieces, the size of hens' eggs, and placed in holes about 9 in. apart, the surface of the bed should be patted together with a spade, and then covered with a layer of straw about 6 in. thick. In about ten or twelve days examine the bed, and if you do not see the thin white filaments of the mycelium spreading out from the lumps of spawn, it is certain that the heat is not sufficient, or the spawn is bad. If the former, the whole bed had better be pulled to pieces and re-made; if the latter, procure fresh spawn, which should be placed in different holes to the first. But if the spawn has begun to run you may proceed to cover the bed with an inch or an inch and a half of good loam, which should be patted close and gently watered, and the covering restored.

This form of bed will do for a cellar, outhouse, cupboard, or the open air, but if the latter it should be covered with straw, at least a foot in thickness. When the mushrooms are gathered a little earth should be placed in the holes whence they are taken. As to the kind of spawn to use, I think the French is undoubtedly the best, as what is generally bought at the seedsmen's is too hard and dry, whereas the French is in thin flakes, cut from heaps full of mycelium. Droppings obtained from a mill track, invariably contain spawn, and have only to be placed in small heaps to produce abundant crops of mushrooms. In the neighborhood of Paris these delicious fungi are grown in caves either underground, or excavated in the side of a hill, and even in deserted slate and stone quarries, as at Frepillon, Méry-sur-Oise, where at one time no fewer than 21 miles of beds were in full bearing. Of course, in these comparatively warm subterranean caves a bed does not require any covering, but yields abundant crops for two, three, and even four months.

There is, in fact, scarcely any kind of waste space where mushrooms might not be grown—in pots and old tubs under the stage of greenhouses, on shelves in stables; indeed, in any situation where sufficient dung can be placed to heat, or merely enough for the spawn to spread if artificially warmed.

Purification of Feathers, Hair, etc.

Horse hair, so-called, cannot, where the markets are competitive, be produced pure and simple—in other words, that of the buffalo, ox, bison, and pig, is proportionately intermixed. At the extremity, the epidermis, and occasionally minute portions of cuticle adhere. The curling does not destroy the tendency of ova to generate. Wool, and other material, from its naturally oily nature, is also subject to the ravages of neglected attention, *alias* moth, etc. Feathers occasionally are subject to their attack, but in a much less degree, inasmuch as these must be prepared by some process before it is possible to use them. All the inferior material used by the moderns cannot but be the hot bed, so to say, of these destroyers, inasmuch as old carpets in which they have long made their home, old clothing—in a word, the mixed refuse—etc., contribute their quota to multiply them. And now to speak of the more mystic causes—these will be manifest upon unfolding facts. "If from the body's purity the mind derives a secret and sympathetic aid," the homes of the wealthier portion of the community should be subject to special vigilance in ascertaining the condition of all bedding, and cause them to be subject to a process capable of fulfilling all its intention, in an economical as well as sanitary aspect. It will, of course, be readily conceded that the necessity of preserving the greatest immunity from all cutaneous and febrile maladies, but others of a more subtle nature demand equal attention. The process employed in manipulating is one simple and effective. 1st. Thoroughly saturating with alkalies of a certain strength. 2d. Submitting the materials to sulphur dioxide in combination with water of a certain specific gravity, so as not to destroy the material. 3d. Well steaming at a pressure of two atmospheres. 4th. Removing to rotary drying chambers, and finally to the dusting machine. By this process, feathers, hair, wool, etc., acquire a freedom from impurities, also elastic properties, and an intrinsic value not to be obtained by other means.

Tinning Iron without Fuel.

A cold process of tinning has been invented by Mr. Daubié, of Bellefontaine, France. The iron is treated by successive immersion in baths containing cold solutions of salts of tin, with the addition of a certain amount of organic matter, such as fecula or starch, which has always been found valuable, both in tinning and galvanization.

The solution patented is thus made: To each 20 gallons of water add 6 lbs. of rye flour, and let it boil for about half an hour; filter it, and afterwards add 212 lbs. of pyrophosphate of soda, 34 lbs. of crystallized salt of tin, 134 lbs. of neutral photochloride of tin, and from 3 ozs. to 4 ozs. of sulphuric acid. When the salts are dissolved the solution is distributed in eight or ten wooden vats, a little additional water being added to the first two or three of the vats. The wire is passed successively through the whole of the vats, and if great brilliancy of surface is required, also through draw plates at intervals, and the wire, while retaining all its rigidity, becomes covered with a brilliantly-polished coat of tin.

Wootz, or India Steel.

In 1819, while Faraday was an assistant in the Royal Institution, he made an analysis of wootz which attracted considerable attention, as, besides carbon, it was found to contain only silica and alumina, from which the conclusion was drawn that the peculiar property of the metal was due to the presence of silicium and aluminum. The uncertain state of analytical chemistry at the time of Faraday, says the *Journal of Applied Chemistry*, has induced Rammelsberg to repeat the analysis of wootz, and he has communicated the results of his work to the Berlin Chemical Society. The following is Rammelsberg's analysis: carbon, 0·867; silicium, 0·136; phosphorus, 0·009; sulphur, 0·002. It will be seen seen that the metal contains no trace of aluminum, and Rammelsberg doubts the existence of such a thing as aluminum steel. It is certain that the usual alloys of aluminum and iron are crystalline and brittle and not at all possessed of the properties of steel.

Aniline Photographs.

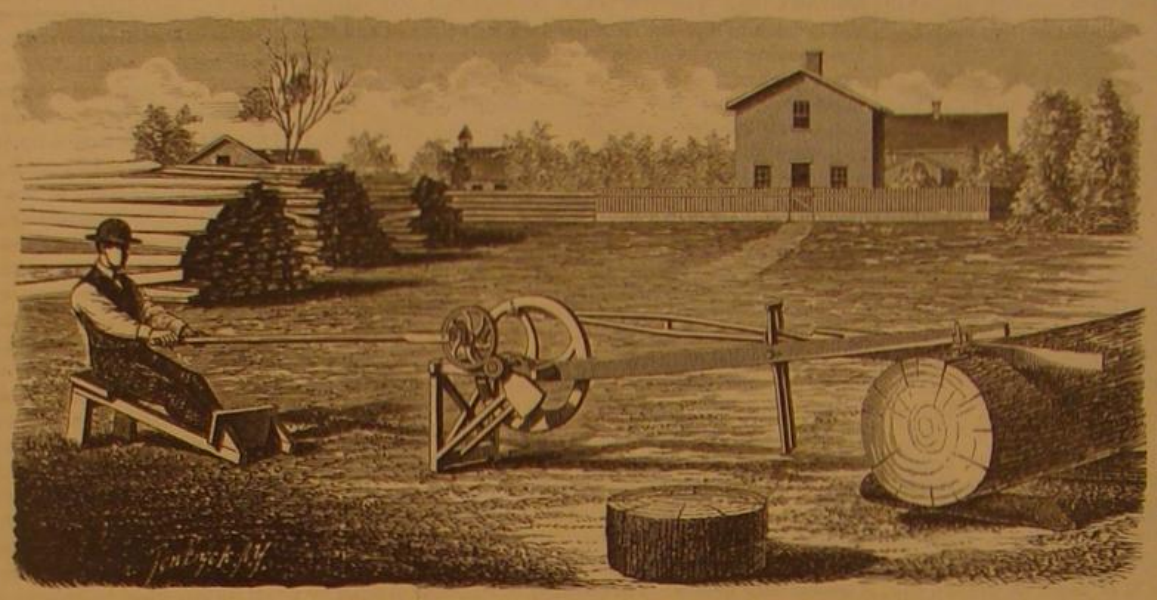
The process consists in preparing paper with bichromate of potash, to which some phosphoric acid has been added; when dry, the paper is exposed under a *positive* for a sufficient time, and when removed from the printing frame the picture is held over a dish containing a solution of aniline in benzole. The benzole in volatilizing, carries with it the vapor of aniline, and when the latter comes in contact with the unaltered bichromate on which light has *not* acted, a rich black body is produced, which is believed to be a very stable compound. Washing in water and dilute sulphuric acid now clears the lights of the prints and leaves a paper positive, which is the equivalent of a carbon print.

Improved Sawing Machine.

In the use of the ordinary cross-cut saw, a great waste of muscular power occurs. The weaker muscles of the shoulders and chest are chiefly employed in the propulsion of the saw, while the stronger muscles of the back, hips, and thighs are exerted to maintain the bent and fatiguing position of the body. Nor is this all, the muscles of the shoulders, chest, and arms are employed to great disadvantage on account of the lev rage being all against them.

The device shown in our engraving has for its object, first, to relieve the muscles from supporting the body, and second, to add their force to those of the chest, arms, and shoulders in driving the saw, so that the power expended shall all be applied to useful work, except that nec ssarily absorbed by friction.

The muscles are relieved from supporting the body by seating the operator upon a suitable inclined bench, as shown, having a foot-board against which the feet rest; the position and motion of the body being precisely that of rowing. The hands grasp a cross bar upon one end of a handle or connecting rod, which is hinged to a planet-wheel, at the other end, the sun-wheel around which it revolves being keyed to the shaft of a fly wheel. The proportions of this gearing are such that four revolutions of the sun-wheel to one of the planet wheel are secured.



SMITH'S HAND-POWER SAWING MACHINE.

The fly wheel carries a crank wrist, from which a pitman passes to the saw, and gives it reciprocating motion. The vertical position of the saw in starting is secured by means of a staple driven into the log over the back of the saw, the legs of which support the saw laterally, and give it the proper direction.

The log is moreover connected to the frame of the fly wheel and sun and planet wheels by means of a timber brace having a metallic eye, through which a metallic pivot pin is driven into the timber. The machine is thus supported while it can be moved to cut at any desired angle across the log.

This description definitely applies to the saw only when used for vertical cutting. A slight modification of the parts upon which we need not dwell, adapts it to horizontal cutting in telling timber, etc.

Patented, May 3, 1870, by Addison Smith, of Perrysburg, Ohio, who may be addressed for further particulars.

THE "FARMER" FOUNTAIN.

Our engraving shows an ornamental design for a fountain for the parlor or conservatory, patented by an inventor who has made many improvements in this field.

In form it is an oval vase, 25×19 inches, the base forming a flower-pot, properly drained, in which vines may be planted, and trained up and around it by tying them to the projecting berries, provided for that purpose. The handles are represented by a young lady in an arbor, offering to shake hands.

There are two basins; the upper one of flint glass, shell-shaped, and flat on the bottom, to allow the fishes to sleep; the lower one of metal, rests, by an overlapping curtain, on the rim of the vase.

The pipes supplying the water pass through the stem of the vase. The other parts of the design show sufficiently for themselves.

Patented, July 12, 1870, through the Scientific American Patent Agency, by John Hegarty, of Jersey City, N. J., and manufactured by Eldridge & Co., New Haven, Conn., and 120 Nassau street, New York city, who may be addressed for further information.

What do Your Children Read?

We commend to parents the following from the *Workingman:* "A bad book, magazine, or newspaper is as dangerous to your child as a vicious companion, and will as surely corrupt his morals, and lead him away from the paths of safety. Every parent should set this thought clearly before his mind and ponder it well. Look to what your children read, and especially to the kind of papers that get into their hands, for there are now published scores of weekly papers with attractive and sensuous illustrations, that are as hurtful to young and innocent souls as poison to a healthful body.

"Many of these papers have attained large circulations, and are sowing broadcast the seeds of vice and crime. Trenching on the very borders of indecency, they corrupt the morals, taint the imagination, and allure the weak and unguarded from the paths of innocence. The danger to young persons from this cause was never so great as at this time; and every father and mother should be on guard against an enemy that is sure to meet their child.

"Our mental companions—the thoughts and feelings that dwell with us when alone, and influence our action—these are what lift us up or drag us down. If your child has pure and good mental companions he is safe; but if, through corrupt books and papers, evil thoughts and impure imaginings get into his mind, his danger is imminent.

"Look to it, then, that your children are kept as free as possible from this taint. Never bring into your house a paper or periodical that is not strictly pure, and watch carefully lest any such get into the hands of your growing-up boys."

Hollow Railway Axles.

A recent railway disaster occurred on a railway train at Newark, England, caused by an axle breaking on a freight car, whereby some eighteen persons were killed and a large amount of damage done to property and person. The axle had been in use eighteen years at least; it was 3 ½in. in diameter at the center; up to the boss, 4½ in.; inside the boss or through the wheel, 3 15/16 in., and the shoulder was turned up square. The fracture was at the shoulder, showing another instance of the viciousness of the practice of thus turning up axles or other bearings to a sharp shoulder. They should all be rounded off smoothly, thus allowing no chance for the slightest check to be made in the metal. The English press have been discussing the cause of the accident as though it were an entirely new question, but in the United States we have long since discarded the square shoulders to axles and other heavy bearings. Sir Joseph Whitworth, in discussing the question of the best method of detecting unsoundness in railway axles, says: "The best method that can be adopted for the purpose is that of drilling a hole through the center of the axle, throughout its length, thus opening up to inspection and examination that part of the material which, in the case of ordinary manufacture, is most subject to unsoundness. The hole should be about one inch in diameter, and, with suitable mechanical arrangements, might be drilled at an average cost of about 1s. 6d. per axle. With the outside turned, and the inside thus exposed to view, a serious flaw in an axle, which is only about 4½ inches in diameter, could hardly escape discovery. The plan would also diminish the tendency of the axle to get heated, and by removing the material near the neutral axis, would, under the circumstances, reduce the internal strains and render the axle safer. It is of great importance both to give proper diameters to every portion of the length of the axle, and to avoid all approach to sudden change of diameter."

The suggestion is a good one, and we commend its practice to our engineers and mechanics.—*Railway Times.*

The Mystery of Life.

It is a simple matter of fact and of every day observation that all forms of animal work are the result of the reception and assimilation of a few cubic feet of oxygen, a few ounces of water, of starch, of fat, and of flesh. In a chemical point of view man may be defined to be something of this sort. That great authority, Professor Huxley, has lately been discussing what he calls "protoplasm," or "the physical basis of life." He seeks for that community of faculty which exists between the mossy, rock-incrusting lichen, and the painter or botanist that studies it; between "the flower which a girl wears in her hair and the blood which courses through her youthful veins." Mr. Huxley finds it in the protoplasm, the structural unit of the body, the corpuscle, the spheroidal nucleus, which, in their multiples, make up the body or the plant. But unless his statement is limited and guarded some color for materialism may be afforded by it. These make up the body, but, nevertheless, they are not the body. Suppose, to illustrate, we take the letters of the alphabet, *a, b, c, d,* we might similarly argue that because these letters occur in mathematics, metaphysical writings, and in comic songs, there is therefore something essentially mathematical, metaphysical, and comic about these letters. Again, Professor Huxley has not proved, and it is impossible for him to prove, that these protoplasms may not have essential points of difference. The facts of organic life cannot be interpreted by the ascertained laws of chemistry and physics. Physiologists cannot tell us how it is "of four cells absolutely identical in organic structure and composition, one will grow into Socrates, another into a toadstool, one into a cockchafer, another into a whale."

ANDERSON'S OIL SAFE.

Our engravings illustrate a device for the safe keeping and storage of oils or other inflammable liquids, patented, by G. D. Anderson, September 1, 1868, and which, we are informed, has come into extensive demand. It is intended to supply a want long felt in retail stores for a suitable receptacle to contain kerosene and other inflammable liquids.

Fig. 1 is a perspective view, and Fig. 2 a section of the safe. The construction is very simple. The general appearance is that of a refrigerator The oil is contained in a metallic vessel, which is inclosed in a wooden case. The interior or vessel is of zinc with double-soldered joints. The bottom is made to incline from each end toward the middle into a groove, from the lowest point of which the faucet issues This structure prevents all clogging and deposit of sediment.

Fig. 1.

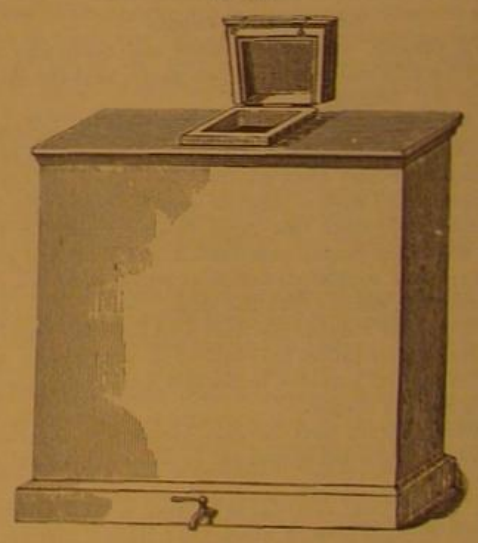
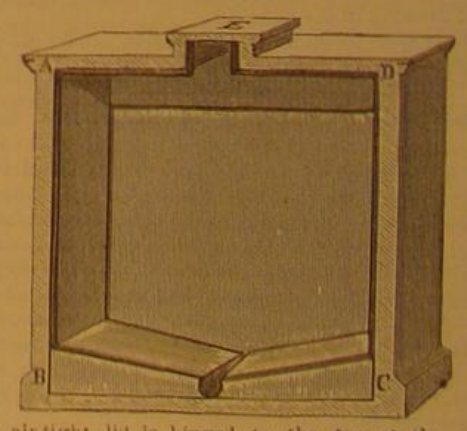


Fig. 2.



An air-tight lid is hinged to the top of the safe, so packed as to prevent egress of vapor, and easily opened and closed.

It will be seen, by reference to an advertisement in another column, that the inventor offers to sell the right for all the States except Ohio, Illinois, Indiana, and Michigan. For further information address G. D. Anderson, Peekskill, N. Y.

Morin says a man cannot perform more than a work of 58 foot-pounds per second, on an average.

THE PRUSSIAN NEEDLE GUN AND THE FRENCH CHASSEPOT NEEDLE GUN.

Some think they see in the war that has broken out in Europe a theological significance. Others look upon it as purely an anti-Napoleonic movement, while others regard it merely as an effort upon the part of France to recover the Rhenish provinces. Doubtless the war partakes of all these characteristics more or less, but in our view the political necessities of the Napoleonic dynasty at the present moment, are the chief cause of its initiation.

He would be indeed a bold prophet who would venture to predict its duration or final result. Should the conflict be confined entirely to Prussia and France, the respective forces would appear to be nearly equal. The greater number of soldiers which Prussia can throw into the field, is counterbalanced by the power of the French navy, which numbers 402 vessels of all descriptions, including 55 iron-clads. The whole number carry 4,680 guns.

Both sides are provided with modern field artillery and with powerful batteries of siege guns. The Prussians have Krupp's breech-loading steel rifles, the merits of which are considered questionable by some, but which it is thought by many will prove very effective when properly worked. The amount of breech-loading artillery possessed by the French seems to have been purposely concealed by that government. The *Mitrailleuse*, to perfect which large sums are reported to have been expended, has yet to prove its superiority to the Gatling gun, which has also been adopted by the French Government. It is also said that the Gatling guns have been sent to Prussia. Our readers will find an illustrated description of this gun on page 363, Vol. XXI., of the Scientific American. But the two weapons which will do most in deciding the result are the Prussian needle gun and the chassepot needle gun. We have before published illustrations and descriptions of these weapons, but as the subject has acquired renewed interest, we again return to it.

The construction of the Prussian needle gun, which proved so destructive during the war of 1866, is shown in Figs. 1, 2, and 3.

Fig. 1 represents the breech piece, with its parts partly in section, contracted longitudinally. In fact this breech-piece is eleven inches long. The case, A, is screwed to the breech of the barrel, which at this point is bored out for a cartridge chamber, to the depth of the lands or grooves in the barrel proper. Inside this case is a cylindrical chamber, B, furnished with a handle and knob, C, which can be moved along a longitudinal slot in the case, having a transverse slot inclining toward the forward or muzzle end. This chamber is convexed or bored at the end, and fits over the conical end of the barrel at D. A sharp blow of the hand on the knob forces its shank into the spirally-transverse slot, and effectually closes the joint at D. Inside the chamber is a cylinder, E, containing the needle bolt, F, the spiral spring, G, and the needle, H. At H is also a plug or guide, screwed to the inside of the chamber, B. On the apex of this the cartridge rests. A spring, I, with its end catch serves to withdraw the cylinder, E, with the bolt, F. The trigger, J, is a bell-crank lever, which depresses the spring, K, and allows the cylinder and contents to be drawn to the rear. L is the powder, M the percussion wafer, N the *sabot*, and O the bullet—all enveloped in paper.

The operation of this mechanism is easily understood. The spring, I, being pressed, unlocks from the case, B, and allows the sliding back of the cylinder, E, so that the rear projection of the bolt, F, takes the spring, K, and the needle is withdrawn into its guide or sheath, H. The chamber, B, is then unlocked by the knob, C, and slid back so that the front projection of F catches the spring, K, thus compressing the spiral, G. The rear of the barrel is thus opened, and the cartridge can be introduced.

The chamber is then moved forward and locked against the barrel, and the spring, I, is pressed down and the needle bolt moved forward, so that the rear projection rests against the spring, K, and the needle rests against the rear of the cartridge, and the piece is ready for firing. The front of the needle bolt is recessed, and receives a leather washer, designed to prevent the escape of the products of the gas combustion to the cylinder, B—an office it performs but inefficiently.

We have expressed the opinion that this gun, although undoubtedly superior to any muzzle-loading gun in destructive efficiency, is far inferior to many American breech-loaders.

The following quotation from the letter of an able correspondent upon the subject sets forth its defects in a strong light:

"The needle gun is a clumsy, unsightly, heavy, and expensive gun compared to many American breech-loaders. It is complicated in its parts, and delicate in its construction. The breech piece, which contains the breech-loading mechanism, is enormously long, extending not less than eleven inches to the rear of the cartridge chamber. The gas check performs its functions badly, as there is so much escape of gas that the gun cannot be fired one hundred rounds without being cleaned. There is also considerable escape of gas into the mechanism through the needle-hole in the face of the breech-closer. This escape of gas soon fills the chamber in the cylindrical breech-closer, which contains the needle pin and spiral spring, with a residuum of burned powder, and seriously impedes their action.

"When the cylindrical breech-closer is shoved forward, the trigger, having taken hold of the needle pin from below, retains it to the rear, and thus compresses the spiral spring, so that the simple act of closing the breech, cocks the piece, and it is only necessary to pull the trigger to fire it. This arrangement is a convenient one for the soldier, and facilitates the firing but it is an objectionable feature in a military arm, because when loaded it must necessarily remain at full cock. It is true there is a means provided for locking the needle pin in this position to prevent accident, but if the soldier should forget or neglect to avail himself of it, then serious accident is liable to take place at any time.

"The ammunition for the needle gun is complicated, expensive, and difficult to make up, considerable special machinery being required for that purpose. The needle gun cannot be fired more than half as many rounds per minute as most of the American metallic-cartridge guns."

Improvements have been made upon this arm which somewhat lessens the force of the above objections, but it is still undoubtedly inferior to some other breech-loaders. The general principle of its construction remains essentially that shown in the engraving.

Fig. 1

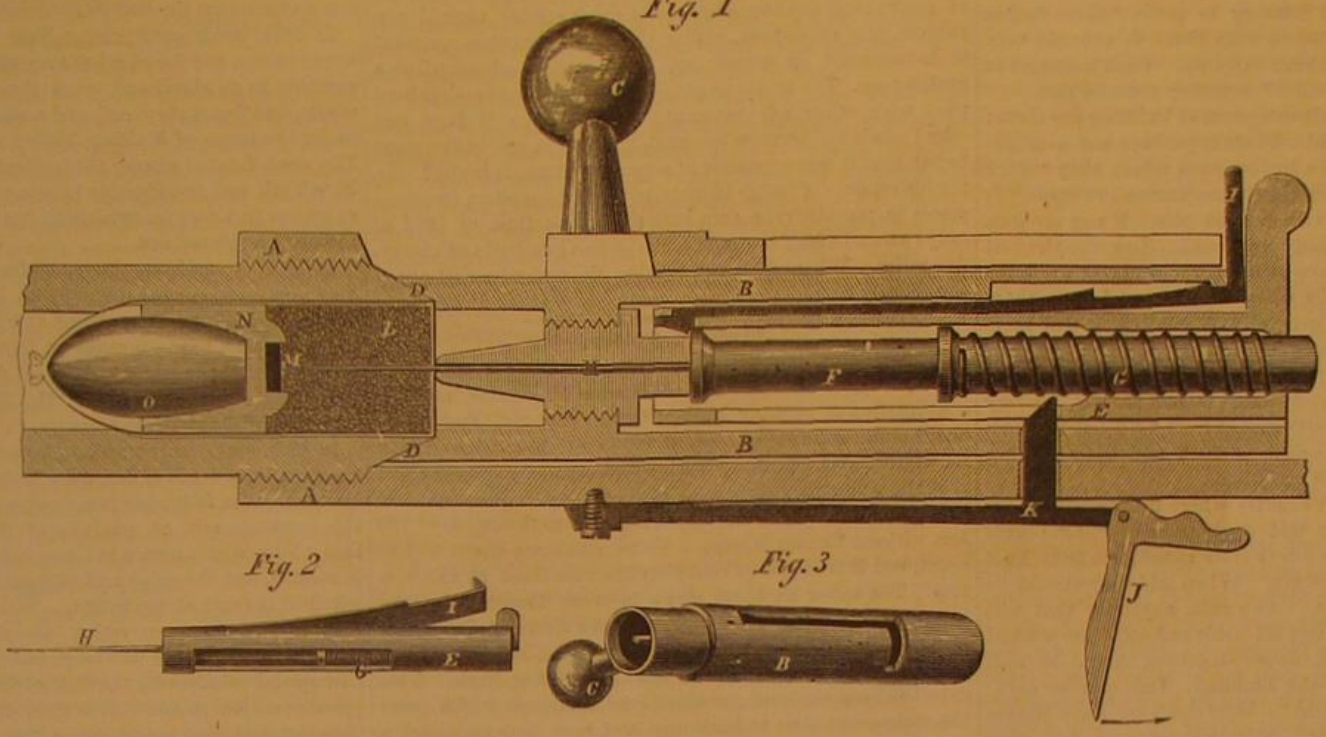


Fig. 2

Fig. 3

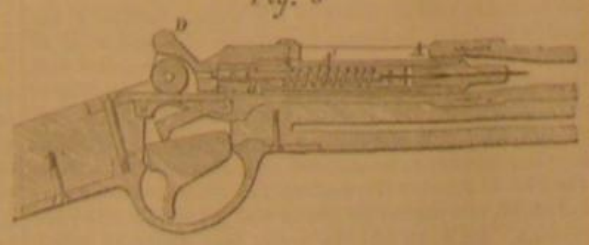
THE PRUSSIAN NEEDLE GUN.

Fig. 4

The chassepot needle gun is considered by some to be an advance upon the Prussian arm. Its construction is shown in Figs. 4 and 5.

An opening on the right hand of the chamber, A, permits the insertion of the cartridge. This chamber is filled by the movable cylinder, A', which may be moved back or forward

Fig. 5



by means of the handle and knob, B. The cylinder, A', surrounds the shaft, C, and can be revolved around the same. It contains the spring by which the needle is propelled. The rear end of the shaft, C, is made in the shape of a handle, D. The spring is compressed when the handle, D, is drawn back. The shoulder, *a*, on the shaft, C, comes in contact with the cylinder, A', when the arm is at rest. When loaded and ready for firing, the two parts are drawn asunder. The shaft, C, also serves to protect the needle which is surrounded by the same and is forced out of the front end of the shaft as soon as the trigger is pulled.

After the cartridge has been inserted, the knob, B, is pressed forward, and is then laid over to the right hand side, as shown in Fig. 4. The aperture, A, is now closed. By the first of these two movements the cylinder, A', is moved forward, thereby forcing the cartridge into the breech; the second movement secures the cylinder, so that it cannot be thrown back by the force of the explosion. The pulling the trigger releases the spiral spring, which then forces the needle through the percussion wafer. It is claimed that this gun cannot be clogged up as easily as the Prussian needle gun, and is more substantially built. But it is constructed on the same principle in almost every other respect.

It will be seen that these arms must be nearly equal in destructive power, and that when opposed to each other terrible carnage must inevitably result. That this carnage can now be averted by the intervention of other powers, seems hopeless, and it is probable that some of the bloodiest battles ever recorded will sadden the annals of the year 1870.

Railway Torpedo.

This useful little device is often of great value in railway operation. It is a small circular tin can filled with detonating powder, and is fastened to the rail by tin straps bent round the rail.

The Philadelphia and Reading Railroad Company use on an average 35,000 torpedoes annually on their numerous roads. These explosives are called "fog signals," and are used in heavy weather, when the signal lights on the towers cannot be seen from the engine. They are intended to prevent accidents, and have done good service in that respect since their introduction. To make them thoroughly effective three are placed on the track a short distance apart, so that if one should fail to make a report, two would remain to perform that service. The explosion of a torpedo under the wheels of an engine is a warning of impending danger, and the engineer always stops the train in obedience to it.

Coal Dust.

Although many attempts to consolidate coal dust so as to render it economical as fuel have been made, none have, we believe, been able to so utilize it except where it is already transported to trade centers. It would seem, however, that there have been bidders for the great dust heaps in the Pennsylvania coal regions. The New York *Times* in a recent article says the deposits of coal dust in these regions have grown into immense mountains—a burden to the proprietors, and a snare for unwary speculation. One of these, of unusually enticing bulk, has been sold, it is said, over and over again, to ingenious capitalists, chiefly from the Eastern states, and of the *Toodles* pattern. They bought the dust pile because it was cheap for its size, and, from its very apparent worthlessness, suggested immense, if vague, possibilities of honest pennies. But the purchase has always been abandoned in despair by one after another of these misguided financiers. One, indeed, conceived the brilliant idea of sifting his mountain for the solid coal scattered through it, and after procuring an army of carts, and working zealously for a week, really obtained a tun or two of admirable coal. As he ascertained, however, that his sifted coal cost about three times per tun what he would have to pay at the mines, he sagaciously concluded that his undertaking was less profitable than laborious, and so gave it up and fled.

How the Chinese Cook Rice.

The editor of the *American Grocer* states that he has recently paid a visit to the Chinese colony of shoemakers, at North Adams, Mass., and has obtained from them the Chinese method of cooking rice. The process of boiling one pound of rice is as follows: Take a clean stew-pan, with a close-fitting top, then take a clean piece of white muslin, large enough to cover over the top of the pan and hang down inside nearly to, but not in contact with the bottom. Into the sack so formed place the rice, pour over it two cupfuls of water, and put on the top of the stew-pan, so as to hold up the muslin bag inside, and fit tight all round. Place the pan on a slow fire, and the steam generated from the water will cook the rice. Each grain, it is stated, will come out of the boiler as dry and distinct as if just taken from the hull. More water may be poured into the pan if necessary, but only sufficient to keep up the steam till the rice is cooked. The pan must not be heated so hot as to cause the steam to blow off the lid. The Chinese at North Adams, if they look about a little, will find Yankee vessels made of tin containing perforated shelves or diaphragms for cooking rice and other articles by steam, on the same principle as the muslin sack, and much more convenient.

Correspondence.

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

Our Dwellings.

Messrs. Editors:—Your correspondent, "F. G. W.," may be about right in the statement made in No. 4, present volume, that "two thirds of our dwelling houses are not put up" in a very workmanlike manner; but his field of observation must be quite limited, or he would not say that the "greatest deficiency is in the foundation supports."

As a rule, builders do not slight their work in those points where the mass of persons inexperienced in such matters could readily detect the fault. Many a poorly-built house is pronounced "built of the best materials, and in the best manner" by the purchaser and others, because the outside looks well when new.

No builder, no matter how cheap a house he was erecting, could afford to allow the flooring to settle "three inches carrying down all the partitions with them, to save the very trifling expense of a few cheap supports. Such instances of "penny wise and pound foolish" economy must be rare.

Some of the real faults of our system of building are these: The lumber is not seasoned. There is perhaps not a single instance in this country of a lumber yard where they "stick up" the timber from which the house frames are made. It is sawed "green," and kept in a solid pile. If any air gets to it, it is accidental, and not intentional. To make the best kind of a house, every piece of lumber in it except the laths should be perfectly dry. In what we call good houses those parts exposed to view are generally of good stock and properly season; but a dry frame is of more consequence than dry doors. The latter can be readily repaired or replaced, the former cannot. The timber used is too narrow. Every wooden house of medium size should have 2×6 outside studding, instead of 2×4. Instead of 2×6 and 2×8 flooring joists, they should be 2×10 and 2×12.

In those sections of our country where the dwellings are clapboarded, and the floors laid double, the covering boards and under floor should be every inch sound, free from knot holes, shakes, and waney edges. When laid they should be jointed to make tight work. As a rule, anything that will hold a nail, the "refuse" and all "odds and ends" are worked in; and those parts, which, above all others, should be well done, are the poorest in the building. Our practice says: "No matter, it is out of sight." Why don't we have houses made from seasoned lumber? Simply because we can't wait for it to dry, and don't want to pay the cost of drying.

When the occupants of a new house find the doors and windows "binding" and "sticking;" and the wood-work in various places showing large cracks, they generally denounce the carpenter. He could not help it—the lumber was not seasoned.

These are but three of the many defects in our American system of house-building; the temptation to mention others is great, but the fact that I have already trespassed too much upon your space restrains me. In most parts of our land we have the best building materials in the world, and plenty of skilled workmen, but we are in too great a hurry to build good houses.

Beta.

Steamboat Speed.

Messrs. Editors:—The ocean, the North River, and the Sound, and the West's great arteries of commerce, the Mississippi and its tributaries, since the advent of the first competing lines of steamboats, have ever been the scenes of the most exciting and enthusiastic competition in the matter of speed.

The desire to outstrip competitors has repeatedly attracted the attention of legislators, and penal enactments have put an end to the dangers of constantly recurring races between rival lines, until, become a dead letter from age, their wholesome provisions are forgotten, their penalties disregarded, and the whole programme of transgression and threatened punishment is again performed for the benefit of the community.

The Mississippi and its tributaries, affording, as they do, fitting opportunities for this species of emulation or opposition, have grown to be proverbial throughout the world as steamboat race courses. To speak to an European at home of a Mississipi boat race brings to his mind at once a vivid picture in high colors, depicting horrible death or intense agony, the result of an act, which, to river men in America, appears far less dangerous or reprehensible than the railway passenger system of the Continent, where escape from the car, in case of danger, is impossible, save through the key in the hands of the guard.

The question of the relative speed of rival boats has again broken out on the Western waters, in the late trial of speed between the *R. E. Lee*, built at Louisville, and the *Natchez*, built at Cincinnati, from New Orleans to Cairo. There was no advertised race, no hand-bills, or "dodgers," but the fact was patent to every steamboat man from Pittsburgh to Cairo, and from St. Paul to the Gulf of Mexico, that a race was on the carpet, and as the day approached, the excitement became intense, and thousands of dollars were deposited as guarantees of their faith by friends to the parties in the race.

Both boats were "light and loose;" and preparations had been made for taking fuel without loss of time, from barges. The most combustible material in reach was procured, and everything done to insure victory by both parties. The telegraph wires worked day and night to post the friends of the contestants, and a general election could hardly have produced more excitement along the line of the Mississippi and Ohio rivers.

Here is the result: The *R. E. Lee* made the run from New Orleans to St. Louis in three days, eighteen hours, and fourteen minutes, beating the *Natchez*, in the race of 1,200 miles, only three hours and forty-four minutes.

For reference, let us look at the following comparative table of the speed of several fast boats of past years.

FROM NEW ORLEANS TO NATCHEZ—DISTANCE, 295 MILES.

				Hours.	Min.
August,	1844—Old Sultana	made the run	in	19	45
"	1851—Magnolia	" "		19	50
May,	1853—A. L. Shotwell	" "		19	49
"	1853—Southern Belle	" "		20	8
"	1853—Princess No. 4	" "		20	26
"	1853—Eclipse	" "		19	47
August,	1855—New Princess	" "		18	53
"	1856— "	" "		17	30
June,	1870—Natchez	" "		17	50
July,	1870—R. E. Lee	" "		17	11
"	1870—Natchez	" "		17	14

Here is food for the thoughts of inventors and river men. In the past twenty-six years, while almost every other branch of mechanical appliance has made giant strides toward perfection, the steamboat, either through ignorance or want of inducement, or something, has scarcely advanced at a snail's pace. The steam engine—the motive power—has kept pace with other advancement; but the boat still lags, and why? Is it not because the model, which is nearly the same to-day that it was a quarter of a century since, is faulty? In the fastest time of to-day there is, with all the modern improvements in machinery, a gain over the fastest time of 1844, of only two and a half hours in a run of two hundred and ninety-five miles. Where does the trouble lie, and who will apply the remedy?

C. C. Haskins.

Sinking Valley.

Messrs. Editors:—Sinking Valley, of Blair county, Pa., is situated between the Bush and Canoe Mountains, and is a continuation of Nittany Valley, Center County, Pa. It is about eight miles long, and from four to five miles wide in its widest parts. Sinking Valley took its name from the fact that the water rises and sinks in the valley. We first find in it two sinks, which have been sounded to the depth of 130 feet without finding bottom. These sinks are about 30 feet apart, and it is supposed that they are connected at the bottom. The water in these sinks is fresh limestone spring water. The water rises above ground at a distance of a quarter of a mile, and flows about two or three rods, when it enters a cave, whose mouth is 30 feet wide and 10 feet high. This cave has been explored for about half a mile, at which point the rocks come close to the water, and here may be heard a sound like the falling of water.

One mile below the cave the water rises at the Arch Spring, which is about 60 feet in diameter, and flows through an arch of limestone rocks. The arch is 35 or 40 feet long, 10 or 12 feet wide, and from 5 to 6 feet above the water. This spring drives a saw mill, and a grist mill which has four run of stones.

Five rods below the mill the water sinks again, this time very gradually. It runs into a pool and never seems to gain any ground, but as fast as it comes it sinks to unknown regions. When the water is clear, the bottom can be seen covered with round sand stones. The water is only 3 to 4 feet deep where it sinks, and when very low it is only 10 or 12 inches deep. This water rises again on the other side of the Canoe Mountain, passes down a ravine, and empties into the Juniata river, at Water Street, Huntingdon county, Penn. The proof that this is the same water is that when the saw mill at Arch Spring saws, sawdust rises on the stream on the other side of Canoe Mountain.

The rocks of Sinking Valley are the No. 2 formation, of Roger's first report, and Auroral of his final report, being the same formation which is known in New York as the Trenton and Black River limestone. An anticlinal axis runs through the valley, to the west of which the limestone dips under the Bush Mountain, and to the east under Canoe Mountain. The strata, next the auroral limestone, are schist or slate and Red River sandstone.

The auroral limestone in the valley varies from ¼ to ¾ mile in thickness, and a considerable amount of zinc and lead is found in it. These ores were discovered by the French, in 1750, or rather disclosed to them by the Indians, as they could always procure an abundance of lead almost pure. But the Indians, true to their craft, kept the precise location of the lead mines a secret.

The earliest account of any permanent settlers in the Valley is in 1760, and in 1763 quite a number took up their residence there, but without purchasing the lands. The attention of the Council was called to the existence of lead in Sinking Valley, in a letter from Major General John Armstrong to President Wharton, dated Yorktown, Feb. 23, 1778, in which he stated that Mr. Harman Husbands, a member of the Assembly for Penn., had some knowledge of a lead mine in Sinking Valley, and suggested that it should be seized and held by the State. The Council soon took the suggestion of General Armstrong, and resolved that General Daniel Roberdeau, then a member of Congress, should go to Carlisle, and make the necessary arrangements. From this place he wrote on the 17th of April, 1778, stating the great importance of going ahead, and asking for forces and $1,200·00, and some provisions. On April 23d, he wrote from Standing Stone, now Huntingdon, and, after hard fighting, he arrived in Sinking Valley, April 27th, of the same year. Fort Roberdeau was erected, and was supplied with some muskets and a pair of cannon.

It is uncertain how long the mines were carried on by the Government, but probably not longer than the fall of 1779. What the total yield of lead was during that time we cannot ascertain. There must have been some kind of a bargain existing between the Government and Roberdeau for taking out lead, as his letter of Nov. 10, 1779, to President Reed, demands payment for ten hundred pounds of lead, at six dollars per pound (Continental money). This epistle fixes nearly the time when General Roberdeau abandoned the mines. The miners attempted to carry on operations for themselves, but soon gave it up on account of the immense expense of mining and smelting the ore.

In the early part of the present century, the lower mines, near the little Juniata River, known now as the Pine Hill, were opened under the superintendence of Mr. Sinclair, but were owned by Messrs. Musser and Wells. Three deep shafts were sunk on the side of Pine Hill, and a drift in the side of the hill, some 300 feet long, 6 feet high, and 6 feet wide, was excavated. These works were very expensive, and not profitable.

In 1821, the mines were visited by some parties from Montgomery county, Pa., with the intention of working them, but they concluded not to make the attempt, as they could not manufacture the lead so as to compete with Galena mines.

In 1852, some enterprising New Yorkers prospected the upper mines, and found what they supposed sufficient encouragement to go ahead and work them. They sunk several shafts, and found some ore, and a stock company was formed under the name of Sinking Valley Lead Mining Company. The stock figured among the bulls and bears of Wall street, New York, and considerable blowing was done about building extensive furnaces for smelting; but suddenly, one fine day, the ore was played out.

In 1862, a stock company, under the name of Keystone Zinc Company, opened the mine on Pine Hill, and was successful in finding sufficient zinc and lead ore to justify them in building an oxide furnace at Birmingham, on the Blair county side of the river. The works were built in 1866, under the superintendence of Mr. Nathan Bartlett. They consisted of eight oxide furnaces.

In 1868, four desulphurizing furnaces were put up under the superintendence of Mr. Ayer Bartlett, son of Mr. Nathan Bartlett. The following is a description of the working of the furnaces, and an analysis of the ore: The ore is put into a kiln, which somewhat resembles a lime kiln, where it is roasted, and the sulphuret of hydrogen is driven off, after which it is crushed or ground. It is then taken to the desulphurizing furnaces which are three in number, each 18 inches in hight, 15 feet long, and 6 feet wide. The ore is first spread evenly over the floor of the upper oven, where it remains several hours. It is then drawn down to the middle oven, and fresh ore is put on the upper one. From the middle oven it is drawn into the lower one, and the ore that is in the upper furnace is drawn into the middle one, while fresh ore is put into the upper oven. The work of these ovens is to drive off the sulphur.

The ore is taken out of the lower oven, and mixed with 60 per cent of nut coal, and charged, through doors in the side, into the oxide furnaces, which are 16 feet long and 8 feet wide. These oxide furnaces have perforated bottoms, to allow cold air to enter. The air is forced in by a blower. The ore is heated to a white heat, and the zinc goes off in vapor, and carries the lead with it.

The fumes pass now into a cooling chamber, 10 feet long, 8 feet wide, and 30 feet high. From this they are drawn by an exhausting blower through a sheet iron pipe, 4 feet in diameter, and 50 feet in length, which opens into a room 30 feet long, 15 feet wide, and 25 feet high; thence into the bag room, which has three rows of muslin bags. The horizontal bags are 80 feet long, and every six feet there are perpendicular bags which are 30 feet long. At the bottom are barrels to catch the oxide as it is precipitated. The oxide is now packed in barrels, and sent to Philadelphia to be ground into paint.

The oxide is of a beautiful snow-white color. The capacity of these works is 14 tuns of ore per day. The ore is the sulphuret of zinc and lead, with sulphur, limestone, sand, and some "Black Jack." It yields 43 per cent of oxide, which contains 20 per cent of lead.

The works cover an acre of ground. In connection with the works there are five large lime kilns, which ship daily 600 bushels of lime to the Natrona Soda Works, Natrona, Pa.

Frank B. Isett, B. S. A.

Hollidaysburg, Pa.

Speed of Large Circular Saws.

Messrs. Editors:—Noticing a communication in your paper from C. H. Crane, of Greenville, Ala., on the speed of large circular saws, and fearing it might have a bad effect where they are not much used, I have thought it would be well to state some facts that I have learned from long experience in setting up and running circular saw mills.

The highest speed they should ever run is 9,000 feet per minute, for the periphery of saws, unless hammered expressly for a higher velocity. I find that there are ten mills speeded too high for the power, where there is one speeded too low. This is especially the case with water mills run without governors. The speed of all water wheels is given at their working velocity, or about three fourths of the speed they will attain when running free without load. Some saws will bear more speed than others, but, as they are generally hammered, 9,000 feet per minute, when not in the cut, give speed enough for the saws of water mills. Running at that rate, a 50-inch saw, before it had got through a log of fair size, would be found to make not far from 500 revolutions per minute.

I find most of the water mills in the country, where there is a limited supply of water, lack for power and are speeded too high, and are, consequently, running on light feed and doing a small amount of business. In such cases it would be better to reduce the speed and carry more feed, doing a greater business with less wear of saw.

A 50 inch saw, with 26 teeth, if kept in good order, will bear to run on two-inch feed in spruce or hemlock, and will cut nearly as smooth as if run on only one-inch feed, and will take but a little more power. The timber here is spruce and hemlock, and generally quite small. I think we can saw more logs than Mr. Crane, if not as many feet, and run our saw at a very much lower speed.

A circular board mill, invented and patented by me (Lane, Pitkin & Brock, manufacturers), running near here, recently cut 807 spruce logs, 12 feet long, making 20,000 feet of 1¼-inch plank, between the hours of 4½ o'clock in the morning, and 7½ o'clock in the evening. The mill used a 50-inch saw, ran 500 turns per minute, and was driven by an engine, 13×24 cylinder, 93 revolutions per minute. The mill was operated by three men only—a sawyer, who runs the mill and sets the log, one man to take away boards and slabs, and one to assist in rolling on, turning, and dogging the logs.

Montpelier, Vt. DENNIS LANE.

Snake Stones.

The power of the imagination to excite as well as to cure diseases of the human system has been experienced from the remotest generations, and a knowledge of this power is sometimes employed to advantage by intelligent physicians. From it have also sprung some of the most absurd as well as remarkable delusions. Among these is the belief that certain charms or mysterious influences reside in various objects, animate and inanimate. The Indian finds "a great medicine" in peculiar stones and other grotesque things, which he uses to heal all manner of distempers. These delusions are not confined to savage life, but exist among all civilized races, flourishing best in communities where the exact sciences have made the least progress.

The so-called snake or mad stone belongs to the above medicine class. Some of its believers imagine that it is endowed with supernatural qualities, by which it works wonders and distinguishes itself above all other pieces of rock in the universe. The most extravagant stories concerning these stones are annually published in the papers, many of them vouched for by the most respectable people.

Here is a communication sent to us by a lady from Washington, Ga.:

MESSRS. EDITORS:—Most people have probably seen now and then in the newspapers accounts of certain magical pebbles or stones which are said to act as antidotes to animal virus, and nine out of ten readers, no doubt regard all such stories as mere inventions of some Bohemian Munchausen desirous of gaining notoriety for his paper, or as the ingenious advertising dodge of some enterprising quack bent upon fooling old women and swindling ignorant people out of their money. For my own part I confess I was, for a long time, inclined to look upon the existence of such talismans as little less apochryphal than ancient traditions concerning the philosopher's stone; and my incredulity, after arriving at years of discretion, was rather strengthened by the recollection of having heard from the negroes, during my childhood, marvelous tales of the healing wonders wrought by certain rare stones which they averred were occasionally found in the bellies of very old stags. As the marvels related of these *mad stones* or *snake stones*, as they are called, were always associated in my mind with stories of talking rabbits and tar babies and other wonders of negro mythology, and like them rested, if I mistake not, mainly upon the authority of a little black urchin named Isaac, who used to enjoy bodily encounters with the devil, and see visions of red lions under the kitchen steps, it is not to be wondered at that my mature judgment was very chary of accepting newspaper accounts of a substance that seemed to belong altogether to Fableland.

Of late years, however, my attention has been more seriously attracted toward the subject of these wonderful talismans by hearing of one in the possession of a Mr. Albert Gibson, of Columbia county, Georgia, a gentleman of wealth and respectability, who has never used his singular heirloom as a means for getting money, and therefore has had no reason for advertising or giving notoriety to its existence. As he is very generous, however, in allowing his neighbors to benefit gratuitously by its healing powers, in case of snake bites or mad dogs, its light has not been altogether hidden under a bushel. Being the first "snake stone" I ever heard of which could boast "a local habitation and a name," it inspired some respect as well as curiosity, both of which increased as I continued to hear such authenticated accounts of undoubted cures performed by it upon persons infected with animal poisons. Finally my interest became so much excited that I determined to write to a gentleman of high standing in the county, a neighbor of Mr. Gibson's, for a full description of the wonder. As his account is very circumstantial and interesting, I give it entire, merely omitting such parts of the letter as relate to private or personal matters, and are therefore of no interest to the public. The writer is a gentleman of the highest integrity, as well as of a liberal education and extensive culture, and his word may therefore be received without hesitation or reserve. Here is the letter:

"APPLING, GA., June 25, 1870.

"DEAR MISS ——:—Yours of the 27th ult. was received by due course of mail, and should have been answered at once but for my inability to get an immediate sight of the celebrated snake stone.

"Mr. Gibson, the owner, never permits it to be carried from home, unless he goes with it. He brought it over once when I was absent, and it was not convenient for him to come again until to-day. * * * *

"The name given to this celebrated talisman is, in my judgment, a solecism. It is, I think, a compound of unknown substances and quantities. In form it is a parallelogram, about 1 inch long, ¾ of an inch in width, and ⅜ of an inch thick, weighs 54 grains, and is very porous. The outward surface is of a whitish gray color, except the side applied to wounds, which is a black irregular surface. When broken (as this has been) the inner parts present a deep blue color, like indigo, which it resembles when pulverized. It has been in the family of the present possessor for more than a century, and is said to have been brought from the East Indies. Some years ago, I saw in "Niles' Register" an account of a similar stone, and these two are the only ones I have ever heard of.

"If human testimony is to be believed, the effect upon animal virus is wonderful indeed. The mode of application, if the bite be recent, is to apply the stone directly to the wound. If any considerable time has elapsed, and the wound healed, to scarify, and then apply the stone. In all cases it is immersed in tepid water. If there be any virus in the person, the stone adheres to the wound until the poison is extracted, or it becomes fully charged. It then drops off, and by again immersing in warm water, it is cleansed, and the virus may be seen exuding from the pores.

"The applications are repeated until the stone refuses to adhere. It has never failed in a single instance to effect a perfect cure. It is alike efficacious in snake bites and wounds from rabid animals, and has been applied in hundreds of cases. Some years since a negro man was sent to Mr. Gibson from the neighborhood of Columbus, who had been bitten by a snake eleven weeks before. He came here with one of his limbs greatly enlarged, and was unable to walk, but in three days after the stone was applied, he was able to go into the field and work as usual, and in a week was sent home perfectly well.

"A brother of the late Judge Thomas, who now resides in Augusta, was once bitten by a rabid dog, and this stone applied soon thereafter to the wound; he never experienced any symptoms of hydrophobia, while the cattle and dogs bitten at the same time on the same plantation, became in a few days rabid. I could mention numerous equally well-attested cases.

"No analysis has ever been made of this stone, as it is called. Mr. Gibson has a small piece that was broken off some years ago, and says he intends to have it analyzed.

"Very truly yours, etc., "C. H. S."

It is to be hoped the owner of the remarkable curiosity will carry out his intention of submitting the broken bit to a careful analysis. It is true that thus far the dissecting analysis of many precious stones, has led to no practical results of the nature anticipated by those deluded souls who spent their lives in searching after the philosopher's stone, and it is possible that an analysis of this "snake stone" might prove equally futile—still the experiment is worth trying. Nor should the tradition regarding the existence of such in the stomachs of deer be wholly disregarded, since it seems not altogether certain that this remarkable substance is literally a stone.

If the inhabitants of countries infested with venomous insects and reptiles could be supplied with bracelets or seal rings possessing such magic virtue as antidotes to animal poison, rattlesnakes, cobras, and tarantulas would cease to be things of terror to the pioneer, and the seed of the serpent need never again, in a literal sense at least, triumph over the seed of the woman. ELZEY HAY.

Washington, Ga.

EFFECT OF THE MADSTONE.—A letter to the Bloomington *Pantagraph* says: "Returning home from Bloomington last Saturday evening, I met at Normal a gentleman from Henry county, on his way from Lincoln, where he had been with his daughter, aged eleven years, to have the so-called madstone applied to her foot for the bite of a mad dog, which was inflicted on her last Sunday week. The stone was applied at one o'clock last Thursday morning, and the father told me that during its application the wound, which, though severe, had not been previously painful, became severely so, and a stench almost unbearable filled the room. When taken off the wound the stone was placed in water, on which a green scum arose, like that seen on the surface of stagnant pools."

THE MAD STONE DELUSION—DEATH FROM HYDROPHOBIA.—Mr. John Sayers, a laborer in the North Missouri Railroad car shop, died yesterday morning, of hydrophobia. As the facts connected with the unfortunate event possess a peculiar interest at this season of the year, we give a brief narration of the circumstances connected with the case: Sayers was a married man thirty years of age, of a robust and powerful frame, and until recently in very good health. On the 24th of May a little poodle dog belonging to him was fighting with another dog, when he attempted to separate them. In doing so his own dog bit him on the inside fleshy part of the hand, near the thumb. Deceased felt some pain from the injury, and went to a man in St. Charles who had what is known as a "mad stone," and it was applied twice. The second time it is said to have adhered twenty minutes. About twelve days ago Sayers accidently knocked the skin off the place on the hand where the cut had been, and soon after felt an acute pain which extended to the shoulder. The pain increased and on Saturday he was obliged to quit. On Monday he went to Dr. Gallagher, and on Tuesday he said the pain had left his arm. His symptons subsequently were not altogether such as usually accompany hydrophobia. He was not violent or wild, but exhibited a deadly aversion to water. He could not drink it, but was able to take some wine. On Wednesday evening a change took place in his condition, and he said he felt he was going to die. A medical gentleman saw him at 9 o'clock, but he thought there was no danger then. For about an hour before his death, Sayers talked in an excited and incoherent manner. He died yesterday morning at half-past 2, and was buried in the afternoon. He leaves a wife and one child. The case is a sad one, and illustrates the horrible danger of a dog-bite in the summer season, and the necessity of taking proper measures to prevent possible results when there is any reason to believe the dog mad. It further tends to show that the virtues of the "mad stone," in which so many believe, furnish but a poor guarantee of a cure, and if it helps to explode the humbug and lead people to resort to the only safe measures, cutting out the part and severe cauterization, it will not have been entirely barren of fruits.—*Missouri Republican, July 22.*

An Undeserved Credit.

MESSRS. EDITORS:—In accrediting the invention of a dry dock, described on page 384, last volume of the SCIENTIFIC AMERICAN, to an English source, you unintentionally, no doubt, did an American inventor injustice. I inclose you a copy of a patent obtained through your agency July 6, 1869, for me. The following extract from the specification will show that the "English inventor" referred to has been either pirating my invention or has, without knowing it, reinvented it: "My invention relates to a new and improved method of constructing coffer-dams for building piers and other submarine structures, and in making the same convertible into other forms for raising sunken vessels. It consists in forming the coffer-dam in two or more sections, the sides of which are partitioned off into water and air tight compartments, each section having a removable side, and all the sides being provided with suitable tubes and other appliances for filling the compartments with either air or water at all times, whereby the section may be submerged or floated as may be desired. It also consists in so constructing the coffer-dam that it may be made (with two of its sections) to inclose a sunken vessel, thereby affording means for raising the same."

By inserting this communication you will do an act of justice to an old client. SAMUEL LEWIS.

Williamsburg, N. Y.

Bartlett Lead and Ozone.

MESSRS. EDITORS:—Your correspondent R. H. desires to know "how ozone can be productive of any one of the peculiarities attributed to Bartlett lead in the article of July 16th, and how ozone exists in the compound."

The peculiarities there stated are that Bartlett lead, "when mixed with oil or spirits of turpentine, does not settle as other paints; that a building painted with it bleaches whiter instead of turning yellow; that when mixed and exposed to the air it thickens; and that it has a gloss unknown to any other pigment."

I suppose your correspondent knows what ozone is thought to be—that it is altered oxygen, in plain English. Oxygen may be altered by various causes; electricity is one of these. It has been pretty well settled that ozone is the bleaching principle of oxygen, or that oxygen altered to ozone will bleach; that in its prime state it will not. It is settled among most chemists that the oxygen contained in the metallic acids which form combinations with other metals and the alkalies is in the form of ozone. The article states Bartlett lead to be, in great measure, at least, a plumbate of zinc. This being so, no one but a person bitterly prejudiced would deny the presence of ozone. H. E. C.

Destruction of Fish by Toads.

MESSRS. EDITORS:—On the 410th page, last volume, of of your journal, is an article on the habits of the toad (*Bufo columita*) in which the reader is left to conjecture much that might have been made intelligible in a few words. The toad never *attacks* any animal, not even a fish, in the sense argued by the writer of the article alluded to above; and it is only the male toad that attaches himself to fishes in the manner described, and only in that season of the year when the female deposits her spawn, the vivification of which depends on that habit of the male, a perversion of which sometimes causes him to attach himself to any moving object that comes within his reach. This may be verified in any pool of water where toads congregate in summer, in this country as well as in Europe.

It is a subject of curious reflection to find a habit essential to the continuation of one race of beings incidentally concerned in the destruction of another race.

Mohawk, N. Y. CHRISTOPHER JENKINS.

Lowest Line of Perpetual Snow.

MESSRS. EDITORS:—The lowest line of perpetual snow known is at the Gulf of Penas, on the west coast of Patagonia, latitude 47° south; that line is about 2,700 feet above the water.

The weather in this particular region is regarded as the most rugged and boisterous of the whole south portion of South America. It is seldom there is a bright and pleasant day during the year. Storms of wind, rain, or snow prevail, and the exception is their absence.

S. P. JOSEPH.

A Dangerous Practice.

It ought to be known that the practice employed by some of unsoldering the tops of fruit cans by means of heat, is attended with danger. The Providence *Press* says that the following singular accident recently took place in the kitchen of a gentleman of that city: While the cook was getting dinner she placed a can of tomato soup upon the range to to warm, as she had been in the habit of doing, with live coals upon the little round cover in the top of the can for the purpose of melting the solder. Instead of the solder melting as usual, however, the can in a few moments exploded with a loud report, blowing a part of it across the room, scattering scalding soup in all directions, and over everything—ceiling, walls, and freshly-ironed clothes, and hurling live coals about the floor, and even as far off as upon a table on the opposite side of the kitchen. The cook, who, fortunately, was not near the range, and who was the only person in the room at the moment, was severely scalded in the face and upon the neck and arms, by the flying soup.

The proper way to open such cans is to cut out the top. Our inventors have provided very simple and handy implements for this purpose.

HYDRAULIC MACHINERY.

(Condensed from Engineering).

A recent inspection of the varied productions of a Birmingham firm has led us to select a few applications of hydraulic machinery for illustration, possessing as they do the merits of novelty and utility. Fig. 1 in our engraving illustrates an hydraulic pulling jack. This jack consists of a cylinder, A, which is made of various lengths to suit the required lift. A piston, B, is attached to the tube, C, which slides in the cylinder, A, through a stuffing box at the end. Screwed on to the cylinder is a cistern, D, containing the pump, E, which is actuated by the hand lever. G is a small tube attached to the pump sliding through a stuffing box in the piston, B, and extending the whole length of the tube, C. The stop valve, H, closes the communication between the pump and cylinder. I I are two small passages from the tube, C, to the cylinder, A, while two other passages, K K, connect the cistern with the cylinder at the back of the piston, B. Water is poured in through the air screw in the cistern, and, after it is full, the jack is suspended with the cistern end downwards and the stop valve screwed up. On working the hand lever the water will be pumped from the cistern through the inner tube, G, and will pass through the passages, I I, into the cylinder and force the piston, B, to the bottom of the cylinder. The water at the back of the piston returns at the same time to the cistern through the passages, K K. By unscrewing the stop valve the water will return through the passages, I I, and the tube, G, to the cistern, and the weight will thereby be lowered. This jack was originally designed for the purpose of pulling up large tree stumps when clearing forests, or estates, of timber. It will be found useful in the shop, on board steamships, or, in fact, wherever heavy weights have to be dealt with. It will either pull horizontally or vertically, and the pump being arranged inside there is no possibility of derangement either from accident or rough usage.

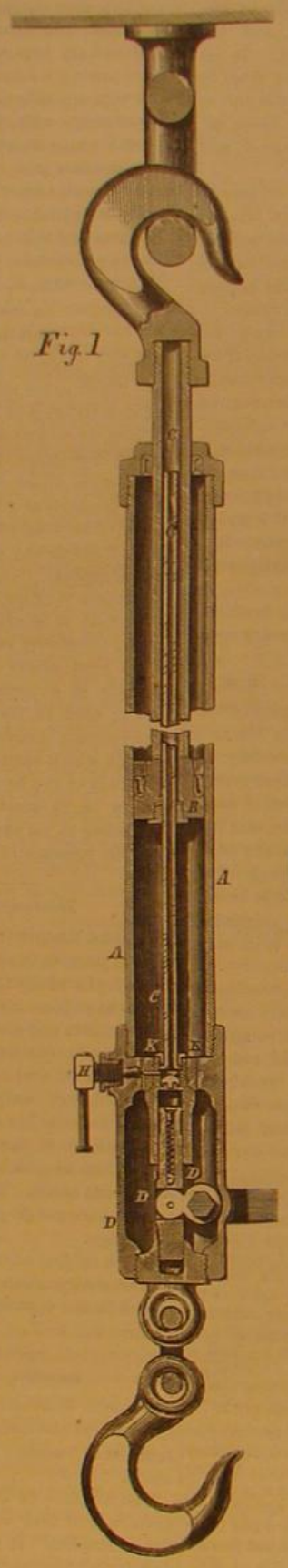


Fig. 1

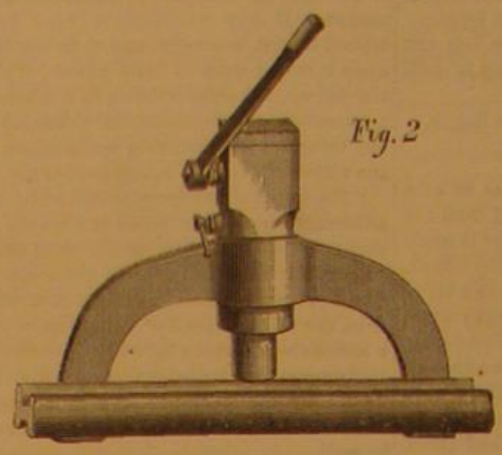


Fig. 2

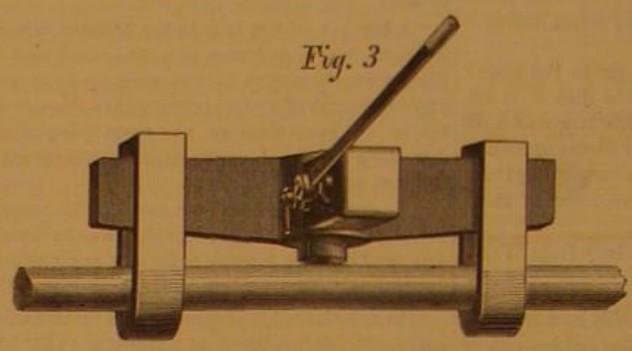


Fig. 3

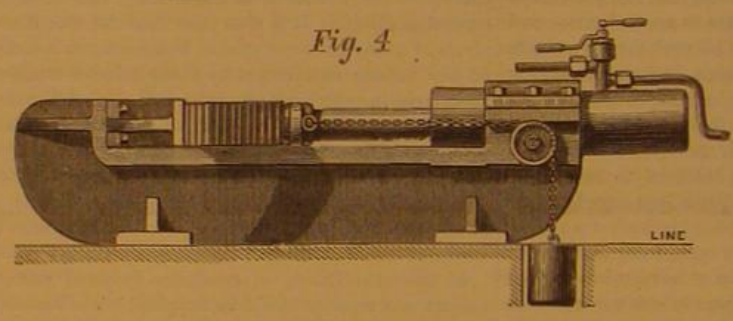


Fig. 4

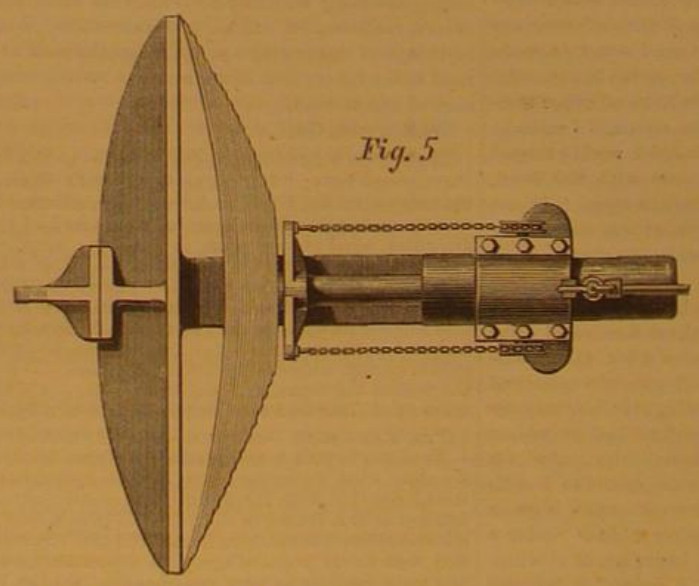


Fig. 5

Figs. 2 and 3 represent two more useful little hydraulic machines, the former being a rail bender or "Jim Crow," and the latter a shaft straightener. The hydraulic "Jim Crow" is a useful tool for platelayers; it is more easily applied, and has a great advantage over the screw crow, which takes a long time to screw up. On main lines where the traffic is great, and the thread of the screw becomes worn, it is often troublesome to get off, and involves the risk of a train passing over it. On the other hand, the hydraulic crow can be unshipped instantly. These crows are in constant use on the Great Northern Railway, and Mr. Budge, the assistant locomotive superintendent, reports favorably of them. They are there found very effective in breaking steel rails of the heaviest section. By merely nicking the rails with a chisel, they are broken off quite true, and a great amount of time and labor is saved. We should add that the jack swivels round in the frame, so that it can be worked in any position. The shaft straightener is for straightening shafting in the lathe, and is also in successful use. It is placed on the saddle of the lathe, and the shaft is passed through the straps, as shown in our engraving. The shaft is then centered, and the ram brought to bear on any part that requires to be straightened. Any irregularity can thus be far more quickly detected and adjusted than when the work is done on an anvil. The machine is lifted on and off the lathe by means of a bar which passes through an eye on each side of the straps.

At Figs. 4 and 5 we show respectively a side view and a plan of an hydraulic spring tester, which is adapted for testing the springs of locomotives, railway carriages, and wagons, etc., up to a length of 6 feet. It comprises within a very small compass a tester with hydraulic cylinder, ram, and balance weights. It has diagonal power pumps in the cistern, and is fitted with pressure gage, cast-iron air accumulator, stop and release valves, and a hand pump for charging the accumulator with air. In operating with this machine the accumulator is first charged with air at a pressure of about 300 lbs. per square inch. The power pumps are then started, and water is pumped into the accumulator until the requisite pressure is attained, which is indicated by the rising of a safety valve. Upon the stop valve being opened the accumulated pressure acts at once on the ram and compresses the spring.

To kill flies, soak quassia in sugared water. Paper saturated with this will attract and poison flies.

A Moon Fallacy Exposed.

A writer in the *American Builder* has taken the trouble to refute at length a large number of popular fallacies regarding the influence of the moon upon terrestrial things. We extract the following upon the cutting of timber and the sowing of seeds:

"An opinion is entertained that timber should be felled only during the decline of the moon; for if it be cut down during its increase it will not be of good or durable quality. This impression prevails in various countries. But can there be imagined, in the whole range of natural science, a physical relation more extraordinary and unaccountable than this supposed correspondence between the movement of the sap and the phases of the moon? Certainly, theory affords not the slightest countenance to such a supposition. But let us inquire as to the fact whether it be really the case that the quality of the timber depends upon the state of the moon at the time it is felled. M. Dechamel, a celebrated French agriculturist, felled a great many trees of the same age, growing in the same soil, and exposed to the same aspect, and never found any difference in the quality of the timber when he compared those which were felled in the decline of the moon with those which were felled during its increase; in general, they have afforded timber of the same quality.

"It is a maxim among gardeners that cabbages and lettuce which are desired to shoot forth early, flowers which are to be double, trees which are desired to produce early ripe fruit, should be severally sown, planted, and pruned during the increase of the moon; and that, also, trees which are expected to grow with vigor should be sown, planted, grafted, and pruned, during the increase of the moon. These opinions are altogether erroneous. The increase or decrease of the moon has no appreciable influence on vegetation, and the experiments of several eminent agriculturists have clearly proved this. Pliny states that if we would collect grain for the purpose of immediate sale we should do so at the full of the moon, because during the moon's increase the grain augments remarkably in magnitude; but if we would collect the grain to preserve, we should choose the new moon. So far as it is consistent with observations that more rain falls during the increase of the moon than during its decline, there may be some reason for this maxim; but Pliny can scarcely have credit for grounds so rational; besides which, the difference in the quantity of rain which falls during the two periods is so insignificant as to be totally incapable of producing the effects adverted to."

Rust Joints.

There are various recipes for the treatment of cast-iron borings, of which a so-called "Rust Joint" is to be made. In all such operations simplicity is to be commended for many reasons. First prepare the joint by bringing the inner joint rings of the flanges together—screwing up the bolts firmly—in this condition there should be an annular space between the flanges of from one quarter of an in. to three eighths of an inch in width, a strand of rope yarn or any soft fiber should now be stuffed to the bottom of the joint, so as to prevent the jointing material from being driven through in the process of calking. A good hammer, a calking iron rather thinner than the joint, and a flat piece of wood or sheet-iron should be in readiness. Now take a suitable quantity of fine cast-iron borings, free from dust, and which may be passed through a sieve to remove large pieces; next dissolve a very small piece of sal ammoniac (chloride of ammonium) in water; say a drachm to a quart (in the absence of sal ammoniac to mix up the borings with, the urine of any animal does quite as well). Now mix upon a flat board, or in a pot or pan, the borings, with sufficient of the fluid to cause them to adhere together in lumps when compressed in the hand. It is now ready for use. By means of the calking iron, and the piece of board or plate, stuff the moist material into the joint to a depth of 1 inch or so from the bottom, all round; now calk it down with the iron and hammer until it sounds perfectly solid, as though it struck against solid iron (this is the most important of all). Now again repeat the process of filling, then the calking, and so on, until the joint is filled to the very surface. It requires a considerable time, and the most careful hammering, to make a perfect joint, as, if there is the slightest trace of softness, steam is sure to escape, and gradually increase the leak. The joint should rest for at least twelve hours before being put under pressure. It will be observed that immediately after mixing the borings with the saline fluid it becomes quite hot, showing that powerful chemical action has been set up, the fact being that the immense surface of the innumerable particles of iron already in contact with the atmosphere, at once, through the presence of the moisture and the destruction of the balance by the presence of an unstable salt, begins to absorb the oxygen of the air. Now it must be observed that as the oxide of iron is being formed, it is held in solution by the still undecomposed chloride of ammonium, which accounts for the mixture remaining black for a time. This is useful in so far that it gives time for the operator to complete his joint before the solid oxide is really deposited. At this particular stage, were steam or water turned upon the joint under pressure, it is clear that the solution of iron oxide would all be washed out and leave the clean borings all but useless; but when time is given for the complete decomposition of the ammonia chloride, and the gradual evaporation of the component gases, the oxide is, as it were, precipitated, and forms a solid cement between the particles of iron. Rust joints very often prove a failure through a neglect of principles. It is evident that an overdose of sal ammoniac, a very common error, must be a source of failure—that the rust cannot form during the presence of the free salt.

A humane way of killing insects for preservation is to drop them into a jar of carbonic acid gas. This does not injure their colors in any way, but kills them quickly. The gas will be easily retained in a stoppered bottle, and is very easy to make. The action of sulphuric acid upon marble dust, or carbonate of soda generates it rapidly. Insects thus killed can be kept perfectly in the gas till they are put in the cabinet.

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To Advertisers.

The circulation of the SCIENTIFIC AMERICAN is from 25,000 to 30,000 copies per week larger than any other journal of the same class in the world. Indeed, there are but few papers whose weekly circulation equals that of the SCIENTIFIC AMERICAN, which establishes the fact now generally well known, that this journal is one of the very best advertising mediums in the country.

THE MANUFACTURE OF ILLUMINATING GAS.

There have been very few changes in the manufacture of illuminating gas since the time that Westminster bridge and Pall Mall were lighted by it about sixty years ago, or since the organization of the New York Gas Light Company, within the memory of many men now living in our city. The original drawings of retorts, scrubbers, and purifiers, as given in the old work of Accum and Aiken, could be made to serve as guides to the constructing engineers of the present day. But the real progress has been in the grand discoveries of the uses to which the incidental products of the distillation of coal are capable. Our chemists appear to have overlooked the direct product, the illuminating gas itself, and to have devoted all of their energies to a study of the properties and uses of coal tar.

This state of things is now fast changing, and, recently, important progress has been made in the manufacture of illuminating gas, so that it is probable that the crude and unscientific method of distilling coal handed down to us by those who first undertook the manufacture, will be entirely dispensed with, and bituminous coal will be distilled for benzole, anthracene, paraffine, and oil, but not for gas.

Nearly one half of ordinary illuminating gas is composed of hydrogen, which, as is well known, burns without any illuminating power whatever. It is also known, that perfectly pure hydrogen can be prepared by passing illuminating gas over lime heated to cherry redness, the dry residue being carbonate of lime. From recent researches, it would appear that a somewhat similar decomposition of the hydrocarbon generated by the distillation of coal takes place in the retorts, carbonic acid, carbonic oxide, and pure carbon, in the form of gas carbon, and coke resulting.

What the gas company wants is, not hydrogen, but a suitable compound of that gas with carbon; but, in spite of all the precautions of the engineers, half of the product of the manufacture is hydrogen. Since the discovery of this fact, attention has been directed to cheaper methods for the preparation of hydrogen, and the subsequent carbonization of that gas in an economical way, thus securing a gas entirely composed of hydrocarbons of great illuminating power. This carbonization can be accomplished in various ways, and we may recur to some of them subsequently.

The method for the manufacture of pure hydrogen that appears to be the most practical, at the present time, is the one proposed by M. Tessie du Motay, and consists in heating a mixture of damp coals and hydrates of the alkalies. A mixture of hydrogen and carbonic acid is thus generated, which can be freed from the latter gas by being passed over other alkalies, which, being thus converted into bicarbonates, can be sold as such, or can be used as sources of pure carbonic acid now extensively required in the arts. The alkalies originally employed can be regenerated, to a considerable extent, and used over again. The hydrogen comes from the water of hydration of the alkalies, and from the moist coal, and the carbon serves as a reducing agent, to give us a pure gas. It is said that hydrogen is more economically made in this way than in any other. The cost of carbonizing it by passing it through benzole, or by synthetical methods, is trifling, and, in theory, at least, we here have a simple and cheap method for the manufacture of illuminating gas, without the necessity of vast retort houses, exhausters, purifiers, condensers, and incidental products of the ancient distillation process. In connection with this method of making hydrogen, and converting it into hydrocarbon, we have the proposition to add oxygen at the point of combustion, but this proposition brings up other questions that it is not necessary for us to discuss in this article.

Since the introduction of petroleum into commerce, attention has been naturally turned to it, and to its products, as a probable cheap source for illuminating gas. Various patents have been taken out, and a number of hotels and small towns in the country are using gas manufactured under one or another of them.

When petroleum is distilled, one of the first products that goes over is a highly explosive and volatile compound called naphtha. It would be entirely a waste product, were it not for the fatal and highly reprehensible habit, on the part of some dealers to adulterate and increase the volume of kerosene by its use. In naphtha we have an admirable material for the cheap production of illuminating gas. To prevent danger from fire, the naphtha is converted into a vapor by steam, and it is afterwards superheated and then passed into retorts, where it becomes a fixed gas. It is then conducted into suitable gas holders. As it is free from sulphur, carbonic acid, carbonic oxide, and other impurities, the necessity for purifiers, and other expensive machinery is dispensed with. The gas prepared in this way is free from the volatile and condensable products of the distillation of coal, and hence, is not affected by cold weather, and is not liable to clog the pipes. The manufacture can be conducted very nearly automatically, so that very little labor will be found to be necessary. The heat required is small, and the yield of gas very large for each retort. When tar, dead oil, and other hydrocarbon liquids are used, greater heat and more complicated machinery are necessary; and such material is itself often the product of the distillation of coal, and therefore does not enable us to dispense with the old methods of making gas.

The progress of science, during the last ten years, also points to the probability of our making illuminating gas synthetically But such a realization is too distant for us to do more than allude to it as within the range of possibility. What we particularly need, is an invention that will enable us to dispense with the present crude way of making gas, which creates a nuisance in the city and affords an article of very inferior illuminating power.

It would not appear to be a difficult matter to accomplish this result, and, as we have pointed out in our article, there are a number of methods that have such elements of success in them, that they ought to be thoroughly tested before being abandoned as worthless. But whatever is done, we hope that the streets of our city are not to be dug up for the laying down of pipes, and to give certain people jobs, before the proposed improvement in gas has been fully tested. We have witnessed enough pipe-laying in our day, and have suffered sufficiently from expenditures of gas to be willing to wait until the proposed change is certain to be an improvement, before asking to have it tried.

COATING VESSELS WITH ZINC.

The protection of iron ships by the application of zinc, or, in other words, the galvanizing of their surfaces, has attracted considerable attention. The process of "galvanizing," as it is called, that is, the coating of iron with zinc, is ordinarily performed by dipping the piece to be galvanized into melted zinc, the piece being previously cleansed from oxide and dirt, and the surface of the melted zinc being covered with sal ammoniac.

Taking this brief description of the process as a starting point, it seems a bold proposition to galvanize a large iron vessel. Yet this is just what is proposed by Mr. Charles Lamport, who, in an address before the Institution of Naval Architects, at London, at a recent session, gave the details of his plan.

Before we notice these details, however, it will be necessary to notice the difficulties which render them needful.

The first of these is the removal of the peculiar skin, or scale, which is met with on all iron plates, as they come from the rolls, and which prevents the adhesion of the zinc. It is also necessary that the plates should be brought to a temperature nearly equal to that of the melted zinc.

It seems, that of late, on the European continent, a method of pouring the zinc over the plates, instead of immersing them, has been rendered possible and successful, by the use of a flux, the nature of which is not given in the address of Mr. Lamport—a very important omission indeed, as he seems to rely upon its use in the application of his method, which is as follows:

Over the sides of the ship he will suspend a bath with so much of a furnace attached as will maintain the zinc in a fluid state. This bath being in contact with the side of the ship, the plate against which it is placed will become of a temperature, he thinks, sufficient to allow of adhesion, if the scale be taken off.

To remove the scale, as well as to perform the other parts of the operation, he proposes to use what he styles molds, one of which will be made of a steel plate one fourth of an inch in thickness, rolled cold, and having a very fine skin put upon it, so as to prevent the adhesion of the zinc to it. Around the edges of this plate will be found a thin edging of metal of the thickness of zinc plate desired to be cast on the side of the ship. Preparatory to the application of this mold, the scale is to be removed by the use of a wooden mold, coated with some substance that will resist the action of sulphuric acid. Between this mold and the side of the vessel the acid is to be introduced and allowed to remain long enough to remove the scale. The flux is to be applied in a similar manner, after which the melting furnace and steel mold, above described, are to be applied, provision being made for its exact accordance with the space previously acted upon by the acid and flux. The melted zinc is then to be poured into this mold and allowed to run through until such time as the iron is heated to the proper temperature for adhesion, when the flow will be stopped and the plate will become permanently attached to the metal. At least, that is the opinion of the inventor of the method. Whether he is right or not will appear from the practical experiments he intends to perform during the ensuing year.

Provision for buckling is to be made by allowing portions of the zinc to remain unattached to the iron, a matter regulated, of course by the non-removal of the scale, except of such parts as are desired to unite with the zinc.

Of course it would be unwise to hazard any positive prediction as to the ultimate success or failure of this method, in anticipation of its practical trial. We cannot fail to see, however, numerous practical difficulties, which will heavily tax the genius of Mr. Lamport to overcome. We shall keep watch of any reports of experiments made in this direction and, if important results are attained, will lay them before our readers in due time.

THE NEW PATENT LAWS---IMPORTANT CHANGES AFFECTING AMERICAN AND FOREIGN MANUFACTURERS---FREE TRADE IN PATENTS NOW FULLY ESTABLISHED.

The advocates of the free trade system, if they did not succeed at the late session of Congress in realizing all their aims, certainly made a clean sweep so far as patents are concerned.

This country is now thrown freely open to all foreigners in respect to patents, and the peoples of all countries may come or send here and compete with American genius and industry on the most favorable terms.

The law which required foreigners to put and continue their inventions on sale in this country, within eighteen months after obtaining their patents, has been repealed, and foreigners, like our citizens, may choose their own time for working their patents.

Another provision of the new law permits a foreigner to patent his invention here at any time, even after it has been introduced and patented abroad for years, provided it has not been used here for more than two years prior to application for an American patent.

The old law prohibited the grant of a patent for any foreign invention that had been brought into use here, even for a day, prior to application for a patent.

In the same way the new law also throws open to foreigners the right to take out patents for designs, and as this virtually includes all the new figures and pattern for every description of fibrous and textile goods, such as carpets, silks, laces, calicoes, trimmings, etc., the law becomes important to our home manufacturers.

The following is the provision of the new statute in relation to design patterns:

"Any person who, by his own industry, genius, efforts, and expense, has invented or produced any new and original design for a manufacture, bust, statue, alto-relievo, or bas-relief; any new and original design for the printing of woolen, silk, cotton, or other fabrics; any new and original impression, ornament, pattern, print, or picture, to be printed, painted, cast, or otherwise placed on or worked into any article of manufacture; or any new, useful, and original shape or configuration of any article of manufacture, the same not having been known or used by others before his invention or production thereof, and patented or described in any printed publication, may, upon payment of the duty required by law, and other due proceedings had the same as in cases of inventions or discoveries, obtain a patent therefor."

The Government fee for a design patent is $10 for 3½ years, $15 for 7 years, and $30 for 14 years, with privileges for extension.

Another novel provision of the new law consists in the registration of trade-marks. When a patent has been granted for the article or the pattern, a further security may be obtained in the shape of a patent upon the trade-mark that is placed upon the article or goods. The following is the law for trade marks:

"Any person or firm domiciled in the United States, and any corporation created by the authority of the United States, or of any state or territory thereof, and any person, firm, or corporation resident of or located in any foreign country which by treaty or convention affords similar privileges to citizens of the United States, and who are entitled to the exclusive use of any lawful trade-mark, or who intend to adopt and use any trade-mark for exclusive use within the United States, may obtain protection for such lawful trade-mark, by complying with the following requirements, to wit:"

The Government fee for registration of a trade-mark is $25. Duration 30 years, with privilege of renewal.

One effect of the above new laws will be to put an end to that extensive class of American industries which has grown up and flourished by the manufacture of articles and goods copied from foreign sources. All who undertake such reproductions without consent of the foreign originator, will be liable to be interfered with at any time, by the grant of a patent, and the stoppage of their works.

Another effect of these laws will be to compel our citizens to invent their own designs, and thereby artistic invention on our own soil will perhaps be encouraged.

We have in preparation, to be issued in a few days, a new

edition of our widely-known instruction book. It will contain the new patent laws, with full directions for those who wish to avail themselves of its benefits. We shall be happy to forward copies of this book *gratis* to all who will send us their names with the stamps to pay the postage—four cents.

Meantime, Messrs. Munn & Co. would inform their friends in all parts of the world, that they are in readiness to take out patents for inventions, designs, and trade-marks, under the new laws, with promptness, and on moderate terms.

Address Munn & Co., 37 Park Row, Scientific American Office, New York.

HOW MERCURIAL THERMOMETERS ARE MADE.

The word thermometer,as everybody knows,of course,means "heat measurer," and yet the word, in its etymological signification, conveys what is, or, at least, may be, an erroneous notion of the actual results obtained by means of this useful and interesting little instrument. That heat should be accurately measured, implies that we should be able to start from zero, or no heat. The zero upon our ordinary Fahrenheit thermometers is only thirty-two degrees below the freezing point of water, and this temperature,as is demonstrated by the use of instruments capable of indicating a relatively very low degree,is still as evidently heat,and a good deal of heat,though not so much as that of our scorching July days. We have no more authority for saying that the lowest degree registered closely approaches the lowest, in the nature of things possible, than we have for asserting, that the highest degree attained or measured is the highest degree possible. All that the thermometer does, is, assuming that the cause is proportional to the effect, to indicate by a regularly adjusted scale, the expansion and contraction of a certain substance—for instance, alcohol or mercury—and from this expansion and contraction, we infer that the cause or condition of it—that is,the increase or decrease of heat is proportional to the result. It would not be erroneous to say, that the thermometer measures the relative increase or decrease of temperature, but it does not, and can not, measure heat itself. Yet the uses of the instrument are as various and beneficial as if heat were as absolutely measured, as we can measure the pressure of the air by the barometer, or the specific gravities of liquids by means of the hydrometer. All results,dependent exclusively upon heat, will be uniform, for the same degree of heat, and, using this law, we can reason from one result to another, the results, of course, having been first obtained by experiment, and registered for use.

As an illustration, having once discovered and noted the fact, that water boils in the open air when the mercury of a thermometer, immersed in it, has expanded to the point of 212° on the scale, we may always count on the concomitance of these results, the boiling of water, and the registered expansion of the mercury, except under the following circumstances, which, so far as we know, have yet received no explanation. After a thermometer has been exposed for some weeks to the ordinary temperature of the air, if it be suddenly exposed to the temperature of boiling water, its freezing point will often be found to have lowered from one to two degrees. This has been observed in some of the standard thermometers of the Royal Society, London, and by various experimenters. It is sometimes two or three weeks before the freezing point corresponds again with that on the scale.

The determination of the temperature at which different physical results take place is of incalculable advantage to science and the arts, notwithstanding what has already been said, that the thermometer really does not measure heat at all.

It is not intended to discuss here, however, either the history, theory, or uses of the thermometer. Our object is to describe the manufacture of the instrument, the indications of which have so much to do with our physical comfort or discomfort, and which are so important to nearly all processes in the arts.

A mercurial thermometer is a very simple instrument. A small glass tube, with a bulb at one end, containing mercury, and a graduated scale, constitute all that is essential to it, yet in this, as in many other cases, simplicity begets difficulty. To make this simple combination perform its duty accurately, is by no means an easy matter. The first difficulty met with, is the want of uniformity in the diameters of the bores of different tubes,and the varying size of the bore in almost every tube. It is scarcely possible ever to find one the caliber of which is the same throughout its length, and,if so found,it is the result of pure accident. It is obvious, therefore, that unless some means of eliminating the errors which would arise from this source, be adopted, nothing like accuracy can be expected in the indications of the instrument. As the character of the bore cannot be altered, the desired result must be obtained in another way.

The method employed to obviate this difficulty is called "calibration." Tubes are selected tolerably free from imperfections,and a column of mercury,of one inch or less in length is introduced into it. The tube is then attached to the frame of a dividing engine, and put in connection with flexible rubber bags, to which pressure is applied, and regulated by screws. The air pressure in one bag being reduced, while it is increased in the other, the mercury column may be forced to and held at any part of the tube.

The mercury being thus brought to the portion of the tube where the graduation is proposed to commence,the exact position of one end of the column is marked upon the tube, a microscope with cross wires being employed to aid the eye of the operator in performing the operation with exactness. By means of the rubber bags, the mercury is again forced along until the end of the column, where the first mark is made, is brought under the microscope cross wires, placed at the other end, and so on throughout the entire length intended to be graduated. The varying lengths of the column which are accurately measured in the different positions are recorded,and indicate the variations in the caliber of the tubes. A permanent mark is made at the end, as at the beginning of the calibration.

It will be seen, that if the spaces successively occupied by the mercury be divided into an equal number of equal parts, any one of these parts will indicate a corresponding increase of volume, although the bore of the tube may vary in its diameter.

The required dimensions of the bulb are found, aproximately, by weighing a measured length of the mercurial column, and computing the capacity of the bulb from the known expansion of mercury and its specific gravity.

The bulb may be formed upon the tube previous to the calibration, or afterwards attached. In the former case, however, the thermometers have their scale divided after the determination of the freezing and boiling points, and no tubes can be used except such as are found to be approximately perfect. In the latter case, the arbitrary scale, as marked from the calibration, may be reduced after the determination of the freezing and boiling points into the Fahrenheit scale, by the application of a simple algebraic formula.

The freezing point is determined by placing the bulb in finely pounded ice, from which the water is drained away as it melts. The boiling point is obtained by placing the bulb in steam having the same elasticity as the atmosphere, a peculiar apparatus, devised by Regnault, being generally employed for the purpose.

In putting in the mercury, a small reservoir of paper or glass is fixed upon the upper end of the tube. Heat is then applied to the bulb, which, driving out the air through the mercury, the latter, as soon as the bulb is allowed to cool, descends through the tube, being forced by the pressure of the external atmosphere. The upper end of the tube is then heated and drawn out, ready to be sealed hermetically. The mercury is then boiled in the bulb, to expel all trace of air, and, while it is in a state of ebullition, the tube is sealed by directing the flame of a blowpipe against the upper end,which fuses the glass and closes the aperture.

The reader must not imagine that all the manipulations we have described are performed on all thermometers in a perfect and accurate manner. A very large majority of these instruments, in common use, are entirely worthless for any scientific investigation, although they furnish, perhaps, sufficiently accurate indications for the regulation of the temperature of apartments, and for other ordinary purposes.

IS THE KNOWLEDGE OF ENGLISH GRAMMAR NECESSARY TO THE WRITING OF GOOD ENGLISH?

A correspondent writes us that the practical working men of this country need a practical grammar in order to enable them to attain that facility and accuracy of expression, essential to a lucid communication of their ideas. The present works upon the subject, he thinks, are overburdened with rules, observations, and quotations, and are not adapted to the use of such as wish to learn to write and speak correctly in the shortest possible time, and without the aid of a living teacher.

As this bugbear of grammar is, we know, preventing many valuable ideas and suggestions from receiving the publicity they deserve, we propose to devote a brief space to its demolition.

First, then, we say that the use of correct and forcible language, either in writing or speaking, is purely a matter of habit. No one in writing can afford to stop and apply grammatical rules to every word and phrase he employs, and no writer does this. If he had these rules all at his tongue's end, they would not enable him to use good language, unless good language is the daily habit of his life. Many of these rules are of extremely doubtful character, so far as the English language is concerned, and more are so loaded down with exceptions that they are practically useful only to critics in defining and pointing out errors of style and construction in such literary productions as depend for their merit more upon their style than anything else. The use of good language cannot be put on and off like a coat. He who accustoms himself to loose forms of expression to-day will to-morrow speak loosely when he perhaps desires to be accurate.

Many of our most able writers and speakers know little or nothing of grammar as a science, and one of the most forcible writers among the contributors to our present magazine literature has recently written a series of articles for the *Galaxy*, in which he has sought to prove that most of the definitions and so-called rules of English grammar are shams; even going so far as to entitle one of his articles "The Grammarless Tongue," meaning by the expression, grammarless tongue, our vernacular. It must be confessed, too, that he made out a pretty strong case.

If, then, the use of good English is not to be learned from "English grammars," how is it to be learned? We answer, by familiarizing ourselves with good language, by studying the meaning and derivation of words, by the habitual reading of such authors as are accepted authorities in the use of language, and whose writings have established its usage. This will not avail, however, if an attempt is not made to shake off bad habits, and acquire good ones.

But it is not necessary to possess the most happy style of expression to communicate important facts. An old professor used to remark that most people of moderate education can write and speak forcibly if they *have something to say*, meaning that they must possess some complete idea, well thought out, before they attempt to utter it. A man having an idea thus mentally wrought out, may misplace capitals and misspell words, but he can scarcely fail to make himself understood; for his thinking has been done in language, and the natural expression of the idea must be nearly or quite as clear as his thinking. But if he try to assume an artificial style quite foreign to that which he is accustomed to use, ten to one he will fail to make himself understood.

We trust no correspondent or reader will hesitate to communicate anything he deems of value to us for fear of making grammatical or orthographical errors. Let the aim be merely to express the ideas clearly, and we will be responsible for all the rest.

DEPRECIATION OF AMERICAN VITALITY.

Dear reader, during this terribly exhausting devitalizing weather, we have steadily kept to a pre-adopted resolution that we would leave the discussion of the "heated term" entirely to the dailies and health journals; and, although the above heading might at first sight lead to the belief that our stock of subjects is so far exhausted that we are compelled to resort to a rehearsal of the oft-repeated platitudes which annually appear at this season, about the heat, and the dust, and the way to avoid sun-stroke, and how to keep cool, and how to get a good sleep in hot weather, etc., etc.; we assure you that we have something more weighty to discuss.

We Americans are charged with a "decrease in vitality;" not at this particular season, but in general. We plead "not guilty to the charge."

What is the evidence of our decreasing vitality? The report of a life insurance company, which shows that out of forty-four deaths occurring during the past year among its insured, eighteen had been insured only three years.

This a cotemporary takes as ample evidence of the decrease of "American vitality," and gives us a column-and-a-half homily upon our sins of omission and commission, which in its opinion are fast bringing the nation into a state of physical degradation.

In defense of our plea, we call attention to the following facts. First, that the present competition among life insurance companies, and the methods in which many of them transact business, are such that we wonder the proportion of deaths occurring among their insured is not greater than it is. Second, the fact that we, as a people, bear and endure more than formerly, is an evidence of increasing rather than decreasing vitality.

Only consider for a moment the burdens of dress which our increasing civilization imposes. Think of the bunion-breeding boots, the chest-compressing corsets, the fashionable, black silk, headachy hats for males, and the almost entire absence of hat for females. Think of the horrible heaps of hair bundled upon the heads of our women, and the merciless exposure of the necks and legs of American children.

Think of the indiscriminate way in which we bolt our food at all hours, and how that food is adulterated, and how abominably it is cooked. Think of the gallons of tepid enervating drinks we swallow, and the annual consumption of alcohol and tobacco.

Think of the system of tasking and cramming from books, which we call education, and how our daughters graduating at eighteen from seminaries of learning, are expected to have mastered, or done their best to master, all the dead and living languages, the sciences, literature, and metaphysics.

Think of what frightful drafts upon the hours of natural rest are made by the balls, routs, and parties of fashionable society.

Think of how our young men plunge either up to the neck in dissipation, or rush without stint into business in the mad race for riches.

Think of how all this rush and bustle, this highly seasoned mental and bodily food feeds the passions, and begets a craving for the excitement which in turn, instead of satisfying, feeds the craving.

Think of our swift journeys by land and sea. Think how the telegraph brings all countries near, and how events, the news of which thirty years since would have scarce reached us in months, are now retailed by the news mongers next morning before we get down to breakfast, demanding increased activity of brain, and keeping the mind constantly at work.

It is safe to say that an average American of to-day lives more in one year than he could have done in ten, a half century ago.

And yet he stands it pretty well. To be sure, his nerves are rather sensitive, and he finds it hard to sit still. You will nearly always see him dancing his cane, or drumming on the table, twitching his legs, whistling, or humming a tune. But even these additional drafts upon his vitality are honored by his constitution in a way that shows that although he may, and often does overdraw the account, that account must be a large one at the outset of his career.

No! American lives may be shorter than formerly, although we think there is not good evidence of even this; but vitality must be on the increase, or the drains made upon it would make us all bankrupt.

We rest our case. What say you, gentlemen of the jury?

SCIENTIFIC INTELLIGENCE.

CURE FOR LEAD POISONING.

In some of the large establishments of France the best antidote for lead poisoning was found to be a lemonade made of weak sulphuric acid, but after a while the workmen became disgusted with the taste of this liquor, and refused to drink it. It was observed that two workmen in one of the factories were entirely exempt from lead colic, and, upon inquiry, it transpired that they made free use of milk. The director of

the works at once ordered enough milk every morning and evening for all of the workmen, and from that time all symptoms of lead poisoning disappeared. The suggestion is worthy of attention on the part of all persons who are exposed to the poisonous action of lead, to make free use of milk. It is at once an agreeable and easily attainable remedy.

USE OF ELECTRICITY IN CAUTERIZATION.

The old method of cauterization by fire is to be replaced by the electro-thermic or galvano-caustic apparatus. The latter process is safer and more certain in its operation. It is possible at will to vary the degree of heat, to raise it instantly to the highest intensity, to diminish or suppress it, to render it intermittent or continued, to direct it into deep cavities, and to destroy all the tissues by contact. It is said that the wounds produced by electricity are less liable to contagion and miasmatic infections than those caused by sharp instruments.

The apparatus can be made of any desired shape so as to be applicable to all parts of the body, and it is known that important cures have been effected by the introduction of platinum wires and the cauterization by the battery of parts of the body inaccessible in any other way. Electricity has already been tried in cases of bad tumors, in amputations, in excisions of cancers, in destruction of wens, for opening cysts, for removing internal tumors, upon wounds by fire, and in numerous other cases. And a recent article in *Cosmos* claims for it the following advantages: The electro-thermic cautery suppresses all pain after the operation; avoids loss of blood; prevents the retention and alteration of the liquids; avoids all putrid and purulent infections; facilitates the organic reconstruction and healing of the parts; affords a method universally applicable, strong or weak, continuous or intermittent; capable of sloughing the tissues, of carbonizing them, of destroying them, of converting them into gas, and must be regarded as one of the most important contributions to modern surgery."

PRESERVED BREAD.

This bread is proposed as a substitute for the biscuit and "hard tack" used at sea. It is easily prepared though the process is somewhat tedious. The bread is baked in the usual way, it is then subjected to desiccation for eight to fourteen days, until it is thoroughly dry; it is then exposed for a short time to the action of steam, and afterwards squeezed into tablets under an hydraulic press for twenty-four hours. The tablets can be preserved for years in hermetically-sealed packages.

Bread thus prepared retains a vitreous fracture, can be easily masticated by the teeth, is admirable for bouillon and soup, and experience has shown that 200 pounds of good flour will afford 188 pounds of compressed tablets. An army provided with this bread and Liebig's extract of meat would be prepared for any emergency that might arise. A soldier could easily carry several days' rations in his knapsack.

DISINFECTING SOLUTION.

According to *Cosmos* the medical authorities of Paris ordain phenic (carbolic) acid for the disinfecting of the bodies of patients who have died of small-pox. For this purpose they take 12 grammes of crystallized phenic acid to one liter of water. Hitherto chloride of calcium has been employed, but never with satisfactory results, whereas phenic acid has been found to be entirely effective, and its application is unattended with inconveniences of any sort.

CURE OF CONSTIPATION BY ELECTRICTY.

Dr. A. Cabe, of Lyons, France, had in his practice a very obstinate case of constipation in a female subject 80 years of age, who for sixty years had suffered in consequence of a severe attack of dysentery encountered in her youth. The patient having had no passage for forty days, the doctor tried to induce a contraction of the intestines by the application of electricity. He inserted the negative pole of a Gaiffe battery into the rectum, and applied the positive to the navel, and in the course of two minutes the results were completely satisfactory.

SOLUBILITY OF CLAY IN WATER.

M. Schloessing has shown that clay is soluble in distilled water. There appears to be a colloidal solution that will remain for months, but if a drop of chloride of lime be introduced the liquid becomes instantly clear. The water of the Mississippi always contains more or less alumina in suspension, which can be removed by adding a few drops of a solution of chloride of calcium, or of sulphate of lime. In this manner the Egyptians clarify the water of the Nile, which is always turbid.

A SPONTANEOUS COMBUSTIBLE GAS.

The bi-bromide of ethylene, when mixed with oxygen gas, takes fire spontaneously in the sunlight. The bromine appears to combine with the hydrogen in a manner analogous to the union of chlorine with hydrogen in the sunlight.

HOW OUR WHEAT CROPS ARE HANDLED.

The facts given in the following account of the mode of handling our grain crops at the west, from a Milwaukee correspondent of the New York *Tribune*, will convey to many of our readers at home, as well as abroad, some conception of the immensity of the grain business in this country:

The city of Milwaukee, with its 100,000 inhabitants, and Chicago, 3½ times larger, are what they are because they handle such vast amounts of the raw material of food. On an average, as Mr. Fisk remarked in his wonderful story of the gold panic, it takes one bushel of grain to bring the other to its market. When a farmer raises 200 bushels, the value of 100 is divided among railroads, elevators, schooners, and operators, who are thus paid for delivering the other 100 to the consumers. In this view the facilities for handling grain become as important as the art by which it is produced. In the descriptions that follow, the accounts of marvelous quantities and vast warehousing apparatus, the farmer will see how stupendous is the system to which he contributes, and warm-hearted Americans may see somewhat in all this to remind them of the marvelous resources and material grandeur of this nation.

As a general mart for the sale of all grains Chicago is quite in advance of this city and of all our cities; but for wheat as the special crop of the West, the grand cereal, Milwaukee is the place for learning how it is treated after it leaves the bins of the farmers. The reason why this place thus bears off the palm and gives law in the wheat market is simply because she has had several far-seeing and enterprising citizens who were duly impressed with the importance of drawing the crops for the great grain region north and west of here to this point for shipment to Eastern cities. The railroads built, Milwaukee has laid her hands on a lion's share of the wheat crops of the Northwest by certain business virtues and by prompt and liberal expenditures at the right time and place. In this respect her example is a pattern, and is profitable for young business places and young business men to study. For it is by no means a matter of course that Milwaukee should receive and ship twenty odd million bushels of wheat. This is not the only outlet. In fact, Chicago is reaching out for this same 20,000,000 bushels, and she would have drawn it had not Milwaukee made it for the interest of all shippers of spring wheat to send their trains here rather than to her vigorous, vigilant, daring, and imperial rival.

WHAT IS AN ELEVATOR?

An elevator, in these grain cities, means an enormous building usually more than 200 feet long and over 100 high, with an equipment of powerful belts and buckets for raising grain, and rows of gigantic bins for storing it. I have just returned from a visit to Elevator A, that stands at the termination of the La Crosse division of the Milwaukee and St. Paul Railroad. This structure is 280 feet long and 80 wide. The total length of the great driving belt, urged by a 200-horse power engine, is 280 feet, that is, the half extending from cellar to comb is 140 feet, and the down half is of course equal to it. This belt is thirty-six inches wide and three-quarters of an inch thick, and is made of six-ply or thicknesses of canvas, with sheets of india-rubber passed between and into them. But such immense strength will not seem excessive when we see the Titan work it has to do. It drives nine receiving elevators or belts set with buckets; each of these is as long as the main belt; that is to say, they lift the grain 140 feet. The buckets are made of thick tin bound with hoop iron, and are well riveted to the belt at intervals of fourteen inches. In shape they are like the buckets in a common grist mill, but very much larger, for these are six inches across the mouth and eighteen inches long. When full one contains a peck. They do not usually go up quite full, but, allowing for this, there are 100 pecks, twenty-five bushels, loaded on one side of one of these belts whenever it is at work. If all nine are running at once, as is often the case, the quantity of wheat lifted on these swift-running belts is 225 bushels. The established weight of a bushel of No. 2 Milwaukee Spring is fifty-five pounds. This would make the total lift of the receiving elevators, every moment they are at work, over 12,000 lbs. Discharging upon each of these nine is a hopper-shaped bin beneath the railroad track. A car load of wheat is rolled over the bin, the doors lifted, and six stout men step in with big, bright, grain shovels. Each knows his place, and they work like so many engines, with a stroke steady and true and effective. In four minutes from the time these six step into the car there is nothing left but a quart or two of sweepings on the floor. A car carries from 250 to 300 bushels, and the swift-running belt that rushes by them in its tireless industry has carried the 300 bushels 140 feet in the air, as fast as those six stout Teutons could shovel it out. I was pleased to note a manly and candid expression on the faces of all who were at work in wheat. They did not look like men who spent their earnings on bad whiskey or smoked them away over lager and pretzels, coming home late to pound a hard-working woman and curse their children.

When carried aloft the receiver throws the grain into a hopper-bottomed bin fixed on scales, and the weight is accurately given. Before the wheat is rolled into the warehouse it is carefully inspected and graded. Nineteen out of every twenty bushels coming here is spring wheat, and thirty-eight per cent of all that arrives this year is graded No. 2. The inspector gives his memorandum to the weigher, and he turns the spout over the bin containing No. 1, No. 2, or No. 3, as directed by the marks on the inspector's book. Very much depends on the care and honesty of this inspector, and the laws of the Milwaukee Chamber of Commerce require that he be sworn, that he give heavy bond, and be himself in no sense a buyer or a seller of wheat. Here let me remark wheat is often graded No. 2, not so much because it lacks plumpness and weight as because you let oats get in with it. And this neglect is rather on the increase. Farmers do not appear to be as particular as they were about their seed wheat. For instance, Mr. Langston, the secretary of the Board, showed me his tables, and from them it appears that in 1865 seventy-seven per cent of the wheat was No. 1. The next year we had that bad fall when it rained all August, and everybody's grain sprouted. There was but ten per cent of No. 1 in 1866. In 1867 it was sixty per cent. In 1868 and 1869 the harvest has been nothing to complain of, but Milwaukee saw but thirty-eight per cent of No. 1 wheat.

The bins in which this wheat is poured are of great size, being 60 feet deep, 20 wide, and 10 across, containing 12,000 cubic feet. The total receiving and storing capacity of this establishment is 1,500,000 bushels. Of the crop of 1869 it has received 7,000,000 bushels. About 10,000 bushels are taken into a train of the average length. So 2,100 trains have rolled into this elevator and discharged.

HOW WHEAT IS SHIPPED.

Milwaukee has an admirable harbor. Two rivers run into the lake, and at the junction is a wide spread of marsh grown up with bulrushes and green with aquatic rankness. But the mud is soft, and canals are easily cut, so that a hundred of these warehouses could be so stationed that while cars rolled up on one side, ships drawing ten feet of water might anchor on the other. As soon as a grain ship is anchored beside an elevator the hatches are removed, and great spouts extend over them from the bottom of one of the enormous bins I have described. The gate is raised and a torrent of wheat pours down. The loading power of these spouts is 12,000 bushels an hour. The *Orient*, for Oswego, was loaded the other day in an hour and a half, and her capacity is 18,000 bushels. The Oswego and Ogdensburg schooners and vessels destined for the Welland Canal usually take on from 12,000 to 20,000 bushels. The Buffalo vessels are larger, often receiving 30,000 and in a few cases 45,000 bushels.

It must not be supposed that one of these bins of wheat stands week after week without further care. It is the business of a good warehouseman to watch his wheat, and see that none of it is heating. If he thinks it needs air he can, by lifting a gate, throw it all in a cascade on the floor, and lift it back with the elevator.

Milwaukee has seven such elevators as I have described, but this is the largest. They vary in receiving capacity from 500,000 to 1,500,000 bushels. During the year past more than 14,000,000 bushels have been shipped to the lake cities. Of this Buffalo takes one half, Oswego the rise of 3,000,000 bushels, Kingston 1,500,000 bushels, and the rest goes in driblets to Erie, Cleveland, Toledo, and Dunkirk.

ACTIVITY IN WHEAT.

Napoleon's war, though it brings quaking and ashes to those Rhenish provinces which he proposes to conquer, adds millions and millions to the pockets of Northwestern farmers. The large dealers say they expected nothing but a decline; one large buyer, the largest in the Northwest, says he expected to see No. 2 Milwaukee Spring at ninety cents, and falling by this time. But by a curious coincidence wheat sells to-day at just the figure it held on the 18th July, 1869—that is, $1·30.

I see large crowds in the Chicago Board of Trade, a confused blending of shouts, men reeking with perspiration making swift entries in little books, and bantering each other and betting in words and figures which I do not wholly understand; and the telegraph wires are loaded with messages about wheat, ordering, countermanding, and again confirming the first order. The language in which the business is conducted is very much condensed, but it is easy to see that the fever in Europe brings tossing and tumult to us, but on the whole it benefits the farmer greatly. Milwaukee No. 2 often commands five and sometimes ten cents more than Chicago No. 2. That is, a farmer or a country merchant has a lot, and sends half to one city and half to the other; that which goes to Milwaukee will sell the best. Why? First, because the more northern wheat is generally better and plumper than that which grows in a hotter sun. Secondly, because the men who handle and inspect wheat in Milwaukee are more careful and honest, and those who have charge of the elevator do not let it heat. Thirdly, these circumstances have given Milwaukee wheat repute and a good position in market, and everywhere "a good name is better than rubies."

Boiler Incrustation.

Incrustation is injurious in three distinct ways: It increases the consumption of fuel, injures the boiler, and may even compromise its safety. Incrustation less than one eighth of an inch thick allows the passage of only one quarter of the heat it would if the plate were clean.

One way in which incrustation injures the boiler is by its requiring the fires to be forced, thereby furthering the oxidation, diminishing the strength, and tending to tear away the plates of the boiler. The very cleaning of the boiler tends to injure the plates and structure. At the same time, there is no doubt that a thin incrustation protects the surfaces of the plates against corrosion, and that it often closes up the joints and prevents escapes.

To prevent evil effects from incrustation, the water can be purified before being fed in, or different apparatus, applied inside the boiler, can be used for the purpose. Before feeding it in, water can thus be purified by chemical reactions: by heating it; or it can be distilled by using the condensed steam as feed-water. In the case of the presence in the water of carbonate of lime, held slightly in solution in the form of bicarbonate, the state of solution being aided by the presence of a slight excess of carbonic acid, by saturating, by means of a sufficient quantity of lime, the excess of carbonic acid, the greater portion of the neutral carbonate will be deposited on account of the very slight solubility of that salt.

The processes employed within the boiler consist in blowing out; mixing the water with substances modifying the incrustations either chemically or mechanically; employing the circulation of the water for extracting the matters in suspension, and applying electricity against the incrustations. Marine boilers are continually blown out. In France very good results in preventing solidification have been obtained by the use of logwood shavings. The steam, though the boiler does not prime, is of a violet color; no doubt from its taking up a little water.

New Method of Producing Ice.

Franz Windhouser, of the Duchy of Brunswick, in Northern Germany, has, it is said, invented a new ice machine. The cooling process takes place in a cylinder, where the air is first powerfully condensed, then cooled by the admission of water, and finally expanded till its pressure is about equal to that of the atmosphere. This simple process, we are told, leads to astounding results, for it lowers the temperature of the air, so that after the latter has been conducted, in moderate quantities, into a space through which water flows, this water is almost immediately turned into ice, of which enormous blocks may be thus obtained if desired. The inventor is very sanguine about the utility of the machine for cooling large apartments, theaters, hospitals, and other localities where the want of pure, cool air is often much felt. No chemicals whatever are required, either for the freezing or cooling process. Of course this is all correct in theory, but practically we doubt that air can be thus used as a cooling agent with economy.

The Ocean Race.

The race between the *Dauntless* and the *Cambria* has terminated in the defeat of the former. The *Sappho*, which started two days later, has at the present writing, July 29th, not yet arrived. The relative speed of the vessels has not been, and could not be decided by this race. The somewhat remarkable fact that the *Dauntless* arrived only an hour and forty minutes later than the *Cambria*, proves nothing, since the distances the vessels were separated on their different routes probably placed them under very different conditions of wind and weather. Beyond a transient pleasure enjoyed by talkers and betters upon the race, nothing has been gained. Per contra, two lives are lost, and the already too great sporting tendencies of American youths have received an additional stimulus.

Has the race paid? We think not.

Domestic Fowls and Destructive Insects.

It is said that M. Giot, a French entomologist, has lately found new employment for fowls. He says that French farmers have, during the past year, complained bitterly of the prevalence of worms, which infest corn and other crops, the highest cultivated fields being the most infested. Fowls are known to be the most indefatigable worm destroyers, pursuing their prey with extraordinary instinct and tenacity. But fowls cannot conveniently be kept upon every field, nor are they wanted there at all seasons. Therefore M. Giot has invented a perambulating fowl house, which is described as follows: "He has large omnibuses, fitted up with perches above, the nest beneath. The fowls are shut in at night, and the vehicle is drawn to the required spot, and, the doors being opened every morning, the fowls are let out to feed during the day in the fields. Knowing their habitation, they enter it at nightfall without hesitation, roost, and lay their eggs there."

Facts for the Ladies.

Mrs. A.V. Snow, of Port Kent, N.Y., has used a Wheeler & Wilson Sewing Machine eleven and a half years without a cent's worth of repairs. She is a seamstress and dressmaker, and made, the first year, one hundred shirts, besides doing all her family sewing for a family of eight persons. For two years past, the machine has earned over $250 a year on custom work, besides doing all Mrs. Snow's family sewing. She has yet some of the first dozen of needles sent with the machine.

Recent American and Foreign Patents.

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

Gloves.—D. S. Hulett, Gloversville, N. Y.—This invention relates to a new and useful improvement in re-inforcement of gloves for driving and other purposes.

Umber Compound.—A. H. Bourne, Fort Scott, Kansas.—This invention relates to a new compound of earths and minerals, for making umber, for use in painting.

Miter and Cut-off Box.—E. M. Wilcox, Bloomer, Wis.—This invention relates to a new and useful improvement in an apparatus for sawing miters and "cutting off," in the various processes incident to working in wood, whereby much labor is saved and accuracy is secured.

Churn.—M. J. Wikoff, Stout's Postoffice, Ohio.—This invention relates to an improved arrangement of the shaft and arms of a churn dasher for introducing air into the cream, either from the outside of the churn case, or rom the space in the case above the cream.

Wood Pavement.—Henry Dowson, Springfield, Ill.—This invention relates to a new and useful improvement in wood street pavements, whereby they are made more durable than such pavements have hitherto been, and it consists in so forming the lower portion of the blocks that double dovetail spaces are left between the blocks, in which spaces double dovetail strips or pieces are inserted.

Manufacture of Iron.—Henry Davies, Newport, Ky.—This invention relates to improvements in the manufacture of iron, according to what is known as the "Ellershausen Process," and consists in an arrangement of mixing table, molten iron ladle, and ore-feeding apparatus, whereby the mixture of ore or earthy matter with the molten metal can be made in exact and predetermined proportions.

Universal Coupling Joint.—Moses A. Keller, Littlestown, Pa.—This invention relates to improvements in universal coupling joints for shafts, and consists in a concave socket, in the end of one section, and a short cylindrical extension, and a ball on the other, fitting the socket, and secured to the socketed section by a pin or bolt fixed in the shell of the socketed section, and passing transversely through a bolt in the base, and traversing its axis perpendicular to a slot formed in the ball for the pin of the socketed section.

Grinders for Cleaning Castings.—Geo. Miller, Providence, R. I.—This invention relates to improvements in the grinding or rattling machines used for grinding and polishing castings, and consists in the arrangement of the cylinders, when mounted on friction rollers, with an opening in one end for loading and unloading them, so that the cylinders, which, being arranged, as they are, on the friction rollers, to have motion imparted to them, may be readily raised up and placed on end, may be filled or emptied while standing.

Cooking Stove.—Benj. F. Warren, Fishkill-on-the-Hudson, N. Y.—This invention relates to improvements in cooking stoves, and consists in the application thereto, under an elevated rear plate and over the oven, in a way not to take up any of the space of the stove available for other purposes, of a magazine for holding fuel, the bottom of which is hinged or pivoted at the back part, and shelving downward and resting at the front on a rear elevation of the grate, and extending the whole length of the same, whereby the fire may be continuously fed at the back from the magazine, and the latter may have a shaking motion imparted to it by the shaking of the grate.

Water Wheel.—Alfred Kneass, Northumberland, Pa.—This invention relates to improvements in that class of water wheels in which the application of the water is designed to be such as to impart both direct and reactionary force, and it consists in a peculiar arrangement of curved buckets receiving the water at the periphery from a scroll in a direct-acting way, and discharging toward the center through issues common to two or more buckets, and above and below a central disk, by which the buckets and rim are attached to the vertical shaft.

Hinges.—S. D. Van Pelt, Anderson, Ind.—This invention relates to improvements in blind and door hinges, and consists in forming the leaves or parts which are attached to the doors or blinds, and frames in some cylindrical form, so that they may be fitted by boring round holes between the doors or blinds and the frames, half in each, when the doors or blinds are fitted and wedged up to the frames. The invention also consists in an arrangement of lugs and notches on the blind hinges, for locking them open or closed, and in a locking stud on the pintle to prevent the blind from being lifted off, except when a slot in the one part coincides with the locking stud on the pintle.

Sulky Cultivator.—N. G. Blauser, Etna, Ohio.—This invention has for its object to furnish an improved cultivator, light, strong, and durable of easy draft, fully under the control of the driver, and guarded from breakage should the shovel strike an obstruction.

Folding Counter Stool.—John L. Young, New York city.—This invention has for its object to furnish an improved folding counter stool, which shall be simple in construction, reliable and efficient in use, not liable to get out of order, and which, when not in use, may be folded up close to the counter, so as to be entirely out of the way.

Life-Preserving Skirt.—Sarah E. Saul, Brooklyn, N. Y.—This invention relates to a new and useful improvement in means for preventing persons from drowning, and consists in a skirt made buoyant by any suitable means so that it will support a person up in the water.

Adjustable Door Sill.—Maurice Armstrong, Girard, Ill.—The object of this invention is to provide efficient means for excluding mud and water from beneath outside doors, and consists in an adjustable sill for the door, which, by means of a hook attached to thedoor, is made to rise and form a close joint with the bottom of the door

Glass Lantern.—McClintock Young, Frederick, Md.—This invention relates to a new and useful improvement in lanterns, whereby they are made cheaper and more useful than the ordinary globe or glass lanterns have hitherto been, and it consists in the construction and arrangement of the frame of the lantern so that the ordinary kerosene glass lamp chimney may be used instead of the common glass globe.

Side Saddle.—Fenwick Smith, Austin, Texas.—This invention relates to a new and useful improvement in side saddles, and consists in forming the saddle tree hollow, or with air chambers therein, and in the construction and arrangement of parts.

Floating Tide Dock.—William Rickard, Jersey city, N. J.—This invention relates to a new and useful improvement in docks for repairing or building canal boats and other marine vessels, more designed for repairing canal boats, and it consists in a water-tight floating dock, with a gateway for the entrance of the boat or vessel.

Carpet Underlie.—Nelson Edwards, Jericho, Vt.—The object of this invention is to provide efficient means for preventing the rise of dust from carpets in sweeping or walking on them, and also for protecting the carpet and rendering it more durable than it would otherwise be; and it consists in an elastic underlie, of cellular construction, provided with self-closing slits or orifices.

Sawing Machine.—Moses N. Clark, Harrison city, Pa.—This invention has for its object to furnish a simple, convenient, and efficient machine to be operated by hand power, for sawing off logs and shingle stuff, and for various other purposes for which a crosscut saw is generally used.

Adding Machine.—Nels Ockerlund, New York city.—This invention has for its object to furnish a simple and convenient machine, by means of which numbers may be added and subtracted quickly and accurately, and which will enable the several amounts or differences to be registered as they are obtained.

Corn Planter.—W. H. Littel, Prairie Du Chien Wis.—This invention for its object to furnish a simple, convenient and effective corn planter, which shall be so constructed and arranged as to enable the corn to be readily planted in accurate check row, without its being necessary to previously mark out the ground either way.

Flour Sifter.—George Gessert, Edwardsville, Ill.—This invention relates to a new machine for dividing and cleaning the middling, and liberating it from specks, so that a grade of flour may be produced from middling fully equal to the first grade. The invention consists in the construction of a machine, whereby the middling is reboited and exposed to an adjustable draft.

Electro-Magnet.—Ludovic Charles Adrien Joseph Guyot-d'Arlincourt, Paris, France.—This invention relates to a new system or arrangement of electro-magnets applicable to every electric apparatus, with the view of obtaining more rapid operation than could hitherto be produced, of reducing the necessity of regulation and of providing a reservoir with a single current.

Safety Guard for Railway Car.—John Atwater Wilkinson, Wilson, N. Y.—This invention relates to a new attachment to railroad cars, whereby the same may be prevented from being thrown from the track over the embankment, and whereby the motion of the train is gradually stopped as soon as the wheels leave the rails. The invention consists in the application to the car or truck of a double, runner-shaped guard, arranged between the wheels, so that it will serve to support the car, when the wheels leave the rails, and to arrest it by friction on the sleepers.

Fire and Deck Pumps.—P. M. and Oscar Snell, Williamsburgh, Ohio.—This invention consists in the combination of a lever having a movable fulcrum placed in vertical slots, with a slide valve with which said fulcrum is directly connected; the object of the arrangement being to give the slide valve the movement requisite to opening and closing the cylinder ports of a force pump. The invention was examined by the United States Board of Inspectors, which met in Washington last fall, and they adopted a resolution recommending it to the attention of manufacturers and others.

Harrow and Shovel Cultivator.—Albert B. Baum, Grantville, Pa.—This invention consists of bars mounted transversely of a frame so as to turn freely therein, except when prevented from rotating by means provided, each with two different sets of teeth projecting from opposite sides of the bars, one set being pyramidal, or such as are ordinarily used in harrows, and the other set being shovels such as are ordinarily used in cultivators, the object of this arrangement being to use either kind of teeth as may be expedient.

Machine for Packing Salt.—John McGrew, West Columbia, West Va.—This invention consists in a series of self-adjusting vertically sliding hammers which receive motion from a horizontal crank shaft; also in providing the hammers with wedge-shaped projections for packing salt into the bulges of the barrel; also in vertically adjustable tubes for conducting salt into the barrel; also in a rotating table for the barrel to stand on in order to insure a packing of uniform density.

Washing Machine.—Henry J. Moreland, Whitehall, Ill.—This invention consists of a suds box of oblong rectangular form provided at its ends with oppositely inclined slotted washboards, against which the clothes placed in the suds box are pressed by a reciprocating beater, said beater being fitted to slide upon guide ways and operated by means of a hand lever.

Wagon Brake.—Henry Racine, Paola, Kansas.—This invention relates to a brake apparatus which is connected with the neck-yoke of the draft animals by a rod running forward under the tongue, and is operated by the rearward movement given to the said connecting rod by the holding back of the animals when going down hill, there being also in the combination a mechanism for preventing the application of the brakes when the animals are backing, by which mechanism also the brakes may be applied independently of the said connecting rod.

Adjustable Muley-Saw Head.—Philip and Michael C. Jobson, Lock Haven, Pa.—This invention has for its object to render a muley-saw head adjustable horizontally for the purpose of regulating the overhang of the saw according to the length of the feed.

Spirit Evaporating Chamber.—Joseph Dawson, Alexandria, Va.—The improvements relate to the evaporating chamber, which allows the liquid to present a larger evaporating surface in proportion to its quantity than has heretofore been attained; also to a device for preventing the wash from boiling over into the spirit chamber, and for returning the wash cooled to the evaporating chamber, when, through excess of heat, it has boiled up out of the same; also to a device which prevents the spirits from entering the cooling chamber and, at the same time, allows the wash to escape therefrom.

Chameleon Whirligig.—Ludwig O. Franke, Baltimore, Md.—This invention consists of two metallic disks placed together so that their peripheries coincide, and connected together by means of eyelets so as to form a whirligig which has its outer surfaces graduated and colored, so that as it is revolved it will constantly present to the eye new arrangements of colors which bear the appearance of rings.

Horse Power.—Robert Quinn, Whitefield, Miss.—This invention has for its object to furnish an improved horse power which shall be so constructed and arranged as to remove the necessity of building the houses for cotton gins, mills, and other machinery driven by horse power two stories high, while at the same time protecting the horse power machinery to be driven and material to be operated upon from the dust.

Folding Carriage Top.—T. H. Wood, New York City.—This invention relates to a new carriage top which is so constructed that its front part can be folded down over the driver's seat, while the front sashes are concealed in a pocket that is provided for their reception. The object of the invention is to so construct a closed carriage that it can be converted into an open phaeton without taking off or removing any part of the cover. It can then be reclosed whenever desired, while the carriage is under way.

Apparatus for Removing Oil from Oleaginous Seeds, Meals, etc.—E. S. Hutchinson, Baltimore, Md.—This invention relates to a novel apparatus for separating oil from seeds, grain, meal, etc., and in fact from all vegetable oleaginous matter, by means of bisulphide of carbon or other chemical. The invention consists chiefly in the arranging the separating vats in pairs, so that a continuous process can be carried on, the two vats of each pair serving to supply each other.

Furnace for Reburning Bone Black and Reducing Ores.—Adam Weber, New York City.—This invention relates to improvements in furnaces for reburning bone black and reducing ores, such as patented to the same inventor the 4th day of June, 1867, No. 65,470. The invention consists in certain improvements in the construction and arrangements described in the aforesaid patent.

Rein Holder.—W. H. Cooper, Glover, Vt.—This invention has for its object to furnish a simple and convenient device for holding the reins when the driver wishes to leave the team standing.

Wagon Hub.—J. D. Ham, Bethany, Ga.—This invention relates to a new wagon hub which is so constructed that it can be set to always hold the rim concentric to the axle, and so that the spokes can be removed and replaced without disturbing the rim.

Combined Toy Money Box and Whistle.—J. H. Chappell, Brooklyn, N. Y.—This invention has for its object to furnish a simple and substantial toy for children which will serve as a toy ball to roll about, as a toy money box or savings bank, as a toy whistle, and which, when it contains some money, will serve as a rattle.

Mitering Machine.—John Holzberger, Newark, N. J.—This invention has for its object to furnish a simple and convenient device for holding the reins when to always produce a true miter, and also to make up for the wear of its parts. The invention consists in making the guide or gage, on which the articles to be mitered are held, adjustable to vary its angle.

Chimney Top.—C. W. Bache, Philadelphia, Pa.—This invention has for its object to provide a chimney top which will at all times furnish a free exit to the smoke, from whatever direction the wind may come. The invention consists in providing the four sides of the smoke stack with doors, and in connecting the opposite doors with each other in such manner that when one is closed by the force of the wind the other will thereby be opened to permit the escape of the smoke on the side opposite to the wind.

Washing Machine.—Emanuel and Sabisea Cool, Buckhannan, West Va.—This invention relates to a new washing machine which is provided with a spring washboard and with a vertically adjustable corruzated roller, all operating in such manner as to produce the requisite rubbing and stamping action and perfect adjustment of parts to the treatment of coarser or finer articles.

Cultivator.—C. L. Waffle, Sharon Center, Ohio.—This invention has for its object to furnish an improved cultivator which shall be so constructed and arranged that it may be readily adjusted for simply stirring up, loosening, and pulverizing the soil, and for throwing the soil around the plants; and which shall at the same time be simple in construction and easily operated, and effective in operation in either capacity.

Self-Oiler for Railroad Car Journal Boxes.—Charles Ihrig, Jersey City, N. J.—This invention has for its object to construct a self-oiling journal box for the axle bearings of railroad cars, and consists in the application to the box of a pump for conveying the lubricating material from the lower to the upper part of the journal box, the said pump being operated by the vertical movement of the car or truck body.

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.

R. D., of Mich.—We presume the process of making oxygen, mentioned in the article referred to by you, is the one claimed to have been discovered by MM. Ciomadene and Moret, in France, for obtaining oxygen from sulphuric acid. Porous matter, such as pumice stone, is saturated with the sulphuric acid, and heated. The resulting sulphurous acid and oxygen are collected separately, and it is proposed to re-convert the sulphurous acid into sulphuric acid. We have serious doubts as to whether this process can ever prove successful, as an economical method of producing oxygen.

C. E. G., of Ct.—A small portable flue boiler as badly scaled as you describe yours to be, is probably spoiled. There are remedies innumerable prescribed, but we know of none that can be relied upon in all cases. Boiling with soda without pressure, as you propose, will hardly, we think, do the business. Boiling with slippery elm bark has sometimes the effect to loosen a scale, but it also often fails. Boiling with oak bark or twigs will also sometimes loosen a scale. Tannin is also used sometimes with effect, but such a scale, in our experience rarely has yielded to anything of this kind.

J. R., of N. Y.—Rock-cork is an old name for a variety of asbestos.

C. J., of Miss.—Unless the hose, which you propose to use as a siphon has enough rigidity to resist the atmospheric pressure, its walls will collapse. A metal pipe would be better. You might, however, prevent collapse in the hose by the use of coiled wire on the interior. There is no doubt that you can drain the land you speak of, by the use of a siphon, extended over the levee, the hight of which is only fifteen feet, and with one leg of the siphon six feet longer than the other. It is probably the best and cheapest plan you can use.

J. J. F., of Texas.—Your plan of filling the space between the outer and inner walls of safes with carbonic acid, instead of the ordinary filling, would not, as you suppose, prevent the application of the oxi-hydrogen blow pipe to the penetration of the outer or burglar-proof wall. The plan of putting materials into separate receptacles, connected by fusible plugs so that when heated they should come in contact, and generate carbonic acid gas, for the protection of the contents of safes, is also, in our opinion, an impracticable scheme.

G .T. B., of Mass.—We regard the habitual use of any laxative as bad, unless the state of the system imperatively demands it. The latter point can only be determined by a skillful physician. The extensive use of aperient medicines, is, we think, entirely unnecessary. The result aimed at may, in most cases, be secured in a more rational way, namely proper attention to diet, exercise and the general laws of health.

J. L. C., of Pa.—It is perfectly practicable to draw water to the hight of eighteen feet through a pipe one and one fourth inches in diameter, and seventy-five feet long, with a common small cast-iron pump. The tarnish of a silver watch is nothing extraordinary. The effect is due to sulphurous gases. The surface first turns a brownish yellow, which will, unless it be cleaned, deepen to a dirty black.

D. M., of Tenn.—Short-hand writing was known to the ancients. The short hand of the Romans was called "Tironian Notes," named it is supposed after Tiro, to whom the invention is credited. Manuscripts written in this hand date back as far as the seventh century. It is needless to say that it does not compare with the elegant and rapid modern systems of phonography.

C. L., of R. I.—"Oil of brick" is a name given by all chemists to empyreumatic oil, prepared by soaking bricks in oil, heating them to a high temperature, and condensing the vapors. It is used by lapidaries as a vehicle for the emery by which stones are sawn and cut.

T. H. S., of Ky.—The best way to coat small brass articles with tin is to boil them in a solution of cream tartar, containing scraps of block tin. If the articles are not finished after casting, they must be scaled with nitric acid, thoroughly washed, first in water, and next in water containing a potash, and afterward dried off in sawdust.

G. H., of Va.—Gas meters are tested at a fixed standard temperature, so that the volume they pass at each oscillation of the bellows is a constant. It is a mistake for a consumer to place a meter in a hot place, as the expansion of the gas will increase his bills.

D. E. P., of N. J.—Where fire insurance companies require the party walls of frame buildings to be bricked in, and two houses are placed together, the bricking in of one wall will not answer the requirement. Each wall must be bricked.

R. H. I., of Pa.—Your opponent is right. The word plank, in architecture, has a definite technical meaning. It is defined as a board exceeding nine inches in width. It is, however, commonly used by builders without regard to width.

E. G. S., of ——.—We do not believe a hair dye exists that is really efficacious in coloring the hair, that does not contain either lead or some other mineral poison.

Business and Personal.

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

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4·00 a year. Advertisements 10c. a line.

A New Waltham Watch, made especially for Railroad Men and Engineers, is fully described in Howard & Co.'s Price List of Waltham Watches. Every one interested should send for a copy, which will be mailed to any address free. Address Howard & Co., 785 Broadway, N. Y.

Our Windmill pumps water for railroads, country and city buildings, hotels, stock fields, drainage, and irrigation. Self-regulating, durable, and well tested. Con. Windmill Co., 5 College Place, New York.

The Entire Right of the best Wrench ever patented for sale. For drawings address J. F. Ronan, 36 Orchard st., Boston, Mass.

For the neatest, most durable, and cheapest curtain holder now in use; also, relative to prices, agencies, etc., address Yount & Keeports, Littlestown, Pa.

For Sale—The entire right of Parsons' Patent Tool Adjuster for Lathes. Drawings and description sent on application. Address C. H. Standish, New Haven, Conn.

Upright Forge Hammers, improved Drop Presses. Send for circular. Charles Merrill & Sons, 556 Grand st., New York.

Send 50c. for silver-plated sample (free by mail) of "The Safety Shutter Bow." It holds the shutters securely, at various bows, and in such a way that they cannot be opened from the outside. Agents wanted. J. Pusey, 2,210 Brandywine street, Philadelphia, Pa.

Cotton Compresses, Gove's Patent, for shipping and plantation use. Equal to hydraulics. Built to order by John H. Gove, Lynn, Mass.

Wanted Immediately—New or 2d-hand slotting machine, to slot not less than 16 inches. Address, with full description and price, Fulton Iron and Engine Works, Detroit, Mich.

Wanted—A partner, with Capital, to introduce a patent of general utility. Address box 139, Staunton, Va.

Send prices of Spoke Planer, Hub Mortising Machine, and Corn Mill to S. C. Talmadge, Monticello, Jasper Co., Ga.

Correspondence solicited with parties having drills suitable for tunneling, driven by power. H. C. Freeman, La Salle, Ill.

Manufacturers of self-regulating wind mills, please send circulars to J. S. McClellan, Urbana, Ohio.

Manufacturers of Carriages, Buggies, and Wagons, send descriptive price list to T. T. Edmunds, Columbus, Ga.

Catlin's Patent Self-closing Barrel Filler for filling packages with liquids of any kind. See other advertisement, and address, for circular, S. C. Catlin, Cleveland, Ohio.

Rawhide Sash Cord has no equal for heavy windows or dumb-waiters. Makes the very best round belting. Darrow M'f'g Co., Bristol, Ct.

Dickinson's Patent Shaped Carbon Points and adjustable holder for dressing emery wheels, grindstones, etc. See Scientific American, July 24th, and Nov. 20, 1869. 61 Nassau st., New York.

Peck's patent drop press. Milo Peck & Co., New Haven, Ct.

Stationary Engine and Boiler, 2d-hand, in first-rate order, cylinder 15x24. For sale cheap. Address Howard Iron Works, Buffalo, N. Y.

Artificial Skin, absolutely water-proof. Applied immediately. Bruises, cuts, & burns, 50c. by mail. Try it. Ward & Co., Skaneateles, N. Y.

Japanese Paper Ware—Spitoons, wash basins, pails, milk pans, etc. Perfectly water-proof, and will not break or rust. Send for circulars. Jennings Brothers, 352 Pearl st., New York.

Pictures for the World.—Prang's latest publications: "Wild Flowers," "Water Lilies," "Chas. Dickens," for sale everywhere.

"Your $50 Foot Lathes are worth $75." Good news for all. At your door. Catalogues Free. N. H. Baldwin, Laconia, N. H.

Foundery and Machine Shop for sale, with fine lot of patterns. Is doing a good business; excellent location for general jobbing, and for m'f'g agricultural implements. Address S. Moore & Bro., St. Peter, Minn.

Patent Water-proof Building Paper for Carpet for halls and stairways, shoe stiffening, walls, ceilings, and roofs, manufactured by Mc Nell, Irving & Rich. Patentees, Elwood, Atlantic Co., N. J., or 59 Duane st., New York, 520 Commerce st., Philadelphia, Pa.

The Best Hand Shears and Punches for metal work, as well as the latest improved lathes, and other machinists' tools, from entirely new patterns, are manufactured by L. W. Pond, Worcester, Mass. Office, 98 Liberty st., New York.

Wm. Roberts & Co., Designers and Engravers on Wood, 36 Beekman st., New York, would respectfully announce that they are now prepared to receive orders from Manufacturers, and others, for engraving of machinery, views of stores, factories, trade marks, etc., etc.

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Temped Steel Spiral Springs for machinists and manufacturers. John Chatillon, 91 and 93 Cliff st., New York.

One 60-Horse Locomotive Boiler, used 5 mos., $1,200. Machinery from two 500-ton propellers, and two Martin boilers very low. Wm. D. Andrews & Bro., 414 Water st., New York.

Kidder's Pastilles.—A sure relief for Asthma. Price 40 cents by mail. Stowell & Co., Charlestown, Mass.

For solid wrought-iron beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Keuffel & Esser, 71 Nassau st., N. Y., the best place to get 1st-class Drawing Materials, Swiss Instruments, and Rubber Triangles and Curves.

For tinmans' tools, presses, etc., apply to Mays & Bliss, Plymouth, st., near Adams st., Brooklyn, N. Y

Glynn's Anti-Incrustator for Steam Boiler—The only reliable preventative. No foaming, and does not attack metals of boiler. Liberal terms to Agents. C. D. Fredricks, 587 Broadway, New York.

To ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's manufacturing news of the United States. Terms $4·00 a year.

Cold Rolled—Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.

For mining, wrecking, pumping, drainage, and irrigating machinery, see advertisement of Andrews' Patents in another column.

It saves its Cost every sixty days—Mitchell's Combination Cooking Stove. Send for circular. R. B. Mitchell, Chicago, Ill.

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Issued by the United States Patent Office.

FOR THE WEEK ENDING July 26, 1870.

Reported Officially for the Scientific American

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105,619.—PAPER FRUIT BASKET.—Alfred Adams, Chagrin Falls, and Joseph F. Jewett, Cincinnati, Ohio.
105,620.—CIGAR MACHINE.—Julian Allen and John Fanning, Brooklyn, N. Y., assignors to the American Cigar Machine Company, New York City.
105,621.—SEED PLANTER.—Prudden Alling, Norwalk, Ohio.
105,622.—APPARATUS FOR REDUCING WOOD TO PULP.—Gustavus Ames, New York City, assignor to himself and William H. Cilley, Northfield, N. H.
105,623.—ADJUSTABLE DOOR SILL.—Maurice Armstrong, Girard, Ill.
105,624.—CHIMNEY COWL.—Christian W. Bache, Philadelphia, Pa.
105,625.—TELEGRAPH INSULATOR.—William W. Baldwin, Cleveland, Ohio.
105,626.—STEAM GENERATOR.—Nelson H. Barbour, New York City. Antedated July 19, 1870.
105,627.—MACHINERY FOR CUTTING WAX INTO SHEETS.—W. F. Barnes (assignor to himself and Susan H. Clark), Rockford, Ill.
105,628.—NEEDLE THREADER.—Nelson Barnum, La Porte, Ind.
105,629.—PRUNING SHEARS.—H. W. Black, Cecilton, Md., assignor to himself and E. T. Evans, Middletown, Del.
105,630.—SULKY CULTIVATOR.—N. G. Blauser, Etna, Ohio.
105,631.—SEWING MACHINE.—Thomas Bletcher (assignor to himself and William Biddell), London, England. Antedated July 19 1870.
105,632.—POWER PRESS.—E. W. Bliss (assignor to Mays, Bliss & Co.), Brooklyn, N. Y.
105,633.—CUTTING ASHLARS.—William Boulton, Tompkinsville, Staten Island, N. Y.
105,634.—COMPOUND FOR MANUFACTURE OF PAINTS.—A. H. Bourne, Fort Scott, Kansas. Antedated June 9, 1870.
105,635.—RAILWAY CAR STARTER.—C. B. Broadwell, New Orleans, La.
105,636.—SPRING BED BOTTOM.—Mortimer Cahill, Kalamazoo, Mich. Antedated July 14, 1870.
105,637.—DESIGN DIE FOR ORNAMENTING.—B. F. Calley, Saugus, Mass.
105,638.—GAGE FOR PRINTING PRESSES.—Andrew Campbell, Brooklyn, N. Y.
105,639.—SHEEP SHEARS.—Daniel Campbell, Elizabeth, N. J., assignor to Henry Seymour & Co., New York city.
105,640.—STEAM HEATER.—B. F. Campbell and Charles Whittier, Boston, Mass.
105,641.—RECEPTACLE FOR MEASURING OUT SHOT.—E. C. Carleton (assignor to William Stewart & Co.), Port Huron, Mich.
105,642.—STEAM GENERATOR.—John Carroll, Detroit, Mich.
105,643.—HULLING MACHINE.—J. E. Carver (assignor to H. T. Pratt and J. C. Alden), Bridgewater, Mass.
105,644.—LAMP.—David Challinor, Birmingham, Pa.
105,645.—TOY MONEY BOX.—J. H. Chappell, Brooklyn, N. Y.
105,646.—WASHING MACHINE.—W. B. Cheeseman, Winona, Minn.
105,647.—SAWING MACHINE.—M. N. Clark, Harrison City, Pa.
105,648.—WATER PROOF CEMENT.—T. S. Clark, Charlestown, Mass.
105,649.—SAD IRON.—John Conner, Richmond, Ind. Antedated July 15, 1870.
105,650.—WASHING MACHINE.—Emanuel Cool and Sabisea Cool, Buckhannan, West Va.
105,651.—REIN HOLDER.—W. H. Cooper, Glover, Vt.
105,652.—CHURN.—W. H. Curtin, Clement, and William Lammers, Breese, Ill.
105,653.—RELAY MAGNET.—L. C. A. J. G. D'Arlincourt, Paris, France.
105,654.—ADJUSTABLE REEL POST FOR HARVESTERS.—J. W. Davis, Dublin, Ohio.
105,655.—EGG BEATER.—G. K. Dearborn, Pawtucket, assignor to Timothy Earle, Smithfield, R. I.
105,656.—CRAMP HOOK FOR TELEGRAPHIC WIRE INSULATORS.—W. H. DeChant (assignor to David Brooks), Philadelphia, Pa.
105,657.—PLANING AND MOLDING MACHINE.—Frank Douglas, Norwich, Conn.
105,658.—WOOD PAVEMENT.—Henry Dowson, Springfield, Ill.
105,659.—MACHINE FOR CRUSHING MINERAL AND OTHER HARD SUBSTANCES.—D. C. Ebaugh, Charleston, S. C.
105,660.—DEVICE FOR PREVENTING PLOWS FROM CHOKING.—W. M. Eccles, St. Louis, Mo.
105,661.—CARPET "UNDERLIE".—Nelson Edwards, Jericho, Vt.
105,662.—FARM GATE.—G. J. Fiedler, Danby, Ill.
105,663.—ELECTRO-MAGNETIC MOTOR.—Louis Finger, Cambridge, Mass.
105,664.—ELECTRO-MAGNETIC APPARATUS FOR MOVING PANORAMAS.—Louis Finger, Cambridge, Mass.
105,665.—MOVABLE SCREEN FOR PHOTOGRAPHERS.—E. J Foss, Cambridge, Mass. Antedated January 26, 1870.
105,666.—DEPURATOR.—S. C. Frink, Indianapolis, Ind.
105,667.—FLOUR SIFTER.—George Gessert, Edwardsville, Ill.
105,668.—MACHINE FOR ROLLING PLOW BEAMS.—William Gilman, Ottawa, Ill.
105,669.—VAPOR BURNER.—L. A. Gouch, Yonkers, N. Y.
105,670.—MANUFACTURE OF SOAP.—Louis Groux, New York city.
105,671.—BOOT JACK AND SPUR.—Timothy Gunn, Hamilton county Ind.
105,672.—COAL STOVE.—Joseph Hackett, Louisville, Ky.
105,673.—PLOW.—J. D. Hall (assignor to William Kingsworth), Canton, Ohio.
105,674.—WAGON HUB.—J. D. Ham (assignor to himself, Eli McCroan, and W. A. Wilkins), Bethany, Ga.
105,675.—BOLT.—Mathew Harbster (assignor to Harbster Brothers & Co.) Reading, Pa.
105,676.—SCHOOL SEAT.—C. G. Harrington and David Mills, Northville, Mich.
105,677.—CHAIR AND LOUNGE.—M. P. Harley, Philadelphia, Pa.
105,678.—OVEN OR STOVE FOR HEATING THE BLAST OF BLAST FURNACES.—J. M. Hartman, Philadelphia, Pa. assignor to George W Whitaker.
105,679.—MODE OF ATTACHING HOLD BACK RINGS TO HAMES.—W. B. Hayden, Columbus, Ohio.
105,680.—HORSE POWER.—J. R. Hedges, Glenwood, assignor to himself and Valentine & Sparks, Buffalo, N. Y.
105,681.—CIGAR BOX.—Eugen Henkel, North Scituate, R. I.
105,682.—WINDLASS.—Alonzo Hitchcock, New York city.
105,683.—OIL STILL.—John Hofferberth, Baltimore, Md.
105,684.—DUMPING WAGON.—Britain Holmes Buffalo, N. Y.
105,685.—STEAM GAGE.—J. P. Holt, Cleveland, Ohio.
105,686.—MITERING MACHINE.—John Holzberger, Newark, N. J.
105,687.—GLOVE.—D. S. Hulett, Gloversville, N. Y.
105,688.—APPARATUS FOR REMOVING OIL FROM SEEDS, MEAL, ETC.—E. S. Hutchinson, Baltimore, Md.
105,689.—RAILROAD CAR JOURNAL BOX.—Charles Ihrig, Jersey City, N. J.
105,690.—GRAIN DRILLING MACHINE.—Joseph Ingels, Milton, Ind.
105,691.—PADLOCK.—Joseph Ingels, Milton, Ind.
105,692.—LAMBREQUIN.—H. M. Johnston, New York city. Antedated July 11, 1870.
105,693.—LAMBREQUIN.—H. M. Johnston, New York city Antedated July 11, 1870.
105,694.—WATER WHEEL.—G. H. Jones, Rose, N. Y.
105,695.—BOXING FOR COVERING THE SHAFTING OF MACHINERY.—M. R. Jones, Darien, Wis.
105,696.—UNIVERSAL SHAFT COUPLING.—M. A. Keller, Littlestown, Pa.
105,697.—COMPOUND SWITCH FOR ELECTRIC BATTERIES.—Jerome Kidder, New York city.
105,698.—WATER WHEEL.—Alfred Kneass, Northumberland, Pa.
105,699.—METALLIC RAILWAY CAR.—B. J. La Mothe, New York city.
105,700.—TRACE-SUPPORTING STUD.—Josiah Letchworth, Buffalo, N. Y.
105,701.—COMBINED HOBBY HORSE AND CARRIAGE MOTOR.—John Liming, Philadelphia, Pa.
105,702.—CORN PLANTER.—W. H. Little, Prairie Du Chien Wis.
105,703.—CORN AND SEED PLANTER.—Wilber C. Lockwood, Spring Mills, Mich.
105,704.—CROSS-CUT SAW.—Peter Longwell, Poplar, Ohio.
105,705.—DEVICE FOR PREVENTING THE UNCOUPLING OF CLUTCHES IN SPINNING MULES.—Hezekiah Macon and Joshua Hunt Providence, R. I.
105,706.—CAR COUPLING.—Malancthon B. Malott, Richmond, Ind.
105,707.—WOOD PAVEMENT.—Duncan McKenzie, Brooklyn, N. Y.
105,708.—ROTARY ENGINE.—Edwin D. Mead, Shortsville, N. Y.
105,709.—GRAIN DRYER.—Robert Milburn and Thomas Browning, No. 76 Church Lane, Whitechapel, Great Britain.
105,710.—PADLOCK.—D. K. Miller, Reading, Pa. Antedated July 22, 1870.
105,711.—GRINDER FOR CLEANING CASTINGS.—George Miller, Providence, R. I.
105,712.—WATER WHEEL.—George Miller, Providence, R. I.
105,713.—TAP-NOZZLE FOR CANS.—Herman Miller, New York city.
105,714.—METALLIC STANDARD FOR WAGON BOXES.—Edward Milner, Marquette, Mich.
105,715.—ATTACHMENT FOR SEWING MACHINE.—Schamu M. Moscheowitz, New York city.
105,716.—CORN HARVESTER.—Nelson Newman, Springfield, Ill.
105,717.—ADDING MACHINE.—Nels Ockerlund, New York city.
105,718.—REED MUSICAL INSTRUMENT.—Isaac T. Packard, Chicago, Ill.
105,719.—PLANKING SET.—E. H. Parker, Bucksport, Me. Antedated July 18, 1870.
105,720.—TREATING AND PRESERVING GRAIN IN BULK.—Charles F. Parrott (assignor to himself and John F. Kohler), New York city.
105,721.—TABLET LOCKET FOR PHOTOGRAPHS, ETC.—G. W. Pitcher, Brooklyn, N. Y.
105,922.—HORSE HAY FORK.—H. G. Porter, Grand Rapids, Mich.
105,723.—HAY CARRIER.—T. J. Powell, Naples, N. Y., assignor to George Smith, Providence, R. I., and J. C. DeLanz, Detroit Mich.
105,724.—HORSE POWER.—Robert Quinn, Whitefield, Miss.
105,725.—FLOATING TIDE DOCK.—William Rickard (assignor to himself and E. K. Meigs), Jersey City, N. J.
105,726.—MUSIC-LEAF TURNER.—E. B. Robinson, Portland Me

105,727.—Match Stick.—John K. Robinson, Middlebury, Ohio.

105,728.—Engine for Separating Fiber from Husks of Cotton Seed.—Thomas Rose and Robert Emerson Gibson, Earlstown, England.

105,729.—Process for Separating the Fiber from the Husk in Cotton-Coated Seeds.—Thomas Rose and R. E. Gibson, Earlstown, England.

105,730.—Life-Preserving Skirt.—Sarah E. Saul, Brooklyn, N. Y. Antedated July 14, 1870.

105,731.—Table Caster.—Daniel Sherwood, E. P. Woods, and George D. Dudley (assignors to Woods, Sherwood & Co.), Lowell, Mass.

105,732.—Table Caster.—Daniel Sherwood and George D. Dudley (assignors to Woods, Sherwood & Co.), Lowell, Mass.

105,733.—Horse Hay Rake.—A. J. Shunk, Des Moines, Iowa.

105,734.—Side Saddle.—Fenwick Smith, Austin, Texas.

105,735.—Automatic Gate.—Pratt A. Spicer and Montgomery Crossman, Marshall, Mich.

105,736.—Rifled Cannon.—A. C. Stimers, Castleton, N. Y. Antedated July 22, 1870.

105,737.—Heating Stove.—Carl L. Svensson (assignor to J. Q. C. Searle), Topeka, Kansas. Antedated July 21, 1870.

105,738.—Heating Furnace.—William A. Sweet, Syracuse, N. Y.

105,739.—Velocipede.—Ephraim Tarbox, Charlestown, Mass.

105,740.—Farmers' Boiler.—L. W. Thickins, Batavia, Ill., assignor to David R. Sperry.

105,741.—Sewing Machine.—Cyrus B. True, Boston, Mass.

105,742.—Dish-Washing Machine.—Sophia S. Tupper, Churchville, N. Y.

105,743.—Hinge.—S. D. Van Pelt, Anderson, Ind.

105,744.—Hollow Augur.—Isaac H. Van Wie, Clarksville, N. Y.

105,745.—Cultivator.—Charles L. Waffle, Sharon Center, Ohio.

105,746.—Cooking Stove.—Benjamin F. Warren, Fishkill, N. Y.

105,747.—Furnace for Reburning Bone Black and Reducing Ores.—Adam Weber, New York city.

105,748.—Stove Leg.—Frank Whalen, Ballston Spa, N. Y.

105,749.—Land Roller.—Elisha Whitcomb and D. A Gunn, Waterville, Ohio.

105,750.—Lubricator.—John B. Wickersham, Philadelphia, Pa. Antedated July 11, 1870.

105,751.—Churn.—Milton Jones Wikoff, Stout's Postoffice, Ohio.

105,752.—Miter Box.—E. M. Wilcox, Bloomer, Wis.

105,753.—Safety-Guard for Railway Cars.—J. A. Wilkinson, Wilson, N. Y.

105,754.—Railway Crossing.—R. P. Williams, Great George Street, Westminster, England. Patented in England, Feb. 24, 1869.

105,755.—Metallic Plate Screen for Screening Paper Pulp.—A. St. C. Winchester (assignor to himself and J. S. Parsons), Boston, Mass.

105,756.—Gas Apparatus for Railroad Cars, etc.—J. S. Wood (assignor to himself and John J. Carberry), Philadelphia, Pa.

105,757.—Gas Apparatus for Railroad Cars, etc.—Joseph S. Wood (assignor to himself and John J. Carberry), Philadelphia, Pa.

105,758.—Folding Buggy-Seal.—Thomas H. Wood, New York city.

105,759.—Preparing Rawhide for use in Chair Seats.—R. F. Wright, Charlestown, and John Rowe, Jr., Wilmington, Mass., assignors of three-fifths of their right to S. H. Woodbury, W. T. Gray, and C. B. Drew.

105,760.—Boring and Mortising Machine.—S. M. Wright, Athens, Ohio.

105,761.—Folding Counter Stool.—John L. Young, New York city.

105,762.—Lantern.—McClintock Young, Frederick, Md.

105,763.—Refrigerator.—Ignazio Allegretti, Philadelphia, Pa.

105,764.—Vent for Casks.—William Ascough, Buffalo, N. Y.

105,765.—Traveling Belt Stop for Machinery.—Thomas E. Baden, Washington, D. C.

105,766.—Box Scraper.—J. R. Bailey (assignor to himself and S. A. Bailey), Woonsocket, R. I.

105,767.—Bench Plane.—J. R. Bailey (assignor to himself and S. A. Bailey), Woonsocket, R. I.

105,768.—Gas Burner.—J. F. Barker, Springfield, Mass.

105,769.—Apparatus for Immersing Shingles and other Articles in Liquids.—Caleb Bates, Kingston, Mass.

105,770.—Combined Harrow and Shovel Cultivator.—A. B. Baum, Grantville, Pa.

105,771.—Bedstead Fastening.—John Benjamin, Naples, N. Y.

105,772.—Automatic Fan.—George H. Briggs, Montgomery, Ala.

105,773.—Platform for Stoves.—Clark Brownell, Troy, N. Y.

105,774.—Machine for Flocking Wall Paper, Show Cards etc.—H. W. Bulkley, New York city.

105,775.—Harrow.—W. J. Burdick, Alfred, N. Y., assignor to himself and J. E. Morchesse.

105,776.—Liquor Pump.—Martin Cavanaugh, Philadelphia, Pa.

105,777.—Scissors Sharpening Attachment for Sewing Machines.—G. T. Chattaway, Brooklyn, N. Y.

105,778.—Spool of Thread for Sewing-Machine Shuttles.—D. M. Church (assignor to himself and Timothy Merrick), Holyoke, Mass.

105,779.—Culinary Vessel.—Emma Clark, Buffalo, N. Y.

105,780.—Organ, Melodeon, etc.—H. A. Clarke, Philadelphia, Pa.

105,781.—Lawn Mower.—Thos. Coldwell and G. L. Chadborn, Newburg, N. Y.

105,782.—Water Closet.—J. M. Davis (assignor to himself and J. C. Grannon), Cincinnati, Ohio.

105,783.—Alcohol and Spirit Still.—Joseph Dawson, Alexandria, Va.

105,784.—Corn-Harvester Cutter.—J. J. De Freitas, Springfield, Ill.

105,785.—Catamenial Sack.—W. A. Dinsmore (assignor to himself and Emily L. Geer), South Boston, Mass.

105,786.—Furnace for Salt Boiling.—W. J. Dodge, Syracuse, N. Y.

105,787.—Sash Lock.—G. W. Dubuison, Norwich, Conn.

105,788.—Rectifying Whisky, etc.—Henry Fake, Brooklyn, assignor to himself and C. A. Todd, New York city.

105,789.—Seat-fastening for Carriages.—J. H. Fellows, Alba, Pa.

105,790.—Manufacture of Straw & other Paper Board.—B. F. Field, Beloit, Wis.

105,791.—Railway Car Coupling.—J. C. Fisher and W. E. Kittridge, Milwaukee, Wis.

105,792.—Chameleon Whirligig.—Ludwig Ottmar Franke, Baltimore, Md.

105,793.—Carriage Axle.—Matthew Ross Freeman, Macon, Ga.

105,794.—Dish Fastener.—Christian R. Freet, Upper Strasburg, Pa.

105,795.—Argand Gas Burner.—Jim B. Fuller, Norwich, Conn.

105,796.—Rotary Engine.—William M. Fuller, New York city.

105,797.—Bottle Stopper.—William H. Gibbs, Cincinnati, Ohio.

105,798.—Bedstead Fastening.—Alexander Grillet, Philadelphia, Pa.

105,799.—Gun Lock.—Lewis Haller (assignor to W.C. Dodge), Washington, D. C.

105,800.—Lock Spindle.—J. L. Hall, Cincinnati, Ohio.

105,801.—Carriage Axle.—William N. Hall, Springfield, Texas.

105,802.—Machine for Sharpening Reaper Knives.—C. C. Hardy, Rutland, N. Y.

105,803.—Earth Closet.—George Baker Jewett, Salem, Mass.

105,804.—Saw Mill.—Philip Johson and M. C. Johson, Lockhaven, Pa.

105,805.—Machine for Bending Corrugated Metal Plates.—Asa Johnson, Brooklyn, N. Y.

105,806.—Fireplace.—A. B. Johnson, Washington, Ind.

105,807.—Hopper for Mills and Grain Drills.—R. P. Johnson, Griffin, Ga.

105,808.—Case for Turbine Water Wheels.—J. O. Joyce, Dayton, Ohio.

105,809.—Composition for "Encaustic" Painting.—W. H. F. Kehrwieder, Philadelphia, Pa.

105,810.—Drill for Seed Planters.—J. F. Keller (assignor to himself and Wm. Updegraff), Hagerstown, Md.

105,811.—Fertilizer Attachment to Seeding Machines.—John F. Keller (assignor to himself and William Updegraff), Hagerstown, Md.

105,812.—Self-acting Mule for Spinning.—P. J. Kent and N. W. Bancroft, Worcester, assignors to themselves, J. R. Kent, and J. G. Avery, Spencer, Mass.

105,813.—Valve for Steam and Other Pumps.—Lucius J. Knowles, Worcester, Mass.

105,814.—Stall for Preventing Cribbing.—John Kraus (assignor to himself and Henry Lapp), Clarence, N. Y.

105,815.—Spinning Machine.—W. La Banister and L. V. Doggett, Pacific, Wis.

105,816.—Heating Stove.—Silas Hoffman La Rue, Allentown, Pa.

105,817.—Pipe Coupling.—William A. Lighthall, New York city.

105,818.—Faucet.—J. H. Lord, San Francisco, Cal.

105,819.—Vapor or Gas Burner.—John C. Love, Philadelphia, Pa.

105,820.—Shuttle for Sewing Machines.—Lucius Lyon, New York city.

105,821.—Horse Collar.—C. K. Marshall, New Orleans, La., assignor to the Climax Horse Collar Co., New York city.

105,822.—Combined Hair Curler and Crimper.—Elisha Matteson (he having assigned two thirds of his right to Abraham Hoagland), Jersey City, N. J.

105,823.—Process of Coating Objects with Collodion and its Compounds.—John A. McClelland, Louisville, Ky. Antedated July 22, 1870.

105,824.—Turning Device.—Wm. H. McMillan and David Morris (assignors to Morris, Tasker & Co.), Philadelphia, Pa.

105,825.—Hand Corn Sheller.—W. A. Middleton, Harrisburgh, Pa.

105,826.—Weather Board Scribe.—Abraham Miller and Uriah Faris, Red Rock township, Iowa.

105,827.—Wrench.—C. H. Miller (assignor to himself and M. Doll), Buffalo, N. Y.

105,828.—Cultivator.—Isaac Miller, Worth, Mich.

105,829.—Awning for Cars, etc.—J. H. Monce, New York city

105,830.—Thawing Device for Hydrants and Fire Plugs.—J. C. Moore, Philadelphia, Pa. Antedated July 16, 1870.

105,831.—Washing Machine.—H. J. Moreland, Whitehall, Ill.

105,832.—Wagon-seat Fastening.—Fred Norris, Freedom Plains, N. Y.

105,833.—Horse Hay Rake.—Sherman R. Nye, Barre, Mass.

105,834.—Telegraph Insulator.—Samuel Oakman, Boston, Mass.

105,835.—Show Case for Ribbons, etc.—Geo. W. Pagett, Oxford, Ind.

105,836.—Manufacture of Hollow Felted Articles.—C. W. Palmer and H. E. Palmer, Lynn, and Charles Houghton Boston, Mass., assignors to Charles Houghton.

105,837.—Hay Loader.—Isaac J. Parker, Buffalo Grove, Iowa.

105,838.—Spade and Shovel.—John W. Pearce, Suisun, Cal.

105,839.—Cylinder for Mixing Fertilizers.—Leman B. Pitcher, Salina, N. Y.

105,840.—Mortar Mill.—Leman B. Pitcher, Salina, N. Y.

105,841.—Steam Engine Governor.—Wm. H. Place, New York city.

105,842.—Washing Machine.—Daniel B. Pond, Woonsocket, R. I.

105,843.—Plow.—Samuel W. Pope, Louisville, Ky.

105,844.—Subsoil Plow.—Elam M. Query, Harris Depot, N. C.

105,845.—Brake for Wagons.—Henry Racine, Paola Kansas.

105,846.—Machine for Pressing Seams and Cutting Welts for Boots and Shoes.—Edwin Reed, Kingston, Mass.

105,847.—Steam Governor.—A. F. Reeder, Normal, Ill.

105,848.—Sawing Machine.—Augustus Renetzky, Lincoln, Ill.

105,849.—Sulky Attachment to Plows.—J. H. Reynerson and John Worrel, Clayton, Ind.

105,850.—Cabinet Bedstead.—Andrew J. Roberts, Boston, Mass.

105,851.—Curing and Preserving Meat, etc.—Adolphe Rock, New Orleans, La.

105,852.—Tuck-creasing Attachment for Sewing Machines.—J. B. Safford, San Francisco, Cal.

105,853.—Spring Bed Bottom.—M. Van Buren Shepard, Chicago, Ill.

105,854.—Spring Curtain Fixture.—John Shorey, Lowell, Mass. Antedated July 15, 1870.

105,855.—Type Setting Machine.—John T. Slingerland, New York city.

105,856.—Pantaloons.—T. E. Sloan, Brooklyn, N. Y.

105,857.—Safety Measuring Funnel.—F. H. Smith, Burke, Vt.

105,858.—Machine for Ditching and Hedging.—William Stacy, Hardin county, Iowa.

105,859.—Cigar Machine.—G. W. Tanner and F. D. Bliss, Providence, R. I.

105,860.—Chuck.—S. P. M. Tasker, Philadelphia, Pa.

105,861.—Die Stock.—Stephen P. M. Tasker, Philadelphia, Pa.

105,862.—Mechanism for Retaining, Adjusting, and Sewing Parasols.—W. J. Tate (assignor to Wm. A. Drown & Co.), Philadelphia, Pa.

105,863.—Railroad Rail Splice.—G. O. Taylor, Hamilton, Va.

105,864.—Hot Air Furnace.—George G. Thomas, St Louis, Mo.

105,865.—Corn Marker.—Jesse B. Thomas, Centreville, Ind.

105,866.—Grain Drill.—John H. Thomas, Springfield, Ohio.

105,867.—Lamp.—G. W. Thompson, Buffalo, N. Y.

105,868.—Clamp for Bridges.—Lucius E. Truesdell, Chicago, Ill.

105,869.—Carpenters' Plane.—C. E. Tucker (assignor to himself and T. L. Appleton), Boston, Mass.

105,870.—Machine for Motive Power.—Horace Wickham, Jr., Chicago, Ill.

105,871.—Curtain Fixture.—John H. Wilhelm, Chicago, Ill.

105,872.—Corn Sheller.—John B. Wolford, Lancaster, Ohio.

105,873.—Machine for Nicking Screw Blanks.—Aurin Wood, Worcester, Mass.

105,874.—Percussion Cap.—B. F. Woodside, McDonald Station, Tenn. Antedated July 15, 1870.

105,875.—Candlestick.—Henry Zahn, San Francisco, Cal.

105,876.—Carriage Step.—W. W. Knowles, Plantsville, Conn.

REISSUES.

4,078.—Mechanical Movement.—H. J. Case, Nelson Chapin, and Charles Richardson, Auburn, N. Y., assignees of H. J. Case.—Patent No. 89,036, dated April 20, 1869.

4,079.—Paper-Folding Machine.—C. Chambers, Jr., Philadelphia, Pa.—Patent No. 15,843, dated Oct. 7, 1856.

4,080.—Medical Vacuum Apparatus.—J. G. Hadfield, Cincinnati, Ohio.—Patent No. 72,631, dated Dec. 24, 1867.

4,081.—Shank Spring.—Edward Heaton, New Haven, Conn.—Patent No. 75,266, dated March 10, 1868.

4,082.—Division A.—Steam Generator.—John B. Root, for himself and T. C. M. Paton, assignee of J. B. Root, New York city.—Patent No. 74,146, dated Feb. 4, 1868.

4,083.—Division B.—Steam Generator.—John B. Root, for himself and T. C. M. Paton, assignee of J. B. Root, New York city.—Patent No. 74,146, dated Feb. 4, 1868.

DESIGNS.

4,257.—Trade Mark.—John Adams, Birmingham, Pa.

4,258.—Carpet Pattern.—James Allinson (assignor to Jas. Bromley & Bros.), Philadelphia, Pa.

4,259.—Lamp.—J. S. Atterbury and T. B. Atterbury, Pittsburgh, Pa.

4,260.—Jelly Glass.—Wm. Doyle, Birmingham, Pa.

4,261.—Glass Ware.—W. M. Kirchner, Pittsburgh, Pa., assignor to the National Glass Co., Bell Aire, Ohio.

4,262.—Corn Husker.—A. T. Morris, Nevada, Ohio.

4,263.—Glass Ware.—John Oesterling, Wheeling, West Va.

4,264.—Tip of a Sword Scabbard.—Virgil Price, New York city.

4,265.—Sword Guard.—Virgil Price, New York city.

4,266.—Trade Mark.—H. C. Rogers, Village of Sauquoit, Paris, N. Y.

4,267.—Type.—Richard Smith, Philadelphia, Pa., assig no to MacKellar, Smiths & Jordan.

Inventions Patented in England by Americans.

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

PROVISIONAL PROTECTION FOR SIX MONTHS.

1,657.—Printing Telegraph Apparatus.—E. W. Andrews, Englewood, N. J., and G. B. Field, New York city. June 8, 1870.

1,661.—Woven and Knitted Fabrics and Yarns.—Louis Robbins, New York city, and John Southmayd, Elizabeth, N. J. June 8, 1870.

1,675.—Steam Boilers.—J. B. Root, New York city. June 9, 1870.

1,680.—Machinery for Raising Sunken Ships, etc.—J. T. Parlour, New York city. June 10, 1870.

1,687.—Embroidering Attachment for Sewing Machines.—N. Wheeler New York city. June 11, 1870.

1,708.—Forming Bats of Wool for Felting Purposes.—John Falconer, New York city. June 14, 1870.

1,716.—Fertilizer.—D. A. Ter Hoeven, Philadelphia, Pa. June 15, 1870.

1,709.—Apparatus for Forming Heels for Boots and Shoes, etc.—H. H. Bigelow, Worcester, Mass. June 15, 1870.

1,733.—Gas Burners.—F. C. Krause, New York city. June 17, 1870.

1,766.—Soap Making.—M. Hyde and Francis Hyde, Baltimore, Md. June 21, 1870.

1,734.—Steel Washers.—W. Butcher, Philadelphia, Pa., and G. W. Billings, Chicago, Ill. June 16, 1870.

1,736.—Paint Brushes.—J. J. Lowerre, Brooklyn, N. Y. June 16, 1870.

1,764.—Rigging Fastenings.—W. C. Ireland, Boston, Mass. June 21, 1870.

1,784.—Apparatus for Making Bessemer Steel.—A. L. Holley, Brooklyn, N. Y. June 22, 1870.

1,801.—Distilling Alcoholic Liquors.—S. F. Van Choate, Boston, Mass June 24, 1870.

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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.

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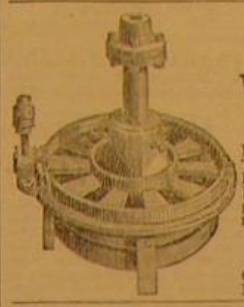

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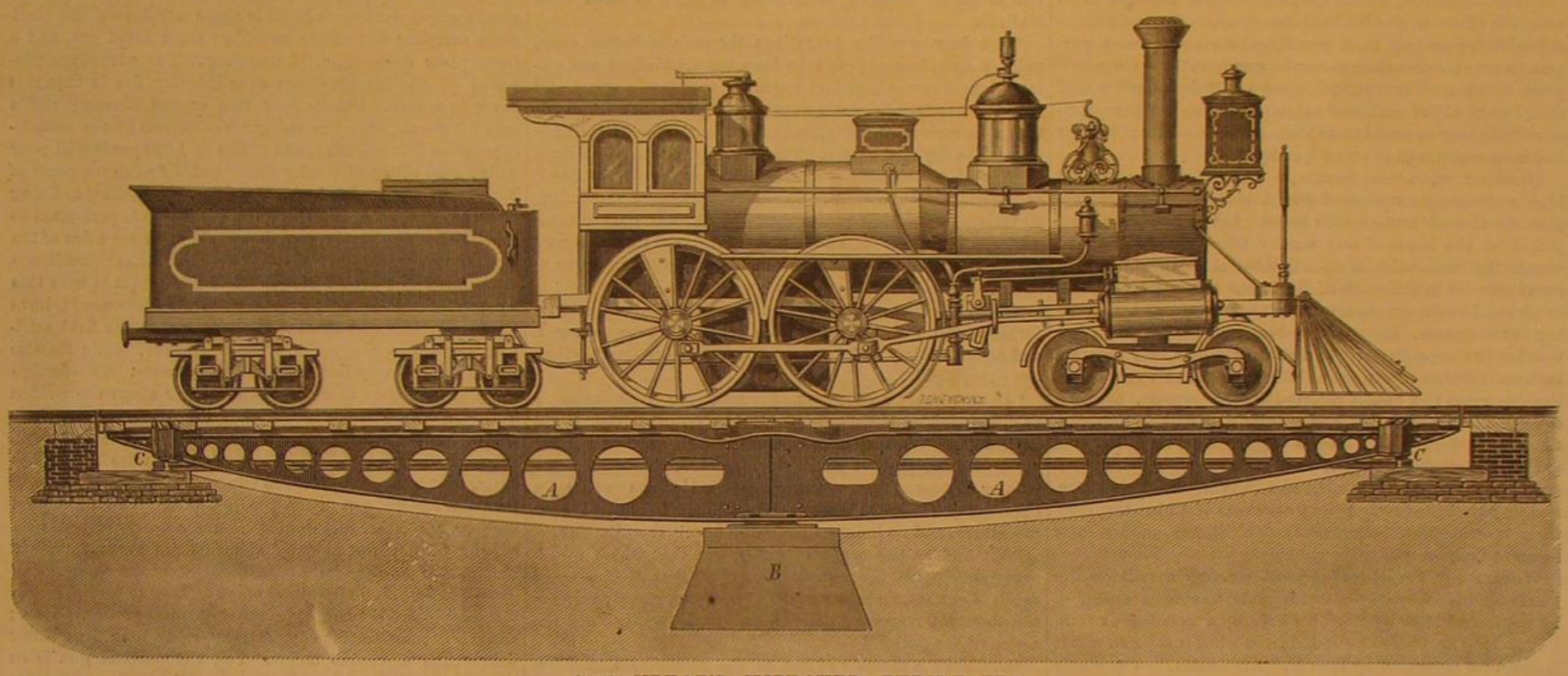

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The letters, A, in Figs. 1 and 2, represent the truss sections alluded to. They are so formed that when brought together and secured, end to end, the under side of the continuous beam thus formed is an arc of a circle, of which the upper side is a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

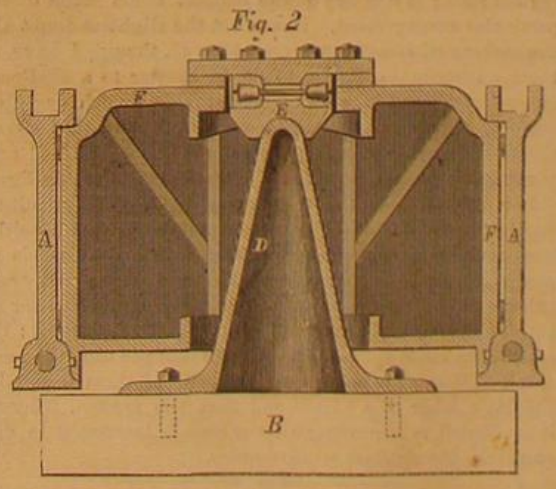
The inventor states that the friction is so reduced by this method of mounting the table that one weighing 25,000 lbs. may be turned with the point of a lead pencil without breaking the point.

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 1¼ 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

Fig. 2



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.

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 diagramed 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 ficing 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 unalloyed 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.

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 "honeycomb," 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 Dundrary 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.

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

"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 quality 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.

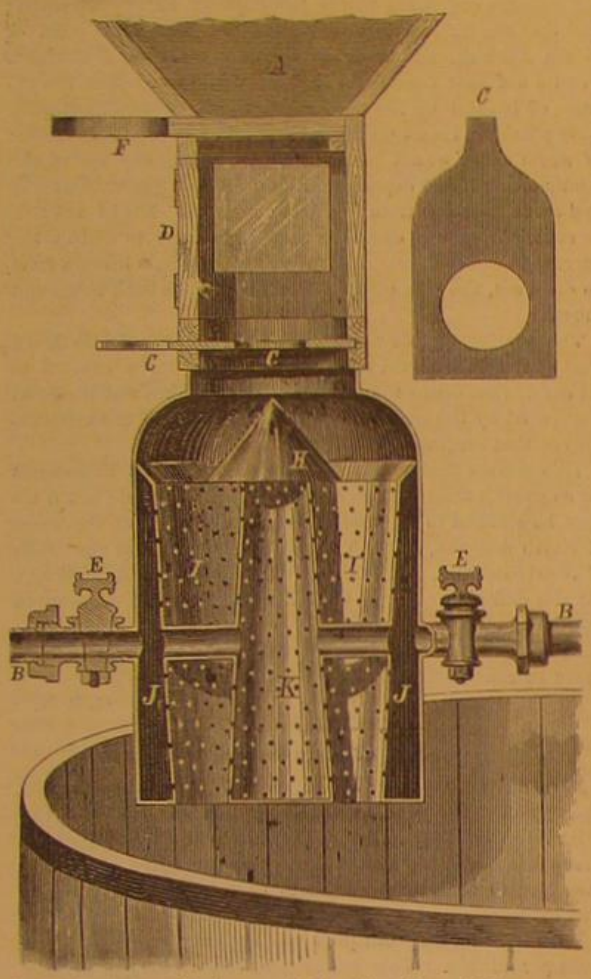
"But there was one change—the greatest of all—and to which all other changes are but means to an end—are but evidences more or less distinct, that this end has been accomplished, a change which I could not record, which can never be recorded, but which was to me, and to all who had ever seen the men, 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.

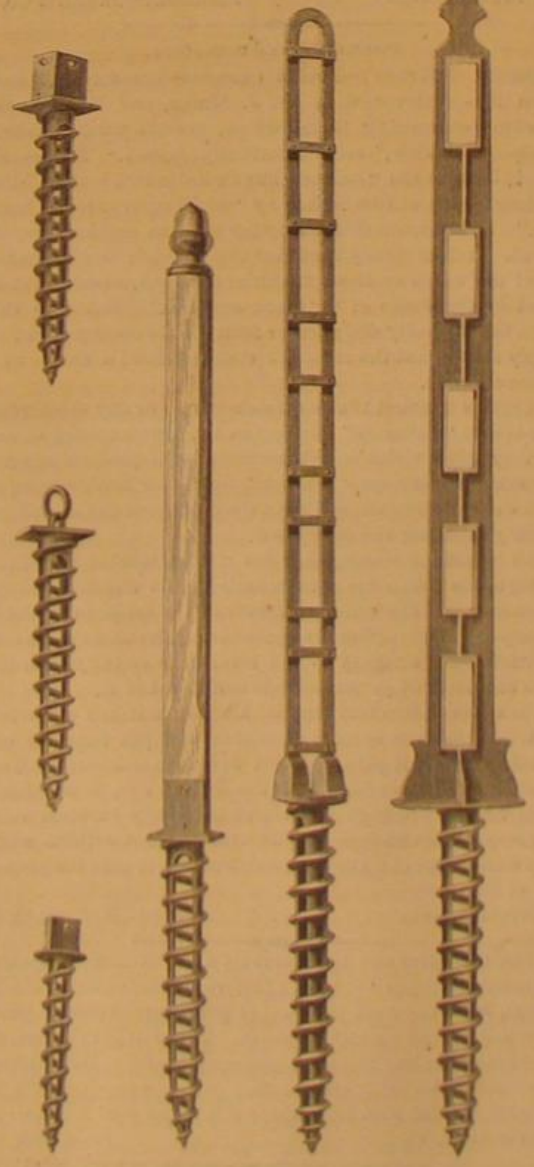
It is well known that a wooden post, having the butt sunk into the ground, will last for a few years only; the part in the earth will rot while the body of the post remains good. Many devices to make a cheap and durable post butt have been tried, but most have failed to give satisfaction.

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 slewed 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 4¼ 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 3¾ 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 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 overabundance 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.

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.

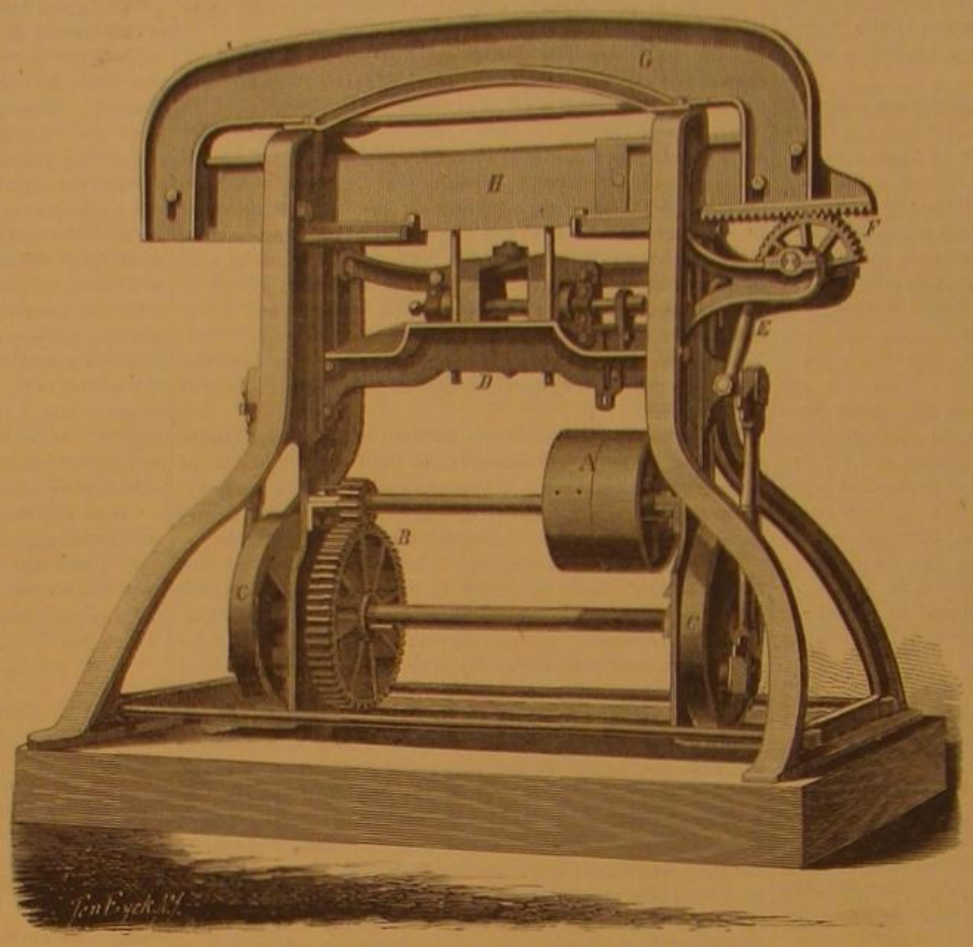
Each ascent of the table cuts a shingle, and the extreme thinness of the knife, rendered possible by straining it like a saw in the arched straining beam, obviates the checking and splitting, hitherto the chief objection to machines of this class.

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.



AUSTIN'S IMPROVED SHINGLE MACHINE.

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.

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.

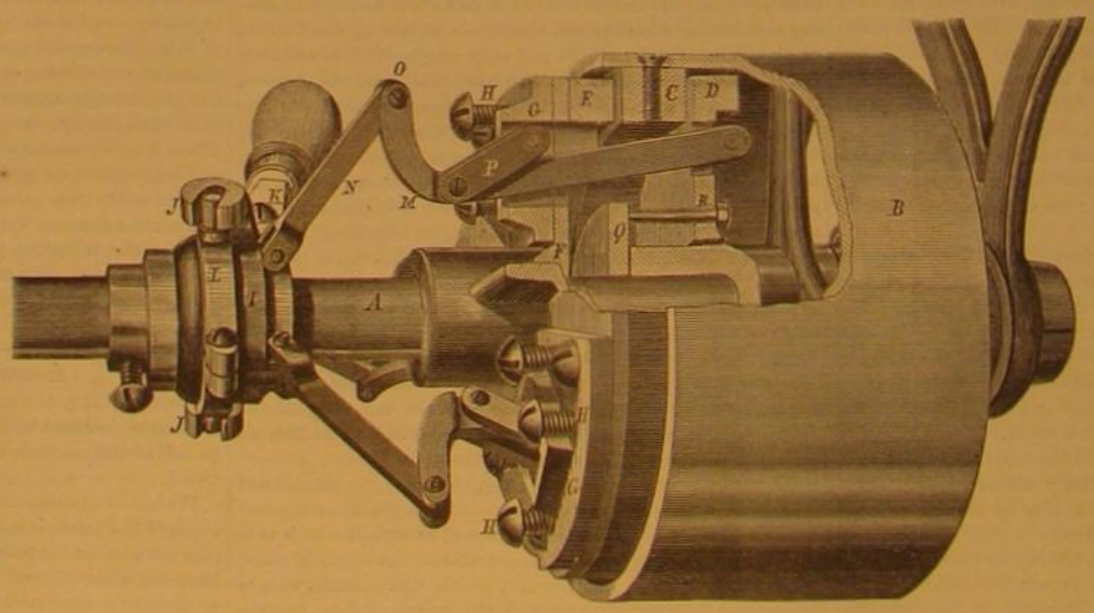
Our engraving is a perspective view of the clutch, with portions broken away to show details of construction.

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.



LULL'S FRICTION CLUTCH.

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 of 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.

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NEW YORK, SATURDAY, AUGUST 13, 1870.

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To Advertisers.

The circulation of the SCIENTIFIC AMERICAN is from 25,000 to 30,000 copies per week larger than any other journal of the same class in the world. Indeed, there are but few papers whose weekly circulation equals that of the SCIENTIFIC AMERICAN, which establishes the fact now generally well known, that this journal is one of the very best advertising mediums in the country.

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 hurled 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 re-

actions 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 arming." 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 & CLAFFLIN'S WEEKLY.

This new claimant for public favor caters to a particular class of mind, in 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 judgment 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 to 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 Amaseur, 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-eighths 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 iron pipe 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. I., of N. Y.—The French "*beton agglomere*" may be worked on a small scale. You will find an article on this subject on page 134, 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.

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

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Gatling Guns that fire 400 times per minute are now made at Colt's Armory, Hartford, Conn. Send for pamphlets.

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Wanted—The address of all manufacturers of Sewing Machine Trimmings and Findings, of all kinds. T. Shanks' Patent Bobbin Winder Manufacturer and Sewing Machine Dealer and Repairer, Southwest cor Lombard and Sharp sts., Baltimore, Md.

Pictures for the Library.—Prang's latest publications: "Wild Flowers," "Water Lilies," "Chas. Dickens," Sold in all Art Stores.

Wanted—An economical second-hand engine, steam or caloric 1 or 2-H. P. Address Lock Box 69, Rutland, Vt.

Situation Wanted as Laboratory Assistant by an American, educated in Germany. Address J. S., Box 773, New York city.

Simonds Manufacturing Co., Fitchburgh, Mass. The report of the destruction of our works by fire, July 21, is false.

Roller-skate Patent for sale. Address C. A. Scott, Cincinnati, O.

Crampton's Imperial Laundry Soap, washes in hard or salt water, removes paint, tar, and grease spots, and, containing a large percentage of vegetable oil, is as agreeable as Castile soap for washing hands. "Grocers keep it." Office 84 Front st., New York.

Peck's patent drop press. For circulars, address the sole manufacturers, Milo Peck & Co., New Haven, Ct.

Millstone Dressing Diamond Machine—Simple, effective, durable. For description of the above see Scientific American, Nov. 27th 1869. Also, Glazier's Diamonds. John Dickinson, 64 Nassau st., N. Y.

The best boiler-tube cleaner is Morse's. See cut inside page.

Rawhide Carriage Washers are cheaper than leather, and run with less noise than any other. Darrow Manufacturing Co., Bristol, Conn.

Scientific American.—Back Nos., Vols., and Sets for sale. Address Theo. Tusch, City Agent, Sci. Am., 37 Park Row, New York.

Our Windmill pumps water for railroads, country and city buildings, hotels, stock fields, drainage, and irrigation. Self-regulating, durable, and well tested. Con. Windmill Co., 5 College Place, New York

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For Sale—The entire right of Parsons', Patent Tool Adjuster for Lathes. Drawings and description sent on application. Address C. H. Standish, New Haven, Conn.

Send 50c. for silver-plated sample (free by mail) of "The Safety Shutter Bow." It holds the shutters securely, at various bows, and in such a way that they cannot be opened from the outside. Agents wanted. J. Pusey, 223 Dock st., Room No. 2, Philadelphia, Pa.

Artificial Skin, absolutely water-proof. Applied immediately. Bruises, cuts, & burns. 50c. by mail. Try it. Ward & Co., Skaneateles, N. Y.

Japanese Paper Ware—Spitoons, wash basins, pails, milk pans, etc. Perfectly water-proof, and will not break or rust. Send for circulars. Jennings Brothers, 352 Pearl st., New York.

"Your $50 Foot Lathes are worth $75." Good news for all. At your door. Catalogues Free. N. H. Baldwin, Laconia, N. H.

The Best Hand Shears and Punches for metal work, as well as the latest improved lathes, and other machinists' tools, from entirely new patterns, are manufactured by L. W. Pond, Worcester, Mass. Office, 98 Liberty st., New York.

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Kidder's Pastilles.—A sure relief for Asthma. Price 40 cents by mail. Stowell & Co., Charlestown, Mass.

For solid wrought-iron beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Keuffel & Esser, 116 Fulton st., N.Y., the best place to get 1st-class Drawing Materials, Swiss Instruments, and Rubber Triangles and Curves

For tinmans' tools, presses, etc., apply to Mays & Bliss, Plymouth, st., near Adams st., Brooklyn, N. Y

Glynn's Anti-Incrustator for Steam Boiler—The only reliable preventative. No foaming, and does not attack metals of boiler. Liberal terms to Agents. C. D. Fredricks, 587 Broadway, New York.

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It saves its Cost every sixty days—Mitchell's Combination Cooking Stove. Send for circular. R. B. Mitchell, Chicago, Ill.

The Burleigh Steam Rock Drills are used exclusively at the Hoosac Tunnel, Mass., and Nesquehoning Tunnel, Pa., making, at each heading, from four to six lineal feet per day. Pamphlets sent on application. J. T. & W. H. Daly, Agents, 49 New st., New York.

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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

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.

Issued by the United States Patent Office

FOR THE WEEK ENDING August 2, 1870.

Reported Officially for the Scientific American

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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 Kais, 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. Isett, 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. R. Wagner, Manada 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. F. 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 Jeinsen, 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. 43,320, 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. 23,544, dated March 29, 1859.

4,089.—HARVESTER RAKE.—Amos Rank, Salem, Ohio.—Patent No. 96,253, dated November 2, 1869.

4,090.—PAPER CUTTING MACHINE.—G. H. Sanborn, New York City, assignee of T. C. Robinson.—Patent No. 97,139, 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. 2,302, dated March 15, 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.—SLASHER 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.

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Proposals.

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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.

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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.

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OF
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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:

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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,
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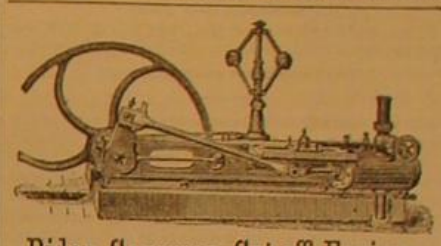

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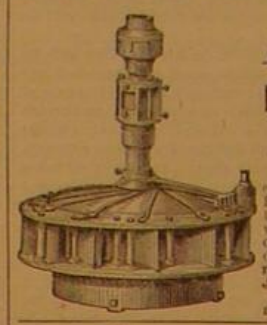

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SCIENTIFIC AMERICAN

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

Vol. XXIII.—No. 8. [NEW SERIES.] NEW YORK, AUGUST 20, 1870. $3 per Annum. [IN ADVANCE.]

Improved Screw Steering Apparatus.

The engraving which appears on this page is that of Jackson & Brothers' screw steering apparatus, which has just received a thorough practical test upon the yacht *Dauntless*, in the great ocean race. Its construction is extremely simple—a fundamental requirement in anything for this purpose.

The shaft of the wheel has formed upon it two screw threads—right and left hand. Upon these threads travel nuts, of great strength, so that when the wheel is turned in one direction, the nuts approach each other, and contrawise when the motion of the wheel is reversed; the motion of the nuts being communicated to the rudder post through stout arms with lugs, playing upon pivots in the head of the rudder-post.

The holes in the lugs are larger than the pivots, and the latter are provided with composition rollers This apparatus on the *Dauntless* is made of polished composition, and is very ornamental in appearance.

It is now in use on vessels of 1,700 tuns. Each of the thirty Spanish gun boats, built at the Delamater Iron Works, and sent to Cuba last winter, was supplied with this apparatus.

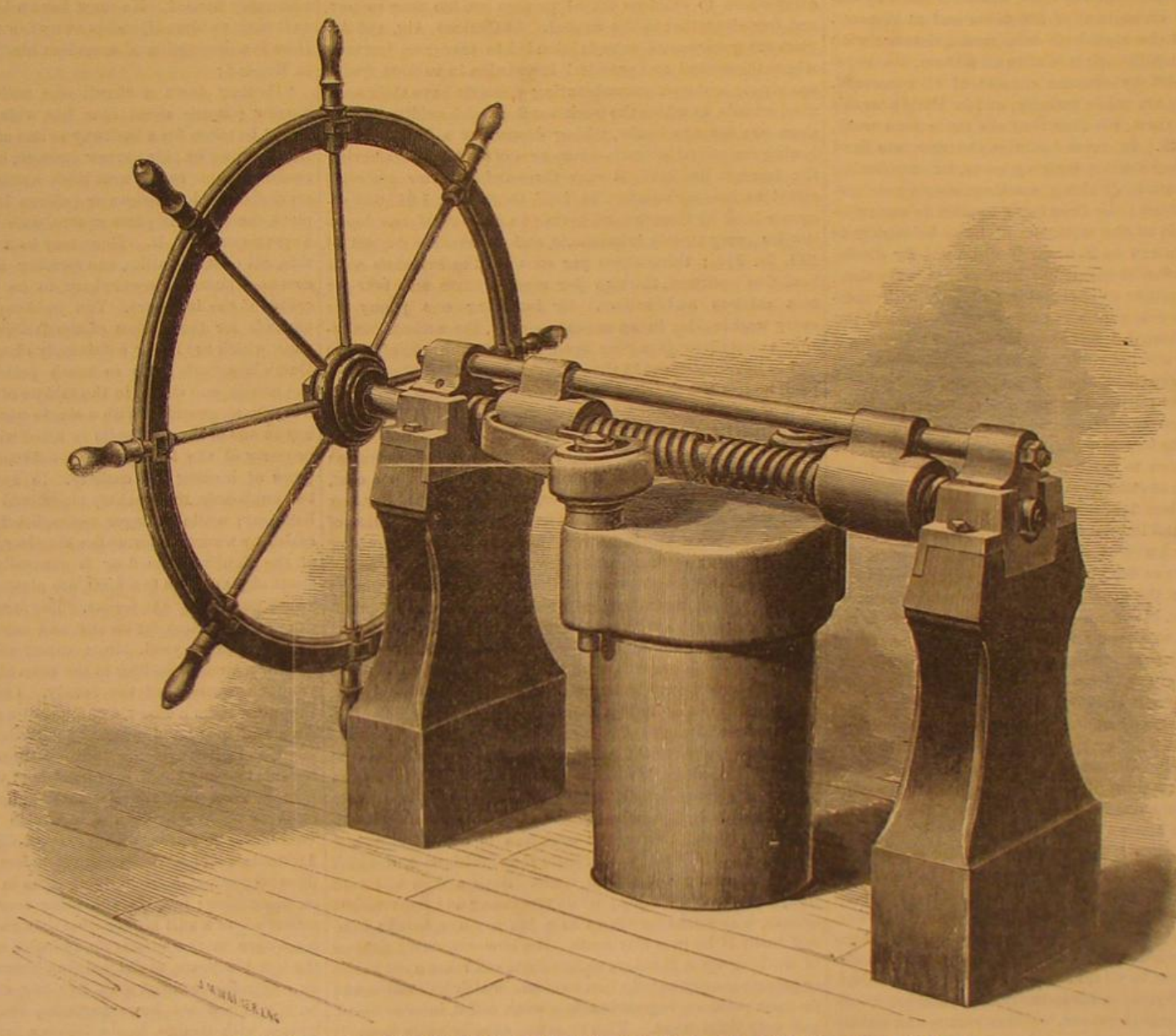
The yachts *Tarolinta* and *Tidal Wave*, well known to all New York yachtsmen, have each one of them, and some twenty or more are on fishing vessels built at Gloucester, Mass. and vicinity.

It is claimed that the apparatus works with less friction, and is more simple in construction than any in use. The rudder can rise two inches above its natural position without disarranging the apparatus.

The nuts working on the screw are provided with composition boxes. They also work upon a guide-rod, provided with shoulders, which keep the end boxes equally distant and firmly in place.

The device is much neater in appearance than the old style of steering apparatus, and judging from the favor it has received from nautical experts, it is a decided improvement thereon. It appears, also, not likely to give trouble by getting out of repair.

For further information address James L. Jackson & Bros., 315 East Twenty-eighth Street, New York.



JACKSON & BROTHERS' PATENT SCREW STEERING APPARATUS.

The "Siphon-Recorder" for Submarine Cables.

At an entertainment recently given in London by Mr. Pender, the Chairman of the British Indian Submarine Telegraph Company, Sir William Thompson's "siphon-recorder" was exhibited for the first time in England. This remarkable instrument writes down in ordinary ink every fluctuation of the electric current received at the end of a submarine cable, and is likely to displace everywhere the mirror galvanometer, by which, hitherto, all messages through long cables have been received. The older instrument shows every change, by the waving backwards and forwards of a little spot of light, leaving no trace of its wayward motions. It is almost incredible to believe that men should acquire the skill required to disentangle at the moment the complex motions of this little spot, distinguishing the effects of earth currents, old signals, induction, and what not from the true signal; even with the greatest skill many repetitions are required, and some uncertainty often hangs on the interpretation of a word. The new instrument receives and indicates everything indicated by Sir William Thompson's earlier invention, and writes it indelibly; this is accomplished without any sacrifice in the sensitiveness of the instrument. A very fine glass siphon waves to and fro over a running strip of paper without touching it, and from this siphon ink is spirted on to the paper by a series of electric sparks, these sparks being generated by a peculiar induction machine. This fine rain of ink leaves a trace of the position of the siphon at every instant, in a fine continuous line. The siphon follows faithfully the rise and fall of the current, and these alternations are arranged so as to form an alphabet, as in the usual single-needle instruments. The rain of ink opposes not the slightest resistance to the free motion of the siphon. The instrument has been doing commercial work on the French Atlantic cable for a couple of months in the island of St. Pierre, and its use on the Indian lines will be followed by increased speed and accuracy. The wonderful delicacy of the "siphon-recorder" is indicated by the fact that it has recorded messages at St. Pierre sent by a rival company's line, although no metallic connection existed between the two lines, which nowhere approached one another nearer than a quarter of a mile. Tapping a rival line in war is a common incident enough, but to tap it without ever going closer than a quarter of a mile of it, is indeed a novelty.—*London Times.*

Fair of the Tennessee Central Fair Association

The third annual exhibition of the above association will be held at the fair grounds at Murfreesboro', Tenn., commencing on Monday, Sept 26, 1870, and will continue for six days. The directors offer to receive and place upon exhibition any article of machinery, manufactured goods, or agricultural product, thus relieving the owner from the necessity of a personal visit, and without other expense than the mere freight bill. The very large number of visitors that will attend this fair from all parts of Middle Tennessee will render the occasion a most appropriate one for artisans, mechanics, and manufacturers of all classes of improved labor-saving machinery, and implements for agricultural and mechanical purposes who desire to find a market in this enterprising and wealthy region of the South.

The Use of Mineral Waters.

In our issue of the 13th inst., under the head of "Saratoga Springs," we uttered a warning against the dangerous practice of an indiscriminate use of mineral waters so common at that watering place. In striking confirmation of the views put forth in the article referred to, are the following extracts from an article by Dr. Kessler, of Hartford, in the last number of *The New York Medical Journal.* The writer says, referring to the custom at European springs of taking medical advice before drinking the waters: "A great deal of injury is thereby prevented, and it were certainly in the interest of many patients in this free country if similar restrictions could be established at our own springs. We have, indeed, seen many evils resulting from the careless and indiscriminate use of mineral waters, many aggravations of suffering and many artificially-produced ailments; and where is the physician who has not witnessed the same in the course of his practice? The use of mineral water cannot be advantageous unless prescribed, directed, controlled, and carefully watched by a physician, who is cognizant of its character and effects; he alone can, during the progress of the cure, determine whether it is suitable or not, how long and in what daily quantities it must be taken, whether bathing should be combined with drinking, what should be the proper diet and regimen, and he alone can institute all those modifications necessitated by individual cases, constitutions, and idiosyncrasies.

"As in every treatment, so chiefly in the use of mineral water, and even in sea bathing, a rigorous diet is of supreme importance, and one of the most essential conditions of success. Drinking four or five glasses of mineral water in the morning and then sitting down to a breakfast of hot cakes and fried ham, or to a more sumptuous dinner table, laden with all the choice luxuries of the season, and all the delicious yet indigestible dishes of salads, and the no less reprehensible ones of pies and pastries, not only annuls the desired effects of the cure, but is productive of harm. But too often the home physician is blamed for having sent the patient to an unsuitable spring; but too often the latter returns, not only unrelieved of his complaints, but even in a worse condition, and yet the cause of all this can frequently be traced to his own imprudence and intemperance."

Claverack College.

The Hudson River Institute and Claverack College has, we are informed, just closed a most prosperous term. President Flack seems to combine rare business and executive faculties with high ability as a teacher. This institution is now empowered to confer degrees the same as other colleges to all young ladies who complete a prescribed course of study. Both male and female students are admitted. We are glad to hear of the prosperity of this long established and popular nstitution of learning.

THE ARTISAN IN FRANCE, BELGIUM, AND HOLLAND.

In France, the working-life of the artisan begins betimes, the law recognizing the child of eight to be fit for eight hours' labor in the factory or workshop; and when he is four years older, considers him capable of working twelve hours out of the twenty-four. Before a child can thus be turned to profitable account, it must be proved that he has received primary elementary instruction, or that he attends a school in the neighborhood of the shop. Apprentices cannot be taken by any one who is under age, or who has been found guilty of an offense against public morality. The master, or *patron* as he is called now-a-days, is bound to thoroughly instruct the apprentice in his calling, to watch over his conduct like a father, see that he is not employed in any work beyond his strength, or in itself unhealthy; and if he is not fairly proficient in the three *Rs*, or his primary religious education has been neglected, must allow him two hours every day to make good his deficiency. Apprenticeships are commonly of five or six years duration; but when a premium is paid, a couple of years less suffices. As soon as the apprentice becomes a journeyman, he must obtain from the authorities a *livret*, or note-book, inscribed with his name age, trade, and description. In this book he has to enter all his engagements, the date of their commencement and close, advances made by employers, and keep an account of his debts and movements. The livret—soon to be abolished—is a great grievance with the French artisan, although it is after all a sham, the regulations being evaded by common consent of all concerned. Most engagements are made verbally, and in Paris a week's notice terminates them, whether they are made for a week, fortnight, or month. In most factories, the men are fined for leaving the shop during working-hours, for introducing strangers, or for eating, drinking, smoking, singing, or gossiping on the premises; the fines being applied to some purpose for the benefit of the workmen or those belonging to them. A workman can be summarily dismissed for disobedience, incompetence, idling, causing disturbances in the shop, or treating his employer or his employer's family with disrespect. On the other hand, he can throw up his work if put in an unhealthy shop, if deprived of his meal or rest time, if he has work given him not stipulated in his engagement, or if he is struck or otherwise insulted by his patron.

Fine and imprisonment await any one seducing workmen to pass into foreign employment. Any one communicating the secrets of the factory in which he is employed, is liable to a fine of from sixteen to two hundred francs, with imprisonment of from three months to two years; but if the offense is committed for the benefit of foreigners or Frenchmen residing abroad, both fine and imprisonment are heavier—the former ranging from five hundred to twenty thousand francs, and the latter from two to five years. Strikes do not seem to be actually illegal, but the penal code declares that whoever, by the aid of violence, blows, menace, or fraudulent maneuvres, shall bring about, or attempt to bring about, a cessation of work, with the object of forcing a rise or fall in wages, or infringe the free exercise of industry, shall be punishable by from six days to three years' imprisonment, and a fine of from sixteen to three thousand francs; and that workmen, employers, and contractors who, by means of fines, prohibitions, restrictions, or interdictions resulting from a concerted plan, shall infringe the free right of labor, shall be fined to the same extent, and be imprisoned for from six days to three months.

As a rule, twelve hours make a working-day in France, out of which one hour is allowed for breakfast, and another for dinner. In some trades, the men are paid by the hour; but payment by the day is most general, although the piece-work system gains ground every day. In Paris and the towns, six days go to the week; but in the provinces, where wages are lower, they reckon seven, but give the Sunday to the workman. Of course, in all trades, the earnings of an individual depend somewhat upon his industry, skill, and quickness. Taking a fair average, however, we may reckon the weekly earnings of the Parisian artisan at the following rates: Plasterers make $5·50; wheel-wrights from $5·50 to $7·50; coopers, $6·00; masons, $6·50; shoemakers, $6·00 to $7·75; watchmakers, $6·00 to $7·25; tailors, $4·75 to 7·25; painters, farriers, jewelers, and carpenters, $7·25; weavers, $7·25 to $8·25; stone-cutters, $6·70 to $9·50; blacksmiths, $6·50 to $9·50; printers, $7·25 to 9·50; and cabinetmakers, $6·50 to $12·00 a week. Ordinary hatters earn from $4·75 to $5·50; while a good "finisher" may make nearly $15; but he does not do it. He works piece-work, and makes up his week after the following fashion: on Monday he will not work at all; on Tuesday, he earns a franc; on Wednesday, two; on Thursday, four; on Friday, five; while on Saturday, which is pay-day, he will make fifteen francs. Parisian wages certainly fall below the English standard; a London carpenter, for example, receives twelve shillings more for his week's work than his French brother. Women's work, in Paris, as everywhere else, is shockingly remunerated; and while wages have generally risen in the last twenty years, there has been no advance where women are the sole workers. The industrious fingers of the French seamstress, let them work their hardest, will not bring her more than $3·00 a week—an amount representing the average income of the flower-maker, stay-maker, washerwoman, and ironer, although they do manage sometimes to get another half dollar. At dressmaking, sewers get $2·75, cutters, $3·50 a week, the head workwoman receiving perhaps $20 dollars a month; while milliners are boarded and paid from $80 to $240 a year. A female weaver cannot earn more than $2·50 a week, and many of them have to be content with a weekly wage of $1·25.

A workman can board very well in Paris at the rate of three francs a day, or something less than $4·25 a week. Under the imperial régeme, whole quarters of the capital wherein the blouses loved to congregate have been swept away, and they have been driven into the suburbs, which can only be reached at an expenditure either of their time or their money—as it is, they have to pay $20 a year for a single room without a fire-place. It is true, model lodging-houses have been built by the benevolent and the speculative, but those for whose benefit they are intended do not take at all kindly to them. The artisan's pride revolts at anything savoring of pauperism, therefore he shuns the habitations erected by the charitable; and while he acknowledges the superior arrangements of the *cités* built for him, he prefers freedom to comfort. He has enough of discipline, of rules and regulations, at the workshop, and objects to being trammeled by them outside its gates, and declines to take up his abode in a *cité*, on the ground that he chooses to be master in his own home.

There is no want of institutions for benefiting the artisan. There are *crèches*, where children in arms are taken care of, while their mothers are working, at a charge of twopence a day; there are *salles d' asile*, where children of tender age receive instruction in fifteen-minute lessons; there are *écoles primaires*, where older ones are taught reading, writing, arithmetic, grammar, geography, physical science, mathematics, and surveying—the two last named institutions being free everywhere to children whose parents are too poor to pay, and free altogether in the capital. At Chalons, Aix, and Angiers are government schools intended to rear good foremen, where theoretical and practical instruction in various trades are given; and most manufacturing districts have their technical schools, to which the workmen flock with avidity. Then there are savings banks, taking deposits of a franc, and allowing compound interest—every sum of twelve francs having the interest (in 1867, it was three-and-a-quarter per cent) added to it every month. In 1867, there were 1,845,603 accounts held by these banks, giving an average of one depositor for every twenty inhabitants, and an average deposit of £12, 7s. 5½d.; thirty-three per cent of the investors were bonâ-fide workmen, thirteen per cent servants, and four per cent soldiers and sailors. By investing one penny for every working-day in an annuity society, the artisan can insure twenty pounds a year upon reaching the age of sixty; and to have assistance in time of sickness, and burial expenses paid, he has but to join a *société de secours mutuels*, the president of which is named by the Emperor, and the managing committee by the members themselves.

While acknowledging that in the course of a generation wages have increased no more than twenty-three per cent, while lodging has become dearer, and food risen fifty per cent, the French Official Report asserts that the condition of the artisan has much improved. He pays less for clothing and furniture; savings banks have taught him the use of economy; his eyes are open to the folly of early marriage; and intemperance swallows less of his earnings. "Vast promenades, where art has brought together everything that can amuse and enchant, are by degrees drawing the artisan away from the unwholesome tavern-haunts, to bring him and his family to green swards, beneath beautiful trees, beside clear waters, and exciting in him that sentiment for art which beautiful and useful works always create!"

The Belgian may be a better subject, but as a workman he is not to be compared to his lively neighbor. His *fort* lies in producing a cheap article, not a good one, and he gets paid accordingly. In domestic trades, such as carpentering, tailoring, and the like, the careful workman is his own master, renting a small house, with a little shop for his wife, of which he lets off as much as he can spare. Such a man will earn from $1·00 to $1·50 a day; while the young and improvident artisan, who works for others as a journeyman, thinks himself lucky if he gets fifty cents. He, however, never dreams of working upon Mondays or fête days, and relies upon public or private charity to help him to exist; which he contrives to do upon potatoes, vegetable soups, weak coffee, inferior bread, and very little meat. This class are equally badly housed: "they herd together in the most dismal streets of the great cities, or crowd the damp hovels which surround the country towns and the pit mouth; their dwellings are as fine fields for epidemics as it is possible to conceive, as they are seldom able to afford more than one room, to which a lodger is frequently admitted, and the moral taint of overcrowding falls heavily upon them."

Miners, colliers, engineers, and workers in copper, iron, and glass, are better paid, better fed, better clothed, and better lodged. Barring the miners, these are a steadier class of men, living generally in the upper parts of respectable business premises in the suburbs. Most of them can read and calculate tolerably well, but despite these advantages, are hardly as well informed as the same class of English workmen. As to earnings, colliers get from eighty-four cents to $1·00 a day; engine drivers, from $1·25 to $2·00, with extras for fuel saving; mining engineers and and overlookers receive about $400·00 a year; and workers in factories are paid from sixty-two cents to $2·00 a day; females, however, cannot make more than thirty-six cents. The mode of payment is commonly by the quarter-day of two hours; the workman dismissing himself, or being dismissed without notice; contracts between master and man being very rare in Belgium, while apprenticeships are unknown. Like the Frenchman, the Belgian has his Council of Prud'hommes to settle trade disputes cheaply and expeditiously, his friendly societies, and his annuity societies. Trades' unions exist, but have little influence, except in the coal and mining districts.

It is not a far cry from Belgium to Holland, but the difference between the people of the once united lands is something extraordinary. While, as a rule, the Belgian artisan is careless, indifferent, and thriftless, the Hollander is painstaking, industrious, and economical, deeming it almost criminal to spend all he earns. With necessaries as dear, luxuries far dearer, and wages much lower than they are here, a Dutchman manages to have a healthier family and a happier home than the majority of English workingmen can boast. A skilled artisan can hardly earn, even in the larger towns of Holland, more than $4·00 a week, which he may possibly make into $4·50 by odd jobs after working hours, and into $5·50 if his wife takes in washing. In small town he must be content with $2·50. In summer, he will work twelve hours, having half an hour allowed him for his breakfast, the same for his tea, and an hour, or an hour and a half, for his dinner, and a smoke after it. He breakfasts on coffee with with sugar and milk, and a sandwich composed of two slices of white or brown bread and butter, inclosing a thinner slice of highly-flavored black bread; he teas on the same; while his dinner consists of potatoes, followed by a mess of vegetables boiled in fat, fish, and a cup of tea. If he can, he goes home to dinner; if he cannot do that, he cooks his dinner at the workshop, or else repairs to an eating-house, where he can satisfy his hunger upon vegetable diet for the charge of four cents.

Meat does not come within the Dutchman's bill of fare; if he indulges in it at all, it is on Sunday, and at home with his wife and children. The Dutch artisan is well clothed and admirably housed. He must have a house, let it be as small as it may, to himself, and in every town his wants are studied. Here is a description of a modern block of workmen's houses in Holland:

"Passing down a street, one notices here and there a narrow passage about four feet wide, which at first sight might be taken for a backway to one of the adjoining houses. But entering by this narrow passage, one finds one's self between a double row of neat brick houses, inclosing a garden, divided off by low hedges or palings into a number of small plots, three or four paces square, each one belonging to the house opposite to it. There may be a dozen houses on each side, all precisely alike, and forming a single property. A common pump is somewhere to be seen, probably in the center of the inclosure. The garden-plots serve as drying grounds for the clothes of the family, or for the pots and pans, which are being continually cleaned, and in which the Dutch housewife takes so much pride. On entering one of the houses, one stands in the middle of a room about fifteen feet square, provided with a single window in front; a chimney in one of the side walls is fitted with a small stove, the property of the tenant, which sufficiently answers the purposes of heating and cookery. In another wall, are one or two cupboards, the crockery closet and pantry of the establishment; while a larger recess, fitted with a bed, and concealed by a curtain, forms the sleeping place of the parents of the family. The floor is generally boarded; the walls, about eight or nine feet high, are plastered and whitewashed, unless papered by the tenant. The furniture in the room is generally sufficient for its size, and carefully kept. There is no back door or yard. In a corner of the room is a steep narrow staircase, leading to the room above, where sleep the younger members of the family. There is in one corner of the upper room a closet, communicating with the main drain. An air of order and propriety pervades the whole establishment, and gives evidence that neatness and cleanliness, are regarded among the first of household virtues."

In a town like the Hague, such houses cost about fifty cents or sixty-two cents a week; in country towns, less. There are, however, numerous dwellings, particularly in Amsterdam and Rotterdam, built before the modern regulations respecting housebuilding came in force, of a very inferior description; but, on the other hand, the newer artisan streets are of a still higher class than those described above—more open, more comfortable, and with real gardens. Within the last few years, model lodging-houses have been erected by companies content with five per cent dividends; these buildings are not huge barracks, but rows of two-storied houses, with double fronts looking into separate gardens. Each cottage is tenanted by two families, one occupying the ground, the other the upper floor, each having their own garden plot. The rent of the ground floor is fifty-two cents per week; that of the upper floor, possessing an attic in the roof, sixty-six cents.

So far as the law is concerned, the Dutch workman has little to complain of, if he was of a complaining nature. He is left to work when he likes and how he likes. There is no law of apprenticeship, because there are no apprentices. A boy wishing to learn a trade gets the necessary tools together, and goes to work at nominal wages, his pay increasing with his capabilities; and the plan answers well enough. Combinations for the purpose of altering wages are, however, sternly forbidden by the penal code; consequently, the only trade associations known in Holland are benefit clubs for giving help in time of need; and somehow trade disputes, when there are any, get settled without much trouble. Once or twice such a thing as a strike has occurred, but it speedily died, from want of sympathy. In truth, nothing save a breach in the dike will move a Dutchman out of the even tenor of his way. The Dutch laborer reflects on the value of his earnings; the energies which a warmer blood and a more impetuous temperament would expend in political excitement, he consecrates to the improvement of his own individual lot; the question of the hour, the news of the day possess little interest for him; he prefers his Bible to his newspaper, and his family fireside to the public-house, the reading-room, or the political meeting. Jealous to a degree of the liberty he possesses, he does not sigh for more; and prefers enjoying in peace the advantages already secured to him, to agitating for others which his fathers did without. The Dutch artisan is a model of contentment, and probably the happiest of his race.—*Chambers' Journal.*

Architectural Specifications.

If every church or chapel, every warehouse or shop, and every mansion or cottage were alike, the labor of the architect in drawing up a specification would approach somewhat to that of the lawyer, and architects might hope to lay down for themselves some accepted form, or head and tail of a form, that would for all time serve all possible cases.

But no two of his buildings are alike, or sufficiently alike, to warrant him in making the specification of any one of them do service for any other. There is nothing for it but to sit down and compose a special document for each individual case.

Architects vary very much in the respective modes of composing these documents. Very many of them take an absolute pride in the length of their specifications. They stint the number of their drawings, and trust to the prolixity of their specifications to make up for their shortcomings in delineation. It is a signal mistake. The form, the size, the number, the position of any separate portion of an edifice can be far better and more clearly expressed by delineation than by writing; and, where time admits, these matters should be described by drawing. When this can be done, the shorter a specification can be the better it will be. Its province should be to specially define when or in what order, with what materials or ingredients, and in what style, quality, or manner the works are to be executed, leaving the drawings to explain their form, size or dimension, their number and position in the building; and, indeed, if architects would but observe this rule, we see no reason why some enterprising publisher of office forms might not with great advantage to the profession issue a set of printed skeleton sheets, whereon architects might draft out their specifications—such sheets to set forth the preamble, the general conditions and the trades in usual sequence; each trade sheet containing, pretty widely apart, marginal titles of the usual items of a building, for the architect to expunge or to fill up as he found necessary. On such printed sheets we would have printed in full for use all those stock clauses that every architect embodies, as a matter of course, in his specifications—clauses that, like the laws of the Medes and Persians, "alter not," such as the growth and seasoning, and freedom from sap of the timbers, the thickness of mortar joints, the pargetting of flues, the goodness of stone and the placing it on its natural bed, etc., etc. These are matters that cannot be expressed by delineation, and which make up clauses that not only pertain solely to specifications but are of invariable use—stereotypical clauses, in fact, that may very fairly be stereotyped for all time; and the mind of the architect may be set free from the bother of seeing to their due insertion in the right place.

We need hardly say that the most perfect specifications are, or ought to be, those which are written out by the person who computes the quantities, even though he be not the actual architect of the intended building, but an independent building surveyor. In either case, the usual process is to take out the quantities from the drawings, with the aid of a rough general specification, this latter document being subsequently amplified and perfected by collation from the surveyor's dimension-book. In the process is very often involved a thorough overhauling of the drawings themselves, which, however conscientiously prepared, will seldom be found to stand the test of a bill of quantities.

Specifications of alterations and repairs of buildings should always be drawn up on the buildings themselves, the latter being begun from the roof outside, thence continued to its inside, after that downward from topmost room to basement, ending with the stairs and passages, taken in like order. The greatest mistakes may be made by attempting to compose such specifications in the office, away from the structure to be altered or repaired.

For the avoidance of errors and ommisions in these tiresome documents, young architects will do well to determine for themselves a handy rotation of trades and their respective items or operations; and, having done so, to adhere to it, and gradually acquire the habit of compiling future ones from their own documents alone. Their headings may be as copious and as oft-articulated or dissected as they please to make them, for all this tends to perspicuity, and perspicuity will ward off litigation, the very service a client requires in his architect. As to photographs or clauses themselves, the shorter they are, and the more they can be exchanged for drawings, the better; indeed, we cannot better close these observations than by quoting the pithy remark of an eminent contractor, who, being asked to define in what a specification consisted, declared it to be simply, "Drawings, drawings, lots o' drawings."—*Building News.*

The Chassepot and the Prussian Needle-Gun from an English Point of View.

The *London Globe* thus discusses the relative merits of these famous weapons:

The "Zundnadelgewehr," or needle-gun of the Prussian service, to which the victories of the Prussian arms, in 1866, have been attributed, appears to have been orginally patented in England, as a muzzle-loader, in 1831, by a Mr. Moser, of Kennington. The invention came before its time. Its cold reception in England drove the patentee to seek foreign patronage for his novelty, and Prussia was lucky enough to appreciate and to adopt the new weapon. Dreysa, a gunmaker of Sommaler, applied the breech-loading principle to Moser's patent, and thus amended, the arm, ten years later, was, in 1848, introduced into the Prussian service. The principle, briefly stated, is the driving of a pointed piston or "needle," by the action of a spiral spring (such as is used in the manufacture of children's toy guns), into a small case of fulminate, contained in and situated between the powder and the bullet of a single cartridge. In the action of opening the breech, the spiral spring is set by the trigger, and thus the trigger, when pulled, releases into operation this spiral spring, which, in its turn, forces the needle into the cartridge, and fires the piece.

Upon this oldest form of the Prussian needle-gun, improvements have been made, the chief effects of which have been a reduction of the mechanism of the needle of 1848, and a general lightening of the entire piece. None of these alterations, however, have touched those two apparent evils in the whole form of this arm which militated against its adoption by England in 1850. These are, the positions of the fulminate in the interior of the cartridge, and the looseness of mechanism, involving possibility of the escape of gas round the needle and at the base of the plunger.

To these two particular points, France mainly devoted herself in seeking a superior needle rifle to that of Prussia. In the Chassepot, such an improved arm has been found. A triple wad of vulcanized india-rubber, placed round the axis of its plunger, and with a steel plate, a cushion to receive the force of the rebound, is intended to render the breech gas-tight, but has been found in practice only partially adapted to that object. An ingenious arrangement of notches on the outer girder of iron, before described, enables the gun to be placed at half-cock. The needle is lighter and smaller than in the Prussian gun, and, above all, the cartridge contains its fulminate at the base of the powder, instead of at the base of the bullet. A vacuum, left when the gun is charged, between the base of the cartridge and the front of the plunger, is intended to effect the combustion and removal of any portion of the cartridge case that may remain after firing.

As compared with the Prussian gun, this weapon possesses, besides the specific improvements mentioned, other advantages of superior manufacture and finish. Its cartridge, besides admitting the altogether different principle of firing, contains a larger charge of powder than the Prussian cartridge, with a smaller bullet, which leaves a manifest advantage in carrying to the French weapon; while the fact that the Prussian bullet is purposely made so small as not to touch the barrel in its passage, while the French bullet is of the ordinary size to fit the rifle barrel, would point to the conclusion that the Prussian marksman is at a disadvantage over the Frenchman in respect to his aim. The number of times of firing per minute is about the same in both cases. The cost of the French weapon considerably exceeds that of the Prussian, and the Chassepot is, in addition, a more difficult gun to make. To all the comparative information which has been published about the French and Prussian guns must be added the following from the *Journal du Peuple:*

"At 500 meters the Prussian weapon gives only negative results, while at 1,000 the Chassepot, in the hands of good marksmen, hits the target with great force. We call attention to this point, for, in the war of large bodies of sharpshooters (the only system which we ought to adopt), an arm which is not reliable over 500 meters cannot reach the reserves of the first front, which escapes the effect of the enemy's fire The drawbacks of large bullets have been noticed, the principal being this, that with needle-guns, the firing is rapid, and, therefore, a great amount of powder is burnt; consequently, the cartridge box must be well stored. Now, there is in the weight of ammunition allotted to a foot soldier, a total which cannot be exceeded, namely, 10lbs. What will happen? With that weight of cartridges, the Frenchman will have twice as many shots to fire as the Prussian. Nothing is more difficult than to replace, during fire, the ammunition by a fresh distribution. Thus, the retreat of a division may depend on its finding itself in face of an enemy which has still twenty or thirty cartridges a head to fire. It will be seen that the winning of a battle may depend on the projectile adopted."

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections for the month of June, 1870:

During the month, 508 visits of inspection have been made, and 993 boilers examined, 896 externally and 267 internally, and 117 have been tested by hydraulic pressure. The number of defects in all discovered, 371; of which 51 were regarded as dangerous. These defects in detail are as follows:

Furnaces out of shape, 11; fractures in all, 36—10 dangerous; burned plates, 40—4 dangerous; blistered plates, 62—2 dangerous; cases of sediment and deposit, 61—2 dangerous; cases of incrustation and scale, 94—5 dangerous; cases of external corrosion, 15; cases of internal corrosion, 9; cases of internal grooving, 6; water gages out of order, 12—2 dangerous; blow-out apparatus out of order, 9—4 dangerous; safety valves overloaded and out of order, 44—7 dangerous; pressure gages out of order, 73—2 dangerous; varying from—47 to +25. These extreme variations are unusual, and result from allowing the gage to run for years without examination or test. A variation of 10 or 15 pounds in either direction is not uncommon, but these should be corrected, and appliances that are so important, and upon which so much dependence is placed, should be correct beyond a doubt.

Boilers without gages, 1; cases of deficiency of water, 7—5 dangerous; broken braces and stays, 10—6 dangerous; boilers condemned, 8.

It will be noticed above that there have been 40 cases of burned plates found among the boilers examined this month. In several instances these have arisen from gross carelessness. Sediment had been allowed to accumulate on the fire sheets, and the burning was inevitable. In two instances the boilers leaked badly, and in the morning the foreman, instead of trying his gage cocks, when he entered the boiler room, unbanked and replenished his fires. The water having nearly all leaked out of the boiler during the night, the sheets over the fire were entirely ruined, and expensive repairs were necessary. The first duty of a fireman on entering the boiler-room is to ascertain where the water is in the boilers. If there is sufficient then replenish the fires. Sediment will accumulate more or less in nearly all boilers. The quantity and character of the deposit may be ascertained by blowing down a few inches each day. If the accumulation is slight, this may be all that is necessary for months, but if there are indications of a deposit that cannot thus be removed, the boiler should be blown entirely down, at least once in two weeks, and all sediment removed, either through the manhole or handholes. Let the work be thoroughly done, and there will be a saving in fuel as well as in prolonging the working age of the boiler.

Rabies in Canine and Other Animals.

The term canine madness, says a writer in the *Chemist and Druggist*, is not expedient, as it leads persons to form a wrong idea of the disease; they are apt to look upon it as something similar to the condition known as madness amongst men. The term hydrophobia is also objectionable, as rabid dogs have no fear of water.

It is not my intention to enlarge on the pathology of rabies, but merely to point out the symptoms, correct one or two popular errors, and indicate the means to be adopted in case of an animal being bitten by a supposed rabid dog.

Symptoms.—The first noticeable change is a restlessness and disregard of familiar things; a capricious appetite, with a partiality for tearing up and swallowing all sorts of things, as sticks and all kinds of filth. The animal takes to howling, and snaps at anything approaching him, there is a peculiar wild look, the eyes steadily following anything moving in front, and also moving as if fixed on imaginary things; the nose and mouth are dry, there is intolerance of light, and difficulty of swallowing, which ends in paralysis and convulsions. Death occurs in about three or four days from the advent of an attack. There is what is called "dumb rabies," a form of the same disease, though characterized by different symptoms. It is more rapidly fatal, and is accompanied by a paralysis of the lower jaw and a considerable discharge of saliva.

The barking, running, and foaming at the mouth often seen in dogs subject to convulsions, must not be mistaken for rabies. There are no specific lesions to be found in the bodies of rabid dogs; the most suggestive sign is the presence of rubbish and filth in the stomach.

Animals bitten by rabid dogs show symptoms of the disease in from about twenty days to three months; this period of incubation has been known to last as long as twelve months.

In case of a person being bitten by a doubtful dog the only sensible plan is to cauterize the part and lock up the dog for a time. The custom of destroying the dog is founded upon the ignorant idea that should the animal become rabid at some future time the person bitten would suffer. The animal should always be kept alive so as to be certain whether or not it was affected. I believe many persons suffer great anxiety from an innocent bite, which would be prevented by the positive proof of the animal showing no bad symptoms.

Now as to the best way of destroying the poison of a bite. It must be remembered that rabies is a disease due to a specific poison, and that the saliva of an affected animal is charged with it. It never, even in dogs, arises spontaneously; it is communicable to all warm-blooded animals, and may thus be carried by wild ones. By a bite the poison-bearing saliva is introduced into the wound caused by the teeth; from this it passes into the blood-vessels and the disease follows. Various substances destroy the virus, as carbolic acid, nitrate of silver, caustic soda and potash, and the actual cautery.

The difficulty is in at once applying the agent before absorption has taken place. Should no medical man or chemist be at hand, a ligature, as a handkerchief or piece of string, should be tied tightly between the wound and the heart so as to stop the circulation; of course this can only be done on a limb. The part may be sucked if the operator's mouth have no abrasions. No fluid caustic should be used, as it cannot be certainly applied to the bottom of the wound. No superficial caustic should be used, as the tissues should be destroyed to some depth; for this reason I look upon nitrate of silver as practically useless. To the actual cautery there can be no objection save the difficulty of finding a proper shaped instrument to fit the wound often caused by the long, thin canine tooth. Caustic potash and caustic soda are specially indicated, as they destroy and penetrate the tissues to a considerable depth. As was long since suggested, the best way of applying it is to keep on hand one or two small probes tipped with the caustic. They are made by melting the caustic and dipping in the probes till sufficiently covered; then keep them in an air-tight bottle ready for use. Perhaps I ought to except nitric acid from what I said against liquid caustics.

I do not think that excision of the parts is expedient, unless in such a position as a finger or ear, capable of being removed *in toto*. The cutting out of a part leaves a surface most favorable to the absorption of any virus which might be left. Excision would require a skilled operator; any one with a good nerve and steady hand could apply the caustic.

CAN the large amount of force which is lost in the form of heat in all mechanical operations be utilized? The answer is, unfortunately, it cannot. Heat is the cheapest possible form of force; mechanical force is far dearer, and electricity is the dearest of all. It would, therefore, never be worth while to transform waste heat into any other form of force.—DR. MAYER.

[For the Scientific American].

THE ORTHOPTERS.--THE GRASSHOPPERS AND THEIR ALLIES.

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

"Sounds do not always give us pleasure according to their sweetness and melody; nor do harsh sounds always displease. We are more apt to be captivated or disgusted with the associations they promote than with the notes themselves. Thus the shrilling of the field cricket, though sharp and stridulous, yet marvelously delights some hearers, filling their minds with a train of summer ideas of everything that is rural, verdurous, and joyous."

These words wrote the good old naturalist of Selborne, Gilbert White, and had he lived in this country, he would probably have found in the quaint quarreling of the katydids a mournful charm, an unwelcome feeling, amid present pleasures, of another summer almost slipped away, a prophecy of frosts speedily to come, bringing with them the sear and yellow leaves, the harbingers of the death of one more year, the emblems of approaching age.

Laying aside sentimental feelings, however, the present is an appropriate time at which to draw the attention of the reader to that order of insects, to which the field cricket, that querulously ushers in the summer, and his first-cousin of the hearth—immortalized by Dickens—and the grasshopper that scoldingly, from his favorite perch in the locust tree, presages the fall, and the cockroach, that swarms in our kitchens, all alike belong. Our fields during the present month are alive with members of this order, which, if it include fewer species than some of the others that we have noticed, is represented by an innumerable host of individuals, and lays claim to our especial attention, as including within its ranks the migratory locust and its allies, the greatest of all insect foes to vegetation. The term *Orthoptera*, or "straight-winged," applied to these, is hardly so happy, because its application is not so apparent at first sight, as the names by which most of the other orders are recognized; the characters of the order are, however, very strongly marked, and are, generally speaking, altogether unmistakable—at least they will be so in the typical members of the group, to the most casual observer, who will only observe systematically. It comprises insects with the mouth organs adapted for biting and not for piercing and sucking—a character that at once distinguishes them from the bugs; the anterior pair of wings are generally thickened, leathery, opaque, and serving as a sheath for the hinder pair; but they are not so solid as, nor shaped like, those of the beetles; as in the latter the hind pair of wings are the largest and are furled when at rest beneath the front pair; but, while those of the Coleopters are folded transversely, those of the Orthopters are shut up longitudinally, just as a lady's fan is closed; and it is from this arrangement of the hind wings, when at rest, that the name of "straight-winged" is said to be given to the order. These wings, too, are veined in a beautiful network pattern very different from those of other insects. A moment's examination of one of the flying grasshoppers in your garden will make all this more apparent than a multitude of words. But the most important difference that the naturalist perceives between these and most other insects is in the history of their development. The little Orthopter, when first hatched from the egg, is not a maggot, grub, or caterpillar, nor does it afterwards pass through a period of suspended activity in a nymph or chrysalis condition. We may say that little grasshoppers do grow to big ones, for as they appear at first they much resemble the perfect form, wanting, however, the wings and reproductive organs. To accommodate their increase of size they cast their skin, like caterpillars, and after several such moultings, they moult to a form which shows us rudiments of the wings, they are then in the pupa stage; one more moult and they appear with wings fully developed and efficient reproductive organs—they are now perfect insects.

TRANSFORMATIONS OF THE GREEN GRASSHOPPER.

In the accompanying cut the larva and pupa stages of the Green Grasshopper (*Locusta viridissima*) are represented in the lower left-hand corner, the pupa being the one beneath.

The Orthopters may be divided into two subdivisions—one embracing the crickets and the grasshoppers, with their elongated hindmost pair of legs, being termed the "jumping" Orthopters or *Saltatoria*; while the less typical group includes the *Cursoria*, or "runners."

Besides the cockroaches already mentioned, the earwigs of Europe, and those most extraordinary insects, which, as their names indicate, present us with the most remarkable protective resemblances, such as the walking sticks and walking leaves, belong to the latter subdivision. Here also belongs the "praying mantes," which, in attitude of prayer, awaits its prey, and often devours even his own kind—an almost human development of inhuman hypocrisy. The higher group is divided into three families—the *Achetidæ*, or cricket; the *Locustidæ*, or grasshoppers, and the *Gryllidæ*, or locusts. The reader will see that there is here an unfortunate confusion of terms; the Latin term *locusta* being applied, not to the family that includes the migratory locust, but to that which includes the grasshoppers. The male members of these three families are musical, each family, however, having its own special kind of instrument. The grasshoppers, and our friend the katydid belongs to the family, have this musical organ at the base of the wing-covers or anterior wings; the basal position of one overlaps the other, and both are furnished with strong ribs, and it is by the friction of these over one another that the shrilling sounds and the cry-like notes of the katydid are produced. The antennæ of the male insect (the one on the wing) in the engraving, cross this musical organ, which, as we have said, is restricted to the males. The females—strange inversion of our ideas—are the sword bearers; but instead of using these weapons to destroy life we see by the use to which the female figured is putting it, that it is the implement with which she safely deposits her eggs, and thus continues her race.

Those species of grasshopper that live mostly amid the low herbage lay their eggs in the ground; others that frequent trees, lay theirs in the crevices of the bark. In the month of September we have taken numbers of female katydids, with their ovipositors, so firmly driven into the interstices of the bark of the thorny locust (*Gleditschia triacanthus*, that it required considerable force, and as much patience, to extract them without doing injury to the insects. The katydid differs from the insect figured, in the form of the wing-covers, which are much wider, descending on each side of the body, and enveloping it as if in a pod. This character distinguishes the katydid from our other grasshoppers, and gives to it its generic name of *Platyphyllum* (broad wing); its specific name being *perspicillatum*.

Photographic.

HOW TO DIMINISH THE TIME OF EXPOSURE.

M. Bazin lately made a communication to the Photographic Society of France, respecting a process for diminishing by one third the time of exposure in the camera, whatever may have been the formula by which the negative was executed. This process consists in augmenting the power of the light on the collodionized plate by additional red rays, independent of the light passing through the objective. This red light is admitted into the camera by making in the four corners of the front, circular openings, which are closed by means of glasses colored red with carmine dissolved in ammonia. These glasses should, besides, be rendered double by means of a ground glass, so placed as to diffuse the luminous rays, the red light striking upon the sensitive layer at the same time that the image is produced by the objective. Under the influence of this red light—the intensity of which should be regulated according to the opening of the diaphragm of the lens, and according to an exposure which should be one-third less than is necessary for obtaining a good negative by the ordinary processes—the developer causes the darker part of the image to come out perfectly, diminishes the crudity of the high lights, and gives much harmony to the picture. The same effect is produced by submitting the sensitive plate to the red light, whether before or after the exposure, but the result is not so good. The other rays have been tried, but the red ray is the only one that has produced satisfactory effects.

In support of this communication M. Bazin showed double proofs made from negatives taken in precisely the same time. That obtained with the addition of the red light gave much more of the details in the very black or dark green parts, with more softness in the light parts, while the proof obtained in the ordinary way presented in the former parts absolute blacks.

HOW TO PREVENT DRYING OF THE FILM WHEN EXPOSED IN THE CAMERA.

The object is to remedy the inconvenience experienced through the drying of wet collodion plates when the exposure in the camera has been very much prolonged. Who has not been a victim to those accidents which render it almost impossible to reproduce objects insufficiently or badly lighted? I avoid this difficulty, says M. Lecourt, by placing at a very little distance before the sensitized plate a second plate, thin, and perfectly clean; I thus maintain the moisture during a sufficient space of time for any exposure whatever, be it an hour or more, without any apparent drying.

Enameling Liquor Barrels.

Owing to the extensive trade in liquor the demand for barrels is constantly increasing, and the growing scarcity of oak timber renders it necessary to find some substitute. This want is likely to be supplied by the process of enameling, some observations on which are made by Mr. Krupsi in a German periodical from which we translate the following:

Up to the present time, these barrels have been made of oak wood, but as this article becomes rarer and more expensive, it became necessary to find a substitute. Iron has been proposed, but, though these have the advantage of greater durability and safety from leakage, there are many disadvantages—such as their greater weight, their liability of getting out of shape, the expansion and contraction by heat and cold, thus having a larger capacity in summer than in winter, and, finally, their expense. These disadvantages are so great that there is no likelihood of iron taking the place of wood in the manufacture of barrels for this purpose.

In Russia, where, with the exception of the western provinces, casks of oak wood are obtained with great difficulty, a substitute has at last been discovered, and quite a trade is done in barrels of pine and deal, enameled on the inside. The enamel prevents the liquid from coming in contact with the wood, and fills the cracks and prevents leakage. These take the place of oak barrels for many purposes, especially for lager-bier barrels. They are mostly bound with wooden hoops. The enameling is done as follows: The barrel is made and hooped, leaving out the bung stave, through this aperture the enamel is applied to the inside and then the bung stave is put in, in the ordinary way. The enamel is made of thirty-three pounds of carpenter's glue, three pounds of finely ground and sifted gall nuts, six pounds of pulverized and sifted glass, and five pounds of sifted cement or fine unslacked lime. The glue is softened with sweet milk instead of water, and boiled down quite thick, then the powdered gall nuts are added, and the whole boiled for half an hour, then the glass powder, and lastly the lime is thrown in. When these ingredients have been thoroughly mixed, five quarts of good linseed oil varnish is added, and the addition of a few pounds of sulphur is also desirable. It is then boiled until it is sufficiently thick, being well agitated all the time to prevent the glass and cement from settling at the bottom. When boiled sufficiently the kettle is immediately placed in ice, which causes the mass to solidify rapidly, so that the undissolved particles will remain in a finely-divided condition in the glue. The enamel is used in a semi-fluid state, and it is best not to prepare very large quantities at once, though it can easily be rendered fluid by heat when it becomes hard.

The casks to be enameled must be perfectly clean and dry, and just before putting on the enamel they should be heated by burning a little alcohol in them. Three coats are given, each one being allowed to dry before putting the next one on. In the case of very large barrels it is necessary to have the bottom well supported, as, when full, the bottom, if not supported, will give way a little, and the enamel not being elastic will crack, which will cause the barrel to leak.

Liquors placed in enameled barrels will not be colored or changed in taste by the coating, as is the case with oak barrels, which, when new, invariably turn the alcohol brown. This enamel, however, will not stand water, therefore when the barrels become dry they must be allowed to float on the water instead of putting water in them.—*Journal of Applied Chemistry.*

THE STRIKE OF THE "RAFFINEURS" AT LA VILLETTE, FRANCE.

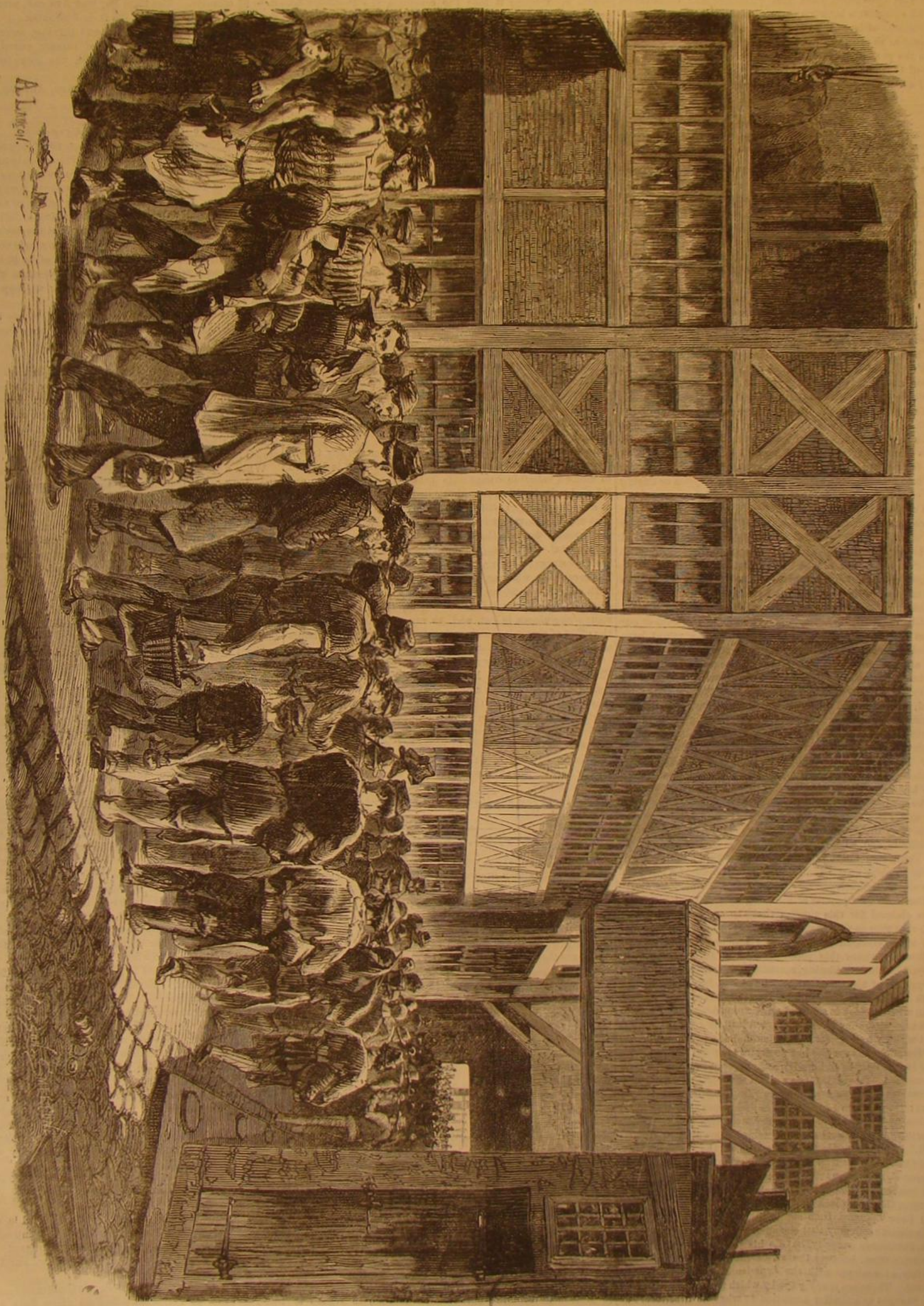
It is impossible to overrate the serious consequences of strikes. Both in Europe and America there have been of late numerous instances of these combinations to raise wages, and the attention of the wise and good has been thereby strongly called to the importance of devising some means of so adjusting the relations of capital and labor that these most disastrous movements shall hereafter find no real or supposed justification.

Our engraving, which we have had sent to us from Paris, represents a strike of the *raffineurs* in the works of MM. Jeanty and Prévost, at La Villette, in France. The peculiar characteristics of the French workingmen are graphically delineated.

What impresses the mind forcibly, both in American and European strikes, is the instantaneousness, promptness, and unanimity with which strikes are decided upon and put into effect. The workmen of a rades' union obey in our days the word of command like soldiers. In the strike we have delineated the day's work had commenced, when the word was suddenly circulated through the shops. Instantly the implements of labor were thrown down, and, seizing their personal effects, the workmen marched sullenly out. This somber, sullen determination is well delineated in the countenances of the strikers.

What will be the conclusion of these demonstrations, as prejudicial to labor as to capital, it is difficult to foresee.

The French Emperor has commanded the prime minister to make a detailed report upon strikes in general, and par



THE REFINERS QUITTING THE WORKSHOP OF MESSRS. JEANTY & PREVOST, AT LA VILLETTE, FRANCE.

ticularly upon the recent strikes in France. The war recently inaugurated will probably defer this report, which will undoubtedly be an important document. The Emperor has asked his Council of Ministers if it would not be possible to avoid such strikes in future by the creation of associations, based upon the model of the English associations, between the employers and workmen. In the present state of affairs, not only do the workmen in a single shop understand each other, but the relations between the trade societies are developing in all countries. The society known in France as the *Internationale* represents the interests of all the societies of workmen in Europe and America. The Parisian sections of this vast association have just published the constitution which establishes between them a solid and permanent confederation. More than twelve hundred members were present at the recent general convention.

In the present crisis would it not be wise to recall the saying of Cobden: "Let us make every effort to fill the deep gulf which the past has dug between capital and labor."

Correspondence.

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

Are Tin Fruit Cans a Source of Metallic Poisoning?

Messrs. Editors:—Under the above heading, in the Scientific American of June 18, there is an article from the pen of Miss Julia Colman, of Brooklyn, who, that paper states, "has achieved considerable popularity as a temperance lecturer, and has made the subject of food and nutrition a favorite study." Under a favorable editorial notice Miss Colman's article reads as follows: "So far as the evidence of the senses goes housekeepers know that cooking tomatoes in tin 'ruins the basins,' as one good woman said; and another admitted that she commonly used up at least one 'basin' in a season for this purpose."

The above statement, as it stands, ignores the very principles upon which the preservation of fruit in air-tight cans depends, and that is that the oxygen of the atmosphere is excluded to such an extent that the fruit itself is not affected, and until this is done there is not the slightest danger of the tin having been corroded, for it is well known that tin corrodes very slowly, even when exposed to the atmosphere. Miss Colman having satisfied her own mind that the acid of the fruit does act upon the can, goes on to say: "Whether the acid acts after the expulsion of the free oxygen or during the canning process, I do not know."

It cannot act to any perceptible extent during the canning process, for there is not sufficient time. Whether it acts or not after the air is excluded is more a question of fact than philosophy, and to make the same appeal that she does to the evidence of our senses, I think I can find more tin cans in good preservation that have contained fruit for years than she can find of tin 'basins' that have been ruined in a season by having tomatoes cooked in them. She says zinc is more readily oxidized than tin, and yet some of the caps of our glass cans are made of that substance. She might have added that zinc, when it does oxidize, is more poisonous than tin, and yet she finds no example of poisoning from this use of zinc, but does of tin. She states that "many if not all the tin cans are freely soldered with lead." Solder, as generally used, is a compound of metals which must have the quality of melting at a lower degree than the metal that it is designed to unite, and to effect this a small portion of lead is made an ingredient, when the solder is intended for uniting tin. But if through cupidity the manufacturers have adulterated or substituted lead for solder it is a thing not generally known.

For my own part I have been canning fruit, both for home use and for sale, for a good many years, and have received cans from different sources, but always from Western manufacturers, and, so far as my experience goes, I can give to the above imputation a positive denial. But, admitting solder to be more unsafe than tin itself does open to a question of some importance.

There is a new process of soldering cans on the inside, and it is claimed for this process that the can is stronger, and also that they can be made at less expense, and for this reason some Western establishments purchase cans made at Baltimore, where this process seems to be generally employed. Inside soldering, spreading, as it does, over a large proportion of the inner surface of the can, brings in contact with the acid of the fruit at least fifty times more surface than when the can is soldered on the outside. Add to this, if it is true, that they have substituted lead for common solder, and we may here detect a source of metallic poisoning.

Miss Colman says she has no desire to create a false alarm, and in justification of herself quotes other authorities. "Professor Youman thinks it is a small matter." But she finds "that many medical authorities disagree with him." One says: "It ought to be known to housekeepers that acid, fatty, saline, and even albuminous substances may occasion colic, vomiting, etc., after having remained some time in tin vessels." And again, Professor Edwards, of the Women's Medical College of the New York Infirmary, says that tin cans, as prepared, are very unsafe; that the acid of the fruit dissolves the lead solder, and sometimes eats through the entire plate, causing the can to leak; and also that serious cases of poisoning have occurred from eating their contents. This is the only direct testimony that she offers. Now I do not impeach the Professor's veracity, but do his judgment and want of discrimination, because the statement he makes is so completely at variance with the experience and observation of others. There are many ways by which fruit cans can be and are brought to a similar condition to what he describes, but he has presented the one most unlikely, if not impossible, and that is that the destruction was commenced by the acid of the fruit acting upon the inner portion of the can, and that the fruit was poisoned while its external appearance was yet good. Now, if the fruit was not sufficiently heated, or if the can was so slightly defective as to escape detection—things that sometimes do occur—the fruit would soon be brought to the same condition that it would be if left standing in open vessels. The partially confined and vitiated air would soon effect an opening sufficient to let the liquid portions escape, when this acid substance together with the *now* free action of the atmosphere acting upon the can both inside and out, would soon bring it into the condition the Professor describes, all of which only makes a case coinciding with that quoted, that "it is dangerous to eat acid, fatty, saline, and even albuminous substances after having remained some time in [open] tin vessels." I say *open* tin vessels, because he says that the cans had been eaten through, so that they leaked before his patients eat the remaining contents, and some space of time (how long he does not state), must have intervened between these two eatings—long enough, doubtless, to have spoiled the fruit. Now, if these philanthropists, including the Scientific American, would escape the charge of trying to create a false alarm, let them make good the statement that lead is being used for soldering fruit cans, and that the acid of the fruit does corrode the inside portion of the can to a dangerous extent, while the air is yet excluded. These with *inside soldering*, are, to my mind, the only points in this connection that are worthy of notice. It is also the duty of manufacturers to come out and clear themselves of these charges, if they are innocent.

In looking over the above I find one thing I intended to state omitted, namely, that what are called porcelain kettles should supersede tin or iron vessels for cooking all acid fruits or vegetables. Such vessels are not expensive, and the meterial will not corrode with anything belonging to the culinary department. A. D.

Hydrate of Chloral.

Messrs. Editors:—My experience with hydrate of chloral differs from that of Dr. Howig. I have taken it some six or seven times, varying in quantity from five to twelve grains. It has invariably caused sleep—real sleep—of three hours duration, but never longer.

As no two organisms are exactly alike, nor are any two in the same relation to a positively normal state, so it is difficult to make a valuable comparison between any two—the one inferred to be healthy, the other acted upon by this substance as a medicament. I will state that my digestion is good, and that my health rarely fails, except sometimes, upon sudden and great changes in the weather, neura'gic "twitches" keep me wakeful. Hydrate of chloral produces a rather oppressive drowsiness soon forgotten in sleep; this sleep, however, has invariably, with me, been an unfinished one, accompanied with some lassitude, and an impulse to sleep again. The elasticity which usually exists during the day, even after some wakefulness, is lost, and, to my mind, it is clear that the effect of this salt is discernible disagreeably twelve hours or more after its administration.

The bowels, generally regular, have been affected in opposite ways, sometimes a looseness has followed, and then a constipation, but always a change unaccounted for, except by this dose. My belief is that the affinities in this salt are so slight that decomposition follows immediately upon administration, and that chlorine—not chloroform—is freed in the stomach. Take the trouble to cover the stopper of a bottle containing hydrate of chloral with black silk, and press it closely in, and you shall soon have the characteristic bleaching of chlorine.

I shall take this substance when I must—not oftener.

Baltimore, Md. R. H. A.

To Preserve Green Grapes.

Messrs. Editors:—A very simple and successful method of preserving the green grapes of wild vines, is one employed in this State, which may be interesting to some of your readers. The grapes must not be too old; the best time is just before the seed begins to harden. They are, after being picked and freed from stems, put into bottles (strong wine or champagne bottles are best) so as nearly to fill the latter. These are then filled with fresh and clean water. After this they are all placed in a large kettle, partially filled with cold water, and the temperature raised nearly to the boiling point. The water in the bottles expands by the heat, and part is driven out. As soon as sufficiently heated, they are taken off, enough water poured out of each bottle to merely allow a well-fitting cork to be pressed in tightly. After being corked they are sealed up with sealing wax or common beeswax. As the bottles cool down a partial vacuum is left in the neck of each.

Grapes thus preserved have kept for years in this climate, where canned fruit almost invariably spoils during the hot summers. They can at any time be opened and prepared like fresh grapes, no difference will be found in the taste. It is better to use the water, also, in which they were kept, as it contains a large percentage of tartaric acid, which gives them the pleasant sour taste. I hope some will try this method and profit by it. A. F.

Indianola, Texas.

[To prevent breakage in heating, put some pebbles in the bottom of the kettle, so as to keep the bottles from touching the metal.—Eds.

Speed of Circular Saws.

Messrs. Editors:—Permit us to answer Mr. C. H. Crane, of Alabama, through your valuable journal, in regard to his test in sawing, page 52 present volume of Scientific American. Last March we set up a direct-action circular saw mill for John Dickerson, of Lafayette, Allen Co. The description of the mill is as follows: 2 flue boilers, 42 in. × 18 ft., engine, 10 × 14 in., the saw frame is of iron, suitable for two saws 54 and 32 in., with a log turner attached for turning logs by steam.

On the last day of June, by his request, we went to see him saw. He raised the steam to 100 lbs., and then began to saw. The first log was sycamore, turned four times and sawed into ¾ in. boards, 841 ft. in 12 minutes. The second log was elm, turned twice, and sawed into ¾-in. boards, 1,085 ft. in 9¼ minutes. The third log was live oak, turned once, and sawed into ¾-in. boards, 405 ft. in 5 minutes.

The sawing, backing, setting, and turning, were all done in 26¾ minutes, and the amount of lumber sawed, 2,331 ft. They have since sawed hickory, with the same feed, 3¾-in. boards, 21 in. wide.

Can any one equal this? Carnes, Ageter & Co.

Lima.

The Rotoscope and Gyroscope.

Messrs. Editors:—An article on page 20, of the present volume, by Mr. Manning, deserves notice. The several propositions and assertions in that article, at variance with well-known principles of rotary motion, it were misspent time to quote and reply to. I will, however, for the benefit of those who do not understand these principles, by taking a slight glance into the history of the gyroscope, show that the device of Mr. Manning, as well as the machine itself, is much older than he may suppose; and by an investigation of its phenomena, on well-known principles of nature, demonstrate that they are such as they should be—that there is no analogy between them and those of the celestial bodies.

From time immemorial, the tendency of bodies to retain the parallelism of their axis of rotation has been observed, as exhibited in the solar system, the spinning of the top, the artificial globe, and various other machines.

So far as my information extends, the first instrument made to illustrate this principle, was devised by the celebrated Laplace, to illustrate the precession of the eqxinoxes. This apparatus consisted of two concentric rings, revolving on axes at right angles to each other, with a small spheroid in the inner ring. To this machine, as the parent, all the gyroscopes may be referred.

When a youth—I am now in the seventy-ninth year of my age—long before matches were thought of, when old men lit their pipes with flint and steel and sun glasses, there was in use a small apparatus for striking fire, consisting in a semi-cylindrical tin box, a few inches long, at one end of which was mounted on an axis a steel disk about two inches in diameter. When this disk was given a rapid motion by unwinding a chord from the axis, on the application of a flint, a stream of sparks would flow into the tin box. If, whilst the wheel was in a rapid vertical rotation, we attempted to change the direction of its axis horizontally, a strong tendency would be felt in the wheel to leave the vertical, and assume a horizontal position.

About forty years ago, with a view to illustrate the principles of rotary motion, Walter R. Johnson made an improvement on the apparatus of Laplace, by adding another ring, and other appendages, which apparatus he called the rotoscope. Of the numerous interesting experiments that he made, I will give but one. He says: "Take the wheel and its supporting ring from the frame." It is then a gyroscope. "Connect with the ring at a point opposite to the axis of the wheel, a wooden rod, from nine to twelve inches long. Attach the end of the rod, remote from the wheel, to a cord suspended from the ceiling. Set the wheel in rapid motion, and then bring its axis and the rod up to a horizontal position. Then suddenly abandon it with the hand; instead of hanging vertically down, the axis of the wheel and rod will for some time be kept horizontal, continually performing a a circuit around the cord. If the velocity of the horizontal revolution be diminished, it will incline downwards. But if the velocity of revolution be augmented, the wheel and ring will rise in opposition to gravity until it strikes the suspending cord."

About twenty-five years afterwards, Abner Lane, of Conn., invented it over again, or perhaps copied it from Mr. Jackson's description and drawings.

A description and figure is given, Vol. XI, page 200, Scientific American. Several editorials and communications afterwards appeared in the Scientific American on the subject, one communication describing a device and experiments similar to that of Mr. Manning. The writer stated that when the gyroscope was exactly balanced it would have no revolving motion, but when the wheel preponderated, it would move in one direction, and when the weight preponderates, in the other direction.

This historical sketch, meager as it is, has taken so much space that the discussion of the phenomena must be deferred for another article, in which will be clearly demonstrated on well established principles in mechanics, that the phenomena of the gyroscope should necessarily be such, as they are determined by direct observation.

Jackson, Tenn. J. B. Conger.

Tempering Saws.

Messrs. Editors:—As your paper takes the lead in all that relates to machinery, tools, etc., I hope I am not intruding on your valuable time in making observations in regard to that most important of all tools, a saw. I say a saw, but I mean all kinds of saws.

I used the second saw mill of Page's (Baltimore) manufacture that came to Louisiana, sometime about 1846, and am

now running the same old machine. I have been, from that day to this, putting in order cross-cut and circular saws. I use still one of Hoe & Co.'s lever, die, and punch gummers to gum out both cross-cut and circular saws, and find it yet about as good as most of the new inventions.

I commenced to write this article about the tempering of saws. If there is anything done in a less mechanical manner than this tempering of cross-cut and circular saws, I would like to see it. Nine tenths of the new cross saws of all the new as well as the old shape of teeth should be left where they are made.

Why, saws are brought to me that the very best file will hardly touch; as for setting with a saw set, it is next to impossible. Put them under the gummer and they crumble like glass. Some parts are twice as hard as other parts. Many of the circular saws are no better; some few teeth are so hard that it is with the greatest difficulty they can be reset. This has become such an evil with us, who use a great many saws, that now, when we go to purchase saws of any kind, we carry a saw set and file to find out their temper. In gumming out a cross saw, it requires a new file for every saw. Will you please to call the attention of all kinds of saws manufacturers to this evil of hardening their saws too much? A cast-steel saw of any kind requires very little tempering. When I order saws of any kind new, I have to order the softest on hand, any other will be returned.

Iberville, La. M. P. M.

Bleaching Clothes.

MESSRS. EDITORS:—My laundress boils a bunch of peach leaves with her clothes to whiten them. Is it an idea, or is there any chemical action produced? The clothes are certainly very white when they come from her hands.

Columbia, S. C. J. .R. B.

Speed of Thought.

When it comes to the relation of mental action and time, we can say with Leibnitz, "Calculemus," for here we can reach quantitative results. The "personal equation" or difference in rapidity of recording the same occurrence, has been recognized in astronomical records since the time of Maskelyne, the royal astronomer, and is allowed for with the greatest nicety, as may be seen, for instance, in Dr. Gould's recent report on transatlantic longitude. More recently the time required in mental processes and the transmission of sensation and the motor impulse along nerves have been carefully studied by Helmholtz, Fizeau, Marey, Donders, and others. From forty to eighty, a hundred, or more feet a second are estimates of different observers, so that, as the newspapers have been repeating, it would take a whale a second, more or less, to feel the stroke of the harpoon in his tail. Compare this with the velocity of galvanic signals, which Dr. Gould has found to be from fourteen to eighteen thousand miles a second through iron wire on poles, and about sixty-seven hundred miles a second through the submarine cable. The brain, according to Fizeau, takes one-tenth of a second to transmit an order to the muscles, and the muscles take one-hundredth of a second in getting into motion. These results, such as they are, have been arrived at by experiments on single individuals with a very delicate chronometric apparatus. I have myself instituted a good many experiments with a more extensive and expensive machinery than I think has ever been employed, namely, two classes, each of ten intelligent students, who with joined hands represented a nervous circle of about sixty-six feet, so that a hand pressure transmitted ten times round the circle traversed six hundred and sixty feet, besides involving one hundred perceptions and volitions. My chronometer was a "horse-timer," marking quarter seconds. After some practice my second class gradually reduced the time of transmission ten times round, which had stood at fourteen and fifteen seconds, like that of the first class, down to ten seconds; that is, one-tenth of a second for the passage through the nerves and brain of each individual; less than the least time I have ever seen assigned for the whole operation; no more than Fizeau has assigned to the action of the brain alone. The mental process of judgment between colors (red, white, and green counters), between rough and smooth (common paper and sand-paper), between smells (camphor, cloves, and assafœtida), took about three and a half tenths of a second each; taste twice or three times as long, on account of the time required to reach the true sentient portion of the tongue. These few results of my numerous experiments show the rate of working of the different parts of the machinery of consciousness. Nothing could be easier than to calculate the whole number of perceptions and ideas a man could have in the course of a lifetime. But as we think the same thing over many millions of times, and as many persons keep up their social relations by the aid of a vocabulary of only a few hundred, or, in the case of some very fashionable people, a few score only, of words, a very limited amount of thinking material may correspond to a full sense of organs of sense and a good development of the muscular system. The time-relation of the sense of vision was illustrated by Newton by the familiar experiment of whirling a burning brand, which appears as a circle of fire. The duration of associated impressions on the memory differs vastly, as we all know, in different individuals. But in uttering distinctly a series of unconnected numbers or letters before a succession of careful listeners, I have been surprised to find how generally they break down in trying to repeat them between seven and ten figures or letters, though here and there an individual may be depended on for a large number. Pepys mentions a person who could repeat sixty unconnected words forward or backward, and perform other wonderful feats of memory, but this was a prodigy. I suspect we have in this and similar trials a very simple and mental dyanometer which may yet find its place in education.—*Dr. Holmes.*

SCIENTIFIC AND PRACTICAL FACTS AND ITEMS.

BY SEPTIMUS PIESSE.

SATURATION.

Acids and alkalies neutralize each other in certain definite proportions. When so neutralized, both alkali and acid are said to be "saturated." As both these materials are extensively used in the arts and manufactures, and also in certain beverages, the following table of saturation will be found useful for reference. The proportions given can easily be multiplied where large quantities are required, such as by dyers, brass-founders, etc. One drachm of carbonate of potass requires to saturate it 55 grains of tartaric acid, or 50 grains citric acid. One drachm of bicarbonate of soda requires 54 grains of tartaric acid, or 48 grains of citric acid. One drachm of crystallized carbonate of soda requires 30 grains of tartaric, or 27 grains of citric acid. One drachm of carbonate of ammonia requires 53 grains of tartaric, or 46 grains of citric acid. Reversing the materials, one drachm of tartaric acid requires to saturate it 65 grains of carbonate of potass, 66 grains of bicarbonate of soda, 70 grains of carbonate of ammonia, or 119 grains of crystallized carbonate of soda. One drachm of citric acid is saturated by 71 grains of carbonate of potass, 75 grains of bicarbonate of soda, 78 grains of carbonate of ammonia, 131 grains of crystallized carbonate of soda. Eight ounces of lemon juice, or two ounces of strong vinegar, are saturated with 60 grains of carbonate of potass, 62 grains of bicarbonate of soda, 67 grains of carbonate of ammonia, or 110 grains of crystallized carbonate of soda.

SOUND AND ELECTRIC FIGURES.

What are termed sound figures may be produced in various ways. One way is to fix a plate of glass at its centre with Burgundy pitch to an upright support on a stand, then to dust the plate with fine dry sand or other suitable powder, such as lycopodium. If now the plate be made to vibrate by drawing over its edge a violin bow, or some horse-hair tightly stretched from the two ends of a cane well rosined, the dust will arrange itself in due time into certain forms, lines, or figures. The same will occur by tying over a broad-mouthed glass or goblet with bladder that has been moistened and allowed to dry to a drum-like surface, and dusted with lycopodium or very fine sand, and then put upon a piano. Certain lines are soon visible after the instrument has been played upon, particularly when one chord only has been struck, so as to lessen the vibration. The blowing of a cornet, using one key, or the tuning of one note of any instrument, near the stretched membrane, will cause it to vibrate, and the dust to arrange itself into form. Thus these experiments clearly exhibit the effects of sound; and by due study of the dust lines we may see what sound, one long passed, has been. A somewhat similar application of this experiment has recently been made by a German philosopher to the study of the nature of electrical discharges between metallic conductors. It is found that when an electric discharge takes place between a horizontal plate of metal powdered with lycopodium, forming the positive pole, and a ball or point placed below it, the dust remains attached to the plate on a well-determined area.

EARNSHAW'S KEY OF MUSICAL KEYS.

This instrument, invented by Mr. E., of Sheffield, England, is chiefly intended for the use of the musical student in the early stages of his task; but it will also be of great use to persons more advanced. One important advantage will be found in the definiteness and precision which it gives of musical intervals, whether tonic, diatonic, chromatic, perfect, augmented, or diminished, of scales, modes, keys, enharmonic relations, signatures, concords, inversions, and of chords perfect and imperfect. Most of these are subjects which every student finds more or less perplexing. This instrument is adapted to relieve him of the difficulty.

STANLEY ELECTRIC DISK.

The science of electricity is one of the most promising to study. Almost every person who has studied it deeply has made discoveries which have proved beneficial to man. By its aid the baser metals are coated with gold and silver. Works of art are produced, and our taste refined. The telegraph is becoming our universal messenger. The light-houses are illuminated by electricity. By a knowledge of its nature we protect our ships and buildings from the dire effects of electric clouds. Electricity is the acme of heat, force, light, and magnetism; what we now know about it is sufficient to teach us how very much more there is yet to learn of this subtile agent. Hitherto, electrical apparatus has been expensive; but by bringing his perfect practical knowledge to bear upon the subject, Mr. Stanley, of Great Turnstile, Holborn, London, G. B., has produced an Electric Disk with Leyden jars, etc., by which a hundred experiments can be easily shown at the cost of a few shillings. As the boy makes the man, so will his toys indicate the bearing of his mind; and where there is a tendency shown by youth for the study of scientific truth, a better toy could not be given to them than Stanley's Electric Disk.

Gum or Rubber Springs.

Of the various materials used in the construction of railway cars, says the *Car Builder*, there are doubtless none of which so little is generally known as the india-rubber gum spring, and the process of its manufacture. The crude rubber has become such an important article of commerce, and in its various modifications is applied so extensively to mechanical purposes, that a brief account of its production, and the process by which it is manipulated into car-springs, will, we doubt not, be interesting to our readers.

Much the largest portion of the crude gum imported into this country comes from Brazil. A considerable quantity is produced in the East Indies, but the quality is inferior. The market is supplied with various kinds—fine and coarse Para, Central American, strip Central, Carthagena, Guayaquil, Java, etc. The finest quality comes from the Brazilian port of Para, and is the product of the extensive region embraced in the valley of the Amazon and its tributaries.

The gum, when received at the factory, is first cut up and passed through a washing machine, where all the dirt is extracted. It is then sheeted out and hung over stretchers in a drying room, which is warmed by artificial heat. In going through this process it will lose from five to thirty-five per cent in weight, according to the quality of the gum used—some being, when purchased, comparatively pure and dry, and some filled with sand and water, and, in some cases, with particles of wood. The better the grade of gum the less will be the waste. After it is thoroughly dried, it is weighed off in batches, say from thirty to fifty pounds, and a certain proportion of dry white lead and bolted whiting mixed with it. This is done in a machine consisting of two cylinders or rolls, about fifteen inches in diameter, heated by steam. Between these rolls the gum is passed, along with the lead and whiting, until the parts are thoroughly mixed and ground, when the proper amount of sulphur is added. This ingredient is not used for the purpose of adulteration, but is merely a vulcanizing agent, its action being analogous to that of yeast in bread-making. The mass or batch of gum, which now resembles putty somewhat in appearance, is next put into a warmer—a machine similar to the mixer—and kept in a condition for the calender—another machine with three large cylinders some four feet in length and two feet in diameter. These cylinders or rolls are kept heated by steam; the gum is put between them, and rolled out into sheets of about one sixteenth of an inch in thickness, and then passed to a mandrel (which corresponds to the size of the hole in the spring), and wound up until the required diameter is obtained. The ends of the roll of gum thus formed are then trimmed off, and the entire roll thoroughly coated with soapstone dust, to prevent its sticking to the mold into which it is then placed: this mold is twenty-four inches long, the iron being about an inch and a quarter in thickness and the inside diameter the same as that of the roll. After being driven into the mold the iron bolt or mandrel is withdrawn, caps two inches thick placed on the ends, and the bolt replaced and keyed up. The caps have three ears, through which bolts are put and fastened with nuts. The mold is then placed in the heater—a large wrought iron cylinder, some six feet in diameter, and thirty feet in length, which is headed up and bolted—and steam gradually admitted until about three hundred degrees are reached. In this condition the mold remains from four to ten hours, being carefully watched. The time is determined by the size of the spring, one of small diameter requiring less time than a larger one. When properly cured, the mold is taken from the heater, and, when cooled, the caps are removed, and the spring taken out and placed in a lathe, where it is cut into the required lengths. The springs thus formed are ready for shipment.

A rubber spring, when properly made, is without doubt, the best for the purposes required of any that has thus far been produced; but, when improperly made, it is one of the poorest. The materials which enter into its composition are liable to adulteration to a very great extent by the admixture of base ingredients, which impair its elasticity and durability, thus confirming the truth of the maxim that the cheapest is by no means the best. Springs can be made to weigh less by using less lead and more whiting in their manufacture; and the essential qualities of the spring are impaired just to the extent to which this is done—the lead having a metallic and durable body, and the whiting a perishable one. The best springs are made by using good Para gum with a suitable admixture of fine sheet Central or Carthagena, and a proper proportion of white lead and whiting. Some idea of the extent of the adulteration of low priced springs may be formed from the fact that fine Para gum is worth in the importer's hands $1 07 per pound, and sheet Central sixty cents per pound; while the manufactured spring is sold at forty to forty-five cents per pound.

THE PUBLIC DEBT.—The Government has, besides discharging all current obligations, paid on the public debt the large sum of $17,034,123! Since the incoming of the present administration the debt has been decreased over $156,000,000. The decrease since last March is over $69,000,000. During the year 1869 the average monthly reduction was over $7,000 000, while thus far in the present year the average monthly decrease has been over $13,800,000! Thus the average monthly reduction for the present year is nearly double that of last year, which shows a constantly increasing efficiency and economy in the revenue collections.

ELECTRICITY OF THE ATLANTIC CABLE.—According to Prof. Zantesdeschi, the Atlantic submarine cable may be considered as a Leyden jar, in which, when the inner insulated wires are carrying a message from America to Europe, those forming the outer layer should reconvey it from Europe to America. He therefore suggests that instruments be established at each end of the cable, by which the sender of the message can ascertain, by indications at his elbow, whether his dispatch has been received at the opposite extremity as he transmitted it.

MCBETH, SHAFFER & CO.'S UNIVERSAL WOOD WORKER.—In our description of this machine, published and illustrated upon page 79, current volume, we omitted to mention that it was covered by patent dated November 27, 1866, obtained through the Scientific American Patent Agency.

Improved Rotary Pump.

The family of rotary pumps is a large one. Notwithstanding some defects which radically pertain to this class of machines, they possess certain advantages, such as compactness, power of acting at the same time both as atmospheric and force pumps, fewness of parts, absence of valves, power of continuous action without air chambers, etc., which peculiarly fit them for certain kinds of work. As exhausters for mines and gas works, they are found to work admirably, while their application to the raising of liquids to any required hight within practicable limits, also renders them applicable to clearing mines of water, and for many other purposes which we need not name.

Our engraving shows a new form of rotary pump, for which it is claimed that its construction prevents loss of work by leakage, that it requires less power to drive it than other pumps of its class, and that owing to its simplicity of construction it is not liable to get out of order.

Fig. 1 is a perspective view, and Fig. 2 a detail showing the internal construction.

It will be seen that the pump consists of a combination of a paddle or bucket wheel, with a cut-off wheel. The packing is stationary.

The case, A, is made in the form of two intersecting cylinders, the portion of each cylinder comprised by their mutual intersection being removed. A cylindrical projection, B, cast with the case, leaves an annular space between it and the outer rim of the case, in which space the buckets or paddles, C, play. These paddles are attached to, and project from the side of a disk, not shown, which disk overlaps the cut-off wheel, D, its edge meeting a properly formed shoulder in the outer shell or case, so as to make a water joint.

The buckets, C, pass into and meet the sides of cylindrical recesses in the cut-off wheel, D, as shown. The bucket wheel and the cut-off wheel move in opposite directions, the one being rotated by a gear, impelled by a gear on the shaft of the other, as shown in Fig. 1, and the direction of the flow being indicated by the arrows in Fig. 2. The buckets, C, moving away from the cut-off wheel, D, constantly increase the space for receiving the water which therefore flows in to fill the space. On the opposite side the buckets, C, constantly approaching the wheel, D, reduces the water space, and therefore forces the water out of the discharge pipe.

The wings of the cut-off wheel always keep the space between the supply and discharge pipes interrupted, and in conjunction with the packing block, C, prevent the return flow of the water.

This pump was patented, June 21, 1870, by August Leuchtweiss, Twelfth street, between Vine and Race, Cincinnati, Ohio, through the Scientific American Patent Agency.

Fig. 1

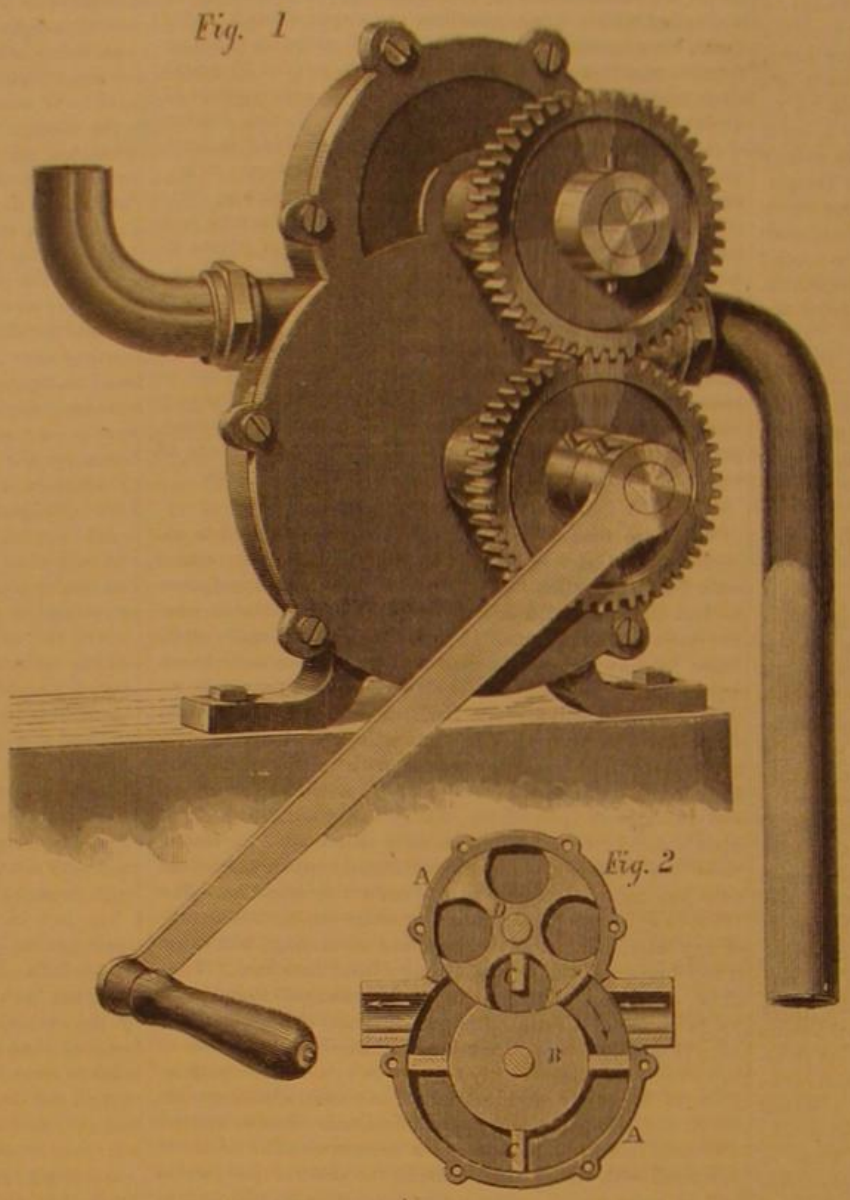


Fig. 2

LEUCHTWEISS' IMPROVED ROTARY PUMP.

Improved Cradle.

It is comparatively rare that we can present inventions of special interest to our lady readers. Yet here is something which they all will do well to examine.

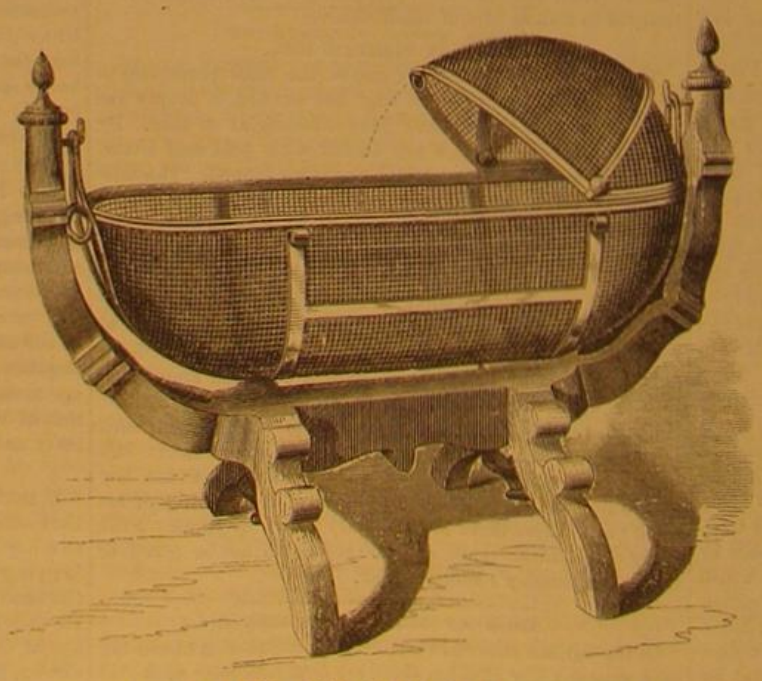
The cradle illustrated in our engraving seems to us to be one possessing peculiar advantages, and calculated to greatly increase the comfort and happiness of a large and important class of community.

In the first place it is very graceful in design, and it is not only airy in appearance but in reality, perfect ventilation being secured.

Secondly, it affords perfect immunity against the attacks of flies and mosquitoes. It would seem that the application of the hood to the beds of adults would prove an excellent thing in sections where mosquitoes are numerous.

The cradle is made of wire netting supported by a suitable metallic framework. The wire of which the netting is made is galvanized or otherwise protected from rust in some suitable manner. A hood of the same material is pivoted at the head of the cradle, so that it can be let down into the position shown in the dotted outline or raised as desired. When closed it forms a hemispherical dome, which, while excluding insects, admits a free circulation of air, permits free movement of the child's head and arms, and does not obstruct the sight of the child by the nurse, as the meshes permit distinct vision.

Patented, January 11, 1870, through the Scientific American Patent Agency, by L. Chevalier, of Williamsburgh, N. Y., and R. Brass, of Waterbury, Conn. The manufacturers are Koch, Chevalier & Brass, 168 Johnson street, Williamsburgh, N. Y., to whom orders or letters for information may be addressed.



CHEVALIER AND BRASS' WIRE CRADLE.

Reflectors on French Ships.

A French paper says it is intended to supply several vessels of the fleet with an apparatus intended to light up the line of the horizon in dull weather, or any point of the sea coast at which it may be expedient to disembark at night. This apparatus, placed in the fore part of the ship, is composed of an electric light and a powerful reflector. The light is produced by the combustion of two cones of coal, in communication with a magneto-electro machine. This is itself put in motion by a small steam engine connected with the ship's engines. The reflector, on Fresnel's system, is analogous to that employed in lighthouses. This apparatus possesses such great illuminating power that, when directed upon a point of any coast, it is clearly visible at a distance of about two miles without its being possible for the enemy on the coast to distinguish the ship bearing the light. The iron-clad frigate *Heroine* carries one of these lights, which has been useful in gloomy weather to the transatlantic packets. It is said the Russian Government has ordered several of them from the French inventor, and proposes placing them in the port of Cronstadt. Speaking of this system, the Austrian Admiral Tegethoff, the victor of Lissa, used to say that if he had then the assistance of such lights he should have annihilated the Italian squadron while anchored in the roads of Ancona. It is, in fact known that one night, shortly before the battle of Lissa, the Austrian fleet approached within reach of the cannon of Ancona. Admiral Tegethoff thought he could distinguish through the darkness a thick smoke, showing that the Italian vessels were getting up their steam and were about to weigh anchor. Such a reflector as that recently invented would have permitted him to see that he was mistaken, and that the fires of the hostile squadron were not lighted. The fate of these motionless vessels would soon have been decided

Hot Boxes.

A correspondent of the *Iron Age* writes from Philadelphia—"Cannot some live Yankee supply a cure for 'hot boxes' on railway trains? With the constant improvements in railway machinery, this would seem to be a simple invention, and yet it hasn't arrived. The question was suggested by a detention to your correspondent the past week by which your readers lost their no doubt valued (if not valuable) correspondence. The Pacific express, the lightning train from Chicago, made its usual excellent time as far as Harrisburg, and should make no stop from that city to Philadelphia, a run of 105 miles. In half an hour the train was stopped with two journals smoking in a forward car. Buckets of water and greasy waste cured this, and the run, after the loss of fifteen minutes, was continued below Lancaster. Shortly again the train halts, and this time a lively tongue of flame is issuing from a journal on a rear car. Three successive stops were made on account of this trouble before reaching Philadelphia, and the loss of time in the aggregate very considerable. Now, we respectfully submit that as somewhat greater problems in machinery have been solved, that the remedy for this nuisance lies within the possibility of human genius. To the man who *does* it we promise a customer *certain* in one of the leading railways, if we can judge any thing from the remarks of a prominent railway official on that 'hot-box' train."

Purification of Lard.

Take 28 pounds of perfectly fresh lard place it in a well-glazed vessel that can be submitted to the heat of a boiling salt-water bath, or of steam under a slight pressure. When the lard is melted, add to it one ounce of powdered alum and two ounces of table salt. Maintain the heat for some time—in fact, till a scum rises, consisting in a great measure of coagulated proteine compounds, membrane, etc., which must be skimmed off. When the liquid grease appears of a uniform nature it is allowed to cool. The lard is now to be washed. This is done in small quantities at a time, and is a work of much labor; which, however, is amply repaid by the result. About one pound of the grease is placed on a slate slab, a little on the incline, a supply of good water being set to trickle over it. The surface of the grease is then constantly renewed by an operative working a muller over it, precisely as a colormaker grinds paints in oil. In this way the water removes any traces of alum or soap; also the last traces of nitrogenous matter. Finally, the grease, when the whole is washed in this way, is remelted, the heat being maintained sufficiently to throw off any adhering water. When cold, the operation is finished.—*Druggists' Circular.*

On Organic Matter in Water.

An English chemist was some time ago called on to assist a large manufacturer of lemonade, who suddenly found it impossible to make lemonade that would keep. After a day or two it became turbid, and its odor anything but agreeable. On investigating the liquid under the microscope it was found full of small spherical cells with, in most cases, a very bright nucleus. After examining all the materials employed, it was detected that the fault was with the water. On putting a few grains of pure crystalline sugar into some of the water, it became turbid in a few hours, and contained the cells above described. On inquiry it turned out that the well from which the water used in the preparation of the lemonade was obtained, had been slightly contaminated with sewage. This led the experimenter to mix a minute quantity of sewer water with a sugar solution; very soon the cells made their appearance. Filtering through the finest Swedish paper does not remove the germs. Boiling for half an hour in no way destroys their vitality. Filtration through a good bed of animal charcoal seems to be the only effectual mode of removing them; but it is necessary to air the charcoal from time to time, else it loses its purifying property.

White Brass.

In our issue of May 28th we noticed the manufacture of white brass at the Thames Foundery in England. Several inquiries were addressed to us to know where the new article could be obtained. We are now able to refer our readers to the advertisement of the "American White Metal Company," who have imported a small supply for the purpose of testing the market.

Scientific American,

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To Advertisers.

The circulation of the SCIENTIFIC AMERICAN is from 25,000 to 30,000 copies per week larger than any other journal of the same class in the world. Indeed, there are but few papers whose weekly circulation equals that of the SCIENTIFIC AMERICAN, which establishes the fact now generally well known, that this journal is one of the very best advertising mediums in the country.

THE INFLUENCE OF WAR UPON INVENTIONS.

We have formerly expressed the opinion that the history of a people could be written from a careful study of the catalogue of inventions for any given period. Such a test would not apply to ancient history before the arts and sciences had reached their present advanced stage; but since patents have become common, and international laws have been passed in reference to them, whether a country was in a state of war or at peace with all the world could be detected from an inspection of the inventions demanded by the wants of the time. There is no doubt that war has exercised a great influence upon inventions. When the existence of a nation is at stake all good citizens feel called upon to put forth every effort to save it, and it is thus that the inventive faculties are sharpened, and unusual applications of machinery or discoveries in science are made. During the earlier wars of Napoleon the French navy was unable to compete with the English, and as a consequence the ports of France were blockaded. This occasioned a serious interference with many trades; the manufacturers of soap, especially, felt the want of soda ash, which they had been in the habit of importing from Spain. It became necessary to find some method by which this article could be manufactured from sea salt. However powerful the English navy might be, it could not prevent the tides of the ocean from overflowing vast tracks of meadow land and thus cut off the supply of salt. We all remember the grand discovery of Le Blanc, of a method of making soda ash out of common salt, that grew out of the necessities of the French nation at this period. It was a discovery of the utmost importance, and in its consequences has not been surpassed by any application of science to the arts that has ever been made. During the same period of the French wars a scarcity of gunpowder called up the question of a cheap manufacture of niter, and as a result of the investigation we have niter beds for the artificial production of the chief constituent of gunpowder. The study of how to prepare niter beds has led to the more important research into the growth of crops, the value of nitrogenous manure, and numerous other questions in agriculture. If any of our readers will take the trouble to look through the list of patents published by us during the late civil war in this country, they will find abundant confirmation of our theory that war has a great influence in directing the inventive talent of the country into certain channels. A very large proportion of the patents taken out were for improvements in fire-arms, or for something relating to the wants of the army. Such capital discoveries as those of soda ash and artificial niter cannot be expected to come very often; but less important inventions are made in time of war that afterwards prove of service, and are kept alive long after the original occasion of their introduction has ceased. The Crimean war involved the sending of provisions a great distance, and this led to the method of drying and compressing many articles of food into compact packages; and out of this want has grown the large business of hermetically sealed cans and desiccated vegetables. We derive the benefit of cheaper food from the unfortunate necessity that then prevailed of sending rations to the army. Some of the leading inventions in the application of electricity to the explosion of torpedoes were made in the interest of war, and in times of peace we apply the principle to the work in mines, to all blasting and engineering problems, and should have great difficulty to get on without this powerful agent. To clothe and feed a vast army concentrates the talent of the best men upon the question of ways and means, and as soon as the answer is obtained for the army it applies equally well for the nation. How to transport troops and the material of war occasions improvements in the construction of roads and bridges, and in the power to be employed for the purpose. We have as a result better engines, more compact vehicles, cheaper roads, which we obtain as a legacy from troublous times. It is a curious fact that the study of fulminates and percussion powder, without a knowledge of which the needle gun would be of no avail, enables us to make cheaply the cyanides that we require in photography and electro-plating. The inventor of a certain class of fulminating powders could hardly have anticipated to what peaceful uses his discovery would some day be applied.

Necessity is the mother of inventions. Steel guns were a necessity. The Bessemer process, which met with such opposition at the start, relieved this necessity, and the Germans were among the first to profit by it, and the blast furnaces of Krupp were able to furnish the Prussian army with the finest steel cannon that had been produced in any part of the world, and when the time came for converting warlike weapons into plowshares and pruning hooks, the same steel was employed and its use further extended into railroad iron and all kinds of machinery. It is a fortunate circumstance for Germany that the war of 1866 established the steel industry upon a sure basis and laid the foundation for manufactures that may be the means of saving the nation, in its present emergency, from a disastrous overthrow.

Our thoughts have been led into this channel by the impending struggle between France and Prussia—the two nations from whom we have received some of the most important inventions and grandest discoveries of modern times. What influence this unfortunate war may have it is impossible to predict. If it were to continue for a considerable length of time, so as to divert the studies of the scholars and practical men of both countries into devising some measures for surmounting the obstacles imposed by the war, we could not fail to hear of important discoveries. It is a severe ordeal for them to pass through, and all of us would be willing to take the chances of peace for providing us with all that we require, rather than that the people of those countries should be made to suffer; but now that the war has begun, and no influence of our Government can prevent it, it becomes an interesting question to watch for the inventions and discoveries likely to grow out of it. As nearly every able-bodied man is in the army, the crops, if reaped at all, must be gathered by improved agricultural implements. The farmer must learn how to make for himself many things that he formerly obtained by exchanging the produce of his farm. Every class of society will be injuriously affected, and to keep out starvation and want will call into exercise the dormant energies and powerful intellect of both nations. It is a melancholy spectacle, and fraught with serious consequences, and no possible discovery or invention can compensate for the loss of blood and treasure that must follow in the path of such a war.

PAPER MONEY VS. GOLD.

Men are prone to be dissatisfied with what they have, and to desire that which they have not or cannot have. In accordance with this peculiarity of human nature, our present currency has been denounced with great bitterness as being filthy trash undeserving the name of money, and as unfit for the purposes of commerce. Commerce, however, seems to have got along very well with it. It must be granted that it has its inconveniences. One is often forced in accepting a stamp to accept with it a singularly adherent and vile smelling accumulation of desiccated lager, gin, soda-water, fruit juice, perspiration, etc., which it has gathered in its travels through horse-cars, and hotels, back slums and brothels, bars, and the filthy paws and pockets of boot-blacks.

Dirt and counterfeit imitations are the worst drawbacks of paper currency. But it has its conveniences as well as inconveniences. Its portability and the fact that when worn it can be exchanged for new currency without loss are qualities which specie currency—for which there has been so much clamor—does not possess.

We have been led to these remarks by an article published in an English cotemporary in regard to the gold currency of England.

This journal asserts that the sovereigns of the British mint become so worn in fifteen years as to be too light for circulation. At that time, it says, they should go into the crucible. But this loss in weight is not an apparent loss, but a real and unrecoverable loss of the precious metal.

The journal referred to (*Mechanics' Magazine*) has made a calculation that to make this loss good and keep the currency at a standard value it would be necessary to renew it at the rate of eight millions per annum, while the speed of reproduction of the mint is only five millions annually. It argues from this that the final destruction of the gold currency as legal money is certain, unless prevented by a greater issue of paper currency.

There is no denying these facts, and there is no dodging the inference that paper currency is to be the money of the future, not only in this country, but abroad.

The article referred to goes on to show that although the gold coin has been supposed to be the currency of English commerce, yet that paper money built every town and village in Scotland, constructed all its docks, harbors, roads, factories, and public works, opened its mines, and reclaimed much of its soil from barrenness.

The question now arises whether a specie basis for the increased paper currency demanded by the commerce of the world can be secured. We are inclined to think not, and also that such a basis is neither necessary nor so desirable a one as government credit. We do not, however, intend to discuss this question. The facts to which we have called attention are, however, so significant of the tendencies of the time in regard to money that they are worth more than a passing thought.

THE SALE OF EXPLOSIVE ILLUMINATING FLUIDS.

We have much in this country to be ashamed of as a nation; but of all the things tolerated which daily disgrace us, the permitted sale of articles of a dangerous nature by those conscious of the danger, to the ignorant and unconscious, is one of the most crying of our many sins against civilization.

How much longer are we going to allow dishonest and unscrupulous rogues to deal with death in the shape of burning fluids? Scarcely a week passes but news reaches us of some person or persons—generally women or children, or both—dangerously or fatally burned by an explosion of the vapor, or the instant combustion of something of this kind, consequent upon the fall of a lamp or some other familiar cause.

We have now before us documents sent by Wm. H. Coleman, of Geneva, N. Y., which indicate that fluids of a dangerous character are not only extensively vended in that town, but that probably in most of the towns and villages of the United States these death-dealing agents find their way, if not regularly, at least with sufficient frequency to amply account for the numerous accidents reported.

A Western manufacturer has, according to these documents, been making and vending an article known as the "Danforth Petroleum Fluid," in the use of which serious accidents having occurred, the fluid was submitted to Professor Towler, of Geneva Medical College, for test. That gentleman found that this fluid contained naphtha, and that it was "highly explosive, not only when treated with oxygen, but also when its vapor is mixed with common air, which vapor is given off at ordinary temperatures."

Mr. Coleman adds: "This evaporation goes on rapidly. A lady who had used the fluid told me that she once set away a lampful for company use, and on bringing it out again but a spoonful or two was left. It will be observed, by the way, that the fluids burns twice as fast as kerosene, so that a gallon actually costs eighty cents."

Among the various tests made by Prof. Towler is one that on account of its simplicity might well be practiced by all users of petroleum oils. It is described by him as follows:

"Level a piece of glass (two inches square, for instance), on the top of a bottle, and pour a little kerosene on the middle and let it spread. If the kerosene is pure (properly rectified) it is impossible, with a burning match to kindle the thin layer of this into flame, as long as the glass itself is not mad hot."

With the fluid under consideration a flame was produced long before the match came in contact with the thin layer of fluid beneath.

We are informed that the establishment which makes this fluid employs 1,000 men, and has 700 offices.

Now, all we have to say about its proprietor is, that if the facts stated about the commodity are true, it is time a vigilance committee was organized to rid the world of such an unprincipled swindler. When they have done with him they might continue their labors in other directions to public advantage.

Mr. Coleman has been at the pains to collate some facts in regard to the treatment of naphtha fluids by insurance companies, and finds a wide difference in their rules upon this important matter. As this is a subject of general interest, we copy his summary:

"The 'Etna,' of Hartford, Conn., says nothing; the 'Hartford' gives 'written permission' for storage of petroleum, naphtha, benzine, etc.; so do the 'Security,' 'Niagara,' 'Manhattan,' and 'North American'—all of New York. The 'Continental' does allow fluids (otherwise forbidden) to be used as lights. The 'Springfield' (Mass.) imposes an additional charge on buildings where camphene, spirit gas, burning fluid, phosgene, or any other inflammable liquids are used for lights; and forbids the storage of gunpowder, crude coal oil, naphtha, and benzine without written permission. The 'Home Insurance Co.' (N. Y.) is the only one that approaches the right ground. Its policy says: 'If the assured shall keep gunpowder, fireworks, nitro-glycerin, phosphorus, saltpeter, nitrate of potash, petroleum, naphtha, gasoline, benzine, benzole, or benzine varnish, or keep or use camphene, spirit gas, or any burning fluid or chemical oils, without written permission in this policy, then in every such case this policy shall be void. Kerosene oil, however, *may be used for light* in dwellings, and kept for sale in stores in quantities not exceeding five barrels—to be drawn by daylight only.'"

We agree with Mr. Coleman that the "daylight" clause is only necessary where the fluids stored are such as ignite below the legal standard of 110° Fah.

IMPORTANT TO MANUFACTURERS AND IMPORTERS.

The law respecting trade-marks, forming part of the new patent system, makes special provision for the protection of "any lawful trade-mark" to the exclusive use of which any person or firm domiciled in the United States, and any corporation created by the authority of the United States, or of any State or territory thereof, or any person, firm, or corporation resident of or located in any foreign country which affords similar privileges to the United States, are entitled, or which they intend to adopt and use for exclusive use. Such trade-mark protection can be secured in the Patent Office by the

parties entitled to such protection, they having to furnish six copies of the proposed trade-mark, together with such statements and descriptions as are necessary to make the nature of the class of merchandise to which the trade-mark is applied and other minor items fully understood. Such trade-mark remains in force for thirty years,and can be renewed for thirty years more. The official recording fee is twenty-five dollars, that for extension being the same. At present only residents of France and Russia will enjoy the same privileges, under this law, as residents of the United States, but it is to be hoped that other countries, especially England, will soon afford similar protection to foreigners, which will entitle their citizens to the benefit of this act. All manufacturers and importers of special goods will find it to their advantage to improve this opportunity for protecting their articles of manufacture and merchandise. They will thereby obtain an honest monopoly and security against fraudulent or unscrupulous competitors.

Our Patent Agency is prepared to furnish the necessary documents, descriptions, oaths, etc., required for securing trade-marks, and to give advice on the subject to applicants on the most liberal terms. A pamphlet about being published by us gives full directions on the subject. Address Munn & Co., 37 Park Row, N. Y.

VISIT TO THE DELAMATER IRON WORKS, NEW YORK.

Last December, was announced in this and other journals an almost, if not quite, unprecedented feat of naval construction, namely, the designing, building, and launching of thirty gunboats in four months' time, by a single establishment, the Delamater Iron Works, situated at the foot of West Thirteenth street, New York. Yet even this did not fully tax the capacity of the works, which, we are informed, could turn out one hundred such vessels, completely equipped for sea, in six months, should occasion demand it.

As may be supposed, an establishment of this kind is well worth a visit from any who are interested in marine engineering. It would, however, be a mistake to suppose these works exclusively confined to this department of engineering. In a recent visit we were surprised to find a much larger variety of work in progress than we had supposed was usual in this establishment. Upon inquiry we were informed that the works have quite a number of specialties, upon which they are constantly running, other than the manufacture and repair of marine boilers, engines, screw propellers, etc.

A brief enumeration of these specialties, as showing how much can be profitably done by skillful organization of inventive talent, financial ability, and labor, may not prove uninteresting to our readers.

These are the most extensive marine-engine works in the United States. When running up to their full capacity they employ a force of 2,500 men in the various departments. They employ, we are told, a larger force of constructing engineers than any other establishment in the country. These engineers are men of high ability, working under one general supervision, bringing to bear variety of experience, in all departments, upon the mechanical problems which constantly arise in the construction of novel and experimental machinery, in which branch these works have acquired a high reputation. This wide range of talent and experience particularly adapts this establishment to the development of new ideas and devices, as it gives full knowledge of all mechanical resources depending upon character of materials or peculiarities of construction. Any piece or set of machinery of whatever size or character can be designed and constructed here throughout.

Among the specialties which form the staple of the work performed, we may mention the Delamater Propeller Wheel, extensively and favorably known in every part of the world. These works were the first to build propeller engines in this country, and have ever since ranked first in this branch of business.

Several kinds of stationary engines are also manufactured, one of which, the horizontal Rider Governor Cut-off Engine, was described recently in these columns. Two styles of these engines are built, one of long stroke and high finish, designed for such as wish a handsome, showy engine, and one of short stroke, for such as wish economical power. The working parts are alike in both styles, the only difference being in length of stroke and finish. Great pains were taken to develop and perfect this engine before putting it into market, and the result is shown in a valve gear that, possessing a degree of delicacy which renders it a formidable competitor to the very best engines in market, still is so simple as not to prove troublesome where high skill in its attendance is unattainable.

Another specialty is Bacon's Trunk Engine, for stationary, marine, and hoisting purposes, which combines durability, compactness, and cheapness in a very high degree. It is claimed that these engines occupy less space in proportion to power developed than any other engine in use.

Another specialty, occupying an entire floor in these works, is the manufacture of Captain Ericsson's Caloric or Hot-air Engines. These engines are well and widely known as the most economical of small motors, occupying little space, requiring no water and scarcely any attention in running, and being entirely free from any danger of explosion. The number of these engines in process of construction indicates an extended demand for them, which we were wholly unprepared to credit previous to our visit to these works.

Experiments in new motors are in progress, with good prospects of successful issue, which, when accomplished, will be laid before our readers.

Still another specialty is the Reynolds Hoisting Machine, driven by friction gearing instead of toothed gearing, which, besides being exceedingly convenient to attach and detach from the main shaft, may be run at greater velocity with a heavy load than is possible with toothed gearing.

Besides these most prominent branches of manufacture, are manufactured and put up mining and pumping machinery of the most improved construction, and telo-dynamic machinery for transmitting power to great distances by means of wire rope. The value of this method of transmitting power is becoming daily more generally known, and as a consequence the demand for machinery of this class is constantly increasing.

All these varied and extensive branches of work are conducted in a quiet, efficient manner, which speaks volumes for the directing and organizing skill of the head of the establishment.

Any of our readers who desire a more minute description of the various specialties to which we have alluded, may, we presume, obtain it on application at the works, where they will find a corps of accomplished engineers ready to advise them on any subject connected with the mechanic arts.

SPONTANEOUS GENERATION.

There are reasons why even the most accurately performed experiments, even if they result apparently in the spontaneous appearance of living organisms, should be regarded with doubt, so far as they are assumed to sustain the theory of spontaneous generation.

We do not at this time, however, propose to discuss these reasons. Our purpose is to review an account of some very remarkable experiments performed by H. Charlton Bastian, as described by him in the columns of *Nature*.

We have not space to discuss these papers at length, as they occupy a considerable portion of several numbers of the periodical referred to. We shall confine ourselves exclusively to the experiments and their results, which were of the most remarkable nature.

It is generally agreed among biologists that living organisms will withstand a much higher degree of heat in dry air or a vacuum than in a liquid medium.

From the experiments of Pasteur, Balbiani, Berthelot Broca, Brown-Sequard, and many others, it has been fully determined that a temperature of 130 deg. C., equal to 266 deg. Fah., in dry air or *vacuo*, is sufficient to destroy all vital action; and that 100 deg. C.—212 deg. Fah.—is sufficient to destroy the eggs and germs of such organisms as are found in infusions as well as their spores and germs.

Mr. Bastian started upon his experiments with the idea that it would be possible to so modify the celebrated experiments of Schwann that the conditions would be more satisfactory to the evolutionists, and at the same time not less in accordance with the views of the panspermatists.

He says: "The withdrawal of all air from the flasks in which the boiled solutions were contained, rather than the admission of calcined air, seemed to be the kind of modification which was desirable. Then the contamination of the boiled fluids with possible atmospheric germs would be as effectually provided against as if air had been only allowed to enter after it had been calcined, and the seemingly obvious advantage would be attained that there would be even greater freedom than usual for the commencement of evolutional changes, on account of the diminished pressure upon the fluids contained *in vacuo*. It was presumed, also, that changes might go on for a certain extent before the evolution of gases had been sufficient to exercise such a repressive influence as to prevent their continuance."

The flasks employed were capable of holding about two ounces of fluid. These proved to be quite large enough, and their small size made it easy to manage the whole process with a very slight amount of assistance. After each flask had been thoroughly cleaned with boiling water, three-fourths of it was filled with the fluid which was to be made the subject of experiment. With the aid of a small hand blow-pipe and the spirit-lamp flame, the neck of the flask, about three inches from its bulb, was then drawn out till it was less than a line in diameter. Having been cut across in this situation, the fluid within the flask was boiled continuously for a period of from ten to twenty minutes. At first ebullition was allowed to take place rapidly (till some of the fluid itself frothed over) so as to procure the more thorough expulsion of the air; then the boiling was maintained for a time at medium violence over the flame of a lamp, whilst the greatly attenuated neck of the flask was heated in the flame of a spirit-lamp placed at a corresponding level. The steam for a time poured out violently into the flame of the spirit-lamp; and whilst the assistant turned down the flame of the lamp so as to diminish still further the violence of the ebullition, a blow-pipe flame was directed upon the narrow orifice of the neck of the flask, which sealed it hermetically. Immediately that the orifice was closed, the heat was withdrawn from the body of the flask.

Mr. Bastian believes that an almost perfect vacuum can be obtained in this way, but in case the vacuum should not prove to be perfect, he thinks "there would not be any material abatement from the severity of the conditions which the panspermatists have a right to demand. If, on the one hand, absolutely the whole of the air had not been expelled from the flasks during the process of ebullition, what remained would necessarily be mixed up with a very much larger quantity of continually renewed aqueous vapor, and the effect would probably be that any living things would be just as effectually and destructively heated as if they were lodged in the boiling solution itself; whilst if, on the other hand, the boiling had been arrested for one or two seconds before the complete closure of the almost capillary orifice at the mouth of the flask, even if any air entered, it would have had first to pass through the blow-pipe flame, and then through the white-hot capillary orifice—it would, in fact, have been calcined as in Schwann's experiment."

The flasks thus prepared were then suspended beneath the mantelpiece in Mr. Bastian's study, and kept at a temperature of from 75 to 86 degs. Fah.

Several sets of experiments were performed. In one set the fluids employed were raised to a temperature of 300 degs. Fah., considerably above the limit at which all vitality is, according to the experiments above referred to, destroyed.

The infusions and solutions employed were all filtered previous to being placed in the flasks. They were beef juice, vegetable infusions, mixed animal and vegetable infusions, and saline solutions. Some of the infusions had a distinct acid reaction. In some of the flasks no life appeared, but in a large majority, even those heated and kept for some time at a temperature of over 300 degs. Fah., a variety of living organisms were found.

We have not space to definitely review each of the large number of experiments performed. We shall confine ourselves to a few of the most striking and important. Those who wish will have the opportunity to peruse an account of them at length in a book, shortly to appear, entitled "The Beginning of Life."

A flask containing an infusion of hay, together with a few grains of phosphate of soda, *in vacuo*, which had been hermetically sealed seventeen days previously, after the fluid had been boiled, was opened on January 25, 1870.

The fluid itself was not turbid or cloudy, though it had become darker in color. The bottom of the flask was irregularly lined with granular and slightly flocculent material.

On microscopical examination of two or three drops, there were seen many actively moving monads; some bacteria of medium size; many quite irregularly-shaped particles in active movement; many flattened bits of protoplasmic-looking material with irregular and slightly curled edges, slowly moving, and ranging in size from 0·0001 of an inch to 0·0002 of an inch in diameter (other masses of this kind were distinctly hollow though mostly irregular in shape); and lastly there were several large irregular masses of fibres, the nature of which could not be determined.

A flask containing a solution (neutral) of crystallized white sugar, tartrate of ammonia, phosphate of ammonia, and phosphate of soda, *in vacuo*, which had been hermetically sealed nine days previously, after the fluid had been boiled for twenty minutes, was opened on January 4, 1870.

Before the flask was opened the solution itself was clear and without the least trace of a pellicle on its surface, though for the last three or four days a very fine deposit was seen on certain parts of the bottom and sides of the flask.

When examined microscopically, a very few monads and bacteria were found in the first few drops of the fluid, which had been poured out before the whole was shaken. The remainder was then poured into a conical glass, and after having been allowed to stand for a time, the supernatant fluid was removed, and the last few drops containing the sediment were examined. In this were seen many bacteroid particles and monads of different sizes, exhibiting the most active movements.

The following experiment, with which we shall conclude this review, was one of a set performed with strong tubes, in which not only so perfect a vacuum was produced as to render them good water hammers, but in which the fluids were raised to 307·4 degs. Fah., and kept so heated for *four hours*:

A tube containing the infusion of turnip was opened at the end of the twelfth day, when it was found that the fluid had been changed to a decided, but light brown color, and there was some quantity of a blackish brown granular sediment at the bottom, though the solution was free from all deposit when placed in the digester. After this tube was suspended in the warm place, as the others had been, it remained in the same position till it was taken down to be opened. A slight scum or pellicle was observed on the surface—covering this partially—on the sixth day. During the succeeding days it did not increase much in extent, though it became somewhat thicker. Although very great care was taken, still the slight movement of the flask, occasioned in knocking off its top, caused this pellicle to break up and sink to the bottom.

The contents of the flask emitted a somewhat fragrant odor of baked turnip, and the reaction of the fluid was still slightly acid. On microscopical examination, there was found very much more granular *débris* of a brownish color, which probably represented the brownish sediment seen when the tube was removed from the digester. There were, also, a very large number of dark apparently homogeneous reddish brown spherules, mostly varying in size from 0·000133 of an inch to 0·000005 of an inch in diameter, partly single and partly variously grouped; the nature of these was doubtful, though they were probably concretions of some kind. There were also other indeterminate flat and irregular masses, which seemed more to resemble protoplasmic substance in its microscopical characters.

In addition, many irregular and monad-like particles were seen in active movement, though there were no distinct bacteria. Several rod-shaped bodies 0·0005 of an inch in length were seen, however, resembling ordinary bacteria, except that they were unjointed and motionless. In one of the drops examined there was a delicate tailed monad in active movement—a specimen of *Monas lens*, in fact, 0·0001464 in diameter, having a distinct vacuole in the midst of the granular contents of the cell. Another ovoid body was seen, about the same size, without a tail and motionless, though it contained two nuclear particles within.

These experiments are doubtless destined to renew with vigor the battle of the panspermatists and the heterogeneous

evolutionists. They are remarkable both on account of the extreme accuracy with which they appear to have been performed, and for the results obtained.

THE ORANGE JUDD HALL OF NATURAL SCIENCE.

The gift of Orange Judd, of this city, one hundred thousand dollars to the Wesleyan University, at Middletown, Conn., to found a Museum of Natural History, and a school of chemistry and technology, is one of the noblest benefactions of modern times.

A few years ago Mr. Judd was a student at that college. He was a poor boy, and compelled to make his way in the world, and encounter at the outset the difficulty of finding any school in which to study the natural sciences. With rare industry and perseverance he has been able to overcome all of these obstacles, and to create for himself a fortune that he now seems disposed to devote to the good of his fellowmen.

The Museum and Laboratory is 62 feet front, and 94 feet deep, and is practically five stories high, as the basement is mostly above the surface. It is built of Portland sandstone, and is essentially fire proof, as the cornices, doors, and window frames are of iron, and the roof of slate, and an iron and brick floor, supported on brick and iron pillars and walls, completely shuts off all fire communication between the chemical department in the first story and basement, and the natural history and cabinet rooms above. The window sashes are the only wood work exposed to fire from without, and the building is 76 feet distant from any other.

The internal arrangement of the building is in accordance with the experience of the best experts in the county.

The President of the College, Dr. Cummings, Professors Johnston and Rice, in company with Mr. Judd, and the architect, Mr. Rogers, visited the laboratories of Yale, Harvard, Columbia, Brown, and Amherst Colleges, and after consultation with the professors of these institutions, decided upon the details of construction, and the result has been the most complete museum and laboratory to be found in the county. Such a school cannot fail to greatly add to the usefulness of the Wesleyan University, and it is to be hoped that the alumni of the College, inspired by Mr. Judd's noble example, may be led to contribute the necessary funds towards founding the professorships required by an efficient department of natural history and technology.

SCIENTIFIC INTELLIGENCE.

TO DETECT LEAD IN DRINKING WATER.

Mr. Wm. H. Chandler, of the Columbia School of Mines, remarks, for the determination of small quantities of lead, to evaporate the water with about two fluid ounces of an acid solution of acetate of ammonia—this reagent prevents the separation of the sulphate and carbonate of lead during evaporation. After concentration any iron and lime salts that may fall down can be removed by filtration. If any lead be present it can be precipitated in the usual way by sulphureted hydrogen, and may afterwards be converted into the sulphate of nitric and sulphuric acids.

ANALYSIS OF SUGAR CANE.

It is now universally conceded that plants obtain their mineral constituents from the soil, and what these constituents are can be accurately determined by chemical analysis. Unless the mineral matter removed by the crops be from time to time replaced, the soil will be exhausted, and no further produce can be raised upon it. On this account every new analysis of the ashes of corn, wheat, tobacco, or other crop, is of value, and M. Popp has rendered a service by examining different varieties of sugar cane in a more careful manner than has hitherto been done. He finds the fresh sugar cane stripped of its leaves to be composed as follows:

	America.	Middle Egypt.	Upper Egypt.
Water	72·22	72·05	72·13
Cane sugar	17·80	16·00	18·10
Glucose	0·28	2·30	0·25
Cellulose	9·30	9·30	9·10
Mineral salts	0·40	0·35	0·42
	100·00	100·00	100·00

The ashes of the American sugar cane and leaves showed the following composition.

	Ashes of sugar cane.	Ashes of the leaves.
Potash	7·66	10·65
Soda	6·45	3·26
Lime	12·53	8·19
Magnesia	6·31	2·45
Oxide of iron	0·56	0·85
Silica	43·75	65·78
Phosphoric acid	5·45	1·25
Sulphuric acid	16·53	2·18
Chlorine	0·21	1·65
Carbonic acid	0·00	3·55
	99·75	99·81

It would be easy to compute from these analyses the amount of potash, soda, silica, etc., removed by a tun of sugar cane, and also to ascertain what kind of soil is best adapted for the growth of such a crop. The plant by its vital force is able to secrete carbon, oxygen, and hydrogen in just the proper proportions to form cellulose and sugar. It is certain that we can control the growth of the stalk by the abstraction or addition of mineral matter to the ground, it would be an equally important discovery if by some practical addition and subtraction of carbon, oxygen, and hydrogen, one could increase or diminish the percentage of sugar at will. In this age of synthesis such a discovery does not appear to be impossible, and we may some day have conservatories for the sugar cane into which gases can be pumped, and the yield of sugar be varied at will.

NEW SOURCES OF RUBIDIUM AND CAESIUM.

Mr. E. Sonstadt has found these rare metals in a number of new substances. If oxalate of ammonia be added in excess to sea water, and the well-washed precipitate ignited, moistened with nitric acid, and examined in the spectroscope, the *a* lines of rubidium and caesium will be distinctly visible in the spectroscope. The same water evaporated to dryness and examined in the usual way will show no trace of these lines, hence the value of testing with oxalate of ammonia previous to evaporation. The presence of the rare earths in sea weeds naturally follows after their detection in the salt water, and the author had no difficulty in finding them.

Various sea shells, and the lime obtained direct from sea water showed at once the rubidium and caesium lines, and the same is true of marine lime stones. The alkalies, rubidium and caesium can no longer be styled rare, since even in a few grammes of sea water they can be more easily recognized than bromine or iodine. The next point in the investigation is to ascertain to what useful purposes they can be applied.

PREPARATION OF BROMIDE OF SODIUM ON THE LARGE SCALE.

M. Castelhaz, a manufacturing chemist, states, in the first place, that, according to the communications received by him from several physicians who have applied bromide of sodium in their practice, instead of bromide of potassium, the efficacy of the former is far greater than that of the latter. As regards the preparation of this salt, the author says: "The best plan is to prepare first, bromide of ammonium, by causing bromine to fall drop by drop into dilute, but pure, liquid ammonia contained in a series of Wolff's bottles, in order thus to prevent the loss otherwise inevitably resulting from the volatilization of the products formed by the great heat disengaged on the bromine and ammonia uniting. The liquids, after saturation, are evaporated in a cast-iron retort, to which an earthenware receiver is fastened, wherein are collected the vapors of water, any excess of ammonia, and some bromide of ammonium, which is accidently carried over. The bromide of ammonium thus obtained is converted into bromide of sodium, by being mixed with pure carbonate of soda, and the application of sufficient heat to volatilize and sublime the carbonate of ammonia formed by the reaction. This mode of preparation yields after re-solution of the bromide in water, and evaporation similar to that used for chloride of sodium, perfectly pure and anhydrous bromide of sodium."—*Chemical News.*

NEW METHOD OF ESTIMATION OF GRAPE SUGAR.

Mr. K. Knapp's new method is based upon the fact that an alkaline solution of cyanide of mercury is completely reduced to the metallic state by grape sugar. The method is executed as follows: 10 grms. of pure and dry bicyanide of mercury are dissolved in pure distilled water; to this solution are added 100 c. c. of caustic soda solution (sp. *gr.*, 1·145); and, next, as much distilled water is added as will be required to make a bulk of 1,000 c. c. A series of experiments made by the author brought to light the fact that 400 milligrms. of cyanide of mercury are, when in alkaline and boiling solution, completely reduced to metal by 100 milligrms. of pure grape sugar. The titration is done as in Fehling's method—40 c. c. of the alkaline cyanide solution are boiled in a porcelain basin; and the sugar solution (not stronger than about half a per cent) is added until all the mercury is precipitated. In order to test the course of the operation, a single small drop of the fluid is put upon a Swedish bit of filtering paper stretched over the mouth of a small beaker-glass, while the bottom of that glass is covered with rather strong sulphide of ammonium. As long as any cyanide remains undecomposed, a brownish spot will appear. The author states that, with a little practice, even 1·10th c. c. of the above dilute sugar solution can be readily estimated.—*Chemical News.*

METHOD FOR RENDERING WOOD DIFFICULTLY COMBUSTIBLE, AND FOR PRESERVING IT WHEN UNDERGROUND.

The wood, says Dr. Reinsch, which must not be planed, is placed for twenty-four hours in a liquid composed of 1 part of concentrated silicate of potassa and 3 parts of pure water. After having been removed from this liquid, and dried for several days, the wood is again soaked in this liquid, and, after having been again dried, painted over with a mixture of 1 part of cement and 4 parts of the liquid above alluded to. After the first coat of this paint is dry, the painting is repeated twice. Of the paint mixture alluded to, two large quantities should not be made up at once, because it rapidly becomes very dry and hard. Wood thus treated is rendered uninflammable, and does not decay underground.—*Chemical News.*

The Bloomfield, N. Y., Gas Well--Testing the Quality of the Light.

The possibility of obtaining, in many places, a supply of natural gas directly from the rocks, not only adequate in quality and quantity for illuminating purposes, but also as a fuel in its most perfect form for driving machinery on the grandest scale, seems about to be realized. The village of Fredonia, in this State, has been lighted chiefly with natural gas for many years. At Erie, Penn., twelve different gas wells are now pouring out their inexhaustible stream of gaseous fuel—one of them driving a large flouring mill, supplying the heat to the boilers, formerly obtained at the expense of ten tuns of coal daily, and furnishing, besides, all the light needed, while another well yields enough to propel the pumping engines of the city water works. Some of the wells at Erie have been in use for several years. Our readers are, no doubt, aware that the wonderful gas fountain in West Bloomfield, Ontario Co., which for the last five years has been an object of so much curiosity and scientific research, has more recently become a matter of importance as a most valuable source of light and heat, capable of being speedily utilized. The project of supplying Rochester with this gas is seriously entertained. About a year ago a company of the most respectable and wealthy gentlemen of Elmira purchased this property with a view of turning it to some valuable account.

To satisfy themselves of its true value and of the uses to which the gas might be most profitably applied, Prof. Lattimore was engaged by the company to make a scientific investigation of the chemical qualities of the gas, and also to ascertain the daily product. His investigations, which were commenced some weeks ago, at once indicated a gas of a high degree of purity, and especially free from those qualities which are so objectionable in ordinary coal gas. The volume of gas issuing daily from the well proved to be surprisingly great; it is enormous, far exceeding the quantity produced by any other well in the world. Prof. Lattimore has made a second visit to West Bloomfield this week, spending two days at the well for the purpose of completing his investigations. The illuminating quality of the gas—its candle power—was the special subject of investigation. This was determined by a series of most rigid experiments by means of the most delicate and highly improved photometrical apparatus known to gas engineers. These interesting tests were witnessed by a large number of the stockholders, all of whom expressed their delight and surprise at the unexpectedly favorable results obtained.

The Exposition of Textile Fabrics at Indianapolis.

The Indianapolis journals comment favorably upon the exhibition of textile fabrics now open in that city. From Ohio, Illinois, Iowa, Kentucky, Minnesota, Indiana, and other States manufacturers have come, bringing with them samples of cassimeres, tweeds, jeans, blankets, flannels, and other woolen fabrics that are all that can be desired. There are some lots of goods on exhibition which in point of excellence of material and finish excite the admiring comments of all who examine them. There are cassimeres and flannels that are just as good as can be manufactured abroad, and much better than nine-tenths of our own people believe can be made in our home mills. And yet it is done, and the people have not yet discovered of what great value our home manufactures are, and what an immense wealth they will shortly represent. These expositions of goods being daily manufactured, gotten up by the Woolen Manufacturers' Association are having the effect to make more generally known the worth and quality of the fabrics they make, and through their influence we predict that it will not be long until our citizens become aware of the fact that it is not necessary to import from the "old country" their cloths, cassimeres, flannels, etc., when they can get as good if not a better article of home manufacture. It is not long since that the manufacture of jeans and linsey in this country was considered the acme of cloth-making on this side of the Atlantic.

Not alone to woolen fabrics is this exposition confined, but from the far South, from South Carolina, Alabama, Georgia, and other Southern States, come manufacturers to exhibit what they are doing there in making cotton goods. We find on exhibition sheetings, shirtings, and drills that are as good as we get from the Eastern factories. This in itself shows that a new spirit of enterprise has found position in the hearts of our people.

How Icebergs are Formed.

Mr. Dunmore, the photographer who accompanied the Bradford art expedition last year to Greenland, publishes in the Philadelphia *Photographer* a very interesting description of the appearance of Greenland, its glaciers, etc. He says:

"The glacier comes moving slowly down from the mountains, a great river of ice, thousands of feet deep, sometimes ten miles wide, to the fiord or bay at the foot of the mountain. The Alpine glaciers roll down into the warm valleys, and there, warmed by the sun, melt away like a piece of wax before a candle, and form brooks and rivers. But in Greenland they cannot do that, it is too cold. Therefore, as the ice at the mouth of the glacier is pushed forward to the water's edge, it must break off in pieces and fall in; and such pieces are icebergs. When they break off, the glacier is said by the natives to 'calve,' or an 'iceberg is born.'

"I can give you no idea of what a beautiful sight it is to see an iceberg break off; but we, who have seen it, will never forget it. Think of a mass of ice as big as the space of ground covered by the city of Boston, falling into the sea, and of the tremendous crash that occurs when it breaks away from its fellows, and they give it a parting salute as they groan and growl their last farewell. Now see the waves leap up forty feet into the air, washing and lashing the glacier with spray, and sweeping everything away not strong enough to bear the shock; then watch the new-born berg as it rocks in the sea like a huge porpoise, up and down, dropping here and there portions of itself, which dive down and reappear in all directions, and you can imagine faintly what it is to see a glacier 'calve an iceberg.' It is a long time before the trouble of the waters ends, or before the new-born babe ceases to be rocked, and is still enough to have its picture made. It is a sight one never tires of.

"The next day our party started to go on top of the glacier. It was very hard to get on to with our cooking utensils and photographic traps, it was so very steep. We traveled six miles on the top of it. The sight was grand from there. It was about two miles wide, and the length of it we could not tell, as it was hundreds of miles. The depth of it was from five hundred to eight hundred feet. We made a few pictures, ate our dinner up there, and then started back."

A Mountain Railroad.

Mr. H. J. Kerr Porter thus describes in the London *Times* his ascent by the Rigi Railway: "A wagon laden with about a tun and a half of timber prepared for sleepers was ready, and on this twenty-five passengers took their seats, and we started, propelled by the engine, which is of peculiar construction. In twenty minutes we traversed 4,700 feet, and were about 1,170 feet above the level of the lake from which we had started. We found thirty-three men at work laying down sleepers and rails; the transverse sleepers are six inches wide by four inches; the ordinary rails are bolted to those sleepers, which are two feet apart, and at six inches outside the metal rails, longitudinal beams six inches by six inches are bolted to the sleepers; in the center a metal rail is firmly bolted, in which there are openings to receive the cogs of the center wheel of the engine, which revolves with the axle, the steam power being applied to a cog wheel on each side, at equal distance from the ordinary wheels and the center one above described; the brakes are applied to the ordinary wheels, which are like the wheels of any carriage, and are about two feet six inches in diameter. The boiler and furnace are not placed horizontally, as is usual, but stand upright, having while on a level, a considerable incline forward; when ascending the mountain the boiler is consequently quite perpendicular, and the floor of the tender perfectly level, the tender and engine being in one, and supported by the four small wheels, one of which I have described above.

Economy in Railway Management.

Economy, in its true sense, seems to be very imperfectly understood; at least those who undertake to practice it take widely different views in regard to what they consider economy. What some would consider economy would be called wasteful extravagance by others. There are many managers, with a reputation as first-class business men, who entertain false notions in regard to economy. Such are those who seem to consider economy to consist in hoarding every dollar they get hold of, and never paying one out until it is *absolutely necessary*—in fact, to hang on to it with the grip of a miser.

It is no economy to save a dollar if it costs five dollars to do it; yet there are many who practice this sort of saving and call it economy. Perhaps there are no more shrewd business men in the country, as a class, than our railroad managers; yet, although they are usually men of sound judgment, they frequently err in regard to the practice of economy.

It is the practice with many, on roads running through timbered portions of the country, where wood is the only fuel used, to purchase soft wood, as it can be had for considerably less per cord than hard wood. Of course they do not do this with the idea that a cord of soft wood will make as much steam as a cord of hard wood; but they fail to make correct estimates of the difference in the real value of hard and soft wood. Some very nicely conducted experiments have shown that soft wood is the most expensive compared with hard wood; that is to say, the difference in the price of the two kinds of wood is not in proportion to their steam-making qualities, the difference, as prices generally range, being in favor of hard wood. And even if this were not the case, it takes a much larger quantity of soft wood to perform the same amount of traffic, and of course the hauling is more expensive, and on many roads the same price is paid for sawing.

All things considered, the *cheap* wood is the most expensive. It would be well for the railroad community if the results of experiments testing the steam-making qualities of the different kinds of wood were published. Then a price could be established, taking certain kinds of hard wood as a basis, and in this way we would be sure at all times to get the full value of the money expended.

There is a great deal of "economy" practiced in the purchase of all kinds of railroad supplies, and in this matter the railroad men of the country have, to use a common expression, "beaten themselves." As soon as manufacturers discovered a disposition on the part of railroad men to get the cheapest article in market, they commenced the manufacture of inferior goods, and this has been practiced to such an extent that it has become a difficult matter to get a genuine article of any kind on the whole list of railroad supplies.

A few days since the writer passed over a railroad in one of the Western States, and happening to meet an old acquaintance who is an engineer on the road, he received and accepted an invitation to take a ride on the engine. As it was some minutes before his train was to leave we took a walk about the station. In the course of the walk he stopped suddenly and picked up a piece of broken link, which operation I noticed with considerable curiosity. He noticed that I watched him with some interest, and said, "What do you suppose I am going to do with this piece of old iron?" I remarked that I did not know, unless it was to save it. He smiled and said, "That was it exactly." He was going to put it on the tender where he had more old iron. He always made it a practice to pick up all the old iron that came in his way that he could handle easily, and when he had a quantity of it on his tender he would throw it off on to some convenient scrap heap. "In this way," said he, "I save tuns of old iron every year that would otherwise be lost. The boys laugh at me, but I don't care for that. "Now," he added, "the company I am running for are sadly in need of more passenger cars, and they are economizing in every possible manner to get means to pay for them. They cut down our wages and reduce the number of brakemen, run the shop short-handed, discharge men off the track, reduce the help at stations, and so on, all for the sake of saving money to buy rolling-stock, when there is property enough in the shape of car wheels, axles, track iron, old springs, and everything in that line lying along the line of the road to pay for a first-class passenger train. There is a place up here a few miles where a whole freight train was wrecked two years ago—thrown off the track by expansion of iron. Most of the running gear is there yet; some of the axles are bent, but I think some of them might be used again. I don't understand why they don't get this stuff together and convert it into cash. It would bring a pile. All along the line there is property of this kind which might be collected with very little expense, and I cannot understand why it is not done." "Yes," he continued, "they are always preaching economy, but they 'save at the vent and waste at the bung.' They measure the oil I use by drops, and furnish a cheap, miserable, nasty stuff at that; they know just how many sticks of wood I burn, and how many ounces of waste or old rags I use. This is all right enough; I find no fault with that. But then they will go and pile six hundred or a thousand dollars' worth of ornament on a locomotive, named after some nabob, and the fireman has to work day and night, and furnish his own emery and acid to keep her looking anyhow. There should be another brakeman on this train, but they can't afford it, although there is useless fancy work enough on this engine to pay a brakeman for a year and a half."

Time was up now, and as he pulled the throttle, he pointed to the tender, and said, with a smile, "There is some more economy—green wood."—*Railroad Gazette.*

DR. R. J. GATLING, the inventor of the celebrated Gatling gun, left for Europe on Saturday, the 6th inst., in the steamer *Italy*.

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.

A. B., of Pa.—It is impossible for us to infer from your letter the cause of the moldy smell pervading your Brussels carpet, as you state there is no dampness to account for it. A practical remedy for the trouble is equally hard to suggest that will not be attended with inconvenience or injury to the carpet. Most things that will destroy mold fungus will injure the colors. The best thing we can think of is carbolic acid, but that is difficult to apply uniformly in so small a quantity as would not also give rise to offensive odor. It is also questionable whether this substance would not affect some of the colors. Perhaps some of our correspondents, under whose notice this falls, may suggest something to help you.

D. L. R. of Ala.—The "anomaly" to which you refer, has been long understood and known, as you will find by reference to works which treat of friction. It generally takes more force to overcome the friction of a body starting from a state of rest, than to overcome the friction after it begins to move. It is supposed this fact is accounted for by the slight indentation of the bearing surfaces while at rest, which does not occur while they are in motion. We have, however, always considered the accuracy of this explanation as questionable.

L. H. B., of Pa., wants some one to invent something in the chemical way that will keep flies out of the house. He draws a most distressing picture of the sufferings of himself and his neighbors this season from these pests, which he says are more numerous than ever before. If he would employ screens, made of mosquito netting for doors and windows, we think he would find them all that he desires. They are very cheap, and we find them here perfectly effectual.

J. J. K., of Wis.—What is meant by fractional distillation is the separation of different volatile liquids from each other by distillation at different temperatures. The most volatile will pass off at certain degree of heat, when the heat is raised to, and maintained at a higher temperature the next in degree of volatility is distilled over, and so on.

J. T. C., of D. C.—The causes of boiler foaming may be classed in two categories. Impurities in the water used, and want of proper extent of water surface to allow the steam to be quietly liberated from the water. It is generally on this latter account that the upright boilers are more apt to foam than horizontal ones.

T. P. B., of Cal.—Zinc will not answer for the sheathing of wooden hulls, because it becomes covered with oxide, and does not maintain a clean, bright surface. When it is attached to the bottoms of iron vessels, however, it acts differently, galvanic action increasing the chemical action, and keeping its surface bright.

E. H., of Ill.—Electricity, when voltaic or frictional, is conducted by the entire thickness of the conductor. The same areas of cross section in conductors of the same materials, will give the same conducting power, no matter what may be the shapes of these cross sections.

H. C., of N. Y.—We do not believe the formation of the insoluble sulphide of lead by means of the use of sulphide of potassium will answer for the pipes of soda water fountains. We think the use of lead for pipes in these fountains should be prohibited unless they are lined with tin.

C. C. C., of Iowa.—We have no doubt that the plant you send us will work into good paper. There are many others that can be so utilized. The question concerning their use is simply one of economy in manufacture.

A. C. C., of Ohio.—Use shoemakers' wax as a preservative for twine that has to be used under water. Melt the wax, and soak the twine in it. Or, soak thoroughly in raw linseed oil, and allow it to dry thoroughly before use.

C. H. D., of N. Y.—No way of separating water from milk that will leave the nutritious ingredients fit for domestic use, has yet been discovered, except evaporation.

J. A., of Pa.—Your method of describing a square within another square, that shall equal one fifth of the larger square, is a well-known solution of an old geometrical problem.

D. C. L., of ——., wishes to learn of some cheap ingredient which, added to coal tar, will add to its drying properties on iron.

D. L. M., of Vt.—Oxygen is undoubtedly greater in quantity than any other elementary substance of our globe.

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 $17. Address MUNN & CO., 37 Park Row, New York.

Facts for the Ladies.

I have used my Wheeler & Wilson Machine seven years without repairs and one needle for all kinds of family sewing for four years. It is the most valuable piece of furniture for me that could be purchased.

MRS. F. E. WILDER.

Hilton Head, S. C.

Business and Personal.

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

J. W. Boughton, Patentee of Elastic Strap, formerly of Chicago, will please send his address to S. Reis, 76 Bleecker st., New York.

Tools and Machines for special uses built to order. Chas. N Trump, Port Chester, N. Y.

For Sale or to Lease—A never-failing water-power at Ellenville, N. Y., ¼ mile from depot of the Ellenville Branch N. Y. and O. Midland R. R., and only 80 miles from New York city, by rail. For full particulars address Blackwell, Shultis, Gross & Co., Kingston, N. Y.

Spoke Finisher and Facing Machine for sale by C. A. Carter, Newark, N. J.

Knife Sharpeners.—Makers will please address Geo. K. Johnson, Lock Box 2,216 Kansas City, Mo.

Wanted—The Best Steam Pump made for mining purposes. Send circulars. A. J. Shotwell, Box 131 Washington, Ind.

Wanted—A thoroughly competent, active, and reliable man as foreman or assistant superintendent in a concern manufacturing a variety of first-class machinery, principally machinists' tools. Practical experience as a machinist essential. Address, stating qualifications and pay expected, Postoffice Box 6,029, New York city.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4·00 a year. Advertisements 10c. a line

Gatling Guns that fire 400 times per minute are now made at Colt's Armory, Hartford, Conn. Send for pamphlets.

Wardwell's Patent Saw Tables—best in use—for sale by Richardson, Merriam & Co., 107 Liberty st., New York.

Wanted—The address of all manufacturers of Sewing Machine Trimmings and Findings, of all kinds. T. Shanks' Patent Bobbin Winder Manufacturer and Sewing Machine Dealer and Repairer, Southwest cor Lombard and Sharp sts., Baltimore, Md.

Pictures for the Library.—Prang's latest publications: "Wild Flowers," "Water Lilies," "Chas. Dickens," Sold in all Art Stores.

A New Waltham Watch, made especially for Railroad Men and Engineers, is fully described in Howard & Co.'s Price List of Waltham Watches. Every one interested should send for a copy, which will be mailed to any address free. Address Howard & Co., 785 Broadway, N. Y.

Upright Forge Hammers, improved Drop Presses. Send for circular. Charles Merrill & Sons, 356 Grand st., New York.

Rawhide Sash Cord has no equal for heavy windows or dumb-waiters. Makes the very best round belting. Darrow M'f'g Co., Bristol, Ct.

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

Peck's patent drop press. Milo Peck & Co., New Haven, Ct.

Our Windmill pumps water for railroads, country and city buildings, hotels, stock fields, drainage, and irrigation. Self-regulating, durable and well tested. Con. Windmill Co., 5 College Place, New York.

The Entire Right of the best Wrench ever patented for sale. For drawings address J. F. Ronan, 36 Orchard st., Boston, Mass.

The Burleigh Steam Rock Drills are used exclusively at the Hoosac Tunnel, Mass., and Nesquehoning Tunnel, Pa., making, at each heading, from four to six lineal feet per day. Pamphlets sent on application. J. T. & W. H. Daly, Agents, 49 New st., New York.

Japanese Paper Ware—Spitoons, wash basins, pails, milk pans, etc. Perfectly water-proof, and will not break or rust. Send for circulars. Jennings Brothers, 352 Pearl st., New York.

"Your $50 Foot Lathes are worth $75." Good news for all. At your door. Catalogues Free. N. H. Baldwin, Laconia, N. H.

The Best Hand Shears and Punches for metal work, as well as the latest improved lathes, and other machinists' tools, from entirely new patterns, are manufactured by L. W. Pond, Worcester, Mass. Office, 98 Liberty st., New York.

Wm. Roberts & Co., Designers and Engravers on Wood, 36 Beekman st., New York, would respectfully announce that they are now prepared to receive orders from Manufacturers, and others, for engraving of machinery, views of stores, factories, trade marks, etc., etc.

Machinists and others using Fine Tools, send for illustrated catalogue. Goodnow & Wightman, 23 Cornhill, Boston.

Tempered Steel Spiral Springs for machinists and manufacturers. John Chatillon 91 and 93 Cliff st., New York.

One 60-Horse Locomotive Boiler, used 5 mos., $1,200. Machinery from two 500-tun propellers, and two Martin boilers very low. Wm. D. Andrews & Bro., 414 Water st., New York.

Kidder's Pastilles.—A sure relief for Asthma. Price 40 cents by mail. Stowell & Co., Charlestown, Mass.

For solid wrought-iron beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Keuffel & Esser, 116 Fulton st., N. Y., the best place to get 1st-class Drawing Materials, Swiss Instruments, and Rubber Triangles and Curves.

For tinmans' tools, presses, etc., apply to Mays & Bliss, Plymouth, st., near Adams st., Brooklyn, N. Y

Glynn's Anti-Incrustator for Steam Boiler—The only reliable preventative. No foaming, and does not attack metals of boiler. Liberal terms to Agents. C. D. Fredricks, 587 Broadway, New York.

To ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's manufacturing news of the United States. Terms $4·00 a year.

Cold Rolled—Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa

For mining, wrecking, pumping, drainage, and irrigating machinery, see advertisement of Andrews' Patents in another column.

It saves its Cost every sixty days—Mitchell's Combination Cooking Stove. Send for circular. R. B. Mitchell, Chicago, Ill.

CITY SUBSCRIBERS. — The SCIENTIFIC AMERICAN will be delivered in every part of the city at $3·50 a year. Single copies for sale at all the News Stands in this city, Brooklyn, Jersey City, and Williamsburgh, and by most of the News Dealers in the United States.

Recent American and Foreign Patents.

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

WYETH'S IMPROVED PUMP.—A useful adjunct to the kitchen or flower garden, to the farmhouse, or country home, or even to dwellings in towns not provided with water-works,is designed to be provided by a double-acting atmospheric and force pump, for which a patent was obtained through the Scientific American Patent Agency, July 12, 1870. The apparatus may be thus described: Two boxes, an upper and a lower, are arranged in the pump-cylinder,at a suitable distance from each other. Two rods of unequal length, having their lower ends attached to these boxes (the longer to the lower box and the shorter to the upper box), pass upwards through stuffing boxes, in a tightly-packed cap, fitted on the top of the pump cylinder, and are connected at the upper ends by links to the lever, one at each side of its pivot, in such a way as to insure direct vertical action of the rods and obviate all lateral pressure in the stuffing boxes. Standards rising above the top of the pump support the pivot of the lever. When the ever is operated, reciprocal action is imparted to the boxes through the links and rods, so that as one ascends the other descends; thus causing a continuous flow of water from the pump. A pipe passes vertically through the cap, on the top of the pump cylinder,through which the water will rush when the apparatus is used as a force pump; while a spout is provided at the side of the pump cylinder to discharge the water, when it is employed as an atmospheric pump. When the spout is open the pump operates simply as an atmospheric pump. If a plug is inserted in the spout, the water, finding no outlet by that channel, will be urged upwards and make its exit by the pipe in the cap, and the apparatus is changed into a force pump. By these means, both these pumps are combined in a single cylinder, and operated by one lever, the distinctive advantages of each kind being available almost instantaneously and at pleasure. Parties desiring further information may address the patentee, H. M. Wyeth, at Newark, Ohio.

MITERING MACHINE.—Ephraim Shaw, Tarr Farm, Pa.—This invention relates to a new instrument for cutting single or compound miters, and consists in the employment of a double joint for securing the saw guide.

CAP FOR PROTECTING NECKS OF BOTTLES.—George C. Furber, Yreka, Cal.—The object of this invention is to provide simple and efficient means for protecting the necks of bottles in forming packages of medicine or other articles, liquids, or compositions.

COMBINED HAY FORK AND KNIFE.—Leverett W. Stuart, Narrowsburgh, N. Y.—This invention relates to a new and useful improvement in an implement for handling and cutting hay, it being a combined hay fork and hay knife.

MEDICAL COMPOUND.—W. S. Crooker, Shamburg, Pa.—This invention relates to a new and useful compound, to be used as a medicine for the cure of diseases, to be taken internally, or applied as a linament to the surface of the body.

HEMMER.—Milo Harris, Jamestown, N. Y.—This invention relates to improvements in hemmers for sewing machines, and consists in the combination with the scroll plate, which turns the edge of the goods of a former or guide, having spiral ridges, arranged in the scroll, to act in a manner as a guide, and insure the turning of the hem.

COMBINED PUNCH AND BENDING MACHINE.—David G. Morris, Catasauqua, Pa.—This invention has for its object to furnish an improved machine, designed more especially for bending and punching hooks, and which shall be simple in construction, convenient in use, and effective in operation.

WATER-CLOSET APPARATUS.—William G. Stuart, Springfield, Mass.—This invention has for its object to improve the construction of valves and other regulating apparatus for water closets, and other uses, where an intermittent flow of water or other liquid is required, and which shall be simple in construction, reliable in operation, and not liable to get out of order.

VALVE.—Josiah W. Carney, Charlestown, Mass.—This invention has for its object to furnish an improved spring attachment for the valve stems of stop valves, stop cocks, faucets, etc., which shall be simple in construction, will make the valve self-closing, and which may be attached to valves already in use, without disturbing the plumbing.

BOOK-DRAWING ATTACHMENT.—J. C. Terry, Springfield, Conn.—This invention relates to the application to books of drawing attachments, whereby they may be removed from the shelves of libraries, cases, and the like, with greater facility than can now be done,and without injury to the books, The invention consists in the application to the covers of the books, in any position where they will be accessible when the books are packed on the shelves, of straps, buttons, projecting ribs, or other devices, affording a means of taking a secure hold to draw the books out.

TRUSSES.—Henry Fuller, Cattaragus, N. Y.—This invention relates to a new and useful improvement in trusses for the treatment of hernia, or rupture.

FARM GATE.—Amasa Hathaway, Prairie du Lac, Wis.—This invention relates to a new and improved method of operating gates for farms and other purposes, and consists in an arrangement whereby the gate is made to open and close by its own gravity.

NON-CONDUCTING CASING.—F. Y. Arnold, Philadelphia, Pa.—This invention relates to a new and useful improvement in means for preventing loss of heat in steam pipes, steam boilers, and furnaces and pipes for heating and conveying air, gases, or water.

KETTLE BAILS.—James Britton, Williamsburgh, N. Y.—The object of this invention is to strengthen the ears, and points of connection of the bail of a tea-kettle with the ears, and so to form the handle portion of the bail that it shall fit the hand.

COOLER.—G. R. Bowman, Hagarstown, Md.—This invention relates to a new and useful improvement in an apparatus for cooling liquids, as water, ale, beer, etc, by means of ice or ice and salt, or other refrigerating substance, material, or composition.

SHUTTLE HINGE.—F. B. Jones, Louisville, Ky.—This invention relates to a new and useful improvement in butt hinges for shutters, more especially designed for inside window shutters which have rabbeted edges, but which are applicable to other purposes.

ACID RESISTING INK.—C. F. Palknin, Charleston, S. C.—The object of this invention is to provide an ink for filling out checks, drafts, bonds, notes, etc., which shall be proof against the action of acids, and thus prevent the fraudulent alteration of such papers.

SUBSOIL PULVERIZER.—G. S. Newsom, Nashville, Tenn.—This invention has for its object to furnish an improved machine for subsoil pulverizing, which shall be simple in construction, effective in operation, and easily operated.

ARCHING BRICK.—W. F. Quinby, Wilmington, Del.—This invention has or its object to construct brick which can be used for arched roofs, ceilings, and door or window linings, without requiring forms or other supports. The invention consists in the construction of segmental brick which have grooved ends, so that they can rest against and lock into one another to form a strictly self-supporting arch.

CAR COUPLING.—S. O. Campbell, Centertown, Mo.—This invention relates to a new car coupling which is so constructed that it can be used without a link, the coupling boxes being directly locked together by the pin. The invention consists in constructing the coupling boxes with horizontal fingers at their outer ends,so that they may fit under and between each other to receive a pin for locking them together.

ROCK DRILL.—Hermann Osterkamp, Eschweiler City, Prussia.—This invention relates to a new construction of rock drill which is to be operated by compressed air or gas. The invention consists in a novel construction of slide which is arranged by a reciprocating motion to impart rotary, and regulate the reciprocating motion of the drill.

CULTIVATOR.—J. B. Tibbits, Portland, Mich.—This invention has for its object to improve the construction of horse-power hoes and cultivators, so that the hoes, shovels, or plows may be readily adjusted to turn the soil towards or from the plants, as may be desired.

COTTON AND HAY PRESSES.—C. W. Stopple, Houston, Texas.—This invention relates to improvements in cotton and hay presses, of that class wherein the follower is worked by a screw, and consists in hinging the yoke which supports the screw nut, upon the top or end of the case, so that when the follower is drawn out, the yoke and follower may be swung around for convenience in filling the case. It also consists in constructing the yoke in two parts, and arranging them so as to admit of applying a nut with flanges above and below the yoke permanently connected to it, or formed on it.

SELF-RAKING ATTACHMENT FOR HARVESTERS.—Charles Barns, West Liberty, Iowa.—This invention has for its object to improve the construction of the improved harvester rake, patented by the same inventor, March 30, 1869, so as to make it more convenient in use, and more effective and satisfactory in operation.

RAILROAD SWITCHES.—James Davis, New Orleans, La.—This invention relates to improvements in railroad switches, and consists in an arrangement for automatically shifting and locking the switches by the action of broad flanges on the front wheels of the car or locomotive, or by shifting wheels attached for the purpose, the said flanges or shifting wheels being arranged to act upon shifting levers connected with the switch bar, so that when acted upon and moved by the wheels, they will shift the switches. The said flanges or wheels also act upon spring locking catches, arranged in connection with the shifting levers for locking them, to unlock them before the shifting action takes place.

GRAIN SCOURING MACHINE.—William McLaughlin, Jersey City, N. J.—This invention relates to improvements in machines for scouring and hulling grain, and consists in arranging a scroll-shaped grove in the face of one of the stones, preferably the runner, beginning at the center, and gradually approaching the skirt, and in arranging the said grooved stone with another stone, having a smooth face, which will confine the grain in the scroll groove, and cause it to be subjected to the action of the stones during several revolutions, the said groove preventing the escape of the grain as soon as it does in the stones on ordinarily arranged machines and causing a more uniform action.

BLIND FASTENER.—John W. King, New York city.—This invention relates to a new and useful improvement in the mode of fastening window blinds or shutters, and consists in the arrangement of a catching device and lever, whereby the blind or shutter is securely fastened when closed, and can be opened only from the inside.

TWEER.—Edmund Youngs, New York city.—This invention relates to a new and useful improvement in tweers for blacksmiths' forges, whereby important advantages over the tweer irons now in use are secured, and it consists in an air chamber with a conical top, with a central conical perforated cap through which the air is discharged, and with an orifice through its bottom for cleaning out the same.

UNIVERSAL LATHE DOG.—John S. Skinner, Lebanon, N. H.—This invention relates to a new lathe dog or chuck, which is so constructed that it can be adjusted for shafts of suitable size. The invention consists in making the dog of two separate jaws, and in connecting them by right and left hand screws, and by a guide bar, which may also be adjustable.

ANIMAL TRAP.—William Ball, Oregon, Mo.—This invention relates to a new improvement in animal traps, and consists mainly in an arrangement in a vertical cylindrical case divided horizontally into two compartments of a vertical shaft, with wings in one of the said compartments dividing it into several sections, and having a coil spring attached to it, tending to revolve it. Each section is provided with bait hooks arranged to trip the spring-restraining devices, and an opening in the side of the case admits the animals to one of the sections, whereby nibbling the bait he trips the spring holder and is carried past the opening to a dark space, and another section is brought opposite the opening, from the dark space openings guarded by folding doors lead to the compartment above or below where the animals, seeing light, will go, and be retained until taken out.

HEMP-DRAWING FRAME.—George Davis and John R. Hoover, Elizabethport, N. J.—This invention relates to improvements in machines for drawing hemp, and consists in mounting the teeth of the combs on oscillating arms in revolving disks, and arranging them so that when engaging with the hemp they will have a forward pitch, calculated to have the best effect in engaging and acting on the fibers, and when disengaging to be pitched backward so as to draw out of the fibers without deflecting them from the course they should follow in passing from the comb cylinder to the delivering rollers.

HORSE-POWER.—James W. Murrell, Eldorada, Arkansas.—This invention relates to improvements in horse powers, and consists in the employment on the driving shaft to which the sweep is connected, and which is mounted vertically in a suitable portable frame, which also supports the counter shafting, of a horizontal drawing wheel, provided with oblique teeth, gearing into a pinion, also having oblique teeth, and arranged to revolve in a vertical plane and impart motion to a horizontal shaft, the teeth on both the driving wheel and pinion representing inclined planes, which may be varied to a considerable extent in the angle of the pitch, as found most desirable, according to the case in hand.

MACHINE FOR DRYING PHOSPHATES.—Ernst Frank and John B. Adt, Baltimore, Md.—This invention has for its object the drying of fish or such other animal substances as are used in the manufacture of ammoniated super-phosphates, and the drying of such super and mineral phosphates as are used in the preparation of artificial guanos or any other fertilizers, such drying being effected by giving the material a regular continuous movement over a furnace containing burning fuel.

ATTACHMENT FOR PREVENTING THE STRAINING AND BREAKING OF PAPER DURING ITS MANUFACTURE.—Lorenzo Dean, Fort Edward,N. Y.—This invention has for its object to prevent the straining and breakage of the paper sheet at any point during its passage through the machine prior to its reaching and passing between the calender rolls, having especial reference to the prevention of breakage while the sheet is passing from the drying to the calender rolls.

MANURE DRAG.—Josiah D. Heebner, Norrittonville, Pa.—This invention consists of a bar provided with a sufficiency of metal teeth projecting downward from one side of proper dimensions for the purpose,and furnished with handles like those of a plow, and with a standard projecting upwards in combination with a beam jointed at its rear end to the top extremity with a clevis to which to attach draft animals, and made in two sections, which are hinged together, the object of this last arrangement being to enable the operator to dump the drag by pressing with his foot on the rear end of the beam, and thus throwing the joint upwards.

MACHINE FOR ASSISTING IN REDUCING FIBROUS MATERIAL TO A TEXTILE STOCK.—Lorenzo Dean, Fort Edward, N. Y.—This invention has for its object the disintegration of the fibers of Esparto grass, straw, or other fibrous material to a condition in which it is ready to undergo a further disintegrating process by a chemical solution, in a boiler, and which produces a textile stock, which may be spun, woven, or felted, or reduced to a pulp for the manufacture of paper and for other purposes.

BOILER FOR REDUCING FIBROUS MATERIAL TO A TEXTILE STOCK.—Lorenzo Dean, Fort Edward, N. Y.—This invention relates to the reduction of Esparto grass, or straw, or other fibrous material, to a textile stock, whence paper or felt may be manufactured, by boiling or "cooking" the grass within a revolving boiler containing any suitable chemical solution.

Inventions Patented in England by Americans.

(Compiled from the "Journal of the Commissioners of Patents.")

PROVISIONAL PROTECTION FOR SIX MONTHS.

1,793.—FAUCET.—I. Carey, Morristown, N. J. June 23, 1870.

1,823.—APPARATUS FOR DISTILLING PETROLEUM.—J. L. Heverin and J.L. Bewley, Freedom, Pa. June 27, 1870.

1,826.—FRICTION BRAKE.—E. W. Sandford and W. Leaver, Brooklyn, N.Y. June 27, 1870.

1,829.—BREECH-LOADING FIREARMS AND CARTRIDGES.—C. E. Snyder, Baltimore Md. June 27 1870.

1844.—COFFEE AND RICE HULLER.—H. T. Pratt and J. Carver,Alden, Mass. June 28, 1870.

1,848.—PRESERVING ANIMAL AND VEGETABLE SUBSTANCES.—E. R. Ken Hamilton, Canada. June 29, 1870.

1,854.—APPARATUS FOR DELIVERING MAIL BAGS AND PARCELS TO RAILWAY TRAINS IN MOTION.—W. McCabe, Rochester, N. Y., and F. W. Glen, Oshawa, Canada. June 29, 1870.

1,857.—CHLORINATING GOLD, SILVER, AND COPPER ORES.—Chas. Stetfield Austin, Nevada. June 30, 1870.

1,866.—STEAM GENERATORS AND FURNACES.—S. L. Wiegand, Philadelphia Pa. June 30, 1870.

1,869.—JOURNAL BEARINGS AND AXLE-BOXES.—G. F. Lynch, Milwaukee Wis. July 2, 1870.

1,880.—APPARATUS FOR THE PRODUCTION OF ICE.—S. Bennett, Jefferson La. July 4, 1870.

1,914.—FURNACES FOR HEATING METALS AND ORES.—W. A. Sweet, Syracuse, N. Y. July 6, 1870.

1,954.—OIL CABINETS.—M. H. Wiley, ——, Mass. July 9, 1870.

1,955.—WARP TENSION AND LET-OFF MECHANISM FOR LOOMS.—E. B. Bigelow, Boston, Mass. July 11, 1870.

1,969.—APPARATUS FOR DRYING MALT, GRAIN, ETC.—A. B. Petracchi Helen Merrill, Robert Heneage, and H. Spendelaw New York city. July 12, 1870.

1,847.—WOOD SCREWS.—G. C. Davies, Dayton, Ohio. June 29, 1870.

1,853.—COPYING PRESSES.—J. Fenson, Toronto, Canada. June 29, 1870.

1,867.—BOAT DETACHING APPARATUS.—O. T. McIntosh, New York city July 1, 1870.

1,944.—LOCKING AND RELEASING HOOKS.—J. Bozorth and H. Fredericks Camden, N. J. July 8, 1870.

1,960.—REAPING AND MOWING MACHINES.—W. A. Wood, Hoosick Falls N. Y. July 11, 1870.

1,962.—BRICK MACHINE.—B. M. Gard, Urbana, Ohio, and E. R. Gard, Chicago, Ill. July 12, 1870.

1,977.—DISH-WASHING APPARATUS.—J. L. Simonds, Boston, Mass. July 13, 1870.

1,979.—COFFEE CLEANER AND POLISHER.—W. Newell, Philadelphia, Pa July 13, 1870.

1,981.—APPARATUS FOR MANUFACTURING CARPETS.—W. Wallace and C. McAllister Philadelphia, Pa. July 13, 1870.

2,010.—ROTARY ENGINE.—Richard Dudgeon, New York city. July 15 1870.

APPLICATIONS FOR THE EXTENSION OF PATENTS.

RAILROAD-CAR BRAKE.—William G. Creamer, New York city, has applied for an extension of the above patent. Day of hearing Oct. 19, 1870.

POWER LOOM.—Alexander Smith and Halcyon Skinner, Yonkers, N. Y., have petitioned for the extension of the above patent. Day of hearing Oct 19, 1870

SEWING MACHINE.—Isaac M. Singer, New York city, has applied for an extension of the above patent. Day of hearing Oct. 19, 1870.

DIAPHRAGM FLUID METER.—J. H. Darlington and William Piper, New York city, have petitioned for the extension of the above patent. Day of hearing Oct. 26, 1870.

MACHINE FOR FOLDING PAPER.—C. O. Crosby, New Haven, Conn., has petitioned for an extension of the above patent. Day of hearing Dec. 7, 1870.

Official List of Patents.

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FOR THE WEEK ENDING August 9, 1870.

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Patent Solicitors, No. 37 Park Row, New York

106,104.—BUTTER WORKER.—Joseph P. Adams and John P. Corbin, Whitney's Point, N. Y.; said Adams assignor to said Corbin.

106,105.—NON-CONDUCTING CASING FOR BOILERS, STEAM PIPES, ETC.—F. Y. Arnold, Philadelphia, Pa.

106,106.—MACHINE FOR TRIMMING & SHEARING HAIR CLOTH ETC.—Olney Arnold and Isaac Lindsley, North Providence, R.I., assignors to Pawtucket Hair-cloth Co.

106,107.—ANIMAL TRAP.—William Ball, Oregon, Mo.

106,108.—RAKE ATTACHMENT FOR HARVESTERS.—Charles Barns, West Liberty, Iowa.

106,109.—SUPPORT FOR TABLES.—Jas. Blake (assignor to himself and Geo. Blake), Scranton, Pa.

106,110.—SUPPORT FOR TABLES.—Jas. Blake (assignor to himself and Geo. Blake), Scranton, Pa.

106,111.—HAMES CAP FOR HARNESS.—Lot Bonine(assignor to himself and W. W. Camp), Vandalia, Mich.

106,112.—PREPARATION OF ALBUMEN. — Gustav Bourgade, New York city.

106,113.—WATER COOLER, ETC.—G. R. Bowman, Hagerstown, Md.

106,114.—SHUTTLE WORKER.—Henry W. Boynton, Haverhill, Mass.

106,115.—KETTLE BAIL.—Jas. Britton (assignor to himself and Garrett Brower), Williamsburgh, N. Y.

106,116.—MECHANISM FOR ACTUATING THE PICKER STAFF LOOMS.—M. C. Burleigh, Somersworth, N. H.

106,117.—MILK SAFE.—J. H. Bush, Bengal, Mich.

106,118.—CULTIVATOR AND HARROW.—E. T. Russell assignor to himself and John N. Greene, who assign one third their right to J. M Tilford, all of Indianapolis, Ind.

106,119.—RAILWAY CAR COUPLING.—S. O. Campbell, Centertown, Mo.

106,120.—BORING MACHINE.—W. W. Carey and G. W. Harris Lowell, Mass.

106,121.—VALVE FOR STOP COCKS.—J. W. Carney,Charlestown, Mass.

106,123.—PIPE JOINT.—Patrick Clark, Rahway, N. J.

106,123.—SAW HANDLE. — William Clemson, Middletown N. Y.

106,124.—RAILROAD-CAR STOVE. — James M. Comins, New York city.

106,125.—MANURE CART.—T. L. Cotten (assignor to M. J. Cotten), Madison Co. Miss.

106,126.—SLEIGH AND CARRIAGE FOR CHILDREN.—B. P. Crandall, Jr., Williamsburgh, N. Y.

106,127.—MEDICAL COMPOUND AND LINIMENT.—W. S. Crooker, Shamburg, Pa.

106,128.—SPOOL-THREAD CASE.—John D. Cutter, New York city.

106,129.—DUPLEX WRENCH.—Augustus B. Davis, Philadelphia, Pa.

106,130.—DRAWING FRAME FOR HEMP, ETC.—Geo. Davis and J. R. Hoover, Elizabeth Port, N. J.

106,131.—RAILWAY SWITCH.—Jas. Davis, New Orleans, La.

106,132.—AUTOMATICALLY-OPERATED WATER-CLOSET SEATS —Perry W. Davis, Portland, Oregon. Antedated Aug. 4, 1870.

106,133.—APPARATUS FOR REDUCING FIBROUS MATERIAL TO A TEXTILE STOCK.—Lorenzo Dean, Fort Edward, N. Y.

106,134.—ATTACHMENT TO PAPER MACHINES TO PREVENT THE STRAINING AND BREAKING OF THE PAPER DURING MANUFACTURE.—Lorenzo Dean, Fort Edward, N. Y.
106,135.—BOILER FOR REDUCING FIBROUS MATERIALS TO TEXTILE STOCK.—Lorenzo Dean, Fort Edward, N. Y.
106,136.—CLOTHES WRINGER.—Charles H. De Knight, Pittsburgh Pa.
106,137.—WASHING MACHINE.—Charles H. De Knight, Pittsburgh, Pa.
106,138.—NUT LOCK.—Jas. Dennis, Churchville, N. Y.
106,139.—PLANING MACHINE.—Frank Douglass, Norwich, Conn.
106,140.—SPINNING RING.—William F. Draper, Hopedale, Mass.
106,141.—ELECTRO-MAGNETIC LOW-WATER ALARM FOR STEAM BOILER.—Wright Duryea, Glen Cove, N. Y.
106,142.—ELECTRO-MAGNETIC LOW-WATER DETECTER FOR STEAM BOILER.—Wright Duryea, Glen Cove, N. Y.
106,143.—MANUFACTURE OF PAPER PULP.—Asahel K. Eaton, Piermont, N. Y.
106,144.—WASHING MACHINE.—William Eaton, Norwich, N. Y.
106,145.—PIANOFORTE.—Loring Farnsworth (assignor to himself and W. H. Flint), Nashua, N. H.
106,146.—AUTOMATIC REEL FOR CLOTHESLINE.—Wm. Farrah, Des Moines, Iowa.
106,147.—APPARATUS FOR DRYING PHOSPHATES.—Ernst Frank and John B. Adt, Baltimore, Md.
106,148.—TRUSS.—Henry Fuller, Cattaraugus, N. Y.
106,149.—DEVICE FOR PACKING BOTTLES.—Geo. C. Furber, Yreka, Cal.
106,150.—LUBRICATOR.—William Gee, New York city.
106,151.—TUCK-CREASING ATTACHMENT FOR SEWING MACHINES.—H. C. Goodrich, Chicago, Ill.
106,152.—CAR BRAKE.—Merritt W. Griswold, New York city.
106,153.—SCROLL SAW.—Nicholas B. Hadley, Providence, R. I.
106,154.—STOVE GRATE.—R. Ham (assignor to Cox, Church & Co.,) Troy, N. Y.
106,155.—HEMMER FOR SEWING MACHINE.—Milo Harris, Jamestown, N. Y.
106,156.—FARM GATE.—Amasa Hathaway, Prairie Du Lac, Wis.
106,157.—SKYLIGHT.—George Hayes, New York city.
106,158.—MANURE DRAG.—J. D. Heebner (assignor to himself and D. S. Heebner), Norristonville, Pa.
106,159.—RAILWAY CAR COUPLING.—J. W. Hess, Montandon, Pa.
106,160.—MACHINE FOR TURNING LOGS.—Wm. E. Hill, Erie, Pa.
106,161.—CULTIVATOR.—Seth B. Hoisington, Galesburg, Ill.
106,162.—APPARATUS FOR THE MANUFACTURE OF BESSEMER STEEL.—A. L. Holley, Brooklyn, N. Y.
106,163.—BALANCE.—Woodbury Storer How, Cincinnati, Ohio.
106,164.—SAD AND CRIMPING IRON.—Charles Hyatt, Buffalo, N. Y.
106,165.—ROTARY BLOWER.—Wm. G. Hyndman, Cincinnati, Ohio.
106,166.—BILLIARD CUE.—M. V. Ingersoll, Norwalk Bridge, Conn.
106,167.—MACHINE FOR SHARPENING HARVESTER CUTTERS.—W. S. Ingraham, Evanston, Ill.
106,168.—BUNG BORER.—W. A. Ives, New Haven, Conn.
106,169.—HINGE.—Wm. Johnson, Milwaukee, Wis.
106,170.—HINGE.—F. B. Jones, Louisville, Ky.
106,171.—PROCESS OF SEPARATING NAILS FROM FELT.—W. Jopes, New York city.
106,172.—MACHINE FOR BENDING CLEVIS AND STIRRUPS.—W. C. Kaiser, Louisville, Ky.
106,173.—LAMP SHADE AND REFLECTOR.—Jas. M. Kenerson, (assignor to himself and Edmund Burke), Newport, N. H.
106,174.—PLATFORM SCALES.—Michael Kennedy, New York city.
106,175.—ATTACHING RUBBER TO WRINGER SHAFTS.—S. R. Kenyon, Greenville, R. I., assignor to himself and W. D. Vernam, Elizabeth, N. J.
108,176.—SHUTTER FASTENER.—John W. King, New York city.
196,177.—GRAIN SEPARATOR AND SCOURER.—W. C. Knox, Jacksonville, Ill.
106,178.—SLEEPING CAR.—G. S. Koontz and John B. Hill, Washington, D. C.
106,179.—BELT GUIDE.—C. P. Leavitt, New York city.
106,180.—PRESSURE GAGE.—Charles Liedke, Sandusky, Ohio.
106,181.—STABLE CLEANER.—T. F. Longaker, Philadelphia, Pa.
106,182.—EGG BEATER.—Thomas Marsh and James Berney, Pawtucket, R. I.
106,183.—FENCE.—David McCurdy, Ottaowa, Ohio.
106,184.—GRAIN-SCOURING MACHINE.—William McLaughlin, Jersey City, N. J.
106,185.—STEAM ENGINE.—Joseph P. Merriam, Sandusky, Ohio.
106,186.—METALLIC HEEL FOR BOOTS AND SHOES.—E. T. Miller (assignor to himself and John Hewitt), Albany, N. Y.
106,187.—SAW.—Charles Mitzelfield (assignor to Mack Flanigan), Detroit, Mich.
106,188.—MACHINE FOR BENDING AND PUNCHING CAR HOOKS.—D. G. Morris, Catassaqua, Pa.
106,189.—WATER ELEVATOR.—T. L. Morriss, Claypool, Ky.
106,190.—PROCESS OF FORGING CARRIAGE SHACKLES.—F. B. Morse, Plantsville, Conn.
106,191.—BASE-BURNING FIREPLACE HEATER.—Andrew Murdock, Brooklyn, E. D., N. Y.
106,192.—ATTACHMENT TO PLOWS.—James W. Murfee, Havanna, Ala.
106,193.—ATTACHING THE POINT TO THE SHANK OF SUBSOIL PLOWS.—J. W. Murfee, Havanna, Ala.
106,194.—HORSE-POWER.—James W. Murrel, Eldorado, Arkansas.
106,195.—SUBSOIL PULVERIZER.—G. S. Newsom, Nashville, Tenn.
106,196.—SCRUBBING BRUSH.—Jacob Odell, Petroleum Centre, Pa.
106,197.—ROCK DRILL.—Hermann Osterkamp, Eschweiler City, Prussia.
106,198.—INK.—C. P. Panknin, Charleston, S. C.
106,199.—VAPOR BURNER.—Robert W. Park, Philadelphia, Pa.
106,200.—VAPOR BURNER.—Robert W. Park, Philadelphia, Pa.
106,201.—STEAM TRAP.—E. L. Perkins, J. H. Moulton, and C. E. Sawyer, Boston, Mass.
106,202.—CORN PLANTER.—George W. Pittman, Winona, Miss.
106,203.—ARCHING BRICKS.—Watson F. Quinby, Wilmington, Del.
106,204.—CAR COUPLING.—Wm. A. Rex and J. M. Rex, Jr., Butler, Ind.
106,205.—DRYER.—J. E. Rice (assignor to himself and C. H. Remington), Moline, Ill.
106,206.—AIR-HEATING STEAM CONDENSER.—Peter J. Rice, Ashtabula, and David A. Scott, Cincinnati, Ohio.
106,207.—MODE OF TREATING TOBACCO.—S. G. Rice, Albany, N. Y. Antedated Aug. 5, 1870.
106,208.—COOKING STOVE.—Francis Ritchie, Troy, assignor to Jewett & Root, Buffalo, N. Y.
106,209.—APPARATUS FOR TANNING.—John Robinson, S. F. Robinson, and C. C. Putnam, Skowhegan, Me.
106,210.—BROILER.—D. E. Roe, Elmira, N. Y.
106,211.—CURTAIN FIXTURE.—Franklin Root, Hartford, Conn.
106,212.—APPARATUS FOR COOLING THE ROLLERS USED IN THE MANUFACTURE OF ISINGLASS.—Ebenezer Rowe, Rockport, Mass.
106,213.—LIQUID FOR RAISING PASTE OR DOUGH.—Arthur Sauer, Gustave Sauer, and L. Cachal, Paris, France.
106,214.—CIGAR MACHINE.—Socrates Scholfield (assignor to himself and R. A. Bright, Jr.), Providence, R. I.
106,215.—NUT-TAPPING MACHINE.—Wm. Scully (assignor to the Michigan Bolt and Nut Co.), Detroit, Mich.
106,216.—APPARATUS FOR CARRYING GRAIN, PLASTER, ETC., FOR SOWING.—O. W. Smith, Flint, Mich.
106,217.—STEERING APPARATUS.—George Seymour, London, England.
106,218.—MITERING MACHINE.—Ephraim Shaw, Tarr Farm, Pa.
106,219.—COMPOSITION FOR OILING WOOL.—James Shaw (assignor to Conyers Button), Philadelphia, Pa.
106,220.—WASHING MACHINE.—M. A. Shepard, Evansville, Ind.
106,221.—BOX.—C. J. Siercks, Chicago, Ill.
106,222.—STEAM GENERATOR.—E. B. Sintzenich (assignor to himself and H. G. Hamilton), Rochester, N. Y.
106,223.—FLOUR BOLT.—John Skinner, Hadley, Mich.
106,224.—LATHE DOG.—J. S. Skinner, Lebanon, N. H.
106,225.—DIE FOR FORGING CARRIAGE SHACKLE BLANKS.—W. B. Smith, Plantsville, Conn.
106,226.—PUMP.—P. M. Snell and Oscar Snell, Williamsburg, Ohio.
106,227.—IRON FRAME FOR PIANOS.—George Steck, New York city.
106,228.—FEEDING DEVICE AND PRESSER FOOT FOR SEWING MACHINES.—C. M. Stocker, Georgetown, Mass.
106,229.—COTTON AND HAY PRESS.—C. W. Stoppel, Houston, Texas.
106,230.—HORSE HAY FORK.—L. W. Stuart, Narrowsburg, N. Y.
106,231.—WATER CLOSET.—W. G. Stuart (assignor to J. W. Trafton), Springfield, Mass.
106,232.—PHOTOGRAPH ALBUM.—J. F. Tapley, Springfield, Mass.
106,233.—REFINING PETROLEUM.—J. A. Tatro, Hartford, Conn.
106,234.—BOOK BINDING.—J. C. Terry, Springfield, Conn.
106,235.—CULTIVATOR.—J. B. Tibbits (assignor to himself and Joseph Stebbins), Portland, Mich.
106,236.—AUTOMATIC TABLE FAN OR BRUSH.—R. E. Tolar and W. D. Orr, Newnan, Ga.
106,237.—COCK.—J. W. Trafton, Springfield, Mass.
106,238.—STUMP PULLER.—Grey Utley, Charlotte, N. C. (assignor to himself and Glenn & Wright), Atlanta, Ga.
106,239.—MEDICAL COMPOUND OR PILL.—J. P. Waddell, Brookhaven, Miss.
106,240.—SHOW CASE.—Edward Watson and R. H. Norris, Paterson, N. J.
106,241.—WIRE FOR ATTACHING SOLES TO BOOTS AND SHOES.—William Wickersham, Boston, Mass.
106,242.—SEWING MACHINE TABLE.—C. H. Wilcox (assignor to Wilcox & Gibbs Sewing Machine Company), New York city.
106,243.—CAST IRON CAR WHEEL.—William Wilmington, Toledo, Ohio.
106,244.—EARTH CLOSET.—Joel Wood, Martinsville, Ohio.
106,245.—TWEER.—Edmund Youngs, New York city.
106,246.—MAGAZINE GUN.—N. H. Ambler, East Cleveland, Ohio.
106,247.—MICA CHIMNEY FOR LAMPS.—John Baird and Warren Fisher, Hamilton, Ohio.
106,248.—SHADE CORD RETAINER.—W. H. Bechtel, Philadelphia, Pa.
106,249.—SEWING MACHINE.—Joseph Bennor (assignor to himself and Abraham Rex), Philadelphia, Pa.
106,250.—SAUSAGE STUFFER AND LARD PRESS.—Abner Bishop, Smithville, Ohio. Antedated August 5, 1870.
106,251.—PROCESS OF FORMING VACUUM IN FREEZING APPARATUS.—E. S. Boynton (assignor to himself and Charles Parker), Meriden, Conn.
106,252.—HOP PRESS.—Jeremiah Brockway, Richland Center, Wis.
106,253.—PRUNING SHEARS.—Ransom Bullard and G. E. Mills, Litchfield, Mich.
106,254.—HANDLE FOR KNIVES, ETC.,—Matthew Chapman, Greenfield, Mass.
106,255.—SEAL LOCK.—Everett Clemons, Catawissa, Pa.
106,256.—RAILWAY RAIL FASTENING.—John Cochrane, Farmingdale, N. J.
106,257.—MACHINE FOR SOLDERING METALLIC VESSELS.—E. T. Covell, Brooklyn, N. Y.
106,258.—SAFETY SHOE FOR RAILWAY CAR TRUCK.—J. S. Crary, Salem, N. Y.
106,259.—SWITCH STAND.—C. C. Dodge, Marshall, Mich.
106,260.—MACHINE FOR MANUFACTURING HOOPS.—J. B. Dougherty (assignor to himself, R. E. Sherlock, J. C. Schanck, A. G. Wheeler, and P. R. Lawler), Rochester, N. Y.
106,261.—LUBRICATOR.—Isidore Dreyfus, New York city.
106,262.—TOY.—J. G. Fine, Cincinnati, Ohio.
106,263.—MANUFACTURE OF ARTIFICIAL MARBLE.—G. A. Frear, Chicago, Ill.
106,264.—MOLDING MACHINE.—Thomas Glover (assignor to Morris, Tasker & Co.), Philadelphia, Pa.
106,265.—CORE FOR CASTING AXLE BOXES.—W. H. Hawley, Utica, N. Y.
106,266.—RAILWAY SWITCH.—J. P. Herron, Atlanta, Ga.
106,267.—BELT SHIFTING MECHANISM FOR LOOMS.—L. J. Knowles, Warren, Mass.
106,268.—DEVICE FOR OPERATING WINDOWS.—J. S. Lester, Knoxville, Tenn.
106,269.—STOVE PIPE.—W. P. Lewis and S. L. Vera, Pittsburg, Pa.
106,270.—APPARATUS FOR EVAPORATING.—N. R. Martin, Canandaigua, N. Y.
106,271.—GRINDING MILL.—Gove Mitchell, Philadelphia, Pa.
106,272.—BLIND FASTENING HINGE.—J. H. Nevins (assignor to W. A. Bosman), Brooklyn, E. D., N. Y.
106,273.—MOLDING AND VENTING MACHINE.—William Newsham (assignor to Morris, Tasker & Co.), Philadelphia, Pa.
106,274.—APPARATUS FOR LOADING WOOD ON RAILWAY CARS.—Jesse Nicholson, Monticello, Ind.
105,275.—ORGAN BELLOWS.—Joseph R. Perry, Wilkesbarre, Pa.
106,276.—MACHINE FOR HUSKING CORN.—Peter Philip, Stockport, N. Y.
106,577.—HEDDLE MACHINE.—Peter Philip, Stockport, N. Y.
106,278.—HINGE.—John Plant, Washington, D. C.
106,279.—SASH HOLDER.—James A. Printz, Reading, Pa.
106,280.—BROILER.—James T. Page, Rochester, N. Y.
106,281.—PLANING MACHINE.—Geo. T. Pearsall, Apalachin, N. Y.
106,282.—PREPARATION OF LIME AND MORTAR.—L. B. Pitcher, Salina, N. Y.
106,283.—MILLSTONE BEARING.—Peter Plamondon, Atchison, Kansas.
106,284.—HOISTING APPARATUS.—Thomas Pollard (assignor to J. V. Merrick, W. H. Merrick, and J. E. Cope,) Philadelphia, Pa.
106,285.—BOOK HOLDER.—Elias Propst and J. F. Avis (assignors to themselves and W. H. Hartley), Tipton, Ind.
106,286.—CHILDREN'S CARRIAGE.—G. F. C. Rosenthal, Philadelphia, Pa.
106,287.—APPARATUS FOR FORCING WATER.—J. M. Rucker, Forest Depot, Va.
106,288.—COMBINED BROILER AND FURNACE.—J. S. Runyan, Columbus, Ohio.
106,289.—ROLL FOR FLUTING MACHINES.—Henry Sauerbier, Newark, N. J., assignor to Susan R. Knox and Daniel Jackson, New York city.
106,290.—MACHINE FOR THE MANUFACTURE OF COMPOSITION PIPES FOR DRAINAGE.—Robert Skinner and Richard Gaines, San Francisco, Cal.; said Gaines assignor to said Skinner.
106,291.—CUTTER-HEAD.—George E. Somers, Waterbury, Conn.
106,292.—SHIFTING BUGGY TOP.—George Stricker, Catawissa, Pa.
106,293.—ATTACHING AND DETACHING HORSES FROM VEHICLES.—George Switzer, Washington, D. C.
106,294.—WHEEL PLOW.—John E. Swallow, Hagerstown, Md.
106,295.—MACHINE FOR BENDING TUBE SKELPS.—S. P. M. Tasker, Philadelphia, Pa.
106,296.—WASHING MACHINE.—W. H. Welch, Bloomington, Ill.
106,297.—CAR SEAT.—William Wells, Salem, Mass.
106,298.—BOX OR CASE FOR HOT BEDS.—William Wells (assignor to himself, E. B. Horton, and David Buffum), Salem, Mass.
105,299.—STOPPING MECHANISM FOR SPINNING AND OTHER MACHINES.—S. B. Westcott, River Point, R. I.
106,300.—SHEARING AND PUNCHING MACHINE.—J. C. Wilcox, New London, Wis. Antedated August 5, 1870.
106,301.—WASHING MACHINE.—J. B. Wilson, Philadelphia, Pa., assignor, by mesne assignments, to himself, P. W. Lawrence, and Walter Reckless.

REISSUES.

4,092.—PLANTING MACHINE.—S. L. Allen, Cinnaminson, N. J.—Patent No. 84,247, dated November 24, 1868.
4,093.—BRIDGE.—Albert Fink, Louisville, Ky.—Patent No. 63,914, dated April 9, 1867.
4,094.—SPINDLE FOR SPINNING.—A. H. Gilman, Boston, Mass.—Patent No. 66,017, dated June 25, 1867.
4,095.—COMPOSITION FOR COVERING STEAM BOILERS AND FOR OTHER PURPOSES.—Ferdinand Leroy, administrator, and P. A. Victor Le Lubez, assignee of Ferdinand Leroy, deceased, London, Eng.—Patent No. 87,281, dated December 14, 1869.
4,096.—SAW.—E. P. Wheeler, E. M. Madden, and William Clemson, Middletown, N. Y., assignees of Joseph H. Tuttle.—Patent No. 9,807, dated June 21, 1853, extended seven years.
4,097.—EXTENSION WASH BENCH.—Samuel Wiswall, Hyde Park, Vt., assignor to A. H. Spencer, Providence, R. I.—Patent No. 36,371, dated October 9, 1869.

DESIGNS.

4,275.—TOP PLATE FOR MANGERS.—S. S. Bent, Port Chester, N. Y.
4,276.—SPOOL STAND.—Robert Gordon, Peoria, N. Y.
4,277.—COLLAR BOX.—Samuel F. Hilton, Providence, R. I.
4,278.—CLOCK-CASE FRONT.—Samuel B. Jerome (assignor to Samuel Peck & Co.), New Haven, Conn.
4,279 to 4,283.—TYPE.—W. H. Page (assignor to W. H. Page & Co.), Norwich, Conn. Five Patents.
4,284 and 4,285.—TYPE BORDER.—W. H. Page (assignor to W. H. Page & Co.), Norwich, Conn. Two patents.
4,286.—NECK-YOKE RING AND SLIDE.—R. L. Reat, Charleston, Ill.
4,287.—GROUP OF STATUARY.—John Rogers, New York city.
4,288.—SAUSAGE FILLER.—Amos Shepard, Southington, Conn.
4,289.—TYPE.—Richard Smith (assignor to MacKellar, Smiths, & Jordan), Philadelphia, Pa.
4,290.—CLOCK-CASE FRONT.—Solomon C. Spring, Bristol, Conn.
4,291.—INKSTAND.—Levi L. Tower, Somerville, Mass.
4,292.—INKSTAND.—Henry Whitney, East Cambridge, Mass.

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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.
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Surgeon General U. S. Army.

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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:

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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."

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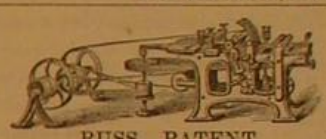

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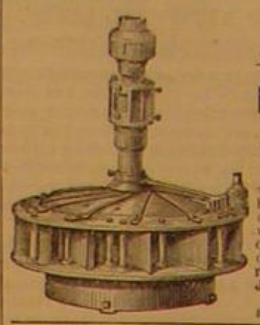

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