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Improved Dish-Washing Machine.

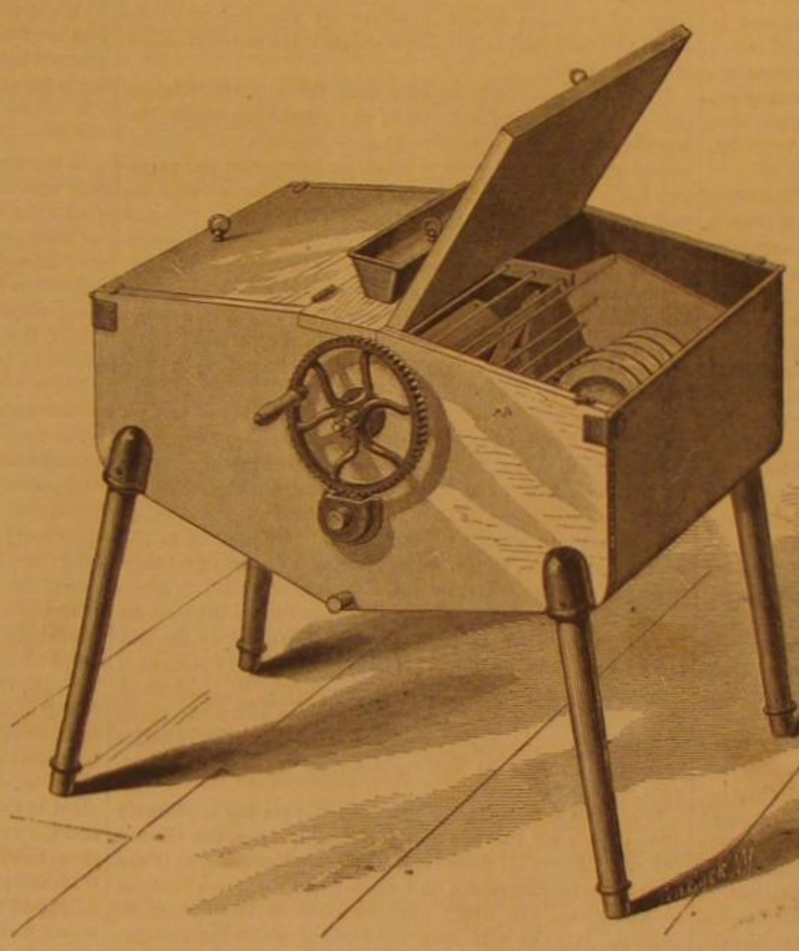
Machines for washing dishes, which can do this work well and rapidly, are a *desideratum* for hotels, restaurants, large boarding-houses, hospitals, asylums, as well as for private families. The one of which the annexed engraving is a perspective view, is extremely simple, and it is claimed does its work in a perfect and rapid manner.

It consists of a trunk or box, the sides of which are made of wood or sheet metal of a suitable kind, and having its bottom and ends formed of a continuous sheet of galvanized iron or other suitable metal, and containing a water or dasher wheel of peculiar construction, with racks of various forms to hold the dishes to be washed, the racks being made of galvanized iron wire, and so constructed and placed as to sustain in the proper position for cleansing any and all of the various dishes in modern use.

The efficiency of the machine depends chiefly on the form of the dasher wheel. This wheel is made one wing at a time, so that the wings, four in number, each have the form of portions of the shell of a frustum of a cone. These are placed in pairs, their concavity outward, so that the apex of one pair is opposite the base of the other. As a consequence of this construction and proper attention to the proportioning of the wheel, it follows that in rotating it by means of the winch, gear, and pinion, the water will be thrown forcibly toward one side of the trunk or box, and in reversing the motion it will be as forcibly thrown toward the other side, so that both sides of plates or other dishes may be acted upon as described below.

In use the dishes are placed in the trunk on the proper wire racks, and the lids are shut and buttoned down. Hot water, with or without soap as may be necessary, is then introduced through a hopper-shaped strainer trough at the top of the machine. Four or five quarts of boiling water and a tablespoonful of soft soap, or its equivalent of hard soap, is sufficient. The crank is then turned to the right and left alternately for from two to three minutes. The water is then drawn off, and about the same amount of rinsing water is poured in, and the dashing is repeated. The covers are then opened, and the dishes being hot will dry in a few minutes. The drying may be, if desired, accelerated by turning the dasher wheel, which forces a current of air over the dishes. This invention is the device of an Illinois lady, and it is another proof that the female sex is not without its share of inventive talent.

Patented, Dec. 7, 1869, by T. D. Clark, whom address for urther informaton at Xenia, Ill.



CLARKE'S DISH WASHER.

How Counterfeit Notes are Made.

A party of men, say from three to a dozen, get together and hold frequent meetings, and act according to a plan laid down. One or two will find out some copper-plate printer in the employ of the bank note company—in fact all such printers are known by the party. These men will then manage to meet one of the printers in the evening, get acquainted, drink, and have a good time generally with him, and so proceed for a few evenings. Then they offer him from $50 to $100 to procure a certain kind of impression. This impression is made in this wise: The printer will take the impression upon tin foil from the plate from which he is printing, which can be done in a moment. Thus you see every line and the size is obtained correctly. From this tin foil an electrotype plate is made. They then get some plate printer that can be found about the city, have a good time with him, and engage him at twenty dollars a day to do the printing. By this plan thousands of copies are struck off that defy detection, except in the quality of the paper, which will differ from the genuine. The place of manufacture is generally at some distance from New York, like Staten Island, Flatbush, or sometimes Baxter street or some similar locality in this city. It is a strange fact in every case where a party of this kind exists, that every member lacks confidence in his associates. Every move made by one is narrowly watched by the others of the party. It would be death to an informant or spy that did not look well to himself.

A Wooden Railroad.

A railroad with rails of wood has recently been built from Quebec through the village of Jacques Cartier, about fifteen miles. The Quebec *Chronicle* speaks of it as follows:

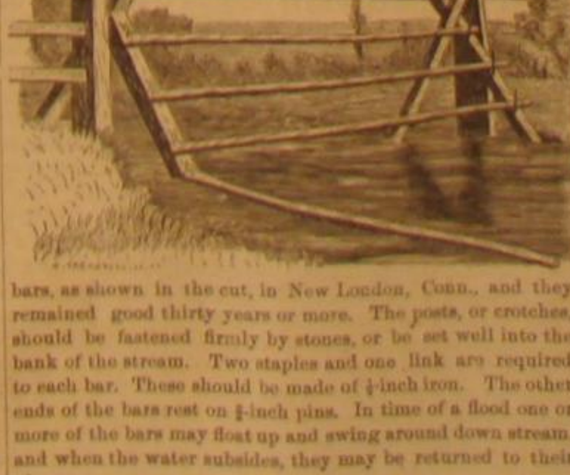
"The problem of wooden railways for colonization purposes may now be said to be solved, and as a proof of it, it is necessary to say that we passed over the road yesterday, at a rate of from twenty to thirty miles an hour, a speed which is seldom passed on any of the iron roads in this Province. The cars conveying the party yesterday were simply rudimentary vehicles, known as platform carriages, but sufficient evidence was given that the line when completed will be as easy and smooth for traveling purposes as upon the old established iron or steel rails. The road is built upon a 4 ft. 8½ inch gage, being the ordinary width of the modern English and American railways. Each rail is 14 feet long, 7 inches in depth, and 14 inches in width—sawn and prepared at a temporary mill recently erected by the contractor on the line for the purpose. Each rail rests on several sleepers to which they are fastened by wedges—by a process so simple that the rail when required, can be removed or reversed by any ordinary mechanic. The locomotive is from the Rhode Island Iron Works, and is most assuredly a splendid piece of mechanical ingenuity, while it is supposed to weigh 21 tuns, loaded, without the tender."

[Will the *Chronicle* inform us as to the cost of the above road per mile.—EDS.

Flood Fence.

Mr. Asa Hartshorn, of Ashtabula county, Ohio, writes as follows to the *Agriculturist*:

"I assisted my father fifty years ago in making a set of



bars, as shown in the cut, in New London, Conn., and they remained good thirty years or more. The posts, or crotches, should be fastened firmly by stones, or be set well into the bank of the stream. Two staples and one link are required to each bar. These should be made of ½-inch iron. The other ends of the bars rest on ⅝-inch pins. In time of a flood one or more of the bars may float up and swing around down stream, and when the water subsides, they may be returned to their places.

"These floating bars have the advantage over any other gate, as they open, and let all flood-wood and trash pass. I am an old man, and have whittled it out, so you can see how it should be on the stream. The round top pole rests in the crotch of the posts above high water, and in this way any stream twenty-five feet wide can be fenced with safety."

Elastic Tires for Traction Engines.

Engineering states that an interesting trial was recently carried out between Rochester and Chatham of a five-horse traction engine constructed by Messrs. Aveling & Porter, of the former place, and fitted with tires formed of india-rubber segments attached to iron plates by a process patented by Messrs. L. Sterne & Co., Great Queen street, Westminster, these plates being bolted to the wheel tire and further secured by iron rings. The front pair of driving wheels of the engine are 3 ft. 6 in. in diameter, and are fitted with indiarubber segments 12 in. long, 4 in. wide, and 3 in. thick. The rear pair of driving wheels are 5 ft. in diameter, and are fitted with india-rubber segments 12 in. long, 6 in. wide, and 3 in. thick. The rubber is firmly attached to ½ in. steel plates, which are bolted on to the ½ in. wrought-iron tires, the segments being still further secured by ½ in. wrought-iron rings placed on each side of the wheel.

The trial, which was conducted by Messrs. Aveling & Porter, took place on Friday last in the presence of a number of Government officials, and some of our leading engineers. The engine started from Messrs. Aveling's works, at Rochester, with two long four-wheel lorries and a load of iron girders, giving a total weight of about 13 tuns. It proceeded at a pace of about 4 miles an hour through the slippery streets of Rochester, traveling steadily up Star hill, which has a gradient of 1 in 12 for more than 300 yards. It made several sharp turnings round corners, the radius of the path of travel being not more than 15 ft. With one ordinary iron skid on the rear wheel of the hindmost lorrie, it descended Rome-lane—a steep falling grade—under complete control. The rough and irregular stone causeway, the timber bridgeway of the Chatham Dockyard, and the rough and broken ground near the landing quay on the Medway were all smoothly and successfully traversed. The girders were landed on the quay, and the engine then returned to Rochester. The ground near the landing quay is full of hillocks of cinder, clinker, stone, bricks, scrap iron, etc., but, although the engine ran over all these substances, not a cut nor permanent indent was to be found afterwards in the india-rubber segments.

The great advantage of Messrs. Sterne's method of attaching the india-rubber in segments over the solid ring is, that if a segment gets damaged it is easily and quickly removed and replaced by a spare segment at a moderate cost. The motion of the engine during the run was easy, and the india-rubber readily impressed itself into the inequalities of the roadways. To avoid all possibility of slip in wet streets and on clay soils, Mr. Aveling proposes to introduce steel staples or crossbars, so arranged as to take the traction without neutralizing the benefit derived from the elastic action of the rubber. There is no doubt a decided advantage in Messrs. Sterne's method of utilizing the india-rubber. Traction engines with their wheels thus tired will prove useful under the special local circumstances, such, for instance, as where they have to traverse paved or very uneven roads. But here to our mind, the advantage of rubber tired wheels ceases, and we believe that the engine in question, or, in fact, any of Messrs. Aveling & Porter's engines, would work as well without as with this addition, and that in most cases the 130*l*. or 140*l*. which these appliances cost, could be more profitably expended on the engine in other ways.

We may observe in conclusion, that there is no fear of the rubber parting from the plates to which it is attached by Sterne's process. Its adhesion has been tested by Mr. Kirkaldy, who found that a direct pull of 6,916 lbs., or 177¼ lbs. per square inch, was required to separate the two. In compression the rubber segments stood 66¼ tuns per square foot, returning to their normal condition after the pressure was removed.

THE quartz miners of California are predicting a long continuance of wet weather. Swallows and martins in Lower California have raised their broods quickly this summer and departed. This phenomenon, it is asserted, is a sure sign of a wet winter. What wonderful meteorologists these little birds must be

THE ISLAND OF CAPRI.

[From Chambers' Journal.]

In the tideless sea of the Mediterranean there rise two immense rocks, bound together, as it were, by a long hill, on which are scattered white houses, surrounded by an over-abundant foliage. The brilliant rays of the sun harmonize with the deep azure of the sea, the gray tint of its rocky shore, and the dark shadow of its giant trees. At the foot of those abrupt rocks may be traced deep, round holes, worn away by the action of the water, which makes a roar as of distant artillery when its waves pour into them. Higher up are immense grottos, from which the stalactites hang in sharp points, or, united at last to the rock itself, become a part of it.

Two large masses rise in the sea, to remind him who sails past of a cathedral with its towers unfinished, through one of which the largest steamships may easily pass—a Gothic porch of nature's building; and when the northern point is doubled, the low landing place is visible, and you are on shore at Capri. The remembrances of imperial Rome have left their impress there. It is a lovely spot, where nature seems too powerful for man. It is like the Sleeping Beauty; and human energy is powerless to grapple with it. The soil on this rocky island is so scarce that the inhabitants treasure it with the utmost jealousy; they inclose it in walls; they arrest its natural fall into the sea by making terraces; they shelter it from the sun by the shade of thick trees; and, in return, it is not ungrateful for the care lavished upon it as all that it produces is of the most excellent quality. The cereals are of the best; but at what an expense they are grown! Each grain is put into the earth separately; were it sown broadcast, the wind, to which the island is so exposed, would carry it away.

Oranges and lemons are of first-rate quality. The olive trees, which are abundant, yield so rich an oil that it is specially sought for to use at table. The white fig of Capri is as celebrated as that of Smyrna, and the vine yields a wine renowned among Italian vintages. The red, which is rather sweet, has a pleasant flavor of raspberries; the white, which is dry and sharp, has a taste of violets so strong that the Neapolitan merchants imitate it by infusing orris root into any ordinary wine, and sell it at ten times its value.

Even with the incessant pains they take to draw from the earth all it can produce, it is quite insufficient to feed the three thousand inhabitants. The Capriotes live like primitive races, by fishing and the catching of small birds, for which their island is a place of rest in mid-ocean during the months of April, May, September, and October. Then may be seen immense flights of quails, thrushes, turtle-doves, and woodcocks, which are taken by nets. All round the island, wherever there is depth of earth in which to fix a stake, they put in the broken masts of vessels at certain distances, between which the nets are spread by the help of a cord and a pulley, exactly as a sail is hoisted on board a ship. The birds arrive in innumerable flights about half an hour before daybreak, fly into the nets, and are picked up by men lying in ambush.

When the quails are more than usually plentiful, they are sold in the market of Naples at four centimes each, and sometimes exported as far as England. The number caught varies from forty to seventy thousand. In the spring they are thin and poor, having suffered from the privations of winter; but in the autumn they are well fed and very succulent, and form a principal source of the riches of the people.

In the whole island there are but two towns, Capri and Anacapri, one at the east, the other at the west end of the island. Each has its own territory. There can be no disagreement when the cultivated ground is separated by an abyss: the people can only meet on the neutral territory of the place of embarkation.

The twins might be supposed to live in peace, yet it is not so; they hate each other profoundly, and never lose any occasion of testifying it. The fishermen load each other with abuse when they meet; they each tear the other's nets. Each town has its own patron saint, and mocks its neighbor's. As the Capriotes mount the hill to Anacapri they spit at the chapel, which is half way up. No marriages occur between them, and the children pull each other's hair when they meet.

An example will suffice to show how far this animosity is carried. As the island cannot grow sufficient corn, there is always a supply provided for six weeks, in case of war. This is kept at Anacapri, as being the least accessible part of the country, and it is never touched but in case of extreme need. It happened that in the month of March, 1826, there was such a succession of tempests and contrary winds that all communication with the mainland was rendered impossible for nineteen days, and the town of Capri found itself without bread. The syndic wrote to his brother officer at Anacapri to ask for corn, to avoid starvation. The council met, and returned for their reply that they should be happy to send some for the syndic's own use, as he was not a native of the island; but the Capriotes should not have any, as they would be only too glad to see them perish by famine. The syndic of Capri proposed to his townsmen to give an answer to this cruel insolence by taking their guns and seizing the provision they needed by force. But he stood alone, and bread was made of potato starch mixed with bean flour, until the storm subsided.

A narrow path covered with sparkling stones, so steep as to be a staircase in some parts, leads from the shore to Capri, a town protected by walls and gates, to which a drawbridge is attached. It extends in a crescent on the summit of one of the hills, and presents a most picturesque appearance from beneath; the houses perched on points of rock which crop out from the masses of verdure beneath. As the rocks are calcareous, whitewash is cheap and abundant, and each house has its annual bath, giving it a clean, bright aspect, which is sadly belied when it is entered.

The streets are infested with small black pigs, which wallow in a mass of dirt, where the flies congregate, and the children play in rags. The town is interspersed by streets so narrow that two persons can scarcely pass, often roofed over, and the houses so open that the whole interior can be seen, giving a curious picture, which reminds you of the East in the middle ages.

As the isle of Capri is inseparably connected with the Emperor Tiberius, who retired here from Rome to indulge in seclusion and pleasure, it is naturally the first object of the traveler to visit the remains of his once gorgeous palaces. These were no fewer than twelve, which he dedicated to the twelve highest divinities; but after his death they were ordered to be destroyed by the senate, to mark their disgust at his sensuality and atrocious crimes.

The one consecrated to Jupiter, which the tyrant preferred to the others, and where he shut himself up for nine months after the death of Sejanus, still shows some of its foundations. Mounting up a steep road from the town through groves of medlars, orange, and fig trees, for about an hour, a mass of ruins marks the site; a fallen column, a broken step, the fragment of a cornice, prove that they were made of marble; but the walls seem to have been of brick, in the shape of lozenges bound together by the indestructible Roman cement, and laid in the form that the ancients called *opus reticulatum*.

Man, time, and lightning have made the ruins indecipherable; the roofs have disappeared; the plaster has fallen; the marble has been ground down; some vaults alone remain, arched chambers where there is neither inscription nor painting, and which the people use for stables. Cattle ruminate and asses sleep where the lord of the world, who thought himself the equal of the gods, tried to drown his guilty conscience in debauch, and paced his rooms in terror at imaginary enemies. A few white mosaics bordered with black are the sole remnant of ancient refinement. There is a semi-circular hall, upon which open small side rooms, marked by arches in the walls, which is supposed by the guides to have been the theater of the palace.

Had it not been that Tacitus and other historians had related its history and poured contempt on its builder, none could guess who had been the master of this heap of rubbish. But when we look at its situation, it must be acknowledged that it was well chosen; it is isolation in the midst of magnificent nature. Placed on the summit of the rocks to the west of the island, the immense panorama has its equal only in the Bay of Rio Janeiro or of Constantinople. The azure surface of the sea is cut on the one side by the harmonious lines of the isles of Ischia and Procida, softened by the distance; beyond is the Cape of Miseno, where Tiberius himself was to meet death in the house of Lucullus. The charming coast-line, dotted with villages and groves, forms the curve of the bay towards Naples, which is marked by a large white spot, stretching on to Torre del Greco, Torre dell' Annunzista, and Castellamare.

Where Cape Campanella juts into the sea the land again disappears near the isle of the Sirens, to form the Gulf of Salerno. Above all these beauties towers Vesuvius, as if she were the guardian of sea and shore; and then, as a contrast to the great, the lesser beauties close at hand must be noticed. It is the wild flora, the seeds of which are brought in profusion by every breeze, and are the ornament and regeneration of a ruin. Pansies, pinks, eglantine, and broom give life and beauty to the skeleton; whilst emerald lizards glide through the leaves, and swallows wing their rapid flight overhead.

A few steps from the palace is a small platform overhanging the sea, called the "Leap of Tiberius." The tradition is, that from this place his prisoners, after suffering horrible tortures, were thrown into the sea in his presence, their bodies torn by the sharp rocks which lie at the foot of the precipice. It is above eleven hundred feet in hight, and a moderate-sized stone occupies twenty-seven seconds in reaching the ground. The rock is as straight as a wall, with here and there a sharp point jutting out, covered with a tuft of verdure.

Still farther, on a pyramidal heap of earth, is an isolated gray ruin, to the top of which a modern staircase leads. Possibly it is the tower from which Tiberius watched for the signals which he established on all sides, to give him the first warning of the insurrections he so much feared. A beacon lighted on the coast of Campania would be easily distinguished here. Or it might be for the study of the stars, as it is well known that he was an adept in astrology, which he studied during his retreat at Rhodes. It will easily be believed that the people attach everything to his memory; they call him "our Tiberius;" if they show a grotto, it is where he sacrificed to the gods—or a cavern, it is where his prisoners were confined; the old people speak as if they had known him, and the children stammer his name.

The Emperor would be much surprised if he could again revisit his old haunts: where he had dungeons full to overflowing, and executioners always ready, there is now not a prisoner in the island. Theft is almost unknown; two murders are mentioned as having formerly taken place; but the peaceful and industrious habits of the people keep them from violent crimes. Each knows the other by name—life has no secrecy; a bad man would soon be discovered, unmasked, and obliged to leave the island. The greater part of the inhabitants have never been on the mainland. Any one coming from Naples astonishes his simpler neighbors by his descriptions of carriages drawn by horses, there being neither cart nor vehicle of any sort in Capri; as the roads are nothing more than staircases, they would not admit of them.

The popular ignorance is great; there is a school in each of the towns, but only one master, who divides his days between them; and at eight years of age the children are sent to assist in the fishing, or to gather mulberry leaves for the silkworms, or grapes from the vines.

Any notice of Capri would be incomplete without a word about the Blue Grotto. The entrance from the sea is so narrow that the persons in the boat must lie down; but as soon as that is passed you enter into fairyland. The water, clear to the bottom, is of an exquisite celestial blue, which is reflected from the calcareous rocks in their pure whiteness. It is a palace of turquoise, built above a sapphire lake. The drops of water from the oars sparkle like pearls with a blue tinge. The effect on the body is most singular, the part under water of a swimmer is silvery white, with blue shadows round the muscles; whilst the head and neck, which are out of the water, are of a bronze color, looking like an alabaster statue with a bronze head. It is certainly one of the most beautiful natural curiosities in the world.

A fisherman was the first to discover it in 1822, though there are some indications that it was known to the ancients. Much has been written as to the cause of so singular a phenomenon; perhaps the most plausible is, that owing to the peculiar form of the entrance, the sea is saturated with light, which is shut up within, and throws its rays to the farthest depths of the vault. In another part of the coast there is a grotto where the color is that of pale green; it is very similar to its neighbor, but not quite equal in beauty.

ROLLING LOADS.

In the present day, excepting only Government wagons, rude agricultural carts, and wheelbarrows, every thing running upon wheels is seated on springs. This fact is a practical acknowledgment of the essential difference between a moving and a stationary load. When a vehicle is at rest the deflections of the springs are constant, and afford as exact a measurement of the insistent load as could be obtained by taking the wheels over a weigh bridge. If the load continued to press with the same intensity upon the wheels when in motion springs would be useless, as their deflection would remain unaltered, and a solid block might, consequently, do their work. But experience has taught us that on the smoothest railroad the springs are at once sensitive to the slightest movement, and that they may be advantageously introduced, and come freely into play, even in the instance of the slowly-revolving turned rollers traveling on the accurately-faced roller-path of a large swing bridge. The deflection of the springs of a vehicle in motion is alternately greater and less than the mean deflection when at rest, and the irresistible inference is that the wheel will press upon the supporting medium with a maximum intensity corresponding to the greatest deflection of the spring. No better opportunity of appreciating the practical effect of this condition could be obtained than is afforded by the running of a couple of trains at high speed in parallel lines and in the same direction. The observer in one train can then note the movement of the springs, with the horizontal element eliminated and the vertical alone apparent. It is hardly possible under these circumstances to avoid drawing a parallel between the train and a ship in a moderately smooth sea. The rising and falling of the several springs correspond with that of the waves, the mean deflection and the mean line of flotation are the same, respectively, as when the train is at rest and the ship in perfectly smooth water; but the maximum stresses must be deduced from the maximum deflection of the springs in the one case, and from the immersion measured from the crest of the waves in the other; a very long railway carriage with a large number of wheels would have no vertical movement itself, neither would a very long ship. Expanding this deduction, we are led to the conclusion that a long-span bridge will suffer no increase of strain from the varying deflections of the spings induced by the unavoidable deviations from mathematical accuracy in the levels of the permanent way, although the rails themselves may be subject to strains some 30 per cent greater than those due to the load at rest.

There may, however, be some other agency at work increasing the strains under a rolling load beyond that evidenced to the senses by the springs; and, as this is a question of paramount importance in the economic design of railway bridges, it is no matter of surprise that it has engaged the attention of the most eminent mathematicians and experimentalists. The results of the earlier experiments on the influence of rolling loads were certainly very alarming, as they appeared to indicate that one tun moving at 30 miles an hour was as destructive to the beam as two and a half tuns at rest. Observations of the deflections of actual bridges, however, soon reassured engineers, as the deflections under speeds of even 40 or 50 miles per hour were not practically greater than those due to the same load at rest. Theoretical considerations, at first sight, might erroneously lead us to anticipate a greatly increased deflection under a rolling load, since they indicate the maximum deflection of an elastic beam under a suddenly imposed load to be double that of the final deflection after oscillations have ceased. The reason for this is obvious enough, for the work done by the beam must be equal to that done by the load, and as the latter is equal to the product of the load into the ultimate deflection, the former must be equal to the product of the mean resistance of the beam into the same deflection; hence the *mean* resistance of the beam must be equal to the load, and as the resistance is *nil* at the commencement of the bending, it must be equal to double the load at the termination.

But the conditions of the rolling load on a railway bridge are not analagous. The load is not sufficiently suddenly applied, and the horizontal motion and *vis viva* of the train destroys other conditions. It might at first be concluded that at least the cross girders of a bridge spaced at intervals of a yard only, and where consequently at 60 miles per hour the load would be imposed in the thirtieth part of a second, would constitute a case of suddenly imposed load and double strain, but experience does not bear out this conclusion. In an instance observed by the writer the deflection of some 8 in. cross girders, amounting to $\frac{3}{8}$ths of an inch under the driving wheels of the engine when at rest, was increased to $\frac{1}{2}$ in. only when the engine traversed the bridge at considerable speed. In fact, in this case it was evident that the work done in deflecting the several girders was not performed, as in the case of a suddenly applied load, by a *vertical* descent of the weight at each girder, but by increased *horizontal* traction on the whole train; in the same manner as the wheel of a road vehicle passing over soft ground consolidates its path by the formation of a rut, at the expense of an additional pull, and not by an up-and-down hammering of the wheel.

One element of increased strain on the main girders of a railway bridge under a moving load is sufficiently apparent, but on investigation turns out to be insignificant in effect. The rails, if normally horizontal, will obviously be deflected below the horizontal line when the load is traversing the bridge, and the path of wheels therefore will be approximately an arc of a circle. The resulting centrifugal force will take effect upon the girder in a practically vertical direction, and in terms of the load the increased bending stress will, of course, be equal to the square of the velocity in feet per second, divided by 32 times the radius of the deflective curve in feet. In practical cases this increase, as we have before observed, will be found insignificant.

The most recent researches of mathematicians show that the passage of a train of ordinary length does not afford sufficient time for the attainment of molecular equilibrium in the girder, and that the increase of strain is not worthy of note. M. Bresse has shown that with a train of indefinite length, moving at the highest practical velocity, the strain, neglecting the effects of possible concussion, may be one-third greater than that due to the same load at rest; but that if the initial camber of the rails be four-thirds of the statical deflection, this increase, under the same reservation, will not take effect.

It is apparent, therefore, that if any important modifications are required in girders subject to a rolling load, it can only be to provide against the effects of shocks arising from irregularities in the roads and other similar causes. The interposition of springs protects the iron-work from direct impact, or some difficulties would be encountered in dealing with the light cross girders of railway bridges. Experiments on the effect of falling weights give very conflicting, and in some instances, unintelligble results. We can easily understand that a rectangular bar of any proportions, provided it be of the given weight per foot, will stand the same intensity of blow, whether it take effect on the flat side or on the edge of the bar; because the work done in fracturing the bar will be proportional to the product of the breaking weight into the ultimate deflection, which will be a constant amount for all rectangular bars of a given span and weight per foot. It is not so apparent, however, that a round bar of the same weight per foot will sustain the same blow as the rectangular bar, nor that the deflection will be proportional to the velocity of impact instead of the square of the same, yet both these are deduced facts from experiment.

The general tenor of the evidence gradually accumulated by engineers relative to the effect of moving loads tends to prove that no additional stength is on that account required in the main girders of railway bridges above some 20 ft. in span, provided the permanent way be kept in fair order, but that the cross girders should be calculated to sustain the load corresponding to the maximum deflection of the springs, which will ordinarily be some 25 per cent greater than the normal load. There are no grounds for the adoption of a factor of safety of ten in railway practice where moving loads are concerned, as urged by some writers, although that factor is quite justifiable in the instance of machinery, where genuine sudden strains have to be encountered.—*Engineering.*

Spontaneous Generation.

The decision of the question of spontaneous generation is one of the utmost moment, even from a practical point of view. It is no mere philosopher's problem, the solution of which would have but little influence on the well-being of our race; on the contrary, it is a matter most intimately concerning our own physical health—and in some cases our very existence, while it is no less important as regards the animal or vegetable productions on which we depend for food or clothing. Unhappily it is a problem, the satisfactory solution of which seems as far off as ever. In each succeeding generation men arise who prove to their own satisfaction, at least, that spontaneous generation does occur. Their experiments are made with all the ingenuity that science can devise, with all the care that an honest love of truth, and an earnest desire to find it, will allow of. In some cases the evidence they bring forward seems conclusive; but only for a time. Sooner or later a flaw is detected in the mode of experimenting, in the instrument employed, or in the chain of reasoning, and once again the old paths have to be trod under new and different conditions.

If we had to select among our foremost naturalists one who more than any other might have been expected to uphold the doctrine of spontaneous generation, that one would have been Professor Huxley. But, like a doughty man of science that he is, he will not be led astray by personal predilections, but boldly and unhesitatingly draws inferences from the evidence before him—inferences wholly unfavorable to a doctrine which, from what he has said on former occasions, we assume he would gladly support did he feel himself at liberty to do so. The point in dispute, we need hardly say, is as to whether what we call living matter is, under all circumstances, as it certainly is under most, the direct product of pre-existing living matter, or whether it may not occasionally be generated *de novo*, from a combination of elements under conditions as yet unknown to us. Happily, we can at the present day discuss these matters without fear of pains and penalties, and without uncharitable assumptions or aspersions. In whatever mode the new life appears, the miracle of its production remains the same—the attributes of Divinity are wholly unshaken.

So far as we can discern, all parties are agreed that in the majority of instances the new growth is the direct offspring of the old, and therefore if we can by any means destroy the vitality of the parent, check its multiplication, or prevent the access of new germs, we can "stamp out" any particular growth as effectually as we can rid ourselves of cattle plague or small-pox. Observers tell us that we are surrounded by infinite myriads of germs of inconceivable minuteness, invisible even under our best microscopes, and only rendered apparent by optical experiments such as those of Dr. Tyndall; and that these germs, under favorable conditions, progress and multiply, it may be, to our sore discomfort. These germs are, on the generally received theory, supposed to be the product of pre-existing organisms. How, then, were these organisms formed in the beginning, if not by the combination of certain proportions of oxygen, carbon, hydrogen, and nitrogen, as it is asserted similar organisms may be still formed? Why limit Creative power to one primordial fiat, and deny the continuous and constant operation of the same Great Cause? But while the general belief will be much strengthened by the recent utterances of Professor Huxley, there is now, as there always has been, a small class of observers who are led to conclude that in certain instances new growths or germs may be and are developed under circumstances precluding the existence of parental organisms of the same description. They take most elaborate precautions to prevent the accesss of germs from without; they expose fluids to a degree of temperature known, or at any rate supposed to be destructive to all forms of life; and yet at the expiration of a short time they find evidences of vitality, and they are led to infer that life has been formed in their experimental flasks, and has not been introduced from without. Some of the more recent experiments in this direction have been particularly suggestive. The chemical elements found in all living creatures have been supplied in certain definite proportions, and life has appeared, while in other cases, where the proportions have been differently combined, or the elements have been of a different character, not a speck of vitality has been observed.

Now, if these experiments be free from flaw, we shall only have to study the conditions under which living specks are produced to be able to regulate their production almost at will; and we shall be able to "stamp out" any objectionable manifestations as we can be under the opposite hypothesis of successful formation. As mere matter of practice, then, if we had to deal with a murrain or a blight, it would be of little import how that murrain originated—whether by "biogenesis," or parental development, if we may so call it, or by "abiogenesis," or spontaneous generation. If we only knew all the conditions under which development took place, we should be able to contend successfully against these plagues, or at least we should in most instances be able to avoid exposing ourselves, our herds, or our crops to conditions favorable to their production; and this is why the settlement of the question of spontaneous generation, as it is somewhat erroneously termed, is so all-important to practical men.

As we have seen, the decision of Professor Huxley on the present state of the question is, that the notion of spontaneous generation is fallacious, and both he and Professor Tyndall seem to be of opinion that there is some flaw in Dr. Bastian's experiments; and in so far as the production of those wonderful spiral coils, which the latter gentleman finds under certain circumstances, it would seem most probable that, in spite of all his precautions, the access of foreign material has not been effectually prevented. Professor Tyndall points to one weak place in Dr. Bastian's experiments; when he declares that, in spite of the removal of the air from the experimental flasks by means of the air-pump, it is perfectly impossible to remove all the germs with which the air had been charged. But if this be the case, then these germs have a faculty of retaining their vitality under a temperature greatly exceeding that which has hitherto been deemed sufficient utterly to destroy vitality.

When it is stated that the living things supposed to arise out of non-living materials, and gradually to emerge from the region of the invisible into that of the visible, are no larger in the latter stage than $\frac{1}{100000}$ of an inch in diameter, it will be seen that, while it would be difficult indeed to suppose any place from which they could be perfectly prevented from obtaining access, it would be equally difficult to suppose that such infinitesimal specks could resist such an elevation of temperature as that to which they were subjected by Dr. Bastian.—*The Gardeners' Chronicle.*

MR. FAVARGER, an accomplished French teacher and lecturer, advertises in another column a series of French readings. Having acquainted ourselves with M. Favarger's system of instruction, and listened to some of his readings, we cordially recommend those who desire to improve their knowledge of and taste for the French language, to attend this course. We also recommend his system of instruction to those who desire to learn the French language.

On the Use of Tin-foil for Preserving Substances Liable to Change on Exposure to Air.

Tin reduced to thin sheets has for many years been employed for preserving a great number of substances from the action of air and moisture. The thin leaves (foil) of this metal are essentially repellent to moisture. When cemented to the surface of damp walls, they protect the paper-hangings which may be afterwards applied, and they are in like manner used for lining the interior of boxes and drawers in which dried medicinal leaves and flowers are kept. It has long been the practice to inclose chocolate in tinfoil, to prevent the fatty matter contained in it from soiling the paper which forms the outside wrapper; in the same way butter of cacao itself is preserved, and some sorts of sweet-meats, sausages, and cheese are among the articles similarly protected. Tobacco-pouches are lined with tin-foil to preserve the flavor and humidity of the tabacco. Cakes of opium are kept in a moist and uniform state by wrapping them in this material, and bisulphate of soda is kept in the same way, for use in making artificial Seltzer water with Briet's apparatus. Lastly, on account of the opacity of tin-foil to the rays of light, bottles are coated with it for the purpose of excluding light from vegetable substances which would be injured by its action.

Notwithstanding the knowledge of all these facts it might be said that the application of tin-foil for the preservation of substances liable to change is still rather limited and there seemed to be a prospect of its admitting of a more general use than has hitherto been made of it. At the same time there was an absence of any precise experiments for the purpose of determining in a scientific manner the degree of impenetrability of tin-foil. Having been engaged for some time in the investigation of this subject, I have obtained the following results:

For many years past I have observed that cacao butter, which readily becomes rancid even when kept in bottles into which it has been introduced in the melted state, if the bottles be opened from time to time, does not undergo the same change when molded in tablets and wrapped in tin-foil. This fact, which was confirmed by many observations, and could only be explained by assuming the impenetrability of tin-foil to atmospheric air, formed the starting-point for some experiments in the same direction, which proved satisfactory. Thus, a piece of well-burned quicklime, inclosed in a double wrapper of tin-foil, was exposed to the atmosphere of the laboratory by the side of another similar piece which was exposed without protection. While the latter became slacked, that which was protected by the tin-foil, and weighed 92·2 grams on the 1st of December, 1867, had only gained 3 decigrams in weight at the expiration of one month, and after being kept until the 25th of March, 1868, it had only increased 94 grams. It had thus gained only 1·8 grams in four months. On being then taken out of its metallic envelope much heat was developed from absorbtion of moisture, and it fell into powder.

Satisfied by this experiment of the efficacy of tin-foil for preserving bodies from the action of air and moisture, it seemed probable that substances the most susceptible of change might be kept in the same way. It was found that substances so deliquescent as chloride of calcium and liver of sulphur, and efflorescent salts such as carbonate and sulphate of soda, remained almost unchanged when wrapped in tin-foil, increasing or diminishing only to a few thousandths of their weight in several weeks.

Other experiments were made of a more precise charactert It is well known that fresh lemons become rapidly dried and ultimately hard when exposed to the air, and they also become parched and covered with mold. I had endeavored to prevent this drying and molding by placing the lemons in close vessels, in dry air, in sand, and also in bran, but none of these methods proved efficacious. Thus, for example, in twenty-one days the lemons lost on an average, 17·33 per cent of their weight in sand, and 17·13 per cent in bran. Experiments were made for the purpose of ascertaining the effect of enveloping the fruit in tin-foil, and also of coating it with a film of collodion. Some of the fruit prepared in each way, and some unprepared, was weighed, exposed to the air, and again weighed at intervals of a month. This method was applied to lemons and oranges, and the following results were obtained:

1. The unprepared fruit became rapidly dried. In two months the lemons had lost 42 per cent of their weight, while oranges, in the same time, had lost 26 per cent.

2. Collodion, when applied to the fruit alone, exerts but a feeble preservative influence in retarding spontaneous evaporation. In two months lemons coated with collodion had lost 29 per cent, and oranges 22·5 per cent.

3. Tin-foil almost entirely prevents the drying of the fruit. In two months, lemons had only lost 1·58 per cent, and in three months 3·16 per cent. In one case the loss was only 0·92 per cent during the longer period. Oranges lost about 5 per cent in two months. On the removal of the metallic envelope, the fruit was found to be as fresh and fragrant as when the experiments were commenced. These observations and experiments will tend to show the remarkable power of tin-foil in preserving substances inclosed in it from the influence of air and moisture derived from air, and may induce those who are interested in the subject to extend the application of this preservative means.—*E. Baudrimont, in the Jour. de Pharm. et de Chemie.*

VARNISHES FOR HARNESSES.—One-half pound india-rubber, one gallon of spirits of turpentine; dissolve by a little heat to make it into a jelly, then take equal quantities of hot linseed oil and above mixture, and incorporate them well on a slow fire.

ON THE EFFICIENCY OF FURNACES AND MECHANICAL FIRING.

BY C. F. DEACON, C. E., BRITISH ASSOCIATION, SECTION G.

Having for some time past given a large share of my attention to the subject of the efficiency of furnaces, I have to bring before you a few results of my experience in this most interesting and important inquiry.

Since the time in which Wye Williams lived and labored, Professor Tyndall and Dr. Frankland have shown that the energy of combustion is within wide limits independent of the density of the air, the natural inference *at first sight* being that in furnaces the temperature of the air does not affect the efficiency. One of Wye Williams' well-known experiments was to introduce a bent plate perforated with fifty-six half-inch holes into the center of a furnace where one or two bars had been removed for its reception. "Adequate mixture," says Mr. Williams, "was thus instantly obtained, as in the argand gas burner; the appearance, as viewed through the sight-holes at the end of the boiler, being even brilliant, and as if streams of flame instead of streams of air had issued from the numerous orifices. It is needless to add that nowhere could a cooling effect be produced, notwithstanding the great volume of air introduced."

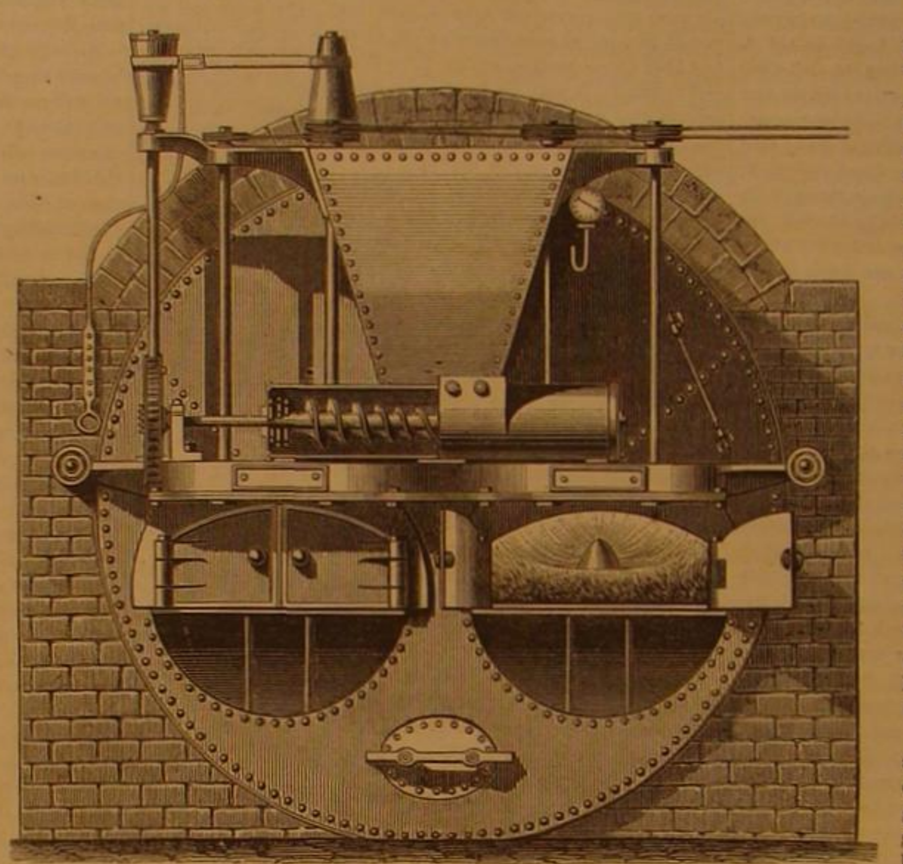
Now I cannot at present do more than state the simple fact that I have tried similar arrangements in many different instances and under several different conditions, and that I have rarely failed to produce a cooling effect. The arrangement by which the results have been arrived at may be thus described: A few of the ordinary fire bars are removed from the center of the flue. A pair of longitudinal bearers about six inches apart are then introduced, their upper surfaces being level with the common fire bars. On these bearers are placed small arched tranverse bars, each about one inch thick, in contact with one another. Semicircular holes are cast in the transverse surface of these bars, so that when placed together on the bearers they present the appearance of a tunnel about nine inches high pierced with numerous small holes, an arrangement not differing widely from that of Wye Williams, except that the tunnel, being of loose cast-iron pieces, is no more liable to deterioration by heat than common fire bars. If the mere fact of admitting air to the hydrocarbons at the moment of their generation, and in minutely divided lines, is sufficient to insure their combustion, surely nothing could do so more effectually than this arrangement. But the result.

A large quantity of fuel being placed upon the incandescent carbon in the furnace, we have, after the expiration of a few seconds, a splendid display of white flame, not entirely smokeless, but comparatively smokeless, unless the quantity of air admitted is very large; white flame and intense heat—evidence of the precipitation of the carbon particles and of their combustion after precipitation; smoke burning—not smoke prevention; greatly increased temperature of the furnace door, evidence of increased radiation of heat. But, as I said before, in almost all cases a loss of efficiency in the furnace—a reduction in the absolute temperature of the flame. Was Mr. Williams deceived by that radiant heat? I cannot avoid the conclusion that he was in some cases at least. But the furnaces adopted with economical results contained elements not yet described. The ash-pit was divided into three chambers by two vertical sheet-iron partitions, made fast to the longitudinal bearers in such a manner that all air entering it at the central chamber must pass through the arched bars, while that entering by the two side chambers reaches the fuel in the ordinary manner. Now, observe the difference: Here we have a long central fire chamber open to the air only at one end. The air before entering the fire chamber passes over the surface of highly-heated sheets of iron, traverses in turn the cross pieces of the little arched bars and the heated surface of the ribs. Even with this simple change the results are, I believe, in all cases, altered from failure to success. A heating effect has been obtained where a cooling effect only could be produced before.

To sum up my own observations on this subject, I find: (1) That the admission of cold air in quantities sufficient for the complete combustion of the gases in ordinary furnaces is attended with a loss of efficiency in all cases, even if that admission takes place in finely divided streams immediately over every portion of the fuel from which the gases are rising. Radiant heat, and consequent temperature of the furnace door, are enormously increased; smoke, however, is considerably reduced. (2) That by the comparatively slow motion of air over heated surface, sand its consequent rarefaction and increase of velocity when issuing from the orifices of the arched bars, a much more perfect chemical union is insured. The flame is not so luminous, but a higher rate of efficiency is obtained. Radiant heat is decreased, the furnace door is rendered less hot, and smoke is more perfectly prevented. The old Cornish system of dead-plate firing when conducted very carefully, and in such a manner that the incandescent fuel at the back of the furnace is never allowed to burn into holes, has, as we all know, certain advantages. But when the back of the furnace is left to itself, I believe it to be a most difficult matter to avoid the admission of cold air *en masse*, a condition which cannot but be attended with loss of efficiency; and in my attempts to discover the best method of mechanical firing, I could not find that those systems in which the coal had a progressive motion from the front to the back were free from these defects. Such methods appear to me to owe their advantages—for no doubt they have advantages—to other causes than that of the perfect combustion of the hydrocarbons; and is not the comparative freedom from smoke in this system of firing the result, in a great measure, of that union of carbon from the front with carbonic acid from the back, producing carbonic oxide, and inevitable loss of heat—the pernicious principle resorted to by a whole army of smoke-burning patentees? The apparatus which appears to me most correct in principle does not profess to compete with the more perfect mechanical stokers, inasmuch as the clinkers are removed by the firemen in the ordinary manner. In short, since my attention was drawn to the subject, I have come to the conclusion that the principle of what was probably the first attempt ever made in mechanical firing—I speak of Stanley's patent—is capable of the highest possible efficiency. Twenty years ago nearly every furnace in Lancashire was fed by the apparatus popularly known as the "hopper." In a box on the front of each furnace two fans revolved horizontally. Fuel was drawn from a hopper by rollers which crushed and let it fall on to the two fans, which in their turn propelled it into the furnace. It was possible to adjust the speed in such a manner that the fuel was spread uniformly over the whole surface of the bars. I would merely add that when the two-flued Lancashire boiler replaced the wagon and egg-ended boilers then in use, the hoppers were taken down, possibly in some places applied to the new flue boilers, found not to throw the fuel evenly over the bars, and discarded. In Leeds, however, they are still in use to a considerable extent, probably because some makers there took the trouble to adjust them to their altered circumstances. For a single two-flued boiler the hopper, as now in use at Leeds, requires about twenty toothed wheels, and at least two worms to drive the crushers and other portions; and notwithstanding the fact that the teeth of those wheels are constantly breaking, and that the whole apparatus trembles under the sudden check caused by a large lump of coal falling between the small crushing rollers, manufacturers who have tried it for so many years, give universal testimony as to its economy. I understand that one engineer in Leeds still makes a considerable number of them. This apparatus does not, of course, prevent smoke, but it distributes the smoke from a given quantity of fuel over a longer period than in hand-firing, and reduces its blackness in the same proportion.

Now, does it not appear that if we can retain the manner of throwing on the fuel, very considerably simplify the means, and use it in conjunction with the fire-bar arrangement already described, we shall have a very efficient furnace and a perfect preventer of smoke? The only drawing I can show you will sufficiently explain the nature of the new arrangement so applied to a two-flued boiler, at a period when the greater part of the improvements were effected. The twenty toothed wheels and two worms have been reduced to one worm and wheel; the two hoppers (one over each flue) to one hopper in the middle of the boiler face. The crushing rollers have been done away with altogether, and an arrangement substituted which crushes and meters the fuel as effectually but much less suddenly. Through the fuel in the middle of the hopper passes a cast-iron screw with a tapering helix of small diameter at the center, but increasing gradually up to the internal diameter of its containing-cylinder outside the hopper. The two halves of this screw are right and left handed, respectively. It has a slow revolving motion, and its action on the coal contained in the hopper is evidently of a nibbling kind, while it metes out to the fans of each flue the desired quantity of fuel. There are other details which have not been overlooked, such as the well-known heaping up of the coal on the dead plate, the cause of which has been entirely removed. And last, but not least, the whole machine is fixed to a frame made fast to the boiler, by three bolts through the shell, no holes whatever being cut in the boiler face. The fires made by this apparatus are perfectly level, and are absolutely free from even light smoke.

I hold in my hand a report prepared about four months ago, on the efficiency of the apparatus in question. It is founded on very carefully made evaporative experiments, the conclusion being that the feeder, when used for the first time in competition with the best hand-firing that could be obtained, gave an increased efficiency of 9·696 per cent over and above the efficiency already attained with the argand furnace alone. The cost of the combined apparatus is, of course, much lower than that of any of the more elaborate mechanical stokers—little more than one half—but I believe the efficiency is higher.



MODE OF FIRING FURNACES MECHANICALLY.

Balloons for War Purposes.

The experiments made at Woolwich by balloons inflated at the Royal Arsenal Gas Works have, on the authority of the London *Artizan*, shown that a hight of 100 fathoms, at a horizontal distance of 600 fathoms from an enemy, would enable the observers to secure a wide expanse of view. The balloons with which experiments were made at Woolwich were held by two new cords fastened to the net-work, and terminated at two different points on the ground, to give greater stability to the balloon, and to provide against one cord snapping, or being cut by the enemy's fire. By the new system of military telegraphy for field service, and by means of wagons at present being placed in store in the Royal Arsenal, lines of telegraph can be carried through the air from the earth several miles distant. The wire can be paid out as fast as the balloon travels, so that if a captive balloon should break away, communication could be kept up with it for six miles; or two or more balloons can be sent up, and kept in telegraphic communication with each other by means of similar lines, so that telegraphic operations can be made from the balloon to headquarters, and thence to the base of operations.

By means of these new military telegraphic appliances the most rapid intelligence, and consequent speedy word of command, can be given. In sieges, war balloons are useful in giving information of depots, points of attack, batteries, inner intrenchments, the explosion of magazines in marshes, to spy out ambuscades that may be in waiting, to rally columns, and to telegraph points of assembly on attack. The observing officers were enabled to survey an area of thirty square miles. It was found that by practice great skill can be attained in judging of distances, and the relative position of masses of troops; while more minute details could be subsequently obtained at leisure by field glasses as to the position of mountain gorges, passes, limits of woods, and the course of streams. The trials hitherto made have been chiefly carried on by professional aeronauts with hired balloons; and it is believed that the British Government have at the present time no war balloons in store.

The result of the observations of Captain Brackenbury and Captain Noble, sent out from Woolwich on behalf of the English Government to the respective seats of war, together with trials and other sources of information, will, it is believed, result in war balloons being manufactured in the Royal Arsenal, and that officers of royal engineers, from generals downwards, will be trained in their use.

Diet of Belgian Miners.

The miners of Belgium eat, according to a report recently published in that country, 2 lbs. of bread per day, about two oz. of butter, 1 oz. of coffee and chickory mixed, while for dinner they have in the evening a portion of vegetables mixed with potatoes, weighing at the most 1¼ lbs. They have meat on Sundays and festivals, but during the week they drink neither beer nor other fermented liquors. Coffee is their only beverage. Yet these workmen are hardy and healthy.

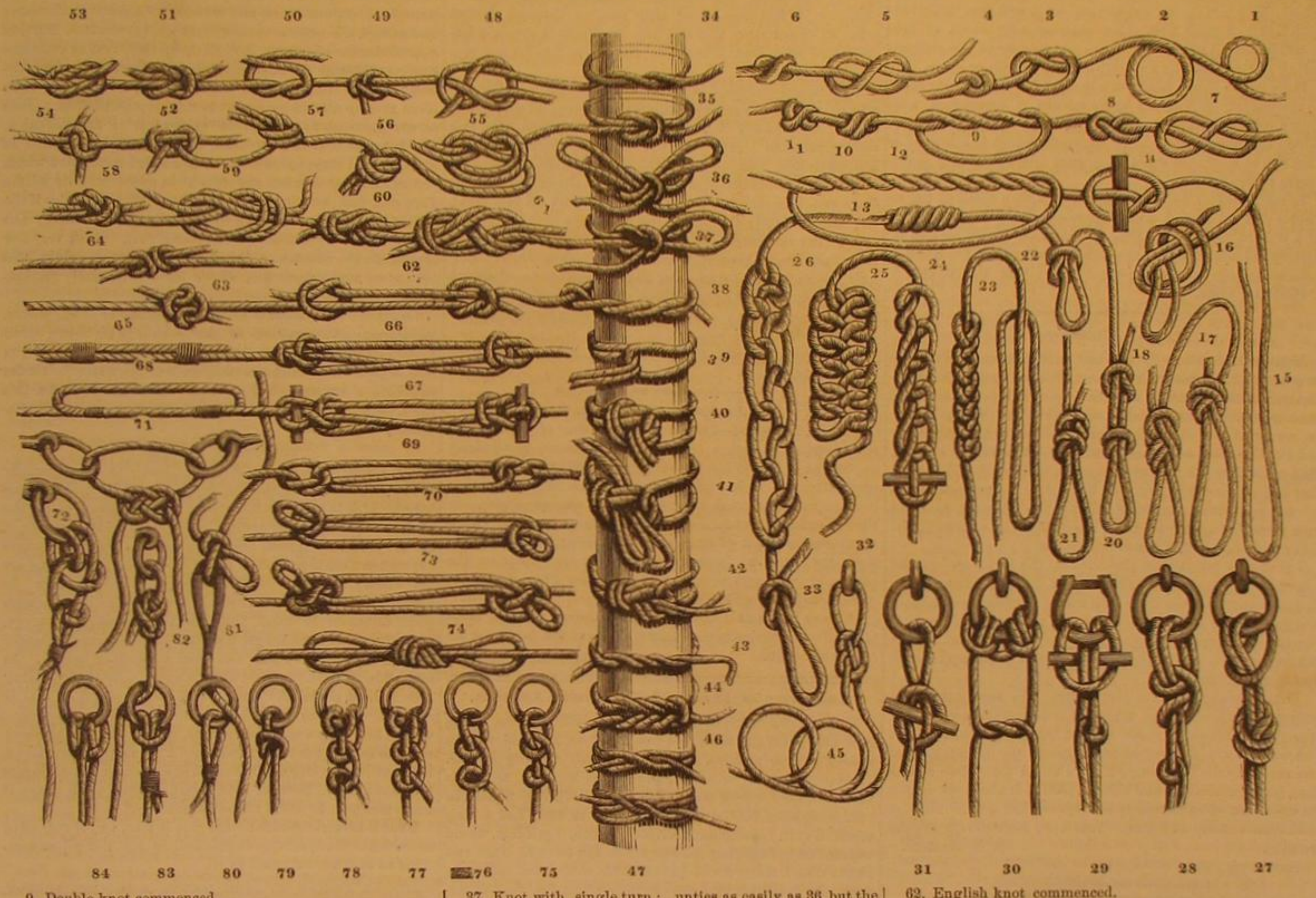
It is not the coffee which sustains them, for it constitutes but $\frac{1}{35}$ of the nutritious properties of their aliment, though M. de Gasparin, in a paper read some years ago before the French Academy of Sciences, attempted to prove, from certain tables, that the waste in liquid excretion is less when coffee is drunk than at other times. The miners' coffee is not like the French *cafe au lait*, for it has but one tenth part of milk in it; he drinks several pints in a day, and eats only bread and butter until the vegetable meal of the evening. The albuminous substance which enters into the rations of the Belgian miner is thus reduced from 23 grammes to 15 grammes of azote. Here is, therefore, proof that life and health can exist throughout a whole population with less nutritive substance than is generally considered necessary.

OZONE AND EXPLOSIVES.—M. Jouglet is said to have discovered that ozone has a tendency to decompose explosive compounds. Nitro-glycerin and chloride of nitrogen explode instantly when exposed to an atmosphere of ozone, while common powder changes so slowly that six weeks' exposure is necessary to its decomposition.

THE ART OF TYING KNOTS.

The knack of tying a good strong knot in heavy rope, or even in lighter cord, is so handy in many professions that we make no apology for devoting a large space to the subject. For illustrations of the explanations here given, see accompanying cut.

1 and 2 are simple loops, showing the elements of the simplest knot.
3. Simple knot commenced.
4. The same completed.
5. Flemish knot commenced.
6. The same completed.
7. Rope knot commenced.
8. Rope knot completed.



9. Double knot commenced.
10. The same completed.
11. Double knot, back view.
12. Six-fold knot commenced.
13. The same completed. This is closed or "nipped," drawing the two ends with equal force.
14. A "boat" knot, made with the aid of a stick. This is a good knot for handling weights which may want instant detachment. Lift the weight very slightly, push out the stick, and the knot is untied.
15. Simple hitch (or double) used in making loop holes.
16. Loop knot commenced.
17. Loop knot finished.
18. Flemish loop or "Dutch" double knot.
19. Running knot.
20. Running knot to hold; the end knot nearest the bend of the rope is the check knot.
21. Running knot "checked."
22. Double loop for twist knot.
23. The twist knot completed. It is made by taking a half turn on both the right hand and left hand cords and passing the end through the "bight" so made.
24. Chain knot, a series of loops. The end of the cord is fastened, a simple loop made and passed over the left hand, the right hand retaining hold of the free end. The left hand then seizes the cord above the right and draws a loop through the loop already formed, the left then finishes the knot by drawing it tight. This is repeated until you have all the knot wanted, when it is secured by passing the free end entirely through the last loop. This is a kind of knot much in vogue for the knotting of leather whip lashes, etc. It is very convenient.
25. Double chain.
26. Double chain secured and pulled out as when in use. Notice the mode in which the end is thrust through the last loop.
27. Lark's head; useful to sailors as a mooring knot.
28. The same, double looped.
29. The same on a ring of a boat. The advantage of instant release by the use of the stick has been noted in No. 14.
30. A treble lark's head. First tie a single lark's head, and then divide the two ends and use each singly as shown in the cut.
31. Simple boat knot with one turn.
32. Crossed running knot, strong and handy. Looks difficult, but by taking a cord about one eighth of an inch in diameter and tying the same two or three times with the picture you will find no difficulty in mastering it. It is a common knot in some parts of the country.
33. A knotted loop for end of rope. Use various, to prevent the end of the rope from slipping, etc. Very readily untied.
34. Simple (lashing) knot commenced.
35. The same finished. (See 51). In making 34 it is necessary to hold the simple knot, as shown in 33, by some pressure on the knot until it is ready to draw tight for the finish.
36. Is the same knot with two turns, sometimes called a rosette. This is very easily untied, as will be seen by tracing the loose ends back in the illustration.
37. Knot with single turn; unties as easily as 36, but the "strands," that is to say, all parts of the knot must be laid as in the true or reef knot (see 50 and 51) or a "granny" knot will be produced which will not hold. One who ties this knot well will be a master of this art.
38. Timber hitch or slip knot, with double hitch. The greater the strain the tighter this knot will hold. It looks as if it might give way, but it will not.
39. Running knot with two ends.
40. The same with check knot, which cannot be opened except with a marlin spike.
41. Running knot with two ends, with a check knot (to the running loops) which can be untied by drawing both ends of the cord.
42. Running knot with two ends, fixed by a double Flemish. When an object is to be encircled by this knot, pass the end on which the check knot is to be through the cords before they are drawn tight. This requires a deal of practice.
43. Ordinary twist knot.
44. Double
45. Form of loop for builder's knot.
46. Builder's knot finished, used by workmen in securing building materials.
47. Double builder's knot.
48. Weaver's knot. On the small scale, lay the ends of the two cords to be united between the thumb and first finger of the left hand, the right hand end undermost; pass the right hand cord back over the thumb to form a loop, and bring it back under the thumb and hold it fast. Now put the end of the upper or left hand cord over the right hand cord and through the loop. Catch it with thumb and finger of the left hand and tighten by drawing the right hand.
49. Weaver's knot completed.
50. True or reef knot commenced.
51. The same completed. Useful for small ropes, but if ropes are unequal in size it is apt to draw out into the shape shown by 52. To obviate this the two ends issuing from each side of the knot are whipped or lashed together.
53. A "granny" knot, the ends not lying alongside of each other.
54. Granny knot with a strain in it, showing its uselessness.
55, 56, 57. Commencement, finished front view, and finished back view. This is a common knot. The two ends to be united are seized together and tied in a common simple knot This will not untie or slip, but if the strain is great the rope is apt to part at one side of the knot. It is a rough and awkward knot but useful on account of the quickness with which it can be tied.
58. And the ordinary knot, the ends used separately.
59. The same knot open. This knot is made by making No. 3 on one rope, holding it open so that we can pass the end of the other cord through the first loop of the last, making it with a second loop. Then draw it tight. It is a strong, ship-shape knot, and can be further strengthened by lashing the two ends together.
60 and 61. Knot used for the same purpose as the simple Flemish. 60 is the tightened or finished knot.
62. English knot commenced.
63. English knot tightened (front view).
64. English knot tightened (back view).
65. Spice, with two ties.
66. Shortening by loops and turns where the end of the rope is free.
67. Shortening knot, can be used when either end is free.
68. The same, with double bend and ties.
69. The same, passing through the knots.
70. Another method of shortening, called making a "sheep shank" or dog shank. Unsafe unless the shank (the loose loop) is attached to the contiguous rope by a stout "seizing," that is a cord tied around it.
71. Shows a dog shank that will hold without seizing.

From 73 to 84 explain themselves without especial allusion to them. It is only necessary to remark in conclusion what is true of knots, if not of men, that the best looking ones are the best; not only "handsome is that handsome does," but "handsome does that handsome is." The neatest knot, in short, is almost without exception the most serviceable, most quickly tied, and most quickly untied.

The Skin Permeable to Liquids.

De Bloch describes in the *Moniteur Scientific* a series of experiments made with different kinds of liquids, none of which could exert any chemical or physical action on the skin. Bordeaux wine, having been experimented with, was found to have penetrated the skin of the arm, washed and wiped dry, after it had been immersed for one hour in the wine, since, on washing the arm with a weak solution of perchloride of iron, the skin was black colored, owing to the formation of a tannate. The author, says Mr. Crookes, seems to have forgotten that the permeability of the skin for liquids is employed in medicine as a therapeutic agent. We, he continues, recollect the case of a lady who bathed in chicken broth, twice daily, for therapeutic purposes; and milk, also is in this way introduced into, and absorbed by, the system.

NATURE is the only workman to whom no material is worthless, the only chemist in whose laboratory there are no waste products, and the only artist whose compositions are infinitely varied, and whose fertility of invention is inexhaustible.

Correspondence.

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

Balancing Saw-mill Shafts.

MESSRS. EDITORS :—In answer to A. McG., of Vt., I think the counter balance is the trouble with his mill. Such mills are numerous in this State. I have had many years experience in using and repairing them, and have always found a counter balance, beyond enough to equal the crank pin, an injury. In my practice I have removed several, with good results. If his mill is driven with any kind of water wheel on the crank shaft it needs neither counter balance nor fly wheel. The less the weight the lighter it will run. If driven with a belt or gears from other shafting, a fly wheel of 500 to 800 pounds is needed to receive the shocks of the reciprocating motion, thereby keeping it from the belt or gears.

Some argue that a heavy saw sash or frame gives strength to the cutting of the saw by its weight in descending, and that a counter balance helps to raise the saw frame. Both of which theories I believe to be incorrect, except in a few mills that run so slow that when they once get down they never ought to rise again.

In many mills I find the saw travels with a speed of ten to twelve feet per second, which approaches so near the velocity of a weight falling the first two feet as in my opinion to destroy its power to help the saw to go down or the counter balance to help to raise the saw. WM. O. GLOVER.

Danbury, Conn.

Smoky Chimneys.

MESSRS. EDITORS :—Having had an offer from my employer to move into a house built expressly for me, and built under my supervision, I had an open fire-place built in the kitchen, with good fire doors attached, and when my family moved in, we found that the chimney had no draft, so I tried having it built three feet higher ; but this did not make any change. So I got a tinsmith to put a pipe on, making it about nine feet higher than it at first was, but all to no purpose. One of my neighbors suggested closing the chimney up tight just above the arch, so I had a board fitted in, and we found quite a change, but it was still defective.

I then took mortar and plastered all the joints around the edges of the board. I then had one of the best chimneys in town. My wife could bake once more—something she could not do since we moved into the house, not being able to heat the stove sufficiently for that purpose. I then took off the six feet of sheet iron pipe to see if it would make any change, but it made none.

Things went well for a few weeks. We were once more eating home-made bread, when all at once things changed ; the oven of the stove would not get hot enough to bake, and we would have a tremendous smoke in the morning when we made the fire. On examining, I found that some sparks had got on the board, and burnt a hole in it about six inches in diameter. I immediately set to work and put in another and lined the top with zinc. This made the chimney as good as ever. D. R. MILLER.

Harrisburg, Pa.

Grand Auroral Displays.

MESSRS. EDITORS :—The year 1870 will long be remembered by the inhabitants of the United States, for the great number of brilliant auroral displays ; and while we could hardly conceive of anything that would equal those of the past September, last evening's exhibition will far excel any of its predecessors. The day had been cool, with frequent showers, but towards evening had almost entirely cleared away. At 6·30 a heavy wind commenced blowing from the W. S. W., carrying before it vast quantities of thick black clouds, that drifted in an E. and E. S. E. direction, entirely covering the northern heavens, and at intervals breaking forth in flashes of the most vivid lightning. The heavens from the zenith to the northern horizon, were tinged with a bright green shade, alternating with that of a beautiful rose color, through which the stars twinkled with a pale yellow luster. The N. W. and N. E. points of the horizon had the most decided tinge of red ; while the direct N. that of the green. The rays at times extended to the Dolphin. The intensity of the display was lessened by the brilliancy of the moon, which was just rising, and had it not been for this, the sight would have been magnificent. The display must have been visible over the greater part of the Northern States, and at an hour when every one could witness it.

Chicago, Ill., Oct. 15th. H. H. BADGE.

To Kindle a Quick Fire.

MESSRS. EDITORS :—As the winter is now near at hand, and as it surely will be a benefit to your hard-working and early-rising readers to know how to "hurry up" a cup of coffee in the cold mornings, I send you the following extract from a book of odds and ends, thinking you will consider it "the right thing at the right time." I must premise that I have not yet tried it myself.

"To make fire kindlers : Melt together a quart of tar and three pounds of resin, and when they are partly cooled, knead into them as much sawdust, with a little charcoal added, as possible ; then, while the mixture is still pretty hot, spread it out on a board, and cut it into lumps about as large as hen's eggs. Leave these lumps to cool fully, and use one of them to light the fire, which it will do well, being easily ignited by a match, and burning strongly long enough to start any wood fit to burn. The above-given quantity of materials will make enough kindlers to last a year."

I should say there would be no risk of spontaneous combustion being generated in these lighters or kindlers, and that they would certainly be much less offensive in smell, when burning, than are newspapers, straw, and other things used as aids to the making of fires, besides being a great saving in time and trouble. G. O'N.

New York city.

Tin-Lined Pipe Versus Lead Pipe.

MESSRS. EDITORS :—I read with much interest the article in your last number on the purity of the Croton water at its fountain head ; that it is not polluted by factories or sewerages, but reaches our city uncontaminated with any unhealthy substance. But from the examination made by Prof. Chandler, I find this water after passing through leaden pipes for distribution through our dwellings is strongly impregnated with lead poison, the same result following several experiments.

The learned professor says the results should lead the citizens of our city to use precautionary measures for protection, and he recommends the use of tin-lined lead pipe. On this recommendation I called on the Colwells, Shaw & Willard Manufacturing Company, No. 213 Center street, to make an inspection of their tin-lined pipe and learn the price. I found there two immense hydraulic presses at work on this pipe ; for, having lately increased the thickness and weight to that of the ordinary lead pipe, they have rapidly enlarged their business. This visit induced me to follow Prof. Chandler's advice by giving an order to my architect to substitute tin-lined pipe for lead pipe, which we called for in the specification. AN OLD SUBSCRIBER.

New York city.

[We think you did a sensible thing in changing your order.—EDS.

Asphalte Pavement.

MESSRS. EDITORS :—I notice in a late issue of your admirable journal an article on asphalte pavement, particularly on that of Paris. When in that city in 1866 and 1867, I paid much attention to that subject, so as to form the opinion that it is the best pavement of any kind in use anywhere. In Place Vendome, I once saw a team of many horses drawing an enormous block of stone on four wheels ; I waited to observe the effect ; no impression whatever was made on the pavement the result was the same as if the Place had been covered with one solid sheet of granite. NEAL DOW.

[We can indorse all that our correspondent says in favor of the French asphalte pavements, they are the best that we have seen.—EDS.

Longevity in Man and the Lower Animals.

The duration of life of larva in closely allied forms, varies from four years and more to a week. Fleas are said to live as long as nine months. Fish have great tenacity of life. The carp is stated to have reached one hundred and fifty years. A pike which was taken at Halibrun in Suabia, in 1497, weighing 350lbs, and measuring 19 feet, had a ring attached to it, bearing an inscription which, if genuine, would warrant us in believing the age of the fish to be at least two hundred and sixty seven years. The toad lives thirty-six years, the frog from twelve to sixteen years, and various tortoises must have seen many years if we may judge from the size to which they attain. Parrots and geese reach an age between one hundred and one hundred and twenty years, and falcons and ravens outlive one hundred and fifty years, but the little wrens live only two or three years. Of mammals, the whale and the elephant have the longest term of existence, living as they do over one hundred, perhaps to two hundred years. The horse lives twenty-five, but sometimes reaches forty years ; the sheep and the goat twelve years ; the lion from twenty to fifty years. Man, there is no reason to doubt, has lived long past the Psalmist's limit of threescore and ten, there being well-authenticated instances of his living over one hundred years ; but it is only among highly civilized nations that satisfactory data can be obtained regarding his longevity. A minute investigation of the conditions that conduce to length of life, goes to support the theory that the longevity of animals is influenced by their amount of procreative power, and their ability to sustain wear and tear.

Distillation Temperature of the Oily Products of Coal.

The attention of our readers has been frequently directed to some one or another of the oily products of coal distillation.

The following table from Tissandier, giving the temperature in degrees Fah. at which the chief light and heavy oils distill will be useful for reference :

LIGHT OILS	Amylène distills at	102°
	Benzine	187°
	Toluène	226°
	Xylène	271°
	Pyridine	302°
HEAVY OILS	Cumène	304°
	Lutidine	311°
	Eupione	338°
	Cymène	347°
	Aniline	359°
	Carbolic acid	370°
	Naphthaline	422°
	Quilonèine	462°
	Anthracene	500°
	Chrysène	572°
	Pyrène	572°

CARPENTERS' MEASUREMENT OF THE TUNNAGE OF A SINGLE-DECKED VESSEL.—Multiply the length of the keel, the breadth of beam, and the depth of hold together, and divide the product by 95.

THE MECHANICS' FAIR AT CINCINNATI, OHIO.

[Reported for the Scientific American.]

The Mechanics' Fair at Cincinnati, Ohio, which is just closing, is certainly as surprising and gratifying to Eastern as to Western eyes. Accustomed, as we are, to visit and record these things where time and geographical position have given great advantages, it is a matter for wonder that a comparatively new country should not only give evidence of capacity for production, but actually take the lead in many matters that we have fancied ourselves eminent in, and this not only in the handicrafts but in objects of art and in appeals to the more cultivated senses. Exquisitely elaborated rosewood furniture, cut glass, and silver abound ; and in textile fabrics, household conveniences, and articles of a general character and utility, the most advanced ideas are represented. Eastern manufacturers who have looked upon the West as comparatively indifferent to anything but what is rude and serviceable, without regard to its artistic merit, would have their ideas greatly altered by a visit to this representation. It is no exaggeration to say that in general it is fully equal to any fair ever held in New York, with the single exception of the Crystal Palace exhibition. The ancient institution which has so long represented the inventors and exhibitors of the East will find very strong rivals in the Western cities if the exhibitions are characterized by the same spirit of energy and enterprise manifested in the Cincinnati Fair. With very few exceptions the articles exhibited are of Western origin, and the extent and variety are, as we have said, really remarkable.

This is no little display of a few mounds of soap, stoves, and quack medicines, such as can be seen in an hour's stroll along any city street, but a great mechanical uprising, if you will, where every one has contributed of his wares to render the Fair a success. Not to dilate unnecessarily upon this topic, we proceed to notice the most salient points in the machinery department.

THE STEAM ENGINES.

The staple trade of the Western country in this specialty is the portable engine, and the number annually made exceeds belief. If it is a matter for wonder what becomes of all the pins, it is perfectly astounding to consider what becomes of all the portable engines. Some six or eight different makers are represented here, and in many cases their productions are not merely "cast in the foundery and hove together" in technical phrase, but are thoroughly and honestly made with great attention to detail, first-class workmanship, economy, and power. It is no longer a matter of indifference whether a portable engine burns one cord of wood or twenty. As much fidelity to the interest of purchasers is shown by leading makers here, as in the East, where every pound of coal is counted. Said one manufacturer to us, "Many years ago, when I first began to make engines, it took two men to wheel wood to supply the boiler, and when I began to reduce this a little, and made engines to run on the sawdust alone, buyers laughed at me. Now, we have reached that pitch where it takes two men to wheel the sawdust away."

That this is not generally the case is true, and is only cited as evidence that portable engine boilers are not all so voracious as they are supposed to be.

PORTABLE ENGINE, BY JOHN COOPER & CO., MT. VERNON, OHIO.

This firm exhibit a portable engine unusually complete in its appointments, and fitted up as to the working parts with what we think needless nicety and detail. The best stationary engine practice is followed in proportion and design, and the object to furnish a strong machine that will not be easily deranged is happily attained. The mechanical reader will substantially understand the appearance of it when we say that the frame, guides, cylinder head, and main bearing are cast in one piece, so that it is absolutely impossible for them to get out of line ; the cylinder, of course, being bolted directly to the head in the usual way. The bed-plate combines great stiffness with lightness, and the proportions of the valve and steam ports are designed in accordance with the best modern practice. The engine is supported on the boiler by two brackets at the side ; the end which carries the main shaft bearing being keyed and bolted between two lugs, while the after or cylinder end is merely bolted, with slightly elongated holes to allow for expansion. In the boiler the tubes, and the water spaces between them, are both ample in dimensions, while the fire-boxes are unusually large in grate surface. They have also applied to the boiler an apparatus for purifying the water, which in the West is very injurious by reason of various mineral substances held in solution. The value of this attachment will be better understood when we say that in some localities, without it, boilers will not last two years. The exhaust nozzle is also much larger than is customary, so that the back pressure is reduced, and danger from fire by discharging sparks is lessened. A wire cloth bonnet is also applied to the smoke stack, though in some cases or positions, where it is not absolutely needed, we should regard this as a detriment, as it is well known that air alone, to say nothing of smoke, experiences great resistance in passing through interstics or meshes, consequently the tendency would be to reduce the draft. The valves are set to cut off at two thirds by lap.

An independent steam pump is applied to these engines, in most cases, which allows the engineer to supply the boiler without running the machinery.

Taken as a whole, this engine represents the efforts Western engineers are making to supply first-class work of good design and economical performance, and is a very great step in advance over the rude attempts of earlier years.

The many professional friends of Mr. Isaac V. Holmes, formerly constructing and superintending engineer of the now defunct Novelty Works, New York, will perhaps be glad to know that he is devoting his energy and experience to this line of business with John Cooper & Co.

PORTABLE ENGINE OF GRIFFITHS & WEDGE, ZANESVILLE, OHIO.

In this machine, which is in the same class, we have a totally different type from the ordinary one. Mr. Wedge, who is an engineer of long experience and excellent mechanical ideas, has departed from the established routine sedulously followed, and designed an engine which has noticeably valuable features. No bed-plate surmounts the boiler, but at the smoke stack end the cylinder is placed vertically; the shaft bearings being carried in blocks on the shell of the boiler as usual, not, however, on the steam shell, but at the smoke-box end, so that no illegitimate strain is imparted. The cylinder end of the shaft has collars as usual, large and ample, while the outboard end is merely a common straight surface, so that it is at once apparent that the expansion to be accounted for takes place across the diameter of the boiler, and gives no anxiety.

The greatest departure, however, is noticed in the selection of the material for these engines. The cross-head, piston, piston-rod, and crank-pin, are made of steel. This insures not merely strength and lightness, but far sounder surfaces and greater uniformity in the wear than can be attained by any other metal. This involves greater cost in the construction, of course—the steel castings being worth alone twenty-five cents a pound against iron at five cents—but Mr. Wedge has not taken this step unadvisedly, and points to upwards of one hundred engines built recently, not one of which has broken down or given out from undue causes. The valves have peculiar features about them; the surfaces being cut away like a gridiron so as to reduce the wear on the faces and the power required to drive them; they are set to cut off at about five eighths of the stroke, and are claimed to be, not unjustly we think, practically indestructible, where decent care is taken.

A point of great value Mr. Wedge claims is made by inserting fusible plugs in the crown of the fire-box; he instances one case where a party had bad water, and, being deceived by the appearances in his tank, actually burned or melted out a plug every day for nearly a year! And it is claimed that with such a plug the boiler cannot be burst. The great object of these engineers has been to produce an engine that cannot be broken unless a man takes a sledge-hammer to it. Knowing full well the class of men who are of necessity called upon to run portables they have the parts as few and as strong as possible, and made of first-class materials, and as good workmanship as can be procured for money; further than this, by long experience they claim to have introduced an engine that will give better results than the average, and cite several cases where they materially reduced the quantity of coal burned.

We think their claims well put forth in this respect, and it is some promise for the future that we shall not always have the portable engines of the past. Too many makers suppose, and proceed upon the ground, that portable engines can be made by the lot and sold indiscriminately to all comers for whatever purpose, but that day has gone by, and competition has become so active that buyers will no longer be satisfied with hap-hazard work, valves with all kinds, or no lead at all, boilers that are simply big with no other value, or defects in construction hidden under all the colors of the rainbow.

We have purposely selected these two machines as most noticeable for the absence of the above features, and it is no more than justice that they should be made known.

SHARP, DAVIS & BONSALL, OF SALEM, OHIO—PORTABLE ENGINE.

This firm exhibit a neat and compact little engine, of vertical design, that is very symmetrical and well proportioned; the valve is driven by a return crank, which is slotted on the end so as to permit the motion to be changed to either forward or back, by simply shifting the stud to one side or the other.

THE STEAM PLOW.

Messrs. Standish & Coffin exhibit a steam plow which is, in principle, a traction engine carrying a series of rotating forks at the rear that cut up the soil in a most terrific manner. All the various requirements of a machine of this class appear to be provided for, and if a portion of the great weight could be reduced—it weighs nearly nine tuns—it would be still more useful. This is only the second machine of its kind however, and there is room for improvement.

Messrs. J. & E. Greenwald, of Cincinnati, exhibit a highly polished steam engine driving the machinery.

Messrs. Cope & Co. exhibit a compact and powerful little steam boiler-feeder, which is automatic in action, under perfect control, and possesses all the qualities needed in such an instrument.

LIME CATCHER.

Messrs. Stillwell, Bierce & Co., of Dayton, Ohio, exhibit a lime catcher, or purifier, which attains the end desired by passing the feed water in thin streams over highly-heated metallic surfaces, and subsequently filtering it at the bottom to remove mud, etc. It is claimed to perform its object in a satisfactory manner.

DRAWINGS.

Mr. F. Millward, mechanical engineer, exhibits some most excellent specimens of artistic drawing. There are not merely tinted or colored pictures, but are executed with the elaboration of a line engraving, and show great familiarity with the means by which the best effects are brought out.

BRASS WORK—SKILLFUL MOLDING.

F. Lunkenheimer, Cincinnati Brass Works, exhibits very fine specimens of his wares in check, globe, steam, and water valves generally. As an evidence of the skill of some person in his employ, there is shown a cup on the saucer with a spoon in the cup, all cast in one piece and at one time, showing no "fins" or marks where the flask joined, or the pattern parted; also a plate, knife, and fork cast in the same way, and a little cream pitcher, with a big belly, all cast in one piece, without core, yet exactly like the original crockery from which it was made. We were given to understand that this ingenious piece of handiwork is produced by baking the sand mold and afterwards carefully cutting it away and replacing it again similar to statuary work.

MACHINE TOOLS.

The Niles Tool Works exhibit a fine column drill, capable of many variations in direction, and very substantial in build; also a large horizontal lathe and boring mill of similar excellence.

Messrs. Pratt & Whitney, of Hartford, Conn., exhibit their famous tools, lathes, planers, shapers, etc., which were universally approved. Many Western builders examined them, and one was honest and candid enough to say that he had made and handled a good deal of machinery, but had never seen any but these that hadn't some bad work somewhere, but here he could not find any. *Verbum sap*—

Messrs. Lane & Bodley, of Cincinnati, exhibit a great variety of wood-working machinery of great utility.

REAPERS AND MOWERS.

The two specimens of mechanical skill on exhibition are truly remarkable. One of them is the World Reaper of E. Bell & Co., Canton, Ohio; the other, the Champion Mower of Whitely, Fassler & Kelly, Springfield, Ohio.

Some two years ago you animadverted pretty strongly upon the poverty of the workmanship in mowing machines, and said in general terms that they were a disgrace among machinery. So they were; but that day has disappeared, pretty much, and houses of any standing in the trade do honest work. But what do your readers say to a mowing and reaping machine constructed like a sewing machine? Most of them reply, "That is impossible." No; it is not impossible. The World Reaper is constructed upon literally the same plan as the best gun and sewing machine work. The gears are all cut—every gear, and the whole is contained in a cast iron bed hung between the wheels; the shoulders, bearings, bosses, and holes being drilled through "jigs," and all things generally so lovely in mechanical accuracy and eternal fitness as to challenge admiration. Remember this is not a sample made for the fair, but, except the superior ornamentation, all are made exactly similar.

The Champion Mower is made in the same way, except the cut gearing, and the splendors of burnished brass and steel work, to say nothing of landscapes by Teniers on the wood-work, fairly make a man wink. No less a steed than Pegasus should be yoked to this chariot, nor a meaner Jehu than Apollo, and both of them might be proud to sit on or drag it, though, to follow out the line, what these two would find to reap in their fiery course, except the whirlwind, it would be hard to say.

Great outlays for machinery and special tools have, of course, to be made, but the makers look for their appreciation in the far greater durability of such machinery over the loose and slovenly course usually pursued.

Finally and fairly we must give the Cincinnati Board of Trade, Chamber of Commerce, and Ohio Mechanical Institute the credit of having the champion fair of the country this year. By the side of that other in New York it shines like the deeds of the just; and so soon as another can be organized for another season let it be. Experience teaches some features can be improved upon, but we are very sure that the general verdict will be that all have been earnest and energetic in trying to make a creditable show of the manufactures of the West.

The Loss of the Captain.

Mr. Henry Bessemer has written a letter to the *London Times*, *apropos* of the loss of the Captain, proposing that turret ships with low freeboard should be fitted with an arrangement by which a heavy counter-weight could, when necessary, be lowered below the keel line, so as to give increased stability. Mr. Bessemer describes his plan as follows: "To effect this object, I propose to form a hollow channel or cavity, say of 50 ft. in length, by 3 ft. square, along the line of the keel, and into this cavity I would fit a mass of iron, its ends sharpened off so as to present fine lines to the water. This mass, when occupying the cavity, would fill it entirely, and the underside of the vessel would in consequence present precisely the ordinary appearance and contour of other vessels; this mass of iron would at all times act effectually as ballast, being in the most favorable position—viz., at a greater distance from the meta-center than any ballast inside the vessel could possibly be placed. This would be the ordinary condition of the vessel when steaming or under sail in moderate weather; the counterweight thus lying snugly in its recess is, however, capable of being at any moment lowered down some 10 ft. or 12 ft. For this purpose massive wrought-iron rams are attached to it at a point near to each end, and are capable of moving vertically in stout wrought-iron cylinders, extending from the keel upward to the lower deck, and there steadied by the floor beams, so that by means of a small hydraulic pump and valve in connection with these rams, the engineer could let down the weight, or reef it again snugly into its recess in one or two minutes with perfect ease, by the mere movement of the valve handle. A weight of 100 tuns or more, acting at a distance of some 10 ft. or 12 ft. below the keel, would more than restore the equilibrium which the inclined position of the vessel and the force of the wind would tend to destroy, and thus enable the vessel to ride out a gale with perfect safety. During the time that the ballast is unreefed it will add some 10 ft. or 12 ft. to the area of the midship section of the vessel, and so far will be a disadvantage in point of speed; but this would be of but little importance, as it would only be required on special occasions, and when steaming be always closely reefed up."

ENLARGING PHOTOGRAPHS.

Prof. Fowler, in the *Philadelphia Photographer* describes a process for producing enlarged photographs, without solar printing, which he thinks will be found good and useful. The small negative is made in the usual manner. He advises that the picture be taken with a long-focused lens at a long distance, only one principal object to be included in the view. From the negative print a transparency or positive upon glass. From this transparency make an enlarged negative in the usual manner, of any size desired. With the enlarged negatives print enlarged positives. The glass on which these positives are printed is to be rubbed over with white wax dissolved in ether, and polished with clean silk cloth.

A colorless collodion, made with ammonio-cadmium, is used. After the picture is fixed, while yet wet, it is toned for a moment with a dilute solution of chloride of gold, afterwards with bichloride of mercury. Wash the picture and let it dry.

The paper to receive the picture is prepared by floating on a solution of gelatin, ten grains to the ounce, and dried.

For use, float the paper on clean water, until it lies quite flat. Then draw it once through the water and drain. Now place it upon the collodion film of the picture, cover with blotting paper, place flat weights thereon, and let stand until dry. Then, by means of a knife, cut the edges of the collodion, and the picture may be raised from the glass, mounted on the paper.

THE question of cremation, or burning dead bodies instead of burying them, for a long time discussed, has again been mooted in respect to the victims of the war. A medical commission has been named in France to examine the subject. In ordinary graves, the natural decomposition of bodies produces deleterious gases, the injurious action of which is now admitted by all hygienists. The quicklime added in the large common trenches to hasten the destruction of bodies does not prevent the disengagement of infectious emanations from all these putrid corpses, and penetrating through the layer of earth which covers them. The business in hand is not to substitute in ordinary cases the funeral pile for interment, but to ascertain the amount of danger caused after a great battle to survivors by the inhumation of a great number of corpses within a narrow space, and to inquire whether their combustion would not have great advantages.

DEATH OF PROFESSOR MILLER.—Our latest exchanges bring us news of the death of William Allen Miller, M.D., F.R.S., professor of chemistry in King's College, London, an accomplished scientist, author, investigator, and effective teacher. Dr. Miller died of apoplexy on the 30th ult., at Liverpool, whither he had gone to take part in the proceedings of the British Association. Born at Ipswich, on the 17th December, 1817, in his twenty-fourth year he became assistant to the late Mr. Daniell, professor of chemistry in King's College, London. He was the author of a celebrated and highly esteemed treatise on chemistry, and has contributed in various ways to the progress of science.

AMONG the most hopeful signs of Southern regeneration are the manufactories that have of late been springing up in nearly all the States. Among others, a large cottonmill is now being erected at Canton, Miss., and an extensive agricultural implement factory has been in active operation at Humboldt, Tenn., for some time past.

QUICK WORK.—At the new elevator of J. and E. Buckingham, Chicago, a few days ago, a vessel of 800 tuns burden was fully loaded with grain, 31,000 bushels, in sixty-five minutes. The machinery employed at this elevator is very perfect. Corliss engines are used. The main driving belt, of six-ply rubber is four feet wide, and cost over $3,000. The improvements in grain elevating machinery made within the past few years have greatly facilitated the handling of the grain crops.

The *Journal of Chemistry* says the name of the inventor of lucifer matches has been sought in vain. The man who first made "lucifer matches" in this country was the late Thomas Sanford, of Woodbridge, Conn., who might have been a millionaire, had he joined in an application for a patent, as solicited by other parties, which would have given them a monopoly of the manufacture.

TEST OF IRON AND STEEL BY THE MICROSCOPE.—Dr. Schott has subjected a large number of samples of iron and steel to microscopical examination, and gives as the result of his observations, that on the regularity and the smallness of the crystals of any specimen, depended the good properties of the metal. In the good qualities also the crystals were found placed very regularly near each other.

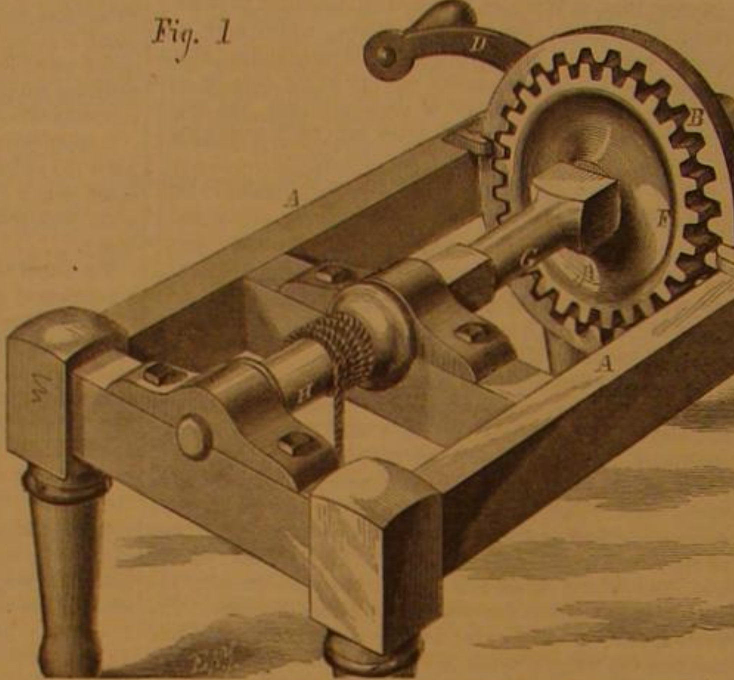
JOSEPH A. SABBATON, the eminent Gas Engineer of the Manhattan Gas Light Company, of New York city, died on the 13th inst., aged 45 years.

New Mechanical Movement.

Our readers who have given attention to the mechanical problems recently published and solved in this journal, will be interested in the stu ly of a new movement patented by Daniel Zeigler, of Lewiston, Pa.

Fig. 1 is a perspective view of this device, and Fig. 2 is a vertical section.

Fig. 1



ZEIGLER'S MECHANICAL MOVEMENT.

A represents the frame within which is placed a fixed vertical wheel, B, provided with teeth around its entire inside circumference.

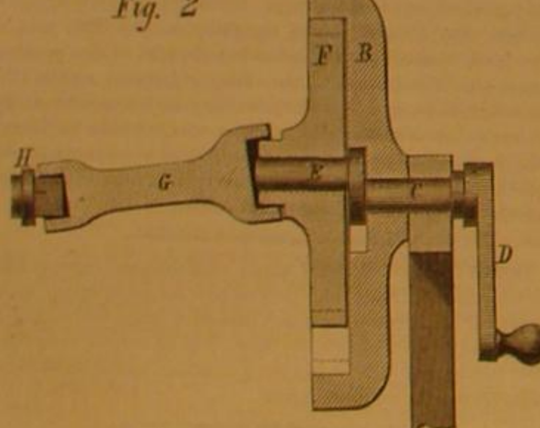
In suitable journal boxes on the frame is placed a shaft, C, provided with a crank, D, on its outer end, and having on its inner end a crank, the wrist, E, of which forms a journal for the spur wheel, F, the teeth of which are less in number than those on the fixed wheel, B.

It is now obvious that if the crank, D (for which, when desired, a pulley or spur gear may be substituted), is turned, the spur wheel, F, will revolve on the crank wrist, E. If the wheel, F, has one less cog than the fixed wheel, B, then F will be revolved a distance of one cog for every revolution of the crank, D; if F has two cogs less than B, then it will revolve a distance represented by two cogs, and so on. Applying the principle of virtual velocities to this movement it will be seen that the less difference there is in the number of teeth in the wheels, B and F, the more power there is gained.

The hub of the wheel, F, is made square and fits loosely in a square socket formed in the end of the connecting shaft, G, a similar joint connects the connecting shaft, G, with a shaft or windlass, H, which shaft may be made to propel another system of gearing similar to B and F. The number of series of such gearing, which can thus be connected, being practically unlimited, the power of the device may be multiplied to any extent consistent with strength of materials. By means of a proper connection, the shaft, H, could be made to turn a screw with almost irresistible force, and ways and means will suggest themselves to every mechanic, whereby the movement may be applied to presses, shears, punches, raising of buildings, pulling stumps, a substitute for the gearing on ordinary derricks and cranes for use on docks, and in building, etc. One great advantage of the device is, that the wheel, B, being fixed, the device cannot run back except by revolving the crank, D; thus holding a weight at any point of its ascent, and obviating the necessity of pawls or brakes for this purpose.

There being always a number of teeth in the wheel, F, meshed in the teeth of the wheel, B, it is not necessary to make these wheels of very great weight in order to get the requisite strength. The inventor states that with a crank

Fig. 2



provided with this movement, in which the wheel, B, is only nine inches in diameter, he is able to raise three tuns with ease.

Some considerable effort has been made to solve the problem how to make one wheel revolve around a fixed wheel, and make but one revolution in so doing. This movement solves the problem when the wheel, F, has only half the number of teeth in the wheel, B.

Patented, Sept. 13, 1870, by Daniel Zeigle., of Lewiston, Pa. Address as above for further information.

The Future of Telegraphy.

The rapid progress of the telegraph during the last twenty-five years has changed the whole social and commercial systems of the world. Its advantages and capabilities were so evident that immediately upon its introduction, and the demonstration of its true character, the most active efforts were made to secure them for every community which desired to keep pace with the advances of modern times. Crude and defective as were its first methods, it was found to be indispensable. As a consequence lin.s were rapidly constructed which of course almost as rapidly fell into decay. The Morse or signal system seemed for a time to be the perfection of human achievement, until Professor Royal E. House astonished the world with his letter printing telegraph. This has since been superseded by improved instruments, but Professor House, if reaping but little pecuniary reward, has immortalized his name as the first inventor of the printing telegraph. For years communication with distant countries was believed to be barred by the waters which rolled between them, until, in 1856, a few persistent capitalists and electricians demonstrated the practicability of ocean cable telegraphy. This was done against the most conclusive practical and scientific demonstrations of its impracticability. The triumph of those who, against all delays and discouragements, had carried through this enterprise, was great; and it is a satisfaction to know that they have also reaped a reasonable pecuniary reward for their enterprise.

Now, almost every considerable expanse of water is traversed, or soon will be, by the slender cords which bind continents and islands together, and practically bring the human race into one great family. During these years inventors and inventive genius have been busy in devising the best methods of rendering effective this greatest of modern developments.

There seems to be practically no limit to the possibilities of this mode of communication. Already the transmission, rapid as it has become, is found too slow, and many active and ingenious minds are at work upon the solution of the problem how the speed of the telegraph can be increased, its cost reduced, and brought within the means of even the poorest of the people.

Wonderful as has been the progress already made, the future promises equally astonishing developments. Never has there been so intense and general devotion of practical and scientific minds to this subject.—*Telegrapher.*

Enameling Slate.

By this process are produced imitations of the rarest marbles at a tithe of their cost. The substance thus produced is not only cheaper than marble, but bears a much more brilliant and permanent polish than stone will, while it has for its base a mineral infinitely stronger and more durable. The process of enameling is interesting, though very simple. It is performed either by "dipping," "splashing," or by splashing and sponging combined, and some of the more elaborate patterns by hand-graining. The colors are applied by either of these methods, and the slab is then placed in an oven or heated chamber, the temperature of which is maintained at from 130° to 250°, according to the size and thickness of the slab. In this oven it remains for a period determined by the size of the slate, generally averaging twenty-four hours. It is then withdrawn, and a coating of specially prepared enamel applied. Again it goes into the oven, emerging from thence to be vigorously pumiced to reduce all inequalities of surface This process of baking and pumicing is repeated, with some variations, three times more, and the slab is then in a condition fit for polishing. The polishing process is formed, firstly, with woolen cloths and fine sand; next, with French merino, the finest and softest that can be obtained; and finally with the hand and powdered rotten-stone.

By the processes thus hastily described, the most elaborate marbles and stones can be imitated. Specimens of Egyptian green, Lumachelle, and S. Ann's marbles, Pyrenees green, Swedish and purple porphyries, all kinds of granites, malachite, and lapis lazuli, have been so well finished as scarcely to be distinguished from the costly originals. Architect's original designs can also be executed in inlays of any pattern.

The enameled slates are principally used for chimney-pieces. They are largely in demand for facias, consoles, table tops, etc., for which their fine and durable polish well fits them.

Temperature of the Sun's Atmosphere and its Internal Molten Mass.

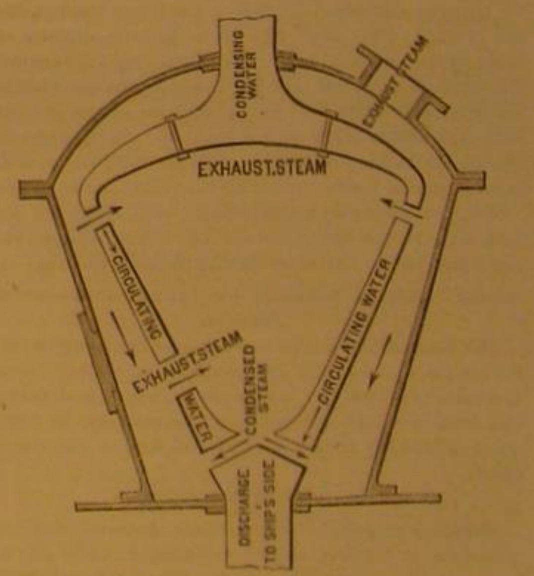
Professor Roscoe stated in the address lately delivered before the British Association that, in the opinion of Zöllner, the hydrogen which mainly composes the red flames that shoot forth with such extraordinary rapidity from the sun's surface, must have been confined under great pressure by a layer of liquid.

The difference of pressure required to produce an explosion sufficient to cause a prominence to rise 3·0 minutes, was calculated to be 4,070,000 atmospheres. This pressure is atstained at a depth of 139 geographical miles under the sun's surface, or at that of 1·658th part of its semi-diameter. In order to produce this enormous pressure the difference in temperature between the inclosed hydrogen and that existing in the solar atmosphere amounts to 74,910° Cent. Zöllner also calculates the approximate absolute temperature of the sun's atmosphere to be 27,700° Cent.—a temperature about eight times as high as the oxyhydrogen flame and one in which iron must exist in a permanently gaseous form.

CONICAL SURFACE CONDENSER.

A short abstract of a paper presented to the North of England Institute of Mining and Mechanical Engineers and Shipbuilders in Scotland, by Mr. Henderson, will be of interest to our readers:

"I consider this condenser to be much simpler in construction and more effective than the one in present use, by reason of its shape, as the whole jet of exhaust steam is brought to impinge instantaneously upon a large and unbroken surface, which causes immediate condensation; whereas, with the tubular surface a very small portion of it is brought into immediate contact until the steam has passed down through the tubes, thus prolonging the process of condensation; hence the great quantity of surface required to cool the escaping steam to the necessary temperature. I have had this condenser constructed along with a tubular one—the cone representing 3 feet surface, and the tubular 15 feet—and have compared their respective efficiency, every other condition being kept alike for these models. After six different trials had been made, and an average of the results struck, I found that 1 foot of surface in the cone condenser was equal to 3½ feet of the tubular one. I have also had a trial of the cone condenser on board of a steamer with engines on the compound principle, 24 inches and 48 inches diameter. The top of cone was 5½ feet diameter, and the bottom 16 inches, length over all 5 feet. With this condenser a vacuum was formed at once, and got up rapidly to 52 inches, the engine working for fully 30 minutes. After that time the condenser got very hot. The engines, partly on that account, had to be stopped, but particularly on account of the unsatisfactory working of the circulating pump. The space in the inner vessel for the circulating water being small, every stroke of the pump causes almost a clean wash out, thus keeping the crown always cool, that being the place where all the work is done.



"With a condenser on this principle a great saving of original cost is effected, and it is much more easily overhauled, as by taking off the door at any time the whole condenser can be examined in two hours; whereas at present when the tubular condenser requires to be cleaned it takes from three to four days, and in many cases a fortnight. Again, the risk of leakage is greatly lessened from the very few joints in the cone condenser, these being only seven in number; whereas the tubular condenser contains many hundreds. The description given shows a few advantages in favor of the cone condenser, and I doubt not many more advantages will yet be discovered, and thus the construction of the marine engine greatly simplified."

The anthracite coal deposits of Pennsylvania underlie four hundred and seventy square miles of mountain and valley. More than forty million dollars have been absorbed in mining capital, about the same sum in canals, and seventy millions in railroads, constructed almost solely as a means of transportation for coal. Sixteen million tuns were sent to market during t.e past year.

In placing Cherbourg in a state of defense, its mole has been armed with guns of long range; the entrances east and west are closed by *torpilles* charged with picrate of potassa, and united with one another by electric wire, so that they can be set fire to at the proper time.

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Contents:

(Illustrated articles are marked with an asterisk.)

CENTRAL SHAFT---HOOSAC TUNNEL.

At last, after years of toil, and at a cost of close upon half a million of dollars, the great central shaft of the Hoosac has reached the grade of the tunnel—1,030 feet below the natural surface. This shaft is elliptical, the transverse diameter being 27 feet, and the conjugate 15 feet, passing the entire depth through a compact mica-slate formation intermixed at intervals with white quartz. At the commencement of the present contract with the Messrs. Shanly, there required to be done 447 feet. This has been accomplished since June 1, 1869—say in 15 months—giving a monthly average of 29·8 feet. The largest month's work was 38 feet. At intervals of about 18 feet are floors of heavy timbers, supported by "hitches" cut in the rock, connected by ladders, in case of accident to the hoisting apparatus, and forming supports for the wooden "guides," in which the crosshead travels, under which is suspended the boiler-plate iron bucket of a capacity of about 400 gallons. The work has been impeded slightly by water, of which the shaft makes nearly three inches per hour. To raise this water, an engine of 60-horse power is constantly working, pumping all the water which collects as far down as 650 feet, caught in tanks by sloping "drip roofs." Below this, the water on the bottom has been hoisted in the iron bucket, a bucketful being sent up by the miners whenever the quantity became inconvenient. Now, the shaft being at grade, a "sump" will be sunk, and a water bucket with bottom valve used, thus avoiding the tedious task of bailing into the bucket by hand.

Workmen are now employed trimming the sides of the shaft, and preparing the "guides" for a wooden cage to be substituted for the bucket so soon as the "headings," east and west, at the bottom, are sufficiently advanced to use rock cars, when the rock will be raised to the top direct from the headings, cars and all.

The shaft being at grade necessitates, probably, the most delicate and responsible professional act an engineer may ever expect to meet, it being necessary to lay down a line less than 27 feet in length at the bottom of a dripping dark shaft 1,030 feet deep, so that both ends of the line being produced shall coincide with the terminal points of the tunnel, each being distant over 12,000 feet from the center of the shaft. To increase the initial difficulty, the top of the shaft is on the summit of a rugged mountain, from 1,500 to 1,800 feet above the grade of the tunnel at its termini. It is no light responsibility to assume charge of this operation. The State of Massachusetts has had manufactured a colossal transit instrument, of the most elaborate and perfect construction, costing $3,000. The most accurately verified lines have been laid down over the mountain, extending long distances beyond in both directions to the tops of neighboring mountains. By the accuracy of this instrument and its manipulation, the line of 27 feet (the transverse diameter of the shaft) will be permanently defined, requiring wonderful exactness, and from its extremities the "plummet" alone can reach the bottom of the shaft. These plummets must of necessity be weighty and beautifully poised, and will require to be suspended in oil to produce perfect rest and protection from the faintest vibration of the air. The most delicate cords, consistent with strength, must be used to suspend them, and after all is done that science can suggest (being perfect as to theory) any intelligent mind can understand how delicate and fraught with danger is the practical part of the operation to the engineer, and what grave effects the slightest error would produce on so small a base as 27 feet. It is quite possible the motion of the earth may effect the plummets more or less; but this point has not yet been thoroughly investigated.

The details of working in this shaft, and otherwise about the tunnel generally, would require a series of articles, but the above remarks may be of some interest, and suggest the difficulty last noted, giving civil engineers something to think over.

MEASUREMENT OF WATER FLOWING THROUGH PIPES--WATER METERS.

Measurement of water flowing through pipes, under any and all circumstances of position, pressure, and velocity, has, perhaps, more difficulties than any other with which the modern mechanic can grapple; notwithstanding which there will come a time when water meters will be brought largely into use, perfected, it may be by future effort, or imperfect, as the case may be. There exist to day, cheap water meters, sufficiently perfect to warrant their adoption until such time as the better one shall arrive. We propose in the present article to give a brief summary of the ways in which inventors have sought to measure flowing water, with some of the prominent and in most cases radical defects of each class of devices.

A water meter must be, in all cases, except where the flow is from the extremity of a pipe or channel into the open air—a water motor also. When a stream flows freely into a measuring can, the can is strictly speaking a meter or measuring instrument, and is the simplest of all instruments yet employed for the purpose; but it requires the constant attention of an attendant, to stop the flow when the measuring vessel is full, to empty the measure, and to start the flow again when the vessel has been emptied.

The next step in advance, is to make the measuring vessel work automatically to empty itself when full. Several ways to accomplish this have been employed. Valves operated by floats, springs, or weights, and siphons, are some of the means employed; but a more practical method is the use of an oscillating movement in a vessel divided into two chambers by a thin partition wall, and pivoted below its center of gravity. This construction throws the center of gravity alternately on opposite sides of the pivot, where it remains until changed by the influx of water. Isochronic oscillations will take place with this device when the flow is uniform, each oscillation bringing the full chamber into a position to discharge its load of fluid.

A small over-shot water-wheel with journals resting in a bifurcated scale beam, counterpoised at the opposite end, has also been employed; the wheel being provided with a stop for each bucket, so that it is held in position until the wheel is so weighted that it lifts the counterpoise and is released from the stop, when it makes a partial rotation and brings another bucket under the stream.

A bucket wheel having a friction brake of uniform resisting power has also been used.

All of these devices are generally provided with a counting or registering apparatus to indicate the quantity of flow, similar to that employed in gas meters. But they are all open to the objection that unless the flow be perfectly uniform, an error in their record creeps in while the position of the instrument is changing. We have seen one oscillating meter that obviated this error by the use of a second smaller bucket oscillator, which received the stream while the principal one was turning on its pivots, and discharged its accumulation into the empty bucket, as soon as the change was made. This reduced the error to so small an amount that it remained of no practical importance.

These meters are only useful where the flow is to be measured from a discharge at a single point. They cannot be placed so that one meter may measure the separate or united discharge from cocks placed at a distance from each other but supplied from a common service pipe.

The problem has, therefore come to include the production of a meter that can be placed in the service pipe itself.

The cylinder of a steam engine with its piston, made to contain a definite amount of fluid, has naturally suggested itself to inventors as a means to reach the desired end, and attempts to modify it that it would meet the requirements of the case have originated a large number of piston meters.

We know of but one of these that has been much used in this country. In England and Scotland, several varieties have been to some extent employed, but all meters of this class are open to objection on the grounds that they are generally expensive, that the reciprocating motion of the pistons absorb much of the force of the flow, the proportion of this absorption increasing with the increase of the number of strokes, and, lastly, that they are very difficult to construct so as to remain free fcom leakage. Leakage takes place in all such meters more rapidly when the flow through the discharge pipe is stopped, as the meter then feels the full pressure of the water. The leakage, if it occur, being constant, a very large loss may be sustained in this way. Of a number of piston meters we once saw tested at the Croton pipe yard in this city, not one was free from this fault.

The absorption of power by the reciprocation of the plunger in piston meters, has led to the substitution of a light diaphragm for the plunger, and to get rid of the leakage from stuffing boxes, many diaphragm meters employ internal tripping springs or weights to work the valves. We have, however, never seen a meter of this kind that promised or performed well in all respects. We have, however, seen a diaphragm meter, which had an exterior tripping device worked by a rotating motion from a rod communicating with the interior, which did good work, at least while submitted to our inspection. Leakage from the aperture through which the rod passed was prevented by a peculiar construction which obviated the necessity for a stuffing box.

Another family of meters, very few of which have any claim to merit, employ the method of leading out through an aperture a minute portion of the liquid and measuring that portion by a small apparatus, generally of the oscillating kind. The aperture through which the flow to be measured takes place being made geometrically similar to that through which the general flow proceeds, the amount discharged through the smaller aperture will be to the amount discharged through the larger inversely as the squares of their diameters, provided the forward and back pressures are the same at both.

We have never seen but one meter of this kind that secured this last condition. This small hole is, moreover, liable to become choked on many meters of this kind, and so destroy the geometrical similarity of the apertures.

We saw in one of our late English exchanges, a notice of a pump which consisted of a flexible tube compressed by rollers placed at the ends of the radial arms of a rotating wheel. This device was spoken of as new and novel, yet we saw the same thing three years since at a test of water meters made by the Croton Department of this city. It was, however, used as a meter, the flow through the flexible pipe moving the roller wheel which drove a registering apparatus.

Nearly all the meters ever invented, may be referred to one or other of the classes included in this summary.

There is one, however, which, though impracticable, is, on account of the peculiar principle adopted, worthy of notice.

It consists of an air chamber into which the flow takes place through a rose, placed nearly at the top of the chamber and in the end of the supply pipe, led through the bottom of the chamber. The discharge pipe issues from the bottom of the air bulb, parallel and close to the supply pipe. A third pipe also issues from the bottom of the bulb, on the opposite side of the supply pipe, and in the same manner, but opening immediately into the air. Neither of the latter pipes extend above the bottom of the bulb on the inside. A small tap at the top of the bulb, serves to admit air when requisite. Water flowing into the bulb, gradually absorbs the air and carries it away through the discharge pipe, while water remains in the bulb to supply the place of the air which has been removed. When the water has risen to a certain level in the bulb, it operates a float which trips a valve and shuts off the flow. A cock passing through the three pipes has then to be turned, when the main discharge pipe is shut off, as is also the supply pipe, and the short eduction pipe is opened, the cock being made to effect this result. The air tap at the top of the bulb being then opened, the water flows out and air again fills the bulb. A registering apparatus marking the number of times the three-way cock has been turned, indicates the amount of water that has passed through the meter.

This meter will work with great accuracy under uniform pressure and temperature, requiring no more trouble in attendance than a common wet gas meter, but uniform temperature and pressure in water flowing through pipes is not to be found.

Our readers may, from this summary, be able to gather the principal methods by which the measurement of moving fluids in pipes has been sought, as well as to gain some idea of the difficulties of the problem. The difficulties arise chiefly from the varying pressure and rate of flow, necessitating both great strength and great delicacy, two things which are hard to combine in machines to be worked by so elastic and intractable a fluid as water. There are besides, practical conditions of durability, etc., which are hard to secure in parts which work in water containing more or less mineral and organic matter.

CHEMISTRY AT THE FAIR OF THE AMERICAN INSTITUTE.

The number of titles entered in the catalogue of the Fair of the American Institute for this year, in the department of chemistry and minerology is 166, but this list represents a very small proportion of the articles exhibited that really owe their inception to the science of chemistry.

We shall, therefore, feel at liberty to speak of some articles not classified by the judges as belonging to this group, while making the round of the building.

The display of oils made by the Downer Oil Company, of Boston, is remarkably fine. The kerosene oil prepared by them is the product of fractional distillation made at a different degree from that followed in the old method, and possessing a higher specific gravity. Kerosene oil prepared in this way is quite as safe as sperm oil or rape seed, and, if it be thoroughly freed from the chemicals employed in its purification so as not to crust the wick, leaves nothing further to be desired as an illuminating oil. The flashing point of the Downer oil is so high that there can be no possibility of its igniting until it has been heated for the purpose. It requires a peculiarly constructed lamp to burn this oil, as it smokes with the burner used for the ordinary brands. The yield of an oil with so high a specific gravity must be small as compared with the products of distillation obtained from petroleum under the old system, and it can hardly come into competition with the refined petroleum for sale everywhere, but for those who can pay for it and desire a safe article there is nothing better in the market. It is a pity, however, that all petroleum could not be made as safe as the Downer oil, by the removal of all the naphtha, so as to guard the community from the fearful accidents that have been occasioned by the carelessness and cupidity of manufacturers.

The paraffine from the Boston works is as pure as wax, and suggests the numerous uses to which that valuable article is now applied. We remember in the Paris Exhibition, of 1855, a small sample of this substance, but at that time no one knew what it was, nor anticipated the important uses in store for it. In looking about the New York exhibition of the present day, we find paraffine used as a substitute for wax on matches, as an acid proof luting, for stoppers to bottles, in photographic operations, for the preservation of meats, and in the manufacture of candles; and the number of persons who have heard of it and understand its value has increased since 1855 directly in proportion to its uses.

The chemicals exhibited by Charles T. White & Co., are of extraordinary purity, and deserve unqualified encomiums. We have been so long dependent upon Europe for our pure chemicals that we hail with satisfaction the appearance of a firm that will emancipate us from this thraldom.

The sulphate of morphia, on exhibition, closely resembles the best Irish calcined magnesia. It is in large cakes, and the money value of the lot cannot fall short of $500. The salt is manifestly prepared with great care, and cannot be surpassed in purity and beauty of appearance.

Another alkaloid, strychnine, made into pure white crystals from the imported *nux vomica*, is in such quantities as to occasion just fears that some one might be tempted to break the vessel containing it for the purpose of making an improper use of the poison. We were struck with the pure white color of this preparation, and were informed that it was extensively used by trappers and hunters in the West, for killing wild animals. The action of strychnine upon the lower animals is such as to suggest a method of detecting it in cases of suspected poison. A frog in a tub of water containing scarcely more than a grain of strychnine, is at once thrown into violent convulsions, and plunges frantically about in the water. This is said to be the best test for strychnine.

The iodide and bromide of potassium were beautifully crystallized, and quite equal to the best German preparation.

We have not space to mention separately all the chemicals exposed by this firm, and can only express the gratification an exhibition of this kind affords us.

In our last number we gave an account of the mechanical construction of the Carré ice machine. The one on exhibition can freeze a large number of cakes of ice, 26 inches long, 9 inches wide, and 3 inches thick, which are easily removed from the molds, and, on being moistened with water and placed in a pile, will produce solid blocks of ice of any desired dimensions. It has been shown that ice prepared in this way will keep much longer than the natural production of our ponds. The principle upon which the Carré machine works is a chemical one, and is founded on the condensation of gases, originally discovered by Faraday. It requires much less power than the inventions by compressed air, ether engines, carbonic acid, sulphurous acid, or protoxide of nitrogen. It also has a great security against fire, as in case of accident, a small quantity of ammonia would serve to extinguish the flames. Theoretically, the same quantity of ammonia can be used indefinitely; but practically, owing to leakage and other causes, there is a loss that must be replaced. The agent employed by Carré is ammonia, and there was evidently no leakage in the machine, as the odor of the alkali would have betrayed it. The value of a cheap method of refrigeration is not limited to the production of ice. It has extensive application in the arts, to prevent the fermentation of the mash of malt, to improve the quality of wines by cold, to facilitate the transportation of animal food by means of refrigerating cars, to crystallize many salts by cold, to secure the better ventilation of churches, theaters, and private houses, to prevent the loss of cane sugar, and for many other purposes.

It would have been interesting to have had the use of ammonia as a motive power exhibited by the side of the ice machine, as it is claimed that with twenty pounds of liquefied ammonia, a force equal to one-horse power can be maintained for an hour. According to experiments made in Paris, a fifteen-horse power steam engine, working four hours, consumed two hundred and forty-seven kilogrammes of fuel, while the ammonia engine, working four hours and eighteen minutes, did not consume more than one hundred and seven kilogrammes. The saving was, therefore, about 60 per cent. If this be true, then the machinery for converting the ammonia into a liquid ought to be driven by an ammonia engine.

Photographing by means of magnesium light was extensively carried on at night by the use of a clock-work, devised for that purpose, by G. K. Proctor, of Salem, Massachusetts. The metallic ribbon is fed uniformly into the flames, and the light is kept up steadily as long as the operator may desire. Now that there is a prospect of our being able to make magnesium so as to sell it for the price per pound at present asked for an ounce, we shall doubtless find many new and interesting applications for this metal.

There is the usual variety of baking powders, some of which are less active poisons than the strychnine mentioned above, but not less certain in their subtile action if we give them time to perform their work. The cost of potash has compelled manufacturers to have recourse to salts of soda; and there is no longer any carbonate of potash sold under the name of saleratus, but carbonate of soda is substituted in its place. This is fortunate for the consumer, as potash is downright poison, and ought to be banished from the kitchen. Too much praise cannot be accorded to the bread preparation of Professor Horsford. It restores to flour its nourishing properties, and gives to the system just the elements of phosphorus and lime that we require for growth and strength.

The case of mineral specimens exhibited by the School of Mines, of Columbia College, is much admired and studied by persons anxious to obtain a knowledge of American minerals. A few of the specimens could not be excelled by any minerals to be found in European cabinets. We must reserve the soaps and soda water, extracts and liquors, and numerous other chemical compounds for future consideration.

SCIENTIFIC INTELLIGENCE.

COMBINATION OF SULPHUR WITH SELENIUM.

By fusing sulphur and selenium we obtain crystalline products; on treating these with bisulphide of carbon we have a series of new compounds. Two equivalents of sulphur fused with one equivalent of selenium, and the product maintained for five hours at a temperature of 212° F., yields a crystalline mass. If this be reduced to powder and dissolved in bisulphide of carbon, and the solution evaporated, various sulphides appear, having the formula—

$$Se^9S^5,\ Se^7S^{10},\ SeS^5.$$

With one equivalent of selenium and three of sulphur beautiful prisms of the color of bichromate of potash are produced. None of these compounds are permanent, and they cannot be purified by re-crystallization in bisulphide of carbon.

COMBINATIONS OF IRON AND HYDROGEN.

Professor Jacobi, of Russia, has succeeded in depositing pure iron by means of the galvanic battery, and of manufacturing numerous articles out of it. But this supposed pure iron on being placed under the receiver of an air pump, and heated to redness disengages torrents of hydrogen, *increases* in volume, and changes into a silver white metal, very malleable and ductile, and so soft that it can be easily cut with scissors. Iron prepared in this way oxidizes rapidly in the air, and decomposes water below the boiling point. All deposits of iron by the battery are rich in hydrogen, and what is very remarkable, their volume is less than that of pure iron. This is just the opposite of what takes place when palladium is charged with hydrogen. It would appear from these facts that hydrogen combines directly with iron the same as carbon, and that hydrogen increases the hardness and density of iron, while it diminishes the malleability and oxidation.

Professor Jacobi has succeeded for the first time in making pure iron, and we can now study its properties. What was hitherto supposed to be the pure metal was a compound.

NEW TEST FOR ALBUMEN IN THE URINE.

Take a mixture of equal measures of acetic acid and phenic (carbolic) acid, and make the preliminary test that water produces no cloudiness in it, and add acid if necessary, until water has no effect. The normal solution is then ready for use, and will then give the reaction for albumen, diluted by 15,000 parts water, whereas nitric acid shows no results beyond 8,000.

LYCEUM OF NATURAL HISTORY.

At the meeting of the Lyceum on Monday evening Professor Seely read an interesting paper on the volatile liquids, suitable for ice machines.

He stated that carbonic acid and protoxide of nitrogen required too powerful engines and too much machinery for their condensation to be applicable for the manufacture of ice. Ammonia needs the best of packing to prevent the escape of the gas. The learned Professor exhibited a table showing the curvature of pressure of a large class of volatile liquids, which would be of value in the study of this subject, and ought to be published.

Mr. Loew recounted some experiments tending to prove the existence of a new modification of oxygen, which was either antozone or a similar body. Some of the members of the society took strong ground that there was no such thing as antozone, while others maintained the opposite theory; and thus the doctors agreed to disagree.

Professor Wurtz made an interesting exposition of his theory of the migration of silica throughout the kingdom of life. We recently alluded to the new chemical relations of silica, and gave the substance of Professor Wurtz opinions on the subject. When the topic comes up for discussion in the society, we shall allot more space to a report of the proceedings.

Professor Henry Morton exhibited some sun photographs, taken by Professor Young, of Dartmouth College, by means of a battery of fifteen prisms. The effects are the same as were obtained at the time of the total eclipse of the sun.

FAIR OF THE AMERICAN INSTITUTE.

MECHANICAL.

The present article will close our regular notices of the mechanical and miscellaneous exhibits at the Fair of the American Institute. The reader will find in another column an article on the Chemical Department.

A very ingenious and useful device for refitting valves on steam and water pipes and steam boilers, without disconnecting them, is exhibited by C. F. Hall & Sons, 65 Murray street, New York. By its use valves can be accurately repaired without the use of emery, and in a very much shorter time. It consists of a spindle running in a guide which screws into the thread which holds the stuffing-box, the latter having been removed, and the place of the valve spindle being supplied with a milling tool, which accurately re-cuts the valve seat to the required taper. The valve is then fitted to the same size by centering the spindle at the end opposite the valve, and placing it in a small milling machine, having at one end a spindle and center which fits the center of the valve-stem opposite the valve, and having at the other end a fixed hollow conical milling tool on a line with the spindle. The spindle is made to force the valve into the milling tool, and, the valve being turned by the hand-wheel on its spindle, is rapidly cut to the required form and truth of taper. When large valves are operated upon, the valve and stem are revolved by a winch attached to the center spindle, and a dog, as in the engine lathe, at the same time it is fed up to the work by a feed screw.

The Wasburn machine shop connected with the Free Institute of Industrial Science at Worcester, Mass., exhibits a 16-in. engine lathe, with 8-ft. bed, and a 9-in. speed lathe, with 4-ft. bed, which are very highly finished and admirably designed tools. These tools merit the attention of visitors, not only from their intrinsic merit, but as an earnest of the institution with which the shop is connected.

In connection with lathes are also shown an adjustable draftsman's stands designed to meet the demand of draftsmen and artisans generally, who for a long time have felt the need of a table which can be readily and conveniently adjusted to any hight and inclination, easily turned to bring either side of the work in front, and at the same time be substantial, elegant, and cheap. It is made mostly of iron, mounted on casters, and its tasteful appearance makes it equally desirable in any office, counting room, library, or sitting room.

A case of the "Young America" skates, exhibited by M. Kinsey, 95 Bank st., Newark, N. J., is worthy of notice from all those interested in the delightful exercise of skating, or in the manufacture and sale of skates as a business. These skates are simple in construction, hold fast when put on, and are very quickly attached. There are no straps to interfere with the circulation or to hurt tender feet.

A plate of steel is fastened to the boot heel, having an oval hole in the center into which the spur in the heel of the skate buttons, the spur being inserted by placing the skate at right angles with the foot, putting in the spur, and then buttoning it by turning the skate into its normal position. This done, the skate is secured by pressing home two clamping blades or plates of steel, operated by lever cams, which grip the edge of the sole, and firmly secure the skate. The clamping plates are easily adjusted to fit the width of the sole. These skates are a highly-finished and attracting exhibit.

A portable bath is shown by H. N. Taft, 37 Park Row, New York city, which is an ornamental and convenient addition to household furniture, especially where the modern improvements in houses are not available. It may even be used as an adjunct to the modern improved bath to great advantage, as the Russian or Turkish bath may practically be taken in it.

This bath is suspended from a hook in the ceiling of any room, by means of a cord and pulley. It is lowered to the floor, for use, and raised to the ceiling when not in use, where it is entirely out of the way.

A cloth screen is attached to a water-tight pan at the bottom, and a water basin at the top. This basin is lowered for introducing either cold water or warm water for a shower bath. The entrance is the same as to a tent. A valve is raised by pulling an inside cord, when the shower or spray descends, and a bath may be enjoyed without wetting the carpet with a drop of water.

In using this bath it is not necesary to step into a colder atmosphere with a wet skin after bathing, as the body can be wiped dry before leaving it, thus avoiding the chill and frequent colds contracted when leaving the ordinary bath. But the facilities afforded for shower bathing are only incidental to the main object in view, which is to afford to every family facilities for hot air and steam bathing. By means of a spirit lamp and a small heating apparatus, which accompany every bath, the temperature of the air in the bath is raised to 130 degrees in a few minutes, or steam is generated if a steam or medicated vapor bath is preferred. This bath collapses in lowering upon the floor as well as in raising. When lowered, the basin is attached to the bottom, and both are raised together. When collapsed, the screen cloth folds into the pan in the most compact manner. The bath weighs less than twenty pounds, and may be packed in a box of ten by thirty inches in size.

In concluding these mechanical notices, we may say that the Fair has proved more interesting than it promised during the first two weeks. The attendance has been large, and we judge it has been a financial success. The building in which it is held is probably the best in the city for the purpose, and though too remote from the business center, is perhaps, all things considered, pretty well located to accommodate the mass of the people who visit. We are informed the exhibition will be closed the 2d of November.

Around the World.

On Monday evening, the 17th inst., Rev. Dr. E. D. G. Prime of the New York *Observer* by invitation of the New York Association for the Advancement of Science and Art, delivered a lecture at the Y. M. C. Association building, on his journey "AROUND THE WORLD, telling what is to be seen; how to go; what it costs, etc."

The lecturer pointed out the route on a large map of the world, selected the most striking scenes in the journey, and graphically described the characteristics of various countries and peoples, enlivening the way with amusing incidents of travel by land and sea.

The audience was a very large one, and many were obliged to go away for want of standing room. The lecture was replete with interest to all who were privileged to listen to it, and a resolution was passed unanimously requesting the learned doctor to repeat the effort in a larger place.

[Our Special Correspondence.]

LETTERS FROM THE SOUTH.

Industries of Alabama—Her Railroads and Resources.

SELMA, ALA., Sept. 15, 1870.

The country from Mobile to Montgomery has few attractions. It is a sandy pine barren, valuable for little else than timber. Leaving Montgomery we come into the great cotton belt of Alabama. This cotton belt, as it is termed, is a flat land, almost everywhere underlaid with rotten limestone. Its special crop is cotton, and it can almost anywhere, by good farming, be made to produce a bale and a half to two bales of cotton to the acre, but with the usual farming of the country the average is hardly 400 pounds of lint cotton. Throughout its extent the water is poor, and it is generally considered an unhealthy region.

Montgomery is situated on a series of hills just on the edge of this belt. It is finely located in some respects, but the natural advantages are poorly improved. For instance, water might be thrown all over the city from a reservoir on one of the many high hills, yet they depend on artesian or driven wells. One of the artesian wells is 800, and the other 950 feet deep. The place contains many fine residences, and displays much wealth, yet we did not see great evidence of enterprise or encouragement of arts and manufactures. In architecture we noted in process of erection, by Col. J. S. Vinter, the first basement store or cellar in the place. A few years' residence in New York had so brightened his ideas as to economy of space. The place hopes for great things from the North and South Railroad to Decatur, but if the people lack the requisite energy, all the railroads in the world cannot build up their town. They now supply the city with gas made from wood. On the completion of the above railroad they intend to use Alabama coal. The Montgomery and West Point Railroad, for many years the worst managed and one of the most important railroads in the South, has lately changed hands, and is now said to be at least safe to travel over, and will soon be comfortable.

Fourteen miles from Montgomery is the famous village of Prattville. Perhaps no other town of its size has so widely extended a reputation. It is the home of Daniel Pratt, the cotton gin maker, the location of his gin and cotton factory, also of the Indian Hill Cotton Factory, and has several fine unemployed water powers. It is, however, fourteen miles from a railroad. The Prattville factory runs 4,000 spindles, and the Indian Hill 3,500. There is also in the place a large sash, blind, and door factory. The cotton factories manufacture sheetings, shirtings, and Osnaburgs. Near Prattville is another small factory called Graniteville, running 2,000 spindles, and making only Osnaburgs.

Fifteen miles east of Montgomery is one of the finest water powers, and when the owners carry out their plans they will have the largest cotton factory in the South. It is on the Tallapoosa River, and is called the Tallasse Factory. From the data I could gather I infer that part of the capital in the enterprise is English. They now run 6,700 spindles, and are putting in sets of 12,000 more of English make to manufacture yarns of the finest grade. Of these 4,000 will be running in October. I asked if they thought English machinery best. They replied, "No; but we have an arrangement in Manchester as to this, by which we get it cheaper than we could possibly buy American."

They consider Philadelphia the best market for fine yarns. They use about one half the power of the Tallapoosa, which there falls 90 feet in half a mile, and have a fall from their dam to mill wheel of 58 feet. Their factory is of granite, iron roofed, 258 feet long, 55 feet wide, and five stories high, with a wing 57 feet square. There is water power on the spot to run ten such factories. I asked if they drew much cotton from the surrounding country, and was told about one fourth of what they consumed. The rest is bought in Montgomery. An idea of the amount of cotton produced in the immediate section may be gathered from the fact that $7,000,000 worth of cotton was last year shipped by railroad and steamer from that city.

There are two other cotton factories in the State, one near Huntsville and the other at Tuscaloosa, both running from 3,000 to 4,000 spindles. In my letter on Mississippi I omitted the new cotton factory at Columbus, called the Stonewall, numbering about 3,500 spindles, which is to be increased. Also I omitted mention of the extensive Southern Car Works on the N. O. and Jackson R. R., which is an enterprise well worthy of note. Of my neglect I have had reminders in seeing their cars on nearly every Southern road.

Besides the N. & S. R. R., Montgomery is also connecting herself with Savannah and Macon by a railroad to Eufaula, which is nearly completed

Selma has more life and vigor about it than any town of the cotton States that I have seen, and well it may have, for soon it is to be the terminus and center of seven railroads, all well planned, and running through rich country. The people of the town have life and energy and are hopeful. They last year sent off over 50,000 bales of cotton; this year they expect to send off over 75,000. Its railroads are the Selma, Rome, and Dalton, running through a rich agricultural and mineral region, raising cotton, the grains, and grasses; the Montgomery and Selma, a new and long-needed line; the Selma and Mobile; Selma and New Orleans, making an air-line with the Selma, Rome, and Dalton; Selma and Meridian; Selma and Memphis, and a branch line of the Alabama and Chattanooga Railroad. The section is almost a perfect level. It is on the prairie cotton belt, and artesian wells 300 to 600 feet deep are used to obtain water. Lately what are called driven wells have been introduced, whereby good water is obtained at twenty to thirty feet. A pipe is driven down, having a pointed plug in the end; above this plug, around the sides of the pipe, are several rows of holes. As the pipe goes down it comes to a stratum of quicksand—which underlies all this country—that contains an immense bed of water. When the pipe pierces this stratum a pump is placed on the top end of the pipe, and in a little while a continuous stream of water flows. The constructor of these driven wells proposed to furnish Selma with water, at least for fire purposes, by putting down five wells in a circle, and connecting them at the top. He demonstrated his plan by experiment and got more water than their steam fire engine could use, but as yet they have not adopted it.

The gas works at Selma use Alabama coal, and it certainly makes an excellent gas. I was informed the yield was about 8,000 cubic feet per ton, and that there was coal which yielded more, but did not coke—a species of cannel. In my next I wish to speak especially of these vast mineral deposits. Selma has three founderies, all doing well, and with her contiguity to the coal and iron there is no reason why she should not have also a rolling mill. A cotton factory run by steam would pay.

I have already stated it is one of the finest cotton regions of the South, and nearly all the cotton used might be drawn, in the seed, from the surrounding country, ginned, the cotton worked into yarns, and the seed into oil, etc. There is now a small cotton-seed oil mill in Selma connected with a gin and press. It consumes about 1,500 to 2,000 tuns of seed per annum. There is no water power near Selma, but it is abundant and never-failing twenty miles or more on the line of the S. R. and D. R. R. Some manufacturers assert that, taking all things into consideration with coal at $5 a tun, they consider steam as cheap as water. I think it depends a good deal on where and of what grade the water power is. However the best of steam coal can ere long be profitably delivered in Selma at $5 or less per tun. H. E. C.

THE EARTHQUAKE.

Distinct earthquake shocks were felt throughout the country on the 20th inst., the news of which is reaching us by telegraph just as we are going to press. In this city and in Brooklyn the shocks were felt.

The earthquake manifested itself here about 11:30 A.M., causing the wildest excitement where the shocks were most severe. The earth vibrated rapidly for about ten seconds, when the undulations ceased for an interval of fifteen seconds, occurring again, and continuing for about the same length of time as before.

The effects on those who felt the quivering of the earth under their feet were various; causing some to believe that the end of all things earthly was near at hand. Mothers rushed from the densely-peopled tenements of the Tenth Ward, bearing their children in their arms, and hurried up and down the streets in a wild and bewildered manner. Every article of household furniture was left behind, and the saving of their lives seemed all that the most fortunate could hope for.

The shocks were noticed more distinctly in the Sixth Ward, although they were distinctly perceptible in the Tenth, Seventeenth, Seventh, and Fifth. Opinions seem to be greatly divided regarding the rumbling noise in the earth underneath; some claiming that the rumbling followed, others that it preceded the undulating motion of the earth, and that it continued for almost a minute, at intervals of a few seconds. After passing Park Row, the wave-like roll seemed to follow the district situated between Center street, East Broadway, and Allen street, until, reaching the Seventeenth Ward, it turned and crossed to Long Island.

In the lower part of the city, below the City Hall Park, there is very little heard of it. On Printing-House square the vibrations were very perceptible, the motion being noticed in the editorial and composing rooms of the *Tribune*. Further up-town, Frank Leslie's publishing house, on Pearl street, was affected. The foreman of the composing room was making up a form at the time, and accused a person standing near, of shaking the imposing stone. The movement of the building being repeated, all on the two upper stories rushed down stairs, leaving hats and coats behind; some even, in the excitement of the moment, carried their sticks full of type to the pavement. One is reported to have carried down an empty brass galley, and another a mallet. The clock hanging in the room stopped, the hands pointing to 11:35. The workmen on the fourth floor describe the sensation as disagreeable in the extreme, and many of them were sick for more than an hour afterward. The acid was in some cases thrown out of the batteries in the copper-plating room. Two artists in the front room of the building on the same floor were thrown from their seats. The first few who rushed down stairs and out at the front door dislodged a large sign which hung over the door. Those behind, seeing this fall, thought it to be the beginning of the general crash. The shock was not felt in the press-room. At the same moment the employés in Russell's book-bindery, situated just opposite, on Pearl street, came hurrying out. Some of the men in Frank Leslie's building, who were seated near windows, state that the shot tower of the New York Lead Company, situated near by, swayed perceptibly, much to their consternation. As no shot was casting no one was in the tower.

Further down Center street, at the *Clipper* office, the same shocks were felt, and the same results followed, all hands rushing into the street. Those in the composing room at the time assert that the large chandeliers vibrated several inches. The sensation was there described by several as similar to that of sea-sickness.

Shocks were very sensibly felt on the line of the Bowery, from Chatham square to Bleecker street. In Division and adjoining streets near Chatham, many tenement houses were so shaken that all the inmates rushed into the street, some still retaining articles which were in their hands when the shock was first felt. Stoves and articles of furniture were overturned. A house situated at the corner of Division and Catherine streets was cracked entirely down the side, gaping open almost an inch. Glasses and bottles were thrown from the sideboard and broken at the restaurant No. 15 East Broadway.

At Lord & Taylor's, on Grand street, two shocks were felt, each of about ten seconds duration. On the fourth floor, in the rear, where the women were at work, considerable excitement was occasioned. One woman, in her confusion, ran to a window and jumped to a distance of about ten feet to the roof of an adjoining shed, receiving, however, no serious injury. Another woman fainted four times in succession. No shock was felt on the first or second stories, but on the third men were unable to write, and some were unable to stand. One gentleman, who had been making a purchase, and was waiting for his change, ran from the third floor to the street, and would not re-enter the building. The clock hanging on the wall in the rear building was stopped at exactly 11:12.

At the public school on 14th street, near 2nd Avenue, there were 1,200 children. The scenes in the different schoolrooms were pitiful. Children were screaming and rushing to and fro in the wildest manner, but in a very short time the whole number, teachers and pupils, were marched out of the school-building into the street. In the Grammar School, No. 19, also situated on East Fourteenth street, they barely escaped a serious panic. The Principal, Mr. Wm. Smeaton, who was seated at his desk in the boys' department at the time, perceiving that the house was shaking, at once ordered the boys to leave which they did without any ceremony. A messenger was at the same time sent to the girls department requesting the Principal to dismiss the girls at once. They went into the street without any idea of the cause of their dismissal, leaving cloaks and hats behind.

Three distinct shocks were felt in Brooklyn at 11:30. The vibration was from north to south, and the shocks were in rapid succession. The motion created a decided sensation throughout the city, especially on the Hights, where it was more distinctly felt. The Rev. Robert Spear, D. D., of Montague street, states that he was seated in his parlor, in company with his daughter, and when the first shock occurred he believed that he was about to receive a paralytic stroke. The paintings on the walls and the chandelier were agitated.

The news we are receiving, indicates that this earthquake extended over a large region of country, but we have yet heard of no serious damage.

Purification of Tannin.

In order to free commercial tannin from the peculiar odor which it derives from a greenish colored resin, Deinz recommends to dissolve six parts of it in twelve parts of hot water in a porcelain mortar, to pour the fluid into a bottle, and after the addition of one half to one part of ether, to shake it vigorously. The mixture appears cloudy and very greenish, but becomes clear after a few hours' standing, while the resinous coloring matter separates in flakes, somewhat in the shape of coagulated albumen. The fluid is then filtered, and the filtrate evaporated to dryness. Tannin treated in this way is odorless, and forms in water a perfectly clear solution.

TOMATO FIGS.—The following recipe for making tomato figs is said to be excellent:—Collect a lot of ripe tomatoes about one inch in diameter, skin, and stew them in the usual manner, when done lay them on dishes, flatten them slightly, and spread over them a light layer of pulverized white or best brown sugar; expose them to a summer's sun, or place them in a drying house; when as dry as fresh figs, pack in old fig or small boxes, with sugar between each layer. If properly managed the difference cannot be detected from the veritable article.

DISINFECTANTS FOR GERMANY.—Professor Hofmann, of Berlin, has written a letter to the editor of the *Chemical News* earnestly appealing to all chemical manufacturers for help in procuring an early supply of disinfectants on a large scale, in order to prevent the hospitals, which are being rapidly established all over Germany, Alsace, and Lorraine, from becoming the "hotbeds of all sorts of contagious poison." The disinfectants named are, liquid residues of the manufacture of chlorine, chloride of lime, green vitriol, permanganate of potash, and carbolic acid.

NEW BOOKS AND PUBLICATIONS.

AMERICAN JOURNAL OF SCIENCE AND ARTS. New Haven, Conn.: Silliman & Dana.

This journal was founded by the elder Silliman in 1818, and now numbers one hundred volumes in two series of fifty volumes each. After the first of January, 1871, it is proposed to issue monthly numbers for the accommodation of writers who desire an early publication of their investigations. The "American Journal" has long been the organ of the pure scientists of the country, and ought to be taken by every reading-room and college library. The subscription of $6 per year barely pays for the press work and paper, and all editorial work is gratuitous. The commencement of a new series and of a new year offers an excellent opportunity to subscribe.

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Jacksonville, Fla., May 8, 1870. Messrs. Freeman & Burr, Dear Sirs,—Received Clothes per express yesterday, and am perfectly delighted with the fit, so is my Father. My friends are wishing they had their measure at your house. Yours, etc., Chas. E. Bowes.

Selins Grove, Pa., May 11, 1870. Messrs. Freeman & Burr, I examined my clothes received of you to-day, and am well pleased with the fit and style of the Coat, in fact, I think I never had better fitting Coats, especially the Dress Coat. You will receive money for them by express, which is paid. You will probably hear of me again soon. Very respectfully yours, A. M. Carey.

Toledo, Ohio, June 13, 1870. Messrs. Freeman & Burr, Gents, Please send me a suit of the inclosed samples, by which you made my other suit. They fit nicely; I am afraid if I ask another measure, I will not get as good a fit. I would like to have them soon. Yours truly, A. U. Young.

For ordering Clothes by Letter, see Freeman & Burr's advertisement on last page.

The Craig Microscope.—A marvel of excellence and cheapness. Magnifies 100 diameters, a power equal to other microscopes 10 times its cost. Especially adapted to the Family circle. Illustrated circular sent. Price $2 75. Address Theo. Tusch, 37 Park Row, New York.

Peteler Portable R. R. Co., contractors, graders. See adv'ment.

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

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Japanese Paper Ware Spittoons, Wash Basins, Bowls, Pails, Milk Pans, Stop Jars, Chamber Pails, Trays, etc., perfectly water-proof, and will not break or rust. Send for circulars. Jennings Brothers, 352 Pearl st., New York.

Agents Wanted to sell the Star Bevel. It is destined to supersede entirely the old style. R. Hallett & Co., West Meriden, Conn.

Of Washing Machines, there is nothing to be compared with Doty's.—Weekly Tribune. Dec. 15, 1869.

Scientific American for sale. M. Munro, Rehoboth, Mass.

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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.

Building Felt (no tar) for inside & out. C.J. Fay, Camden, N. J.

Screw Wrenches.—The Best Monkey Wrenches are made by Collins & Co. All Hardware dealers have them. Ask for Collins Wrench.

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Recent American and Foreign Patents.

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

MATCH SAFE.—Charles Goldthwait, South Weymouth, Mass.—This invention relates to a new and useful improvement in boxes or safes for holding matches, and consists in forming a box or safe with separate compartments, provided with igniting surfaces, and so as to be tightly closed when not in use.

EARTH CLOSET.—Hamilton Sherman, Waverly, Pa.—This invention relates to a new and useful improvement in the mode of discharging any earth or other deodorizing material upon the deposits made in privies or commodes.

CULTIVATOR.—C. P. Norton, Prairie City, Iowa.—This invention has for its object to furnish an improved cultivator, which shall be so constructed that the plows may have a free vertical and lateral movement, and at the same time each horse will draw only his own plow; and which shall be simple in construction and effective in operation.

CAR COUPLING.—Lewis A. Evans, Chester, Pa.—This invention is founded on the principal of making the drawheads of a railway car rotary, and with orifices for the admission of the heads of the link of greater length than width; and of making the link-head wider than the said orifices, so that in order to insert the link-head through the orifice, the drawhead must be turned into a position where the length of its orifice is parallel with the width of the link-head, which having been done, and the link-head passed through the orifice in order to secure the link in the drawhead, the latter must be turned into a position where the length of its orifice is at right angles with the width of the link-head, by which arrangement the link-head is prevented from withdrawing until the drawhead is once more rotated so far as to bring its longer side again parallel with the wider side of the link-head.

COTTON BALE TIE.—Michael R. Clark, Columbia, S. C.—This invention has for its object to enable the bands of a cotton bale to be tied in such a manner that all the compression given to the bale by the press shall be preserved by the bands, and the bale on being removed from the press shall not be able to expand to any appreciable degree.

PLOW.—W. T. Bunn, Humbolt, Tenn.—This invention relates to an improvement in double-shovel plows, and consists in constructing the stock of the plow of two beams, one of which is provided with a coupling—and two shanks provided with handles, the handles being combinations of the shanks—and connecting the beams to a draft beam and the handles to each other by slats or rods provided with holes for regulating the distance between them.

ELASTIC SHAFTING.—Robert Brown, Detroit, Mich.—This invention has for its object to improve the construction of shafting in such a way that it may give or yield when the power is applied, to prevent the teeth of the gearing from being broken by the sudden shock.

COTTON PRESS.—Sinclair Booton, Seguin, Texas.—This invention relates to a new hay or cotton press, which is provided with two followers, that move simultaneously, they being connected by right and left hand screws

FIRE-ALARM THERMOMETER.—Mrs. Augusta Guest, Brooklyn, N. Y.—The object of this invention is to construct an instrument for closing the circuit of an electric fire alarm, as soon as the atmosphere which surrounds the instrument has reached a certain degree of heat.

GYMNASTIC APPARATUS.—John Smith, St. Paul, Ind.—This invention has for its object to construct a gymnastic apparatus, which is to be operated entirely by the hands, and still to call all the muscles of the body into harmonious action; taking cognizance of the principles that the fingers are the proper indices of human power, and that any strain put upon the body in excess of what the fingers can bear is dangerous and injurious.

RAILROAD CHAIR AND CLAMP.—Loyst J. Smith, New York city.—This invention relates to a new device for securing railroad chairs to the rails, and also for clamping the ends of rails together without the use of chairs.

PLOW.—J. H. Johnson, Bentonville, Ark.—This invention relates to an improvement in plows, and consists in the combination and arrangement of parts for the purpose of subsoiling, furrowing, pulverizing, harrowing, and packing the ground, two or more of the operations being performed at the same time.

TABLE.—Joseph Taft, Rockville, Conn.—This invention relates to improvements in tables, and consists in a pair of light metal stands, and a folding detachable top constructed and combined in such a way that the top may be taken off the stands and folded up into convenient shape for transportation. The said invention is designed to provide simple and cheap tables for picnics, also for hotels, in which it is sometimes required to set out tables for unusual numbers of people.

PACKING CONFECTIONERY.—George and C. B. Miller, Philadelphia, Pa.—The object of this invention is to provide for use a new and improved method and means of packing confectionery and small gift articles, and the invention consists in the arrangement of the packing box, its compartments, and the materials to be packed.

BOLT FEEDER.—E. J. Weaver, Sterling, Ill.—This invention has for its object to furnish an improved device for feeding the meal or flour to the bolt, which shall be so constructed as to feed the flour or meal regularly and uniformly, and at any desired rapidity, relieving the miller from the constant attendance that is required when the flour or meal is fed to the bolt by a "shoe" in the ordinary manner.

FOLDING BEDSTEAD.—Mark Crosby, Boston, Mass.—This invention relates to that class of French parlor bedsteads which can be folded up, with the bed, into a form resembling a neat bureau or stand, and the invention consists in a new and improved method of connecting the parts that fold together, so as to admit of the side pieces being made narrower at the middle than at the ends, while at the same time it allows the bedstead to fold readily and easily, inclosing the bedding between the folded parts.

CAR COUPLING.—W. B. Snedaker, Phœnix, N. Y.—This invention relates to a new car coupling which is so constructed that it will be self-locking and readily uncoupled.

STEAM BOILER FEEDER.—A. R. Young, Red Wing, Minn.—This invention relates to a new and useful improvement in apparatus for supplying steam boilers with feedwater.

SELF-ADJUSTING ROTARY COTTON CHOPPER.—S. A. Jefferson, Franklin, Tenn.—This invention has for its object to furnish a rotary horse hoe or cotton chopper which shall be so constructed and arranged as to adjust itself to any inequalities of the ground, and which can be used twice upon the same crop.

FOLDING CHAIR.—Emil Bartels, New York city.—This invention has for its object to furnish an improved folding chair, simple in construction, convenient in use, and which may be compactly folded when not required for use.

REFRIGERATOR.—A. H. Phelps, Trenton, Mich.—This invention relates to improvements in refrigerators, and consists in a novel arrangement with the cooling chamber of a removable ice receptacle and an air circulating tube calculated to cause such movement of the air within the cooling chamber as to cool it very quickly after the ice is put in. The invention also comprises an arrangement in connection with the chamber of a thermometer in a way calculated to be more efficient in indicating the temperature.

PUMP.—Adam Knecht, Ilchester, Md.—The object of this invention is to construct a pump for deep wells which will draw water where ordinary pumps are insufficient, and one which may be placed any suitable distance away from the well to convey the water to any desired locality.

COMBINATION LOCK.—F. B. Kalkbrenner, Clinton, Mo.—This invention relates to improvements in the construction and arrangement of combination locks, and consists in the arrangement of a number of rings with V-shaped inner faces on a cylinder, made up of disks having V-faces, which provide grooves for the rings, the said disks being connected together, and the outer ones having flanges which confine the said rings. These disks and rings each have a notch across the face, which being brought into line admit the shank of a hasp, which has notches across its face, to slide into the cavity formed by the said notches in the rings and disks, after which the notches across the hasp coinciding with the rings allows them to be turned across it, thereby locking it.

CLOCK BALANCE.—R. R. Ramsdell and G. A. Whitcomb, Marlborough, N. Y.—This invention relates to improvements in balances for clocks and other instruments, for use in substitution of the pendulum, and consists in a horizontal balance, mounted at the center, and provided with weights at the ends, also in the adjusting apparatus for the weights to extend or return them, and connected to the pallet by a wire by which it is vibrated.

WINDOW AND DOOR SCREEN.—David Goodwillie, Chicago, Ill.—This invention relates to improvements in the construction of the screens used for windows and doors for excluding flies, mosquitoes and other insects, and it consists in so arranging the frames and attaching the wire screens as to make use of the screens for holding the frames together for cheapening and simplifying the construction by avoiding the necessity of using the tenons and mortises now used, which are more expensive than this improvement. The invention also consists in improvements in supporting the screens in the windows.

WRENCHES.—James F. Cass, L'Orgnal, Canada.—This invention relates to improvements in socket wrenches, and consists in a combination with a piece of metal having a socketed end of one or more sleeves arranged in the socket, the smaller within the larger, for nuts of different sizes, so arranged that the smaller sleeves will be forced inward against spiral springs by the nuts if too large for the said sleeves, but the smaller nuts will be received and acted on by the said smaller sleeves.

ELECTRIC FUSE.—Charles A. and Isaac S. Browne, North Adams, Mass.—This invention consists in an electric fuse, having a primer with wires or metallic bands extending from a chamber in the primer to the inside surface of the completed cap, and secured by means of a groove in the primer in such a manner that when the main wires of the fuse are passed through the sides of the cap, and the primer is fully introduced, metallic communication is made between the wires or metallic bands in the primer, and the main wires of the fuse.

CLOVER HULLING ATTACHMENT TO THRASHING MACHINE.—Jacob H. Golladay, New Lisbon, Ohio.—This invention relates to improved attachments to thrashing machines for hulling clover seed, and consists in the combination with the thrashing cylinder and the toothed concave attachment used in connection with it, of a perforated sheet-iron scouring or hulling plate placed around the cylinder at the discharging place, closing it, except at one end; also the combination of feeding apparatus, with the feed-board, whereby the seed chaff, and the like, previously thrashed and separated from the straw in the ordinary way is fed to the cylinder at the end where the discharge passage is closed, and worked between the cylinder and the said perforated sheet along to the opposite end, where it discharges, in a way to scour and hull the seed in a very efficient manner.

TABLE FOR BAKERS.—Alonzo S. Maxwell, Dixon, Ill.—This invention relates to improvements in tables for bakers' use, and consists in the application of a heat reflector and a holder below the top of the table, for holding and keeping warm the dough previous to baking, for "raising" the same, the table being so placed relatively to the fire that heat rays thrown out by it will be received at the reflectors; the holder is made with openings for the heat to rise up to the space above where the dough is placed. The invention also consists in inclosing the sides, or some of the sides, of the space above the holder with wire gauze or other reticulated substance, through which the air may circulate and arranging the reflectors' sides and bottom to fold up under the holder to exclude flies from the space above the holder in which baked articles may then be kept.

WEATHERBOARD BRACKET.—J. M. Milhollin, Champlin, Minn.—This invention relates to improvements in apparatus for spacing for weatherboards for nailing on and holding them, and consists in a bracket carrying a holding spring and a spike, the latter on a lever, and adapted for drawing into the last board nailed on at a gaged distance from the bottom to receive the lower edge of the one to be nailed on, and the spring is arranged to bear the side of the board against the studs, the lever being arranged to draw the spike out for moving the bracket.

RAILROAD TRACK.—J. N. Farrah Pepperell, Mass., and Jacob Stone, Belvidere, N. J.—This invention relates to a new manner of supporting railroad rails with a view of preventing accidents and economizing materials. The invention consists in supporting the rails upon longitudinal metal stringers or plates which may be flanged to form safety troughs to hold the cars in case they should run off the track.

SAWING MACHINERY.—George W. Lombard, Westminster, Mass.—This invention relates to a novel construction of saw blade and machine for operating the same, and has for its object to produce a constantly operating strong and reliable saw for cutting fellies and other light work.

SNOW PLOW.—Alexander Dunbar, New York city.—This invention relates to a new snow plow, which will not be forced into the snow like a wedge to throw it aside, but will surround and gradually elevate and throw aside the column of snow to be displaced.

LIFTING JACK.—L. D. Warren, Havana, Ill.—This invention relates to a new lifting jack which is of extremely simple construction, and on which no pawls, clamps, or screws are required.

FRICTION PULLEY FOR SPRING SPINDLE.—Warren D. Huse, Laconia, N. H.—This invention has for its object to make the spindle of family or machine spinning, twisting, or spooling machinery reversible at will, so that it may readily be operated in either direction.

DRILL AND HOLDER.—Ira McLaughlin, East Arlington, Vt.—This invention relates to a new drill for boring metallic or other articles, and has for its object to provide a simple and efficient feed mechanism and a reliable and adjustable holder for the article to be bored.

COMBINED MOP AND SCRUBBER HEAD.—William H. Kline, Jersey Shore, Pa.—This invention relates to a new and useful improvement in a head for holding a mop and scrubbing brush, by means of which the laborious operations of mopping and scrubbing are greatly facilitated.

COMBINED TOOL.—G. H. Miller, Dyersburg, Tenn.—This invention has for its object to furnish an improved tool, formed by the combination of various attachments with the shank of a screw driver, to adapt it for use for various purposes.

GUARD BOLT.—Edward H. Kent, New York city.—This invention has for its object to furnish an improved guard bolt designed to be used in connection with an ordinary spring bolt to guard the door from being opened by anyone from the outside of the door who might have succeeded in forcing back the latch bolt.

SUBSOIL PLOW.—L. Carleton, Pomeroy, Ohio.—This invention has for its object to furnish a strong, durable, and effective subsoil plow, which shall be simple in construction, and easily and quickly adjusted to run at a greater or less depth in the ground, as may be desired.

MEAL CHEST OR BIN.—William B. Smith, Oskaloosa, Iowa.—This invention has for its object to furnish an improved chest or bin, for holding meal, sugar, etc., for household use, or for holding meal, sugar, spices, and other articles for store or grocery purposes, and which shall be especially serviceable where economy of space is an object.

HORSE-COLLAR FASTENINGS.—E. L. Welbourne, Union City, Ind.—This invention relates to improvements in fastenings for horse collars of the character of the fastenings for which a patent was granted to D. C. Westfall, Oct. 1, 1867, No. 69,520, and the invention consists in certain improvements in the construction and arrangement of the same.

FLUTING MACHINE.—Charles Dion, New York city.—This invention has for its object to furnish a simple and convenient machine for fluting, which shall be convenient in use and effective in operation, doing its work accurately and well.

GRAIN SEPARATOR.—William M. Redd, Hazel Green, Wis.—This invention has for its object to furnish a simple, convenient, effective, and reliable machine for separating the chaff, straw, oats, and other coarse or light substances, and fine seeds, from wheat.

Official List of Patents.

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FOR THE WEEK ENDING Oct. 18, 1870.

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108,311.—GANG PLOW.—Carell Atwood, Lebanon, Ill.
108,312.—FEED DEVICE FOR POWER PRESS.—P. E. Austin (assignor to himself and Leander Buell), New Haven, Conn. Antedated October 11, 1870.
108,313.—DUMPING CAR.—Andrew J. Ballard, Cohoes, N. Y.
108,314.—FOLDING CHAIR.—Emil Bartels, New York city.
108,315.—COMBINED COLLAR AND CUFF BOX.—J. C. Bauer, New York city.
108,316.—DOME-TOP STOVE.—Philo D. Beckwith, Dowagiac, Mich.
108,317.—VIADUCT.—Charles Bender, Phœnixville, Pa.
108,318.—LIQUID COOLER FOR COOLING LIQUIDS UNDER PRESSURE.—Edmund Bigelow, Springfield, Mass.
108,319.—MACHINE FOR BOARDING LEATHER.—M. B. Bishop, Wittingham, Vt.
108,320.—COTTON PRESS.—Sinclair Booton, Seguin, Texas.
108,321.—BOX SCRAPER.—J. R. Brown, Cambridgeport, Mass. Antedated October 1, 1870.
108,322.—BOX OR CASE TO CONTAIN BACON, HAMS, SIDES, ETC.—M. W. Brown, New York city.
108,323.—ELASTIC SHAFTING.—Robert Brown, Detroit, Mich.
108,324.—ELECTRIC BLASTING FUSE.—C. A. Browne and I. S. Browne, North Adams, Mass.
108,325.—LATHE-DOG.—Charles Buss, Marlborough, N. H.
108,326.—TRIP-HAMMER.—J. C. Butterfield and James Hay, Chicago, Ill.
108,327.—ROTARY GRATE BARS.—David Byard, Sharon, Pa. Antedated October 4, 1870.
108,328.—SUPERHEATER FOR GAS WORKS, ETC.—M. L. Callender, Brooklyn, N. Y.
107,329.—SUBSOIL PLOW.—Leonard Carleton, Pomeroy, Ohio.
108,330.—WRENCH.—James F. Cass, L'Orgnal, Canada.
108,331.—FORMING CIGAR TIPS.—Seth L. Cole, Brooklyn, N. Y.—Antedated October 15, 1870.
108,332.—CONSTRUCTION OF WATCHES.—D. G. Currier, Waltham, Mass.
108,333.—SECTIONAL STEAM GENERATOR.—Byron Densmore, New York city. Antedated October 4, 1870.
108,334.—ROOFING FABRIC.—Drake W. Denton, Ithaca, N. Y.
108,335.—VISE.—Alexander Dick, Buffalo, N. Y.
108,336.—FLUTING MACHINE.—Charles Dion, New York city. Antedated October 15, 1870.
108,337.—FINISHING COPPER PLATES.—B. F. Dudley, Boston, Mass.
108,338.—SNOW PLOW.—Alexander Dunbar, New York city.
108,339.—LAMP.—John Dunn, New York city, assignor to Holmes, Booth & Haydens, Waterbury, Conn.
108,340.—MECHANICAL MOVEMENT.—Augustus Eckert, Trenton, Ohio.
108,341.—WHEELBARROW.—James Ennis, Columbus, Ga.
108,342.—RAILWAY TRACK.—J. N. Farrah, Pepperell, Mass., and Jacob Stone, Belvidere, N. J.
108,343.—SOCKET FOR LOCK-SPINDLE.—Owen Gallagher, Boston, Mass. Antedated October 15, 1870.
108,344.—WATER METER.—Othniel Gilmore, Raynham, Mass.
108,345.—SAFETY VALVE.—H. A. Goll, Chicago, Ill. Antedated October 5, 1870.
108,346.—MATCH SAFE.—Charles Goldthwait, South Weymouth, Mass. Antedated October 8, 1870.
108,347.—CLOVER-HULLING ATTACHMENT TO THRASHING MACHINES.—Jacob H. Golladay, New Lisbon, Ohio, assignor to himself and J. W. Whidden, Rockford, Ill.
108,348.—WINDOW AND DOOR SCREEN.—David Goodwillie, Chicago, Ill.
108,349.—COTTON SEED AND GUANO DISTRIBUTER.—James T. Graves, Wilson, N. C.
108,350.—CORPSE PRESERVER.—H. V. Griffith (assignor to himself, D. W. A. Bedford, and J. M. Hileman), Altoona, Pa.
108,351.—HAND-STAMP.—H. H. H. Grosskopf, Philadelphia, Pa.
108,352.—FIRE-ALARM THERMOMETER.—Augusta Guest, Brooklyn, N. Y.
108,353.—SELF-RELEASING DAVIT-RINGS.—Augustus Guild and W. H. Pierce, Middletown, Conn.
108,354.—COMBINED EAVES-TROUGH AND LIGHTNING-RODS.—J. W. Hankenson and Winslow Baker, Minneapolis, Minn.
108,355.—TOBACCO-CASING MACHINE.—Edward Holbrook, Jr., Louisville, Ky.
108,356.—SPINNING MACHINE.—Warren D. Huse, Gilford, N. H.
108,357.—WHIFFLETREE COUPLING.—James Ives, Mount Carmel, Conn.
108,358.—SELF-ADJUSTING ROTARY COTTON-CHOPPER.—S. A. Jefferson, Franklin, Tenn.
108,359.—GUN CHARGER.—Herman Kahn, Troy, N. Y.
108,360.—COMBINATION LOCK.—F. B. Kalkbrenner, Clinton, Mo.
108,361.—GUARD-BOLT FOR LATCHES.—E. H. Kent, New York city.
108,362.—STRIKING MOVEMENT OF CLOCK.—Friedrich Kienast, Ansonia, Conn.
108,363.—ALARM-LOCK FOR MONEY DRAWERS.—George Kimball, Cleveland, Ohio.
108,364.—MOP AND SCRUBBER-HEAD.—Wm. H. Kline, Jersey Shore, Pa.
108,365.—PUMP.—Adam Knecht, Ilchester, Md., assignor to Michael Knecht, Alleghany county, Md.
108,366.—BRAKE FOR LAND CONVEYANCE.—W. T. Kosinski Philadelphia, Pa.
108,367.—BORING TOOL.—Wm. P. Lathrop, West Winsted Conn.
108,368.—GATE.—Francis Livings, East Enterprise, assignor to himself and Peter Wycoff, Cross Plains, Ind.
108,369.—FERTILIZING COMPOUND.—J. W. Lowenstein, New Orleans, La.
108,370.—SAWING MACHINE.—G. W. Lombard, Westminster Mass.
108,371.—MEDICAL COMPOUND OR LINIMENT.—J. D. Love Harrisburgh, Oregon.
108,372.—TURBINE WATER WHEEL.—W. V. Martin, Waverly, Ohio.
108,373.—BAKERS' TABLE.—A. S. Maxwell, Dixon, Ill.
108,374.—DRILL AND HOLDER.—Ira McLaughlin, East Arlington, Vt.
108,375.—PRODUCING CASTINGS DIRECT FROM THE BLAST FURNACE.—John W. Middleton, Philadelphia, Pa. Antedated October 8, 1870.
108,376.—WEATHER-BOARD GAGE.—J. M. Milhollin, Champlin, Minn.
108,377.—COMBINED TOOL.—George H. Miller, Dyersburg, Tenn.
108,378.—WATER CLOSET.—David Morrison and J. D. Smith New York city.
108,379.—BELT SHIFTER.—J. E. Mutchler, Grand Rapids, Mich.
108,380.—PNEUMATIC STREET CAR.—David Myers, Chicago Ill.
108,381.—NUT FASTENING.—Frederick Myers, New York city.
108,382.—NUT FASTENING.—Frederick Myers, New York city.
108,383.—SCREWDRIVER.—Abner Newton, Darby Creek, Ohio.
108,384.—CULTIVATOR.—C. P. Norton, Prairie City, Iowa.
108,385.—COOKING UTENSIL.—E. L. Packard, Stoughton, assignor to L. H. Packard, Boston, Mass.
108,386.—REFRIGERATOR.—Augustus H. Phelps, Trenton, assignor to Phineas E. Saunders, and M. E. Phelps, same place, and Joseph Cook, Detroit, Mich.
108,387.—MACHINE FOR MAKING ROPE.—W. G. Pike, Philadelphia, Pa.
108,388.—AGING ALCOHOLIC LIQUORS.—Hiram Purdy, Burlington, Iowa.
108,389.—OVEN.—John Rainey, Brooklyn, N. Y.
108,390.—BALANCE PENDULUM FOR CLOCK.—R. R. Ramsdell and G. A. Whitcomb, Marlborough Depot, N. H.
108,391.—GRAIN SEPARATOR.—William M. Redd, Hazel Green, Wis.
108,392.—CULTIVATOR.—Thomas M. Reed, Germantown, Ohio.
108,393.—WASHING MACHINE.—Charles W. Reeder, Trenton, Mo.
108,394.—STEAM GENERATOR AND HOT-WATER APPARATUS.—Jas. Rigby and P. A. Palmer, Marietta, Ohio.
108,395.—APPARATUS FOR THE SUPPORT OF SKATERS.—P. J. Schopp, Louisville, Ky.
108,396.—EARTH CLOSET.—Hamilton Sherman, Waverly, Pa.
108,397.—TAMPING DEVICE FOR BLASTING PURPOSES.—John Shoemaker, Putneyville, Pa.
108,398.—CULTIVATOR.—H. M. Skinner, Rockford, Ill. Antedated Oct. 12, 1870.
108,399.—DESK, BUREAU, AND CHURN POWER.—J. J. Slater Nicholsville, Ohio. Antedated Oct. 1, 1870.
108,400.—DUMPING CAR.—E. C. Smeed, Lawrence, Kansas Antedated Oct. 1, 1870.
108,401.—GYMNASTIC APPARATUS.—John Smith, St. Paul Minn.
108,402.—RAILWAY CHAIR AND CLAMP.—L. J. Smith (assignor to himself and H. D. Blake), New York city.
108,403.—MEAL CHEST OR BIN.—Wm. B. Smith, Oskaloosa Iowa.
108,404.—CAR COUPLING.—Warren B. Snedaker, Phœnix, N. Y.
108,405.—HANGING MILL STONE.—H. P. Straub, Cincinnati Ohio.
108,406.—TABLE.—Joseph Taft, Rockville, Conn.
108,407.—MACHINE FOR WASHING AND CLEANING COFFEE.—Samuel Thompson, Baltimore, Md.
108,408.—CUTTING AND ENGRAVING STONE, METAL, GLASS, etc.—B. G. Tilghman, Philadelphia, Pa.
108,409.—SHUTTLE.—H. E. Towle, New York city. Antedated Oct. 12, 1870.
108,410.—COOKING STOVE.—Alvah Traver, Troy, N. Y.
108,411.—STRAW CUTTER.—Melzer Tuell (assignor to himself and Sylvester Bowers), Penn Yan, N. Y.
108,412.—ROTARY STEAM ENGINE.—W. P. Vickery, East Auburn, Me.
108,413.—HEATING TABLE FOR SILVERING GLASS.—H. B. Walker, New York city. Antedated Oct. 1, 1870.
108,414.—LIFTING JACK.—L. D. Warren, Havana, Ill.
108,415.—COTTON PLANTER AND FERTILIZER DISTRIBUTER.—B. H. Washington, Columbia county, Ga.
108,416.—SAFETY DEVICE FOR LAMP.—H. W. M. Washington, Green Plains, Va.
108,417.—FLOUR-BOLT FEEDER.—E. J. Weaver, Sterling, Ill.
108,418.—HORSE-COLLAR FASTENING.—E. L. Welbourn, Union City, Ind.
108,419.—WAGON.—J. W. West, Saylorville, Iowa. Antedated Oct. 8, 1870.
108,420.—PAINT BRUSH.—J. L. Whiting, Boston, Mass.
108,421.—THRASHING MACHINE.—Hazen Whittier, West Roxbury, Mass.
108,422.—MILLSTONE DRESS.—J. P. H. Wohlenberg, Lyons Iowa.
108,423.—BOILER FEEDER.—Augustus R. Young, Red Wing, Minn.
108,424.—STONE-CUTTING MACHINE.—Hugh Young, Middletown, Conn., and J. L. Young, New York city.
108,425.—TOOL FOR CUTTING STONE.—Hugh Young, Middletown, Conn., and James L. Young, New York city. Antedated Oct. 1870.
108,426.—STEAM ENGINE.—Hugh Young, Middletown, Conn. and J. L. Young, New York city. Antedated Oct. 8, 1870.
108,427.—TREADLE MOTION.—Arthur M. Allen, New York city.
108,428.—TRUSS.—H. R. Allen, Indianapolis, Ind.
108,429.—METHOD OF FORMING BIFURCATED END OF RAILWAY CROSSINGS.—Joseph Armstrong, Brinsworth, England.
108,430.—LANTERN.—C. S. S. Baron and A. L. Baron, Bell Air Ohio.
108,431.—CLOTHESLINE OPERATOR.—Chas. Barron, La Fayette, Ind.
108,432.—APPARATUS FOR CARBURETING AIR AND GASES.—Abraham Bartholf, New York city.
108,433.—TREATING THE ORES OF LEAD AND ZINC FOR THE MANUFACTURE OF PIGMENTS, ETC.—E. O. Bartlett, Birmingham, Pa.
108,434.—APPARATUS FOR LIGHTING AND EXTINGUISHING GAS BY ELECTRICITY.—Frank Bean, Somerville, assignor to E. C. Bean Boston, Mass.
108,435.—MACHINE FOR CUTTING SOLES, FOR BOOTS AND SHOES.—J. H. Bean, Marietta, Ohio.
108,436.—TURBINE WATER WHEEL.—E. R. Beardsley, Aroma, Ill. Antedated Oct. 15, 1870.
108,437.—MANUFACTURE OF OIL-CLOTH.—William Berri, Jr., Brooklyn, N. Y.
108,438.—SASH HOLDER.—G. W. Bishop, Saratoga Springs, N. Y.
108,439.—MACHINE FOR DRESSING SPOKES.—R. H. Boynton and H. S. Boynton, Oshkosh Wis.

108,440.—Blinds for Harness Bridles.—John L. Brown, Connellsville, Pa.
108,441.—Hubs for Carriages.—Norman Bryan (assignor to himself and W. Sawyer), Thomaston, Ga.
108,442.—Attachment to Mills.—Norman Byran (assignor to himself and W. Sawyer), Thomaston, Ga.
108,443.—Window.—Thomas Bullivant, Ledbury Road, Bayswater, England.
108,444.—Plow.—W. T. Bunn, Humboldt, Tenn.
108,445.—Cotton-seed Planter.—M. S. Burns, Memphis, Tenn.
108,446.—Hoisting Block.—J. A. Burr, Brooklyn, N. Y., assignor to Burr & Co., New York city.
108,447.—Bed Bottom.—Edwin L. Bushnell, Poughkeepsie, N. Y.
108,448.—Milk and Liquor Cooler.—A. P. Bussey, Westernville, N. Y.
108,449.—Work Table.—Fannie M. B. Clark, Wilmington, Vt.
108,450.—Cotton Bale Tie.—Michael R. Clark, Columbia, S. C.
108,451.—Composing Stick.—A. F. Cloudman, Brooklyn, N. Y., and G. W. Coffin, Charlestown, Mass.
108,452.—Steam Fire Engine.—E. R. Cole and H. S. Cole, Pawtucket, R. I.
108,453.—Medical Compound for Hog Cholera.—T. L. Cotten (assignor to Martha J. Cotten), Madison county, Miss.
108,454.—Boat-detaching Apparatus.—J. C. Cottingham, Philadelphia, Pa.
108,455.—Pen.—Germond Crandell, Washington, D. C.
108,456.—Washboard.—Aylett R. Crihfield, Lincoln, Ill.
108,457.—Folding Bedstead.—Mark Crosby, Boston, Mass.
108,458.—Machine for Ornamenting and Lettering Looking-glasses, Signs, etc.—W. M. Davis, Brookhaven, asignor to himself and S. S. Norton, Brooklyn, N. Y.
108,459.—Heating Stove.—Isaac De Haven, Allegheny City, Pa.
108,460.—Car Starter.—David A. Dickinson, Baltimore, Md.
108,461.—Cotton Picker.—B. I. Dreeson, Marion county, Texas.
108,462.—Treating Copper Pyrites.—C. Marie Tessie Du Motay, Paris, France.
108,463.—Table Cutlery.—E. G. Durant, Northampton, Mass.
108,464.—Ventilator.—E. J. Durant, Lebanon, N. H.
108,465.—Hoe.—Augustin Ellis and Oliver Albertson, Salem, Ind.
108,466.—Key for Door, etc.—H.H.Ellwell, South Norwalk, Conn.
108,467.—Self-acting Mule, etc., for Spinning.—James Entwistle, Conshohocken, assignor to himself and John Parkinson, Philadelphia, Pa.
108,468.—Corn Planter.—Robert Erdly, Selin's Grove, Pa.
108,469.—Manure Distributer and Seed Sower.—S. L. Fraser, West Town, N. Y.
108,470.—Bed Bottom.—Safford B. Freeman, Burlington, Iowa.
108,471.—Cultivator.—Julius Gerber, Rockford, Ill.
108,472.—Bedstead Fastening.—Edward F. Gilbert, Lyons, N. Y.
108,473.—Chain.—John Good, Brooklyn, N. Y.
108,474.—Copper Paint for Ships' Bottoms, etc.—T. F. Griffin and Robert Tarr, Jr., Gloucester, Mass.
108,475.—Changeable Gage Car Wheel.—Jonas Hamilton and G. F. Morse, Portland, Me.
108,476.—Cotton Plow and Planter.—John H. Hannon, Halifax, N. C.
108,477.—Spring Cushion for Car Seats.—W. B. Hatch, Elmira, N. Y.
108,478.—Adjustable Harrow.—Abraham Havens, Trenton, N. J.
108,479.—Machine for Marking Carpenters' Squares.—Albert M. Healy, Berlin, Conn., and Charles H. Raymond, Woodstock, Vt., assignor to the Southington Cutlery Company, Southington, Conn.
108,480.—Weather Strip.—Coleman Hicks, Lancaster, Ky. Antedated Oct. 8, 1870.
108,481.—Permutation Lock.—J. C. Hintz, Jr., Cincinnati, Ohio.
108,482.—Water Wheel.—David O. Holman, Adams, N.Y.
108,483.—Ladder.—John Hughes, New Berne, N. C.
108,484.—Corn-husking Machine.—M. C. Jeffers, New York city. Antedated Oct. 15, 1870.
108,485.—Subsoil Plow.—J. Harvey Johnson, Bentonville, Arkansas.
108,486.—Ruffling Attachment for Sewing Machine.—Allen Johnston, Ottumwa, Iowa.
108,487.—Manufacture of Paper Stock.—Morris L. Keen, Jersey city, N. J., assignor to himself and Samuel A. Walsh, New York city.
108,488.—Plow.—H. M. Keith, Commerce, Mich.
108,489.—Instrument for Clipping or Shearing Horses, etc.—Henry Knight, Ryde, Isle of Wight, England.
108,490.—Potato Digger.—M. W. Knox, Sheridan, N.Y.
108,491.—Shoe Fastening.—Harvey T. Lee, Marysville, Cal.
108,492.—Ruffler for Sewing Machine.—A. M. Leslie, Chicago, Ill.
108,493.—Strap-bolt for Wagon Bed.—W. J. Lewis and H. W. Oliver, Jr., Pittsburgh, Pa.
108,494.—Iron Safe.—Lewis Lillie, Clinton, N. J.
108,495.—Arrangement of Electrical Circuits for Automatic Transmitting Instrument.—George Little, Rutherford Park, N. J.
108,496.—Chemical Telegraph.—George Little, Rutherford Park, N. J.
108,497.—Wall Protector.—Benj. K. Maltby, Cincinnati, Ohio.
108,498.—Egg and Cake Beater.—H. S. Maltby, Cincinnati, Ohio.
108,499.—Apparatus for Separating Gas Tar and Ammoniacal Liquor.—E. D. McCracken, New York city.
108,500.—Cotton Gin.—Robert McKenna, White's Station, Tenn.
108,501.—Slide Door for Heating and Puddling Furnace.—Samuel McLaughlin, Philadelphia, Pa. Antedated Oct. 8, 1870.
108,502.—Die for Swaging Wrench.—Thomas Meikle, Louisville, Ky.
108,503.—Mortising Machine.—L. G. Merrill, Angels, Cal.
108,504.—Medicine.—Ezra Miller, New York city.
108,505.—Manufacture of Confectionery.—George Miller and C. B. Miller, Philadelphia, Pa.
108,506.—Bottle Stopper.—William Morgenstern (assignor to himself and Franz Otto), New York city.
108,507.—Boat-detaching Apparatus.—M. V. Nobles, Elmira, N. Y.
108,508.—Medical Compound.—W. W. Oglesby, Benton County, Oregon. Antedated October 8, 1870.
108,509.—Manufacture of Paper.—C. E. O'Hara, New York city.
108,510.—Coating the Interior of Pipes, Tubes, etc., with Silver or Other Metal by the Electro-depositing Process.—Dubois Parmelee, New York city.
108,511.—Brick Machine.—Zelora Phillips, Osseo, Mich.
108,812.—Fastening for Shovels for Cultivators and Plows.—Joshua Pierpont and S. S. Tuttle, La Harpe, Ill.
108,513.—Switch for Galvanic Battery.—E. M. Pierson, Newark, N. J., assignor to E. D. McCracken, New York city.
108,514.—Manufacture of Sugar.—Juan Poey, Havana, Cuba.
108,515.—Back-lash for Mill Gearing.—J. L. Post, Ashley, Ill.
108,516.—Gang Plow.—J. L. Purcell, Thompson, Ill.
108,517.—Bakers' Oven.—John Rayney, Brooklyn, N. Y.
108,518.—Cotton and Corn Cultivator.—Moses Reed, Little Rock, Ark.
108,519.—Construction, Jointly, of Fire Beds and Tweers.—P. H. Roots and F. M. Roots, Connersville, Ind.
108,520.—Brooch Fastening.—William Sackermann, New York city.
108,521.—Manufacture of Wrought Iron.—Charles Sacre, Manchester, Stanhope Perkins and William Smellie, Gorton, Kingdom of Great Britain.
108,522.—Stop Valve.—Robert Safely, Cohoes, N. Y. AnebtdOedateotcı 15, 1870.
108,523.—Dyeing Woolen Goods.—W. W. Sanborn (assignor to himself and A. A. Sanborn), Lewiston, Me.
108,524.—Kitchen Boiler.—W. B. Scaife, Pittsburgh, Pa.
108,525.—Vegetable Cutter.—Henry Seib, New York city.
108,526.—Children's Dining Chair.—Addison Smith, Perrysburg, Ohio. Antedated Oct. 8, 1870.
108,527.—Lamp Chimney Cleaner.—A. D. Smith, Grafton, Ohio.
108,528.—Vapor Burner.—C. E. Smith, Columbus, Ohio.
108,529.—Water Wheel.—I. W. Snyder, Dryden, N. Y.
108,530.—Machine for Making Horse Shoes.—J. H. Snyder, Troy, N. Y.
108,531.—Steam Heater.—D. E. Somes and F. C. Somes, Washington, D. C.
108,532.—Separating Attachment for Husk-hackling Machine.—G. B. Stacy, Richmond, Va.
108,533.—Friction Pulley.—Joseph Steger, New York city.
108,534.—Device for Holding Open Doors.—J. B. Sweetland, Pontiac, Mich.
108,535.—Chuck.—J. F. Thomas, Ilion, N.Y.
108,536.—Bee Hive.—E. B. Turnipseed, Columbia, S. C.
108,537.—Potato Digger.—Nicholas Vandenburgh, Schuylerville, N. Y.
108,538.—Sink.—Samuel Walsh, New York city.
108,539.—Adjustable Gear Wheel.—W. H. Ward, Auburn, N. Y.
108,540.—Manufacture of Soap.—Alexander Warfield, Philadelphia, Pa.
108,541.—Machine for Cleaning and Separating Grain.—Frederick Wegmann, Naples, Italy.
108,542.—Manufacture of Box, Cartridge Case, etc.—C. S. Wells, Springfield, Mass.
108,543.—Cartridge.—D. E. Williams, Davenport, Iowa.
108,544.—Tire-setting Machine.—J. H. Williams, Pleasant Hill, Ohio.
108,545.—Sled Brake.—James Willis, Mifflin, Wis.
108,546.—Separator of Thrashing Machine.—Aaron Wissler, Brunnerville, Pa.
108,547.—Mechanical Movement.—Jacob Woolf, Burr Oak, Mich.
108,548.—Time Table Indicator.—Leander Wright, Rochester, N. Y. Antedated October 15, 1870.
108,549.—Composing Stick.—R. C. Young (assignor to O. F. Grover), Middletown, Conn.
108,550.—Treating Shellac.—August Zinsser, New York city.

REISSUES.

4,155.—Hydrant.—William Bailey, Troy, N. Y.—Patent No. 48,504, dated July 4, 1865.
4,156.—Auger.—W. A. Ives, New Haven, Conn.—Patent No. 95,803, dated October 12, 1869.
4,157.—Cooking Stove.—S. H. La Rue, Allentown, Pa.—Patent No. 103,204, dated May 17, 1870.
4,158.—Preserving and Hardening Wood.—J. L. Samuels, for himself and B. F. Josselyn, W. B. Lake, G. G. Burnett, H. S. Dent, M. A. Stirling, G. W. Dent, J. S. Josselyn, and B. R. Nickerson, San Francisco, Cal., and F. T. Dent, Washington, D. C., and H. J. Stone, New York city, assignees of J. L. Samuels.—Patent No. 60,794, dated January 1, 1867.
4,159.—Ochers for Paints.—D. S. Wood, Tiskilwa, Ill.—Patent No. 106,643, dated August 23, 1870.

DESIGNS.

4,419.—Ornamentation of Glassware.—Charles Ballinger (assignor to McKee & Bros.), Pittsburgh, Pa.
4,420.—Carpet Pattern.—Jonathan Crabtree (assignor to John Gay), Philadelphia, Pa.
4,421.—Clock Case.—Robert Dunn, Brooklyn, N. Y., assignor to the Waterbury Clock Company, Waterbury, Conn.
4,422.—Clock Case Sash.—S. B. Jerome (assignor to Samuel Peck & Co.), New Haven, Conn.
4,423.—Box for Bureau.—Cheney Kilburn (assignor to Kilburn & Gates), Philadelphia, Pa.
4,424.—Shoe.—G. H. Maynard, Berlin, Mass.
4,425.—Fire-place Stove.—J. R. Rose and Edward Calely, Philadelphia, Pa., assignors to S. B. Sexton, Baltimore, Md.
4,426.—Buckle.—J. E. Smith, Waterbury, Conn.
4,427.—Key-ring Tag.—Nelson Stafford, Brooklyn, N. Y.

Inventions Patented in England by Americans.

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

PROVISIONAL PROTECTION FOR SIX MONTHS.

2,411.—Recording Pressure Gage and Alarm Apparatus.—M. B. Edson, New York city. September 3, 1870.

2,415.—Machinery for Cutting Loaf Sugar into Cubes.—G. H. Mollers, New York city. September 5, 1870.

2,419.—Lubricator.—W. Gee, New York city. September 6, 1870.

2,425.—Fertilizers.—Campbell Morfit, Baltimore, Md. September 7, 1870.

2,427.—Machinery for Making Type.—W. W. Dunn, San Francisco, Cal. September 7, 1870.

2,456.—Weighing Machines.—H. Fairbanks, St. Johnsbury, Vt. September 12, 1870.

2,458.—Apparatus for Distilling Oils.—H. F. Howell, St. Catharine's Canada. September 12, 1870.

1,907.—Bearing Surfaces.—E. D. Murphy, New York city. July 14 1870.

2,414.—Steam Boilers.—J. B. Root, New York city. September 5, 1870.

2,433.—Pipe Joints.—W. C. Allison, Philadelphia, Pa. September 8, 1870.

2,434.—Tube Expander and Cutter.—T. T. Prosser, Chicago, Ill. September 8, 1870.

2,443.—Reaper and Mower.—W. A. Wood, Hoosick Falls, N. Y. Sept. 9, 1870.

2,449.—Apparatus for Ironing and Goffering Fabrics.—S. C. Smith Chicago, Ill. September 10, 1870.

2,457.—Machinery for Making Paper Bags.—A. Mason, Boston, Mass. September 10, 1870.

2,477.—Fastening for Garments, etc.—J. E. Dallon, Brooklyn, N. Y. September 14, 1870.

2,486.—Microscopic Apparatus.—J. L. Oliver, Boston, Mass. September 15, 1870.

2,257.—Type Casting, Breaking, Rubbing, and Setting Machine.—J. A. T. Overend, San Francisco, Cal. September 29, 1870.

2,528.—Valve Gear for Steam Engines.—D. F. Mosman, Chelsea, Mass. September 20, 1870.

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OVERCOATS, $50.		BOYS' SUITS, $15.

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