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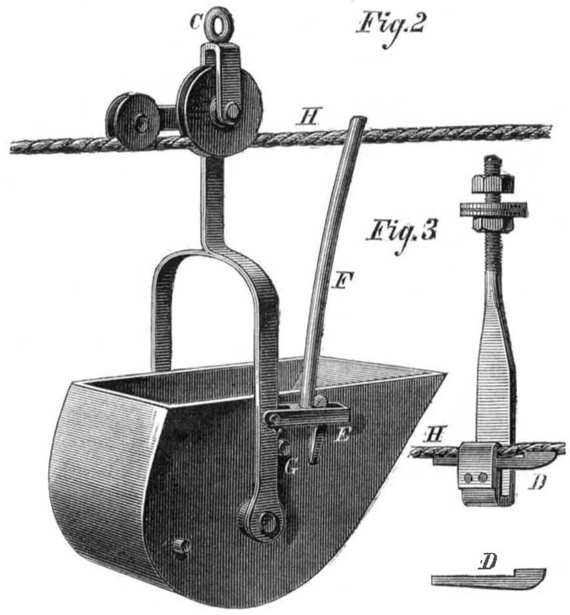
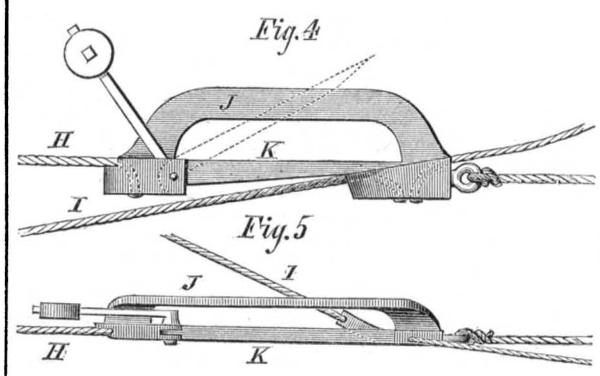
HAVENS' AUTOMATIC WIRE ROPE RAILWAY.

Our illustrations represent a novel and ingenious invention, or rather combination of devices, having for its object the speedy, cheap, and economical transportation of merchandise, of any description, directly from vessel to storehouse, yard, or dock, or between different points of the latter localities. It consists chiefly in a suitably supported

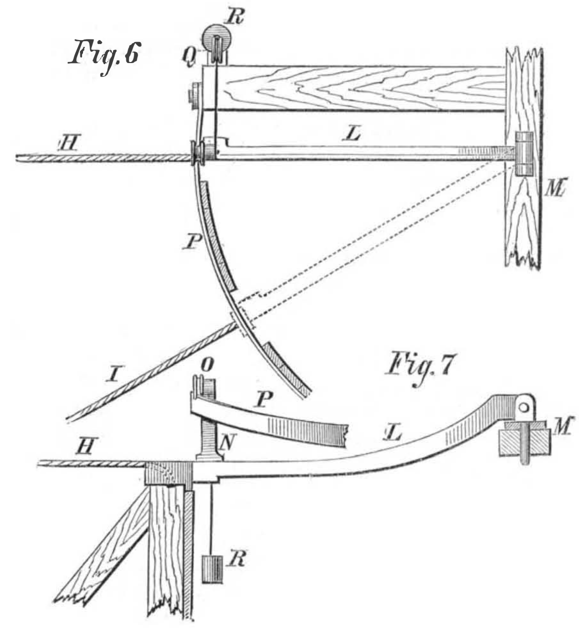


wire rope, over which, by the action of gravity alone, buckets slide to the desired place of deposit of their contents. Discharge follows, and then, by an ingenious switch arrangement, the receptacle is shifted to another rope, along which it returns to its starting point to be refilled. There are other devices, for sending the charged bucket from the end of the first rope as a center to any part of a yard or other storing place, which will be explained as we proceed.

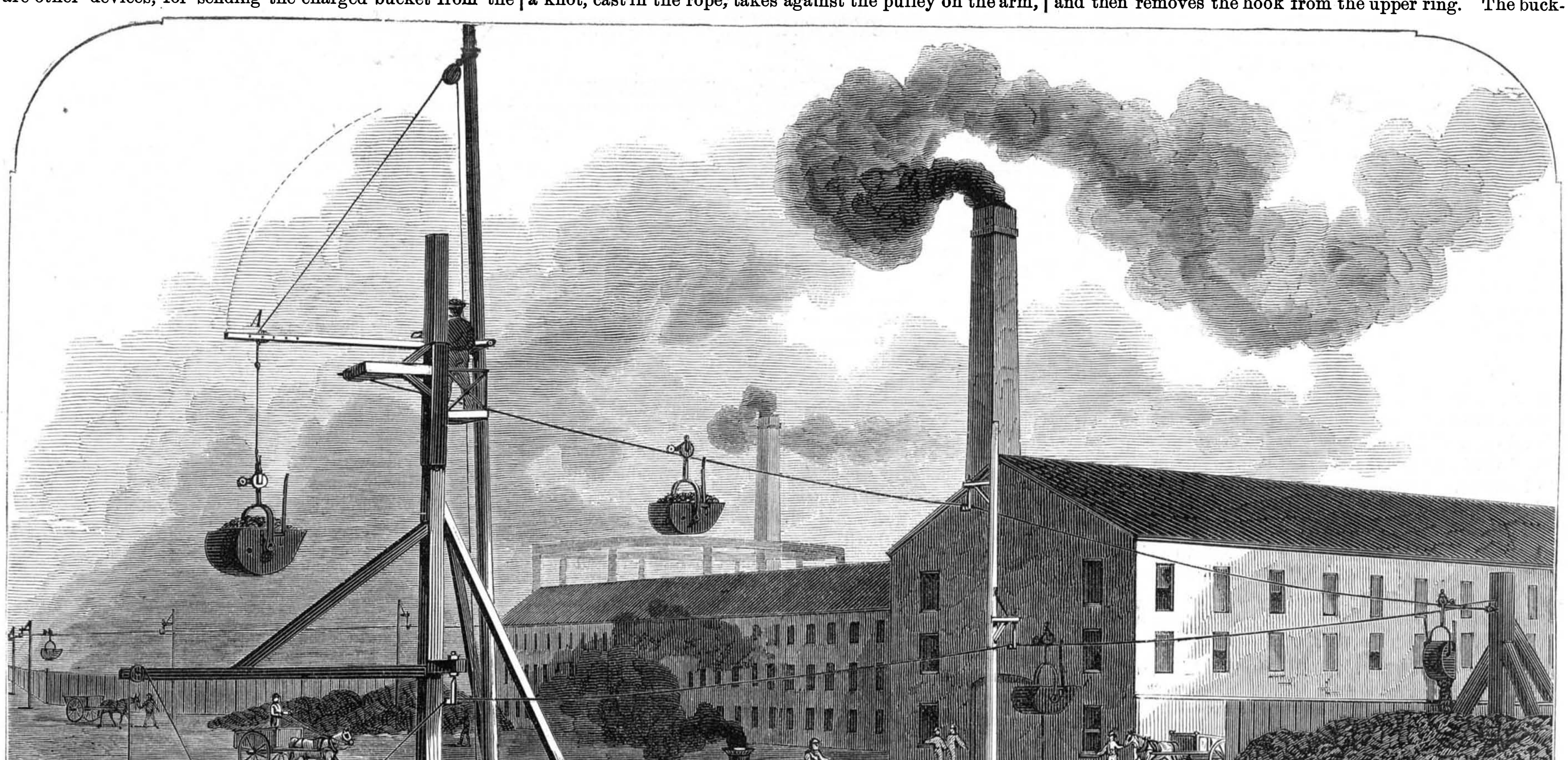
In our large engraving, which gives a general view of the apparatus in operation, the invention is represented as in use as a coal railway, taking the coal directly from the barge and dumping it at a considerable distance away. Two tall poles, it will be observed, are placed close to the edge of the wharf. One is provided with a platform on which a workman is standing, and also a suitable support to which the outrigger, A, is pivoted, so that the latter, moving only in a vertical plane, can be swung into a perpendicular position.



The other and taller pole carries at its upper extremity a pulley, over which the hoisting fall passes. This rope leads from the drum of the hoisting engine (which, by the way, is of a novel and improved form, and is also the invention of the originator of the apparatus we are describing) through a block on the ground up over the pulley on the pole, and thence through a sheave or similar arrangement on the end of the arm, A. The end of the rope is hooked to the ring, C, of the bucket, shown in Fig. 2. The engine being set in motion, the filled receptacle is hoisted from the barge until a knot, cast in the rope, takes against the pulley on the arm, A, preventing the further passage through of the line. Movement is thus imparted to the outrigger, and it is swung from its horizontal to a vertical position, thereby bringing the bucket directly over the upper of the two wire ropes shown in the engraving. It will be observed, from Fig. 2, that the bale of the bucket is connected to an iron bar



which terminates above in two rollers, the smallest of which serves to guide the larger, as both rest upon and glide over the rope. The receptacle being in the position above described, the hoisting fall is slackened, and the workman on the platform guides the rollers directly on the wire rope, and then removes the hook from the upper ring. The buck-



HAVEN'S AUTOMATIC WIRE ROPE RAILWAY.

et, now full, begins its downward course, and, acted on by gravity, travels down to the end of the rope.

Before proceeding further, it will be well to notice the arrangements for supporting the wire lines in order to keep them from sagging along their length. This is accomplished by clips, Fig. 3, one of which for each rope is attached to a midway post. The lower end of this device is turned up and shod with a metal plate. The line fits, as shown, in an inside groove, and is there secured by a key, D, driven firmly in. This means of support clearly offers no obstruction to the passage of the bucket rollers, and still holds the line up firmly in position. The usual nuts, screw, and washers, serve to attach the clip to its post.

We left the filled bucket near the end of the upper line; and supposing it to have arrived over the coal heaps, it is ready to discharge its contents. Referring once more to Fig. 2, pivoted to the side of the bale is a slotted piece, E, which slips over an upwardly projecting stud, thus holding the bucket in the position shown. Attached to piece, E, is a rod, F. The construction of the bucket is such that the rear or bottom curved portion is the heavier, so that, when empty, its tendency would be to invert to the left of the engraving; but this is prevented by a lug, G, which takes against the bale, so that the receptacle naturally assumes a level position. When, however, it is full, the delivery side overbalances the other; and to prevent its turning over and thus discharging, the catch, E, is used. If, therefore, the filled bucket be started down the rope, it will hang square until the rod, F, strikes some obstacle and, thus pushed back, swings up the catch. Discharge immediately takes place, as shown in the large engraving, and then the bucket reassumes its level position, the piece or catch, E, falling naturally back again over the projection on the side.

The empty receptacle will now have arrived at the end of the upper rope and is ready to start on its return along the lower line. In Figs. 4 and 5 vertical and plan views, the switch mechanism is represented. H is the upper wire rope, and I the lower one. J is a peculiarly shaped metal arrangement, to which both of the above mentioned ropes are secured, as represented by the dotted lines. Pivoted to J is a tongue, K, directly in line with the rope, H; and this tongue is counterbalanced by a weighted lever which ordinarily holds it in the position indicated by the dotted lines. When the bucket comes rolling from the left along the rope, H, its wheels strike this tongue; and pushing it down so that its further end rests against the opposite side of the piece, J, they run over it and up and along the line which forms a continuation of the rope, I. That is, the bucket runs up hill until its motion is arrested, when of course it takes up a return movement. As soon, however, as the bucket clears the tongue, the weight on the latter pulls it up again; so that, when the returning bucket reaches the piece, J, the tongue no longer forms a bridge between the opposite ends. The bucket is therefore compelled to continue straight on down the rope, I, which, as shown at K, in both Figs. 4 and 5, forms a downward path leading off at an acute angle.

If the reader will refer again to the large illustration, he will see the empty bucket on its returning course near the middle post. The lower rope is firmly secured at its end to a hanger on the pole, which forms the starting point of the apparatus, but is continued by another line, B, which leads out along an arm, passes over a pulley, and ends in a weight which keeps it taut. On this line the bucket runs and necessarily drags it down, its weight counterbalancing that on the rope, so that it is gradually eased down into the hold of the vessel. Here the fillers remove it from the line, and then, by suitable means, allow the latter to become gradually once more taut.

In Figs. 6 and 7 are shown the plan and elevation of the turntable device, by means of which a bucket may be transported to any desired point in the yard. L is a curved metal arm connected to a support, at M, to two pivots, transverse and vertical, so that it has free movement in both of these directions. At its opposite end is affixed a standard, N, Fig. 7, on top of which is arranged a small roller, O. Fastened to the solid framework of the device is a metal band or track, P, which has a curve conformable to a circumference, described with the arm, L, as a radius, as shown in Fig. 6, and also, besides, a downward bend, as shown in Fig. 7. On this band, the roller, O, rests, and thereby supports the arm, L, hanging beneath. At the upper part of standard, N, and near the roller is secured a cord which, passing over a pulley, at Q, terminates in a weight, R. The object of this arrangement is to draw the arm, L, up automatically to the highest point of the curved band, P, or in the position of Fig. 6. When thus placed, the end of the upper wire rope, H, directly meets the end of the arm, L. Consequently a bucket sliding along rope, H, will run up on the arm until its motion is stopped by the ascent and then start down again. Meanwhile the under rope, I, has been connected so as to coincide with the bar, if the latter were carried over (its upper roller running on P) to the position marked by the dotted lines. The bucket, however, it is evident, running back over the arm, L, would fall from the end, unless prevented, while the arm was being shifted. This difficulty is obviated by arranging boards inside the track, P, against which the receptacle takes and is stopped. At exactly the point, however, where the dotted arm and rope, I, coincide, an opening is made out of which, of course, the bucket escapes and travels away down rope, I, to the desired point. The boards inside the track may be made movable so that, rope, I, being attached at any place, a suitable opening can be easily made.

It is hardly necessary to explain the advantages of this very ingenious apparatus, since, we think, they are obvious from the details of the description. The fact may be noted, however, that this device differs from many others of its class, in that the road itself does not move, endless belt fashion, but merely the buckets. Hence a single line may be put up, supported at intervals as we have described, for almost any length; and then the buckets can be dragged over it by connecting a light endless cord or equivalent arrangement.

The absence of cumbrous trestle work or staging, and of elevated or underground tracks, is a point of merit, as is also that of gravity being the sole agent for performing the work. As to its employment the inventor considers the arrangement especially adapted to retail coal yards, on account of its portability and economy. An attachment, he states, may be applied to weigh and register the weight of each bucket passed over the rope, so the only power required is that needed to hoist it to the necessary elevation.

The device is covered by several patents, and is the invention of Mr. A. F. Havens, a well known engineer of this city. Further information regarding right to use, etc., may be obtained of the proprietors, the American Gas Works Construction and Supply Company, room 33, 61 Broadway, New York city.

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Contents.

(Illustrated articles are marked with an asterisk.)

THE VIENNA PATENT CONGRESS ONCE MORE.

It will be remembered that this body, after long discussions, adopted a series of resolutions affirmatory of the duty of all nations to encourage the arts and sciences by the grant of patents to inventors, in reward for useful discoveries, specifying also the various legal provisions by which inventive rights ought to be secured. But the Congress then proceeded to destroy the practical value of its labors by adopting as its final resolution the absurd proposition that inventors ought not to be allowed to sell their patent rights except at such rates as government officers might dictate.

The most singular circumstance connected with the passage of this silly proposition is, that it was supported and its adoption secured by American votes. Mr. R. W. Raymond, of the *Engineering and Mining Journal*, who was a delegate, is our authority for this statement. He says that the American party was strong enough in numbers and in logic to defeat the obnoxious resolution, and would have succeeded in doing so had not two of their number, Hamilton Hill of Boston and Mr. Hall, changed their minds during the night, and voted next morning with the opposition. These gentlemen palavered at a great rate during the five days' discussions in favor of granting liberal rights to inventors, and then, at the last, they changed front and voted against the essential thing for which they had been arguing. It is to be hoped that American inventors may never again be misrepresented by such a pair of incompetents.

MANUFACTURE OF ILLUMINATING GAS FROM CRUDE PETROLEUM.

The Pittsburgh *Commercial* states that the method discovered by Mr. Charles Gearing, of that city, has been put into successful practical operation at Sharpsburg, Pa., and the borough is now admirably lighted by gas made from crude petroleum oil, 8,000 feet of gas being produced from one barrel of the oil.

As the subject is one of great importance, not only to the inhabitants of our towns and cities, who need good light at a cheap price, but also to gas companies and oil producers, we will give a few details of the Gearing process, from which practical gas men may, in some degree, judge of its actual merits. To us it looks like a good improvement, worthy of the careful investigation of all who are interested in the extensive branch of industry to which it pertains.

In the simpler form of the Gearing apparatus, some seven retorts are employed in connection with one furnace. These retorts have double chambers, made by enclosing small cylinders within other cylinders of large diameter. The inner cylinders are filled with pebbles, the object of which is to provide very extensive heating surfaces. A jet of steam and air is, by means of an injector, introduced at one end of the first of the series of retorts, and then passes on through the pebbles, successively into and through three other retorts, until the steam and air are thoroughly dried and heated; thence the jet goes into contact with the crude petroleum in another retort and takes up therefrom a supply of the oil vapor, thence on successively through three other retorts contained in the furnace, where the final heating takes place, thence into the gas holder. The operation is simple and continuous. The peculiar construction of the retorts is alleged to prevent loss of oil by conversion and deposit into solid carbon, the only resulting deposits in the retorts being the sand usually found in crude oil, with some other foreign matters.

A company has been formed, we understand, to put this process in operation in Titusville, Pa. We shall look with much interest for the practical results. The success of this or any other method of employing crude oil for permanent gas illumination would create an immense demand for the article and give relief from the depressing effects of over production under which the oil market now suffers.

THE DEPARTMENT OF PARKS, NEW YORK CITY.

Mr. S. H. Wales, formerly of the SCIENTIFIC AMERICAN, has recently been chosen President of the Department of Parks in this city, with a salary of $10,000 a year. This is a post of much responsibility, the duties of the office are onerous and varied, and their discharge with satisfaction to the public requires the exercise of marked ability on the part of the incumbent. Happily for Mr. Wales, he retired some time ago from active business life, and is therefore enabled to devote his whole time, if need be, to the important functions that now devolve upon him, and which, we are glad to say, are especially congenial to his tastes. In æsthetics Mr. Wales is a gentleman of the highest cultivation, a lover of science, an extensive traveller, a careful observer and an indefatigable worker. He possesses, moreover, an intuitive appreciation of the wants of the people; he is an approachable man, and a gentleman of the noblest integrity. His administration is, therefore, likely to prove not only popular but most useful. His unanimous election as President reflects the highest credit upon his associate commissioners.

The general scope of the powers and labors of our Department of Parks is not generally understood, and is far more extensive than is commonly supposed. It embraces the custody of twenty-four parks, covering an area of more than 1,000 acres, of which the Central Park has cost nearly $12,000,000. The work also includes the surveying and laying out of all streets and avenues north of 59th street, the hydrographical surveys of the Harlem river, the care of bridges across the river, the building of tunnels and suspension bridges, and the establishing of bulkhead lines. It also takes in the surveying and laying out of streets and avenues in the adjoining towns of Kingsbridge, West Farms and Morrisania; and upon the annexation of those towns, the regulation and grading of streets and avenues, drainage, etc., will belong to the Department. It has charge of the construction of the Museums of Natural History (the two structures now in progress costing $500,000 each), also the care of these museums and of an observatory. All these require the constant service of a large force of architects, engineers and laborers (some 1,500 in all.) A distinct police force is also maintained by the department. It also runs a menagerie, and an exotic and plant-propagating department, which requires many skilled gardeners. In addition to these the Department employs blacksmiths, tailors, carpenters, painters, plumbers, stonecutters, masons, etc.

The ordinary expense of maintaining the parks is about $500,000 per annum; and for construction of works, $1,000,000 was appropriated for the year 1873. The Commissioners are now laying out and constructing two new parks (Riverside and Morning Side); and in short the details are very numerous.

From the foregoing, which is only an outline of its labors, it will be seen that the Department of Parks is one of the most important institutions in our midst. The effective management of its extensive concerns involves more real labor, watchfulness and ability, on the part of its executive, than almost any other department of municipal or state government.

CHEMICAL SUGAR.

Dealers and manufacturers of the important article of sugar have lately experienced a disturbance of the even tenor of their ways by the announcement of a new chemical discovery, by which saccharine commodities may be produced as by magic, without the troublesome and expensive methods of cane growing and grinding. The new discovery is credited to M. Jouglet, a French engineer, and his process is alleged to involve the mere bringing together of certain common and cheap articles, from which the best qualities of sugar are rapidly and economically produced. The process is claimed to be the subject of a patent, which is at present in the hands of a large company.

We imagine that the stock of the company will be for sale on the market a long time in advance of the sugar, and we advise sugar manufacturers not to shut up their existing establishments just at present.

There is undoubtedly room for improvement in the manufacture of sugar, and many diligent students are engaged upon the subject. Every year adds to our knowledge and facilities for conducting this great industry, which is so extensive and involves so much capital, that the smallest economical advance, in any of its processes, is a matter of importance to the world. But we should about as soon expect to see the steam engine superceded by the hot air machine, as to find the present sugar processes set aside by the novelty now announced.

The production of sugar by chemical means from various materials, is by no means a new thing, having long been practiced. Thus starch, treated with warm diluted sulphuric acid, is converted into sugar. It is cheaply produced, and an extensive manufacture is carried on. This product is known as grape sugar, or glucose, and the only drawback to its substitution for cane sugar is the fact that grape sugar has only half the sweetening power of the cane. Starch sugar is employed to adulterate honey and cane sugar, and is used in lieu of the latter in various saccharine preparations.

The cheap and common materials suggested by this French engineer may refer to rags or other refuse containing woody fiber, such as cotton wool, paper, etc. Exhaustive attempts have heretofore been made by chemists to induce people to eat their linen rags, after a cooking which converts them into sugar. This consists in treatment with sulphuric acid, by which means a fine crystaline article of sugar may be produced from old collars and shirt tails. But rag sugar, like that from starch, lacks sweetness, and the stuff is unsuited for the popular taste.

TIDINGS FROM THE MISSING ARCTIC EXPLORERS.

The United States steamer Juniata has arrived at Newfoundland, bringing news that the steamer Tigress, the vessel which was sent by our Government in search of the survivors of Captain Hall's expedition, had found and visited their last winter encampment, near Littleton Island, Greenland, in latitude 78° 23'.

It will be remarked that the statement of the persons belonging to the Hall expedition, who were rescued from the ice this spring, after floating southward for several months, was to the effect that, when they last saw their vessel, the Polaris, she was at anchor near the shore, with sails furled, and they were astonished that she did not come to their rescue.

It now appears from the statement of the natives that the Polaris was so badly injured as to be incapable of movement, and Captain Buddington and party took to the shore. Here they wintered in good health; and this spring they built a pair of whale boats, and on the 1st of July launched out southward, intending to find their way home by intercepting some of the whaling vessels that visit Baffin's Bay. These are the latest tidings of the missing men, who are supposed to be safe on board some one of the whalers, now cruising in that vicinity and soon to return home. The Tigress has gone from Disco on a new search among the whalers, to find the Buddington party if possible. The natives say that when Captain Buddington left he presented the wreck of the Polaris to them; but in about a month afterwards, during a gale, the ship was carried off shore and sunk.

FAILURE OF THE BALLOON TO EUROPE.

The departure of Professors Wise and Donaldson on their proposed aerial flight to Europe was brought to an adjournment, *sine die*, on the 12th instant, by the sudden collapse of their balloon, which unfortunately proved to be deficient in strength. The day above mentioned was most beautiful and auspicious for a balloon ascent. The air was clear, the wind gentle, the preparations complete. Early in the day it was announced by the Messrs. Goodsell, the projectors, proprietors of the *Graphic*, that the inflation had begun and that the balloon would start in the afternoon, from the Capitoline grounds, Brooklyn. Yielding to the urgent written petition of many of our prominent but verdant citizens, the Messrs. G., reluctantly, of course, consented to admit a few select thousands of spectators to the grounds, at 50 cents per head and 50 cents extra for reserved seats, to witness the ascension.

We regret to say that the veteran aeronaut, Professor Wise, who in the early stages of the enterprise expressed his unlimited confidence in the use of the gigantic balloon, who was in fact the consulting engineer for the apparatus from the very beginning, and who, in several public letters, announced the brave intention of going up in the machine, came to the conclusion, towards the last, that the apparatus was unsafe, and declined to risk his life in the car. He left the grounds before the final catastrophe occurred. Professor Donaldson, however, who is afraid of nothing, stuck to his post, determined to go up if such a thing were possible. So the inflation proceeded, and the gigantic bag, over 100 feet in diameter, swelled majestically in the air, impatient of restraint, and tugged with tremendous force upon the retaining ropes. The gas kept pouring in, the balloon grew larger and larger, the inflation was all but complete, Professor Donaldson made his final arrangements to leave the earth, and the thronging multitude stood gazing at the great air ship with breathless interest, when suddenly a ripping of the cloth was heard, and several rents in the top appeared, through which the gas took instant flight; and the enormous envelope fell flat to the earth, a mass of shapeless rags. The result fully justified the fears of Professor Wise.

Professor Donaldson states that the *Graphic* people have agreed to furnish a new balloon, of smaller size, to be made of silk, and that it will be ready in October, when he will again essay the voyage to Europe. Professor Wise complains of bad faith on the part of the *Graphic* people, who, he says, did not furnish the strong materials agreed upon, but made everything as showy, as cheap and flimsy as possible. The result appears to sustain these charges. On the part of the *Graphic* people, the whole thing was designed as a pure advertising dodge for their newspaper, and in this respect has proved an undoubted success. Let no one, therefore, suppose that the great transatlantic balloon did not accomplish what its projectors originally contemplated.

GAS AS FUEL.

Two of the three prime necessaries of civilized housekeeping, water and light, are now provided in our city homes without carriage. The third, fuel, is still subject to many troublesome and expensive handlings. Consider the cost of a poor man's fire, after the coal is paid for at the retail coal yard. The retailer's profit and the cartman's pay for delivering the coal in small lots being included in the purchase price, we will leave them out of the account—though the cost of distributing a year's supply of coal throughout a city like this is something enormous—and take up our dirty fuel from the pavement at the consumer's door. If there is a hole in the side walk through which the coal can be pitched to its place in the cellar, its conveyance thither is a matter of small moment; but the chances are that there is no such convenience. In this more common case, the coal must be shoveled into pails, buckets or baskets, and toilsomely carried to its receiving bin, perhaps through a preliminary alley way of considerable length. This cannot be done without an expenditure of time and strength, having a measurable money value, which increases by so much the original cost of the coal. The fire is wanted on the third, fourth or fifth floor. Some one must descend to the cellar, shovel up the coal, and bear it by hand up the intervening flights of stairs, putting forth, it may be more human effort than was required to lift the coal from its native bed in the mine. At the mine, coal lifts and carries coal; in our houses, the work is done by human muscles. In the process of feeding the fire the coal is handled again: a small matter when we think only of one bucketful: but multiply it by the number of bucketsful handled every day in the city, and the product is an amount of labor not at all to be despised. While burning, the fire calls for constant attention; it must be watched, regulated and renewed, each step costing still more time and labor, the grand aggregate of which, for all the coal consumed, is very great. Then the ashes must be taken up, sifted and carried away, involving yet more cost of time and strength; and coals and ashes soil the hands, clothes and furniture, which must be made clean agian by additional labor. The burden of all this labor falls heaviest on the poor, for by them the coal is most frequently handled; but the rich are far from exempt. Could we sum up the cost of service employed in caring for our household grates and furnaces, the aggregate would swell immensely our yearly biils for fuel.

Further, the burning of coal in small quantities, as in cooking stoves and small heaters, is wasteful in the extreme. The combustion is imperfect; but a fraction of the possible heat is cooled; and much of that is wasted in cavernous chimneys. Then a large percentage of the coal is consumed when no heat is required, when it is objectionable even, to keep the fire in readiness for the time of need. In short, there are a thousand ways in which the original cost of coal is augmented and its efficiency diminished in the common crude and unscientific use of it for household purposes: ways never suspected by those who have never used a fuel which has none of the drawbacks of coal: which burns cleanly, quickly, perfectly and requires no carriage, namely, gas. It is more than probable that our children will live to look back upon our wasteful, troublesome, and expensive fires as we do upon old time tallow dips and the fetching of water in buckets from the town pump. Already the use of gas as fuel, especially for cooking, has been proved to be not merely convenient but economical; and economical in spite of the fact that the gas used has been expensively and, for fuel, needlessly refined, and paid for at an exorbitant rate even for illuminating gas. A cruder product would answer just as well. "Don't never prophesy unless you know" is the sound advice of one of our humorists In the face of the caution, however, one may safely predict that the fuel of the future will carry itself, and will leave no soot or ashes. Further, the combustion will be perfect, and under perfect control; and however small the quantity burned in any case, its full heating power will be developed.

For several months a friend of ours has been testing the availability of gas for these purposes. He has used a range having two separate burners for boiling or frying, and a third burner heating at once a roasting chamber (on the principle of a Dutch oven) and an ordinary closed oven for baking. Broiling is done in the roasting chamber under a sheet of flame which covers uniformly the top of the chamber. The range has ample capacity for a family of six or eight persons, though in the present case the cooking was rarely for more than two, living modestly yet fully up to the average of people in moderate circumstances, and having two meals always, generally three meals, a day. Biscuits were baked occasionally but not bread, which, however, was almost always toasted in the roasting chamber under a full sheet of flame. During the three months just past the gas consumed —measured by a standard meter officially sealed—amounted to a trifle short of one thousand feet, costing, even at the high rate charged by our metropolitan gas companies, two dollars and a half, and averaging not more than one cent a meal. Had coal been used for the same cooking, it would have cost more to hire a boy to fetch it from the cellar and carry away the ashes.

The secret of the economical cooking can be told in few words. There was no fuel wasted. Its full heating power was scientifically developed, where it was wanted, and just so much as was wanted and no more. There was no waiting half an hour for the fire to kindle and heat up the stove; there was no high degree of heat maintained when a lower degree would suffice; and the instant any portion of the heat was no longer required, that moment, generally speaking, the flow of gas was stopped. Was a certain temperature required at a given point for ten minutes, half an hour or any other interval, the gage could be set to maintain it uniformly and trustily. It was certain the fire would not get too hot, or go out, or vary in the least. This divested the cooking of half its trouble and nine tenths of its anxiety; and there was no food spoiled by accidental causes. It is true that such economical cooking involves more than ordinary care, intelligence, foresight and conscientiousness on the part of the cook, still it is not more than the majority of women are capable of; and when cooking is thus made light, cleanly, and free from uncertainty and worry, there will be less repugnance on the part of well to-do wives to this most important domestic duty.

If costly illuminating gas can be used economically for fuel, there can be no question of the feasibility of warming our rooms and cooking our food with gas less highly refined and consequently much cheaper.

SCIENTIFIC AND PRACTICAL INFORMATION.

FACTOR OF SAFETY FOR STEAM BOILERS.

A committee, appointed by the Franklin Institute of Philadelphia to determine a factor of safety for the iron of steam boilers, assume the ultimate strength of a single riveted sheet to be 34,000 pounds per square inch, and recommend that 6,000 pounds per square inch be adopted for the working strain. This allows a factor of safety of $34,000 \div 6,000 = 5 \cdot 67$, if we consider the ultimate strength of the material, or an average value for the factor of $(34,000 \div 2) \div 6,000 = 2 \cdot 83$, with reference to the elastic strength of the iron. When we remember that many boilers are subjected to shocks and pulsations, and that allowance must be made for deterioration and for uneven quality of the iron, this large value for the working loads seems open to grave objections.

CONVERTING BONES INTO FERTILIZERS.

How to dissolve bones conveniently on one's farm or country place, for fertilizing purposes, without resort to sulphuric acid, is an inquiry frequently asked, and has been more than once answered in the SCIENTIFIC AMERICAN. Place the bones in wood ashes, the pile being moistened with water, is the reply that has been given.

A method, said to be in use in Russia, is as follows: A trench, three or four feet deep and of any desired length, is dug in the earth, and filled with alternate layers of ashes and whole bones, each layer being about six inches thick. The lowest as well as the top layers are of ashes, and each layer of ashes is thoroughly saturated with water. At distances of three feet, poles are rammed down to the bottom of the ditch, and every eight or ten days they are taken out and enough water poured in the holes to saturate the ashes. At the end of two months the whole heap is thoroughly stirred up with a fork so as to mix the ashes and softened bones, which are then left to ferment again, water being added as often as necessary. In about three months more, the heap being worked over twice or three times more, the decomposition of the bones will be so complete that only a few of the largest bones remain, and these are taken out and put in another heap.

CRANK PINS FOR STEAM ENGINES.

A paper on this subject by Theron Skeel, C. E., was lately published in the *Iron Age*. As the conclusions therein established are of interest and importance to those designing engines, we give below a brief summary of the paper:

A crank pin has a tendency to become hot, because the work absorbed by the friction of the bearing is changed into heat. By reducing the friction, we reduce the tendency of the journal to heat. The friction can be reduced by making the rubbing surfaces smooth, and using a good lubricant. At high pressures, the lubricant is forced out from between the surfaces. The pressure at which this occurs is supposed to be somewhat above 2,000 pounds per square inch of bearing surface, as millstones can be run, without excessive heating, with a pressure of nearly 2,100 pounds per square inch on the spindle. The tendency of a crank pin to heat is independent of its diameter, it being only necessary to provide sufficient area to dissipate the heat stored up by the friction. The bearing upon a crank pin is less than the projected area of the pin, and the length (of the pin) that bears should always be used in making calculations.

Let l = length of the pin in inches; S = stroke of engine in inches; I = indicated horse power of the engine. Then the formula deduced by Mr Skeel is as follows: $l = I \div (s \times k)$, or the proper length for a crank pin of an engine is equal to the indicated horse power of the engine, divided by the stroke, multiplied by a coefficient which is determined by experiment. An examination of the best modern practice shows that this coefficient is between 1·3 and 1·5; and that if a crank pin gives a larger coefficient than this, it is liable to heat.

EXAMPLE: What length should be given to the crank pin of a steam engine having a stroke of 30 inches, and developing 250 indicated horse power? l = from $250 \div (1 \cdot 3 \times 30)$ to $250 \div (1 \cdot 5 \times 30)$ = from 6·41 to 5·56 inches, the latter being the least length of pin advisable.

THE liability of safety valves to stick, in consequence of corrosion, is obviated by nickel plating both the valve and the seat.

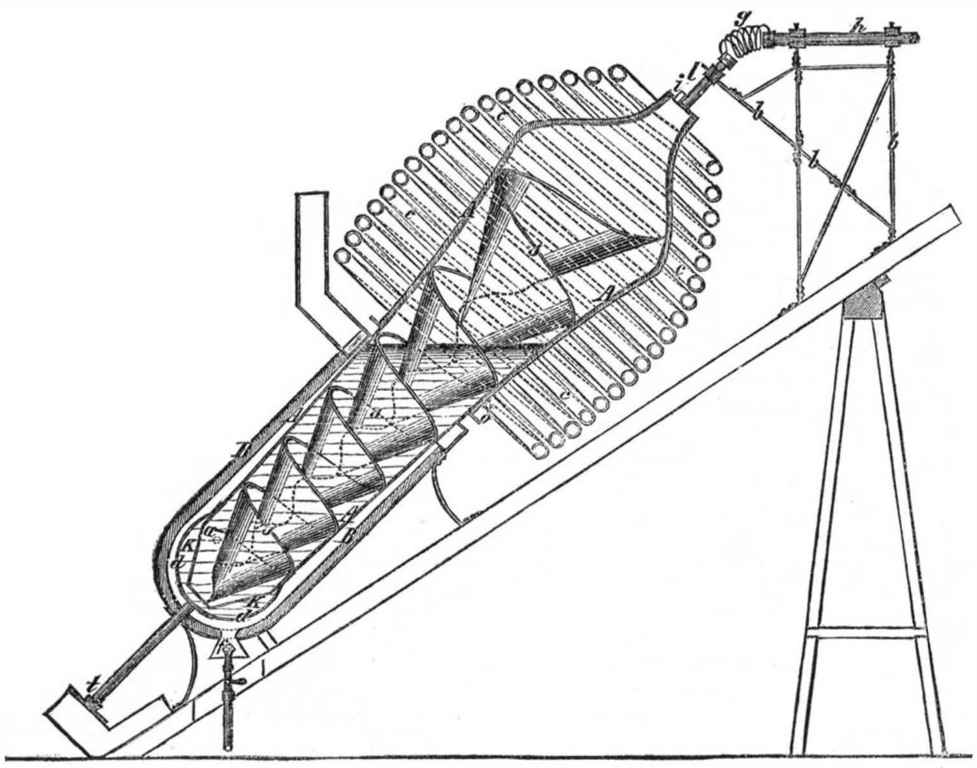
NEW STEAM MOTOR.

Among the novelties at the World's Fair, Vienna, is the steam motor of Friedrich Siemens, of Dresden, Saxony, which is worked without the use of pumps, valves, or special moving parts, but operates through the rotation of the steam generator itself. The exertion of power begins instantly with the development of steam, and is continued by the expansion of the steam until close to the vacuum, so that the greatest possible amount of power is developed from the steam pressure and made useful.

Our engraving, from the *Deutsche Industrie Zeitung*, represents such a motor, one tenth the natural size. The machine consists essentially of a rotating boiler placed in an inclined position. A is the boiler or shell, inside of which there is a worm or screw, *s*, made out of plates cut funnel shape, and attached to A. At the lower end the boiler, A, is provided with a double bottom, *d*, while the upper end is surrounded by a spiral tube, *c*, its spirals being in reverse of those of the interior worm or screw, *s*. The double bottom of the boiler forms a water space, K, which communicates through circular holes, *a*, with the inner space of the shell, A. The machine is mounted on a sloping axle-tree which is stepped at *t*, and supported above on the shaft, *l*, and bar, *b*. The motion of shaft, *l*, is transmitted to the horizontal shaft, *h*, by means of the flexible connection. The lower part of the shell, A, is surrounded by a furnace of clay, B; and fire is applied through an opening at *f*. In this example a gas flame is employed. The products of combustion rise from *f* and surround the shell, A, finally escaping through the upright pipe, at the upper end of B. The boiler, A, is filled with water at *i*, and here a fusible plug is used, which melts when the temperature of the steam rises above that of a given pressure, and permits the escape of steam into the atmosphere, thus ensuring the safety of the apparatus. When the fire is kindled at *f*, the steam which developes rises through the water and acts on the spirals, *s*, causing the turning of the whole machine. The steam continues to rise until it reaches and enters the spiral condensing pipe, *c*, which surrounds the upper exterior portion of the shell, A. In passing through the pipe, *c*, the steam is condensed, and the water of condensation is screwed back by the rotation of the pipe, *c*, down below the water level in the boiler, A, near *o*, where the water enters the boiler, and is again converted into steam. In starting the machine the steam must first be allowed to escape at *o*, out of the spiral condenser, in order to drive out all the air; then the opening, *o*, is closed, and the steam, then rising into the cooling pipes, *c*, is condensed as before described.

The machine, if once filled and made completely tight, continues to work without requiring any other attention, except to keep the fire going. No pumps to supply water, on valves or other devices are required; but a constant use of the same water over and again takes place; the water being first converted into vapor, which is then condensed, then again evaporated, and so on.

In lieu of water other liquids may be employed, and it has been suggested that quicksilver might be advantageously used.



NEW STEAM MOTOR.

A Remarkable Poison.

This poison is obtained by pressure from the seeds of *strophanthus hispidus*, an apocynaceous plant, found in Africa; and from experiments made with samples of it, taken from arrows upon which the natives place it, it appears that it acts more powerfully than digitaline or antiarine, and quickly paralyzes the heart. The $\frac{1}{17000}$ of a grain will kill a frog, a sparrow, or a dog, though the resistance of certain animals varies. A snail, for instance, requires $\frac{1}{10000}$ of a grain; a mouse has withstood $\frac{1}{17000}$ of the extract (obtained by macerating the seeds in alcohol), while the latter dose kills a dog nearly a thousand times heavier than the mouse. The heart comes to a complete standstill after a few irregular efforts.

THE RIGI RAILWAY.

The construction of railroads over mountains has made wonderful progress in the last year or two, and some of the greatest achievements of modern engineering science have been made in developing the plans for such schemes. The railway up the Rigi (in Switzerland, on the borders of Lake Lucerne) is the work of three German engineers, Herren Riggenbach, Naeff, and Zschokke, the first named gentleman having proposed the construction, an idea which was suggested to him by a visit to the Mount Washington railroad, in this country. We present an illustration which shows the general character of the work.

The Rigi line starts from Vitznau, on the borders of the lake, and rises up the mountain side to a station at Staffelhöhe, which is above the hotel and bath establishment, called Rigi Kaltbad and well known to most travelers in Switzerland. The length of the line is 5,760 yards (about 3¼ miles), and the hight of the upper terminus above the lower is 3,937 feet, being an average ascending gradient of about 1 in 4½. After leaving Vitznau, the grades vary from 1 in 5·56 to 1 in 4. Among the instances of bold and difficult construction exhibited by this work are a bridge of three spans over a defile in the mountain, the track going into the side of a rock and through a tunnel. The bridge and tunnel together are 525 feet long, the grade being 1 in 4 and the direction a very sharp curve. The track is very solid and well built, and the engines have vertical boilers placed in the middle of their length. The boilers maintain their perpendicularity even in ascending grades of 1 in 5¼.

It is proposed to continue the line to the Rigi Kulm, the summit of the mountain, and perhaps down the other side to Certh, at the eastern foot. The line at present existing was opened for public traffic on May 23, 1873.

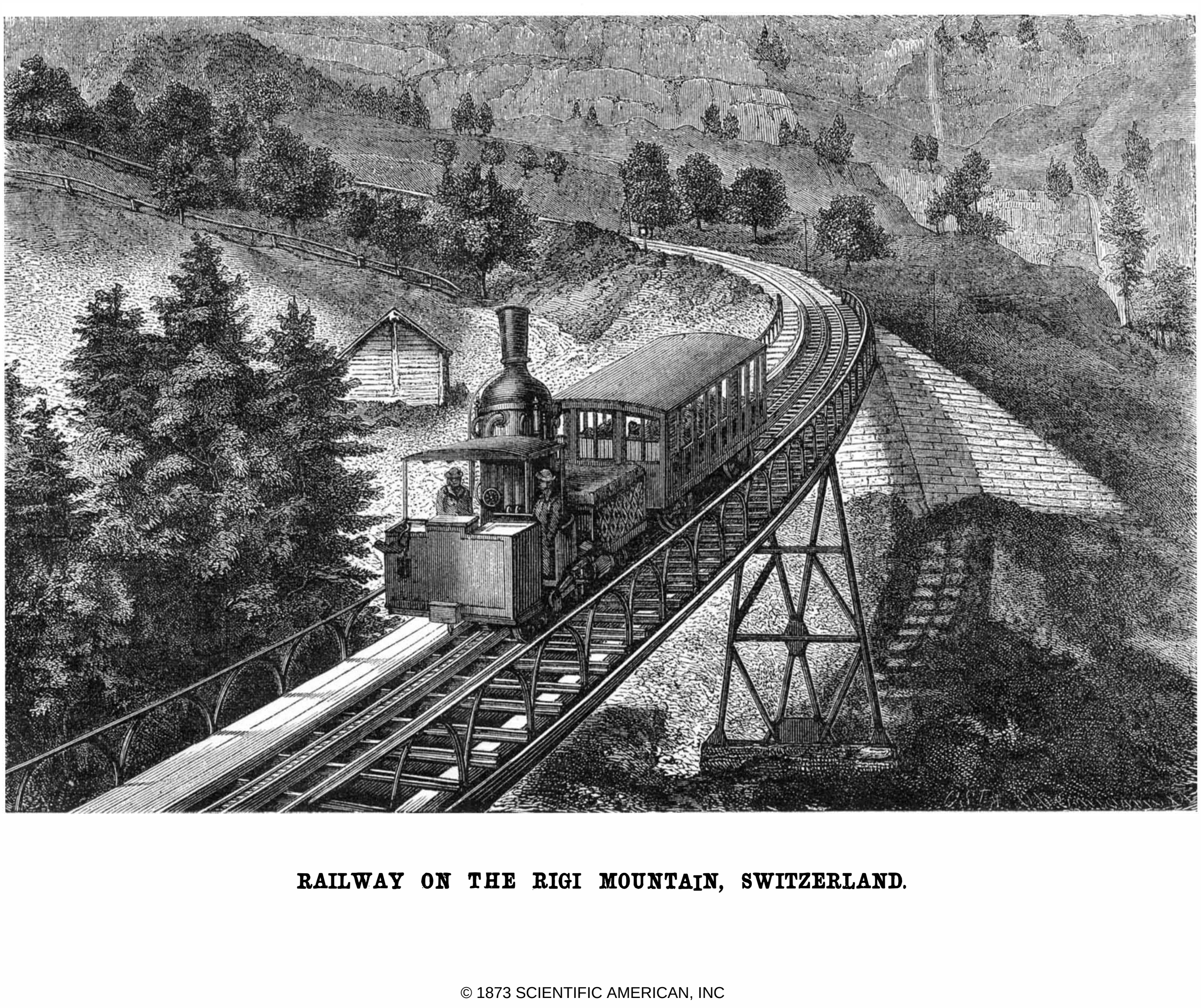
Slate Roofing Paint.

Our attention has been called to the superiority of a new paint compound, advertised on another page of this issue, which consists largely of pulverized slate. We have not tried the article, but we have the evidence of acquaintances who have used it, and speak of its merit in the strongest terms. It is equally adapted for new and old shingle roofs, rendering them impregnable to sparks; and it preserves the shingles equal to any other paint.

WE have received a letter from "Some of Your Readers" who are shocked at our incredulity respecting the miracles at Lourdes, France. They call our attention to the fact that a French gentleman has offered a reward of 10,000 francs ($2,000) to any one who can explain away the facts stated in a published book which gives an account of the miraculous cures, etc. This is a liberal and courageous offer, and it proves nothing but the public spirit and implicit faith of the gentleman who makes it.

THE annual exhibition of the American Institute in this city is now open; but some days will elapse before the machinery department will be in full blast.

G. A. P. writes to say that he has a preserved specimen of the devil fish measuring 4 feet from tip to tip of the arms.



RAILWAY ON THE RIGI MOUNTAIN, SWITZERLAND.

THE PLANET MARS—IS IT INHABITED?

Can it be possible that in all the vast universe but a single planet, and that the merest infinitesimal portion of the grand whole, can be the abode of living creatures such as ourselves? Does Science teach that other worlds are unpeopled deserts, serving no other purpose than to traverse their orbits obedient to the Divine will? Such are the questions which astronomers have been forced to meet and answer, unaided except by the testimony afforded by analogy and by deductions from theory, based perhaps on evidence mainly presumptive.

Leaving out of their consideration the possibility of organisms existing under conditions unknown upon the earth, the searchers of the heavens have examined the brilliant orbs which circle round the sun, first crudely and imperfectly, but as their knowledge and means increased with the progress of science, with augmented accuracy and power, adding discovery to discovery; until, link after link, the chain of proof has been forged, leading to but never reaching a universally accepted conclusion. As to all the planets, but two, the answer is certainly negative; the condition of all other worlds is such as to render human existence upon them absolutely impossible. Of the excepted pair, on one, Venus, life may exist, but every probability is to the contrary; regarding the other, Mars, divided opinion is encountered; and while it is asserted on one hand that, with reasonable certainty, the planet may be assumed as the abode of living beings, on the other the presumption is as specifically denied. Deferring the consideration of Venus to some other opportunity, it will be of interest to examine the present state of our knowledge regarding the Planet of War, and, at the same time to glance briefly over the arguments, *pro* and *con*, which have been advanced to prove or disprove its habitability.

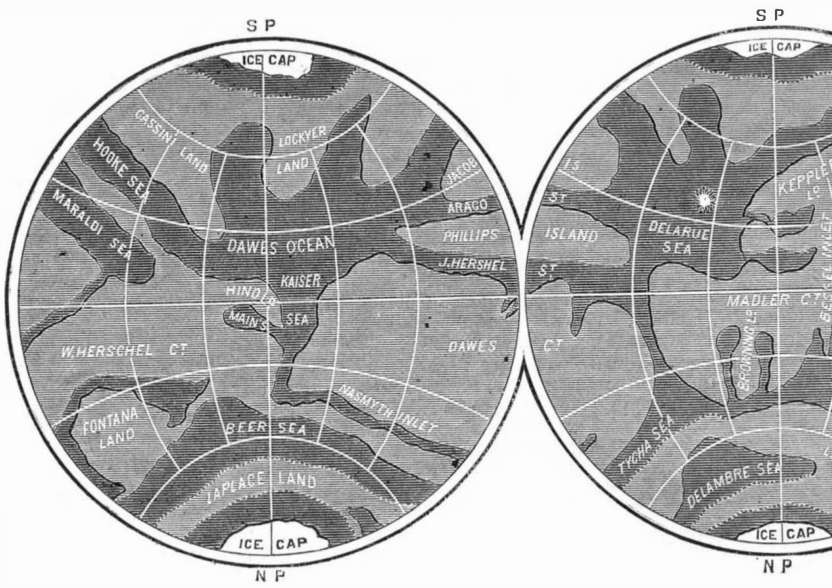
Just at the present time, Mars is plainly visible in the evening heavens, a ruddy star in or near the constellation *Virgo*. Forty millions of miles, at least, divides us from the bright globe of light which modern revelation tells us is the miniature of our own earth; 5,000 miles is its diameter, bearing a proportion to the similar terrestrial dimension of 5 to 8; consequently the relative surfaces are as 25 to 64, or more plainly, our world is two and a half times the larger of the two. Comparing the relative densities, Mars' is about three fourths that of the earth, hence the force of gravity at its surface is much less than the corresponding terrestrial attraction. If, therefore, the inhabitants of that planet are proportioned similarly to ourselves, their strength must be far greater in reference to their dead weight than is the case with us. In fact, if that organization, known as the Fat Men's Club, could be transported to Mars, its members, here barely able to support their mountainous protuberances and walk, would easily skip lightly over six-foot fences or bound along the ground in a way that would leave the best of our runners far in the rear. The nature of the inhabitants of Mars, we shall allude to, however, in detail further on.

The orbit of Mars is very eccentric. Its center is 13,000,000 miles from the sun, so that the light and heat received on the surface of the planet must vary considerably. It is less than ours in the proportion of 4 to 9. The Martial year lasts for 687 of our days, and the Martial day is 40 minutes longer than ours. The inclination of the equator to the plane of its orbit is $27\frac{1}{4}°$, or very little more than is the case with the earth, which is $23\frac{1}{2}°$. The changes of the seasons, so far as depending upon this cause, differ little from our own.

These general points being fixed, let us now turn to the planet's geography, or *areography* more properly, as we say *selenography* in referring to the moon. Comparatively speaking, our knowledge of the surface divisions of Mars is next in extent to our information regarding the earth. We know more, in fact, about the hemisphere of the moon than we do of our own globe; for while the vast lunar deserts have been measured to nearly an acre, and the mountains and craters to within thirty or forty feet, there are on the earth 11,400,000 square miles unexplored and unknown.

Jupiter and Saturn are almost constantly obscured by their closed envelopes, so that their true surface is rarely if ever beheld. Uranus and Neptune are mere points of light. Mercury is almost always eclipsed by the rays of the sun. Venus, nearly twice as large as Mars in diameter, is nearer to the earth, and comes within 30,000,000 of miles of us, but travels between the earth and the sun, so that her bright face is turned to that luminary and her dark hemisphere toward us. Hence Mars is the best fitted for examination.

In regarding the planet through a powerful telescope, it is at once observable that the poles are marked by brilliantly white zones which, it is believed, are caused by deposits of snow and ice. These arctic regions appear to extend during the Martial winter to parallel 45° of latitude, or as if the ice of North America, in our winter, should reach down as far as the northern part of New York State. We have said that Mars is ruddy, and the fact is easily discernible by the naked eye. Aided by the telescope, however, the surface appears to be far from uniformly red. The color is confined to particular spots or regions, the intermediate parts being of a greenish hue. Observations extending over long periods have demonstrated that the relative position of these divisions has never changed, hence they are not accidental phenomena. Thus, being considered as physical peculiarities, they have been made the subject of close study by almost all eminent astronomers.



THE HEMISPHERES OF MARS.

For reasons which we shall explain hereafter, the red portions of the planet have been considered as land and the green regions as water, and their appearance has been carefully mapped.

We give herewith a map, constructed by Mr. R. A. Proctor from a number of drawings, in which the various seas and continents are marked with the names of noted astronomers, by which they are distinguished. It will be observed that the seas seen are all land-locked—true mediterraneans—and communicate with each other only by narrow straits. The most remarkable features are the great equatorial zone of continents—of which there are four, namely, Herschel, Dawes, Madler, and Secchi—and the peculiar forms of the bell-shaped seas in the first of these grand divisions.

The waters, or rather the spots which we assume to be fluid, are of the same color as terrestrial seas, grayish green; but the land is a uniform ocherous red. To explain this latter peculiar tint, various theories have been propounded. It was at first supposed to be due to the atmosphere; but this view was soon abandoned; and at the present time it is generally believed to be the prevailing tint not only of the soil but of the vegetation. So that instead of verdant expanse of prairie or green forests, the eye is met by crimson trees or scarlet grass, and the dull lurid shades peculiar to such hues.

But it may be well urged that we are assuming too much in jumping to the conclusion that the red spots on Mars are land, the green ones water, and the white ones ice and snow. What proof have we that land, water, and ice exist on the planet at all? Mars has *clouds*. The invariable appearance of the moon, even under the strongest telescopes, does not exhibit the slightest trace of floating vapor on its surface, nor do the occultations of the stars indicate the existence of an atmosphere. With the planet we are considering the contrary is the case. Its spots change in brightness, and it seems at times as if a vail blurred the configurations of its surface for hours and days at a time. We can tell by the position of the Martial equator what season is in progress in either hemisphere at any time: and it has been found that when it is winter in one hemisphere and summer in the other, the former portion is always obscured. Just as upon the earth, the wintery sky is rarely clear. Aeronauts tell us that, at high altitudes, the clouds below them sometimes entirely obscure the surface of the earth, or, at times, breaking away, admit but small portions of its dark surface to the view. Hence, when Mars is thus covered in parts, it is as if such portions were blotted out, while the shape of the true surface below is changed. Careful observations, therefore, indicate, with every appearance of probability, that the misty vail is formed of clouds, vapor, or fog; so that, in fact, unless it be a fine day on Mars, we cannot see his surface.

[To be continued.]

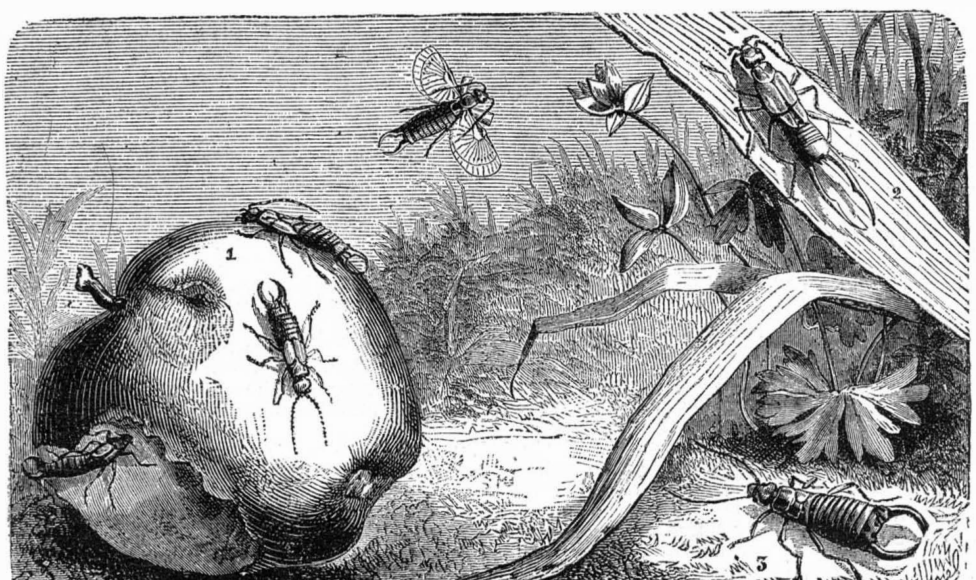
Is Phosphorus Thought?

There appears still to be much difference of opinion among chemists about the changes which occur in the secretion of the kidneys after waste of nerve tissue. For example, Dr. L. Hodges Wood, as the result of his observations published in 1869, denied the correctness of the generally received statement that the amount of phosphates in the urine is increased by fatiguing mental exercise. He found that, while the alkaline phosphates were slightly increased, the earthy phosphates were notably diminished after mental work, and that, when the mind was not much employed, the excretion of earthy phosphates was increased instead of diminished. He accounts for this on the hypothesis that, when the brain was worked it, withdrew more phosphorus from the circulating fluid.—*Medical and Surgical Reporter.*

EARWIGS.

The insects popularly termed earwigs are known scientifically as *forficulæ*, a name derived from the Latin, and meaning "small scissors." The French appellation is *perce-oreille*, or ear piercer, and is given on account of a pair of claws or nippers extending from the posterior extremity of the body, which resembles the instrument sometimes used by jewelers for boring the ear to admit earrings. The vulgar name, earwig, is owing to the supposed predilection of the insect to enter the human ear; an erroneous impression, doubtless based on the instinct of the animal which teaches it to take refuge in dark cavities. Even if it did enter the organ of hearing, it could do no harm, as it could not penetrate any further than the drum, and might be easily dislodged from the passage by a drop or two of oil.

The color of the insect is from brown to dusky yellow. The body is elongated and flattened; and the head is slightly movable and heart shaped, having filiform *antennæ* of from twelve to forty articulations; on the sides of the head are small eyes. A breastplate, rectangular in shape, follows; and, in the segments in rear of the thorax, two pairs of differently constructed wings. The first pair are shorter than the abdomen, cut squarely in rear, united to the frame in the center, and not crossed upon each other like the similar appendages of grasshoppers and crickets. The wings proper would hardly be supposed to exist, as exteriorly they appear as a horny shell which, when folded close to the body, become a means of protection. The rest of the member is formed of a diaphanous, rainbow-tinted membrane, which folds up like a fan and is completely covered by the exterior scale. The abdomen is covered with scales, similar to those on the tail of the crawfish, from which the sex of the animal may be told, the male having nine above and eight below, and the female, seven above and six in the ventral region. The male insect has also much stronger nippers, and the last segment of the back is larger than in the female. The claws attached below the thorax are six in number, short, and only suitable for running. They terminate in tarses of three articulations.



EARWIGS.

The young, on leaving the egg, and after the first change of skin, have no vestige of wings except a slight elevation on the posterior sides of the second and third segments of the thorax. After the second change, short wings appear, more or less united in a thin envelope or sheath; and it is not until the third sloughing that the insect has all the members entire.

Earwigs dislike light and live entirely in obscure places, concealing themselves under stones, in cracks of trees, and sometimes in deep flowers. They are social, and numbers are found together. They are voracious eaters, feeding on flowers and boring into ripe fruit, or, if they cannot get vegetable diet, contenting themselves with carrion or manure. If kept without nourishment, they devour each other. Their only utility to man is the war which they wage on several insects destructive to wheat and other grain, particularly those varieties the larvæ of which bury themselves in the kernels of the plants.

The females have a remarkable and curious fondness for their young. The eggs are developed in little cavities in the earth and always in damp places. The mother watches them carefully, transporting them from the place if the moisture dries, or gathering them if they become scattered. The larvæ at first are white, and appear to swell after emerging from the egg, but become dark and hard in a few hours. The female still guards them, and, it is said, gathers them under her, as a hen does her chickens. Earwigs are destitute of feelings of gratitude or filial affection; for just as soon as they attain sufficient size, they proceed to devour their mother, if she happen to get injured or die, and also such of their relatives as fall under the inevitable law of natural selection.

The engraving, extracted from *La Nature*, given herewith represents the three varieties of the earwig common in Europe. The insects marked 1 are the ordinary garden species or true earwig. No. 2 is called the "giant Labidour" and is the largest of the different kinds. The *antennæ* have a large number of articulations, the *elytræ* are elongated and rectangular, and strongly protected by a shell-like covering. The nippers are nearly straight, have a tooth in the middle, and appear dark at the extremities. The male insect represented grows, nippers and all, to about an inch in length, and the female to about two thirds that size. In Fig. 3 is shown the "apterous Chelidour," a variety confined to the Pyrenees mountains; a similar and smaller species is also found in the Alps and other ranges. The head is somewhat triangular, and the body, of a chestnut brown. The insect attains the length of half an inch.

Correspondence.

Spontaneous Generation.

To the Editor of the Scientific American:

In your issue of August 23 is an editorial on "Spontaneous Generation," containing some interesting facts and statements on that important subject. Knowing that your desire, as a friend and votary of science, is to give your readers "the truth, the whole truth, and nothing but the truth," and knowing also that very many of your readers are most deeply interested in the results of the investigations referred to, I venture to ask space for some additional facts and statements.

Your article opens with the statement that "All experiments thus far made with infusions of different substances, for the purpose of producing infusorial animalculæ, appeared to prove that the access of air was necessary for their formation." The truth of this was admirably shown by Professor Huxley, in his great address, as President of the British Association, in September, 1870. After pointing out the fact that the theory of spontaneous generation (the doctrine of *abiogenesis*) was the accepted theory of the world, on the origin of life, until two hundred years ago, he proceeds in a most masterly and exhaustive manner to trace the history of the opposing theory, that all life originates from some antecedent germ (the doctrine of *biogenesis*), from its first enunciation by the philosopher Harvey to the date of that address before the Association.

Professor Huxley's conclusion, which is very guardedly and yet very strongly stated, and which was reached by passing through all the experiments up to that date, is as follows: "But though I cannot express this conviction of mine too strongly, I must carefully guard myself against the supposition that I intend to suggest that no such thing as abiogenesis ever has taken place in the past or ever will take place in the future. With organic chemistry, molecular physics, and physiology yet in their infancy and every day making prodigious strides, I think it would be the hight of presumption for any man to say that the conditions under which matter assumes the properties we call 'vital' may not, some day, be artificially brought together. All I feel justified in affirming is that I see no reason for believing that the feat has been performed yet."

Perhaps no one will deny that Professor Huxley is as wel fitted as any man living to reach a just conclusion on this subject. Notwithstanding his strong desire to believe the theory of abiogenesis true—a desire, the strength of which is shown by the unwarranted admission concerning the possible power of organic chemistry, etc., thrown in by the way —he feels himself compelled to declare that he sees "no reason for believing" that the feat of producing life by spontaneous generation has yet been performed.

That at the time of making his address, Professor Huxley was familiar with Professor Bastian's loudly trumpeted experiments, that after sufficiently investigating them he determined to ignore them in that address as being unworthy of scientific consideration, and that he had the very best reasons for doing so, appear from an eminently spicy and trenchant letter which appeared in *Nature*, October 13, 1870. That letter furnishes data from which any ordinary reader, who makes no pretensions to science, can reach a judgment for himself upon the value of Professor Bastian's experiments and the caliber of Professor Bastian. It is as follows:

"Dr. Bastian and Spontaneous Generation.—I find that the address which it was my duty to deliver at Liverpool fills thirteen columns of *Nature*. The reply with which Dr. Bastian has favored you occupies fifteen columns, and yet professes to deal with only the first portion of the address. Between us, therefore, I should imagine that both you and your readers must have had enough of the subject; and, so far as my own feeling is concerned, I should be disposed to leave both Dr. Bastian and his reply to the benign and lethean influences of time.

But I am credibly informed that there are persons upon whom Dr. Bastian's really wonderful effluence of words weighs as much as if it were charged with solid statements and accurate reasonings; and I am further told that it is my duty to the public to state why such distinguished special pleading makes not the least impression on my mind. With your permission, therefore, I will do so in the briefest possible manner. The first half of Dr. Bastian's reply occupies seven columns of your number for the 22d of September. In all this wilderness of words there is but one paragraph which appears to me to be worth serious notice. It is this:—

"In the first place, he does not attempt to deny: he does not even allude to the fact [that living things may and do arise as minutest visible specks in solutions in which, but a few hours before, no such specks were to be seen.] And this is in itself a very remarkable omission. The statement must be true or false; and if true, as I and others affirm, the question which Professor Huxley has set himself to discuss is no longer one of such a simple nature as he represents it to be. It is henceforth settled that, as far as visible germs are concerned, living beings can come into being without them."

If I did not allude to the assertion of Dr. Bastian, put between the brackets, it is because it bears absurdity written upon its face to any one who has seriously considered the conditions of microscopic observation. I have tried over and over again to obtain a drop of a solution which should be optically pure, or absolutely free from distinguishable solid particles, when viewed under a power of 1,200 diameters in the ordinary way. I have never succeeded; and, considering the conditions of observation, I never expect to succeed. And though I hesitate to speak with the air of confident authority which sits so well on Dr. Bastian, I venture to doubt whether he ever has prepared, or ever will prepare, a solution in a drop of which no "minutest visible specks" are to be seen by a careful searcher. Suppose that the drop, reduced to a thin film by the cover glass, occupies an area one third of an inch in diameter; to search this area with a microscope in such a way as to make sure that it does not contain a germ one forty-thousandth of an inch in diameter, is comparable to the endeavor to ascertain with the unassisted eye whether the water of a pond a hundred feet in diameter is or is not absolutely free from a particle of duckweed. But if it is impossible to be sure that there is no germ one forty-thousandth of an inch in diameter in a given fluid, what becomes of the proposition, so valuable to Dr. Bastian that he has made your printer waste special type on it?

I now pass to the second part of the reply, which, though longer than the first, is really more condensed, inasmuch as it contains two important statements instead of only one. The first is, that Dr. Bastian has found *bacterium* and *leptothrix* in some specimens of preserved meats. I should have been very much surprised if he had not. If Dr. Bastian will boil some hay for an hour or so, and then examine the decoction, he will find it to be full of bacteria in active motion. But the motion is a modification of the well known Brownian movement, and has not the slightest resemblance to the very rapid motion of translation of active living bacteria. The bacteria are just as dead as those Dr. Bastian has seen in the preserved meats and vegetables; and which were, I doubt not, as much put in with the meats as they are with the hay, in the experiment to which I invite his attention.

The second important statement, in the second part of the reply, is: "Professor Huxley is inclined to believe that there has been some error about the experiments recorded by myself and some others." In this I cordially concur. But I do not know why Dr. Bastian should have expressed this my conviction so tenderly and gently as regards his own experiments, inasmuch as I thought it my duty to let him know, both orally and by letter, in the plainest terms, six months ago, not only that I conceived him to be altogether in the wrong, but why I thought so.

Any time these six months, Dr. Bastian has known perfectly well that I believe that the organisms which he has got out of his tubes are exactly those which he has put into them; that I believe that he has used impure materials, and that what he imagines to have been the gradual development of life and organization in his solutions is the very simple result of the settling together of the solid impurities, which he was not sufficiently careful to see, in their scattered conditions, when the solutions were made. Any time these six months, Dr. Bastian has known why I hold this opinion. He will recollect that he wrote to me asking permission to bring for my examination certain preparations of organic structures, which he declared he had clear and positive evidence to prove to have been developed in his closed and digested tubes. Dr. Bastian will remember that, when the first of these wonderful specimens was put under my microscope, I told him that it was nothing but a fragment of the leaf of the common bog moss (*sphagnum*); he will recollect that I had to fetch Schacht's book "Die Pflanzenzelle," and show him a figure which fitted very well what we had under the microscope, before I could get him to listen to my suggestions; and that only actual comparison with *sphagnum*, after he had left my house, forced him to admit the astounding blunder which he had made.

To any person of critical mind, versed in the preliminary studies necessary for dealing with the difficult problem which Dr. Bastian has rashly approached, the appearance of a scarlet geranium, or of a snuff box, would have appeared to be hardly more startling than this fragment of a leaf, which no one even moderately instructed in vegetable histology could possibly have mistaken for anything but what it was; but to Dr. Bastian, agape with speculative expectation, this miracle was no wonder whatever. Nor does Dr. Bastian's chemical criticality seem to be of a more susceptible kind. He sees no difficulty in the appearance of living things in potash-alum until Dr. Sharpey puts the not unimportant question: Whence did they get their nitrogen? And then it occurs to him to have the alum analyzed, and he finds ammonia in it.*

And as to elementary principles of physics: In his last communication to you, Dr. Bastian shows that he is of opinion that water in a vessel with a hole in it, from which the steam freely issues, may be kept at a temperature of "230° to 235° Fahrenheit for more than an hour and a half."† I hope that Professor Tyndall, whom Dr. Bastian scolds as authoritatively and unsparingly as he does me, will take note of this revolutionary thermotic discovery in the next edition of his work on heat.

It is no fault of mine if I am compelled to write thus of Dr. Bastian's labors. I have been blamed by some of my friends for remaining silent as long as I have done concerning them. But when, because I have preserved a silence which was the best kindness I could show to Dr. Bastian, he presumes to accuse me publicly of unfairness, and to tell your readers that my address "is calculated to mislead" them, I have no alternative left but to give them the means of judging of the competency of my assailant.

Jermyn Street, October 10. T. H. HUXLEY.

*See *Nature*, No. 36, p. 198. †*Ibid*, No. 48, p. 433.

After such a damaging exposition of Dr. Bastian's claims by so great and so competent a man, you will doubtless agree with me that no scientific man would be inclined to expect anything of any real scientific value from such an experimentor, should he even devote his time for a century to come to his experiments. The opinion of Mr. Wallace, and all his school of prejudiced and purely imaginative philosophers, will have no weight with the true scientist when arrayed against the careful research and clear logic of Professor Huxley's address and the damning facts of Professor Huxley's letter.

The truth is Professor Bastian has attempted to prove what can not be proved even if it be true. Such is the deliberate conclusion of my esteemed friend and teacher, Dr. Arnold Guyot. Said this great man, in conversation a few days since: "The conditions of the problem—in the material and instruments used and in the limitations of the eye and the microscope—are such that, even if life should be spontaneously generated, in the manner claimed by Professor Bastian, it could never be proved." It can never be known that there is no life germ as a minutest visible speck present in any flask of liquid. To ascertain with a microscopic power of 1,200 diameters that there is no germ one forty thousandth of an inch in diameter in a flask that exposes to view a lateral surface of three square inches, would be just as easy as to ascertain with the naked eye that not a single flea is living on the side of a pyramid of 600 feet base and 900 feet ascent, or on any one side of Cheops itself. This, however, provided the miniature ocean currents in the flask should be not more active than the living inhabitant of the Cheops. But the germ of one forty-thousandth of an inch in diameter is too large; reduce it to one one-hundred-thousandth of an inch and then make the calculation. A microscope which would make such a germ, when brought into its range, clearly visible would lift up a man to the hight of the Himalayas.

I trust that these facts and statements will not be uninteresting to your numerous and intelligent readers.

Princeton, N. J. D. S. GREGORY,
Professor in University of Wooster, Ohio.

The Devil Fish.

To the Editor of the Scientific American:

I notice in your last issue an illustration representing the devil fish. Until I saw it, and your announcement of two living specimens, I was not aware of the existence of any living specimens in the world. My attention was particularly attracted to the matter because I have a most perfect fellow (in alcohol), and have earnestly endeavored to find out how many there were either in Europe or America. Thus far I have not been able to find any in America, except my own. If the one in the Hamburgh aquarium is but two feet from tip to tip, mine is more than as large again, being four feet three inches. The smaller one has, however, the advantage of being alive.

The strength which these creatures possess is almost beyond comprehension, as is evidenced by what took place when my pet (!) was captured. He had seized hold of a submarine diver, at work in the wreck of a sunken steamer off the coast of Florida. The man was a powerful Irishman, who claimed to weigh three hundred pounds. His size and build fully verified his statement, and, to use his own language, "the baste landed on top of my shoulders and pinned my arms tight. I felt my armor and myself being cracked into a jelly." It seems that he was just about being brought to the surface, else the monster would have killed him, for he was suffering so from the terrible embrace that he could move no part of himself. When dragged on to the raft from which he had descended, and finally released, he had fainted. The men on the raft seized the fish by one of its wriggling arms, and tried to pull it off, but could not break the power of a single one of the suckers. The fish was only removed by being dealt a heavy blow across the sack containing the stomach. This sack stood stiffly up above the eyes, while the eyes stood out like lobster's eyes and gleamed like fire. The monster is, all in all, one of the most frightful apparitions it could be the fate of a man to meet. It fulfils in every particular the horrible features attributed to it in Victor Hugo's "Toilers of the Sea." Notwithstanding the severity with which the able Frenchman has been criticized for "creating a nondescript with his weird imagination," the truth must be granted that his "nondescript" has an actual existence, as is evidenced by the specimens in Brighton and Hamburgh, as well as my own. The likeness of the picture to mine is perfect in every particular.

CHARLES B. BRAINARD.
Winthrop House, Boston, Mass.

J. H. says: "I am building a planing mill inside the fire limits, and have concluded to use perpetual motion in place of steam power. I do not care about a highly finished machine, but it must be all right in its working parts, have a capacity of about 80 horse power, and be easily controled. Whom do you consider to be the most reliable maker of perpetual motion engines?" [Inventors of perpetual motion engines would do well to advertise their devices in the SCIENTIFIC AMERICAN.—EDS.]

BURNT AND BROKEN GRATE BARS.—R. F. writes that he recently visited Cape Breton, N. S., and there saw, in a boiler furnace, a system of protecting the bars from the burning to which they are subject, and from the violent raking which is necessary when they are choked with clinker. The means employed consist of a layer of flat pieces of freestone, placed underneath the coal. The clinker adheres to the stones, and the bars are protected from burning, warping, and choking.

THE GREAT EXPOSITION—LETTER FROM UNITED STATES COMMISSIONER PROFESSOR R. H. THURSTON.

NUMBER 11.

VIENNA, August, 1873.

While there is not very much that appears new or specially interesting among the metal or the

WOOD-WORKING TOOLS

of the exhibition, there is occasionally one which attracts the attention of the American mechanic by its novelty; such, for instance, is the combination of wood-working tools referred to in the preceding letter and known among English builders, as well as at home, by the name of the "universal joiner," and the planer also there referred to. Among them may perhaps be also included the dovetailing machines of Hall in the United States section, and of Armstrong in the British section. The former, by the ingenious application of boring tools, cuts a peculiar and very pretty form of dovetail, and the latter, by an equally ingenious use of circular saws having parts of their edges turned over to form portions of cylindrical saws, cuts the usual form of dovetail in a very neat and rapid manner. Both of these machines are most creditable in design, workmanship, and performance.

A considerable amount of

SAW MILL MACHINERY

is exhibited in other sections than in that of the United States. We have none at all on show. The British exhibit is by far the most extensive, and is the best in all respects. Some German firms present good exhibits, however, and, in the Austrian section, one or two of the most creditable of all their exhibited machines are of this class.

The general design of these machines presents no important novelties. For log sawing, the use of the circular saw seems quite unusual. The best machines are what the builders call the portable or, more usually, the semi-portable log frame. In these machines the frames are made stiffer and stronger than we are accustomed to make them in America; the saw frame is carefully counterbalanced; the balance weights are placed at the side and quite out of the way, below the level of the floor, and the machine as a whole is strong and compact, and its performance seems most satisfactory. These frames are constructed to take logs of two and a half feet in diameter, and they find a market in all parts of the wood-producing States of Europe and the British colonies. They require comparatively light foundations; and as they may therefore be readily removed from one locality to another, they are very well entitled to the name which has been given them. One of these machines, which seems, if possible, a better specimen of the type than its neighbors, takes a log sixteen inches in diameter and is said to weigh four tuns. The Armstrong dovetailing machine and several of the tools made by Ransome & Co., including the band saw and their mortising machine, are recognized at once as American designs; and in every part of the exhibit of wood-working machinery, we find familiar types, usually strengthened and made somewhat more substantially than at home, by continental as well as by British builders. The fact is simply another illustration of the extent to which our people and our institutions have benefitted those older countries from which our population has been derived.

The visit to the Exposition of a large

PARTY OF ENGLISH WORKMEN

has excited some interest, just now, among all classes. A society of mechanics and of those interested in the "promotion of scientific industry" has sent to Vienna thirty-five delegates from among its working members. The London *Engineering*, in an article referring to this delegation, remarks, very justly, of the English mechanic, that while he may have no superior as a workman, "he is behind the average continental mechanic in mental and scientific training," and that "England is no longer without rivals in industrial production," and further that the British are "heavily weighted with the evils of discord between capital and labor." Still, while laboring under the disadvantage of a lack of opportunity for obtaining the superior education of the German, and while having no such inducement to exercise that native inventive talent which he undoubtedly possesses in a hardly less degree than the American, and while involved in those sad quarrels which are a natural consequence of a misapprehension, by both masters and men, of those laws of political economy which control the relations between capital and labor, the English mechanic holds a position here which commands the highest respect; and it may well be a cause of pride that we who are most closely competing with him are his nearest relatives. Other nations have, like the United States and Great Britain, sent corps of observation to Vienna, in which are included some of their most skilled artisans; and it may be fully expected that this enlightened policy will produce most valuable results. No nation, however, has as many representatives from among the class of "practical artisans" as the United States. Large numbers of our most intelligent and most experienced mechanics have visited Vienna to see for themselves what the world on this side of the Atlantic is producing that is worthy of imitation. All are, probably, in some degree disappointed in their expectation of finding a large proportion of novelties here, yet probably none will go home feeling that the time and the money expended has been lost. From

THE GERMANS

they learn the value of a practical mental and scientific training, and see what it has done for a nation that cannot be termed a nation of mechanics. They learn also how splendidly the Teutonic nations have developed this kind of education, and how much we, and still more the British, have been left behind in that great field of culture. They learn from

THE FRENCH

that we do not excel in the combination of the useful with the ornamental, or in the exhibition of good taste in general work, or in the manufacture of those delicate kinds of apparatus and those marvellously perfect constructions which have become the ordinary tools of scientific work. From

THE BRITISH

they learn to admire that simplicity of form and that substantial construction which distinguish the mechanical works of that nation to a degree that we may well hope at some future time to imitate, though perhaps hardly to excel. They learn, finally, that, while we may feel proud of the position already attained, we have still ample opportunity to improve in many ways.

The exhibition of machinery for

MAKING CLOTHS AND FOR WORKING TEXTILE MATERIALS

is exceptionally large, and includes a most interesting variety. In this department, the United States exhibits almost nothing, but every other manufacturing nation is quite well and, in some cases, magnificently represented.

The Avery continuous wool spinner [deservedly attracts much attention. It is the machine which excited so much interest in the Fair of the American Institute of 1872, with one or two small but valuable improvements in details. The machine spins continuously and rapidly, and does its work well. It is compact and forms a remarkable contrast with its only competitors, which, however, are now placarded "*Hors Concours.*" This machine is claimed to be specially adapted to working short wools, and, on trial, to have worked a very large percentage of shoddy. Wool-preparing machines are largely exhibited. Cards are present in some variety, and at least one example of a comber is exhibited in the British section. Platt Brothers, of Oldham, exhibit a fine collection of cards and the comber referred to. These machines are well known in the United States, and no very remarkable novelties are found here. They are all well and neatly made, and are capable of doing the best of work. The whole exhibit of textile machinery is far more remarkable for its magnitude than for novelty. In the exhibit of Bede & Co., the use of friction gearing is an innovation which, if as successful as it is claimed to be, will be largely imitated.

The exhibition here, of one of our best card setting machines, of our harness making machines of some of our well known inventions, and of our standard machinery in this important department, would have added immensely to the interest of the United States section of the exhibition contained in the machinery hall. The manufacture of

SILKS

is with us a comparatively youthful branch of industry, although the Cheneys and a few other manufacturers have, in isolated cases, been long engaged in it. Naturally, it has no representation in the United States section. France and Switzerland have very interesting exhibits of silk-working machinery, and it is easy to trace the whole process of silk manufacture, from the winding of the fiber from the cocoon to its final appearance in the woven goods.

In one of the annexes may also be seen illustrated the whole previous history of this invaluable textile material. Beautiful specimens of many varieties of the moth are shown; the eggs, the grub, the cocoon, are all exhibited, and the whole process of treatment, not only of the cocoon but of the butterfly and its eggs, is fully exhibited. With the baking of the cocoon, for the purpose of killing the unfortunate insect within it, the process of silk culture ceases and that of manufacture begins. The thread is wound from the cocoon by means of winding or reeling machines, which are, in some examples seen here, so contrived as to slightly twist the fiber while winding it.

The process of spinning is remarkably well and largely illustrated in the Swiss section. It is quite different from cotton or wool spinning, and consists merely in twisting together the requisite number of fibers to produce the desired size of thread. The "drawing" which is so important a part of the process of spinning textile materials of short fiber is not necessary or possible here. Among the silk looms are several very fine specimens, which are at work weaving silks of various widths and patterns.

Switzerland exhibits some examples of waste silk working machinery. As the fiber is, in this case, much broken up, and resembles more nearly those more familiar textiles, cotton and wool, the process of working is intermediate between that by which new silk is worked and the ordinary method of working long wools.

If we may judge by what is shown here, the silk manufacture of Switzerland must be a large and an exceedingly important branch of that nation's industry.

SEWING MACHINES

can hardly be classified with the textile machinery, but they are hardly second to them in importance, and they appear in every section of the machinery hall in wonderful variety and in great numbers. As a matter of course, the more important and most effective of these machines, wherever exhibited, are of American make or are copies, made with great accuracy frequently, of American machines. The manufacturers of Great Britain and on the continent have imitated our methods of manufacturing, and sometimes produce exceedingly creditable work. The exhibit of sewing machines in the United States section is very extensive, and all of our standard machines are well represented. This is one of the most attractive departments of the whole *Welt-Ausstellung,* and interests all classes of visitors. Examining carefully the construction of these machines and comparing those of foreign make, it is soon discovered that, where defects occur in the latter, they are generally the result of a lack of knowledge of the proper distribution of material. The machines are made of standard forms and their parts are always made to gage and are interchangeable; but still the fits are sometimes a little loose, and the neat adaptation of the special qualities of steel and of iron, or of case-hardened iron, which invariably distinguishes the American productions, is sometimes not seen in the foreign copies.

The large number of ingenious and convenient attachments, which accompany the American machines is also one of the distinguishing characteristics. The foreign manufacturers do not invent them, and they are somewhat slow in adopting those invented in the United States. It is not at all remarkable that, notwithstanding the fact that so many sewing machines are now built in Europe, hundreds of thousands are still annually exported from America. Even the humble cottagers of Bohemia and the semi-civilized people of Russia and of Turkey are now becoming purchasers of these universally useful little "labor savers." An old subscriber to the SCIENTIFIC AMERICAN, who resides in Sweden, states that the poor peasants of that country also are succeeding frequently in satisfying the ambition, which is common to all, of possessing an American sewing machine. The sewing machine has thus become one of the most important aids in the advancement of civilization. Increase of production and the decrease of prices are therefore matters of great moral, as well as commercial, importance. The expiration of the last of the important patents upon essential details will now soon take place, and these very desirable consequences must soon follow.

R. H. T.

The Multiplex Telegraph.

On page 64 of our current volume, we called attention to an article in a contemporary, describing a French invention by which four operators can, it is asserted, each work a telegraphic communication over a single wire in one direction simultaneously; and not only this, but four others can operate at the same time in the other direction. A correspondent, J. T., writes to inform us that the honor of this invention belongs to the United States, and that the original and only inventor of the system by which more than two telegraphic instruments can be worked at the same time over one wire is Mr. Merritt Gally, of Rochester, N. Y., the inventor of the "Universal" printing machine. Mr. Gally's telegraph improvement has been patented in the United States and in some European countries.

Our correspondent states as follows: "By the use of Mr. Gally's invention a large number of operators at different stations along a single wire can be simultaneously employed sending different messages in either or both directions without conflict, each accomplishing as much or more work than would be possible for him to do by the use of the Morse key. Mr. Gally has adapted his system to each and every kind of receiver or register. The operator can receive his letter in print or by sound, or both simultaneously; or by the embossing, marking, or the electro-chemical recorder; and his instruments are so simple and accurate in their manipulation that it seems impossible that a mistake could occur in their operations. No time whatever is wasted in adjusting the instruments. They are always in readiness, and the first stroke of the operator sends the first letter of his message. Each touch of the key board represents a letter or other signal complete. The operator may be sending a message to a distant station, be receiving another from an intermediate or more distant station, and through a third part of his instrument be in active communication with every office on the line, receiving or sending calls or explanations; while on the same wire numerous other operators, all along the line, may be similarly employed. By using the electro-chemical recorder, on Mr. Gally's system, at least sixty operators may be simultaneously employed upon a single wire sending messages to any destination along the line; thus entirely doing away with the necessity of previously preparing the messages in punched slips of paper, as is done for the automatic machine."

The writer makes other claims as to Mr. Gally's invention; but the above will suffice to show the nature and great importance of the discovery. We hope soon to publish full particulars and illustrations of this last addition to and improvement in our telegraphic apparatus, the capabilities of which multiply with astounding rapidity.

IMPROVED RAILROAD HAND BRAKE.

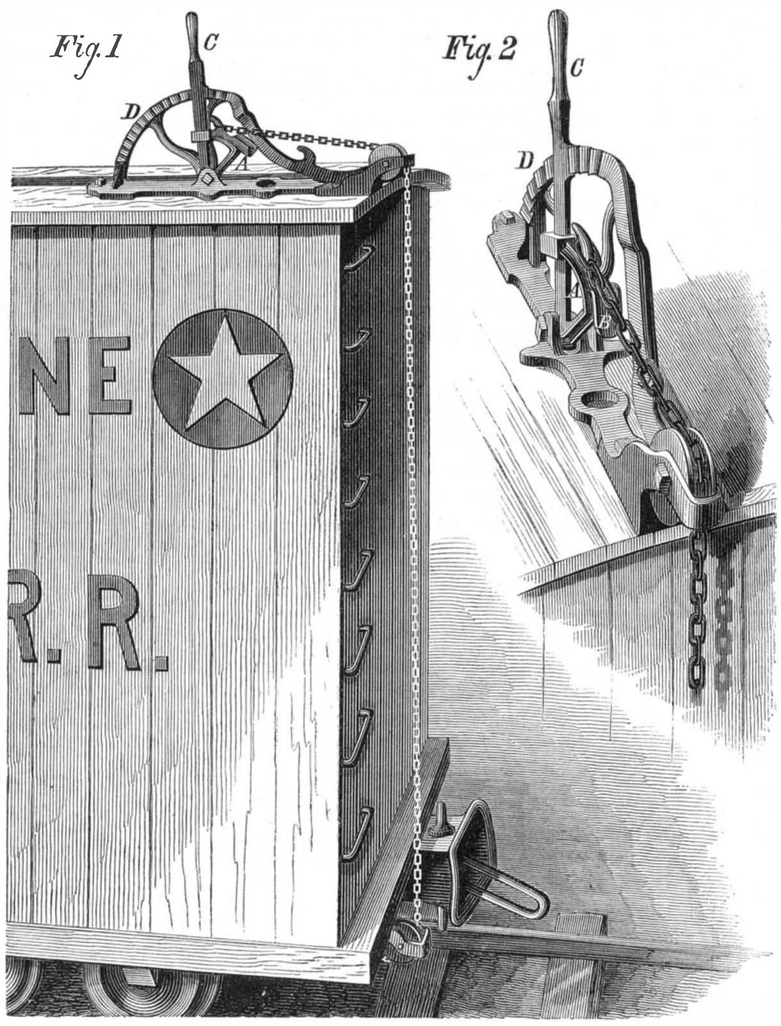
We illustrate herewith an improved form of railway hand brake, which, it is claimed, saves fully two thirds in distance run and time occupied while setting brakes. It is also stated to be much safer in use than the ordinary "twist up" arrangement, as it is placed from three and a half to four feet from the end of the car roof, so that, in case of accident, there is less danger of the brakeman being thrown between the train.

The device is quite simple, and consists of a bed plate, to which is pivoted, in lugs, a segment, A. On the latter is formed a hook, to which the brake chain is attached, and also a fork, B, for guiding the same. C is a wrought iron lever, connected with the segment and provided with a steel lip to engage in the teeth of the rack, D. The brake chain passes from the hook on the segment over a pulley, journaled in suitable bearings cast with the bed plate, and thence down under another pulley, secured as shown under the car, and so to the brakes. The arrangement on the roof of the car is, secured by but two bolts; and having merely a single motion, can necessarily be quickly operated.

The inventor informs us that on the occasion of a competitive trial between his device and the ordinary brake, which took place on the Little Miami railroad, while the latter stopped four cars and an engine in 1,130 feet, actual measurement, his invention performed the same operation within 425 feet, thus gaining 705 feet; and this although the cars in both cases were of the same weight and running as nearly as possible at the same speed.

From our engraving, giving two perspective views of the apparatus, and also showing how it is applied, a clear idea of its construction will be obtained. It appears strong and durable, and, according to the inventor, is not expensive.

Patented by Mr. W. S. Foster, of Foster's Crossings, Warren county, Ohio, who may be addressed for further particulars.



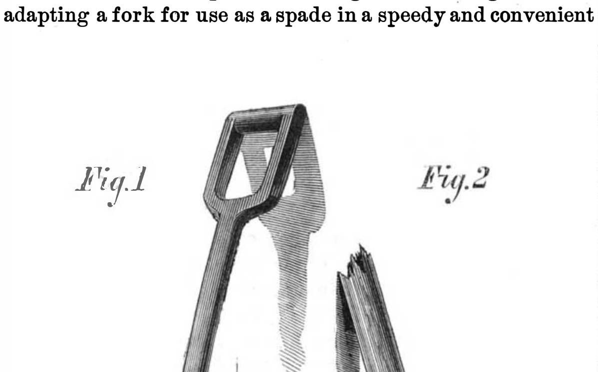
FOSTER'S RAILROAD HAND BRAKE.

To Prevent Burrs from Heating.

Says a correspondent in *Leffel's Mechanical News*, writing on the above subject: Dress from center to circumference, leaving no bosom. Draw a line across the center, each way, dividing a four feet burr into 16 squares or divisions, and other sizes more or less, in the same proportion, with all straight furrows. Let the draft be one half the diameter of the rock. Lay off the lands and furrows one quarter inch each, observing to dress smooth. Sink the furrow at the eye one quarter inch deep for corn, and run out to three sixteenths at the periphery; for wheat, three sixteenths at the eye and one eighth at the periphery. When thus finished, crack the lands in straight lines, square with the draft of cross lines, so as to make lines face in the runner and bed direct. This will never heat.

COMBINED SPADE AND FORK.

Our illustration represents an ingenious arrangement for adapting a fork for use as a spade in a speedy and convenient



manner. The fork may be of any ordinary pattern and the device, consisting of a sheath of corresponding form, is made to slip over the tines.

In our engravings, Fig. 1 shows the attachment partially in place. From the back is cut a triangular piece, A, which is hinged at its lower angle to the main portion. The same has a right-angled flange formed on its upper edge, which, when the fork is inserted, forms the top of the sheath. B is a projection on the triangular piece made semicircular so as to fit around the handle of the fork.

When the sheath is slipped entirely over the fork, a ring or sleeve, C, on the handle is brought down so as to surround the projection, B, and thus firmly hold the attachment in place. The sheath is made of sheet metal and, when affixed, forms the spade, as shown in Fig. 2. The plan is novel and economical, as the appliance can necessarily be obtained at a much less cost than an entire spade.

Patented July 15, 1873. For further particulars address the inventor, Mr. Heber Stone, Galveston, Texas, or care of W. S. Pierce & Co., 63 and 65 Stone street, New York city.

The Geographical Distribution of Mineral Oils.

M. J. Girard says, in *La Nature*, in relation to the above subject, that sources of bitumen have been known from antiquity. Those of the Euphrates, of Judea, the naphtha deposits of Bakou on the Caspian Sea, and the asphaltum of the Dead Sea, have existed from the earliest times. At Bakou, the inflammable gas or vapor of naphtha often produced remarkable phenomena, believed by the inhabitants to be supernatural and hence made an object of worship. A temple consecrated to fire was once erected there; but on its ruins, a paraffin factory now stands.

There is a certain relation between the mud volcanoes of Sicily and the Crimea and the sources of natural oil, as the emission of gas, surely indicating inflammable substances within is very common at times of eruption of the former.

Bituminous deposits are found in the mountains of the Caucasus, in South America, and especially in China, where the inhabitants utilize the gas flowing from the wells for domestic purposes. Before the discovery of the Pennsylvania petroleum, the sources of Burmah furnished the material in sufficient quantity to warrant exportation. There are important deposits of mineral oil at Pegon,and emissions of gas are observed at Chittagong and are locally known as the burning fountains of Bramah. In Assam,wells have been sunk for the extraction of oil, and recently petroliferous regions have been discovered in the south of India, in Australia and in Sumatra.

These mineral products are found all over the globe,though in the greatest quantities in the basins of large rivers, like the Indus, Euphrates, St. Lawrence,Mississippi,Colorado and many of the streams of California and Mexico; and also near lakes and inland seas. Pure and mixed oil has also been discovered in the islands of the Mediterranean, in the Grecian Archipelago, and in Ceylon.

Incrustation of Water Pipes.

The Boston fire insurance companies are now calling attention to the condition of the water pipes in that city. It seems that the water supply is greatly diminished by the incrustation formed on the inside of the iron pipes by the action of the water, so that a three inch pipe that has been laid ten years becomes reduced to two inches, those of four inches to three, and the six inch mains reduced to five and four inches. A pipe was recently taken up in Howard street through which one could not see, though water flowed slowly: and a pipe of three inch bore was taken up in Beacon street, filled up solid with rust. Here is a chance, says the Boston *Advertiser*, for an inventor to discover some coating to render iron pipes proof against the action of water. In the suburbs cement pipes are used, but it said that they are hardly strong enough to bear the pressure of the Cochituate water.—*New York Times.*

A Chemical Remedy for the Potato Disease.

Professor Alexander S. Wilson, in a communication to the *Chemical News*, states that he has made analyses of the tubers of diseased potatoes, and finds in the ashes a marked deficiency in the salts of magnesia and lime. In the ash of the healthy tuber from 5 to 10 per cent of magnesia salts are usually found, and over 5 per cent of lime. But in the ashes of diseased tubers, although the proper quantities of other minerals were found, the percentage of magnesia was only from 1 per cent up to 3·94 per cent, and of lime only 1·77 per cent.

With these considerations before us, I think, says Professor Wilson, that we are justified in appealing to chemical science—to solve the problem as to the prevention of the disease—to suggest not a substance that will destroy the enemy, for this is next to impossible, but to give the plant such nourishment that will enable it to resist the adverse circumstances in which it is placed, as well as the attacks of its own peculiar enemies.

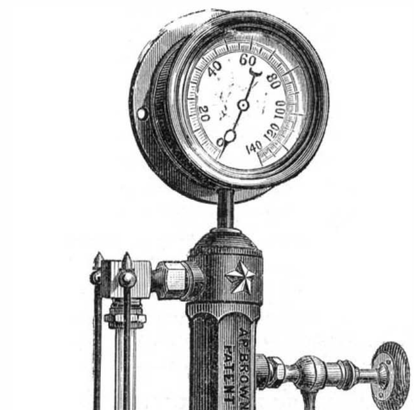
Some years ago, Professor Thorpe found, from the analyses of diseased and healthy orange trees, that, in the former, the amounts of lime and magnesia are deficient; the same thing, we have seen, is the case in the diseased potato plant.

It has lately been shown by Dr. Crace Calvert, that lime is one of the few substances which we know that are capable of altogether preventing the development of fungi in organic solutions. He does not give any experiments relating to the action of caustic magnesia on fungi, but doubtless its action will be found to be similar.

Here, then, is a curious and, at the same time, significant fact: Diseased potatoes are deficient in lime salts: lime prevents the development of fungi. May not the development of fungi in the vessels of plants be furthered by this deficiency? The circumstances are such as scarcely to leave room for doubt. So far, then, theory and practice agree; lime has been found by experience to be useful in preventing the disease, and I cannot doubt that magnesia, if tried, will be found to have a similar effect.

COMBINED WATER AND PRESSURE GAGE.

The inventor of the device of which we herewith give an illustration has combined the glass tube water gage, the try cocks, and the pressure gage in one neat and compact arrangement, which is claimed to be far cheaper than the separate articles: The boiler need be punctured in two places instead of six; the pressure gage is placed right before the eyes of the engineers, boiler tenders, or other workmen; and the gage glass is specially arranged to prevent, by a most ingenious contrivance, accidents from broken glass tubes. The three try cocks are opened by compression, and are self-closing, being fitted with spiral springs. In each of the horizontal passages at the top and bottom of the glass tube is a valve, consisting of a ball of solid material. This is so placed that, if the tube be broken the pressures of water and steam in the tube no longer balancing each other, the ball is instantly driven into its seat, closing the orifice, preventing the escape of hot water and steam and the scalding of the bystanders, as well as the loss of power from the boiler. The engineer can then, without danger or waste of time, put in another glass; and by slightly pressing in the piston, on the bottom at the left, the ball is driven from its seat, and water rushes into the upright tube,



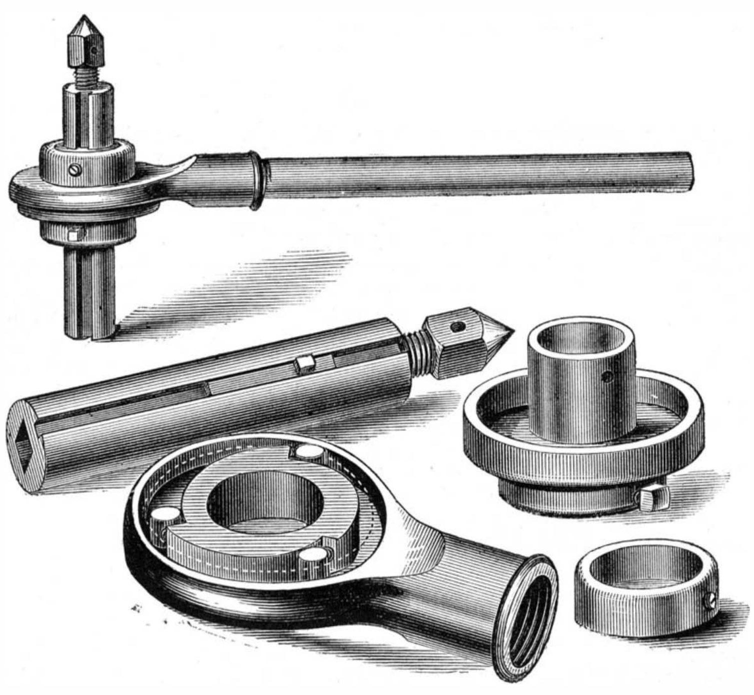
the pressure of which drives the ball in the upper part away, and equilibrium in the gage is restored.

By the valuable safety improvement, and by bringing together the various parts, frequently distributed about a boiler to the great inconvenience of the attendants, the inventor, Mr. A. P. Brown, claims that he has effected an important improvement in boiler engineering. For further particulars address T. Holland, 8 Gold street, New York city.

IMPROVED CLUTCH DRILL.

Little explanation, in addition to our illustration, is needed to show the action of this invention. By communicating the motion of the lever to the drill spindle by means of a friction clutch, the strain is distributed all around the spindle, and the liability of the drill, when acted upon on one side only, to swerve from the perpendicular is prevented. The merest possible motion of the lever moves the drill; and it will be seen that the clutch can be slid lengthwise on the spindle, allowing the latter and the lever to work clear of obstructions. The inventor claims that, by using cast steel as a material, he has produced the best and cheapest drill stock now in market, and the only one which uses friction as a means of communicating the motion, and which has, consequently, the advantages above mentioned.

For further information, address Mr. George W. Gill, 405 Commerce street, Philadelphia, Pa.



GILL'S CLUTCH DRILL.

Value of Foreign Patents.

In Europe the American origin of an invention is looked upon as a sort of guarantee that it is a good one, and those inventors who have, in addition to their American patents, secured patents in Europe have generally realized a larger profit from them than from those obtained at home. The reason of this is obvious when we consider the large amount of capital invested in the manufacturing branches of industry in England, France, and other European countries, and the competition which is naturally created thereby. Under this state of affairs it will readily be seen that the monopoly or control of any special branch of industry will, in a measure, free the manufacturer from the incubus of competition, and enable him to make a larger per cent upon his invested capital.

Cheap manufactures beget cheap labor and competition begets cheap manufactures. Therefore it is policy for the manufacturer to secure a monopoly of some branch of industry which he can manage and control, independent of his neighbor and competitor. In the United States, our manufacturing business has not yet resolved itself entirely into the hands of large manufacturers, but is divided up among a large number of small manufacturers who are not able to control more than a limited patronage. It would not, therefore, always justify them to invest in patent rights; and being small manufacturers, there is no inducement to get up such a close competition in business as would reduce their profits. The inventor depends mostly upon supplying the wants of the manufacturers, and it therefore behoves him to secure his inventions where the largest manufacturers and the closest competitition is found, and it is there he will realize the largest profit from his invention.—*Mining and Scientific Press.*

DOWN HALL, NEAR HARLOW, ESSEX, ENGLAND.

This mansion, the seat of Sir H. Selwin Ibbetson, Bart., M. P., occupies the site of the former house, once the residence of Prior, the poet, of which, however, nothing remained of the smallest architectural interest. Building materials of a good character being wanting in the neighborhood, and the site being upon an excellent gravel, it was determined to build the whole of the walls in concrete. The quoins, cornices, and columns, dressings of openings, etc., are in stone, and it has been especially sought to avoid giving the forms of stone work to any of the concrete. The plain surfaces, which alone are treated as concrete, are divided into panels, the stiles being plain Portland cement and the panels rough cast with fine sea shingle. The decorative panels and two horizontal friezes are executed in sgraffito. The internal arrangements offer no special features except the entrance hall, which, being of very large area and only of the same hight as the reception rooms, and therefore requiring to be broken up, is treated as a Pompeian atrium, the columns offering great facilities in the construction of the upper floor. Mr. F. P. Cockerell was the architect of the house, which is important not only as a fine specimen of construction in concrete, but as a most elaborate and handsome dwelling of the best modern type.

A Butter and Cheese Exchange.

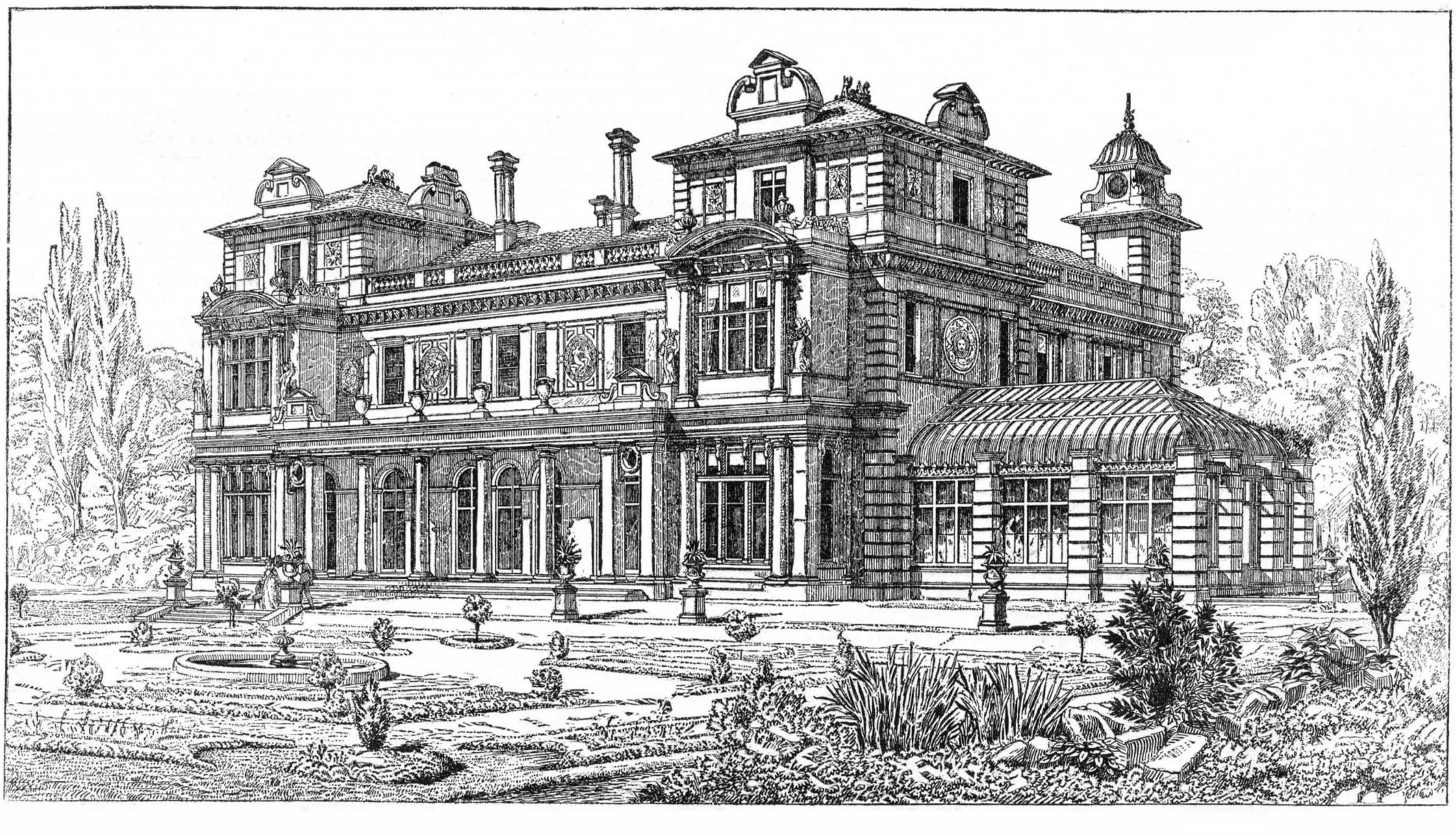
A new exchange for the butter and cheese dealers of this city was formally opened, on the 10th instant, in the large building at the corner of Reade and Greenwich streets, owned and occupied (as a sugar refinery) for many years by Messrs. R. L. and A. Stuart. The location being near the North River, by which most of these products arrive, and the building having been refitted to accommodate the business, the promoters of the enterprise look forward to advantageous results to the trade generally. From facts gleaned at the opening ceremonies, we are able to present some statistics of the dairy and provision products, which, by their extent, surprised us, and will be new to many of our readers.

It is estimated, from the present average of receipts from the 1st of May last, that there will arrive at the piers of the Hudson, during the current year, 3,500,000 packages of butter and cheese, of the aggregate value of $50,000,000, while the value of wheat is estimated at $24,000,000, corn at $26,000,000, flour at $20,000,000, cut meats at $12,000,000. It will thus be seen that dairy products and provisions represent by far the largest amount of business in the produce trade.

The Electric Light.

Up to the present time, as is well known, the electric light has been used only for lighthouses, as an electric sun illumination for signals, or on the stage, where a strong light may be required without regard to cost; but thus far it has been quite impossible to employ it for lighting streets or houses. By the old method the electric spark was passed between two points of charcoal, each attached to a copper wire connected with an electro-magnetic machine. The disadvantages attending this mode consisted in the facts that for each light a separate machine was required, and that the light so obtained, although very powerful, was impossible to be regulated, besides being non-continuous, owing to the rapid consumption of the charcoal points from exposure to the air. All these difficulties Mr. A. Ladiguin, of St. Petersburg, Russia, has tried, and apparently overcome most successfully. By his newly invented method, only one piece of charcoal or other bad conductor is required, which, being attached to a wire connected with an electro-magnetic machine, is placed in a glass tube, from which the air is exhausted, and replaced by a gas which will not at a high temperature combine chemically with the charcoal. This tube is then hermetically sealed, and the machine being set in motion by means of a small steam engine, the charcoal becomes gradually and equally heated, and emits a soft, steady, and continuous light, which, by a most simple contrivance, can be strengthened or weakened at the option of those employing it, its duration being dependent solely on the electric current, which of course will last as long as the machine is kept in motion. Taking into consideration the fact that one machine, worked by a small three horse power engine, is capable of lighting many hundreds of lanterns, it is evident that an enormous advantage and profit could be gained by the illumination of streets, private houses, public buildings, and mines, with the new electric light. In the latter, it must prove invaluable as no explosion need ever be feared from it, and these lanterns will burn equally as well under water as in a room. Without mentioning the many advantages this mode of illumination has over gas, which by its unpleasant odor and evaporation is slowly poisoning thousands of human beings, and from which explosions are frequent, we can state that, by calculations made, this electric light can be produced at a fifth of the cost of coal gas. We hope shortly to place before the public more complete particulars, as well as reports of further experiments which are proposed to take place in Vienna, Paris, and London.—*Golos, and Journal of Society of Arts.*

THE London Underground Railway is now in process of extension from Moorgate street to Aldgate. The new line passes under Finsbury Circus, under Bloomfield street, under Finsbury Chapel and the Moorfields Roman Catholic Chapel. But it is stated that these buildings will not be disturbed by the works.



DOWN HALL, NEAR HARLOW, ESSEX, ENGLAND.

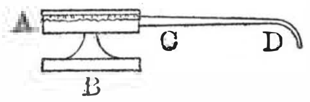
THE MAGIC LANTERN AS A MEANS OF DEMONSTRATION.

BY HENRY MORTON, PH. D.

PART 3.

EXPERIMENTS WITH THE VERTICAL LANTERN.

1st. Propagation and reflection of waves. For this we either use the water condenser or a shallow tank made by cementing a ring of glass five inches in diameter and about one inch deep upon a piece of plate glass. To produce the waves an admirable contrivance has been made by Mr. George Wale, of Hoboken, N. J., which is constructed as follows: The little box, A, is covered with a sheet of elastic rubber, and has attached to it the bent tube, C D. A light tap upon the elastic cover drives a puff of air out from the end of the tube and produces a single, well defined wave in the water over which it is held. The reflection of this wave from the sides of the tank can be well observed, and admirably illustrates the law of reflection from a concave circular surface. By placing an elliptical ring of thin brass in the tank, the peculiar properties of that curve in connection with reflection can be admirably illustrated. Thus, when the waves are produced at one of the foci, they are seen to develope a reflected center at the other, while in other positions curious patterns are evolved from the crossing and interfering lines.



2d. Cohesion figures. With the same tanks used in the foregoing experiment and some specimens of oils, we can exhibit, in a very perfect manner, those characteristic differences, in the behavior of films of the latter on the surface of water, first studied by Tomlinson (*Philosophical Magazine*, October, 1861, and March, 1862). Thus, some perfectly clean water being poured into a tank which has been washed with a solution of caustic potash, well rinsed and drained (not wiped) dry, a single drop of oil of coriander is allowed to fall upon its surface. It will instantly spread into a large circular sheet which, in another instant, will break into a moss-like pattern, such as is represented in Fig. 13, and this, in a moment more, will fall apart into a multitude of minute globules.

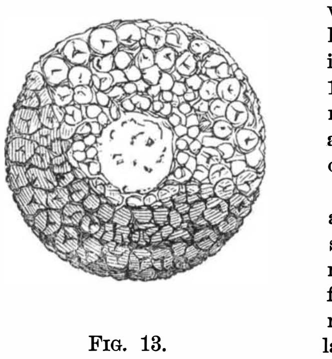


FIG. 13.

Taking a fresh tank, and dropping upon it some oil of cinnamon, we have, as before, an instantaneous flash into a large circle (see Fig. 14); but this slowly developes a series of beads around its edge, and then, one by one, circular openings break out in the interior, each of which acquires its string of beads and gradually expands until one of them, reaching the margin, breaks through, and the whole figure, with a jerk, passes into some new and irregular form.

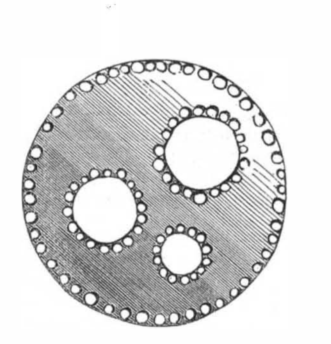


FIG. 14.

Again, with a fresh tank and several drops of carbolic acid, we obtain another striking effect. Each drop assumes the shape of a sort of jelly fish (Fig. 15), having a globular center and irregular fringed margin, which last is in constant motion and changes its outline, while the entire object sails about from point to point of the tank. Ether, likewise, makes a very beautiful though transient figure; and indeed, by changing the substance, an indefinite variety may be given to the experiment.

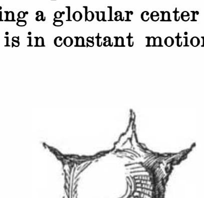


FIG. 15.

The most scrupulous cleanliness is essential with the tanks and water. The former, after use, should be washed with a little solution of caustic potash, be thoroughly rinsed, and then allowed to dry by draining.

MOTIONS OF CAMPHOR ON WATER.

This phenomenon, which has exercised the ingenuity of scientific men for nearly a century and has finally, we think, received its full elucidation at the hands of Professor Tomlinson (*Philosophical Magazine*, Vol. 34, page 409), admits of striking and amusing exhibition with the same arrangement as we have above described, an absolutely clean tank being, however, essential. Into this a few grains of gum camphor are thrown (contact with the hands being avoided as much as possible); and at once they will set up a rotary motion and one of translation, like so many waltzers in a ball room. The accidental shapes of individual pieces or groups of fragments clinging together, with their motions, sometimes produce effects ludicrous in the extreme.

WATER WAVES ON A CHLADNI PLATE.

This experiment (Fig. 16), devised by the present writ , is arranged as follows: By means of a clamp which fits the front part of the vertical lantern, a plate of glass, ab a foot square, is so held by its middle that one corner cov the condenser. This corner has cemented to it a thin ring of soft rubber of about five inches in diameter, and in this is poured water to the depth of one tenth of an inch. In the figure, C D being the clamp and A B the glass plate, E F is the ring or rubber exactly over the condenser. The parts being so adjusted, we draw a violin bow over the edge of the plate so as to produce a low musical note. At once the water within the ring of rubber is thrown into a system of large waves, which are seen on the screen in a shaded network of singular beauty. On so drawing the bow as to produce a higher note, smaller waves take the place of the larger ones, and with a mixed note we can even get two or more systems, superposed. The sound emitted by the plate is distinctly heard at the same time; and as an illustration of the connection between sound and vibration, wave length and pitch, this experiment certainly answers well, to say nothing of the beauty of the wave patterns as exhibited on the screen.

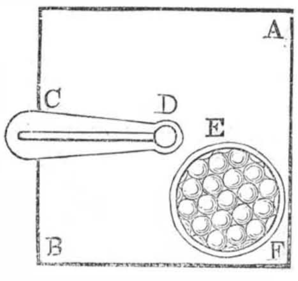


FIG. 16.

DUST FIGURES BENEATH A CHLADNI PLATE.

If a little impalpable silica, such as may be obtained by passing fluoride of silicon into water and drying the gelatinous silica so formed, is scattered on the surface of the condenser and the Chladni plate is adjusted close over it: then on sounding the plates, the figures, which Faraday showed to result from the vortical air currents developed by the various motions in the vibrating plate, can be well exhibited. If the same light powder is scattered in a glass tube, and the latter is sounded with a moist cloth, so as to produce the figures of Kundt, these can likewise be readily exhibited in the lantern. A more convenient method is to sound the tube with a whistle, and the tube itself may be made square, of plate glass. These arrangements, as also the method of exhibiting the dust figures, are due to Mr. Wm. E. Geyer, Instructor in the Stevens Institute of Technology.

EXPERIMENTS IN ELECTRICITY.

If a piece of thick platinum or tin wire is bent into a hoop circling the interior of one of the glass tanks above mentioned, and the tank itself is filled with a strong solution of bichloride of tin: then, on inserting another wire at the center of the solution and connecting with a series of two or three Grove's elements, so as to make the center wire the negative and the hoop the positive pole, a beautiful growth of metallic crystals will shoot out from the center and spread over the entire surface of the field. A similar experiment may, of course, be performed with a vertical tank, but the unsupported weight of the metallic blades then soon breaks them down. In this arrangement, however, they are supported perfectly, resting, in fact, on the bottom of the tank, as the solution should not be more than an eighth of an inch deep.

If a small compass needle be mounted on a pointed support, like an inverted tack or drawing pin, its motions are, of course, vastly amplified in the huge image projected on the screen, and may thus be utilized in a number of ways which are too evident to need mention and too numerous to admit of it. If, moreover, a piece of covered copper wire is bent into a flat rectangle and placed beside the needle, with its ends, of course, in binding screws or mercury cups, it will form a galvanometer quite delicate enough for all ordinary use. It will indeed show the induced current developed by introducing a magnet into and withdrawing it from a helix. This, of course, opens a wide field of illustration.

A more complete apparatus for use as a lantern galvanometer has been described and used by Professor A. M. Mayer, of the Stevens Institute of Technology, with great success, but as it involves several modifications in the constructive detail of the instrument, we must refer the reader to the Professor's original description. (See *American Journal of Science*, 1872, Vol. 3, page 414; *Journal of the Franklin Institute*, 1872, Vol. 63, page 421; and "The Earth a Great Magnet," Chatfield & Co.

Another arrangement, superior to this for many purposes and not requiring a vertical lantern, has since been devised by Professor Mayer, and will be found described in *American Journal of Science and Arts*, 1873, Vol. 5, page 270.

MAGNETIC EXPERIMENTS.

If a powerful steel magnet, about an inch and a half long, be laid upon the horizontal condenser, and a plate of glass, on which fine iron filings have been previously sifted, be then brought close over it and gently tapped, the iron filings will be seen to arrange themselves in that beautiful system of curves known as the magnetic spectrum.

A great variety of similar experiments, illustrating the laws of magnetic force, will suggest themselves to any one familiar with the subject, and a number will be found in the little book already named, "The Earth a Great Magnet," which is the substance of an illustrated lecture which was delivered by Professor Mayer at the Stevens Institute of Technology, as well as in the Academy of Music, in New York, and at New Haven.

Steam Locomotives without Fire.

The fireless locomotive, heretofore engraved and described in the SCIENTIFIC AMERICAN, has lately been tried in Chicago. The Chicago *Tribune* says:

"In front of the cars was the motive power, contained in a small, compact, and neat locomotive, manipulated by an engineer. This was the fireless locomotive. It consisted of a boiler, eight feet long by three feet in diameter, and the usual machinery on a small scale. There was no fuel, no fire, no fireman. The steam was supplied for the round trip of six miles before starting. At the depot was a supply boiler, sixteen feet by three feet, in which steam was generated until 200 pounds pressure was indicated by the steam gage. The locomotive boiler was three fourths full of cold water. Instead of boiling this by means of a fire and raising the pressure to a required hight, the heat was introduced from the supply boiler through an iron tube. The iron tube was connected with the locomotive boiler, the latter running under the water along the bottom of the boiler and letting out the superheated steam, as it was freed from the supply boiler, into the locomotive boiler. This steam, rising through the cold water, permeated it, and quickly raised its temperature to 170 degrees. With this supply of steam the locomotive started, drawing a heavy four horse car over the three miles, to 35th street in ten minutes. The amount of steam consumed was 80 pounds, the locomotive starting back with 90 pounds remaining. When the starting point was reached, there was 57 pounds of steam in the boiler, the pressure being reduced only 33 pounds in the return trip, which was down a grade. It must be borne in mind that there was a large car, heavily laden, making eighteen miles an hour. The experiment proved conclusively that, as a substitute for dummy engines, the fireless locomotive is, beyond question, a success. There is no fire or fireman required, very little steam escapes, and the locomotive, not being one half the size of the clumsy dummy engine, does not frighten horses and endanger the public safety."

Railway Dead Weights.

We think it may be safely be said, remarks the *National Car Builder*, that, as a rule, every piece of inferior wood or metal used in the construction of a car adds unnecessarily to its weight; and on the other hand, the better the stock from which castings or other iron work are made, and the greater the care in selecting, seasoning, and applying to their special uses the various kinds of timber, the more the aggregate weight can be reduced without impairing the requisite strength. The modern buggy and other vehicles built at our carriage shops, are illustrations of this. Their strength, lightness, and slender proportions, as compared with their predecessors of former days, are almost a marvel, and are due to the quality of the material and the skill with which it is utilized. Let the same principle be applied, as far as practicable, in car construction, and a vast quantity of dead weight may be got rid of.

Budding Fruit Trees.

This is the proper season for budding most trees. Peaches especially are growing luxuriantly, and a bud or two inserted at this time will in two or three years give a bounteous return. It is very easy to go to a nursery and purchase a few young trees in spring, but it is not quite so easy to procure large ones of a bearing age. Therefore when there are any old pear, or even peach trees, standing around our dwellings, it is but a few minutes' work to put in a few buds of some excellent kind, and thus insure a crop that will be remunerative in time to come. By the way, the quickest, easiest and surest method, when the bark separates easily from the scion, is to cut beneath the bud, half way through the scion, commencing half an inch below the bud and ending the same distance above. At the latter point merely run the knife around the bark and twist the bud off, leaving as a matter of course all the wood adhering to the stick. These in the case of peaches rarely fail under the worst of treatment, and in fact so sure has the operation now become that the large propagators use this method in preference to all others.—*Correspondent of New York Tribune.*

Preventing Fires on Board Ship.

Dr. M. Schuppert, of New Orleans, La., writes to call attention to the frequent destruction of vessels by fire, and the consequent loss of life and property; and he points out the special liability of cargoes of cotton to spontaneous ignition, as bales are often put in places where they may absorb oil. He proposes to have, in the holds of such vessels, boxes filled with marble dust, into which pipes are to be led to convey dilute sulphuric acid. The carbonic acid gas disengaged by the contact of the sulphuric acid will undoubtedly extinguish fire; and Dr. Schuppert points out that the gas, being heavier than atmospheric air, can easily be confined to the hold of the vessel.

SQUARING THE CIRCLE.—A correspondent sends us a paper by an author who wisely conceals his name. It proposes to square the circle by the following irresistible logic: $\frac{11}{14}$ of the diameter = $\frac{1}{4}$ of the circumference. Therefore a quadrilateral figure $14 \times 11 =$ a circle whose diameter is 14. The objection to it is that $\frac{11}{14}$ of the diameter of a circle does not equal $\frac{1}{4}$ of the circumference.

C. M., of Reading, Eng., says: "You cannot think how eagerly your admirable publication is sought after in these parts, and what interest is taken in it. The knowledge I have gained in my little way has proved not only beneficial, but of great and lasting advantage to others; and I wish my scribble would bring you 5,000 more subsbribers."

American Progress in Stock Breeding.

In nearly all matters relating to industrial and material progress, the United States are making unquestionable advance, the basis of which is individual effort. Here every man aspires to better his condition, and tries to attain improvement in whatever his hand may find to do. If a mechanician, he is not satisfied until his devices are made superior to the old fashioned styles. If a horse breeder, his mind is given to the raising of a stock that shall beat the world. This pervading spirit of enterprise, this constant study for improvement, ramifies into almost every pursuit, and the general result is an elevation of the quality of American productions which makes them specially sought for in foreign lands.

An exemplification of this is seen in the circumstances connected with a recent cattle sale at New York Mills, N. Y., near Utica, at the farm of Mr. Samuel Campbell. The animals sold were chiefly of the short horn variety, imported twenty years ago from England, and since that time subjected constantly to American study and improvement. The result is now seen in the production of cattle of such great superiority that bidders for them have come from distant lands to pay down probably the highest prices ever before given for animals of this variety.

The New York *Tribune* says that about 500 people were in attendance at the sale, among whom were: the Right Hon. Lord Skelmersdale, whose seat is near Liverpool; Mr. Halford, of Papillon, Market Harborough; Mr. Calthorpe; Mr. Richardson, who represents Sir Curtis Lampson, of Sussex: Mr. Berwick, agent for Lord Dunmore, but who buys for Earl Bective, recently Lord Kenlis, of Underley Hall, Lancashire, and Mr. Kello, agent for Mr. R. Pavin Davis, of Horton, Gloucestershire.

A three year old bull brought $12,000. A cow, $30,600. A yearling heifer, $19,000. Another cow, $35,000, bought by Lord Bective. The culmination of the intense interest, however, was reached in the bidding for the Eighth Duchess of Geneva, which was sold to Mr. R. Pavin Davis, of Gloucestershire, Eng., for the unprecedented sum of $40,600. After this 11 cows of the Duchess family sold for $238,800, an average of over $21,700. Of these six went to England at a cost of $147,100, and five remain here at a cost of $91,700.

After the Duchess family came the Oxfords, then the other families, the bulls being brought in after all the cows were sold. There were in all 111 animals presented. The sum realized was $380,890.

Poisonous Undershirts.

Well authenticated instances of poisoning, resulting from wearing fabrics colored by some of the dyes in common use are by no means unusual. A highly intelligent gentleman, B.P., Esq., of Byfield, Mass., called a few weeks ago to consult us regarding his own case, which was of so serious a nature as to cause much alarm, not only to himself but to his family.

He had a few days previous purchased some new undershirts of cotton, colored with various tints, among which aniline red predominated. In a short time after putting on the garment, a peculiar eruption of an irritating nature appeared on the portion of the body covered by the cloth. The effects were not merely local, but to a considerable extent constitutional, pain and uneasiness being experienced in the back and lower extremities. In proof that the eruption was caused by the dye colors, it may be stated that a portion of the garment about the upper part of the chest was lined with linen on the under side; and wherever this came in contact with the skin, no eruption or redness appeared. The gentleman had worn cotton stockings, upon the upper portion of which there was woven in the fabric a narrow line of red. Beneath this band of red, around the leg, appeared a corresponding band of irritated skin after wearing the hose one day. The poisonous influence of the dye colors in this case cannot be disputed. It is not probable that the number of persons is large who possess such idiosyncrasies of constitution as to be easily poisoned by dye colors, but that three are some does not admit of a doubt.—*Boston Journal of Chemistry*.

Prizes for Electrical Inventions.

Among the general subjects for which prizes of gold and silver medals are offered by the Society of Arts, London, are the following:

A galvanic element which shall combine the constancy fo the Daniell's cell with the low resistance and high electromotive force of a Grove's cell.

An electric condenser which shall combine high capacity with small bulk and small residual charge.

A sensitive pocket galvanometer. The size should not exceed that of a watch.

To which may be added, as of use in telegraphy:

A varnish or coating which can be applied to iron wires so as to protect them against rust, and which shall not be liable to chip off when the wire is bent or rubbed.

Electric weaving. To the manufacturer who first practically applies electricity to the production commercially of figured fabrics in the loom.

Telegraphs. For an economic and permanent means of telegraphing through uninsulated wires, between places not less than 1,000 miles apart.

All communications and articles intended for competition must be delivered addressed to the Secretary, at the Society's House, free of expense, either on or before the 31st December, 1873 or 1874, except where otherwise stated. In the first case they will be considered during the session 1873-74; in the second case during the session 1874-75. Any communication rewarded by the Society, or any paper read at an ordinary meeting, will be considered as the property of the Society.

VIENNA PREMIUMS AGAIN AND THE AMERICAN SEWING MACHINES.

By reference to the "General Regulations of the Vienna Universal Exhibition," published by Archduke Regnier, President of the Imperial Commission, we find medals were to be awarded, in the mechanical department, in two classes—one for merit, and one for progress. The medal for merit was for the article possessing the greatest merit of its kind and class; and the medal for progress, for the article or thing which had made the greatest progression toward perfection. (In this country, the award of progress would be called a second premium.) Hence we conclude that, as the Wilson Sewing Machine was the only sewing machine that received the Grand Medal of Merit, when the awards were made at the Vienna Exposition, it must have been the best sewing machine on exhibition; although other sewing machines that received medals for progress should not be considered very inferior machines. At the great American Centennial Exposition of 1876, they may have so improved as to equal the world renowned Wilson Shuttle Sewing Machine.—*New York Tribune*, Sept. 8, 1873.

THE number of complete patents granted in England, in 1872, was 2,734.

NEW BOOKS AND PUBLICATIONS.

A TREATISE ON CIVIL ENGINEERING. By the late D. H. Mahan, LL.D., Professor of Civil Engineering at West Point, N. Y. Revised and Edited by De Volson Wood, Professor of Mathematics and Mechanics in the Stevens Institute of Technology. New York: John Wiley & Son, 15 Astor Place.

Dr. Mahan's "Civil Engineering" is one of the standard American text books; and we have here a new edition, containing the methods and formulæ of the present day. The work is too well known to need commendation in this place; but we are happy to give unqualified praise to the manner in which this new issue has been improved and edited.

SOUND AND MUSIC: a Non-Mathematical Treatise on the Physical Constitution of Musical Sounds and Harmony, including the chief Acoustical Discoveries of Professor Helmholtz. By Sedley Taylor, M. A., Fellow of Trinity College, Cambridge, England. Price $3. New York and London: Macmillan & Co.

This book is an acceptable supplement to Dr. Tyndall's "Lectures on Sound," and applies the masterly reasoning of that work to the explanation of the theory of musical intervals and harmonics. We cordially commend it to students of acoustics, and to musicians desirous of investigating the science of their art.

PROGRESSION: Devoted to the Railroad Interests of the West and South. Volume I., No. 1. Subscription, $2 a year. St. Louis, Mo.: Lee and Josselyn.

This is an excellent specimen of contemporary journalism; and the field t proposes to occupy is large enough even for Western energy and pluck.

THE PRACTICAL MAGAZINE: a Monthly Illustrated Cyclopædia of Industrial News, Inventions, and Improvements. Price $1. London, England; and J. R. Osgood & Co., Boston, Mass.

The eighth issue of this very handsome publication has just come to hand from the well known publishing house of J. R. Osgood & Co. There is no falling off either in the literature or illustrations of this first class magazine, which includes in its present issue, among other engravings, an admirably life-like portrait of Robert Crawshay, of Merthyr Tydvil, one of the iron kings of South Wales.

THE AMERICAN TEXTILE MANUFACTURER: a Journal devoted to Textile Manufactures, Market Reports, Practical Information and Scientific Subjects.

This neatly printed sheet is issued by the Textile Publishing Company, 234 and 235 Broadway, New York. It contains a considerable amount of trade information, and some articles, original and selected, relating to the industries on which it relies for support. We are glad to see that our efforts in the cause of industrial progress are appreciated by the editors of this new publication.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From August 25 to August 28, 1873, inclusive.

BATTERY GUN.—J. P. Taylor, Elizabethton, Tenn.
BRUSH MAKING.—Florence Manufacturing Company, Mass.
BUFFER AND COUPLING.—W. H. Skidmore, Philadelphia, Pa.
COMPOUND FAUCET.—W. S. Bate, Philadelphia, Pa.
GAS MAKING.—H. H. Wainwright, Philadelphia, Pa., *et al.*
GAS MAKING.—O. C. Hoffman, New York city.
HACKLING MACHINE.—J. C. Todd, New York city.
INTERNAL SCREWING.—J. L. Pope, Cleveland, Ohio.
LOCK AND KEY.—D. K. Millor *et al.*, Philadelphia, Pa.
LOOM HARNESS.—F. Condit, Providence, R. I.
SHAFT COUPLING, ETC.—J. Charlton, Philadelphia, Pa.
SHUTTLE GUARD.—E. M. Stevens *et al.*, Boston, Mass.
TRIMMING PAPER, ETC.—M. H. Semple, Lowell, Mass.
WATCH REGULATOR.—C. Teske, Saratoga Springs, N. Y.

Recent American and Foreign Patents.

Improved Sawing Machine.

Allen Xander, Slatington, Pa.—This invention consists in the improvement of sawing machines. The table is provided with one or more boards arranged to slide in and out of supports in the under side of it, to hold the work directly in front of the saw when it may be required to do so for cutting slots or notches in the end of the work. This tool may also be used for making long grooves in the work by running it over the cutter on the table.

Improved Hoisting Jack.

John Churchill, Cross River, N.Y.—The object of this invention is to construct a hoisting jack which is easily operated, effective in action, and readily adjusted to different hights. The invention consists of a bell crank lever with treadle, which acts by means of an intermediate connecting rod and weighted link on a sliding rack, guided between a strong frame.

Improved Automatic Gate.

John S. Foit, Kenton, O.—This invention has for its object to furnish an improved gate, which shall be so constructed that it may be readily opened and closed by simply moving the end of the lever in one and another direction. The invention is an improvement in the class of gates having appliances for swinging them at a distance; and consists in the arrangement of a set of parallel levers and their connecting rods with a pivoted plate, upon which the gate itself is pivoted and partly supported. By this arrangement, by operating either of the levers, the gate is swung open and latches upon the post, and by moving either lever in the opposite direction the gate will be swung shut.

Improved Land Marker.

George W. Betts, Shadeville, O.—This invention relates to an arrangement of a sliding bar and pivoted lever with the pivoted frame to which the markers are connected. The plows or markers have a free vertical, but no lateral movement. The rear ends of levers pass through keepers attached to a bar, so that the plows or markers may all be raised and lowered at the same time, by raising and lowering the said bar. The bar is attached to the rear ends of two levers which are pivoted to short studs, attached to the rear bar of the frame. The forward ends of the levers are connected by a board for the driver to rest his feet upon, so that he can, with his feet, raise the plows from the ground, to pass an obstruction or for convenience in turning around. To a hand lever is pivoted the forward end of a bar which slides in the slot of an upright, attached to the rear bar of the frame. The bar projects rearwardly, so that, by adjusting it by means of the lever, it can be made to support the plows when raised from the ground; or it can be adjusted to act as a lever for forcing the plows farther into the ground. The slotted upright has several holes formed through it to receive pins, between which the bar slides, so that by adjusting the said pins the bar may be adjusted to support the plows at any desired distance from the ground.

Improved Machine for Making Taper Tubes.

Thomas J. Jones and John T. Jones, Sharon, Pa.—This invention consists of a taper mandrel, with a clamp for holding the plate of which the tube is to be formed at one edge, and a lever and bending plate, so contrived that the tapered plate is bent to the form of the mandrel by pressing said bending plate upon it by the lever, the mandrel being shifted around from time to time, and held stationary while the pressing is performed. The invention also consists of a mandrel and holding clamp, a welding roller, and a carriage, so combined and arranged that the bent plate, being reheated and arranged on the mandrel with the edges lapped and adjusted in the carriage, is quickly and thoroughly welded by the pressure of the welding roller, under which the lapped edges are caused to pass forward and backward until the joint is completed.

Improved Knob Latch.

August Heyse, Terre Haute, Ind.—The object of this invention is to furnish an improvement in the class of door locks having a sliding spindle with wedge-shaped pieces attached to it. The invention consists in the arrangement of guide pieces in connection with the bolt spindle. The latch bolt consists of three parts: Head, shank, and wedge extension. The head is considerably larger than the shank part, and is acted upon at its rear side by the end of a band spring. The wedge part extends sidewise in a right angle from shank, forming, with guide piece, a square aperture for the knob spindle. Two wedge projections are placed centrally, but in opposite directions, on spindle, and act from both sides on wedge extension. The latter is, therefore, pressed back whether the knob is pressed or pulled, opening thereby the door. A spring presses the bolt forward again as soon as the knob is released. The whole lock is let into the door, which is, as well as the side face plate, provided with slotted perforations.

Improved Circular Saw Guards.

Oscar A. Dean, Bethel, Vt.—The object of this invention is to provide means for protecting the operator in using circular saws: and consists in a guard consisting of two or more pieces. By raising and lowering the guard bar the two guards may be kept nearly in contact with the piece of lumber which is being sawn, and all danger from pieces, splinters, or loose knots being thrown toward the operator is prevented.

Improved Reversible Rotary Steam Engine.

Orwin Adams, Black Hawk, Col. Ter.—This invention has for its object to furnish an improved rotary steam engine. To the main shaft is keyed the drum, through slots in the face of which the pistons move in and out. The shaft works in cast steel bearings made adjustable. The pistons are bolted to yokes, which work upon the shaft. To the pistons and yokes, at or near their point of intersection, are secured slides, which move along the outer surface of a circular guide to force and hold the pistons out, and along the inner or concave surface of an elliptical guide to force and hold the pistons in. Steel circular rings, working against the metallic packing in edge of the drum, are let into the heads of the cylinder, and are adjusted by set screws. The part of the cylinder above the points of intersection of the guides is recessed to allow the exhaust steam to escape freely around the edge of the pistons, as soon as they have completed their stroke. The steam is prevented from passing directly from one port to the other by a packing held against the drum by springs. To the shaft, at one end of the cylinder, is secured a cam which moves a bar downward by striking against a pin and friction roller attached to the said bar. The bar is moved upward gradually, as allowed by the cam, by a spring, and is slotted to receive and slide upon a spindle and shafts, and to its upper part is attached a dog which, as the said bar moves upward gradually, through suitable mechanism opens the valve suddenly at the beginning of the stroke. As the valve opens the valve stem is caught and locked by a tappet. At the end of the stroke the valve will be instantly closed by the action of a stiff spring. To reverse the engine, the valve works are thrown out of gear, and the cut off is thrown open by a lever. The engine, when reversed, works at full stroke, and is regulated by the throttle valve. The cut off may also be made reversible by an extra cam, friction pulley, and lever arrangement.

Improved Crib.

Ward B. Carpenter, West Topsham, Vt.—The object of this invention is to provide an attachment to a crib, by means of which the same can be readily changed from the rocking position into a stationary one without being perceptible to the child sleeping therein, and permitting the quick and easy removal of the crib from one place to another. The invention consists of a slide attachment pivoted centrally to the rockers, made of two halves, having casters at their outer ends, by which the rocking crib can be changed directly into a crib moving on casters.

Improved Grain Sieve.

Lorin D. Carpenter, Buffalo Grove, Iowa.—This invention relates to the construction of sieves for cleaning and separating grain, designed for all kinds of separating machines; and consists in a series of perforated angle plates so as to overlap each other, and bent up at their lower edges so as to form long narrow troughs, into which the grain is received, and whence it is discharged.

Improved Device for Preventing Horses from Cribbing.

Alexander Stilwell, Dwaar's Kill, N.Y.—This invention consists in a device or machine for causing pain when the horse attempts to crib. In fastening the device to the horse it is brought in contact with the throat. It consists of a metal frame with levers, guards, etc., suitably arranged. When the horse attempts to crib, the cribbing action distends the larynx and presses upon a cross, which causes points to rise and punish him. When he is quietly eating his feed this action does not take place, and he is fully protected.

Improved Foot Power Apparatus.

Ebenezer Harding and Henry Harding, Delavan, Minn.—This invention consists of a fly wheel, foot treadle, and crank for obtaining motion, and a lever and connecting rod for transmitting and converting the motion to work vertical saws, mortising machines, and the like, arranged in a simple and efficient way, calculated to provide driving mechanism for small shops, by which sawing, mortising, and the like can be done to better advantage than with the ordinary hand power machines.

Improved Lamp.

John Kirby, Jr., Adrian, Mich.—This invention is an improvement in the class of hanging or chandelier lamps provided with a detachable feeding reservoir; and the improvement relates to the construction of the suspending devices of the detachable reservoir, and the means for drawing off the settlings of the permanent reservoir.

Improved Ferry Bridge.

Carroll J. Atkins, Louisiana, Mo.—This invention consists of a bridge or platform for ferry boats arranged to swing down, without obstruction, as low as needed to be level with the boat deck at low water; and an incline in the bow of the boat to run under the projecting end of the bridge and raise it to the level of the boat deck, whether the water be high or low. The invention also consists of large V-shaped notches in the edge of the platform or bridge, and corresponding projections on the boat to enter them, and thus bring the boat and bridge into alignment. This part is more particularly designed for railroad ferry boats and bridges, to insure the alignment of the tracks for running the cars from one to the other.

Improved Boot Heel Screw.

William Ackerman, Flint, Mich.—The object of this invention is to fasten boot heels made partly of wood and leather to the upper part of the boot heels by means of screw bolts, so that by unscrewing them the heels may be easily taken off and put on again, or new ones substituted in their stead. The screws may also be provided with sharp points, to be used in winter and by persons employed in occupations which require a firm hold of the feet, as raftsmen and others.

Improved Packing for Hydrants.

John W. Murphy, Baltimore, Md.—This invention consists in a hydrant packing ring, cylindrical on the inside and tapering downwardly on the outside, whereby leaking and waste of water or other liquid is effectually prevented.

Improved Manufacture of Friction Matches.

Charles F. Bonhack, New York city.—The object of this invention is to furnish to manufacturers of matches an improved dipping machine, by which the matches may be dipped more quickly and conveniently than with the machines hitherto in use: and also a more even and complete head of the matches be produced, and the workmen to a great extent protected against the deleterious influence of the phosphoric vapors. The invention consists of the combination of the receptacle for the phosphorus paste and surrounding water bath with stirrers and transferring rollers, together with regulating and guiding appliances.

Improved Weighing Attachment for Wagons.

Jacob W. Hill, Jefferson, Iowa.—This invention is intended to furnish an improved weighing attachment for wagons, to enable the load to be conveniently weighed without the necessity of driving to a platform scale, and which shall be so constructed that the knife edges will not be liable to wear while transporting the load. The bolsters are made in two parts, one attached to the axle, while the other or false part supports, and is movable with, the wagon box. The levers for lifting the box are pivoted to the fixed part of the bolster, and the weighing levers—which have for their fulcrums bars that are pivoted to the lifting levers—pass through slots in the fixed bolster, and converge and connect with the graduated arm of the beam or weighing lever, which has a fixed fulcrum beneath the box, and projects laterally through a slotted keeper.

Improved Pessary.

Edmund P. Banning, Sr., New York city, assignor to Banning Truss and Brace Company, of same place.—The object of this invention is to so improve the arrangement and connection of uterine repositors with their pendent shaft that any desired repositor suitable to the special position of the uterus may be applied, relieving thereby any undue pressure on the same and protecting against irritation and ulceration. The invention consists in the improvement of pessaries by providing the adjustable stem with a ring jointed to the support at one point only.

Improved Fence Post.

Hosea O. Elmer, Sand Bank, N. Y.—This invention consists of a fence post having its upper part of iron, its lower of iron, wood, and cement or artificial stone, and provided with an intermediate cap. By means of the iron clasps the entire strength of the wooden rail is secured, while splinting by ordinary use is rendered impossible.

Improved Tassel for Canes and Umbrellas.

William Harnach, New York city.—This invention is a cane or umbrella tassel made of a slitted strip of paper colored like the color of leather and varnished with a waterproof varnish. The appearance is better, because the surface is smoother, the substance more compact, and the color brighter. It is claimed to be equally if not more durable than leather, and is considerably cheaper than leather.

Improved Window Sash Ventilator.

John C. Bates, Cold Spring, N. Y.—This invention has for its object to furnish an improved device for ventilating rooms, cars, etc., through the sashes of the window. In the bottom of a window sash is formed a longitudinal slot, which is covered upon the inner side by a plate. The upper part of the sash bar is cut away adjacent to the plate so as to form an upward opening into the room, which opening may be surrounded by a box attached to the plate. A metallic plate is hinged at its upper edge to the sash bar or to a light metallic frame attached to said sash bar and surrounding the opening through it. The ends of the hinged plate are flanged or bent inward, and the said plate is made of such a size as to shut and fit closely into the opening through said sash bar. To the middle part of the inner side of the hinged plate is pivoted a long nut into which screws a screw, swiveled to the plate and having a knob formed upon its end for convenience in operating it. A fine wire gauze placed in the opening of the ventilator prevents the dust from entering the room, while allowing the air to pass in freely.

Improved Current Wheel.

Christoph Weeke, St. Charles, Mo.—This invention consists of a pair of boats arranged at some distance apart, connected by frame work and supporting a couple of revolving drums between them, whereon endless chains with a series of buckets work, one of the drums being provided with tackle for swinging it up and down, and having deflectors connected with it to vary the influence of the water on the buckets according to the power required. The other drum, which is in stationary bearings, gears with a vertical drum which is to transmit the power by a belt, and is as long as the extreme distance between high and low water, to allow the boats to rise and fall and yet work the driving belt properly.

Improved Hub Boring Machine.

James Duncan and William H. Arnold, Buchanan, Mich.—The wheel for centering and holding the wagon wheel, the hub of which is to be bored, is mounted so as to revolve in a vertical plane, and has a large central hole for the hub, also radial arms to which the rim is to be clipped by holders, so as to hold the hub in the hole. The small end of the hub projects through the wheel to the right and extends between sliding centering jaws, which are drawn up against its sides by a right and left screw, so as to line the hub with the boring mandrel before it is fastened to the arms by the clips. Two opposite sides of the wheel are first adjusted and fastened, then the wheel is turned a quarter of a revolution, and the intermediate two points are adjusted and fastened. The jaws are mounted on a frame and may be adjusted to hubs of different lengths. The boring mandrel is mounted on a carriage, which slides toward and from the wheel on ways, being moved by a hand crank shaft. It is revolved by a belt worked by a long drum on the driving shaft, which allows the belt to run along with the mandrel as it moves forward and backward. The cutters are alternately reversed, as shown, to cut on opposite sides of the mandrel, to divide and balance the pressure.

Improved Cooking Stove.

William W. Karshner, Aubrey, Kansas.—This invention is an improved cooking stove, which is so constructed that all the heat may be thrown to the top of the stove and directed to one or more of the boiler holes, as desired, to enable cooking to be done without heating the lower part of the stove; or all the heat may be made to pass around the oven, to enable the baking to be done without heating the upper part of the stove; or the heat may be made to circulate through both the upper and lower parts of the stove before escaping into the chimney; or may be made to pass directly into the chimney without heating either the upper or lower part, thus enabling the fuel to be used with great economy, and the room to be kept comparatively cool when desired, it being necessary to use no more fuel than the special purpose may require.

Improved Compound for Destroying Insects, etc.

John B. Lunbeck, Leon, Iowa.—The object of this invention is to furnish a compound for the destruction of the "borer," and other worms, grubs, and insects, which prey upon fruit and other trees; and it consists in a liquid or semi-liquid compound, composed of pine tar, soft soap, tobacco juice, and strong alkali. These ingredients are boiled together, and unslaked lime and strong dry ashes added. When all are stirred together, oil of tansy is put in. The compound is applied to the body of the tree, both above and below the surface of the ground, after excavating the earth and scraping the loose bark from the tree. A single coat of the compound applied with a common paint brush is sufficient to protect the tree for one year.

Improved Fly Trap.

Andrew J. Davis, Hartford, Mich.—The object of this invention is to furnish an effective and simple fly trap, by which the flies are caught rapidly and killed easily therein. The invention consists in the arrangement of an upper cage with cones for the entering of the flies, which cage is connected to a lower chamber with one cone leading into the upper cage, forming a double-acting trap. When the cage is filled with flies, the upper part is dipped into hot water, and the flies are then emptied out on taking off a cover. By detaching the cage from the lower chamber, the bait may easily be put into the lower chamber and through the top into the upper cones.

Improved Feed Water Heater and Purifier.

Samuel J. Sadler and Henry Volmar, Cleveland, Ohio.—This invention consists in separating the reservoir by a diagonal plate into two parts, of which one retains the water until the sediment is precipitated and then allows it to flow over to the other from the surface.

Improved Flooring Clamp.

Sylvanus B. Wood, William S. Terry, Robert Y. H. Terry, and Alonzo W. Terry, Hamburgh, Ark.—This invention has for its object to furnish an improved clamp for forcing and holding jointed or matched work. In a lever about four or five feet long and of such a size as to give it the requisite strength is formed a slot to receive the tongue or tenon of a block, secured in place by a pin. The block is placed transversely upon the lever, and upon its forward side is formed a tongue to fit upon the edge of the boards. An iron bar bent twice nearly at right angles has a screw thread cut upon each end, and one extremity is passed through a hole in the lower end of the lever at right angles with the plane of the slot in the said lever, where it is secured in place. Upon the other end of the bar is screwed a nut having a flange formed upon each of its four sides, the first flange being flush with the inner surface of the said nut, and each successive flange being set back about half an inch farther than the next preceding one. Upon the rear side of the bar, at or near its lower end, is formed an arm projecting outward and upward. The outer end of the arm is made pointed, and to it is attached a brace the other end of which is connected with the bar. To the bar at the side of the lever is attached a flange which has a curved slot formed in its upper part to receive a pin attached to the lever, to limit the movement of the bar and prevent it from falling over back when being adjusted to the work. In using the clamp, the flanged nut is adjusted upon the end of the bar, according to the thickness of the joist, so that a flange of the said nut may rest against the outer side of said joist, and the point of the arm against its other side. The face of the block is then adjusted upon the edge of the board, and the lever is operated, forcing the board to its place, and holding it there until nailed.

Improved Street Lamp.

James S. Hagerty, Baltimore, Md.—This invention relates to means for securing the glass cover to lamps, and particularly street lamps, so that it may be comparatively inexpensive, securely held, and easily detached. It consists in a novel mode of locking the lamp seat to its holder; in peculiar means for preventing the seat from lurching forward; and finally, in a new device by which the cap may be slid up and down in the socket and held off or on the glass with equal facility.

Improved Water Regulator and Cut-Off.

Charles E. Seal, Winchester, Va., and Edwin F. Brooks, Baltimore, Md.—This invention consists in improving water cut-offs, by combining with the main valve, that operates the waste valve, a hand mechanism by which both may be simultaneously operated from any part of a building.

Improved Hay and Cotton Press.

David A. Nelson, Tyler, Texas.—This invention relates to presses for reducing the bulk of cotton and allowing it to be baled into convenient form for transportation. It consists in a novel mode of attaching the sides of the press box so that they can be speedily thrown down from the cotton after compression and allow its convenient manipulation. Also in a new mode of connecting the follower with its superposed lever so that it can readily turned up out of the way when the cotton is being filled into the press box. Also in a peculiar mode of combining levers to cause two followers to clamp and press the cotton between them as if in a vise.

Improved Fence.

George W. and James B. Durant, Bryan, Texas.—This invention consists in a peculiarly constructed metallic post support; in anchors thrown out on each side of the post support to steady the same and cause it to preserve its exact position; in a post formed of pieces that can be cheaply and quickly made from inexpensive timber; in a paling fence of a novel and economical construction; and in a peculiar method of preparing the lumber so that it can be conveniently packed for transportation, easily put together to form a fence, and withal so that great saving in the cost of a fence is attained.

Improved Lathe Chuck.

William Johnson, of Lambertville, N. J.—The shell is cast in a single piece, and to it are attached three worm wheels, which are made to revolve on their respective arbors at equal distance from the center of the chuck of the lathe and from each other. These wheels are confined to the shell by plates which revolve with them; and on each is an arm which projects out over the chuck, to which the holding jaws are attached. The jaws are grooved to fit the arm; but when they are turned round on the arm to a certain position, they can be removed from the holding pin at will. When the worm wheels are turned, the jaws, when thus attached to the arms, will be carried toward or from the axis of the lathe, as may be desired. These wheels are revolved by means of a worm screw which is made to engage with the worm wheels—two wheels upon one side of the screw and one upon the other. This screw is turned by means of a wrench.

Improved Cotton Seed Planter.

John L. Slocumb, Raymond, Miss.—The size of the discharge opening in the seed hopper is regulated to regulate the quantity of seed dropped by slides which work in guides attached to the bottom of the hopper, and are secured in place, when adjusted, by set screws. The conductor spout is made long and narrow, and is secured beneath the discharge opening. Sweeps overlap the upper part of the opener plow and are designed to push back the clods and top soil, leaving the furrow of a uniform depth. They can be adjusted higher or lower, to enable the seeds to be planted deeper or shallower in the ground, as may be desired. The face of the drive wheel has a deep and wide V shaped groove formed in it, so that it may press the side of the furrow inward to cover the seed without packing it upon said seed. With the wheel is connected gearing which moves the shaft within the hopper, to which are attached radial arms, which, as the said shaft is revolved, keep the cotton seeds stirred up so they cannot clog, and will pass readily to the discharge opening. Two flat arms, set at an angle with the axis of the said shaft, are inclined in such directions as to push the seed from the sides toward the center of the hopper, so that they may more readily pass out through the discharge opening. With the drive wheel is connected other gearing communicating with another shaft that passes through the conductor spout. To the shaft are attached two circles of radial arms, at such a distance apart that the arms rigidly attached to the front and rear edges of the spout may pass between them. By this device the seeds, as they pass through the spout, will be separated from their fibers, or said fibers will be torn apart, so that the seeds will be deposited in the furrow uniformly and not in clumps or clusters.

Improved Cotton Press.

James D. Pridgeon Marion Court House, S. C., assignor to J. P. Pridgeon & Co., of same place.—The follower which works upward in a vertical case has two arms jointed at one end to the lower side, one near each end, which, at the other end, have rollers to roll forward and backward on the bed frame. A rope is attached to the follower at one end, and is so led and arranged with suitable mechanism that a drum being turned one way will force the follower up into the press case by moving the arms toward each other, so as to cause them to rise up erect, or nearly so; and said drum being turned the other way will allow said arms to roll back at the lower ends, return to the horizontal line, or nearly, and let the follower down again.

Method of Forming Hollow Cores for Castings.

James Semple, Chicago, Ill.—This invention consists in combining, with a wax or other suitable mold, an elastic, inflatable and collapsible tube provided with connections by which it may be filled with air, emptied thereof, or closed airtight.

Improved Bridge Truss.

Frederick Schwatka, United States Army, now at North Platte, Neb.—The construction of this truss cannot be intelligibly described without the aid of a drawing. It allows, however, the braces and counterbraces to be made shorter, thus increasing their strength and decreasing the weight of the bridge. The centers are upon the longer lines, which gives points of support to these long lines whenever they are subject to compression, thus materially increasing their resisting power to deflecting strains and strains of torsion. The mass of the iron, also, is thrown toward the top beam, thus allowing a liberal use of wrought iron in place of cast iron.

Improved Feeding Elevator for Corn Shellers.

Peter Kaufman, Hudson, Ill.—To dispense with a second hand or "feeder" for these machines is the object of this invention; and it consists in an elevating chain, constructed as described. The chain is composed of wire links and plate links connected together. A portion of the plate links are made elevating links, one end of the plate of which this link is formed being turned outward at right angles and divided and spread. Pulleys are attached, one to the machine and the other to the box, the former being revolved by the motion of the machine which carries the elevator. As the belt is revolved, the ears of corn will be picked up, one by one, and carried to the hopper of the machine.

Improved Tyre-Upsetting Machine.

Durbin L. Badley, Afton, Iowa.—The object of this invention is to furnish a tyre shrinker, which accomplishes, by its powerful action, the tightening or shrinking of tyres, with less time and labor than similar devices hitherto in use. The invention consists in the construction and arrangement of a sliding plate operated by an eccentric lever and a stationary plate carrying fixed blocks, and pivoted segmental blocks operated by a suitable mechanism. The turning of a disk to one side presses the segmental blocks against other blocks, so that the tyre can be firmly clamped between the rough uneven surfaces of these blocks. The reversing of the disk releases the tyre. When the tyre is firmly clamped, the forward or backward motion of the lever carries the sliding plate toward or away from the stationary plate, so that the shrinking or loosening of the tyre in a slow and powerful manner is obtained.

Improved Car Coupling.

Phillip Maughan Thompson, Toronto, Canada.—This invention consists in a peculiar construction of the inner chamber of the drawhead, whereby the link is not only guided but maintained in its true and nearly horizontal position; in a device by which the coupling plate may be lifted by the brakesman without leaving the car, or stooping over so as to endanger his safety and run the risk of being precipitated between the cars; in a simple novel and effective means for enabling the cars to remain uncoupled during the making up of a train; in making a car-coupling link in two parts which are pivoted so that one can turn upon the other and so that the two will separate as soon as a car has gone off the track; and finally, in the lock employed for connecting these two parts of coupling link detachably together

Improved Method of Casting Water Traps.

James Semple, Chicago, Ill.—This invention consists in the improvement of stench traps, by locating a reinforcement at and on the inside of the bend. This becomes absolutely necessary in their construction because of the common practice that prevails of thrusting sticks or metallic rods down the pipes to relieve them of any obstacle that has lodged therein.

Improved Wood Grinding Machine for Making Pulp.

Soren B. Zimmer, Elkhart, Ind.—This improved wood grinding machine consists of a large flat horizontal stone disk fixed stationary on the frame, with a bevel face inclining toward the axis above the stone, around which the wood is caused to revolve in boxes operated by arms projecting from a rotating shaft above the stone. The boxes contain springs, which press the wood on to the face of the stone. The arms are jointed to lower the boxes from time to time as the face of the stone wears away. The joints are clamped fast after adjusting them to make the arms rigid to hold the boxes off the stone. Water is discharged upon the face of the stone by tubes from a hollow penstock projecting up through the center, and connected by a pipe below with any suitable supply.

Improved Steering Apparatus.

Charles A. Seavey, Hodgdon's Mills, Me.—A casing is placed upon and attached to the deck, having a top. A bracket is rigidly attached to the top, the end of which supports the point of the wheel shaft. A bevel pinion on the wheel shaft meshes into the bevel wheel of the vertical shaft. The upper end of this shaft is supported by a bracket. Its lower end revolves in a box in the lower part of the casing. There is a spur pinion on the vertical shaft which engages with horizontal rack bars which receive an alternate horizontal motion as the pinion is turned in either direction. These rack bars slide in grooves in the casing and are confined by the top. A yoke is rigidly attached to the top of the rudder post, and in its top are slots or grooves. Swivel blocks on the ends of the rack bars rest in the grooves. The swivel pins allow the yoke to vibrate without binding, while the blocks have a slight movement in the slots. It will be seen that the movement of the steering wheel is instantly imparted to the rudder.

Improved Wagon Jack.

Nelson Crandall, Wooster, Ohio.—This invention relates to the construction of jacks for raising carriages and wagons. The stand consists of two plates separated by a longitudinal strip, a base block, and another block, all of which are about the thickness of the lifting bar and lever, but which allow the lifting bar and lever free play between the plates. The lifting bar is provided with a slot, in which slot is a stationary pin for limiting its vertical motion. The bar is confined between the plates. The lower end of the bar is cut on a circle, so that the end of the lever will always lift without binding it or causing undue friction. The lever is provided with a series of ratchet notches and a pawl. The pawl holds the lever and lifting bar in position when the latter is loaded. When the pawl is removed the long end of the lever will rise, and the lifting bar will drop by its own gravity. Friction rolls prevent friction against the edges of the lifting bar.

Improved Pole for Vehicles.

Henry Schmidt, Albany, N. Y.—The inner ends of the two parts of the bar are screwed into a short rod or double nut. Upon the outer ends of the parts are screwed ornamental knobs. Upon each of the parts of the rod is placed a sleeve, upon the upper side of which is formed a slot to receive a tongue formed upon the upper side of the parts, so that the sleeves may be free to slide longitudinally, but cannot turn. The outward movement of the sleeve is stopped by a knob, and its inward movement is limited by a collar. To the lower side of each of the sleeves is swiveled a bow, the ends of which are secured to the harness saddle by the screws that secure the saddle tree and pad to each other. To the upper side of the sleeves are attached short bars, to the ends of which are attached rings to receive the reins. To the center of the bars is attached an ornamental device which may be so formed as to receive and hold the check rein. In case it is desired to use the bar with a single horse, the part to be used is unscrewed from the double nut, and the knob from the outer end of the other part is screwed upon it, thus forming a neat single bar.

Improved Machine for Making Basket Splints.

John B. Poe, Worthington, Ind., assignor to himself and John F. Allison, of same place.—This invention consists in making basket or chair splints of bark, and also in certain means for making them either of the fiber or the bark. The forward end of the feed table, upon which the slab is placed to be sawn into bolts, is slotted to pass between the cutters so that the said cutters may come close to the feed roller. The journals of the feed roller revolve in curved slots in the plates, and the said roller is held down to its work by springs, so that the roller may accommodate itself to the varying thickness of the slabs. The cutters revolve in water in a trough placed upon the table, from which the water may be withdrawn, through a hole in its bottom, to remove the sawdust. This arrangement keeps the cutters from becoming covered with gum. To the end of the shaft which is geared to the feed roller is attached a crank wheel, which may be made large and heavy to adapt it to serve as a fly wheel. To the crank pin of the wheel is pivoted the end of the connecting rod, to the other end of which is pivoted the clasp that holds the end of the knife or saw. The cutter is made with teeth when hard wood is to be operated upon, and with a sharp edge when bark or soft wood is to be worked. Against the forward edge of the end parts of the cutter rest plates, upon one end of which are formed beveled toes to rest under the beveled edge of the edged cutter to prevent the cutter from springing down. When the toothed cutter is to be used, the plates are turned end for end. The cutter is held down to its place by bearing plates which can be adjusted as required. A plate is attached to the feed table to adjust the thickness of the splints cut from the bolts by the cutter.

Improved Fireplace.

William Lossie, Owensborough, Ky.—This invention consists in adjusting the hinged upper portion of the back of the grate by means of a screw rod and swiveled nut, and in the construction of the grate proper with a revolving bottom section in connection with two fixed side sections.

Notes & Queries

E. M. McD. & Bro. ask: What will dry and harden black paint for use on a carriage?

G. G. asks: Can a pine tree be grafted, and if so, with what kinds of trees? Which is the most suitable time to transplant a locust tree, and to cut it down, for the preservation of the wood?

H. D. A. asks: What can I use to stain the unpolished part of tools? Japan will not answer.

T. M. Jr. asks: How can I preserve grapes in the bunch, fresh as when taken from the vine?

P. T. says: I hear that water used in steam boilers will not go as far in hot dry weather as in cold damp weather; in other words, that a boiler will use a great deal more water to make a given amount of steam in dry weather than in wet weather. Is it so? [This is a subject rather new to us, and we would be glad to hear from others of our readers on the matter.—EDS.]

F. G. asks: What effect has Portland cement upon coal tar and pitch? Would a dry mixture of 6 parts coarse sand and one part of Portland cement, stirred into boiling tar or pitch, make a better concrete than the sand and cement alone, when elasticity was an object? Is sand, highly impregnated with iron (so much so as to be discolored and lumpy) a good ingredient for cement concrete? Would it make the concrete harder and more enduring?

P. H. asks: What is the best thing to clean brass on fine toilet boxes?

S. S. asks: How can I mend a glass vase? It is cracked for the distance of 3 to 4 inches and lets in the dust.

Answers to Correspondents

L. K. can find Kepler's laws in any book on astronomy.—W. T. W. should read this journal regularly, and would not then ask a question which we have repeatedly answered in the last few weeks.—R. S. B.'s specimen of leather has the plain color given by the bark, and is not dyed at all.—T. G. A. can waterproof and fireproof wood by using the process described on p. 280, vol. 28.—S. P. P. had better try the method mentioned on p. 406, vol. 25, for preserving eggs.—O. B. and C. G. H. Jr. will find the cement for leather on p. 119, vol. 28.—E.F.B. can clean his zinc bath tub with soap, a scrubbing brush and elbow grease.—C. H. can attach rubber to brass by following the directions for flannel on iron, on p. 107, vol. 28.—E. B. can make printers' rollers by melting together glue and molasses to the proper consistency, and casting in a mold.—S. E. H. can cement wood to glass by using plaster of Paris. A cheap book on mechanical plan drawing is reviewed on p. 376, vol. 28.—J. S. H.'s query belongs properly to mensuration, and he had better read up that subject.—P. B. will find his query as to the effective weight of a safety valve lever answered in an article which will shortly be published.—J. A. H. will find recipes for colored fires on p. 165, vol. 24.

G. W. I. asks: How many cubic feet will a boiler of 1 horse power heat to 60°? Answer: About 140, if your question refers to air.

M. R. asks: Which describes the largest circle, the bow or the stem of a ship or boat when she is going ahead with the helm hard over? In other words, which end goes off endways the most? Answer: This will probably remain an open question until some careful experiments are made. It would seem likely that sailing vessels, side wheel steamers, and ships fitted with screw propellers, all turn on different points, and slight changes of rig or load may vary these points in any particular case.

H. K. says: Upon a shaft are keyed two wheels, namely, a belt pulley and a gear wheel, both of the same diameter. The gear wheel drives a breaker, and receives very heavy jars. Question is: How much lighter dare I make the arms of a pulley than those of the gear wheel? The pulley drives the shaft. 2. What are the proper proportions of arms for pulleys and gears? Haswell gives proportions for gear wheels, but does not take the width of face into consideration. Is not that an important omission? Answers: 1. Divide the whole strain received by the pulley among the number of arms, and proportion them accordingly. 2. The arms of a gear wheel ordinarily require to be about twice as strong as those of a pulley which transmits power by a belt, owing to the different ways in which the strain acts in the two cases.

J. H. F. asks: Can some one give me directions how to carburet pure hydrogen gas made by the action of sulphuric acid on zinc scraps? Answer: Pass the hydrogen gas through spirits of turpentine, benzine, or naphtha. The hydrogen in this case does not chemically combine with the carbon in the turpentine, etc., but carries off, mechanically suspended in it, a certain portion of the volatile hydrocarbon.

J. B. asks: What is the best and cheapest process of bronzing some small articles made of iron wire? Answer: Clean the wire perfectly, and then immerse it in a solution of sulphate of copper (blue vitriol) until covered with a coating of metallic copper. Then wash and immerse the articles in the following solution: Verdigris 2 ounces, sal ammoniac 1 ounce, vinegar 1 pint, diluted with water until it tastes only slightly metallic, then boiled for a few minutes and filtered. The articles of wire are steeped in this liquor at the boiling point, until the desired effect is produced; but do not keep them in too long. When taken out, wash carefully in hot water and dry.

J. T. D. asks: 1. What is the cause of the pieces of lumber clattering and inclining to raise up back of the saw when pushing hard against it? 2. What is the proper angle for saw teeth; or in other words, how much hook should a saw tooth have? Our saws vary from 8 inches to 19 inches diameter. 3. How fast should saws of these diameters run on one arbor? Answers: 1. We presume that you mean small circular saws from 8 to 20 inches in diameter, known as bench saws and sawing by a gage. The back half of the saw, having an upward motion, has a tendency to lift and raise the piece being sawn, especially when it springs and pinches on the saw or crowds between the saw and gage; while the cut at the front of the saw has the opposite tendency of holding that part of the piece down; this would cause the piece to tremble. 2. The hook or pitch of the tooth should be on a line to from one fourth to one fifth the diameter of the saw; a one fourth pitch is mostly used for hard and one fifth for softer timber. For very fine toothed saws, designed for heavy work, such as sawing shingles, etc., even from soft wood, one quarter pitch is best. 3. 9,000 feet per minute is the usual rule for the rim of a circular saw to travel; this speeds a 12 inch saw 3,000, a 24 inch 1,500, a 36 inch 1,000, a 60 inch 600, etc. Taper ground saws nicely balanced with collars attached to them, like shingle saws, may be run at higher speed with safety, say 12,000 feet per minute.—J. E. E., of Pa.

W. H. P. asks: How can I polish mineral specimens? Answer: The easiest way for you is to first grind the stones on the grindstone to the shape required, and then to smooth with emery, finishing by polishing with rottenstone.

F. L. R. asks: What will cement meerschaum? Answer: Make fine freshly calcined plaster of Paris into a cream with water, by sifting or dusting the plaster into the water, and apply as a cement to the broken parts. It sets in a few minutes, but takes a few days to become dry. It is fireproof.

J. I. asks: Is there a way to dissolve or disintegrate burnt clay, which, in hardness and cohesion, is about the same as a soft burnt brick? Hydrofluoric acid is too expensive; caustic potash or soda is too slow; heating and quenching in water is not effectual; sulphuric or other acid softens but does not dissolve or cause crumbling. Answer: If your clay were not burnt so hard, sulphuric acid would effectually dissolve it, as these are the materials used in the manufacture of what is known as aluminous cake. As chemical means have failed, however, we would suggest mechanical ones, in the shape of the pickaxe and hammer.

D. J. G. asks: How bones are treated before being ground into flour for fertilizing purposes? Answer: Expose the bones to the air and heat of the sun until hard and dry; then crush and grind.

W. C. D. asks: 1. Can you give me a receipt for making a hard white enamel? 2. Can you give me directions for putting the above enamel on a brass plate, making a good clear enamel? Answers: 1. Take tin 3 parts, lead 10 parts, mix; calcine in an iron pot at dull red heat, and scrape off the oxide as it forms, keeping it free from metal. Reduce this oxide to fine powder by grinding and elutriation. Take 1 part of this fine oxide, fine crystal glass 2 parts, manganese a few grains; powder, rinse, melt and pour fused mass into water, and repeat this process of powdering and melting, etc., 3 or 4 times. This powder is finally fused on the surface of the polished brass, either by the blowpipe or the heat of a small furnace.

R. C. G. says: I want to construct an engine for a boat 20 feet long by 4 feet beam, and to occupy as little room (with boiler and fuel) as possible. I propose to put in an oscillating engine 6 x 6 to make 200 revolutions per minute, geared to screw shaft, also to use a jet condenser, with a boiler of 20 square feet of heating surface. Please give me your opinion as to the practicability of the plan. Answer: The engine is probably larger than you need, and we think the boiler is too small for the proposed engine.

C. F. C. says: 1. I have a vertical engine of 5½ inches diameter x 6 inches stroke, and a boat 25 feet long x 6 feet beam. I propose to use the engine to drive the boat with a three blade propeller of 20 inches diameter. Please tell me what are the proper dimensions of a vertical tubular boiler sufficient to drive it. Answer: You do not give sufficient data, but we can probably furnish you with figures by means of which you can answer the question for yourself. Calculate the power your engine is to develope, and allow about one square foot of grate surface, and from 18 to 20 square feet of heating surface, for each horse power.

S. asks: Can you give me a formula for a gall ink which will write black when first exposed and retain its fluidity after being exposed to the air? 2. What work on fermentation and its preventives should you recommend? 3. What practical work on chemistry as applied to the arts and sciences is the best? Answers: 1. You can make an ink which will write black at once by using white copperas instead of the ordinary kind, and by leaving the infusion of galls to itself some time before mixing. Here is a recipe: Galls, 125 parts, white copperas, 24 parts, gum arabic, 24 parts, water, 827 parts, in all 1,000. 2. Dussauce on "Vinegar." 3. Bloxam's is very highly spoken of.

M. T. asks several questions as to water supply for a town. Answer: These are professional questions, the solution of which you should entrust to some reliable and competent engineer. A small outlay incurred for a thorough report will more than repay you.

E. E. P. asks: What will remove grease and dirt from parchment, and not disfigure the written or printed matter? Answer: We think you can restore the parchment to its former appearance by the use of concentrated benzine.

C. H. asks: 1. How much power can I realize from a steam pipe ¾ of an inch in diameter with a pressure of 10 pounds only? 2. How should such an engine be constructed? Answers: 1. Consult our article on the "Efflux of Steam," page 113, current volume. 2. You will find rules on this subject, in answer to former inquiries.

F. A. asks: 1. What amount of fall would a stream of water conducted by a one inch pipe require to produce one horse power by a suitable wheel? 2. Would a 2 inch pipe with one half the fall give the same power? 3. How can I harden copper and bronze? Answers: 1. A horse power would be produced by the fall of one pound of water for a distance of 33,000 feet in a minute, or by producing an effect of 33,000 foot pounds. 2. You can calculate the discharge of water from pipes of different diameters, by means of the formulas given in the article on "Friction of Water in Pipes" (page 48, present volume of the SCIENTIFIC AMERICAN), and thus ascertain the amount of fall required. 3. Copper and bronze can be hardened by heating them and allowing them to cool slowly.

G. P. A. says: 1. In raising and setting a pair of steamboat shafts, open on the bottom center and on the after half center, I contend that the shafts out boards must go back and be lowered to bring them right. Am I right? 2. What is the rule for raising shafts, how much to a foot, and what must be taken off for the length of the cranks? Answers: 1. The outboard ends of the shafts should be lowered, and should go back, if the cylinder is forward of the shaft. 2. To find how much the outboard end of the shaft must be lowered, measure the throw of the crank, the length of the shaft from face of crank to center of outboard bearing, and the amount the cranks have opened at the bottom center (or the difference of distances between cranks measured at center of shafts and center of crank pins), all in inches. Multiply the length of the shaft by half the opening of the cranks, and divide by the throw of the crank. The result will be the amount that the outboard shaft must be lowered.

A. R. S. asks: Is there any method, either with or without instruments, by which in a few moments I can measure land, in plots of from 50 to 640 acres, with tolerable accuracy? Answer: No.

A. B. says: What kind of a cable would be best, a chain, a wire rope, a common rope, or a tarred rope, to be used on a hoisting machine, exposed to the weather and in use every day, where the cable is required to raise a weight of 1,200 or 1,500 lbs. a distance of 20 feet and return every two minutes, running over two pulleys and winding up on a drum? What size should the rope be? Answer. If the drum is of good size, wire rope, five eighths of an inch in diameter, will probably give better satisfaction than a chain or hemp rope.

B. S. E. asks: 1. What should be the dimensions of the boiler of an engine 1¾ inches bore x 2 inches stroke? Of what metal can it be most conveniently constructed? 2. What are the formulæ for the fly wheel and the safety valve? Answers: You will find answers to both these questions by consulting recent back numbers of our paper.

F. N. asks: 1. Why does the water in a boiler rise when the throttle is opened, and why does it rise more in one locomotive than in another? 2. When a locomotive is running at 16 miles an hour and is at once reversed, where is the pressure on the valves (top or bottom side) to cause the reverse lever to want to fly back to where it was before she was reversed? 3. Will an engine working pretty hard use as much water with 150 lbs. of steam as with 100 lbs.? Answers: 1. Because the pressure is relieved. If there is such difference as you state between the two boilers, it is probably on account of the different steam space in each. 2. If such action does occur, it may be due to the motion of the engine, which cannot be stopped at once; in which case the pressure will be under the valve. 3. Generally not.

O. G. says: 1. The supply pipe to a boiler and the waste water pipe from a heater are two inches in diameter, and were put in new two years ago; they are now nearly closed up with lime. Is it possible that I can take the lime out of them, or not? 2. Are all steamers in the United States subject to the Government inspection or not? I own a tow boat and do not go into any port of entry with her, either in this State or out of it. Answers: 1. Possibly you may be able to remove the incrustation by the use of some of the scale preventives in the market. 2. We think not.

J. H. asks: 1. Please give an illustration and description of an injector as used to supply boilers with water. 2. Suppose an engineer on board a steam boat is caught with low water, hot fire, feed pump out of order, steam rising, and it is desired of him to keep running, how can he get out of the difficulty without hauling the fire? Can he keep the machinery running? Answers: Write to the manufacturers and you can obtain a full description. 2. Engineers do sometimes try to keep the machinery in motion, under such cases, and almost invariably burn the iron of the boiler.

T. C. W. asks: Can a locomotive push a passenger train as well as it could pull it? Answer: Yes. But the engineer is unable to see the track or control the train very well when going backwards, and it is considered unsafe.

C. K. asks: Can you give directions for making what is known as the water blast, that is, a draft of air driven by a direct action of water? Answer: You will find a diagram and description of this device in Science Record for 1873, p. 285.

C. M. N. asks: How can sal ammoniac and nitrate of silver be precipitated? Answer: We know of no method of precipitating these soluble salts.

J. G. T. says: I have a pulley 8 inches diameter with groove cut for ¼ inch round belt; required the diameter of small pulley to make 4½ revolutions to one of the 8 inch pulley. Answer: Take for the radius of the pulley, the distance from center of pulley to center of belt when placed in groove, and make the calculations as before. Strictly speaking, even in the case of a flat belt, the working radius should be the same, namely, distance from center of pulley to center of belt, so that diameter equals diameter of pulley plus thickness of belt. In practice, the thickness of belt, unless very great in comparison with the diameter of the pulley, may be neglected without much error.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On Ships on Fire. By M. S.
On the Devil Fish. By G. A. P.
On Squaring the Circle. By ——.
On the Lourdes Miracles. By ——.
On the Million Dollar Telescope. By D. W. M. & Co.
On Blasting in a Coal Mine. By C.M.
On the Patent Right Question. By A. B. F.
On an Ocean Railway. By C. A. B.
On Church Clocks and Chimes. By W. M.
On Toads in Rocks. By W. A. A.
On Jumping from Railway Trains. By J. B. T.
On the Zodiacal Light. By A. D.
On Aeronautics. By M. B.

Also enquiries from the following:

J. B. A.—J. C. L.—W. C. B.—A. J. B.—J. M.—R. W.—T. C. S.—J. M. H.—D. M. G.—R. B. M.—R. L. & S. Co—O. S.—W. S.—E. M. D.—W. T.—A. B. W.—R.—H. G.

Correspondents who write to ask the address of certain manufacturers, or where specified articles are to be had, also those having goods for sale, or who want to find partners, should send with their communications an amount sufficient to cover the cost of publication under the head of "Business and Personal," which is specially devoted to such enquiries.

Correspondents in different parts of the country ask Where can machinery for boring wells be obtained? Who makes ore crushers? What is the cost of a brick compressing machine? Who makes egg beaters, and what is the wholesale price? Who makes drive wells? Who makes jig saws? Where can I get a cabinet maker's work bench? Who makes the best pick with a changeable point for miner's use? Where can I get a machine for cutting splints for lighting cigars, etc.? Where can I find a hand power drill that will do the work of 8 or 10 men? Which is the best brickmaking machine? Who has for sale a peat compressing patent? Where can I obtain a machine for splitting match wood? Where can diamonds suitable for dressing millstones be obtained? Who makes stave cutting machines? Makers of the above articles will probably promote their interests by advertising, in reply, in the SCIENTIFIC AMERICAN.

[OFFICIAL.]

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APPLICATIONS FOR EXTENSIONS.

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

26,244.—MUSIC REGISTERING MACHINE.—H. F. Bond.
26,262.—JOURNAL BOX.—W. M. Ferry. Nov. 12.
26,327.—NURSING BOTTLE.—F. J. La Forme. Nov. 12.
26,410.—SEED PLANTER.—W. Blessing. Nov. 26.

EXTENSION GRANTED.

25,309.—NAIL MACHINE.—D. Dodge.

DESIGNS PATENTED.

6,825.—SAW FRAME.—T. S. & H. Disston, Philadelphia, Pa.
6,826.—MUFF.—M. Gross & B. B. Zippert, New York city.
6,827.—FUR COLLAR.—M. Gross & B. B. Zippert, N. Y. city.
6,828.—CHAIR.—S. Hayward, Boston, Mass.
6,829.—SKIRT MATERIAL.—J. Anderson, New York city.
6,830.—PAPER CLIP.—T. Orton, Chicago, Ill.
6,831.—STOVE.—W. D. Southard, New York city.

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