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Portable Spring Grist Mill.

Our illustration this week shows an arrangement of portable mills, with bolt, which is claimed to combine many important improvements.

The mill is complete in itself, with surfaces dressed and ready to make flour, when it leaves the shop. All that is required is to attach the belt. These mills are built under the patents of Messrs. Reed and Buckingham, and are of three sizes, namely 24 inches, 30 inches, and 36 inches diameter. The grinding surfaces are composed of the best French burr stones, set in cast iron cups, and the mill is what millers would call an upper runner, that is, the upper stone revolves while the lower one is stationary.

The spindle, which is attached to the upper or runner stone, is hollow and contains a stationary tube by which the grain is fed directly to the stones. As by this means the grain does not touch the revolving surface until it enters between the stones, it cannot fill up the eye or hang as it does in the common mills; so that any kind of grain, such as oats or crushed cobs, may, it is claimed, be ground without difficulty, when, on other mills, they can only be ground by being mixed with heavy substances. This is a feature of very great importance in all mills where a high motion is required, as, without such an arrangement for feeding, it would be difficult to introduce the grain between the stones.

The runner stone is attached to the spindle in such a manner that, while it is carried around with a true and even motion and held steady on the spindle by springs, it can still rise when necessary by the yielding of the springs, and permit hard substances, such as nails or pieces of iron, to pass through the mill without injury to the stones or their connections. In this important feature, this mill differs from all others. The method of attaching the spindle to the runner stone by means of springs, which operate as above described, was patented by Gen. C. P. Buckingham, and has been used exclusively on these mills.

This method, and the arrangement for feeding, constitute the distinctive features of the above described mills.

The bed stone is hung on a point, and is prevented from rotating by two trunnions on opposite sides of the cup. It is clasped by spring bars at four points on the side which permit it to train itself with certainty, hold it when in train with a firm grasp, and prevent all wobbling of the stones.

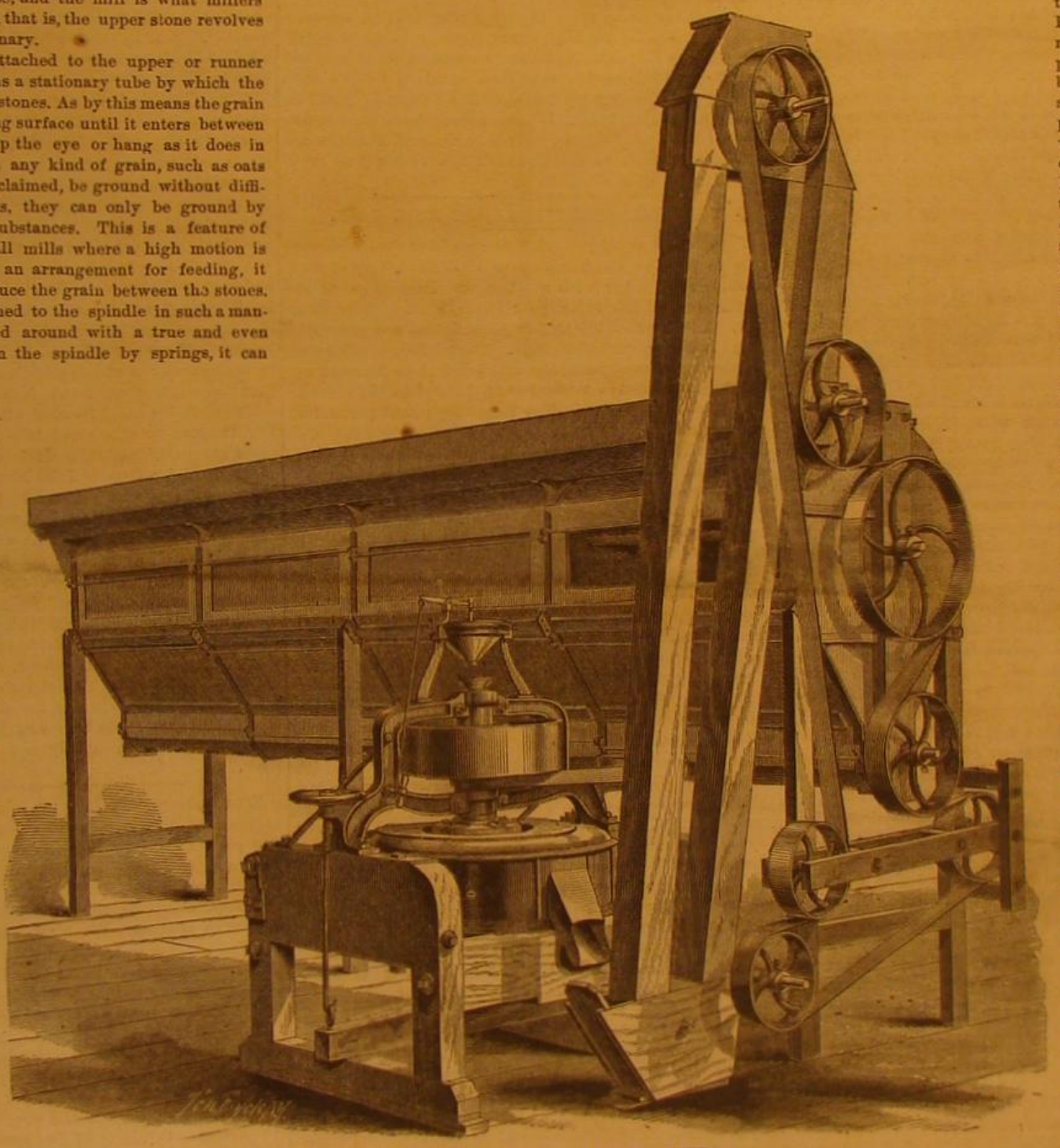
The bearings, two in number, are in the iron frame above, and may be oiled at pleasure without stopping the mill. For the purpose of dressing the stones, the frame opens back on hinges so as to turn the surface of the runner up and bring it on a horizontal line, the stones remaining in their bearings; and in dressing the runner, it can be turned round on the spindle as if chucked in a lathe, so as to make the surface perfectly true without trouble or danger of getting the stones out of line. In putting the surfaces of the stones together for grinding again, it is claimed to be impossible to get them out of position. The operation is as simple as shutting a book.

The bolt chest is composed of iron frames and wood panels, held together by iron rods, arranged to be packed closely in boxes for shipment, and which can be set up ready for work in a few hours. The iron trussed reel—30 inches long by 30 inches diameter—is also in sections, and is furnished with a coat of best quality bolting cloth. The lower part of the chest forms the conveyer trough, which is provided with the proper cut-off and slides for grading the flour, while at the top is the cooler conveyer, to temper the flour before entering the reel.

There is also attached a return conveyer, so that at the option of the miller he can return part of the flour to the head of the reel to be rebolted, thereby producing the maximum yield.

A flour elevator is also furnished complete, as represented, and the arrangement of the various parts to each other is such that the same belt drives them all.

It is claimed that there is nothing about the mills or bolts that can, for a long time, get out of repair. With proper attention, the running parts cannot get out of order (excepting the wear of the stones themselves), and will, it is claimed, last for many years.



PORTABLE SPRING GRIST MILL.

A good mill that, with ordinary care, will make the best of flour, and one that can be furnished for a moderate price, and, at the same time, have such attachments as will guarantee the best results, both as regards quality and quantity, and also one that is so arranged and completed at the shop that any ordinary carpenter can in a few days set it up in place, ready to work in any room or building where there is power, is certainly a great desideratum.

These mills have been in the market for some fifteen years, and, it is claimed, not one has failed to give satisfaction. This mill took the gold medal at the Exhibition of the Mechanics' Institute, Cincinnati, and was especially noticed in the report of the committee. It also received the first premium at the Ohio State Fair, and the highest award (silver medal) over all others at the Cincinnati Industrial Exposition.

The manufacturers make a specialty of building portable machinery, and have, within the past two years, very much improved these mills, which they guarantee to do as much and as good work as any mills of like size in the United States. They state that the 36 inch mill and bolt grinds and bolts from ten to twelve bushels of wheat per hour as an average business, and that the yield and quantity of flour is unsurpassed. For further information address John Cooper & Co., Mount Vernon, Ohio.

Price's Composition Pavement.

Notwithstanding the many failures in constructing improved pavements, and the few successes that have been achieved, inventors seem resolved not to relinquish the problem until they secure a complete triumph. Mr. Thomas Price, of Pittsburgh, Pa., assignor to himself and John D. Burton, of the same place, has recently patented, through the Scientific American Patent Agency, a new method of making asphalt pavements of carbonized rock—that is to say, of broken rock whose pores have been filled with asphalt, tar, or other carboniferous material. It is intended, therefore, to produce a pavement, every particle of which shall be air and water proof, and whose hard ingredients will readily and instantly combine with the binding material.

The invention consists in the use of a compound prepared as follows:

Rock of a suitable kind, preferably lime rock, is broken into pieces of convenient size, and then in a suitable vessel exposed to heat. Its pores are thereby opened, and it is prepared for the reception of the asphaltum, tar, or equivalent matter. The latter, being mixed with the heated rock, penetrates the pores and envelopes the several pieces, so as to make them thoroughly air and waterproof. During the process of heating, the rock is liberated of all gaseous matter and properly prepared for the reception of the asphaltum and tar. The rock, after having cooled, is reheated, and more tar or asphaltum added, which may be mixed with a small quantity of plaster of Paris, some oxide of zinc or iron, and some disinfecting powder for destroying the smell and noxious vapors. This composition should be spread three and a half or four inches thick, upon a bed of gravel or other material, and then pressed by hot and heavy rollers until quite firm. It will, it is claimed, prove a durable pavement, easily put down, and as easily taken up and replaced when necessary, which will become the stronger the more it is compressed by wear. The patent on this invention was issued March 12, 1872.

Transplanting Hair.

The successful transferring of skin and flesh to assist the recovery of wounds, has induced some one to experiment on hair, and the result is a process of removing portions of the scalp, with the hair on, from some luxuriant head, and planting it on the victim of baldness. A cotemporary points out that it may soon become fashionable to wear hair of various hues and shades, thereby producing the most singular and beautiful effects of color; or the hair might be made to appear white, green, blue, or red, at the owner's option, and by various ways of disposing it. "Take, in due proportions, hair of all the prismatic tints, rumple it, and immediately you have white hair; comb it in another way, and there is your purple, your ultramarine, your yellow, or any possible hue." If these directions are followed, the recognition of the original color of the head may require the use of the spectroscope

THE TOBACCO MANUFACTORIES IN BROOKLYN.

The manufacture of tobacco is carried on in the city of New York and its vicinity to a greater extent than in any other part of the United States, although there are factories for this business, of more or less importance, in every large city. In Brooklyn, there are several large factories for the production of plug tobacco for chewing, three of which give employment to about 1,600 hands, producing nearly 7,000,000 pounds per annum, and paying over $2,000,000 tax. The Brooklyn *Daily Union* has recently made an investigation into the processes employed in the preparation, and gives, among much other interesting information on the subject, the following particulars:

The Pioneer Tobacco Company has a factory situated in Hicks street, occupying the space on the west side, between Warren and Baltic streets, connected with the New York office of the firm by a private telegraph. The visitor was permitted to witness the process of manufacturing plug tobacco in all its stages, from taking the tightly pressed leaf from the huge hogsheads in which it was packed after being dried on the Virginia plantation down to the pasting of the gaily colored label and the more important revenue stamp on the box in which the finished plugs are packed for final sale. It would be impracticable to give within the ordinary limits of a newspaper article a detailed description of all the various manipulations which the innocent "weed" is subjected to in this vast establishment, where five hundred and fifty employees, men and women, are busily occupied in preparing the coarse and brittle leaves into preparations designed to tempt the palates of men all over the earth; though everything is done with the utmost care and regularity, and the nicest system is everywhere discernible. The "hands," as the handfuls of tobacco leaves tied together at the stalk when picked are designated, go through innumerable processes of drying, moistening, extraction of stems, dipping in licorice juice—a beastly process, and sufficient to impart a permanent distaste for the article to any but the most hardened devotee—followed by more rolling, squeezing, flavoring, drying, and finally rolling and cutting into its desired shape of plugs. The flavoring process is a secret and mysterious feature of the tobacco transformation—defying even the scrutiny of the Government officials. The bunches of leaves, after a long series of torturings, are laid in a pile upon the floor, and each successive layer is sprinkled from a watering pot with some liquid mixture whose ingredients are one of the trade secrets of which every factory has its own peculiar one, and even to hazard a guess at which would probably be deemed an impertinence. Essences and volatile oils, and the mixer thereof only knows what else, are thus sprinkled upon the leaf already partly saturated with licorice, and are forever after blended with the delicate aromatic flavor of the tobacco. The delicacy referred to may be partially realized when it is stated that the odor in some of the apartments of the factory is almost powerful enough to raise a man's hat off his head unless it fits tightly. One of the pleasantest episodes of the tobacco's journey through the building is its brief visit to the 'drying room," where it is hung upon racks and subjected to a degree of heat that speedily extracts all the moisture from it, and compared with which a Turkish bath is but a cold and chilling institution. It would be a dangerous place for an unpopular revenue officer—if there could be such an individual—to be entrapped into. For there are traditions among the operatives—though they have never yet been publicly recorded—of men who have been unwittingly locked up in the drying room late in the day when the hands were leaving for the night, and how upon opening the doors the next morning there was nothing left of them except the heels of their boots, the unhappy owners of which had been melted away like tallow dips in a hot oven.

When the tobacco has been thoroughly prepared, it is rolled by hand: women working with nimble fingers and extreme skill in this process: into long sausage shaped rolls, known technically as "lumps," and containing either one pound or one half pound, each of which is verified by actual weighing. These rolls are afterwards passed through a large machine, which presses them out into flat slabs nearly as hard as stone, and which squares them off at the edges and corners, and then they are ready to be packed for sale.

The second place visited was P. Lorillard & Company's factory in Sedgwick street, a huge establishment occupying an immense building on each side of the street, connected by a covered bridge at the second story. This factory is larger than that of the Pioneer Company already described, but the processes used are mainly the same, except some variations in the mechanical contrivances. There is also a private telegraph here connecting with the office in New York. The same courtesy, also, was displayed to the reporter, who was shown through all the apartments and permitted to witness the various manipulations.

The factory of Messrs. Buchanan & Lyall, in Degraw street, was next visited, with similar experience, the place giving evidence on all sides of able management, and a thorough and well regulated system, while the large force of operators testified to the immense amount of business done there.

The above mentioned are the three largest plug tobacco factories of this city, but not even a visit to their extensive workshops and laboratories, their "lump," "sorting," "dipping," "casing," and "rolling" rooms would give an adequate notion of the magnitude of the supply they furnish to the country's commerce. This will be best gained from the following statistical summary of the amount of business they have done during the few past years, and which is steadily increasing as each twelve months roll by.

P. Lorillard & Co. employ in their Brooklyn factory from four hundred to six hundred hands, paying them for salaries an average of over $3,000 weekly. Their monthly sales are about 250,000 pounds of plug tobacco, the value of which is about $70,000, and the revenue tax upon which is $75,000. Their total sales in 1871 were 2,500,000 pounds, the net value of which, without adding the tax, was $787,000. This, of course, represents only a portion of the business done by that large firm, it having other factories in other cities in the vicinity of New York.

The Pioneer Company employs about five hundred and fifty operatives, and manufactures about 2,250,000 pounds of plug tobacco per annum, paying the government therefor in taxes about $730,000.

Messrs. Buchanan & Lyall employ about four hundred and fifty laborers, and manufacture about 1,800,000 pounds of tobacco yearly, paying about $600,000 a year tax. Their weekly salary account is upwards of $2,000.

A smaller establishment is Watson's factory, opposite Lorillard's, where from 75 to 125 employees are hired, manufacturing about 200,000 pounds of plug tobacco annually. The business done by this establishment is mostly foreign, its products being chiefly exported to South America—a trade in which it has almost a monopoly.

It will accordingly be seen, by referring to the above figures, that the three large Brooklyn plug tobacco factories employ constantly from fifteen to eighteen hundred operatives, paying them about $350,000 per annum for wages, and that they manufacture seven million pounds of tobacco each year, upon which they pay the Government annually over two millions of dollars taxes. It is said that during the last five years, for the same article, the whole State of Virginia has not paid so much to the United States Treasury as these Brooklyn factories.

THE GOVERNMENT WORKS AT HELL GATE.

The great work of removing the rocks at the dangerous pass in the East river, known as Hell Gate, City of New York, is progressing with great vigor. Engravings of the works were published last year in the SCIENTIFIC AMERICAN. A number of interesting illustrations are also to be found in *Science Record* for 1872. The mining, it will be remembered, is done by running out tunnels, into the rocks under the river, from a vertical shaft located on the shore at the margin of the river. The following recent particulars are from the *Evening Post*:

The work of removing the obstructions at Hell Gate, which was begun about two years ago, has been vigorously carried forward with but trifling interruption, and will, it is now estimated, be completed within a year and a half. One hundred and sixty five thousand cubic yards of rock were to be removed from the river, and of this amount at least forty-two thousand cubic yards have already been taken up. About two hundred and forty men are now employed in the work, nearly all of whom are Cornish miners of long experience. A much larger number were formerly employed, but the introduction of the diamond drill, and the increased use of machinery in all branches of the labor, has permitted a great reduction of the working force. A hundred of the workmen were discharged last week.

The immense bed of rock is now perforated by sixteen tunnels and seven concentric galleries, the floor line of which is thirty two feet below the level of the river at mean low tide. It was originally designed to make the channel but twenty five feet in depth; but subsequently it was determined to render it perfectly safe for vessels of the largest draught. The average hight of the tunnels and galleries is twenty-two feet, and their width sixteen, leaving a roof from seven to ten feet thick, supported by numerous pillars. The length of the extreme gallery is six hundred feet, and of the grand tunnel two hundred and twelve feet and a half. There will ultimately be twenty-eight tunnel headings, some of which will extend three hundred and seventy five feet.

THE DIAMOND DRILL.

The work of boring is done wholly by machinery, the laborers serving only to trim and dress the rock after the rougher work has been executed, and to perform the operations connected with blasting. Of the six drills used, two are the diamond pointed drills and four Burleigh steel percussion drills. The diamond drill is the invention of Rodolphe Leschot, a French engineer, and was first used in the construction of the Mont Cenis tunnel, but is now worked by improved machinery under American patents. The two used at Hell Gate were introduced last October, and have proved so satisfactory that three more will be added in a few weeks. This drill consists of a hollow steel disk an inch and a half in diameter, the rim of which is studded with twelve bits of black carbon. Attached to an iron pipe of the same thickness, it is propelled by compressed air at a pressure of sixty pounds per square inch, and cuts its way through the hardest rock with marvellous rapidity. The motion is rotary, and the number of revolutions seven hundred and fifty per minute. Unlike percussion drills, it receives no wear except from friction, and hence is constantly in working order, and needs no sharpening.

Fifty-four feet and four inches have been tunneled by this drill in eight hours, through a mass of granite and quartz. By screwing on additional pieces of pipe, it can be propelled in one direction to an indefinite extent; but for blasting purposes it is seldom driven further than fifteen feet. Occasionally, however, through the intervention of a new process in blasting, it is expedient to continue a tunnel of this character for a long distance, thereby effecting a great saving of time. Sand or clay is then rammed into the bore until it is nearly full, to act as a recoil block to the charge, and the rock is blasted section by section.

BLASTING WITH NITRO GLYCERIN.

All the blasting at Hell Gate is done by nitro-glycerin, and has been so carefully managed that not an accident has yet occurred. The nitro-glycerin is made into cartridges from eight to fifteen inches in length, about an inch in diameter, and holding from four to eight ounces. They are coated with a glutinous composition which effectually protects them from water. When a blast is made, a little tube of fulminate is attached to the cartridge and a spark transmitted to it through a wire connecting with an electric battery. Though a large number of cartridges are often discharged in succession with great rapidity, they are never fired at once, as the vibration in this case might seriously jar the stone roof, opening seams for the admission of the water.

The explosions are of tremendous force, shattering the rock into fragments of a size convenient for removal. These are piled on cars drawn by mules, running on iron tracks which are laid in all the tunnels, and conveyed to the shaft, where they are hoisted up by a steam derrick. The masses already taken out form two immense embankments on the river front.

A building near the mouth of the shaft contains three large steam boilers and five air compressers, the latter furnishing the motive power for the drills. In working the compressers, lubricating oil is now used instead of water, thereby avoiding the formation of ice in the pipes during severe weather. Near by is a powerful steam pump, which drains all the tunnels comparatively dry through pipes radiating from its base.

Before blasting, it is necessary to use great care in ascertaining the line of resistance and quality of the rock, which is chiefly composed of granite, quartz, and gneiss. The strata embrace a great variety of minerals, however, including, besides various metallic deposits, veins of decomposed felspar that are as soft as clay. The testing is done with the diamond drill, which in two instances struck sand and water after boring twenty-eight and thirty-four feet respectively, rendering it necessary to abandon blasting in that direction and to have the bores tightly plugged up. In opening tunnel heading No. 3, a section of rock was struck so full of seams that the water poured through the roof at the rate of six hundred gallons per minute. This was effectually remedied by constructing a massive schilt of timber, oakum, and Roman cement, fourteen feet in length by twelve in width.

The work is carried forward almost constantly night and day, the men being divided into gangs which relieve each other at regular intervals. It is executed under the supervision of Major General John Newton, of the United States Engineer Corps, who planned it from the beginning. The Superintendent in immediate charge is G. C. Reitheimer, an engineer of wide experience in various countries, who has devoted himself especially to work of this kind.

When the rock is at length completely honeycombed, and nothing remains but the roof, its supporting pillars and the outer walls, it will be mined with seven thousand pounds of nitro-glycerin, which is equal in explosive power to seventy thousand pounds of gunpowder. All the charges will be connected by wires with an electric battery in the office of the superintendent, when, at the given signal, it is confidently expected that the whole vast mass will be blown into atoms, which will be entirely removed from the bed of the river.

BROWN TINT FOR IRON AND STEEL.—Dissolve, in four parts of water, two parts of crystallized chloride of iron, two parts of chloride of antimony and one part of gallic acid, and apply the solution with a sponge or cloth to the article, and dry it in the air. Repeat this any number of times, according to the depth of color which it is desired to produce. Wash with water and dry, and finally rub the articles over with boiled linseed oil. The metal thus receives a brown tint and resists moisture. The chloride of antimony should be as little acid as possible.

A WORD TO BOYS.—Boys, did you ever think that this world, with all its wealth and woe, with all its mines and mountains, oceans, seas and rivers; with all its steamboats, railroads and telegraphs; with all its millions of grouping men, and all the science and progress of ages, will soon be given over to the boys of the present age—boys like you? Believe it, and look abroad upon your inheritance, and get ready to enter upon its possession. The presidents, emperors, kings, governors, statesmen, philosophers, ministers, teachers, men of the future—all are boys now.

ROUGH WEATHER.—The captain of the steamship *Dorian* reports that he sailed on February 19th from Gibraltar and six days afterwards encountered a continuation of gales from W. S. W. to W. N. W. veering every few hours, and accompanied with squalls of terrific force. During 25 years' experience afloat, he never saw such weather." In the squalls the water was actually torn up in sheets and hove in the air, rain pouring in torrents, the mastheads enveloped in clouds, lightning fairly blinding, and the thunder cracking as it were among the masts, deafening all on board. Never in the tropics or near the line, have I seen such close proximity to the lightning This weather continued more or less up to the 15th inst., when it gradually toned down, enabling us to make some headway."

THE New York Mutual Gas Company, a new corporation is now laying pipes in this city. It will have new and improved appliances, use naphtha to enrich its products and supply its customers with gas of superior brilliancy—so they say. The present price of gas here is $3.50 per thousand cubic feet; in Pittsburgh, Pa., $1.80.

Beware of Green Colors.

The third report of the Massachusetts State Board of Health contains a valuable article on the evil effects of the use of arsenic in certain shades of green. The subject is not new; more than one hundred years ago the use of arsenic as a pigment in certain manufactures was forbidden by law in France. But the beauty and healthfulness to the eye of the color, and the thoughtlessness or cupidity of makers of wall paper, artificial flowers, toys, lamp shades, confectionery and other articles, render it necessary to warn the public again and again of the injury—sometimes a fatal one—inflicted by its use.

It appears that arsenic, aside from its uses in medicine and in destroying men or vermin, is employed in the arts, mainly as a large ingredient of *green coloring pigments*. Into one of these it enters as the arsenite of copper, known popularly as Scheele's green, and into another as the aceto-arsenite of copper, which is called Schweinfurt green. The generic name of emerald or mineral green is applied indifferently to either. Of these two colors, the first contains fifty-five per cent, more than one half, of white arsenic; the other in every one hundred grains, contains fifty eight grains of arsenic. Both pigments furnish the prettiest and most durable shades of green, each costs comparatively little, and the process of manufacture does not require great skill. Hence, it spite of their deleterious effects, both are used. At one time, in Paris, when it was proposed to make the use of arsenic illegal in the manufacture of wall paper and artificial flowers certain of the makers said such a law would force them to close their shops; and in 1860 a paper maker in England said that in his shops alone two tuns of arsenic were used weekly.

GREEN COLORS IN PAPER HANGINGS ARE DANGEROUS.

The most frequent instances of poisoning by these colors have followed the use of green paper hangings. Makers of the paper, dealers in it, paper hangers and even people who live in the rooms papered with it have often suffered under every sympton of poisoning by arsenic, and in some cases have received lasting or fatal injury. In 1862, in London, four children died in succession, and a *post mortem* chemical examination in the case of the last one showed traces of arsenic. The walls of the room in which they lived were covered with green paper, in which chemical tests showed the presence of arsenic—three grains in every square foot. In 1859, a middle aged woman in Boston was attacked with the well known symptoms of arsenic poisoning; and although her life was saved by removing the paper, yet her health was permanently injured. Such cases might be multiplied almost indefinitely from the reports of physicians.

Some years ago this subject excited considerable discussion, and arsenical paper hangings became unfashionable. The fashion appears to have changed again, however. Dr. Frank W. Draper, author of the article on this subject in the report, says that, in every store he visited while making his investigations, he found paper for sale which, on being tested showed signs of the presence of arsenic. Under these circumstances, it would be well if every one who wishes to buy any green wall paper would subject it to the following simple chemical tests:

EASY TESTS FOR ARSENIC.

Take a fragment of the paper and put it into a solution of ammonia. If arsenic be present, the liquid will assume a bluish color. In case a further test is required, pour a little of the ammoniacal solution on crystals of nitrate of silver; and arsenic, if present, will show itself by leaving a yellow deposit on the crystals. As arsenic is used in coloring all qualities of paper, from the cheapest to the costliest, a knowledge of this test will be of service to every one, whether dealer or customer.

It is of some interest to know how the poisoning by wall paper is effected. Formerly it was held that the poison was set free by some kind of decomposition, and vitiated the air as a gas. The modern theory is, however, that "the poison escapes from the paper into the atmosphere in the form of dust, mechanically disengaged," as by dusting or wiping the walls, or jarring them in any way. The dust of a room whose walls were covered with paper containing arsenic, on being submitted to a delicate chemical test, is said to have exhibited unmistakable traces of the poison.

GREEN COLORED DRESSES, TOYS, CONFECTIONERY, ETC., ARE POISONOUS.

But it is not alone in coloring wall paper that these poisonous pigments are used. Confectionery, pastry, ornaments and toys are colored with them, articles that soon find their way to children's mouths. Toy boxes of water colors furnish an illustration. One of the green blocks of paint, weighing 38·26 grains, on analysis was found to contain 8·89 grains of arsenic. The shelves in closets and pantries are sometimes covered with arsenic paint, from which the poison is easily absorbed by any warm or moist substance. The brilliant green paper so common for covering paste board boxes, for tickets, for *bonbon* wrappers, for lamp shades, is colored with arsenic. The green of artificial grass and leaves is generally produced by arsenic. In one case, in a single twig of twelve leaves, ten grains of pure arsenic were found. Arsenic is used to color cloth for women's dresses. Dr. Draper procured a sample of the stuff called tarlatan, resembling muslin, at one of the retail stores in Boston, which was found to hold feebly 8·21 grains of white arsenic to every square foot. To handle or to wear such goods is dangerous to life.

MESSRS. T. L. VON DORM and E. L. EATON, photographers, of Omaha, will please accept our acknowledgments for an excellent photograph of the U. P. R. R. bridge at that point.

The Administration of Chloroform, Nitrous Oxide, etc.

The recent death from fright in a dentist's chair in this city of a woman to whom nitrous oxide or laughing gas, had been partially administered, has called renewed attention to the dangers that attend the inhalation of anæsthetics generally. It seems to be the opinion of the most experienced medical men that no danger attends the operation if it is properly conducted.

Dr. Curtis of Cincinnati holds that many surgeons are too hasty in putting persons under the anæsthetic influence. He himself determined to give chloroform very slowly, and to urge large inhalations of atmospheric air. As patients seem inclined to refuse full inspirations to avoid inhaling the chloroform, he gave it loosely through a silk handkerchief, and so slowly that from 15 to 30 minutes were required to prepare the patient for operation, never giving it fast enough to diminish sensibly the force or volume of the pulse or to darken the color of the surface. He never gave more than was necessary to prevent sensation, pinching the surface to learn when this was accomplished, and renewing the inhalation during operation only when he found sensation returning. Soon after the introduction of chloroform into surgery, a Boston surgeon, while operating on a patient under its influence, discovered that the blood flowed very freely; but, as it was dark blood, he concluded it was venous, and would not seriously affect the subject. Soon he was alarmed by the sinking of the patient, who was only restored by strong stimulants and friction. The operator had given chloroform without the admixture of a quantity of atmospheric air sufficient to purify the blood of carbon; and hence, though he had wounded an artery, as he discovered by the irregular discharge, the blood was purple, instead of vermilion, as it should have been. The chloroform had been given too fast, excluding the oxygen of the atmosphere, as was evident by the dark color of the blood, the reduction of the force of the circulation, and the purple hue of the surface generally. This is a point to which great attention should be paid in the use of the anæsthetic agent.

The inhalation of chloroform is only a speedy method of making a person "dead drunk," and Dr. Curtis soon saw that if the anæsthetic state were brought on gradually, as intoxication generally is, and stopped as soon as sense and muscular motion are by taking alcoholic liquors, it produced no worse effect upon the system. In both cases the patient often vomits, both when taking the narcotic and when getting rid of it; and in both, insensibility to the severest operations may be produced. By taking proper care in regard to these things, Dr. Curtis says that operations may safely be performed on very small children and very old persons, on those whose lungs or hearts are diseased, or who are much reduced by chronic ailments *of* various kinds.

A singular effect which chloroform has upon some persons is its dulling the brain and destroying the intellectual faculties for months after it has been taken, and after physical health has been restored. One gentleman of active mind, a ready thinker and fluent writer, might be named who has been under the influence of chloroform three or four times for surgical purposes, and after each time his intellect has been torpid for months, though his surgical recovery was rapid.

Electric Probe for Wounds.

In the last general assembly of the Scientific Association of France, M. Trouvé exhibited and described his probe for the search and extraction of foreign bodies remaining in wounds. Surgeons have at all times been occupied with the discovery of a simple and practical means, capable of revealing to them to a certainty the presence of any foreign body in the tissues. Since Garibaldi's wound, two plans have been proposed, the one frictional and the other electrical. That by friction (Dr. Nélaton's plan) was preferred to the employment of electricity, proposed by M. Favre, of Marseilles, which was the subject of a communication to the Academy of Sciences. The style or probe which Dr. Nélaton uses to discover the presence of a ball has at its extremity a small "rugous" or wrinkled porcelain ball, which becomes blackened in contact with a leaden bullet. This plan is, without doubt, ingenious, and in this special case of great utility; but the services which it can render are very limited. In fact the body, the presence of which it is sought to verify, must be of lead, and the wound should not be closed, very straight, nor even very curved. This verification becomes even impossible when, as frequently happens, the bullet is encysted or covered with a portion of muscle or cartilage, or even with a fragment of the clothing of the wounded person.

The apparatus of M. Trouvé consists of three distinct parts: a battery, a probe, and an indicator (*récélateur*). In principle, it is founded on the difference in conductibility between metals and other bodies. The battery is formed of a zinc and carbon element, enclosed in a case of hardened india rubber hermetically sealed, the exciting liquid being bisulphide of mercury. The probe is a pipe, flexible or rigid, constructed so that the preliminary probing may be effected, and then the stylets of the indicating apparatus may be introduced. The indicator contains in its interior a very small electromagnet with a vibrator and two small rods of steel, very sharp and insulated from each other; and as soon as these points, which are in connection with the battery, touch any metallic substance, the vibrator begins to move.

With this apparatus, it is possible to distinguish the different metals from one another. If the metal is lead, the rembler vibrates regularly; if however, it is iron or copper, the trembler has a jerky movement. Iron may be distinguished from copper by its action upon the needle of a galvanometer.

Recent Decision by the Commissioner of Patents.

Harriet L. Low, Administratrix. Application for the extension of Letters Patent granted to Henry H. Low, March 6, 1858, for an Improvement in Sawing Machines. Decided March 2, 1872.

Practice where the original patent has been reissued.—Where a patentee assigns his entire interest in his patent for the original term, and the assignee without the concurrence of the patentee surrenders the original patent and secures a reissue, the patentee may have certificate of extension attached to the original patent.

Leggett, Commissioner:

The invention to which this application relates is an improvement on sawing machines. The claim is very narrow, disclaiming all the parts of the machine, and claiming only the combination in the definite form stated. The examiner reports that this combination was new and patentable at the time the patent was issued, and that the proof shows the same to be of considerable value to the public. The statement of accounts is not very full or definite; but this is explained partly by the death of the patentee, and his books not showing minutely the expenditures on account of the patent; but enough is shown to satisfy the Office that the net receipts have been very small, and much less than the value of the invention.

An argument has been filed in opposition to the extension, based chiefly upon the fact that the application is for the extension of the original patent, while the original patent was surrendered and reissued March 6, 1866, and again reissued April 2, 1867. In the application for extension, no allusion whatever is made to these reissues. They are ignored as completely as if they had never been in existence.

The remonstrant holds that, when the original patent was surrendered and reissued, it ceased to exist, and cannot now be revived by extension. This doctrine would be just and applicable provided the patentee had joined in either application for reissue; but the records of the Office show that he assigned his entire interest in the original term of the patent to one C. S. Burt, and that said Burt as assignee secured the reissues without joining with him, the patentee; and there is no evidence in the Office that the patentee or administratrix had any knowledge whatever of the reissue. Under such circumstances, it would be a manifest and unnecessary hardship to require the patentee to apply for the extension of the reissue, and then compel him to incur the expenses and risk of another reissue in case he preferred the original form of the patent. In this case, the patentee assigned only the the original term of the patent, reserving to himself, under the law, the exclusive right to the extended term; and it would be an anomaly in law if the assignee could render the extended term worthless to the inventor by obtaining a worthless reissue just before the expiration of the original term; yet such might be the case if the remonstrant's doctrine is law.

But it is not necessary to further discuss this matter, as the question has been adjudicated by the courts. In the case of Potter *vs.* Braunsdorf, 7 Blatch., 110, Justice Blatchford says: "Where a patentee, having secured his invention by a patent with a specification in such form as he regards to be most proper, assigns the entire patent for the original term only, reserving his right under the eighteenth section of the act of 1836 to apply for and obtain an extension, it ought not to be and it is not in the power of the assignee, by surrendering the patent and obtaining a reissue of it on a specification not signed, assented to, or adopted by the patentee, and which perhaps the patentee may regard as rendering the reissued patent invalid, or as securing, by new and different claims, rights of little value, to effect, without his consent, the statutory right conferred on the patentee to apply for and obtain an extension of the only patent which he has ever adopted or assented to."

The extension is granted, and the certificate will be attached to the original patent; or, if the original patent is lost, to a certified copy of the same.

The Imitation of Gems.

Nowhere has chemistry—the science most essential for this purpose—been brought to greater perfection than in France. Accordingly, none have attained more skill in the art of imitating gems than the French. If the revenue that Paris has derived from this source alone for the last quarter of a century were stated in plain figures, it would seem more fabulous than any story in the "Arabian Nights." But it would seem worse than fabulous to say than three fourths of those gems which were worn daily, or at least nightly, in New York, Philadelphia, and Boston, including those that sparkle on the bosoms of some of our great men, have contributed to that revenue in proportion to their size and characteristics. Yet it would really be no exaggeration of the fact. Let those who think we want to trespass on their credulity turn to the works of Kunkel, Neri, and Fontainieu, That of M. Fontainieu alone would be sufficient. That learned member of the Royal Academy of Sciences has been enabled, by a long series of experiments, to produce a perfectly colorless crystal. This he calls *fondant*, or base; he has formed one by each of the five different processes; he has also shown how the various colors are produced, according as a given piece of crystal is intended to be a diamond, an amethyst, an emerald, a ruby, etc. Several German chemists have given the world the benefit of their researches on the same subject, and some have enriched themselves and others by them. This is true, for example, of Professor Lippert, of Dresden, who prepared 3,000 casts; of these one jeweller bought 1,000 and rapidly made his fortune; the remainder were purchased by different jewellers, each of whom obtained the prices of real gems. Since the celebrated experiments of Lavoisier, every person of ordinary intelligence is aware that the diamond is simply pure carbon crystallized, and that it can be burned in oxygen, the sole result of the combustion being carbonic acid. M. Despretz, another French chemist, has actually made real diamonds, having melted and crystallized carbon by means *of* a galvanic battery; but Nature has so carefully kept the secret to herself thus far, that the learned Frenchman's diamonds are so small as to be visible only with a microscope.—*British Trade Journal.*

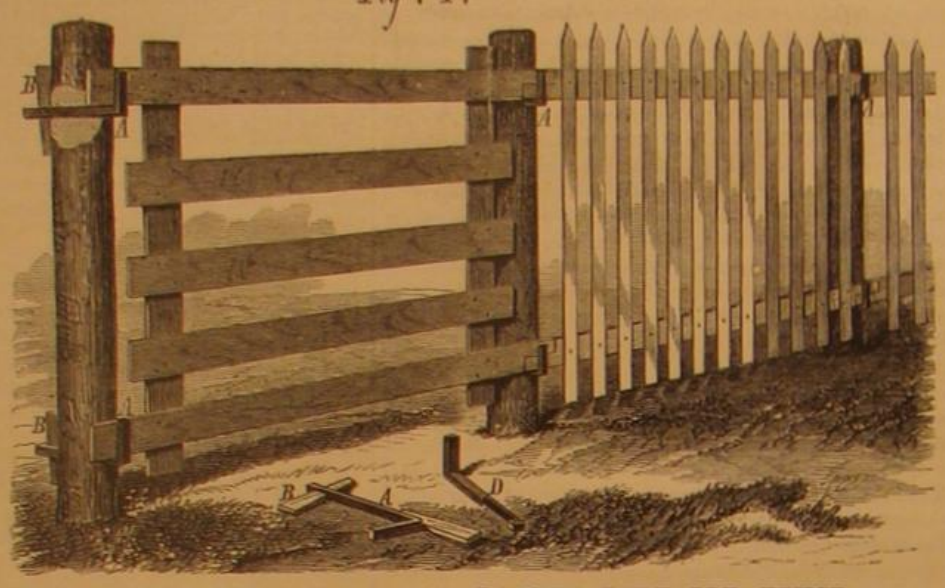
LET him who regrets the loss of time make the proper use of that which is to come.

Improved Portable Fence.

Although there have been many inventions intended to supply a good, cheap, and convenient portable fence, yet, so far as we are aware, very few if any have proved entirely satisfactory. The inventor of the present device has himself been the author of several improvements of this kind, which, upon trial, have proved not to be wholly free from some of the defects usually attending this class of devices, namely, their liability to being blown over by wind storms, the room they occupy, their inefficiency in restraining animals, and their liability to get out of repair.

In the present invention, he claims to have so far profited by previous failures that he has produced a fence free from the defects named. That others are convinced, as well as himself, is evident from his statement that, at a recent exhibition of the fence, the inventor sold in a single afternoon twenty-seven local rights to make and use it.

Fig. 1.



LANDIS' PORTABLE FENCE.

It is claimed to be as strong as any post fence, requiring only small posts, having the sides slightly hewn, and it has two holes bored for the insertion of hooks for fastening, which finish the same without weakening them.

Two metal hooks or clamps, A, Figs. 1 and 2, with slots for wedges, B and C, are used, as shown, for fastening panels to the posts. Another style of hook is shown at D, Fig. 1. The panels consist of two strips nailed at right angles across the slots or rails, say ten or twelve inches from each end. The slots should be six inches apart, and number four or five to each panel, two extending six inches beyond the rest, for fastening on the clamps or hooks. The rails are left unimpaired and not weakened. In picket fences, the rails may meet as shown. In rail fences, the rails need not meet within six inches, as also shown, the post, of course, closing up that space.

Cross lines of posts may be set on farms, and fences removed with great facility from one line of posts and fastened on to another when and where wanted. Any panel may be detached anywhere, and an easy way of access from one field to another obtained, to pass with teams or stock without, as is often the case, going from one end of a field to another; this is especially a great desideratum for lawns, gardens, lots, etc., as means of access where gates are not always just where wanted.

Whitewashing preserves fences. It is believed that by having a large enough trough, made of boards, into which to lay panels, and filling the same with whitewash, two men, by immersing the panels, may whitewash more in one day than they could in a week in the usual way, doing it more thoroughly, dispensing with brushes. This fence is exceedingly simple, and may be made indoors at seasons when farmers have most leisure.

Two patents were obtained on this fence through the Scientific American Patent Agency, Feb. 6, 1872, by Israel L. Landis, of Lancaster, Pa., who may be addressed for further information.

Wood Ashes.

Ashes from the wood of the hickory, sugar maple, elm, etc., contain about 50 per cent of potash compounds, consisting chiefly of combinations with carbonic acid and silica, while the ashes of pine wood will rarely yield more than 20 per cent. Ashes saved from clearings often contain earth, mixed with them in gathering the remains from fires. When wood is used for burning lime, the ashes are often put into the market largely mixed with that substance. Sifted coal ashes are sometimes used to adulterate wood ashes, and the fraud can hardly be detected by the eye.

Leached ashes always retain a portion of potash, usually in combination with silica or phosphoric acid. These compounds are slowly soluble in water, and, therefore, are not removed in leaching, but they are valuable, especially to grain crops and grasses. Ashes, whether leached or unleached, should never be suffered to go to waste. Even coal ashes may be used to good advantage on stiff clay soils. Their effect, however, is more mechanical than chemical.

Cut your Hay and Clover before they Ripen.

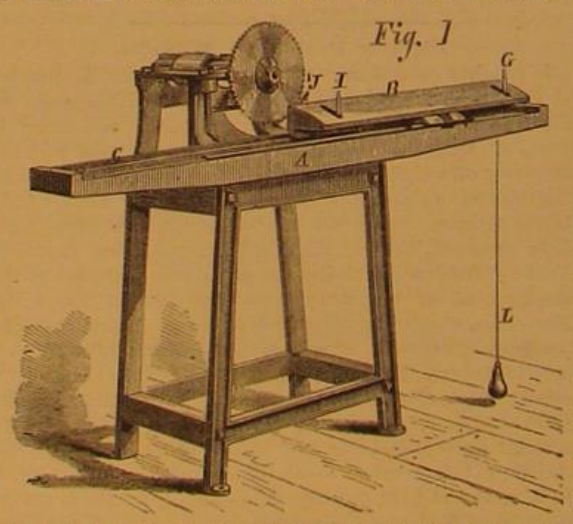
An interesting discussion is in progress, among the chemists of continental Europe, on the true character of that substance which forms the frame work of plants, generally known as *woody fiber*. Chemists have heretofore considered this as a single proximate element, but the researches of Dietrich and König have pretty clearly established the complex character of this substance. There is first the true frame work, or vegetable fiber, consisting, substantially, of organized starch. To this substance, the term *cellulose* has been appropriated. Covering this true skeleton is found a second substance, much denser than the cellulose, and containing the chief part of the mineral matter remaining as ash after the plant is burned. This is called *lignin*. These terms have been heretofore applied indiscriminately to woody fiber.

The point of interest in the discussion lies in the fact that cellulose is largely digestible, while lignin is almost indigestible. Dr. Marcker, at Weende, has conducted a series of instructive experiments on the digestion of hay by sheep. Of the crude fiber of meadow hay, he found that about 60 per cent was digested, and the 40 per cent which remained in the excrement consisted chiefly of the lignin, containing a large proportion of the mineral elements of the food. Of the albuminous portion of the hay, but 55 per cent was digested, while the non-nitrogenized substance, such as sugar, gum, etc., proved more digestible, 68 per cent having disappeared. When the experiment was repeated with hay of the second cutting, in which the woody fiber had not fully matured, it was found that 68 per cent of the crude fiber was digested Professor E. Wolff has made similar experiments with red clover hay, with results almost identical. He ascertained, however, in another experiment, that clover which was cut before it had blossomed was about one sixth more digestible than that which had passed the bloom before it was cut, From these experiments, it is fairly to be inferred that the increased weight which grass acquires in ripening is from the increase of indigestible lignin, and not from digestible cellulose. Meadow grass or clover cut at or before blooming is worth 16 per cent more than an equal weight cut after it has matured. The nutriment in the seed of timothy hay is an unknown quantity in these experiments, and will change the results somewhat.—*R. T. Brown.*

PALMER'S STAVE JOINTING MACHINE.

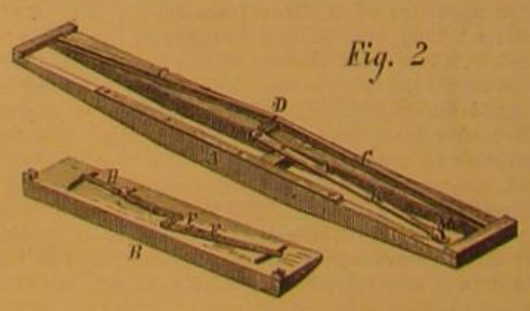
The simple invention illustrated herewith is, in our opinion, calculated to effect a great saving in the jointing of staves, and in the manufacture of all kinds of casks. The object

Fig. 1



which the inventor has accomplished is to joint every stave to the proper curve corresponding to its width, so that out of a lot of jointed staves, those required for a cask may be taken indiscriminately, and no matter whether there may be a third more staves in one than in another, the same ellipsoid

Fig. 2



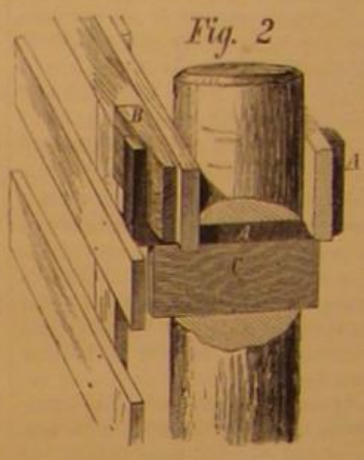
form will be produced in both, and a perfectly tight symmetrical cask will result. We are told that barrels made in this way, without the use of flags, prove perfectly tight. The jointing proceeds with the same rapidity with which the slitting of a stave might be done with a circular saw. The parts are few, and all may be made as strong and substantial as need be. The entire absence of delicate complications, and the ease by which the machine may be manipulated, are points that will attract the attention of practical men, and we have no doubt that this machine will take its place permanently among standard appliances in the manufacture of all sizes and descriptions of casks.

The general principle which underlies the machine is that of making the stave move on a carriage which moves on two guide ways, inclined to each other at an obtuse angle in such a way as to make the carriage describe a curve, the angle of the guides, and consequently the curve cut, varying to suit the width of the stave.

Fig. 1 represents the device as placed on a saw table ready for work. Fig. 2 represents the details of the same. A, in both figures, represents the frame of the carriage ways, and B the carriage. The latter may be rounded on the top to suit the curve of staves cut with barrel saws, or flat, for flat staves. C, Figs. 1 and 2, indicates horizontally inclined guide ways meeting at D. E is a lever pivoted at F. G, Fig. 1, is a pin rising from the end of the long arm of the lever, E, up through a slot in the carriage.

Now, as the lever, E, is also joined to a lever, H, Fig. 2 (where the carriage is shown bottom side upward), the arms of which lever are of the same length as those of E, it is obvious that any movement of the pin, G will also produce an equal movement, in the same direction, of the pin, I, Fig. 1, which rises from the end of the long arm of the lever, H, through a slot in the carriage, the same as the pin, G.

Fig. 2



Thus the two pins move laterally in the same direction and to the same extent, when a stave is placed against them. At the same time the carriage guide ways, C, Fig. 2, are adjusted to give the proper curvature to the edge of that particular stave.

The stave, therefore, has only to be laid upon the carriage in the proper position to be jointed. In doing this, the pins are moved by the edge opposite that presented to the saw, and the guideways are correspondingly adjusted.

A spur, J, Fig. 1, holds the end of the stave which is remote from the operator.

The adjustment of the carriage ways remains to be described.

When the carriage is brought into the position shown in Fig. 1, the lever guide pins, G and I, being left free to move, the end of the long arm of the lever, E, Fig. 2, enters a recess in the end of the lever, K, Fig. 2, being guided thereto by a weighted cord, L, attached to it, which cord runs over a pulley, M, in the recessed end of the lever, K. The lever, E, thus engages the lever, K, and causes it to shift the guideways, a ratchet and pawl (not shown) holding the guideways in place till the cut is made, when the pawl is automatically disengaged on the return of the carriage.

The device is capable of adaptation to any saw table, by slight modifications.

Many testimonials certifying to the value of this machine have been shown us, as coming from practical men who have them in use.

Any desirable bilge may be given to casks or barrels by its use, and it can be applied to the jointing of any kind of staves, large or small, curved or straight. The machine is cheap, and will, we believe, meet a long felt want on the part of stave manufacturers.

Patented August 8, 1871, by Lemuel R. Palmer, whom address, for further information, Belfast, Me.

New Stuffing for Cushions.

A material which has come quite extensively into use in Germany, as a substitute for hair in the stuffing of saddles, etc., consists of a mixture of flax seed and tallow. The advantage of this substitute consists primarily in the fact that the mobility of the seeds, one upon the other, prevents the packing or settling in any particular place, as often happens in saddles stuffed with hair, thus causing any given pressure to be readily and uniformly distributed over any given surface. The tallow serves the purpose, too, of keeping the leather flexible, and of preventing the absorption of perspiration, protects the article itself, and prevents the back of the animal from becoming galled. Animals with sores or galled spots on the back can be ridden with saddles stuffed with this material without any great inconvenience. The tallow also has the effect of preventing the rotting of the flax seed, and is to be added in sufficient quantity to give the requisite softness to the entire mass. An aromatic odor can be imparted by introducing oil of turpentine or camphor powder, and the durability considerably increased thereby. One part of tallow to from six to ten parts of flax seed may be used, according to the temperature.

CARPETED FLOORS.—When a carpet is taken up to be cleansed, the floor beneath is generally much covered with dust. This dust is very fine and dry, and poisonous to the lungs. Before removing it, sprinkle the floor with very dilute carbolic acid, to kill any poisonous germs that may be present and to thoroughly disinfect the floor and render it sweet.

[For the Scientific American.]

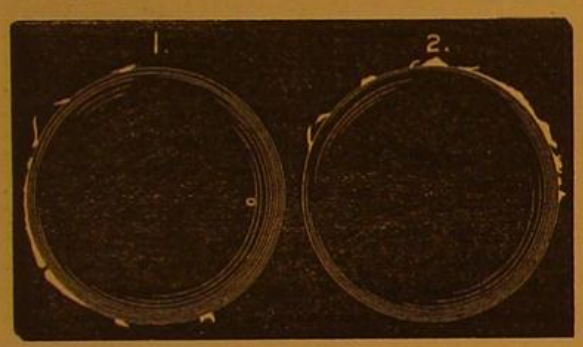
THE DISCOVERY AND HISTORY OF THE CHROMOSPHERE.

BY J. H. LEACH, OF DARTMOUTH COLLEGE.

The discovery of an atmosphere beyond the photosphere of the sun opened a wide field of observation to astronomers, a field which the triumphs of the spectroscope have rendered so interesting as to claim the especial attention of scientific men; and in no other department of science have such wonderful discoveries been made, and in so short a time, as in the department of solar physics. The invention of the telescope enabled men to explore the depths of space, to measure and examine the surfaces of the heavenly bodies, but that of the spectroscope has discovered to them their very composition.

The prominences of the chromosphere, as such, were first observed during the eclipse of 1842; red clouds had indeed been seen prior to this, but no suspicion of their character had entered the minds of the observers. The eclipse of 1842 found a corps of observers, composed of the first scientific men in all Europe, among whom were such men as Arago, Biele, and the younger Struve, awaiting the phenomena. The appearance of the prominences was an object of surprise, and various theories were entertained in regard to them, some believing them to be mountains on the sun, others flame, and some entirely denied their existence, believing the sight of them to be an optical delusion.

The prominences were next seen during the eclipse of 1851. Observations made during this eclipse dissipated, in a measure, the doubts entertained in regard to their reality. Drawings were made of the prominences by many observers, but the time had not come for a general acceptance of their solar origin; this was to be proved and acknowledged by the scientific world in 1860. The observations made during this eclipse were especially directed to the solving of this problem to the satisfaction of all. M. Goldschmidt's account of his observations at this time is very interesting. In addition to sketches of the prominences made by M. Goldschmidt and others, the aid of the photographic art was brought to bear upon the solution of the prominence problem by De La Rue and Secchi. Every photographer well knows the feeble actinic power of red light; against this they had to contend, but in spite of all difficulties they succeeded in obtaining several good pictures.



The following engravings represent the prominences as photographed by De La Rue, in 1860. Fig. 1 represents the earliest phase, while, in Fig. 2, the prominences on the left are nearly obliterated; those on the right are revealed. The problem was never solved to the satisfaction of all. The prominences were proved to be solar beyond a doubt. A solar envelope or atmosphere, beyond the photosphere, in which the prominences had their origin was revealed; in fact, the chromosphere was discovered. Science could measure the dimensions and copy the forms of the solar appendages; but it remained for the spectroscope to reveal their composition Kirchoff and Bunsen, quietly working in their laboratories, were soon to open an avenue leading to discoveries which should rival those of the telescope.

Some idea of the delicacy of spectrum analysis may be gained when we know that the $\frac{1}{180000000}$ of a grain of sodium can easily be detected; and we have only to take a book from our shelves, and open it over a lighted taper to detect in its flame the presence of sodium in the dust which has fallen from the leaves. An instrument having such a power of delicate analysis was now to be employed in the investigation of the chromosphere and its prominences. Nine years must pass away before an eclipse would occur whose path would furnish accessible stations for observation. The total eclipse of August 18, 1868, furnished unusual advantages, and it was at this time that the spectroscope was first directed toward the solar prominences.

The results of the observations made during this eclipse will be given in another article.

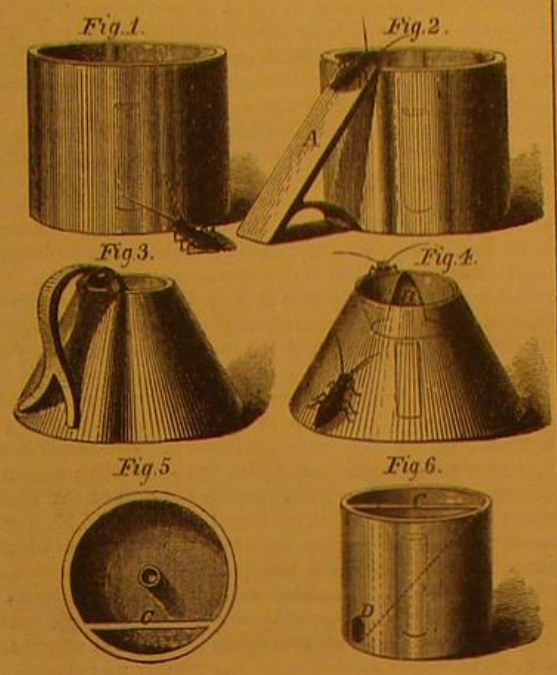
THE RAILROAD ACCIDENT NEAR SPRINGFIELD, MASS.—The danger of heating railroad cars by stoves has received a further illustration by the conflagration of the ruined cars in the Springfield, Mass., accident. There is an opportunity for an ingenious mechanic to invent some means of heating the cars by the exhaust steam of the locomotive. Many attempts have been made to perfect such an arrangement, but none capable of practical application has been produced.

CHEAP PAINT.—A cheap paint may be made for out-buildings and general use, by taking milk and cement—or water lime, as some call it—mix and apply three or four coats; a dry color may be added. This will last for years, and by renewing once in two or three years, a building will be kept looking well at small expense.

LIVE within your means, if you would have the means in which to live.

A PATENT OFFICE CURIOSITY, AND A SPECIFICATION IN RHYME.

Among nearly 20,000 specifications, including substitutes, now on file in the United States Patent Office, the following is one of the most remarkable and amusing. In this case, a late Commissioner decided that no patent should issue upon a poetical specification which was in other respects entirely sufficient. This specification was written by the inventor, Dr. D. Breed, late of the Patent Office.



ROACH TRAP.

To all those whom it may concern:
By this description, you may learn
That I, D. Breed, a District man,
Have made invention of a plan,
Both new and useful, of a trap
For catching roaches while you nap.

In setting forth my new invention,
Of first importance I would mention
My trap's a novel earthen cup
Outside of which the roach creeps up
And, jumping in to eat molasses,
The well glazed mouth he ne'er repasses.

In drawings, figures one and two
Show simple forms, yet something new;
The first has rough outside or way;
The next, an inclined path at A.
The central stem (in dots you see),
Is crowned with bowl like half a pea,

To hold molasses, say a drop,
And smoothly glazed from base to top.
But this is no essential thing;
Without it, in the roaches spring,
If, in the bottom of the cup
You place the sweet whereon they sup.

The figure three shows form unique
Of which in highest praise I speak;
'Tis glazed on in and outer sides,
Except between the handle strides
Where creep the roaches up a track
Without a fear of sliding back.

In figure four, at B, a spout
Is made, to wash dead roaches out;
This form is glazed entire within,
Also the mouth up to the brim.
But on the outer side, all round,
No trace of glazing can be found.

In five and six, a septum, C,
Cuts full two thirds the cup from three.
The smaller part has open door
At letter D, close to the floor,
And inclined way to top of cup
Where Mr. Roach with ease walks up;

Nor needs his wife or child his hand
To reach the highest brink and stand.
A little trip in balance hung
May o'er the mouth of cup be swung;
But that, an almost useless thing,
To save expense, away I fling.

Of varied traps, with spiral walk
And sundry forms, I yet might talk—
Of clay or other mortar made
To suit the fancy or the trade;
Forms now conceived, yet not revealed,
That sleeping lie in fancy's field.

From this description, you may make
Whatever form you choose to take,
From figure one to six, made part
Of this to aid the potter's art.
I recommend said figure three
Of porcelain, like cup for tea.

CLAIM.

As manufacture new, I claim
Said pottery trap, or porcelain.

If, while you sleep,
The roaches creep
Into your sugar bowl,
And, when you wake,
They quickly take
Safe to their hiding hole
Before your head,
Upon your bed,
Again you lay to nap
Be sure to get
And bait and set
The rhyming roaching trap.

D. B.

THE richer a man makes his food, the poorer he makes his appetite.

[For the Scientific American.]

FRICTIONAL GEARING.

BY E. S. WICKLIN.

NUMBER I.

Frictional Gearing is the term applied by Webster to wheels that transmit motion, by surface contact, without teeth. Among mechanics and practical men, who build and use them, such wheels are usually called "friction gear." When spoken of separately, that is, without reference to their combination, they are called friction "pulleys," especially those with faces parallel to the axes. When made conical, they are termed "bevel friction," and are usually spoken of as "wheels."

This style of gearing is now in use in the lumbering region of the northwest, and is fast gaining favor wherever used. It has some advantages, not possessed by other modes of communicating motion, which do not appear to be counteracted by any peculiar disadvantages. As a rule, however, it does not strike the mind of the mechanic favorably when first suggested, but must be seen to be appreciated. The first impression appears to be that the point of contact is too small to possess any considerable amount of adhesive force. It is generally received as a law that friction, or adhesion of contact, is not in proportion to the extent of contact, but to the amount of pressure and the condition of the surfaces. But to many minds, this law appears more as a learned theory than as a practical truth. In fact, there are few, even of our best mechanical thinkers, who do not manifest some surprise when, for the first time, they see with what apparent ease one smooth wheel will drive another equally smooth, by what appears to be a very slight contact; and that the second wheel is not only itself driven, but carries with it ponderous machinery, involving the expenditure often of more than fifty horse power. Nor is it strange that many minds are unprepared for such results, since most of our mechanics rely, to some extent at least, upon books, in the absence of personal experience. And here books fail.

There are, perhaps, no other means of transmitting motion about which so little has been written, in proportion to its importance, as frictional gearing. And most that has been written is upon the grooved wheels, which are frictional with a vengeance, and are, by the unequal motion of the parts in contact, as well calculated to absorb the motive power as they are to destroy each other.

As examples: In the latest edition of Webster's "Unabridged" we find the following definition: "Frictional gearing, wheels which transmit motion by surface friction instead of teeth. The faces are sometimes made more or less V shaped, to increase or decrease friction, as required."

In a recent work on mill building, perhaps the latest published in this country, a work of large pretentions, the only allusion to this class of machinery is a single seatence, in the chapter on friction, as follows: "Friction also furnishes a convenient medium of communicating and transmitting motion in machinery, as in gigging back the carriage and log in saw-mills; and in some modern mills, the whole driving power for both saws and mill stones is communicated by friction of iron upon iron."

Another late mechanical work gives us the following information upon friction gearing: "The surfaces of the wheels are made rough so as to bite as much as possible."

The above quotations furnish a sample of what may be learned from books of this very important mode of transmitting motion. And yet, in all the vast lumbering region of the northwest, comprising a large part of two or three States, and furnishing building and fencing material for several millions of people, there are few mills in which some part of the work is not done by friction gear. And in many mills the whole power, amounting to from 100 to 300 horse power, is thus transmitted.

The growing popularity and importance of this rather new style of gearing cannot fail to make it a subject of interest to mechanical engineers and manufacturers.

With this view, the writer now proposes to give, in a short series of articles, some observations taken from a practical stand point, and also the results of a few experiments, made to determine the percentage of adhesive force or traction of these wheels as compared with belted pulleys.

Now a word as to what friction gearing is, where it has become an undoubted success. In large mills where this gearing is used to transmit power to drive five or six gangs, one or two large circular saws, a muley, gang edgers, trimmers, slashers, lath mills, shingle mills and more besides: where 20,000 feet of boards may be sawn in an hour: the faces of the wheels are not "made more or less V shaped so as to increase or decrease friction as required." Nor is the power "communicated by the friction of iron upon iron." Neither are the surfaces of the wheels "made rough so as to bite as much as possible." On the contrary, the surfaces are made smooth and straight as possible; one wheel, or pulley, is made of iron, and the other of wood, or of iron covered with wood. So it is seen that the books are wrong, at least so far as applied to the localities where this gearing is most used.

Where it is practicable, this gearing is so arranged that the wood drives the iron. This is done so that the "slip," in starting up machinery while the driving wheels are in full motion, will tend to wear the wooden wheel round rather than to cut it in grooves, which is done to some extent when the wheels are reversed; though this tendency is much less than might be supposed, as in most cases the "hull wheel," used for drawing logs into the mill, is a large wooden wheel driven by a small one of iron. And these wheels, though started and stopped with the driver in full motion a hundred times a day, work well and last for several years. But for

machinery in constant use, the wooden wheel should always drive the iron.

For driving heavy machinery, the wooden drivers are put upon the engine shaft, and each machine is driven by a separate counter shaft. Two or more of these counter shafts are usually driven by contact with the same wheel, and each is arranged so as to be thrown out from the driver and stopped whenever required, and again started at any moment without interference with other machinery. This is easily accomplished, as a very slight movement is sufficient for the purpose.

To drive small machinery, these friction drivers are put upon a line shaft so as to drive a small counter shaft, from which the machine is driven by a belt, and stopped and started, by throwing out the counter shaft and throwing it in again.

Correspondence.

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

A Visit to a Watch Manufactory.

To the Editor of the Scientific American:

For many years I have had a great desire to become acquainted with the manufacture of watches by machinery. None of the many articles published on the subject seemed satisfactory, and I gladly availed myself of an invitation to visit the works of Giles, Wales, and Co., at Marion, N. J. Here I found an immense building devoted to the manufacture of the movements of watches. The building is constructed almost entirely of iron and glass, and is remarkable for its excellent facilities for light and ventilation. Inside, it is a perfect hive of industry, more than five hundred men and women being busily engaged in their various duties. I spent three days in wandering through the building, and trust the notes of my observation will be interesting to the general reader. The work is all done on four different floors and a basement. I will begin with the basement, which is devoted to the engine room, smith shops, hardening room, punching room, etc. On this floor, all the heavy work is done. Here all the parts are wrought into shape from the crude material. All the steel used here is of American manufacture, and has been found to be superior to all other as it is not so liable to spring, when hardening the pinions, staffs and springs. The company is able to supply itself in America with all the material necessary for its watches, except the stones for jeweling purposes.

Ascending to the first floor, we find it occupied by the office, forwarding rooms, and machine shop. In these latter shops, the company makes all the various machines used in making the different parts of the watch. They have four or five hundred of these machines, some of them performing very novel work. Many of them require the greatest accuracy and leave nothing to the eye or touch of the workman. Exactness is secured by gages, the coarsest measuring to the $\frac{1}{250}$ of an inch, the next, to the $\frac{1}{1250}$ of an inch, and the finest, to the $\frac{1}{100000}$ of an inch. The workman has only to trust to the guidance of these gages.

The second floor, I find devoted to the balance and pinion department. Here the expansion balances are made and the pinions finished. The operations of making and polishing the pallet jewels are also going on. I was astonished at the skill and ingenuity displayed in the machinery constructed for these purposes. The machines cut and polish the hard stones, with all their perfect angles, of the greatest exactness in size, and so small that it takes one hundred thousand of them to weigh a pound. The facility with which the precious stones are cut up into jewels is indeed astonishing, considering their hard and brittle nature. The rough stone is first sawn into slabs, then these into squares. The latter are then cemented to the chuck of a lathe which runs with lightning rapidity. They are then cut by a diamond pointed chisel, fixed to an arm which moves around in a horizontal semicircle. Thus they receive a convex form. By another application of the diamond point, the little cup shaped cavity for holding the oil is formed. Then the minute perforation for the pivot is made by a fine diamond drill, first applied to one side and then to the other. These perforations are then brought to the required size and smoothness by a hair-like wire covered with diamond dust. In this room are also made steel screws, perfect in every particular and yet so small that it takes 40,000 of them to weigh one ounce.

I next ascended to the motion room on the third floor. In this room all the motion works are fitted, including the mainspring barrel, the winding and stop works, the enameling, marking the figures and gilding the plates. Here also, in a room with locked doors, is performed the damascening, a process which gives to the metal the appearance of watered silk. This is a secret known only to the operators.

Thence I go to the fourth floor which may be called the great workroom of the establishment. Here the different parts of each watch are brought for final adjustment. Every part is made to harmonize. Each pivot must have its proper side stake and end stake, lest an atom of dust or a change of temperature lock the wheels and stop the watch. The greatest attention is given to the adjustment of the watches. Every watch is carefully tested with reference to the effect of heat and cold, and position. The springs and driving powers are so carefully harmonized that all work with the greatest precision.

Since my visit to this wonderful manufactory, I am satisfied that the old way of making watches is superseded, and that American industry and genius has surpassed Europe in one of her oldest and most difficult branches of manufacture.

Jacob Sayler.

Testing Turbine Wheels.

To the Editor of the Scientific American:

I have read your remarks in the Scientific American of March 16th, on the subject of turbine wheels, with much interest, and the common sense of your conclusions seems to me so apparent that I ask leave to say a few words in following them up.

The fact which you state, that every competent hydraulic engineer concedes a different percentage of water power under different heads, seems to me to prove that more patents are yet to be obtained before the best effects can be had. The power, as we get it, is a fitful uncertain thing and difficult to calculate in advance, and is by no means what is claimed as the proportion of the whole power of the weight of the water. If it were definitely determined what proportion of the good effect upon a turbine wheel is impact, purely a blow, and what the weight of the water in quiet pressure, we could at least make an approximate prediction as to what a well constructed machine would do under any known head; but, so far as I am informed, speculation, for this, is our best basis at present. It seems to me also that the fact, which you state, is sufficient to show that no such result as the utilization of 90 per cent, or 80 per cent, or even 70 per cent of the whole weight of the water has ever been realized.

I have seen a turbine of small size, accurately and nicely constructed, for the purpose of using as a cross test with a hydraulic engine also well constructed. Both were used upon the same stream and under the same circumstances. The wheel exhibited a little over 40 per cent of the whole power of the water, as shown by the engine, which registered the whole, less the friction. Certainly, one of the phases of which you speak was present. The water was of great head, the wheel making some 3,000 revolutions in a minute. It lost the power of the water, out of proportion to the work put upon it, apparently up to the point where the more quiet weight pressed upon it, probably up to the point in speed where the wheel nearly ceased to urge the water in "meshing" through.

The relations between a turbine wheel and a water pressure engine may be pointed out as much the same as those between a reciprocating and a rotary steam engine. The aim of inventors of both rotary steam engines and turbine wheels is to imprison their respective forces until no more work is left in them.

No other test for economizing power would be so satisfactory as for claimants—on wheels already competing, or any others—to force back to its normal head 90 per cent, 80 per cent, or 70 per cent of the water used, giving credit for friction in returning it.

R. H. A.

Extracting the Precious Metals from their Ores.

To the Editor of the Scientific American:

On page 168 of this volume of your valuable journal, you call the attention of your readers to the importance of a new method of extracting the precious metals from their ores. The article leaves no doubt as to the paramount importance of this widely absorbing topic. You justly point to the disappointment experienced by the miner in obtaining so small an amount of the gold and silver, compared with the assay value. This gives rise to the questions, are our present methods scientifically worked, or are they for the most part chimerical? From the attention I have given to this subject, I am inclined to take the latter view, perhaps from a certain amount of obtuseness that prevents my seeing things as others see them. I admit the utter impossibility of my seeing the newness of the method for the reduction of gold and silver by means of the caldron for the boiling of the ores, and I cannot comprehend the acumen of the metallurgical chemistry proposed for the refractory metals. Assuredly, Barba (who invented the *beneficio de cazo*, in South America in the year 1590, for the reduction of the *plata cornea* or horned silver of the mineralogist, and also employed chloride of sodium and magistral or sulphate of copper) ought not to be ignored; especially as that method has been in use for nearly 300 years, and is used both in North dan South America. Substituting iron for copper is the only new feature, and I think its advantages quite problematical. The refractory ores are treated, in this newly devised apparatus, with chloride of sodium, nitrate of potassa, lime, bisulphuret of carbon, fixed and volatile oils, hydrochloric acid, and sulphuretted hydrogen, an array of specially selected chemicals sufficient to break the bonds that hold together substances of the most refractory nature. The *rationale* of the chemical changes, I leave others to formulize.

The ultimate effect of boiling the ores in the caldron with the above substances may be anticipated: The oxidation of the mercury and its loss in the subsequent washings, and the risk of explosion by treating the ores with the hydrocarbons in the heated caldron, also the great expense of such a process for poor ores, where such a method is admissible.

I am glad to see this matter open for discussion in the columns of your valuable journal; it is the precursor to the settlement of this troublesome question.

Newark, N. J. J. Tunbridge.

Some of the good people of Boston are indignant at the action of the city authorities of Hartford, Conn., for enacting a resolution for erecting a statue, in their public park, of Horace Wells, for whom they claim the discovery of anæsthetics. Boston claims the discovery for her citizen chemist, Dr. Jackson.

Work does not wear men so much as worry.

Huano Manure.

An important improvement in the manufacture of artificial guanos, the discovery of which affords for many cases a practical solution of the difficulty of disposing of sewage, has just been announced in Great Britain, having reference to a substance called Huano manure. This material, it is claimed, is as rich as Peruvian guano, and its manufacturers furnish a guarantee to that effect. It is worth, according to the scale of fertilizers, from $40 to $45 per tun, although its first cost, as manufactured, is less than $13 per tun. In the course of inquiries leading to the invention in question, it was first ascertained that Portland cement transforms night soil into stone, which, upon being crushed, gives 18 per cent of phosphate of lime; and when applied as a manure for growing turnips, it has produced 26 tuns to the acre. Owing to the insoluble nature of the phosphates, however, the action was slow, and the next step in the process was to utilize this property of cementation in the superphosphate manufacture, in which night soil is substituted for water in the decomposition of the phosphates. During this process the phosphates part with the two portions of their lime, uniting with sulphuric acid to form sulphate of lime, (plaster of Paris), from which is derived the valuable property of cementing night soil from a liquid into a solid mass. This solidification produces simultaneous deodorization, removing all offensive and foul effluvia, as well as any capability of giving out deleterious gases, and such powers of destruction are transformed into fertilizing endowments. It will thus be seen that cementation lawfully usurps the place hitherto occupied by fermentation and evaporation, and hydrates all the moisture—which, being chiefly urine, possesses manurial value to the last drop—together with the incorporation of the whole of the ammonia, alkaline salts, and other valuable constituents existing in the night soil.

The inventor, Mr. Hughan, has made arrangements with an extensive manufacturer of superphosphates to carry on the process, and great expectations are expressed as to the value of the results to be anticipated. The advantages of working the new patent, in connection with such a manufacture, are: 1. The night soil gives that pasty condition to phosphates essential to the reception and dilution of the acid employed in superphosphate manufacture. 2. The phosphates are increased one fourth in quantity from the alkaline phosphates and phosphoric acid of the soil; thus, if 75 units of phosphate of lime are introduced, 100 are withdrawn. 3. The phosphates receive a new supply of nitrogen equal to from 2 to 4 per cent of ammonia from the soil. 4. The phosphates obtain 5 to 8 per cent of alkaline salts, containing 1 per cent each of magnesia and potash, from the soil. 5. The phosphates receive, in addition, 16 per cent of organic matter intermixed with the urea and uric acid, possessing the latent quality of evolving ammonia to the last atom, and inducing nitrification, as well as the ammonia and nitrates as returned in the analyses. On the other hand, night soil receives from phosphates the following advantages: (*a*) Cementation; (*b*) solidification; (*c*) deodorization; (*d*) portability by rail or sea in the service of agriculture; (*e*) the bringing within the pale of sanitary laws, contributing to health and to municipal revenues. It is even suggested that the present superphosphate manufacture must ultimately pass over into night soil utilization, either voluntarily or by legislative enactment.

A Gigantic Mastodon.

The farm of Mr. Arden Mitchell of Otisville, Orange county, New York, has become suddenly famous by the recent discovery, in a swamp upon the premises, of the entire skeleton of one of the largest mastodons that ever tramped the earth. According to the New York *Times*, the discovery was made by a laborer who had been hired to dig muck.

The man had excavated to the depth of four feet when he came upon an enormous bone, shaped like a rib. He stopped work and informed Mr. Mitchell of his discovery, who, thinking it must have belonged to some monstrous animal, directed that deeper and more extended digging be done. At a depth of fifteen feet, the pelvis, head and other large bones were found. Search has been continued until almost the entire skeleton has been exhumed. It is said to be much larger than the famous remains in the Boston Museum, which were also found in Orange county, and which were the largest known specimen of these extinct mammalia. The upper jaw and main portion of the head of this new marvel weighs about five hundred pounds, and measures three feet seven inches across the top. There are four teeth in the upper jaw, two on each side. The back teeth extend seven inches along the jaw bone, and are four inches across. The openings where the tusks have been are three feet and eight inches deep and eight inches in circumference. The vertebræ was found in forty pieces, but lying all together, while the pelvis was taken out whole and uninjured. The channel where the spinal cords lay when the monster was alive is five inches in circumference. Among the missing bones are the tusks, the lower jaw bone, and those of the hind legs. One bone of a leg that has been found weighs alone over 350 pounds. When the skeleton is reconstructed, it will measure fourteen feet from the bottom of its feet to the top of its head, and over twenty-five feet from head to tail.

A singular incident connected with the skeleton is that in its stomach was found a quantity of undigested matter. Among it were fresh looking and very large leaves, of odd form, and blades of strange grass, of extreme length, varying from an inch to three inches in width, and looking as if freshly cropped from the earth.

Speak nothing but what may benefit others or yourself; avoid trifling conversation.

SOCIETY OF ARTS OF THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

MEETING HELD AT THE INSTITUTE IN BOSTON MARCH 14, 1873.

The President, J. D. Runkle, in the chair.

Mr. S. Dana Hayes read an interesting paper on the history and manufacture of petroleum products. This industry, though less than twenty years old, has become one of great importance in this country, and petroleum and its products take a high rank among our exports.

The crude and refined petroleum exported from the United States in 1871, estimated at a low average value of twenty-five cents per gallon, amounted to nearly $35,000,000.

Mr Joshua Merrill, of the "Downer Kerosene Oil Company" of Boston, has done more perhaps than any one else to bring this new manufacture to its present advanced state.

THE FIRST COAL OIL

manufactured in this country was made by Mr. Atwood in Waltham, Mas[illegible] in 1852. This oil was used for lubricating purposes, and was made in connection with picric acid, benzole, and other products, from coal tar; 175,000 gallons of this oil were made, and it was considered as one of the best lubricating oils of that day. Its odor was very offensive, which, with several other comparatively poor qualities, would render it quite unmerchantable if compared with the neutral hydrocarbon lubricating oils of the present day.

It appears that some of the lighter coal tar products were used for illuminating purposes in this country as early as 1856, and it was found, upon the introduction of the Knapp and Deitz lamps, which were designed for burning resin and other oils, that some of the light hydrocarbons, obtained by Mr. Merrill from Trinidad bitumen, burned readily in them, giving a brighter and more beautiful light than the common animal oil lamps and candles.

The first attempt to produce lubricating oils from the Albert coal of New Brunswick was made in South Boston by Mr. Merrill early in 1857. By the autumn of that year he had six retorts, with a capacity of 1,200 pounds of coal each, in operation, producing 360 gallons of crude oil in twenty-four hours. The number of retorts was soon after increased to fifty, and the establishment then yielded at the rate of 900,000 gallons of crude or 650,000 gallons of refined oil per annum.

It was found that the first products of the distillation were several thin, light colored hydrocarbons which, being unfit for lubricating purposes, were considered valueless; and as considerable loss of material resulted from their production, attempts were made to prevent the decomposition which caused their appearance; but all endeavors in this direction only served to show that any distillation of these hydrocarbons is destructive; and as it was soon after discovered that these lighter hydrocarbons were valuable for illuminating purposes, further attempts were not made to prevent their production.

The lightest product of the distillation of the Albert coal was called "kerosolene;" its specific gravity is only ·634, and boiling point, 85° Fah. It possesses remarkable anæsthetic properties, which have been utilized to some extent.

The production of illuminating oil from

PENNSYLVANIA PETROLEUM

was commenced in 1858, and in 1860 there were fifteen establishments in the United States engaged in this manufacture exclusively. After the introduction of petroleum, the use of Albert coal steadily diminished until 1865, when it was finally abandoned.

By distillation, petroleum breaks up into thin hydrocarbons even more readily than Albert coal, and the process may be so modified that the entire contents of the retort will be converted into illuminating or burning oils. By the present process of distillation, nine distinct commercial products are formed, as follows:

Name.	Spec. Grav.	Boiling Point.
Rhigolene	·625	65° Fah.
Gasolene	·665	120° "
C. Naphtha	·706	180° "
B. Naphtha	·724	220° "
A. Naphtha	·742	300° "
Kerosene oil	·804	350° "
Mineral sperm oil	·847	425° "
Neutral lubricating oil	·883	575° "
Paraffin	·848 (?)	575° "

Mr. Hayes exhibited specimens of these products before the Society.

RHIGOLENE

is the lightest of all known liquids, and it evaporates so rapidly at common temperatures as to reduce the temperature to 19° Fah. below zero in twenty seconds. It corresponds to the kerosolene produced from Albert coal, and, like that, has been used as an anæsthetic in surgical operations; its value for this purpose is due to its rapid evaporation.

The most noticeable characteristic of the heavy lubricating oils produced from Albert coal and petroleum was their offensive odor, and though many experiments were made by various manufacturers, it was not until November, 1867 that any success attended the effort made to produce a neutral odorless lubricating oil. At this time, Mr. Merrill, partly as the result of an accident, succeeded in making a clear, nearly odorless, neutral oil. Subsequent experiments demonstrated that this desirable result was attained by employing a very moderate fire in the distillation, and withdrawing it gradually toward the close of the operation; thus removing all the light odorous hydrocarbons, without decomposition either of the distillate or the heavy oils remaining in the still.

This important discovery was secured by letters patent in this country and Europe, and the demand for these oils is steadily increasing. In 1871, 50,000 gallons were sent to England alone, where it was used for lubricating spindles, oiling wool, etc.

PARAFFIN

is one of the products of the destructive distillation of petroleum, and was made by Mr. Merrill in 1859, and since then he has made 50,000 pounds in a single month. Its principal uses are for making candles, waterproof fabrics, chewing gum, etc.; and a manufacturer of friction matches in New York has used 100,000 pounds in one year.

MINERAL SPERM OIL

is a heavy and perfectly safe illuminating oil, first made by Mr. Merrill while experimenting with paraffin oil in lamps; he produced it by subjecting the heavy paraffin oil to a partially destructive distillation, which, without sensibly increasing its volatility, made it less viscid, so that it would ascend the wicks freely, and still retain its character as a fixed oil.

This oil is comparatively inodorous and will not influence or give off an inflammable vapor at any temperature below 300° Fah.

Mr. Merrill estimates that the present yield of petroleum is sufficient for the production of 100,000 gallons of mineral sperm oil every day—a quantity double that of the whale and sperm oils obtained in the best days of whale fishing.

It costs at present somewhat more than common kerosene, but it burns more slowly and gives as bright a light, so that the actual cost of the light obtained is about the same; a single lamp, burning mineral sperm, costs one half cent per hour. Its perfect combustion requires more oxygen, and a different form of burner, as the Argand or Dual, is necessary; these burners are as cheap and as easily obtained as and others, being made by the same manufacturers.

Referring to the origin of petroleum, Mr. Hayes said the prediction made by the chemist Liebig, many years ago, that he should live to see the sunlight of past ages shining in his house, seems to be now practically realized for the whole civilized world.

That ancient sunlight has come down to us, stored up in the vast deposits of coal and petroleum.

He performed a number of interesting experiments to show the different degrees of inflammability possessed by the different petroleum products, and demonstrated that the ordinary kerosene now in use is but little safer than naphtha.

The mineral sperm was ignited with difficulty; and a burning torch was instantly extinguished, when plunged beneath the surface of this oil, without inflaming it.

A vote of thanks was tendered Mr. Hayes for his interesting communication.

W. O. C.

VALUABLE PHOTOGRAPHIC IMPROVEMENT.

Among recent photographic improvements is the process of Colonel Stuart Wortley, of London, long distinguished as a scientific observer and amateur photographer.

Instead of the usual nitrate of silver bath, Colonel Wortley employs what is known as an emulsion. That is to say, he mixes with the usual collodion a few grains of nitrate of silver and also of nitrate of uranium. These substances give to the collodion a remarkable sensitiveness to light. In taking pictures, the operator simply pours the sensitized collodion upon the glass plate, and then rinses it in water. The plate is then ready for immediate use, or it may be kept, in a dark place of course, and used at convenience. The picture is readily developed by means of pyrogallic acid, ammonia, and bromide of potassium, and the finest pictures are produced with more certainty and much less trouble than by the ordinary process. A trial was recently made in London before a photographic committee, for the purpose of exhibiting the relative merits of the old and the new process, the latter being conducted by Colonel Wortley, and the former by Mr. Gordon, a celebrated photographer. Both parties used the same lenses. Repeated trials upon all sorts of pictures, outdoor views and gallery portraiture, revealed the fact that the new process was the best. It proved to be more sensitive than the wet process, finer pictures with less labor being the result.

Colonel Wortley promises soon to give us the exact formula by which he prepares his plates, when we shall place it before our readers. The process is attracting much attention abroad, and it would seem that the days of the wet bath and its troublesome paraphernalia are nearly ended.

THE HOLTZ ELECTRICAL MACHINE.

On page 380, Vol. XVI. of the SCIENTIFIC AMERICAN, we published an illustrated description of the Holtz electrical machine, the most powerful instrument known for generating frictional electricity. Sparks of unprecedented length are produced by this machine, with very small expenditure of power in operating it.

Mr. E. B. Benjamin, 10 Barclay street, New York, has just imported from Berlin an improved machine of the same kind, the largest yet made. It is destined for the University of Pennsylvania, and is said to be the most powerful electrical machine in the world. It was constructed under the supervision of Mr. Poggendorff, and has all the improvements devised by Holtz, Bokhardt, and other celebrated electricians and physicists.

When adjusted properly and working under favorable conditions, this machine gives a spark eighteen inches in length, with a loud detonation. The effects produced by this elegant specimen of scientific and mechanical skill are highly interesting, and it is a matter of congratulation that such an instrument is to remain in this country. The revolving plate of glass is thirty-four inches in diameter.

SCIENTIFIC AND PRACTICAL INFORMATION.

TREATY BETWEEN CHINA AND JAPAN.

There is at last a prospect that China, the most impenetrably conservative nation in the world, may yield somewhat to external influences, and allow the introduction, into her interior, of the productions of America and Europe. This hope is held out to us by the conclusion of a treaty between China and Japan, arranging the terms of commercial intercourse between the two countries, stipulating the conditions on which certain ports, to be afterwards selected, in each country shall be open to the commerce of the other, and appointing a system of arbitration for the settlement of disputes. In spite of the rigorous conditions under which the English have traded with the Chinese in the five treaty ports, Amoy, Ningpo, Shanghai, Foochow and Hong Kong, much good effect on the prejudices of the Orientals has been made by the traders there, and the opening of some more localities to similar influences, especially to a nation of the same branch of the human family, is likely to widen the beneficial result of that interchanged commerce which has already done so much, and which will in the future do more, for the cause of civilization.

RAMIE.

Our readers have been informed of the advantages to agriculture likely to result from the introduction of this fiber into our country, and many, if not all, will be interested in knowing that its cultivation in California has been entirely successful. Some cloths of great strength and delicacy of texture, possessing a high finish that is not usually seen except on silk goods, were recently exhibited at the California State fair, and attracted much attention. The farmers of the State are very anxiously making enquiries on the subject, and a company has been formed in San Francisco to promote the cultivation, and to give the necessary information to agriculturists. The great strength and fineness of this fiber give it a place among materials for textile manufactures which only silk can rival, and there must be many States in our extensive country in which the cultivation can be successfully carried on.

AN ABSCESS CURED BY INADVERTENCE.

Dr. Du Hadway reports the singular restoration to health of a man afflicted with a psoriatic abscess. The Dr. tried several remedies without success, and at last prescribed two drams iodide of potassium in six ounces distilled water; dose, a tablespoonful three times a day. The patient, a foreigner, misunderstood the directions, and swallowed the whole at once. Strangely enough, the 120 grains iodide of potassium did him no harm; but, on the contrary, his appetite, which had been very poor, was restored, and in ten days the abscess was healed. He needed no further medicine, and is completely restored to health.

WEIGHT OF WROUGHT IRON AND STEEL.

Many of our readers, who send us inquiries as to the weight of wrought iron and steel of different sections will find the following formulæ useful: The weight of a bar of round iron is the square of the diameter in inches × the length in feet × 2·63. The product shows the weight in pounds avoirdupois. The weight of a bar of iron of any section is the area of the cross section in inches × the length in feet × 3·36; and the product also shows the weight in pounds. For round steel bars, change the constant factor from 2·63 to 2·67, and proceed as for round iron bars. For steel bars of other sections, substitute 3·4 for 3·36, the other factors remaining the same as for wrought iron bars.

FRICTION GEARING.

We commence this week a series of able articles upon Friction Gearing, a subject which is of great and increasing mechanical importance. The use of this kind of gearing has proved very economical and satisfactory for many kinds of work, and our readers will receive with interest the theoretical and practical information contained in these contributions. They are from the pen of an able engineer, Mr. E. S. Wicklin, of Black River Falls, Wis., who has had a large experience, in designing and constructing this class of gearing, in the western lumber mills.

WE are indebted to E. Furse, banker, No. 9 Piazza di Spagna, Rome, Italy, for specimens of asbestos wall paper, and plain thick paper for enveloping books, valuable papers, and choice goods. Mr. Furse would like to introduce the article into this country if he can negotiate with reliable parties.

ANTS ON PEACH TREES.—A writer in the Boston *Cultivator* says that in his experience he has been led to look upon the black ant as his best friend in the peach orchard, his only object in traveling up and down the tree being to destroy lice, which frequently cover the young and tender leaves of the peach tree.

A CANDLE TO BURN ALL NIGHT.—When, as in case of sickness, a dull light is wished, or when matches are mislaid, put powdered salt on the candle till it reaches the black part of the wick. In this way a mild and steady light may be kept through the night by a small piece of candle.

TO PRESERVE CLOTHES PINS.—Clothes pins boiled a few moments and quickly dried, once or twice a month, become more flexible and durable. Clothes lines will last longer and keep in better order for wash-day service, if occasionally treated in the same way.

Self-acting Trap for Sewer and Drainage Reservoirs.

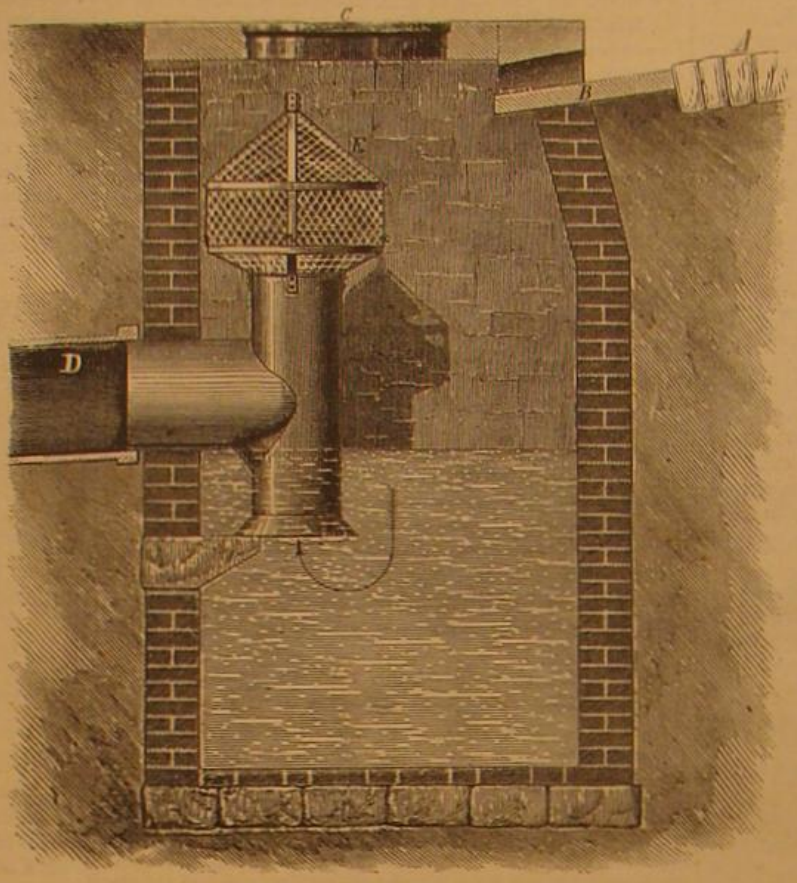
Our engraving is an illustration of a self-closing sewer trap, invented by M. K. Couzens, civil engineer, Yonkers, N. Y., for which a patent was issued, through the Scientific American Patent Agency, January 10, 1871.

The inefficiency of the various traps in use, to prevent the clogging of pipes leading from street receiving basins to sewers, led to this invention, which secures a secondary, self-closing, and higher outlet to the sewer of the drainage waters received, whenever the lower or ordinary one is clogged by sediment.

The body of the trap is of cast iron or other metal, and the horizontal portion that enters the connection pipe is of double capacity or area of section to the vertical part. A float valve of non-corrosive metal is fitted to the trap, and, in its elevation and depression by the rise and fall of waters in the basin, is guided by, or plays upon, a vertical rod, suspended from the metal bucket frame that is attached to the upper part of the trap. A permanent conical hood is seen above the valve to protect the central opening therein. The peculiar shape of the basket frame and its wire covering protect the valve from sticks or blocks that may enter the basin. The compression of air in sewers by freshets has often occasioned damaging explosions, before air escape valves were invented and applied.

This invention incidentally supersedes such valves, entirely accomplishing that object in a more certain and preferable manner. The simplicity and details of the plan will, from the clearness of the illustration, be readily conceived by practical men. A represents the surface of the street, B the drip stone, C the iron cover in the sidewalk, D the connecting pipe with the sewer, and E the basket frame inclosing the float valve and its attachment, as described.

We are told that Strickland Kneass, Esq., Chief Engineer of Philadelphia, and other eminent engineers, who have examined the invention, have recommended its general adoption. For further particulars, address the patentee as above.



SELF-ACTING TRAP FOR SEWER AND DRAINAGE RESERVOIRS.

The Use of Earthquakes.

The usefulness of earthquakes was a favorite subject with the late Sir John Herschel. Were it not for the changes in the earth's crust which are constantly being effected by the action of subterranean forces, of which the earthquake is the most active manifestation, there can be no doubt that the action of the sea beating upon the land, together with the denuding power of rain, would inevitably cover the entire earth with one vast ocean. "Had the primitive world been constructed as it now exists," says Sir John Herschel, "time enough has elapsed, and force enough directed to that end has been in activity, to have long ago destroyed every vestige of land." Mr. Proctor shows most clearly the beneficial manner in which the restorative action of the earth's subterranean forces is arranged. Of course, every upheaval of the surface must be either accompanied or followed by a depression elsewhere. "On a comparison of the various effects, it has been found that the force of upheaval acts (on the whole) more powerfully under continents, while the forces of depression act most powerfully (on the whole) under the bed of the ocean. It seems as if Nature had provided against the inroads of the ocean by seating the earth's upheaving forces just where they are wanted."

KEHOE'S IMPROVED STRIKING BAG.

The name of Kehoe is familiar to every athlete in America. The Indian clubs of his manufacture have long been held to be the best in market. Those of sedentary habits have received much benefit from the use of the apparatus made by him, which consists not only of the clubs and the striking bag herewith illustrated, but of wooden and iron dumb bells, wands, rings, etc., etc.

The latest of these contrivances to secure healthful exercise and muscular development is the striking bag, illustrated herewith and patented March 12, 1872. It is intended to be a substitute for the flimsy and unsatisfactory ones hitherto in use. It is constructed scientifically, with a view to avoid all possible injury to the hand, and yet to enable the full exertion of the muscles of the hands, wrists, arms, shoulders, back, loins, legs, and particularly of the abdomen, to be put forth in the act of striking. It is covered with buff leather, or English buck, and is accompanied with the necessary rope and hook for its suspension. It consists of an inner bag filled with sand, to give the proper weight, which is inclosed in an outer bag containing cork shavings, sponge, or other soft elastic material, and which, surrounding the hard sand bag, prevents any injury to the hands. Gentlemen of sedentary habits will find this exercise particularly beneficial. A few minutes sparring in the morning will quicken the circulation and equalize it for the day, giving a warm and healthy glow to the whole body. These bags may be obtained of Mr. Sim. D. Kehoe, 100 William street, New York.

Structure of the Albuminous Substances.

It has long been known that urea is capable of undergoing transformation into carbonate of ammonia, under the influence of alkalies and water; and I have indeed recently, in these pages, proposed a ready method of estimating urea by the quantity of ammonia which it furnishes on being maintained at a temperature of 150° C. in contact with alkali. If however, instead of being heated with caustic alkali alone, the urea be boiled with strongly alkaline solution of permanganate of potash, it yields no ammonia, but undergoes oxidation to the state of nitrogen gas, or nitric acid, according to circumstances. No other substance is known which gives up all its nitrogen in the form of ammonia when acted on by alkali, and gives no ammonia on treatment with alkaline permanganate of potash.

In investigating the albuminous substances, I have observed the following facts: If casein be heated to 150° C. with alkali, it yields about 3 per cent of ammonia; and if the residue be afterwards boiled with permanganate, some 7 per cent of ammonia is then obtained. Now, if casein be at once boiled with permanganate of potash, it yields only 7 per cent of ammonia.

Albumen, if heated with potash to 150° C., gives 3 per cent of ammonia, and on subsequent boiling with permanganate, about 12 per cent of ammonia. If it be at once boiled with permanganate, it yields only 12 per cent of ammonia.

Creatine (which contains urea conjugated with sarcosine) behaves in a parallel manner. The two thirds of its nitrogen, existing in the condition of urea, are evolvable as ammonia by proper treatment with alkali, but only the other one third of its nitrogen is evolvable as ammonia by the action of permanganate of potash.

The structure of creatine is known; but the structure of casein and albumen is unknown. Let a similar explanation be applied to casein and albumen as to creatine. In casein, about one sixth of its total nitrogen exists in the form of urea, being transformable into ammonia by alkalies, and oxidisable to nitrogen or nitric acid by permanganate of potash.

In albumen, too, about one sixth of the entire nitrogen exists as urea.

On extending my experiments to gelatin, I was much interested in observing that no ammonia is evolved when that substance is heated with alkali to 150° C., but that abundance of ammonia—some 9 per cent—is formed by the action of the permanganate. Gelatin, therefore, *differs totally from* the protein substances—it contains no conjugate urea.—*J A. Wanklyn, in Mechanics' Magazine.*

Photo-Intensifying Process.

A new process, by M. Merget, is as follows:

The negative, no matter how feeble, provided all the details are indicated, is fixed with hyposulphite of soda, and washed thoroughly; a solution, more or less strong as the case may require, of corrosive sublimate ("mercuric chloride," as it is now called) is then poured over it. This at first blackens and then whitens the image. If but little intensification be required, the solution should be very weak, and it should be washed off as soon as the negative has been blackened by it, and before the white stage is reached: but if the negative be very feeble, the solution should be strong, and should be left upon the film until the whitening process has reached its maximum effect. The film is then to be thoroughly washed, and the image is to be blackened by pouring over it a solution of pyrogallic acid—strength, three grains to the ounce of water—to which has been added an alkali in sufficient quantity to impart to the mixture its maximum of reducing power. The alkali may be either potass or soda, caustic or carbonated, or it may be ammonia; in fact, the old discolored alkaline developer, strengthened with a little more ammonia or carbonate of soda, will answer the purpose, although a fresh solution is better. The application of this alkaline pyrogallol (as pyrogallic acid is now called) immediately blackens the negative and intensifies it to the required degree—that degree depending upon the extent to which the previous action of the mercuric chloride has been carried. The negative is now to be well washed, dried, and varnished in the usual way

New Type Foundery.

We learn, by a letter which we have seen from London, that the advertising agents, G. P. Rowell & Co., and S. M. Pettengill & Co., of New York, have been offered one of the large type foundries of London at a great sacrifice, and the writer proposes that the whole machinery and equipment shall be removed to New York, and put up and operated.—*Milwaukee paper.*

CURRIER'S TEA AND COFFEE POT STAND.

Our engraving illustrates a new and ornamental tea and coffee pot stand, patented November 14, 1871, by Thomas D. Currier, of Waldoborough, Me. The pedestal may be formed in any desired style to suit the taste. From it arise two standards, as shown, to the tops of which is connected a bail or handle for convenience in carrying.

The pot is supported in a ring which is pivoted to the standards in such a way that it hangs perpendicularly when not tilted. From one of the pivots projects, upward and forward, a handle, as shown, by which the pot is turned so as to deliver its contents from the spout.

By these means, the pot may be carried and used without burning the hands, so that the advantages of the coffee urn are secured without the expense of a faucet, the latter being likely to get out of repair and difficult to clean.

From the ring, which supports the pot, descends an arm or brace, which engages the bottom of the pot, as shown, and assists in supporting the vessel. In the pedestal is deftly concealed a call bell, which is operated by the knob shown at the front. The whole is susceptible of tasteful ornamentation, and the device is fast winning popular favor. Address the patentee, as above, for rights to manufacture, etc.

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Contents:

(Illustrated articles are marked with an asterisk.)

AFRICAN DIAMONDS---AN INVENTION WANTED.

Mr. J. L. Babe, of 3217 Sansom street, Philadelphia, Pa., has lately returned from the diamond regions of South Africa, and during a recent call at our office gave us a variety of interesting particulars concerning the localities and methods of searching for the precious gems. More than thirty thousand persons are now engaged in this novel business, and thousands of diamonds are constantly being found, many of large size and great value. Mr. Bale brought with him several hundreds of the diamonds, one of which, a fine large one, is valued at not less than $120,000. In its natural state, the African diamond is smooth and polished, and when set without cutting is quite ornamental; but its beauty is, of course, greatly enhanced by cutting in the usual manner.

The new diamond fields of Africa are at the present moment the focus of attraction for adventurers from all parts of the world. From this country and Europe the intending diamond searcher steers for Cape Town, a large and flourishing British colony at the extreme southern point of Africa, the Cape of Good Hope. Here, by steamer, he coasts up the eastern shore of the continent for 500 miles, over the waters of the Indian ocean, to the British city of Port Natal; thence on foot, or in ox carts, overland north westerly, through African wilds for some 400 miles, to the Vaal river. This locality is almost midway between the Atlantic and Indian oceans, where the Vaal river empties into the Orange river, and the latter into the Atlantic ocean. This is the present South African diamond region.

The diamonds are found in a certain species of cement-like earth, whitish in color, which, under the blow of a wooden mallet, is readily reduced to powder. This earth is of peculiar formation, and its constituents have not yet been fully determined. It occurs in pockets, of considerable depth and of about an acre in superficial area, which pockets are scattered about, at little distances apart, over the region we allude to. The pockets are walled in by slaty rocks, which rise to or nearly to the surface of the ground. The indications are that these cavities or pockets in the rocks have been filled by the oozing up from below of this cement The diamonds are found in the cement, which is mined by picks and crow bars, and the following is the general operation:

The pockets are staked off into "claims," a claim consisting of a plot of ground thirty feet square, and for which the operator pays the proprietor from two hundred to eight hundred dollars. The mining is carried down vertically as far as paying earth is found, a narrow wall being left standing between each claim. Some of the pits have now reached a depth of 70 feet. The mining is chiefly done by the native blacks, the earth being raised in buckets to the surface, and carried to a sorting table. Here the cement is pulverized by hand, by means of wooden mallets, care being taken not to strike so hard as to injure the diamond. The pulverized cement is then spread out upon a table in a thin layer, and the anxious eyes of the searcher carefully scan the particles. Good eyes are in demand. Fortunate is he who after days of hard work finds at last one or two of the bright little stones to reward his labors.

The work of crushing and separating is, as we have stated, all done by hand. An invention is greatly needed by which the crushing, at least, may be done by mechanism. Mr. Babe thinks that a machine turned by a couple of men, or by mule power, would be the best. It must have a crushing power sufficient to break up chunks of the earth, and pulverize them to particles of not less than one thirty second of an inch in size. It must also effect the crushing without injury to the diamonds contained in the cement. The natural adhesiveness of the cement is rather more than that of common dried mortar. Here is a problem for the ingenious to work out.

Another problem is to construct a diamond separating machine that shall be reliable and require no water. The present diamond fields are dry diggins, the river diggins having been exhausted.

It is said that these diggins were accidentally discovered by the observance of some protruding diamonds in the plastered walls of a small farmhouse, the cement having been used in making the mortar. This building still stands, says Mr. Babe, an object of veneration and interest to all diamond hunters.

SMALL POX---ITS PREVENTION---THE TREATMENT OF PATIENTS WITH REFERENCE TO THE PROTECTION OF THE PUBLIC.

We shall take as a basis for our remarks upon this subject the following well established facts:

First, since small pox has been known to mankind, there has not been one instance where, introduced into the borders of any country, it has been thereafter wholly annihilated.

Second, the utmost that has been accomplished toward extinguishing the disease has been to render communities proof against its becoming epidemic.

Third, this has been accomplished through the two agencies of vaccination and the isolation of those who have contracted the disease.

Fourth, that the disease, once contracted, will run its course till, by its self limited character, the patient either dies or recovers.

It has been claimed that vaccination, repeated at intervals of about seven years, is an absolute preventive of small pox, even of the lighter form of the complaint called varioloid. This we do not believe, since we have known at least one case of fatal result from small pox where repeated attempts at prevention had failed, the patient being apparently unable to contract the vaccine disease. But admitting that vaccination may sometimes fail, when persistently attempted, the cases in which it fails are so rare that they are not worth mentioning as an argument against the value of revaccination. The fact remains that, probably, not one out of a million persons, who intelligently practice revaccination, will ever have small pox. Clearly, then, if revaccination was universally practiced, this one means might be considered as ample protection to the public.

But we have proof, in the almost epidemic character this disease has assumed, that vaccination is neglected by a large portion of our population. It is, therefore, thought necessary to supplement its protective effect upon the public by the isolation of those so unfortunate as to contract small pox, and laws are enacted empowering health boards and officers to remove—forcibly if need be—these sufferers from home and friends, to indiscriminately thrust them into pest houses, where those accustomed to kind care and pleasant homes must feel the depressing influences of foul air, filth, the sight and smell of all that is loathsome, and receive only the cold care of paid nurses, whose gratification is scarcely concealed at the death of a patient and the consequent lessening of their burdens. Now, on the principle that whatever is necessary to protect society is justifiable, and on no other, this course may be justified. The patient who has lead a cleanly life, who has tried to protect himself and society from small pox by vaccination, yet still has taken the disease, must feel that such treatment is a social crime. He reasons: "I have done my duty to the public, have taken every possible precaution. Those who have not done their duty now stand in fear of me, and shut me in this lazar house. It is they who are the criminals, not I. Is it right to punish one innocent for the protection of many guilty? No." There can be but one answer to such a question.

How can we avoid such injustice then? At present the law has no power to discriminate, because there are no adequate means for making discrimination. People are born, move about where they like, live where they please, sometimes change their names, and finally die unknown to and untraced by any public authority. They are earnestly requested to conform to sanitary laws, but rarely compelled to do so. When they have conformed, they have nothing to certify that they have done it. No record is kept either of compliance or non-compliance. An imperfect scar received in any way may be taken for the vaccine cicatrix, and a person may claim to be protected by vaccine disease who never had it. Others who are protected may be thought to have neglected it, and so there is no means whatever, in any locality, of determining its degree of immunity from small pox.

The State Board of Health of Massachusetts, in their late able report, lament that the law of that State does not empower them to isolate small pox patients, and ask that this disability may be removed, leaving it to the judgment of health officers whether such isolation is necessary to public protection or not. We do not quarrel with isolation in and of itself. We believe in it. Small pox patients should be isolated. Their houses should be closed to visitors and warning signals placed upon them; but in the large majority of cases, occurring among those residing out of tenement houses, this is enough. We do not think isolation in pest houses would ever be needed were vaccination compelled by law, and a proper system of registration adopted. Nevertheless, as aid to the easy enforcement of such a law, we would make every patient who cannot show certificates of vaccination, performed once in seven years, liable to isolation in a pest house, and only these, with the exception of those living in houses containing more than one family, hotels, barracks, etc. Such of these latter as can show the proper certificates and can provide for private isolation by procuring a proper tenement where their cases can be treated like those occurring in private families, should be allowed to do so.

A great deal of hardship might thus be prevented, while in our opinion the total risk to the public, and the death rate among cases which occur, would be greatly lessened.

We should, moreover, be correcting an injustice and relieving the responsibility of physicians, who are frequently mulcted by fines for non-compliance with the imperative law of Health Boards which requires the reporting of every case coming to the physician's knowledge.

A REMARKABLE TELEGRAPHIC IMPROVEMENT.

The Western Union Telegraph Company has acquired the exclusive ownership of the patents of 1868 of Joseph B. Stearns, of Boston, Mass, for instruments by which telegraph messages are transmitted in opposite directions, by the use of a single wire. This improvement is one of the most important that has been made in connection with telegraphy since the introduction of Henry's inventions by Professor Morse.

Many of the Stearns instruments are now in use, and the Western Union Company is introducing them upon its lines as fast as they can be manufactured. The importance of the invention will be understood when we state that *it practically doubles the transmitting capacity of every telegraph wire owned by the Company.*

Let none of our readers suppose that the chimera of "sending two currents in opposite directions on the same wire" has been realized in this invention. Not that, but its practical equivalent is realized, to wit: Two messages are transmitted simultaneously in opposite directions by means of one wire while the electrical current is always moving in one circuit, in the usual manner. By ingenious arrangement of instruments at the two ends of a line, say between New York and Boston, the operator at New York is enabled to transmit a message to Boston while the operator in Boston is at the same instant transmitting a message to New York, one set of signals being transmitted by that portion of the current which passes over the wire, the other set of signals being transmitted by that portion of the current which returns through the earth. We shall, on a future occasion probably, illustrate and fully describe this marvel in telegraphy.

The actual money value, of this remarkable invention, the Western Union Telegraph Company is estimated, to-day at a quarter of a million of dollars; and each year, as business increases, its value must augment.

We ought to add that Mr. Stearns, the inventor, is one of the best of living electricians, and his discovery is the simple result of profound and exact study of the laws of electricity. As a man of genius, who has conferred lasting benefits upon his fellow men, Mr. Stearns is entitled to the highest respect.

EPIDEMICS OF DISEASE, DISASTER, AND CRIME.

It would almost seem that the old saw "It never rains but it pours" was meant specially to apply to the calamities of the human race, and that accidents and crimes are epidemic as well as disease. To a certain extent this is assuredly true. Diseases become epidemic when a particular combination of conditions favorable to their rapid spread are established in an infected district. So when the moral atmosphere becomes tainted, when judges and legislatures are bought up by rings, when gambling houses, rum shops, and brothels are numerous; when news stands teem with corrupting literature, the conditions are established for an epidemic of crime. When legislatures are thus corrupt, and valuable franchises are granted to grasping corporations, permitting them to monopolize avenues of travel without any proper guarantees that the safety and convenience of the public will be considered, when inspectors can be tampered with and induced to report as safe what is unsafe, when in the haste to make money the people of young cities build block after block of inflammable materials, when tenant houses are put up in the most shabby manner and with shameless disregard to everything except the anticipated and exaggerated rents to be extorted from their unfortunate occupants, the conditions are well established for an epidemic of disaster.

The philosopher studying the conditions of epidemics can easily trace at least one fundamental condition common to them all, namely, moral infection. It is this corrupting influence that leads to neglect of duty on the part of officials who are paid to establish, so far as man can control them, the conditions of health. Thus we have streets and slums in our large cities reeking with filth, and foul with noxious fumes. Thus we see buildings little better than traps for human beings, erected under the very eye of those appointed by law to correct such evils. From moral laxity follows the judicial laxity that allows those justly accused of crime to escape conviction, and convicted felons to escape punishment. What wonder, then that in this era of social corruption the three epidemics have simultaneously come upon us?

The kerosene explosions, boiler explosions, explosions of fireworks, falling of buildings, disasters on railways, the burning of cities and vast tracts of most valuable timber, small pox raging in our midst and extending itself through out the land, the murders and the long list of minor crimes that have passed into the history of the last twelve months—what a terrible, soul-appalling list would they make, were we to blacken our pages with their enumeration!

But we see the signs of a healthful and hopeful reaction. The patience of a long suffering public is exhausted. There is an under current of public opinion setting in that will soon render it dangerous for criminals to practice their offences against society, or public servants to shirk their

plain duties. Already this effect is indicated in the decisions of courts, in the altered tone of public offenders, and the general feeling that better times are at hand.

Let us, from the painful recollections of the era of epidemics out of which we hope soon to emerge, learn permanently the lesson that there is no safety in a society where morals are generally corrupted.

THE PRESENT STATUS OF ORGANIC CHEMISTRY.

The different compounds belonging to the vegetable and animal kingdoms, as well as those which, by chemical operations, may be obtained from the same, possess certain peculiarities which distinguish them, in many respects, from the compounds belonging to the mineral kingdom. Some years ago, the opinion prevailed that the cause of this difference was to be found in the fact that they were formed by so called vital forces; it was assumed that there is an essential difference between inorganic and organic compounds, and chemistry was therefore divided into inorganic and organic chemistry. It was found that, while, in regard to mineral compounds, the synthesis is just as easy as the analysis (that is, it is as easy to make them as to decompose them into their elements), in regard to organic compounds, on the contrary, their synthesis (formation out of their elements) was surrounded with difficulties which appeared for a long time so insurmountable that the hypothesis was adopted that the elementary substances followed other laws in living nature than they did in dead; and that it was only possible to change the products of living organisms into inorganic elements, but that it was utterly impossible to do the reverse, that is, to make an organic compound out of its inorganic elements.

The modern development of chemistry has, however, demonstrated that this view is totally erroneous; a more intimate knowledge of the organic substances has revealed methods to manufacture chemically those substances thus far only obtained by the intervention of organic life.

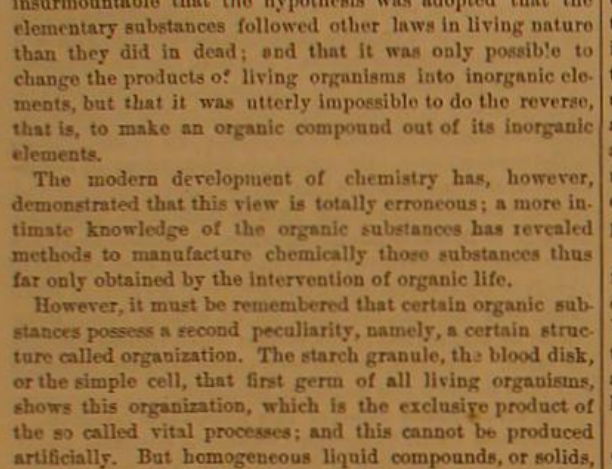
However, it must be remembered that certain organic substances possess a second peculiarity, namely, a certain structure called organization. The starch granule, the blood disk, or the simple cell, that first germ of all living organisms, shows this organization, which is the exclusive product of the so called vital processes; and this cannot be produced artificially. But homogeneous liquid compounds, or solids, either amorphous or crystalline, all thus far exclusively derived from organic sources, have now been made, by simple synthesis in the laboratory, in such enormous numbers that there is no more any doubt but that the rest of them will soon be made in a similar manner.

We have come, therefore, to the conviction that the same chemical laws prevail in living as in lifeless nature; and that the peculiar properties which characterize the compounds built up by living organisms are not owing to their organized origin, *but simply to the fact that they are carbon compounds* and that therefore the cause of those peculiar properties has to be sought in *the chemical nature of carbon itself*. And this is easily ascertained when we compare the chemical properties of carbon with those of the other elements. That there is a peculiar power in the carbon itself, was already recognized several years ago, when, by the most prominent chemists, carbon was designated as *the great organizer*.

In order to understand this peculiar property of carbon, we must first explain what is meant by the modern term "atomicity."

Without deciding the reality of the existence of the indivisible so called atoms, we need only accept the chemical fact that different elementary substances combine in definite proportions by weight; and that if there are atoms, and we suppose that they combine, atom with atom, the definite proportions referred to could be best accounted for by assuming that these atoms possess, for each elementary substance, a definite weight. Therefore, the name "atomic weight," if objected to by reason of the hypothetical basis on which it is founded, may be exchanged for "chemical equivalent," or "combining equivalent," and the word "atomicity" for "quantivalence."

Among all elementary bodies, hydrogen is distinguished by the simplicity of its combinations; and the latter are therefore adopted as types of all other compounds, which are simply formed by the substitution of the atom of another element for an atom of hydrogen. Hydrogen alone, pure, consists of a double atom, for one of which only the other substance may be substituted:



The elements of the first group contain one atom of hydrogen combined with one atom of another substance. Therefore, chlorine, fluorine, bromine, and iodine, are called monatomic or univalent. In the second group, two atoms of hydrogen are combined with oxygen, sulphur, selenium or tellurium; the latter are therefore called diatomic or bivalent. In the third group, nitrogen, phosphorus, arsenic and antimony are each combined with three atoms of hydrogen; they are triatomic or trivalent; while, in the last group, carbon is combined with four atoms; it is, therefore, called tetratomic or quadrivalent.

Monatomic elements form among themselves but few and simple compounds, while polyatomic elements form different combinations. Chlorine forms but one compound with hydrogen, and the chemical affinities are satisfied; but when an atom of oxygen is combined with only one of hydrogen, one equivalent is unsatisfied, and this may be filled up by hydrogen, and form water, or by chlorine, and form hypochlorous acid, or again with oxygen; when again one affinity of oxygen will be unsatisfied, which can only be closed up by another atom of hydrogen.

Water = H — O — H
Deutoxide of Hydrogen = H — O — O — H.

This latter graphic representation is coming into great favor to represent the manner in which the atomicity of the elements is satisfied. The univalent hydrogen is only attached to one element, while the bivalent oxygen is attached to two.

The polyatomic elements have also the property of combining with themselves. It is very characteristic of the tetratomic carbon that the capacity in its atoms to satisfy its own affinities by combining with itself is developed in the highest degree. Therefore, a great number of carbon atoms may combine to a single group, and behave like a chemical unit. To this property a second one must be added, which makes it distinct from all other elements, namely: all free affinities of such an atom group of carbon can be satisfied by hydrogen. Therefore, most carbon compounds contain also hydrogen.

That part of chemistry ordinarily called organic is therefore now named *the chemistry of the carbon compounds and its derivations*. Their number is indeed something startling. Weltsien published in Brunswick, Germany, in 1860, a systematic review of the same, and described more than 3,000, and since that time we have become acquainted with several hundred more.

We ought here to remind our readers that, in the modern chemical theory on which the above speculations are based, hydrogen = 1 is considered as a double atom, and is written $\frac{H}{H}$, so that H becomes in fact = ½, or, what is the same, by taking H = 1, we have C = 12, O = 16, S = 32; also, Se and Te are doubled. Many other elements remain as they are. Not only does this theory agree better with the views of organic compounds explained above, but there are two other satisfactory reasons why the new numbers should be adopted. To these we may recur later.

IF a person "faints," place him on his back and let him alone; he wants arterial blood to the head; and it is easier for the heart to throw it there in a horizontal line than perpendicularly.

Examples for the Ladies.

Mrs. C. D. Goodman, Cleveland, Ohio, has used her Wheeler & Wilson Machine 4½ years with the same No. 2 needle that came in it without breaking or blunting it.

Mrs. J. R. Bowen, Wellsboro, Pa., has used her Wheeler & Wilson Machine almost constantly since 1859 on all kinds of material, without any repairs or personal instruction.

Mrs. Mary Hacher, Muscatine, Iowa, has used her Wheeler & Wilson Machine since September, 1857, and earned from $10 to $20 a week, making dresses and cloaks, from the finest to the heaviest, and her machine is now in as good order as when she bought it.

Business and Personal.

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

Notes & Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.]

1.—DYEING QUESTIONS.—Will some reader of the SCIENTIFIC AMERICAN inform me how to dye a bright Prussian blue, also a dark green, and a solferino on raw cotton?—W. H.

2.—ADHESION OF RUBBER BELTS TO PULLEYS.—What is the best preparation for moistening heavy rubber belts, put to heavy strains as in saw mills, etc., to make them adhere to the pulleys, and preventing slipping, at the same time not injuring the belt or gruming the pulleys?—O. E. S.

3.—POTATO STARCH.—What percentage of starch can be obtained from the potato; and what machinery is required for its manufacture?—X. Y. Z.

4.—FORCING CEMENT INTO FISSURES.—What is the best means to force cement (hydraulic) into a wall or cavity extending upward higher than the point of injection, as into the roof of a dam built across an adit in mines, so as to make a water tight job?—T. S. M.

5.—RELATIVE STRENGTH OF IRON AND WOOD.—Can any one tell me of what thickness of plate a hollow iron spar would require to be built—of say 20 inches diameter—to equal in strength a first rate pine spar of the same diameter, supporing them each to be 60 feet in length? Also, whether there would require to be any angle or T iron up the inside of it? Or would the boiler plate alone be sufficient?—H. A. C.

6.—VACUUM IN CASKS AND MINES.—Upon what principle of physics is it that, when the faucet of a liquor cask is opened without any vent above having been provided, the air, by jerks, seeks to enter in? Is the answer be that it mounts to fill the empty place which the liquor, by jerks, leaves in descending, the question is why that liquor does not stay up steadily, being so far within the limit of thirty feet in hight? Again, is it, or is it not, a cognate phenomenon, that a current of air is set agoing in a deep mine, along a gallery having communication with the upper air only by a single orifice through a partial partition wall along the middle of such gallery, partial because, stopping short at the farther end, or breast, it so gives room for a round of motion of the air? It is frequently resorted to, in the mining region, as a means of ventilating the deep mines. The questions are: In the first case, if the weight of atmosphere was sufficient to counterbalance hydrostatic pressure of liquor in the cask, why did it not do it? Secondly, in the case of the mine, since the heavier air was already at the bottom, why did it not stay there?—J. A. P.

7.—VARNISH FOR VIOLIN.—Will some of your readers tell me how I can prepare varnish for a violin? I have been told that there must be no oil about it. How can I stain the violin a darker color than the natural wood?—J. D.

8.—POISON FOR WOLVES.—Will some of your correspondents inform me of a quick and deadly poison for wolves, other than strychnia crystals, which they are too sharp to eat?—S. C.

9.—DRIVING ELEVATOR.—I wish to use a long elevator where I cannot get power to the upper pulley conveniently. Will driving the lower pulley make it work? The ascending side will need to carry a load of about two hundred pounds.—C. W. W.

10.—GOLD SOLUTION AND BRONZING.—Will some of your readers please inform me how I can make a gold solution for gilding to be used by boiling, without a battery? And how can I do antique bronzing with a green shade?—F. M.

11.—PREPARATION OF INDIGO.—What amount of sulphuric acid is required to dissolve one pound of indigo? What is the best substance to use for neutralizing the acid, and how much is necessary for that purpose? What kind of a vessel is to be used for the process?—D. C.

12.—BOILER QUESTIONS.—Is there any cheaper or simpler method of feeding boilers, from a tank a little above the water line in boiler, than with a steam pump? What is the best way of bringing the flame down the outside of an upright tubular boiler to increase its steam making capacity?—C. S. B.

13.—SALT IN THE EARTH.—During our late war, the men would occasionally get a piece of fresh meat to eat, and, when out of salt to season it, they dug the soil from under old houses and, leaching the water through it, cooked the meat in it. The latter would be found to be agreeably salted. How do you explain the presence of salt in the soil? There were no cellars under the houses. It was only necessary to procure the dirt where it was protected from the sun.—C. E. W.

14.—TENSION OF BELTS.—My plan for driving burrs from an upright shaft is condemned on account of the pulleys being too close. They are 6 feet between centers, and are respectively 2 feet and 3 feet in diameter. It is reasoned that a short belt requires a greater tension—which therefore is harder on the belt and spindle,—and will not transmit the same power. I contend there is no difference under like conditions, if tightener pulleys are used in each case, and the belts present the same surface to the pulleys. The tension may be given by tighteners or by the weight of the belt; they would be just the same, and transmit the same amount of power, and be no harder on the spindle. If I am wrong, why?—T. S. L.

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at 1 W a line, under the head of "Business and Personal.

ALL reference to back numbers must be by volume and page.

D. M., of Mich.—We think the specimen sent is what is called chrome iron, made from the ore known as spiegeleisen.

C. A., of Mass.—A body floating in a stream moves with the mean velocity of that part of the section of the current occupied by the submerged portion.

W. B. W., of Mo.—Judging from your description, your boiler furnace is all right. What is meant by furnaces out of shape, in boiler reports, is that such furnaces as are made of iron, in the boiler and forming a part thereof, are distorted.

W. H. W., of Conn.—You can use the differential screw for the purpose named; will publish your other query.

G. N. L., of —.—Your theory of vibrating flames is corroborated by modern research. Consult Tyndall's Lectures on Sound.

E. A. L., of —.—Water has been proved to be more compressible than some solids. Its density increasing, therefore, as the depth increases, there is a theoretical depth at which water would become as dense as, say, iron, and at which, therefore, iron would cease to sink. Practically, however, it is probable that there is no depth in the ocean to which any known solid that sinks at the surface will not descend. This answers your other queries.

T. B., of N. J.—Your plan for balloon propulsion by inclined floats is old; it has been tried and found wanting.

CHAPPED HANDS, ETC.—For these, or chapped lips, or chafed skin in any part of the body, no application is so good as glycerin, rubbed in twice a day. Two applications will generally cure any case of the sort.—B. T., of —.

MELTING ASPHALTUM.—Query No. 1, March 23, 1872.—The best solvent for asphaltum is oil of turpentine. Put in the mineral, and heat till it is dissolved. As the vapor of turpentine is dangerously inflammable, a water bath is the best vessel for the purpose.—D. B., of N. J.

LAKE DWELLINGS.—Query No. 11, March 23, 1872.—Sir Charles Lyell's work "The Antiquity of Man" contains all the information on this subject which has hitherto been obtained.—D. B., of N. J.

ANTS.—In answer to No. 20, page 169: Sprinkle lime on the places the ants frequent. If on shelves, spread paper over them. I think also that moles will not work among it.—H. C. M., of Pa.

FRUIT JELLIES.—M., No. 27, page 169, is exercised about fruit jellies. He will doubtless be surprised to learn that they are called "fruit jellies" because not a particle of fruit is used in making them. They are simply gelatin dissolved in water, colored, and flavored with the so-called flavoring extracts.—Alex., of —.

MOLES.—T. M. G. had better keep his moles till the wire and other worms in the soil are killed off by these useful animals. Moles would not be in his garden were there not pernicious worms, bugs, etc. to feed them. The moles won't touch his vegetables, but they are great on small deer like worms. As regards the ants, let T. M. G. get some quicklime and grind it fine; sift plenty of it on the ground where these insects make their holes. The lime should be fresh, so as not to have lost any causticity by slaking.—Alex., of —.

STOPPING CRACKS IN IRON.—If H. P. S., query 20, Feb. 24, will take some litharge and common glycerin, and make a paste or cement, he will be able to stop the leakage.—C. W. D., of Wis.

FRUIT JELLIES.—Query 27, page 169.—To M. Fruit jellies, so called, are made by putting half an ounce of alum in one pint of water; let it boil a minute, or till dissolved, then add four pounds white sugar; boil two minutes longer and strain; when cool, add half a two shilling bottle of vanilla, lemon, or strawberry extract or other flavor.—Mrs. K., of —.

TRANSFERRING TO GLASS.—Query 17, page 169.—K. W. can transfer engravings to wood or glass by first coating the wood or glass with copal varnish, then press on the picture, face downwards, smoothly and tightly; let it dry. Then damp the paper slightly, and rub it off with the finger, leaving the picture to be looked at through the glass, or, if on wood, to be varnished.—Mrs. K., of —.

CEMENTING EMERY TO WOOD.—To J. J. T., query 28, page 169. The following cement is wonderfully tough, as I have good reason to know: Melt together equal parts of shellac, white resin, and carbolic acid in crystals; add the last after the others are melted. The effect of the carbolic acid is surprising.—E. H. H., of Mass.

GINGER BEER.—Query 14, page 122.—To F. L. C. Take white sugar, 5 pounds, lemon juice, 1 gill, honey, ¼ pound, bruised ginger, 5 ounces, water, 4½ gallons. Boil the ginger 30 minutes in three quarts of the water; when cold, put in the other ingredients and strain; add the white of an egg well beaten with a teaspoonful of lemon essence. In four days bottle; it will keep longer with the honey than with yeast.—Mrs. K., of —.

CLEANSING HAIR BRUSHES.—Query 25, page 169.—To F. C. To cleanse a hair brush, take a basin of cold suds, add a spoonful of spirits of ammonia, put in the brush, and draw a coarse comb through the bristles as many times as necessary; a cloth too may be used to help the cleansing. Finally rinse in clear water.—Mrs. K., of —.

TANNING RABBIT SKINS, ETC.—Query 4, page 169.—To L. H. T. A simple way to tan skins is, first, to wash them in cold suds; then dissolve pulverized saltpeter and alum in hot water, add cold water, and soak the skins in it all night; then hang them over a pole to drain; when nearly dry, sprinkle with powdered saltpeter and alum; fold the flesh sides together, lay them where they will not freeze, turn every day till dry, then scrape the flesh side with a blunt knife and rub with pumice stone and the hands.—Mrs. K., of —.

PAINTING SHEET IRON.—Query 18, March 16.—Let J. C. try asphaltum varnish on his sheet iron smoke stack.—V. S. V., of O.

TO DESTROY ANTS.—Take of flowers of brimstone, half a pound and potash, four ounces. Set in an earthen pan over the fire till dissolved and united; then pulverize and make, with water, a strong solution and sprinkle where the ants frequent.—F.

IGNITION OF STEEL FILINGS.—A. M., of Oregon.—The fact you mention is a familiar and convincing illustration of the nature of combustion. Steel in a mass is a very incombustible substance, but, reduced to a fine powder and sprinkled so as to allow a large proportion of the oxygen of atmospheric air to each granule, it burns readily. The experiment is a good illustration of the increase of chemical action secured by pulverizing materials.

EYE STONE.—A friend gave me an eye stone, and said it was a common article in the drug market, and used for removing dust, etc., from the eye. It looks on one side like a bivalve shell, but is plane on the other side. Is there such a thing known in the market? F. M. E., of Mo.—Answer: Yes. It is taken from the head of a fresh water crab.

COLORING SHELLS.—Query 3, March 16.—Dissolve a little lac dye in a solution of chloride of tin; and having made the shells thoroughly clean, dip them in this preparation until they are of the desired color. The dye should be allowed to stand (first after boiling) to allow of any settlement.—E. H. H., of Mass.

RAILROAD ACCIDENTS.—P. B. P., of Pa.—The device you send is not new, and the very great expense attending its use has prevented its general adoption.

ANTS AND MOLES.—T. M. G. should drop one or two castor oil beans in their holes, and he will then get rid of them.—K., of Md.

ELASTIC CEMENT.—W. M. S., query 10, March 16, can mend his gas bag by putting on a patch with a solution of rubber in bisulphide of carbon.—D. G. P., of Ill.

PAINTING IRON BATH TUB.—If C. A. H., query 15, March 16, will mix his paint to a proper consistency with best coachmaker's japan varnish, it will give him satisfaction. For white lead paint, use half turpentine and half coachmaker's japan. It will not darken much. Venetian red is best for a first coat, for any color but white.—P. D. W., of —.

O. E., of La.—We hardly think there would be danger of explosion from pulverizing chlorate of potash on clear white paper by rolling it with a bottle. Should there be, however, a small fragment of camphor, sulphur, phosphorus, resin, etc., upon the paper or bottle, you might produce an explosion. Violent friction will sometimes explode chlorate of potash, without the contact of other combustible materials. In such cases the explosion is not very dangerous, however, a small part only exploding, while the remainder deflagrates and decomposes more gradually. We should prefer a mortar and pestle, taking care not to use the pestle violently.

FLUID AND LIQUID.—Query 2, March 16.—To H. W. H. The words fluid and liquid are often used synonymously. Water is both fluid and liquid, but oxygen is fluid but not liquid. Both terms apply to those substances whose parts change their relative positions upon the slightest pressure.—D. G. P., of Ill.

BRASS COLORED PAINT.—O. W. V., query 9, March 16, will will find copper bronze varnish as near to a brass colored paint as anything he can get.—D. G. P., of Ill.

PIN SPOTS IN STEEL.—Let H. M. H., query 23, page 185, get a small iron box with a sliding top to it, fill it with pulverized charcoal, and imbed his pieces of steel in it, put in the top, and lute with fire clay. Heat it in a slow fire to a red heat, then take out and let it cool off.—J. H., of Md.

GAS IN WELLS.—Being much troubled some time ago with a foul well, down which it was necessary to send men to repair a pump, all other remedies having failed, I found the following treatment a perfect success: Having attached one end of a common hydrant hose to a steam boiler, I ran the other nearly down to the water, and blew the well full of steam. It soon condensed, with the aid of a little water sprinkled down, and having displaced (or perhaps absorbed) the carbonic acid, the air was perfectly purified. In the absence of a steam boiler, probably as good an effect would be produced by forcing air down through the hose, with a common force pump or otherwise.—O. S., of N. J.

BLOWING OUT BOILER.—D. & N., query 21, March 9, had better let the water cool in their boiler, and then let it out and wash with cold water. Query 20: They will see that it is not right to wash a hot boiler with cooler water. The consequences might be fracture by irregular contraction.—S. F., of Pa.

ANTS AND MOLES.—Query 20, March 9.—For ants, place a fresh meat bone where the ants can get at it, and they will flock to it in large numbers. When they are on it, dip it in hot water; repeat it a few times and the ants will have disappeared. For moles, dig a hole like a post hole across one of the mole holes, and in the bottom, place some rags previously dipped in sulphur. Set fire to them, and, when once well on fire, cover up close with a board, and the mole hole acts as a pipe. The mole leaves.—A. M., of Ky.

PREPARATION OF NITROGEN.—Professor A. W. Hoffmann, of Berlin, recommends the use of nitrite of ammonia for the preparation of nitrogen gas. It is only necessary to heat this salt when it is decomposed into nitrogen and water, thus:

$$NH_4NO_2 = 2H_2O + 2N.$$

The nitrite of ammonia is very easily prepared from nitrite of potassium and chloride of ammonium. The nitrogen prepared in this way is very nearly pure, the only contamination being a little nitrous oxide, a gas very soluble in cold water.—E. J. H., of —.

TEST FOR NITRIC ACID.—P. C. H., No. 19.—The most delicate test is brucine, which is said to indicate one part of nitric acid in 100,000. One part of brucine is dissolved in 1,000 parts of water. To half a drop of the solution to be tested, add one or two drops of the brucine solution, and from one to five drops concentrated sulphuric acid. Sulphate of aniline will detect one part of nitric acid in 1,000 parts of water. To the solution to be tested, add two drops sulphate of aniline and from two to six drops concentrated sulphuric acid. The ordinary laboratory test is to place, in the test tube containing the solution, a crystal of copperas or sulphate of the protoxide of iron. One or two drops of strong sulphuric acid are then allowed to run down the side of the test tube to the bottom of the liquid; and this sets free the nitric acid, and this in turn oxidizes the iron, forming a dark brown ring or zone.—E. J. H., of —.

ELASTIC CEMENT.—No. 10, March 16.—Dissolve one dram of gutta percha in one ounce or more of bisulphide of carbon, so as to make a fluid that will easily pass through coarse filtering paper. After filtering, add about fifteen grains of pure india rubber, and let it dissolve; or, when it has become soft and gelatinous, quickly rub the whole smooth with a palette knife on a slab. Paint four or more coats of this varnish over and around the hole in your bag, allowing each coat to dry before the application of the next. Treat a piece of fine strong calico in the same way. The last coat on each should be pretty thick, and when nearly dry, apply the patch to the bag, and press evenly and quite firmly together. When at last the whole is supposed to be dry, press with a warm iron, and then paint the surface of the new piece with a coat or two. If nicely done, your bag will be as strong as ever. Chloroform may be used in place of the bisulphide.—E. H. H., of Mass.

FLUID AND LIQUID.—No. 2, March 16.—These are practically synonymous terms, and I would venture the following definitions, even if they appear far fetched: Liquid, a form of matter allowing of perfect mobility of particles or atoms. Fluid: a term whereby we may imagine the perfect mobility of the particles of matter not ordinarily visible. Thus we speak of water as a liquid. But carbonic acid gas we might speak of as a gaseous fluid, since in pouring it from one vessel to another, it may, under certain arrangements, be seen to flow, and comport itself much in the same manner as when pouring water. Its particles are perfectly mobile. We speak metaphorically of the electric fluid, as the term there again conveys to the mind the impression of mobility, and thus its condition in passing along or through a wire. This I give as a popular illustration, not that such a theory is by any means correct. E. H. H., of Mass.

CLEANING DISCOLORED GLASS.—Query 16, March 16.—I have frequently cleaned glass that appeared smoky, when soap, turpentine, alcohol, or scouring with whiting would make no impression on it, by applying dilute nitric acid.—W. G. B., of Mich.

FAST COLORS.—Query 8, No. 12.—A dye of logwood an blue vitriol is made fast by wringing out the goods in a solution of blue vitriol and then plunging in a hot solution of logwood. After sufficient coloring, dry and air the goods one day; wash them in soapsuds until little color escapes; then immerse in cold urine and bring to a boil, leaving the goods to cool in the urine. Remove and wash thoroughly in soapsuds, rinsing in clear cold water. It is of the utmost importance that the goods be absolutely clean before coloring commences.—W. D. P., of Wis.

Declined.

Communications upon the following subjects have been received and examined by the Editor, but their publication is respectfully declined:

ATMOSPHERIC ELECTRICITY.—G. W.
BOILER EXPLOSIONS.—J. M. H.
CANAL BOAT PROPULSION.—
FORCE.—S. H. T.
RIFLES.—G. W. T.
SCIENCE IN THE COURTS.—ALEX.
SHAVING WITH PUMICE STONE.—A. K.—R. B. F.
SMALL POX CURE.—J. H. V.—A. M. L.
SOLAR PHENOMENON.—C. S. M.
SPIRITUALISM.—E. G. J.
THE DAVENPORT BROTHERS.—F. J. I.
WATER WHEEL TESTS.—S. & S.—L. B. A.
ANSWERS TO CORRESPONDENTS.—G. W.—J. E. M.—C. H. W—J. T. B.—L. H. & Co.—L. H. S.—P. D. W.—J. F. A.—J. G. W.—G. A. B.—C. T. T.—D. H. B.—J. L.—C. G.—H. F. R.—J. L. G.—G. & H.—T. H. J.—A. H. N.
NOTES AND QUERIES.—J. A. Y.—S. T. W.—J. D.—C. L.—B—P.—M. C. W.—N. Y.—G. E. P.—S. H. S.—M. P. B.—D. H. B.—P. C.—J. D. J.—J. H. P.—M. S.—C. W. A.—T. V.—Q.—J. G.—F. M. G.—T. H. J.—R. H.—J. K. C.—M. A. R.—W. L. H.—A. H. B.—B. F. A.—W. M. D.

Recent American and Foreign Patents.

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

ATMOSPHERIC ENGINES.—Silas E. Tuttle, of Evansville, Wis.—This invention has for its object to furnish a simple, convenient, and effective atmospheric engine, so constructed that a partial vacuum may be formed in the cylinder by burning the oxygen of the air, causing the piston to be forced forward into said vacuum to make its stroke by atmospheric pressure on the other side of said piston. The two cylinders are open at one end and have numerous holes in the heads at the other ends to allow the air to pass through freely. The pistons work air tight in the cylinders. Valves are so arranged upon a cross bar, actuated by suitable mechanism, that when one of said valves is opened the other will be closed. A reservoir contains alcohol or some other suitable inflammable substance which is led through to the interior of the cylinders near their open ends. Wicks pass through the pipes from the reservoir to the cylinders. The pipes are provided with stop cocks to enable the flow of the inflammable substance through the pipes to be regulated or stopped, as desired. Air pipes, connected with the cylinders, near their open ends, admit air to said cylinders, which are opened and closed by the valves so arranged that one will always be opened as the other is closed. Lamps are placed just below the open ends of the cylinders and as close to them as is possible without having the valves in their movements interfere with the lamps. To the valve rod is attached a lever, to allow the valves to be opened by hand in starting the engine. By this construction, as each valve is opened, the flame from the lamp sets fire to the wick, which forms a vacuum in the cylinders as the valves are closed, and the atmospheric pressure forces the pistons forward alternately, and they thus keep up a constant motion in the shaft.

UPRIGHT PIANO.—Oscar Altenburg, of New York city.—This is an improved arrangement of the case or frame of an upright pianoforte, which consists in hinging the face plate of the top to the case so that it can be folded down, and in providing it with a rib or device for the support of the music when thus folded down. The object of the invention is, first, to allow a convenient and full display of the action and a free escape of the sound waves; also, ready approach to the pins for tuning, and to dispense with the necessity of opening the top of the case, which may be used as a support for various articles.

FENCE.—Albert C. Betts, of Troy, N. Y.—This invention consists of a portable wire fence formed of longitudinal parallel lines and vertical pickets, the wires being fastened to the pickets by staples, and the pickets being placed at such distances apart as to prevent the wires from being forced apart by animals so as to pass through, and not so near as to interfere with rolling the structure thus formed up into a roll for convenience in carrying it from the factory or shop to the place where it is to be set up, or for removing it from place to place. The wires and pickets thus arranged and connected are made in sections of greater or lesser lengths, according to convenience in handling, and secured in position in the field by erecting the pickets upon the ground and fastening the wires or pivots to posts set permanently in the ground, a rod apart or thereabout, the said wires being secured by staples, which may be readily pulled out again to release the wires and pickets when the fence is to be removed. The inventor proposes to secure the wires to the pickets by machinery adapted to secure all the wires to one picket at once, the wires, pickets, and staples being fed or supplied to the machine in regular course, and thus to provide this part of the fence for market at a very cheap rate, so that the only labor required in the field will be the setting of the posts and securing the said wires and pickets thereto. Stakes driven in the ground will answer well for the posts, for the weight of the wires and pickets is not such as to require great strength.

FENCE.—John A. Stone, of Chapel Hill, Texas.—This invention relates to a new fence of very simple construction and claimed to be of great strength and durability. A series of posts is secured in the ground at a depth of eighteen to twenty-four inches, and at distances apart about twelve inches shorter than the rails to be used. The rails are placed obliquely against the fronts and backs of the posts, and so that the ends of the rails between one pair of posts rest on the ends of the rails between the adjoining pairs. After the rails have been placed—say, to about half the hight of the posts—false posts are, by means of wire bands, tied to the true posts, against that face of each with which the rails are in contact. The false posts reach from the ground to the hight to which the rails are to extend, and serve to confine the latter in their positions. After the false posts have been secured, the remaining rails are applied. The height of the fence may be cheaply increased without the use of rails by having one or more strands of wire stretched between or through the posts. Such wire may, however, be dispensed with.

SLED.—John K. Reichert, Lancaster, Ohio.—The invention consists in avoiding the usual mortise in sled runners, which weakens and renders them liable to break, by making the standards, which support the cross-pieces of metal, and providing them with a socket at one end and a bifurcation at the other.

FARE BOX.—John C. Schooley, New York city.—The patentee has contrived a fare box so constructed that not only the valves which prevent escape of the fare shall operate automatically, but the fare itself shall proceed on its course from the first or inspection chamber to a safe deposit chamber whenever the box is lowered or suspended by the handle in the most natural and easy way. When the box is again presented for a fare, the valves swing open as before.

CORN CRIBS OR HOUSES.—Commodore B. Clark, Pleasant Grove, Iowa.—This invention relates to an improvement in corn cribs or houses, intended especially for storing and preserving corn in bulk, and it consists in the peculiar construction of parts when combined in such a manner as to form a crib or house, from which the corn can be taken as desired for use with the greatest facility, and which shall serve to exclude both rain and snow, and noxious or destructive vermin or animals, and yet permit a thorough circulation of air through the body of corn.

CARTRIDGE BOX.—John Miller, U. S. A., Lexington, Ky.—The invention consists in the peculiar construction and arrangement of parts in a cartridge box whereby 40 rounds may be carried with convenience, and 50 in case of emergency, while ready access is always afforded to the single cartridges, and the rattle of screw driver against box is prevented by securing it within the box. This improvement seems to possess decided advantages over its predecessors, and will doubtless be appreciated by those acquainted with military accoutrements.

FENCE.—John McKnight, of Romulus, N. Y.—This is a new arrangement of the supports and fastening devices of a fence, which has for its object to facilitate the putting together of parts and their transportation, and thereby to reduce the expense of putting up a fence. The invention consists in the application to the fence posts of elbow supports for the panels, and in their combination with a face post and bolt for holding the panels in contact with the posts. The posts of the fence are firmly secured in the ground. The panels are made in suitable style and of the necessary or desired lengths. To the lower part of each post is fastened, by a bolt or pin, the upright part of an elbow piece or angle iron. The horizontal part of the angle iron has an aperture for the reception of the tenon formed at the lower end of a false post or face piece. From the upper part of each post projects a horizontal bolt or pin, through a slot in the upper part of the face piece. The ends of the panels are placed upon the angle irons either so as to overlap or abut against each other, and are then confined to the posts by the face pieces. Forked plates are slipped over the bolts in front of the face plates to prevent the bolt heads from cutting into the wood.

TOOL HANDLE FASTENING.—Alanson R. Sweat, of Harlan, Iowa, assignor to himself and B. B. Mastick, of same place.—The object of this invention is to provide ready and convenient means for fastening axes, hatchets, hammers, and similar tools on to handles, so that such tools may be readily removed in case of failure, and so that the handle itself will be greatly strengthened thereby. It consists in a combined key and wedge attached to a head plate. The handle is fitted to the eye of the ax or other tool in the ordinary manner, except that the handle shank is made narrower so that a space is left at the back of the eye for the key. The key the wedge, and the head plate are made in a single piece of metal, and may be forged or swaged and made of malleable iron or other metal. The end of the handle is split in the ordinary manner, and the wedge is driven into the split with the key at the back of the handle. The key projects through the eye, which forms a support to the handle and allows the key and wedge to be driven out with ease. By this method the handle and ax or other tool is readily separated, and the handle may be changed from one tool to another as may be found convenient.

BUCKLE.—Robert F. Russel, of Hazleton, Pa.—This invention relates to buckles for harness and other purposes, where the ordinary tongue buckle cannot be used without annoyance or trouble. It consists in a metallic loop, and a slide, and a ring, constructed, combined, and arranged in a peculiar manner. The adjustment is made by pressing the end of the loop inward, thereby detaching a stop from the slide, and then slipping the slide from the loop, which allows the strap to be adjusted as may be desired. When the strap has been adjusted, the slide is slipped back toward the ring and is caught by a stop lug. The inventor does not limit or confine himself to the precise form or arrangement of the parts described, nor to any particular use or purpose for the buckle, but designs it for all the purposes for which it may be adapted.

GATE.—William H. Phillips, of Staunton, Ind.—As a vehicle approaches this gate, the driver guides the horses in such a way that the wheels may strike against the erect cranks and force them down. This operates mechanism to open the gate, and, at the same time, raises other cranks into an erect position, so that the driver, by guiding the horses so that the wheels of the vehicle may strike the erect cranks at the other side of the gate, may thus close the gate and, at the same time, raise the first named cranks ready for the next vehicle in whichever direction it may be moving.

WATER WHEEL.—Vincent M. Baker, of Preston, Minn.—This invention relates to an improvement in gates and gate mechanism for water wheels; and has for its object, by the improved arrangement, to gain larger spaces for water entrance and avoid unnecessary friction. The invention consists in sinking the gate rings, in a new form of flanged gates, and mode of connecting them, in such manner that the greatest pressure of water shall be on the inner end of the gate. This causes it to open and close more easily than it would if the pivots were placed in the center. The greatest pressure of water, being on the inner ends of the gates when closed, helps to open them, and the draft of water around the wheel when they are open helps to close them. Balls may be placed in a recess for the lower gate ring to rest on, by which the gate move more easily. Two balls may be placed back of the segment that moves the gate rings, to remove the friction by hoisting. The gate thus made with straight inner face, beveled inner end, curved outer end, and with a flange at top and bottom, is claimed to be superior to other gates. On the straight inner face the water is conducted to the wheel in a straight line; hence less friction than there would be if said face was curved. Leakage is prevented by the flanges covering the joints between the rings and ease when the gates are closed.

OYSTER STEAMER.—William A. Jones, Erie, Pa.—This is an improved steamer for steaming oysters, enabling the juice from the oysters to be preserved, so that it may be put back upon them when served. The steamer is made to be placed in the griddle hole of the stove or range, like an ordinary kettle. It supports a vessel inclosed in another vessel which rests on an annular support. Below is a support for a vessel to catch the juice. A perforated plate receives the oysters to be steamed. A funnel shaped band conducts the juice from the oysters to a dish to preserve it, so that it may be poured back upon the oysters when served. The parts may be made large, so as to contain any desired number of sets of the attachments for use in hotels, saloons, etc., where several dishes of steamed oysters may be wanted at a time

TRUSS.—Edmund P. Banning, Jr., New York city, assignor to "Banning Truss and Brace Company," of same place.—This invention relates to a new manner of securing the pad of a truss to the supporting plate, with the object of insuring stability of the pad during the motion of the body. It consists in the combination of a double slotted abdominal plate and a single longitudinally slotted hernia pad, held loosely together by set screws, thereby admitting of a rotary motion of the pad. The body of the patient is thereby enabled full freedom of motion, and will not displace the pad. This improvement is claimed to be of vast importance. It is maintained that it produces an absolute closure of the rupture, where, heretofore, with the ordinary trusses, every motion of the body, nearly, was followed by a greater or less dislocation of the pads.

BACK BRACES.—Edmund P. Banning, Jr., New York city, assignor to "Banning Truss and Brace Company," of same place.—This invention consists in a new arrangement of parts, more particularly in the method of the adjustable application of an up and down adjustable and partly flexible fulcrum for a back brace. The back bone brace is made of a flat spring of proper length, width, and thickness, and sufficiently powerful for the purposes to which it is to be applied. The spring is inclosed in a sheath or covering of suitable fabric. Its upper end carries a pivoted transverse piece of plate, to the ends of which the upper parts of the shoulder straps are secured. The lower ends of these shoulder straps are secured by links, or otherwise, to a short strap projecting from the sheath, or directly to said sheath. The straps contain buckles, or equivalent devices, for being lengthened or shortened, according to the figure of the patient. The upper plates, being pivoted, allow free side motion to the body without affecting the position of the spring. To the lower end of the spring is pivoted another transverse piece or plate, to which the body belt is connected. The pivoting of the piece offers the same advantage as that of the upper plates. The fulcrum of the brace is formed by two small metallic pads or plates, which are, by more or less flexible joints, secured by a transverse bar that slides on the spring. By means of a plate, secured or bolted to the transverse bar, the latter is transformed into a sleeve that embraces the spring, and can be vertically adjusted thereon. The pads can therefore be set up or down at will to fit the small of the back of the patient.

UTERINE SUPPORTER.—Edmund P. Banning, Jr., New York city, assignor to "Banning Truss and Brace Company," of same place.—The object of this invention is to construct a uterine support which will be light, cleanly, and under the complete control of the wearer, and which can be used in cases of anteversion, retroversion, or to relieve the bladder from all pressure by the displacement of the womb, by a reversal of the concave tip. The invention consists, first, in making the stem and spring of one V shaped wire, which, at its outer end, is adjustably connected with the supporting brace, while its inner end sustains a tip of suitable material for the support of the uterus or for its lateral displacement, this tip being concave, and by its reversal made adjustable for both ante and retroversion. The invention also consists in the use of a peculiar concave shaped tip, to be used in cases of anteversion.

VELOCIPEDE.—David Martin, Harrisburgh, Pa.—This invention consists of an arrangement of propelling and steering apparatus for operating a four wheeled carriage by using both hands and feet. The four wheels have each a separate cranked axle, having two bearings inside the wheels upon the top of a T headed vertical arm, of a connecting bar or auxiliary axle, cranked downward to mount the connecting beam and operating gear as low as possible. The connecting beam is rigidly attached to the hind auxiliary axle, and to the front one by a saddle, fifth wheels, and a king bolt. The front cranked axles are each connected to a hand lever, pivoted on the top of a standard, supported on the auxiliary axles, and rising to a suitable hight for being worked by hand by a person in a standing position, or nearly so, above the connecting bar. The double acting connections will, it is believed, cause a more uniform action of the force on the crank than a single connection will. The hind crank axles are connected to the cranked treadles, pivoted to the connecting beam by links, and the treadles extend forward under the seat, and a little in front of it where they have each a foot piece, mounted on a pivot, with a spring under it conveniently for being acted upon by the feet of the operator, partly sitting on the seat and partly standing on the treadles, and at the same time working the hand levers. The carriage is guided by mechanism, actuated by an oscillatory movement of the body. It is believed that a carriage constructed and operated on this plan, by which both the power of the legs and arms can be applied, being made light and with large wheels, may be propelled at a high rate of speed.

FIRE ESCAPE LADDER.—Carl Gustav Buttkereit, Toledo, Iowa.—This ladder is composed of U shaped metallic sections, so connected that each side bar of one section embraces or is coiled around the side bars of the next, which thus allows the ladder to be packed in a small space or extended with great facility. The sections are connected so they can slide on one another, and be contracted into a small space, and a long ladder can be preserved in a box close to a window to be thrown out when needed. The rounds of the ladder are the middle parts of the sections, and may be enlarged, if desired, by having plates or steps secured to them. The ends of each section, coiled around the upright parts of the next section below, may be extended out laterally, to form braces against and keep the ladder a desired distance from the wall. The ladder, if used as a fire escape, can be suspended by a pin from the inner side of the window. This pin may be readily drawn out, after the ladder has been used, by pulling on a cord which is suspended from it. Then, by an extension rod, the ladder may be held up to another window to assist in the escape of others.

LADDER.—George W. Willis, of Atchison, Kansas.—This invention relates to improvement in the class of ladders which are provided with an extensible foot or leg, whereby they are adapted to stand upon inclined or uneven surfaces. The lower end of one of the side bars of the ladder is sawn off, so as to make it shorter than the other. A rod or bar, which may be made tubular, if desired, to combine lightness with strength has upon it a foot, which may be the piece sawn from the side bar. The rod passes through and works up and down in keepers attached to the side of the shorter side bar. The rod has a knob or handle formed upon or attached to its upper end for convenience in raising or lowering it. Upon the outer side of the rod are formed teeth upon which a pawl takes hold to hold the said rod securely in any position in which it may be moved. The pawl is pivoted to lugs formed upon the keeper, and its engaging end is held against the teeth of the rod by a spring. The rod may be kept from turning upon the side bar by flanges or wings attached to it. By this construction the ladder can be readily adjusted to stand firmly upon an uneven or inclined surface.

GOVERNOR.—John S. Warren, of Fishkill-on-the-Hudson, N. Y.—Balls and links move a collar vertically in the governor shaft in the usual way. The collar carries a sleeve which revolves with the governor shaft. To the upper and lower ends of this sleeve are keyed bevel friction gears which act upon a bevel friction gear on the end of a horizontal shaft which controls the water wheel gate. When the speed is accelerated, the lower friction gear acts to close the gate, and when the speed slackens, the upper one opens the gate. When the speed is at the proper rate, neither gear acts.

MINERS' BOOTS AND SHOES.—George Latham and John Burton, of Jeddo Pa.—The miner is compelled to work much on his knees, and to lie on his side during the process of working veins of coal. The toe and the sides of his shoes and boots, if not specially protected, soon wear out. Much of the time the miner is compelled to stand in water which holds mineral substances in solution, which are very destructive to leather. Boots and shoes for such hard service, to be durable, must be made different from those for ordinary wear. To accomplish this the inventors re-inforce the toe by a piece of strong leather sewed with the upper securely to the sole. This piece reaches up over the toe two inches, and extends back on each side, with diminished width, not less than one inch, except at termination, and is strongly secured to the upper. A re-inforce counter piece of sole leather at the heel is sewed with the counter to the heel, extending up in the middle of the heel three inches, more or less, and secured to the counter. A metallic plate is riveted to the counter piece and to the upper over the sewing, which not only makes the connection of the two parts strong, but protects the parts from wear when the miner lies on his side, as he frequently does in working veins of coal. The counter extends in a single piece around the heel, and is sewed and protected by the plate on each side With shoes and boots constructed in this manner, it is claimed, the miner much better prepared for the hard labor which he performs than with coot gear of the ordinary construction.

SPRING BED BOTTOM.—Warret Owen and Stephen Harter, of Pierceton, Ind.—This invention has for its object to furnish an improved spring bed bottom, simple, comfortable, and not liable to get out of order, and so constructed as to be level when supporting the weight of the sleepers, and to tend to rise somewhat in the center when the weight is removed, and thus

side bars, wedges, longitudinal slats, cross bars, wires, or equivalent connections and short longitudinal bars with each other, by which the above named advantages are secured.

GIRDER FOR RAILWAYS.—Richard M. Upjohn, of New York city.—This invention relates to a new form of girders and supports for elevated and other railway tracks. Inverted T beams and channel beams are used, and formed of wrought iron, steel, or any other suitable metal. The channel beams may form one or more stories, according to the purpose or use which the girder is to subserve, and are placed on opposite sides of the vertical part of the T beams, so that the lower flanges of the channel beams rest on and are bolted to the base of the T beams, while their upper flanges are bolted to those of the beams resting on them, and so on. The several opposite channel beams are bolted together through the vertical part of the T beam, so that all are firmly bound together. The girder thus formed may be used in all positions, from a vertical to a horizontal, and for any purpose for which girders are employed, the size and weight of parts being varied to suit the conditions of location, etc. The girder is, however, specially adapted to form a support for the track of an elevated railway. In adapting it to this use, the vertical part of the T beam is extended above the channel beams, so as to form a ridge, and an inverted U shaped rail is laid or fitted on the same, and is bolted to the channel beams and the T beam in a suitable manner. The usual provision of slots is made in each length of girder, to permit the bolts to slide, for the expansion and contraction of the beams. Iron plates or tarred felt, sheet lead, or any other suitable material, for the purpose of preventing the transmission of sound from the girder when cars are passing over the track, may be used.

FUNNEL ATTACHMENT FOR LIQUID MEASURES.—Cornelius C. Jadwin, of Honesdale, Pa.—The inventor constructs liquid measures with a funnel instead of the ordinary lip, so that introducing the nozzle into the mouth of a jug, can, or bottle, the latter may be filled conveniently without employing the common funnel, which is usually more or less covered with fluids of previous delivery, and is likely to soil the hands. The improvement will be found specially adapted to measuring vessels for molasses, oils, varnishes etc.

BOAT DETACHING APPARATUS.—Christian Quaritius, of Canarsie, N. Y.—This invention consists of a detachable connection of the hoisting and lowering pulley block tackle with the boat and stop chains in connection with the detaching bolts for pulling them out when the boat strikes the water, or just before, and a drum with a friction brake in the boat, whereon the bight of the "fall" rope between the pulley tackle is wound for paying off therefrom sufficient rope, under the control of one in the boat, to let it down by the friction brake. It is claimed that this arrangement has the advantage of being entirely under the control of the person in the boat, and the rope pays out alike for both ends, of necessity, so that there is no danger of either end falling before the other. Also, that the complete detachment of the boat is insured. This invention has been patented in several countries in Europe, and is highly commended for safety and simplicity of operation.

BOB SLED.—John Wampach, of Shakopee, Minn.—The tongue and the front beam of the forward bob sled are connected together by a chain, the object of which is to apply the draft directly to the beam instead of through the runners, as heretofore, and to do it in such manner as to allow the runners to vibrate freely as much as required without twisting or cramping the connecting device, as it would be if a rod or any rigidly arranged connection was used. The reach which connects the two bolsters is made in two parts jointed together, so that they may work vertically and horizontally, to allow the bobs to work more freely in running over uneven ground. T bars are used to strengthen the connection of the knee posts with the braces and for further strengthening the knees in the lengthwise direction of the sleds, in which they are exposed to very great strains.

MACHINE FOR CUTTING STAVES.—Adam Cook, of St. Clair Borough, Pa.—This invention consists in the adaptation of an improved cutter to stave machines, by which better means for adjusting the hight of the cutter and securing it in place are attained. There has also been made an improvement in the method of holding the plate which carries the guides to the frame so that this plate may be adjusted nearer to the cutter as the guides wear away. This mode of securing the cutter also admits of its more ready removal than the common mode does.

HEATING STOVE.—William H. Landon, of Princeton, Canada.—This invention consists of a combination of an interior fire shell and a damper with that class of stoves comprised mainly of a horizontal elliptical shell with its major axis in a vertical plane, in such manner as is claimed to greatly economize the heat. It also consists of a novel arrangement of ventilating damper. The stove is composed of two end plates of cast iron, of an oval form, the front one having an extension forming a hearth and ash pit, and near the bottom of the hinder one is an opening for a ventilating damper, and also for removing any ashes which may be deposited within the hot air space. On the inner side of these plates, near their edges, a groove is formed in the casing to receive the outer shell, which is made of Russia or other suitable sheet iron. Within the latter there is another parallel groove, extending about three fourths the distance around the stove, to receive the inner shell or fire plate. The space between the shells, which is called the flame flue, is about two inches, more or less. The inner shell or fire plate commences about the center, vertically, of one side, and, curving downward under the fire chamber, upward along the opposite side, terminates at the center of the top, where it is made, by means of a sharp reverse curve, to touch the outer shell, and also to divide the pipe hole into two equal parts. A semicircular damper is placed here, with its crank shaft lying parallel with and touching the top of the fire plate, outside the pipe. This damper, turned in one direction, closes the direct communication between the fire chamber and smoke pipe, and forces the flame into the flame flue and around the shell. When turned in the other direction, such connection is direct, and a strong draft is obtained for kindling the fire or quickening the combustion. The ventilating damper is cast upon a shoe which fits the curve of the shell, on which it rests, and keeps the damper in position.

FERTILIZER.—James Fox and Andrew Fox, of Avoca, N. Y.—An ordinary farm wagon has one of the wheels provided with a belt rim. A long hopper or trough, such as commonly employed on machinery for sowing plaster, is provided with an agitator, a pulley for driving it by a crank, said pulley being worked by a belt, driven by the rim of the wagon wheel, and the crank being connected with said pulley by means of a disk and a shaft. The trough is suspended from the box of the wagon at the under side between the wheels transversely by means of bails, hooked rods and a cross bar, resting on the top, and extending across it and beyond the sides at each end. The hooked rods pass up through holes in the cross bar, and are held by nuts at the top. The trough is provided with pieces on the top, to be held up snugly against the bottom, for steadying it; or the said pieces may rise up between or outside of the side boards, close to them, as preferred. In addition to the central vertical rods of the agitator, bent V shaped rods work near the surface of the sides of the hopper to prevent the plaster clogging them; the said ends being connected to the said sides at the upper ends, and operated by suitable mechanism. The trough is provided with a slide at the bottom for regulating the feed, said slide being provided with screws for working it.

WINDOW SASH SUPPORTER.—Ralph L. Young, of Topeka, Kansas.—The window frame has boxes on each side. Spiral springs are securely attached to the frame at the top of the boxes at their upper ends, and to guide blocks at their lower ends. The inner portion of the boxes is slotted, and a portion of each of the blocks projects through the inner portion of the boxes and into the sash grooves. This portion engages with the sashes by entering a recess or cavity therein. The outer portion of the boxes is grooved, and the blocks have shoulders by which they are kept in the slots and grooves as the sashes are worked up and down. This arrangement is very simple and cheaply made. The springs are claimed to be much more durable than cords, and they work noiselessly.

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Sash holder, A. and L. L. Griffin ... 124,949
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DESIGNS PATENTED.

5,705 and 5,706.—CARPETS.—M. Blatchford, Halifax, England.
5,707 to 5,719.—CARPETS.—A. Cowell, Kiddermirster, England.
5,720.—CARPET.—J. C. Johnston, Scarborough, N. Y.
5,721 to 5,723.—CARPETS.—H. S. Kerr, Philadelphia, Pa.
5,724.—OIL CLOTH.—J. Meyer, Lansingburgh, N. Y.
5,725 to 5,727.—OIL CLOTHS.—J. H. Park, Burlington, N. J., Byerly Hart, Philadelphia, Pa.
5,728.—TYPE CASE.—A. H. Bailey, Somerville, Mass.
5,729.—TYPE.—C. E. Heyer, West Roxbury, Mass.
5,730.—CLOCK FRONT.—N. Muller, New York city.
5,731.—BIRD CAGE.—G. R. Osborn, B.A. Drayton, New York city.
5,732 and 5,733.—CHANDELIERS.—F. R. Seidensticker, West Meriden, Conn.

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716.—COTTON FABRICS, ETC.—Hamilton Woolen Co., Southbridge, Mass.
717 and 718.—HAIR NETS.—A. G. Jennings, New York city.
719.—SHIRTINGS, ETC.—Langdon Manufacturing Co., Manchester, N. H.
720.—TEA.—E. Pavenstedt & Company, New York city.
721.—ROOFING MATERIAL.—New England Felt Roofing Co., Boston, Mass.

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APPLICATIONS FOR EXTENSIONS.

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

20,635.—REPAIRING CAST IRON CYLINDERS.—S. Falkenbury. June 5, 1872.
20,636.—SEWING MACHINE.—A. F. Johnson. June 5, 1872.
20,571.—DOOR LOCK.—J. R. Marston. May 29, 1872.
20,616.—FURNACE.—G. Bantz. June 5, 1872.
20,678.—RESTORING VULCANIZED RUBBER.—F. Baschnagel. June 5, 1872.
20,369.—PLATE FOR SAFES.—I. S. Cady. July 10, 1872.
20,685.—RIVETING MACHINE.—P. B. Tyler, W. Jones, B. Lathrop. June 5, 1872.
20,679.—VAULT COVER.—E. L. Brown. June 5, 1872.
20,672.—CAR SEAT, ETC.—S. C. Case. June 5, 1872.
20,631.—EVAPORATING PAN.—D. M. Cook. June 5, 1872.
16,537.—POWER LOOM.—A. Smith, H. Skinner. May 6, 1872.

EXTENSIONS GRANTED.

19,638.—FLOATING ANCHOR, ETC.—J. Humphries, Washington, D. C.
19,654.—TRIMMING MACHINE.—M. H. Semple, Lowell, Mass.
19,707.—SPRING TESTING MACHINE.—P. G. Gardiner, New York city
19,626.—PHOTOLITHOGRAPHY.—A. G. Butman, Boston, Mass.
19,619.—PLANING BLIND SLATS.—C. Carlisle, Woodstock, L. Worcester Brattleborough, Vt.
19,644.—SAWING MACHINE.—H. L. Low, Galena, Ill.
19,770.—DOLL'S HEAD.—L. Greiner, Philadelphia, Pa.

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HORSE SHOE.—A. Quinn, Brooklyn, N. Y.
MAGNETIC INDICATOR.—H. Glover, Brooklyn, N. Y.
MAKING NAILS.—M. D. Whipple, Brighton, L. W. Whipple, Boston, Mass.
MALLEABLE CAST IRON.—A. F. Andrews, New Haven, Conn.
ORDNANCE.—N. Thompson, Brooklyn, N. Y.
RAILWAY RAILS.—O. W. N. Yost, Corry, Pa.
REFINING SUGAR.—J. A. Morrell, New York city.
STEEL AND IRON.—Z. S. Durfee, New York city.
TINTING PHOTOGRAPHS.—H. Vander Weyde, O. Sarony, New York city.
TYPE SETTING MACHINE.—J. W. Paige, Rochester, D. Reynolds, Albany, N. Y.

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